RAE 2020

Lucent Cloth

Jeanne Tan
PolyU-UoA 38c

Lucent Cloth

Descriptor (300 words)

Lucent Cloth comprises of 20 illuminative Polymeric Optical Fibre (POF) textiles from 4 design collections developed between 2014 to 2018. The collections are entitled, Dimensional Illumination, Crafting Photonics, Sensory Light and Carrara.

Early research on POF textiles focused on the use of POFs as flexible screens thus prototypes are often possess a flat surface and a stiff handle. The integral characteristics of POFs are fragile and susceptible to breakages when abruptly bent. Existing designs and POFs tend to utilize a plain weave to develop textiles that are flat to prevent fibre breakage that will affect the illumination on the lateral side of the textile. Tan's research demonstrates new methods of illuminative textile making; based on research in materials, weave processes and knit processes. New developments were made in the areas of textile tactility, structure, ease of component connection via weave patterns. The research overcame the fragile and stiff characteristics of POF fibres to develop new textiles that possess pliant 3 dimensional structures, soft and sheer handle with stretch ability that had not been previously explored.

Tan's works were discussed in illustrated features in WGSN (Worth Global Style Network) and Harper's Bazaar. Tan had presented this research through 15 international exhibitions; 2 exhibition books; 1 journal publication; 3 international public lectures; 1 international designer residency; 1 filed patent; 4 international awards for design and research; successful competitive bidding of 1 PhD student for project sustainability.

Over the period of five years, Tan had utilized POFs as a medium to develop a range of novel techniques for weaving and surface treatment. The work had achieved control over handle, illumination stability, interactivity and component integration. The research process involved extensive experiments, sampling, interdisciplinary research with engineers for component and software application designs.

Contents

Jeanne Tan

Jeanne is a textiles and fashion designer. Her practice informs her research and vice versa. Her work investigates the interface of design and technology; integrating traditional craft and engineering as the syntax of the creation's narrative. Jeanne's research focuses on interactive textile design, hybrid design approaches and smart wearables.

Research Questions

This practice based research sets out to investigate:

- How combinations of materials, weave structures and patterns can lead to innovations in soft three dimensional structures, textured tweed and lightweight, sheer illuminative textiles that expand possibilities in smart wearable applications.
- How textile design and component placements can be integrated to create interactive textiles.
- How weft knit structures can offer extensive flexibility, close to body fit for novel POF textiles without compromising on the fibre structure and illumination.
- How POFs can be knitted to create a flexible textile without causing fiber damage and compromising on the stretch ability.

What constitutes the research output/ body of work

The output comprise of 3 Polymeric Optical Fibre (POF) textile collections, a novel illuminated knit (Patent Filed), 2 exhibition books, 2 journal publications. The textile collections are entitled,

- Dimensional Illumination (2014)
- Crafting Photonics (2015)
- Sensory Light (2017)
- Illuminated Knit (2018)

