

Textile Futures Responsibilities

紡織的未來及責任

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本文論述現時看待紡織的方式，以及倫敦藝術大學（University of Arts London）旗下紡織未來研究中心（Textile Futures Research Centre）一眾研究員的責任。紡織未來研究中心由中央聖馬丁藝術與設計學院（Central Saint Martins College of Art and Design）和切爾西藝術與設計學院（Chelsea College of Art and Design）共同成立，專門研究紡織設計。研究中心設有兩位總監、五位首席研究員和六位副研究員，並招收六位博士班學生進行指導。研究中心源起自 2007 年成立的紡織未來研究小組，當時研究小組希望在倫敦藝術大學內建立關於創作實踐的新群體。研究中心的所有成員都從藝術和設計的脈絡發展自己的研究項目，而非以自身的紡織技術或人文研究訓練出發。關於今次演說的背景，重要的是倫敦藝術大學沒有配備媲美工程學院的高科技紡織實驗室。因此，中心全體研究員為了革新紡織生產，都謀求與外面的夥伴合作，希望通過未來設計方案、社區參與、原材料開發，研發新的重要紡織技術。紡織未來研究中心目前有三個研究平台：

循環轉化與紡織環境設計（TED）：推動可持續發展的時裝紡織品生產和設計方法，研究如何就循環經濟而設計。

都市布料：研究物料與社會的關聯，以研發回應社會需要的紡織品，處理和推廣本地擁有權的概念。

Urban Fabric, investigating the connection between materials and society to develop socio-responsive textile solutions that are empathetic and promote local ownership.

Weaving Futures, exploring research and development of 3D, surface and e-textile, innovative studio and industrial jacquard weaving methods in collaboration with industry.

Central Saint Martins also has the **Design and Living Systems LAB**, led by Professor Carole Collet, pioneering innovative ecological design and fabrication models working with both existing 'natural nature' and a new 'programmable nature'.

Anne Marr

This essay will portray and discuss current approaches to textiles and responsibility by different researchers from the Textile Future Research Centre (TFRC) based at the University of the Arts London (UAL). TFRC is a centre for textile design research which spans across Chelsea College and Central Saint Martins (CSM). It consists of two directors, five lead researchers and six associate researchers as well as providing supervision for six PhD candidates. The centre emerged from the Textile Futures Research Group which was originally founded in 2007 to establish a new community of practice across the UAL. All TFRC members have developed their research from an art and design context, rather than being trained in textile technology or humanities research. In the context of this presentation it is important to note that the University of the Arts is not equipped with the high tech textile laboratory of the calibre of a large engineering faculty. In order to innovate new textile outcomes, TFRC researchers seek collaborations with external partners as well as developing new critical textile approaches through future design scenarios, community engagement and material prototyping. There are currently three TFRC research platforms:

Circular Transitions and TED, developing sustainable fashion textile production and design methods, investigating how to design for a circular economy.

What is Responsible Textile Design?

Textiles, women and technology have been intrinsically linked for many decades: impacting on economics, the environment as well as rapid social change, bringing about new advances but also creating new challenges and responsibilities. For example, during the Industrial Revolution new steam-powered looms enhanced the production times of fabrics, whilst impacting dramatically on the environment as well as on industrial working conditions and a drop in demand for traditional textile craft skills.

At the turn of the 20th century female consumers were already embracing new "smart" textiles such as electric corsets and radioactive ski wear which were hailed for their medical benefits at that time. In the 1920s the role of women in textiles changed from producer to developer and saw German Bauhaus designers Anni Albers as well as French designer Sonia Delaunay 'in the driving seat' – designing new materials and pioneering technologies. Over the past twenty years new digital and smart technologies as well as bio technologies and future crafts have all led to rapid changes in textile production and as a result raised new questions about the responsibilities of designers.

