

# Carole Collet

## ***Suicidal Textiles: A Nobel Textiles Project.***

When Craft meets Science and Sustainability.

### **Keywords:**

Textiles. Craft. Apoptosis. Science with design. Macramé. Biology. Biomimicry. Nanotechnology. Future. Garden.

### **Introduction**

In this practice-base presentation, I will present and analyse the textile artifacts produced for the Suicidal Textiles collection as part of the Nobel Textiles project showcased at the Institute of Contemporary Art In London In September 2008. Nobel Textiles was the result of a collaboration between the Medical Research Council and Central Saint Martins College; where five Nobel Laureates were paired together with five researchers working in the field of textiles and fashion. This paper will first introduce the rationale behind the Nobel Textiles project, then I will discuss the parallel process between the biological fabrication of life and the man made fabrication of textiles; where traditional craft techniques can become the key connection between science, design and sustainability. Finally, I will explore hypotheses for a sustainable future and question the role of craft and design in the context of forthcoming scientific discoveries.

### ***Science with Design: a New Paradigm for Sustainable Textiles?***

When working in the context of textiles, one navigates perpetually between design, engineering and craft. Influenced very early on by Papanek, Lovelock and Fuller, ecological thinking became a pre-requisite for my design work. More recently, I have explored how life sciences could inform design and provide new approaches to develop fundamentally sustainable solutions.

Investigating both biomimicry principles and biological models soon became a priority when I became familiar with Janine Benyus 's work at the 'Doors of Perception: Flow' conference in 2002. Benyus, referred to as a 'biologist at the design table' (Kenny Ausubel 2004:3), argues that when it comes to designing solutions, nature has a head start of nearly 4 billions years, so why not looking at role models in nature that can become design models for us?

*" Heat, beat and treat has become a de facto slogan for our industrial age, it is the way we synthesise just about everything. Nature, on the other hand, cannot afford to follow this strategy. Life can't put its factory on the edge of town; it has to live where it works. As a result, nature's first trick of the trade is that nature*

*manufactures its materials under life-friendly conditions-in water at room temperature, without harsh chemicals or high pressures.” (Benyus 2002: 97)*

Designing and making textile products, whether at mass manufacturing level on global scale or in a local craft workshop can be extremely damaging to the environment, and therefore to us. Sadly, one of the key issues in textiles, still now, is that a majority of consumers and manufacturers believe that natural means ecological. This is a lingering misunderstanding: using natural fibres and natural dyes is not a valid ecological solution. Natural dyes require the use of heavy mordants, and the growth of conventional cotton is responsible for the use of a quarter of the world's pesticides. These are only two examples on a long list of environmental issues connected to textiles. The past 20 years have seen major developments and improvements, closed loop systems, water treatments, filtering of toxic emissions and the growth of the organic cotton, as well as the introduction of Life Cycle Analysis and more recently the concept of 'upcycling' advocated by Michael Braungart and William McDonough. But there is still a long way to go:

*“The industry that launched the Industrial Revolution has long illustrated some of its most notorious design failures. About one half of the world's wastewater problems are linked to the production of textile goods, and many of the chemicals used to dye and finish fabrics are known to harm human health. Often, the clippings from carpet or fabric mills are so loaded with dangerous chemicals they are handled like toxic waste, while the products made from these materials are considered safe for use in the home.” (Braungart and McDonough 2002)*

So in this context, could biology, the study of living organisms, together with biomimicry, the emulation of nature's principles, become the new formula for sustainable textiles? With this in mind, I embarked on the Nobel Textiles project: to explore nature as a role model and a mentor, not as a raw material or an inspiration as is more common when designing and making textiles.

### ***Nobel Textiles: Suicidal Textiles***

Nobel Textiles evolved out of a conversation with Professor Amanda Fisher, Director of the Clinical Science Centre at the Medical research Council in the UK back in 2007. Biologists often use textiles as a metaphor to communicate science. DNA for instance, is compared to a thread: *“ In every cell of your body you have 2 metres of the stuff: if we were to draw up a scaled up picture of it with the DNA as thick as sawing thread, that cell's worth would be about 200 kilometres long” (Sulston 2002: 15)*

Professor Fisher had the vision to recognize textile design and biology as two languages that could inform and benefit each other. She proposed to pair up Nobel scientists with textile researchers to explore the parallels and cross over between science and design. This was a great opportunity to test out new models for future textiles.