2 Exhibition Books:

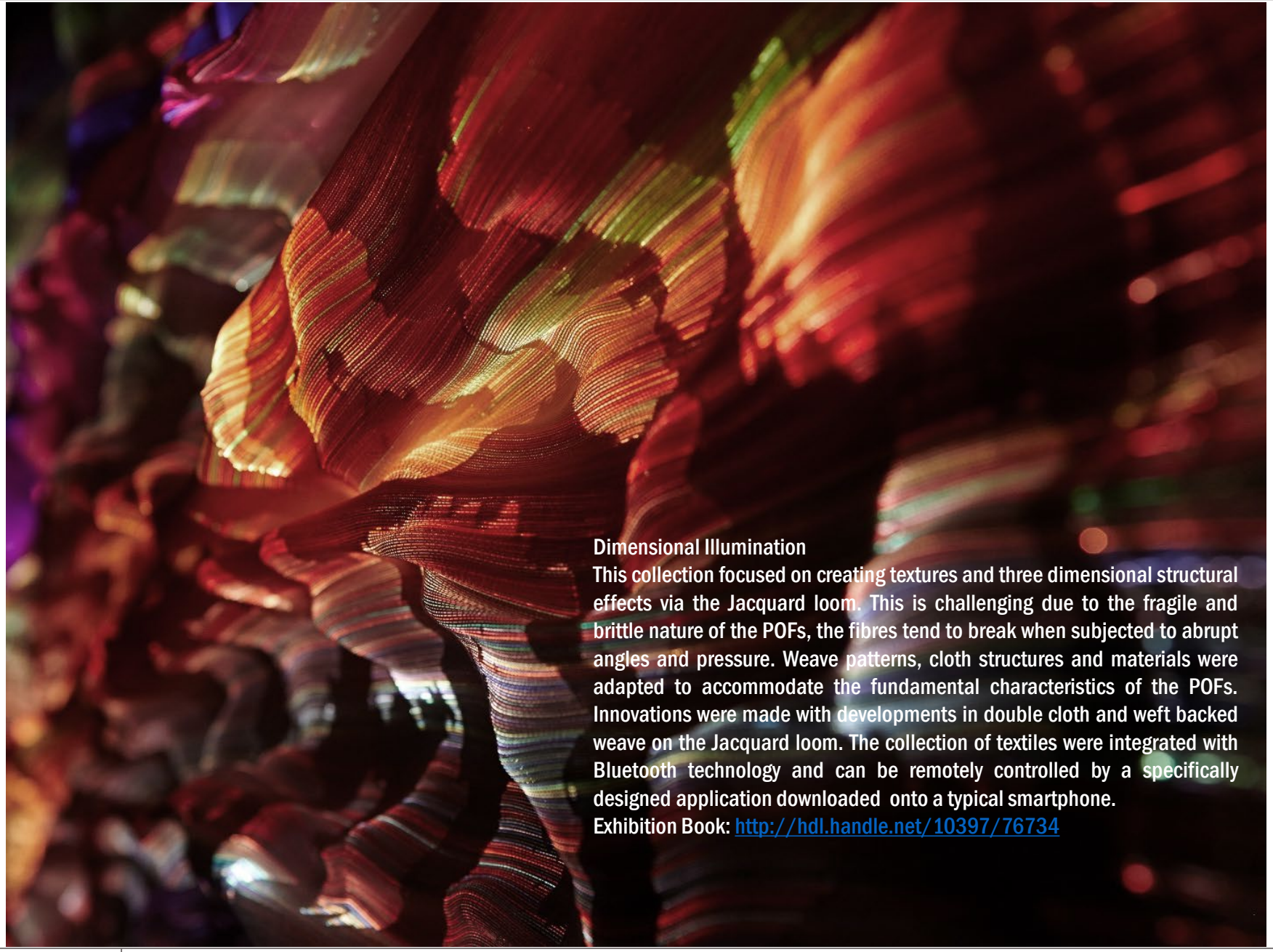
1. Tan, J. (2015) Crafting Photonics. Hong Kong: The Hong Kong Polytechnic University. ISBN: 978-962-367-793-6.URI: http://hdl.handle.net/10397/63018
2. Tan, J. (2014) Dimensional Illumination. Hong Kong: The Hong Kong Polytechnic University. ISBN: 978-962-367-780-6. URI: http://hdl.handle.net/10397/7673

2 Journal Publications:

1. Chen,A., **Tan,J**., Henry, P. & Tao, X.M. (2019) The design and development of an illuminated polymeric optical fibre (POF) knitted garment, The Journal of The Textile Institute, DOI: https://doi.org/10.1080/00405000.2019.1661937
2. Bai,Z.Q., & **Tan,J**. (2015) "Connexion: Development of interactive soft furnishings with polymeric optical fibre (POF) textiles", International Journal of Clothing Science and Technology, Vol. 27 Issue: 6, pp.870-894. DOI: https://doi.org/10.1108/IJCST-05-2014-0058

Tan's contribution to the research are,: The production of original textile designs using the medium of POFs.