Sadly the textile industry today has become unsustainable: Western consumers buy 60% more clothing today than ten years ago (Dean 2014). By 2019 there is projected to be 35.4 billion pounds of annual textile waste (Takruri 2015). At the same time 17-20 % of all industrial water pollution comes from the textile industry (Delgado 2015) and the list goes on. Today humanity uses the equivalent of 1.6 planets to provide the resources we absorb (Global Footprintnetwork 2016). This means it now takes the Earth one year and six months to regenerate what we use in a year. Our planet is already in crisis and textile responsibility must address urgent questions about the actions caused by inventing and producing textile materials and new making processes. Therefore we must ask difficult questions, addressing our textile responsibilities:

編織未來：與業界合作，探討和開發立體紡織、平面紡織、電子紡織、創意工作室、工業提花編織等各種技術。

中央聖馬丁藝術與設計學院設有由卡羅爾·科萊教授（Professor Carole Collet）領導的「設計與生活系統實驗室」，提倡利用原有的「自然界特性」和全新的「可編程大自然」，發展創新的生態設計和組裝模型。

何謂「負責任的紡織品設計」？

多年來，紡織、女性、科技三者之間有着千絲萬縷的關係：能夠影響經濟、環境，以及瞬息萬變的社會，所帶來的不僅是進步和發展，更引發前所未有的挑戰和責任。例如工業大革命期間，新出現的蒸氣織機加快了生產布料的速度，為環境和工業生產帶來的沖擊，令傳統紡織技藝的需求顯著下降。

二十世紀初，女性消費者已開始採用新式「智能」紡織品，例如當年認為有醫療效用的電熱胸衣和放射性滑雪裝束。1920年代，女性於紡織品的角色由生產者變成研發者，當時有德國包浩斯設計師安妮·亞伯斯（Anni Albers）和法國設計師索尼雅·德勞內（Sonia Delaunay）「航領業界」—設計新物料，開拓科技。過去二十年，新的數碼智能技術、生物科技、未來工藝創作者都為紡織品生產帶來急劇變化，同時就設計者的責任提出新問題。

可悲的是現今紡織業已經不可持續發展：相比於十年前，西方消費者所購買的衣服，多了六成（丁潔絲，2014），而預料 2019 年年底前，每年將會棄置 354 億磅紡織廢料（Takruri，2015）。同一時間，百分之十七至二十的工業污水來自紡織業（Delgado，2015），有關數字不勝枚舉。今天，人類需要相當於 1.6 個地球的資源才能滿足所需（全球足跡網絡，2016），即是每年花掉的資源，地球就需要一年半時間才可以補充過來。地球正面臨危機，紡織界必須承擔責任，解決污染和浪費等逼切問題，製造新紡織物料，革新生產程序。因此，我們必須帶出具有爭論的議題，以正視紡織界的責任：

What actions are the material and making processes responsible for?

What kind of cultural and ethical information does this material stand for?

Sustainable design responsibilities can only be successful if they holistically address the following parameter: environmental, economic and social impact. More specifically sustainable textile design needs to look at:

Whether materials cause harm to the environment or to the body?

How does their production and distribution affect the new economic opportunities as well as enhancing human skills and abilities?

How do they promote well-being for diverse future communities?

The status quo is deeply rooted in our economic distribution systems. Sustainable Fashion pioneer Kate Fletcher observes: 'The domination of consumerist fashion (...) means that alternatives are squeezed out. Other options seem unworkable (...) because cultural conditions create desire for the current set up and alternatives from outside (...) appear inferior, impractical and unattractive.'(2012) At TFRC we are applying holistic design research approaches and are developing responsive textiles thorough multiple lenses. As a result we are including a much wider pool of stakeholders before, during and after the design process. We collaborate with other creative disciplines and involve scientists, manufacturers, engineers, retailers, psychologists, local communities, politicians and journalists to drive innovation.

物料和生產程序會引致甚麼後果？這種物料帶有怎樣的文化和道德訊息？

只有全面處理為環境、經濟，和社會所帶來的影響，才能真正履行可持續發展的設計責任。具體來說，要做到可持續發展的紡織品設計，需要考慮：

物料對環境或人體有害嗎？

生產和運送物料如何帶動新興經濟？怎樣提高技術和人力？

物料以後如何促進不同群體的福祉？

目前的設計和生產狀況，深深植根於經濟分配制度。提倡時裝可持續發展的先驅凱特·傅萊徹 (Kate Fletcher) 認為：「消費至上的價值觀支配時裝界……意味着替代品被排除在外，其他選擇也不太可行……由於文化環境製造對現存體制的渴求，外來替代品……顯得較為次等、空洞、乏味。」(2012) 紡織未來研究中心正採用全面的設計研究方式，從多個角度研發響應式紡織品，所以於設計期間和之後，我們也比以往加入更多持份者。例如研究中心會與不同的創意學科合作，並讓科學家、生產商、工程師、零售商、心理學家、本地團體、從政者、記者等各界人士參與研發，推動創新研究。