I chose to work with Sir John Sulston who was awarded the Nobel Prize in 2002 with Sydney Brenner and Bob Horvitz, for his work on Programmed Cell Death on the model organism *C.elegans*. I felt there was a connection between the controlling of cell death and the design of obsolescence and was curious to explore this paradigm.

For the final exhibition, I produced "Suicidal Textiles", a collection of sustainable garden textiles and compost furniture inspired by the process of apoptosis in *C.elegans*.

*C.elegans*, a revolutionary model organism

*"Our knowledge of apoptosis we owe in great part to a tiny worm no longer than a millimeter. This little nematode lives in abundance deep in our compost heaps, quietly feeding on the microorganisms that decompose our food. Caenorhabditis elegans is not only common in nature but has become a widely used organism in the scientific world thanks to the foresight of Sydney Brenner."* (McVittie 2008: 14)



*C.elegans*, photo: Carole Collet 2007

When I first started my research for this project I was unaware of the key scientific role that this worm had played. A very common and apparently insignificant nematode is now the focus of hundreds of research labs, and every year international 'worm meetings' take place and scientists report on new medical discoveries enabled by the study of *C.elegans*. I visited Stephen Nurrish Lab at University College London to meet *C.elegans* and to witness the process of cell differentiation. This MRC Lab for Molecular Cell Biology focuses on developing new and more effective anti-depressants and uses *C.elegans* as a model organism. I chose to celebrate this model organism in the form of garden hangings using digital tools and aperiodic repeats (as in DNA) for the printed patterns.



Toile de *C. elegans*, digital design, transfer printed. © Carole Collet 2008.

### **Understanding apoptosis, the science behind 'death':**

At embryonic and growing stage, both plants and multi-organisms generate more cells than they need. Some cells will then naturally commit suicide in order for others to develop. This process of programmed cell death (PCD) effectively acts as a shaping and sculpting tool for all multi-organisms, including humans. What interested me in this principle is the fact that "nature" overproduces cells, then triggers suicidal behaviours to be able to fully complete a healthy specimen. So the way nature 'manufactures products' is by overproducing raw materials which then effectively biodegrade until the final shape of the 'specimen' is achieved. In the context of sustainability and textiles, where minimising resources, maximising efficiency, reducing waste are the key strategic tools, I was suddenly confronted with a very different model.

### **Sir John Sulston and his work**

John Sulston was able to identify the first mutation in a gene that is responsible for a cell to commit suicide. His work shows that apoptosis is an integral part of the normal process of cell differentiation. His research led to the sequencing of the complete genome of the *C.elegans*, the first multi-cellular animal genome to be fully sequenced. He subsequently played a leading role in the decoding of the Human Genome. The understanding of Programmed Cell Death or apoptosis has key medical implications. If this process is malfunctioning, and the balance of cell production is upset (not enough or too many 'suicides') this may result in illnesses such as cancer. Apoptosis is therefore a crucial tool for the 'fabrication of life'.

In one of our conversations, John Sulston explains the process of Programmed Cell Death to me: *C.elegans* grow from egg to adult in three days. In this time 1090 cells are produced, 131 will commit suicide to shape the final worm so that a total of 959 cells remain and form the complete organism. John compared this phenomenon to that of producing 'too much noise' and the elimination of cells becomes a way to sculpt a shape. There is no visible difference between a cell that continues its development and a cell that commits suicide. So to complete the map of cell growth and cell differentiation in the worm, John spent hours on a Nomarski microscope to watch cells growing and dying. By using very simple and colour coded hand drawings, John mapped out the 1090 cells of the worm, one by one.

The paradox of using 'death' as a strategy to fabricate life informed my first design decision. I wanted to use materials that could mimic this suicidal behaviour to shape and sculpt my work. I also chose to design a collection for the garden as a tribute to *C.elegans*. With this project, I posed the following questions: Can scientific biological principles challenge our approach to sustainable design? Can textile craft become the catalyst for new biomimicry design models and sustainable practice?