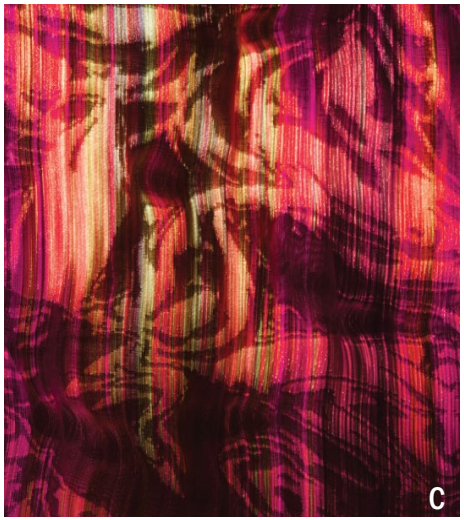
- Advanced weave techniques to create interactive POF textiles with soft three dimensional structures.
- Novel strategic weave patterns for component coupling.
- Novel knit technique that offer extensive flexibility without compromising the integral structure of the POF and the illumination.
- Expand possibilities for interactive POF textile handle, tactility and structure. Woven materials that offer 3 dimensional soft structures and stretch materials that offer close to body fits for ergonomic design applications.

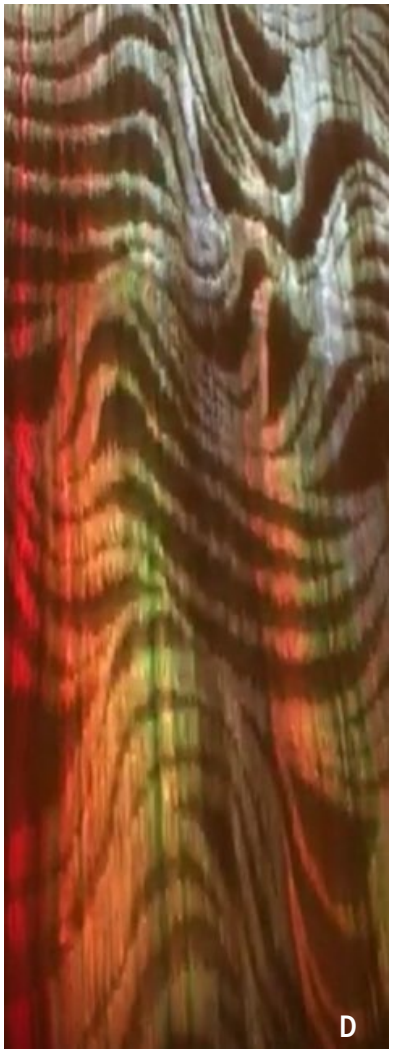


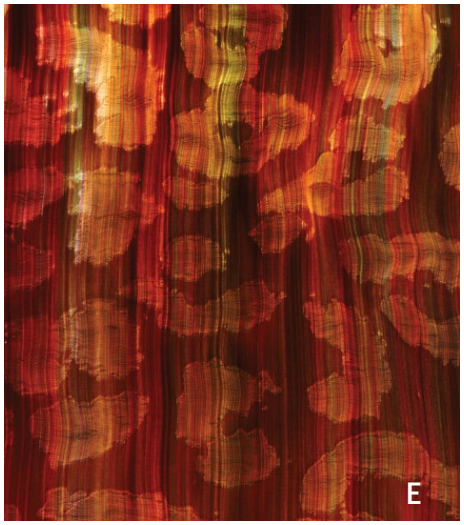
Dimensional Illumination

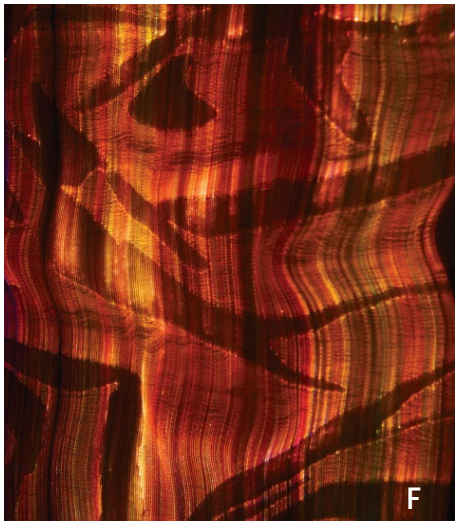
This collection focused on creating textures and three dimensional structural effects via the Jacquard loom. This is challenging due to the fragile and brittle nature of the POFs, the fibres tend to break when subjected to abrupt angles and pressure. Weave patterns, cloth structures and materials were adapted to accommodate the fundamental characteristics of the POFs. Innovations were made with developments in double cloth and weft backed weave on the Jacquard loom. The collection of textiles were integrated with Bluetooth technology and can be remotely controlled by a specifically designed application downloaded onto a typical smartphone.