紡織環境設計 (TED) 研究小組/ 循環轉化研究平台由麗貝嘉·姆莉教授 (Professor Rebecca Earley) 和凱特·高茲沃斯教授 (Professor Kate Goldsworthy) 主導，發展出「TED

十大原則」猶如構思設計的工具，帶領研究小組處理「為循環再生而設計」到「設計行動主義」等複雜的可持續發展議題。

TED 研究小組目前正研究如何就循環經濟進行設計，開展了由瑞典政府資助的研究項目「Mistra 未來時裝計劃」(Mistra Future Fashion Project)，探討短期流行的衣服相對於耐用衣服的潛力。項目會構想設計原型、建議、指引、工具等，研究如何在講求速度的同時，亦可循環原則而設計，以推動更能持續發展的循環供應鏈，制定計策以鼓勵有利可持續發展的用家習慣，增加用家參與和可持續消費的機會。新時代下紡織品設計師要搭建溝通的橋樑，集結供應鏈上的不同細線，促成物料完全循環再用的機制。而另一個研究項目「垃圾換現金」(Trash-2-Cash) 中，研究團隊則直接與北歐成品生產商合作，利用廢紙和聚酯纖維廢料，開發零廢棄紡織品和布料纖維，希望可以更有效運用廢料，也為減少堆填區廢物出一分力。

編織未來是編織未來下的其中一個研究項目，以菲莉帕·布羅克 (Philippa Brock) 為首。布羅克與業界夥伴合作，通過研究和試驗，延伸工業編織程序和設備的界限，創造新知識和生產方法。她主理的立體數碼提花紡織研究，發掘布料加工程序的潛力，例如在織機編織布料時直接打摺和繡花，減少生產布料的製作階段，擴展更能夠持續發展的工業生產線。

The Textiles Environment Design (TED) / Circular Transitions research platform, led by Professors Becky Early and Kate Goldsworthy, has developed **TED's Ten** – a generic tool box operating around ten strategies to navigate the complexity of sustainable issues ranging from "Design for Cyclability" to "Design Activism".

TED currently investigates how to design for a circular economy by exploring the potential for short-life versus long-life garments in the **Mistra Future Fashion Project**, funded by the Swedish Government. The project will include the development of prototypes, recommendations, guidelines and tools for how to design for circularity within a context of speed. It promotes a more sustainable circular supply chain, as well as devising strategies to encourage sustainable user behaviour and increase user engagement and sustainable consumption. New here is the role of the textile designer as a communicator to bring together different strands from the supply chain in order to contribute to the overall vision of closing the material loop. In **Trash To Cash** the TED team is working directly with Nordic end-product manufacturers in order to develop Zero-Waste textiles and fibres by utilising

paper and polyester waste materials. The project's aim is to encourage better waste utilisation and be instrumental in the reduction of landfill waste.

Weaving Futures is a TFRC research area led by Philippa Brock. Working in collaboration with industry partners, Brock creates new knowledge and methods through the investigation, testing and extending the boundaries of the industrial weaving processes and equipment. Brock's innovative 3D digital jacquard research explores the capacity to create finishing processes such as pleating and embroidery directly through the weaving process on the loom. This reduces the number of manufacturing stages involved in the creation of a fabric – enhancing a more sustainable industrial production line.

In Nobel Textiles Brock responded to Sir Aaron Klug's scientific findings on self-assembling structures – marrying scientific discovery to weave design.

Her latest project: Series 1580, Palimpsest explores woven 3D structures enhanced through lasercutting.