Sir John Sulston and Carole Collet, December 2007, discussing work in progress.

### **Suicidal Poufs**

The “Suicidal textiles” collection attempts to embed this biological model and relies on using very traditional textiles techniques such as macramé and crochet to mimic cellular development and apoptosis. Where the hand-made fabrication of each knot symbolizes cellular growth, the use of natural biodegradable fibres metaphorically embodies the cells destined to die. The core of the pouf is made of knotted nylon ropes and will endure outdoor conditions over a long period of time, whilst the knotted abaca, jute and sisal fibres will biodegrade over a few years to reveal the final shape of a pouf. This process also visualises the composting activity going on inside the pouf, which in turn feeds *C.elegans* living on decomposing matter. The combination of natural (biodegradable) and synthetic (non biodegradable) fibers is also carefully controlled through colour coordination. It is sometimes difficult to differentiate one from the other when both the nylon and the sisal have been dyed the same colour. This resonates with cellular development where it is not possible to distinguish cells that grow and cells that commit suicide until the later get the genetically pre-programmed signal to decompose. The use of macramé as a traditional craft was a deliberate choice to represent the real time of cell fabrication in nature. The slow process of making knots one by one echoed the rhythm of ‘life manufacturing’. As such, the traditional craft of macramé became the catalyst for a biomimicry design model.



Suicidal Pouf series, © Carole Collet 2008, photo: Simon Denton



Suicidal Pouf, © Carole Collet 2008, photo: Carole Collet.

But whereas it takes 3 days for *C.elegans* to become fully developed, it will take a few years for the suicidal poufs to evolve into their final form. Whilst the garden furniture is performing a dual function of vegetal composting bin and sitting pouf device, they will evolve with the seasons, and will be dependant on weather conditions to biodegrade at a faster or slower rate.

The suicidal pouf collection is a metaphor for a scientific process. Mimicking the natural apoptosis process and following a biomimicry principle was the main emphasis here. As such, it answers the brief to communicate a scientific principle through textiles, which was the prime objective of the Nobel Textiles project. However the limitations of this work lies in the sustainable potential of the project. The process of fabrication does not control the trigger that will start the decaying phase; environmental and unpredictable weather conditions are in charge here. In *C.elegans*, a gene will send a signal to a cell, which will execute the code by performing suicide. It is a pre-programmed, genetically controlled system. To achieve this in textiles I would need to collaborate with a biologist to replicate and control the chemical signal in the fibre. The next step of my research is to combine both biomimicry and biology to achieve a fundamental sustainable textile output. Nature is the best craft-maker, and we have a long way to go before to reach such creative sustainable intelligence. But where does that leave us designers and makers?

## ***The making of things in the century to come***

To design for a better sustainable future implies a better appreciation of nature and our relation to our environment. Policy makers, designers, manufacturers, technologists and consumers cannot do it alone. There needs to be a convergence of systems, an interdependence of research fields. Science, I believe will enable the next design revolution and allow for a new way of making things. So will scientists become designers? Will materials become machines? What becomes of the craft-maker and the designer in this context?

The conception of craft as perceived at the end of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> by Ruskin and Morris promotes the value of making things that celebrates the mastery of difficult skills, and the *"intricate, delicate sensibilities awakened in us by objects"* (Hara 2007:417). A craft maker performed highly technical transformations of natural materials, but retained a close connection with nature. On the contrary mass production and the fast mechanic of making products undermined nature by treating it as the source of limitless raw materials, without the need to be accountable. As if the human specie was separate from nature.