Exhibition Book: http://hdl.handle.net/10397/76734





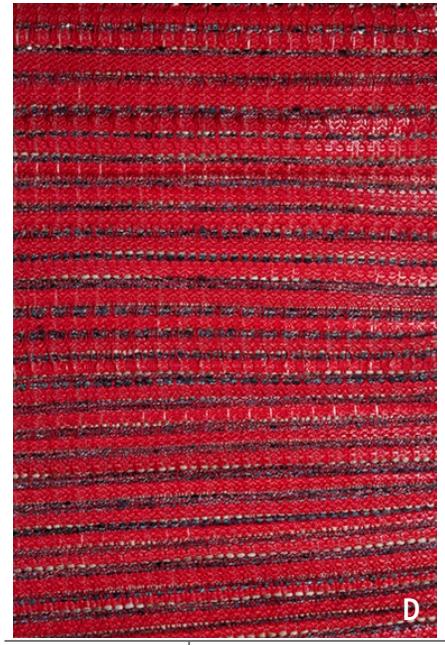


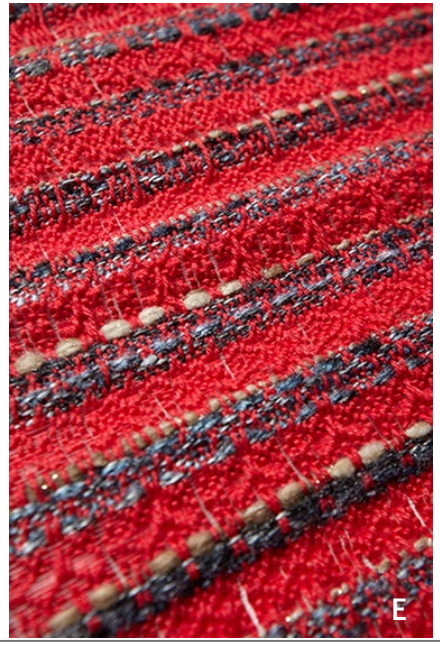


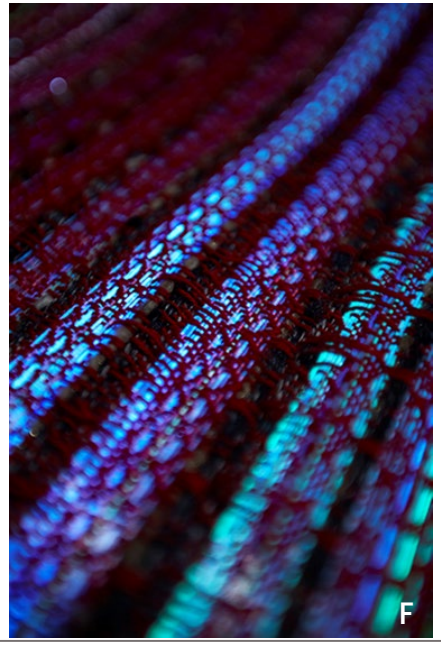
Dimensional Illumination Collection
Material: POF, cotton and polyester yarns.
Technique: Jacquard weave, laser engraving and LED color mixing.
Technology: Integrated Bluetooth technology with smartphone remote control.
Size: 167cm by 100cm (For each textile)
A. Halo B. Calyx C. Mystic D. Luminescent Waves E. Bloom F. Scion G. Bamboo