Fig. 1
Co-designing with the Women of Hebron at Central Saint Martins
在英國中央聖馬丁藝術與設計學院與希伯倫婦女一起設計

在「諾貝爾紡織品計劃」(Nobel Textiles)中，布羅克與化學家兼生物物理學家阿龍·克盧格爵士(Sir Aaron Klug)配成一組，回應克盧格關於自行排組粒子結構的科學研究，將科學發現融入編織設計。她的最新項目「系列之1580·覆寫本」(Series 1580, Palimpsest)探究運用雷射剪裁，增加紡織立體結構的形式。

都市布料是由安妮·馬爾(Anne Marr)主導的研究領域，力主探索新物料和生產程序，同時強調公共空間和社區參與。因為城市的人文風景是日常生活的介面，所以能夠對物質資源和社群福祉有重大影響。都市的面貌可以展示文化資本，創造有意義的本土連繫，讓居民於社會和經濟上增權益能。因此，研究目的是以設計介入生活，帶來正面影響，諸如：

- 任用「參與式設計」，鼓勵協同設計，探究設計擁有權
- 加強「利社會交流」，提升歸屬感，增加居民文化資本
- 製造可持續發展的都市環境，以開發響應人為建設的物料促進幸福生活

「六紋帶」(Six Branch)是中央聖馬丁藝術與設計學院的紡織設計學士課程學生與非牟利合作社「希伯倫婦女」合作的項目。「希伯倫婦女」是活躍於巴勒斯坦希伯倫地

區的手工藝團體，有一百二十名刺繡女工，旨在為當地婦女提供以手藝賺錢養家的機會。「六紋帶」由「希伯倫婦女」創會幹事娜娃·莎勒米婭(Nawal Slemiah)和紡織未來研究中心研究員琳達·佛羅倫斯(Linda Florence)共同發起，二人都盼望為「希伯倫婦女」尋找製作和銷售的新機遇。而「六紋帶」就是通過紡織設計進行文化交流的平台，表揚傳統刺繡工藝，鼓勵跨區域協同設計。

The **Urban Fabric** research area is led by Anne Marr explores new materials and processes with an emphasis on public spaces and community engagement. City surfaces are the interface of our daily life and therefore impact greatly on sustaining material resources as well as community wellbeing. Urban surfaces can communicate cultural capital to create meaningful local connections and social and economic empowerment for residents. The aim is to make a positive impact through design interventions such as:

- stimulating **co-design** and investigating design ownership through **participatory design**
- enhancing **pro-social interaction** promoting a sense of belonging and increasing the **cultural capital** of residents
- Creating **sustainable** urban environments and enhancing **wellbeing** through responsive surface materials.

Six Branch is a collaboration between BA Textile Design students from Central Saint Martins and the Women in Hebron, a collective of 120 embroiderers based in the Hebron area of Palestine. The collective offers vital opportunities for local women to generate their own income whilst raising a family. The Six Branch project was initiated

The development of new ideas started as an open dialogue — with Slemiah travelling to London to introduce the students and staff to the narrative of existing textile patterns and explain specific working methods. Originally it was planned that London tutors would also travel to Palestine — however due to the politically uncertain situation in the region the visits had to be postponed. Instead Slemiah has visited London four times and her team has taken part in skype calls with students to discuss the development of the work. The students created storyboards and colour palettes inspired by traditional Palestinian patterns and the design process was shared using collage, drawing and stitch. The project uses social media technology such as Skype and Facebook chat as a means to bring makers and designers together in order to enable co-design. (Fig. 1) Each side learned about the cultural, political and economic situation of their counterpart, creating a peaceful message about cultural exchange and shared responsibilities. Currently five new Hebron interior products have been developed and will be for sale in 2017, promoting cultural understanding through embroidery.

Material Boundaries is a project lead by Rebecca Hoyes and Anne Marr exploring where textiles end and ceramics begin. (Fig. 2) This led to a collection of new hybrid materials and a series of spatially applied textile

製造商和設計師進行協同設計，並互相了解兩地的文化、

「六紋帶」的意念發展由開放式對話展開—莎勒米婭率前往倫敦，為聖馬丁的學生和教職員介紹現行的紡織模式，並解釋具體的生產方法。原定計劃是倫敦的導師也會到巴勒斯坦交流，但基於當地政局不明朗，故決定將行程延期。期間莎勒米婭先後到過倫敦四次，她的團隊也經常與學生用 Skype 通話，討論合作進展。學生又從傳統的巴勒斯坦圖案中得到靈感，創作故事板和調色板，而拼貼、繪圖、縫紉都是設計過程的一部分。項目利用 Skype 和 Facebook chat 等社交媒體為交流工具，(Fig. 1) 讓兩地