In the past 20 years we have started to shift our understanding of how we should or could relate to our planet. Overpopulation and climate change for instance have become a real threat that we will have to deal with in our lifetime. But I believe that we cannot go back to the romantic vision of the Arts and Crafts. Nor should we be condemned to adopt a modernist aesthetic void of decoration and patterns. Our social and economic context is simply too different. So what could be another way to relate to nature, if not to learn how to fabricate, recycle and consume like natural ecosystems by using our technological knowledge? Some say that we now live in the information and digital age, but I also believe we have entered the biological era. After all, we are all digital, not analogue: biological data is digital. *"This is the truly remarkable outcome of knowing the structure of DNA - not the helical form itself, but the confirmation that the instruction for making a life form one to the next is digital not analogue"* (Sulston, Ferry 2003: 24)

The discovery of DNA and its implications are still to be unraveled, and designers need to become involved in this process. Scientists are now able to delegate the fabrication of engines and matter to nature itself. *"To have any hope of understanding our future, we must understand the consequences of assemblers, disassemblers, and nanocomputers. They promise to bring changes as profound as the industrial revolution, antibiotics, and nuclear weapons all rolled up in one massive breakthrough."* (Drexler 2004: chapter 4)

In 2007, BBC news reported that scientists at the University of Edinburgh had designed a molecule that performs like a small engine. *"Led by Professor David Leigh the team from Edinburgh have designed and built a molecule, known as a rotaxane, that can move and sort particles."* Last month the Weizmann Institute in Israel announced that they produced strands of DNA designed to give off a green light corresponding to "yes", thus moving on further the potential of DNA computing. (BBC news web archive 2007, 2009)

Perhaps more related to textiles, the engineering of spider silk protein in the tobacco plant is now on the horizon and the field of synthetic biology promises not only new materials but also new systems of productions. (Scheller 2001)

Nanotechnology, genetic engineering and biotechnology have become mainstream terms. But too often technologists leave the craft-makers and the designers out. But what happens when the fields of design and biotechnologies merge together? When molecules become machines and proteins become tools, how will we design for our everyday life?

*"A craftsman in a job shop can keep tools in plain sight; working with them every day makes them familiar to his eyes, hands, and mind. He gets to know their abilities naturally, and can put this knowledge to immediate creative use. But people - like us - who have to understand the future face a greater challenge, because the future's tools exist now only as ideas and as possibilities implicit in natural law. These tools neither hang on the wall nor impress themselves on the mind through sight and sound and touch - nor will they, until they exist as hardware. In the coming years of preparation only study, imagination, and thought can make their abilities real to the mind."* (Drexler 2004: chapter 2)

There are two key issues that designers must engage with when working across biology and nanotechnology. First of all, the danger of combining design and technology is that there seem to be a constant search for novelty for the sake of novelty. The media hype around anything that embeds technological innovation can be misleading for the design agenda. The role of the designer is to imagine and create new dreams: *"Design is not the act of amazing an audience with the novelty of forms or materials; it is the originality that repeatedly extracts outstanding ideas from the crevices of the very commonness of everyday life."* (Hara 2007: 435). I believe that if the imaginary of our future rests in the hands of the scientists and is only driven by technological innovations, we risk forgetting about our human needs for aesthetics and poetics.

The second key issue, and one that is much more difficult to assess is that of ethics. The designer 's role is also to question and interrogate the socio-economic and technological context of the time as well as the consequences of our lifestyles and discoveries. As such designers together with scientists must investigate the ethical consequences of manipulating atoms and proteins. Genetic pollution and the control of new nano-particles must be addressed or we would be failing our dream of a sustainable world.

### ***So what next?***

Over the past centuries, we have changed our perception and use of the natural world. From nature as an inspiration and a metaphor, to nature as a limitless resource, then a model and a mentor, will we soon use nature as a tooling machine for craft-makers and designers? Will the field of science merge with the arts? How do we regain control and perspective of what we can create without endangering further our planet? In the quest for new models of design and the emergence of new scientific fields, one needs to remain equipped with a key skill: that of knowing how to ask the right questions which take into account human needs on a short, medium and long term future. The role of craft as a catalyst for the application of biomimicry principles is one model amongst others, but we need to acknowledge that the interdependence of arts, crafts and science will be crucial for the future to come. As Mae Jemison argues: *"Science provides an understanding of a universal experience*

*and the arts provide a universal understanding of a personal experience.”* (Mae Jemison, astronaut, TED talks 2009)

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For more visual references related to the Suicidal Textiles Collection please see:

<http://www.carolecollet.com>

<http://www.nobeltextiles.co.uk>