Video: https://vimeo.com/340800784

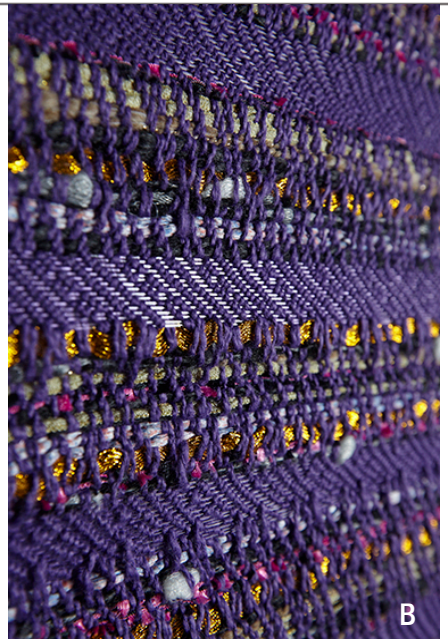
Crafting Photonics
This collection of 6 textiles explores technology from a craft perspective. The research is distinct from existing research in its exploration of rustic textures and the use of thicker POFs. The utilization of the Dobby loom enables the flexible use of yarns of different qualities to create textures and weave patterns that had not been explored before within the context of POF textiles.
Exhibition Book: http://hdl.handle.net/10397/63018

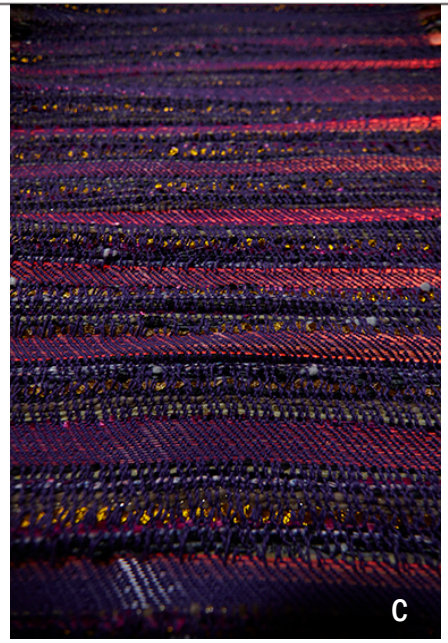


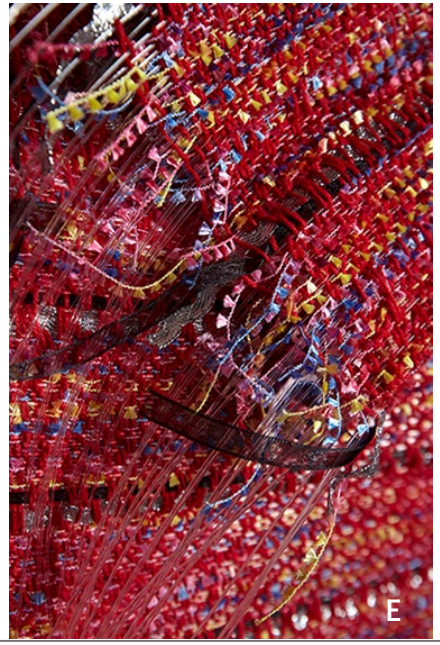


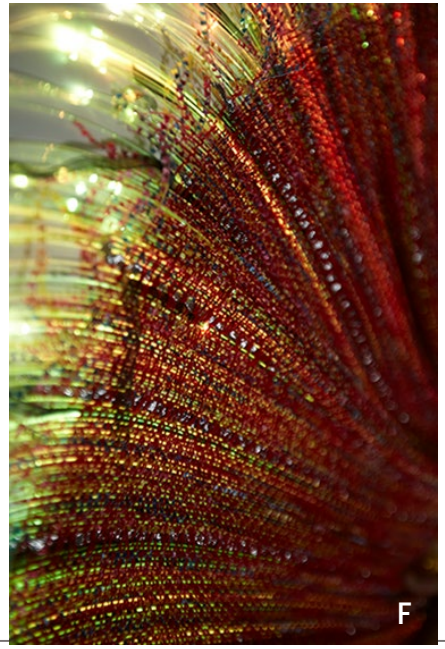


A. Sylvan. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Figured Twill on Dobby loom, laser engraving and LED color mixing. Dimension: 98 cm x 50cm.
B. Close up view of Sylvan.
C. Illuminated view of Sylvan
D. Mote. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Twill derivative weave on Dobby loom, laser engraving and LED color mixing. Dimension: 88 cm x 50cm.
E. Close up view of Mote.
F. Illuminated view of Mote.