Fig. 2
Hybrid Knots Prototype 03 by Rebecca Hoyes and Anne Marr
Rebecca Hoyes 與安妮·馬爾共創的混合結原型



design outcomes. The project brings together recent material innovations such as Kevlar, silica and basalt yarns and bonds them with sustainable once fired clay. All textile materials were selected on their qualities of surviving 1000C during the kiln firing, leading to many failed experiments but eventually also to new textiles, which combine both soft and hard qualities. A systematic combination of processes and materials eventually led to new semi-flexible ceramic-textiles. Possible outcomes include playful hybrid knots and prototypes for external urban use. This project illustrates the responsibility of textiles to constantly invite open-ended research to *unlearn* existing knowledge and risk failure. Tacit textile knowledge is built through active engagement with materials and there is a need for designers to acquire material knowledge through direct handling and experimentation. Interdisciplinary collaborations bring opportunities to develop new sustainable material qualities as well as re-applying and preserving craft techniques to stimulate their potential for future technologies and craft innovation.

The **Design and Living Systems Lab (DLS Lab)** was set up by Professor Carole Collet in 2014 to explore biological sciences through design to grow new design propositions that could facilitate the transition to the 'one planet living' (Bioregional 2003).

Collet's Biolace project explores the possibilities for new knowledge emerging from synthetic biology and the potential for future textile fabrication. Her 'Reprogrammed Nature' approach focuses on the reprogramming of living organisms to grow tailored and customised 'biosynthetic' materials. **Biolace** explores the advantage of biological systems in terms of zero waste, minimum use of energy and materials – programming and engineering living organisms to grow tailored materials. Her speculative design scenarios transport us

政治、經濟狀況，帶出文化交流和承擔共同責任的和平訊息。現在「六紋帶」新發展了五種希伯崙的室內產品，準備在 2017 年推出市場，以刺繡增進文化理解。

「物料界限」(Material Boundaries) 是由麗貝嘉·海茲 (Rebecca Hoyes) 和安妮·馬爾負責的研究項目，以探索陶瓷從何而起、紡織從何而終為目的，(Fig. 2) 因而研發出一系列新的混合物料和應用於空間上的紡織設計。項目利用克維拉纖維、矽石、玄武岩玻璃線等各種近年的革新物料，結合可持續發展的耐火陶土進行試驗，所選用的紡織物料都能承受攝氏一千度的窯火，儘管很多試驗都失敗收場，但最終也製作出特性軟硬兼備的新纖維。研究將不同程序和物料有系統地組合，終於生產出新的半柔性陶瓷纖維，並可製作成具玩味的混合繩結和織品模型等適合城市人的產品。項目表明了紡織品也能負起不斷開放式研究的責任，冒着失敗的風險，忘掉現有的知識。內隱的紡織知識是建立於積極的物料試驗，設計師需要直接處理物料，進行實驗，才可以實際理解物料。跨學科合作提供機會研發可持續發展物料的新特性，保存和重新應用工藝技術，激發物料成為未來科技和革新工藝的潛力。

「設計與生活系統實驗室」(Design and Living Systems Lab, 簡稱 DLS Lab) 由卡羅爾·科萊教授 (Professor Carole Collet) 於 2014 年創立，用設計探索生物科學，提出各種設計新主張，促進社會轉變至「共享地球的生活態度」(BioRegional, 2003)。

科萊的項目「生物花邊」於合成生物學發掘新知識，發展未來製作紡織品的潛力。「為大自然重新編程」的做法是集中於為生物再次編程，培育成度身定制的「生物合成」物料。「生物花邊」就零廢棄、使用最低能源，和最少物料等方向，探討生物系統的優勢—為生物設計和編寫程式，栽種出特定的物料。科萊的設計方案從理論預測未來，帶大家預想 2050 年的紡織生產，工廠會重新設計，能夠同時生產紡織品和食品。項目已成功栽培「黑草莓」，融合生產食物和衣飾製作，生產出可用於時裝業的「生物製造」花邊鬚根。(Fig. 3)

「菌絲橡膠」(2016) 探討如何以大自然為好幫手：集中與真菌菌絲等生物協調合作，讓菌絲「自然地」自動組織橡膠物料。

into the year 2050, where plants are re-engineered to grow textiles and food at the same time. With Strawberry Noir, food production is combined with the growth of 'bio-manufactured' lace roots for the fashion industry. (Fig. 3)

Mycelium Rubber (2016) explores Nature as a co-worker: here the focus is on collaborating with living organisms such mycelium fungi to 'naturally' fabricate self-patterned rubber materials.