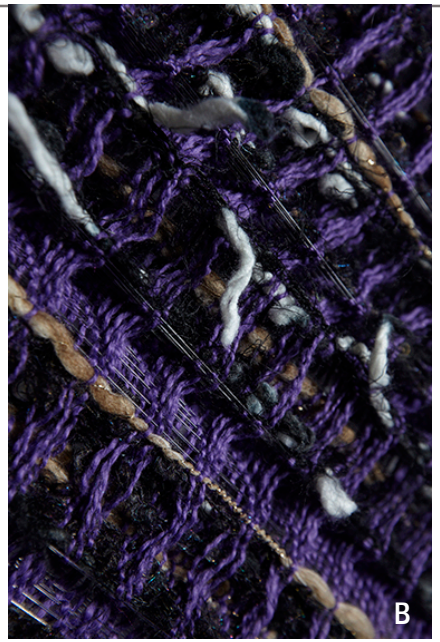


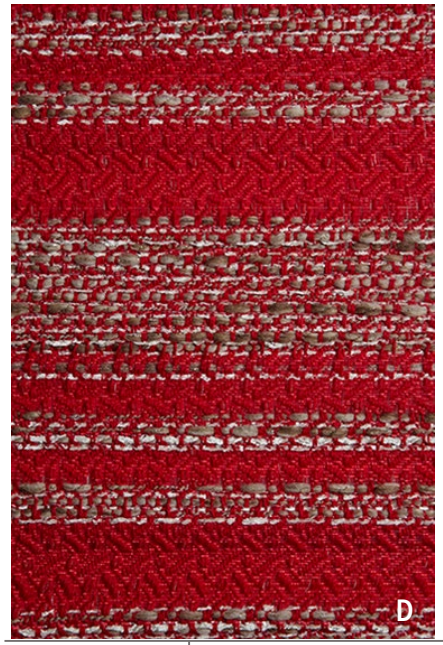


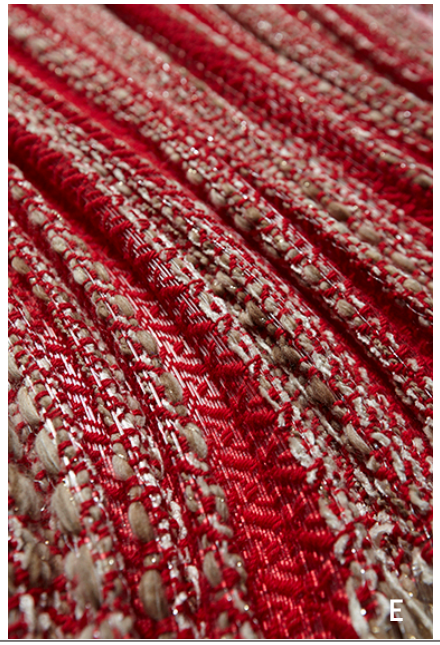


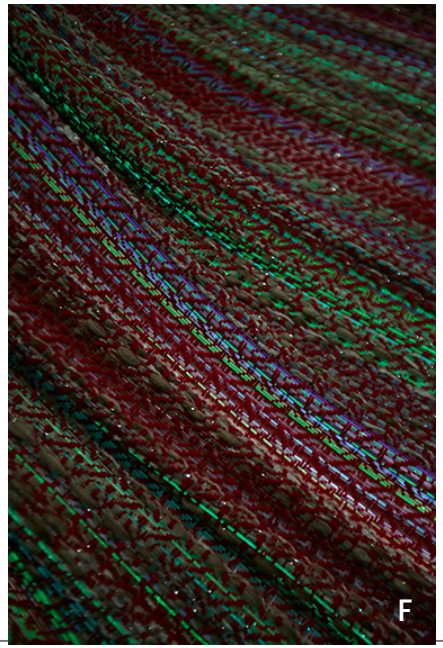


A. Cusp. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Figured Twill on Dobby loom, laser engraving and LED color mixing. Dimension: 98 cm x 50cm.
B. Close up view of Cusp.
C. Illuminated view of Cusp.
D. Plica. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Diamond Twill weave on Dobby loom, laser engraving and LED color mixing. Dimension: 96 cm x 50cm.
E. Close up view of Plica.
F. Illuminated view of Plica.