In **Future Hybrids**, Collet has re-imagined future fur production with the help of fungi – using nature as a model translating natural behaviours and principles into product conceptualisation and production.



Fig. 3
Carole Collet's Strawberry Noir produces black strawberries and black lace doilies
Carole Collet 作品《Strawberry Noir》的黑草莓和黑蕾絲布

科萊又於另一個項目「未來集合體」中，利用真菌重新定義未來的毛皮生產—以大自然為模型，將自然界的習性和法則，轉化到產品構思和生產上。

創立「設計與生活系統實驗室」是為了探索目前新興生物革命的潛力，於操縱基因和合成生物學等模糊不清的科技範疇上，鼓勵重估設計的地位和可能。

結論

要預測甚麼科技變革對人類裨益最大，甚麼改變會顛覆社會，殊不容易。

現在談及承擔責任便必須無所不包，才可以構想出合乎情理的新穎方法，處理傳承未來的社會、經濟，和可持續發展之間，既複雜的共存關係。

紡織未來研究中心的成員，擁抱新科技，也樂於肩負責任，探究重要而合乎道德的知識，思考如何最有效運用紡織技術，並確保可以傳承下去。

understanding of how best to apply textiles and ensure they can contribute to shaping a truly inheritable future.

The DLS Lab explores the potential of the current emerging biological revolution and promotes a re-evaluation of the position and potential of design in an area of technological ambiguity such as gene-manipulation and synthetic biology.

Conclusion

It is difficult to predict exactly which technological changes will be most beneficial and which will be disruptive.

Responsibility today can only be all-inclusive in order to develop a sensible and innovative approach to address the complex interrelationship between inheritable social, economic and sustainable futures.

At TFRC we embrace new technologies and we embrace the responsibility to develop a critical and ethical

understanding of how best to apply textiles and ensure they can contribute to shaping a truly inheritable future.

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Anne Marr is currently the Course Leader for the BA of Textile Design at Central Saint Martins, as well as Deputy Director of the Textile Future Research Centre (TFRC), both based at the University of the Arts London.

Marr's research is based around the socio-cultural context of textiles, particularly the area of Urban Fabric, exploring understandings and boundaries of different textile-based approaches to respond to societal or urban needs and to create more empathetic communities.

Recent projects such as 'Threads and Yarns', supported by the Wellcome Trust, investigate the connection between materials and society in order to develop sustainable socio-responsive textiles that empathise with urban experiences and promote local ownership and community engagement. In her work, Marr aims to stimulate social innovation as well as push the boundaries of pattern and material design. In her latest collaboration with designer Rebecca Hoyes, Marr is developing new hybrid material research – combining soft textile properties with hard ceramic qualities and new kiln-based finishing techniques such as textile glazing.

安妮·馬爾是倫敦藝術大學中央聖馬丁藝術與設計學院紡織品設計系學士課程系主任及紡織未來研究中心副總監。

馬爾從社會文化的背景研究紡織業，尤其是「城市結構」(Urban Fabric) 的範疇，她探索以紡織為本的不同方法如何回應社會和城市的需要，以及創造更具人情味的社區環境，以及這些方法的概念和界限。

她最新的創作項目包括英國惠康基金會支持的「Threads and Yarns」，內容是探討物質與社會之間的連繫，從中發展可持續、具社會責任的紡織業，須與城市生活息息相關，並推廣本地擁有權及社區參與。其工作目標是推動社會創新，並突破圖案及物料設計的界限。她最近與設計師 Rebecca Hoyes 合作，研發新型混合材料，結合織物的軟質感和瓷器的硬度，以及織物上釉等需在窯中完成的新裝飾技術。