A. Nexus. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Honeycomb weave on Dobby loom, laser engraving and LED color mixing. Dimension: 107 cm x 50cm.
B. Close up view of Nexus.
C. Illuminated view of Nexus.
D. Iota. Material: Coarse POF, wool and synthetic fancy yarns. Technique: Entwining figured twill weave on Dobby loom, laser engraving and LED color mixing. Dimension: 76 cm x 50cm.
E. Close up view of Iota.
F. Illuminated view of Iota.

Sensory Light

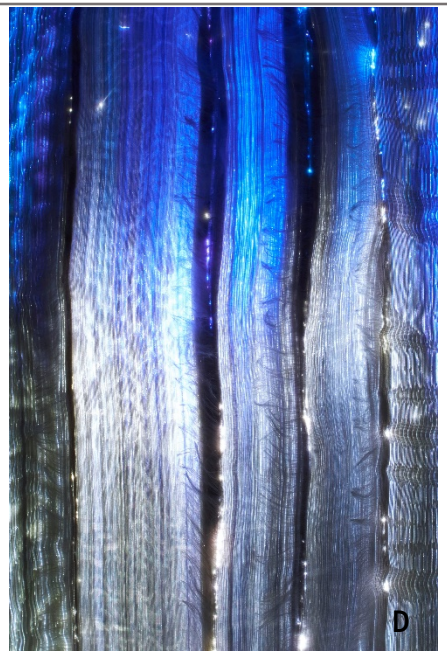
This collection of 6 textiles (Current, Drift, Dulcet, Flux, Torrent, Twist)) investigates POF textiles that are sheer and light distinct from existing textiles that are heavy and opaque. This research made innovations in:

- Obtaining optimum light illumination via gradation laser engraving.
- Ultrasonic welding for seams to reduce fibre damage caused by sewing needle penetration.
- Developed weave floats at either end of the material to enable efficient bundling of POFs for component coupling.


A


B


C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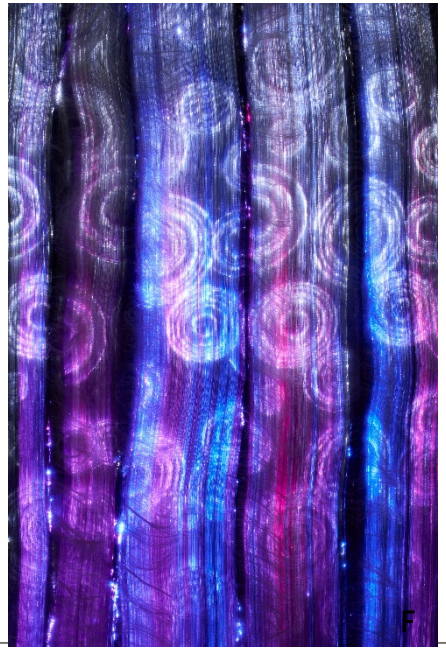
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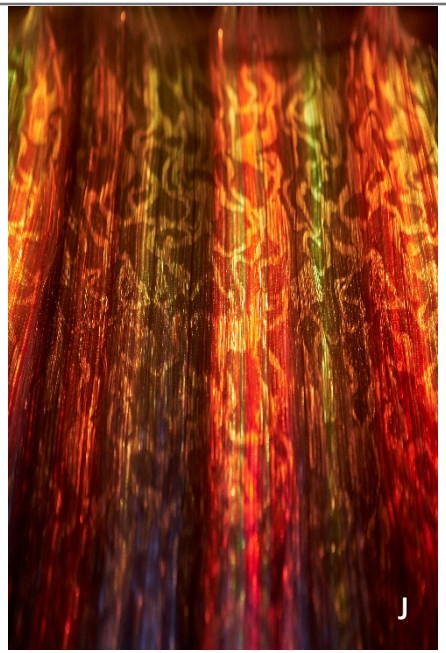
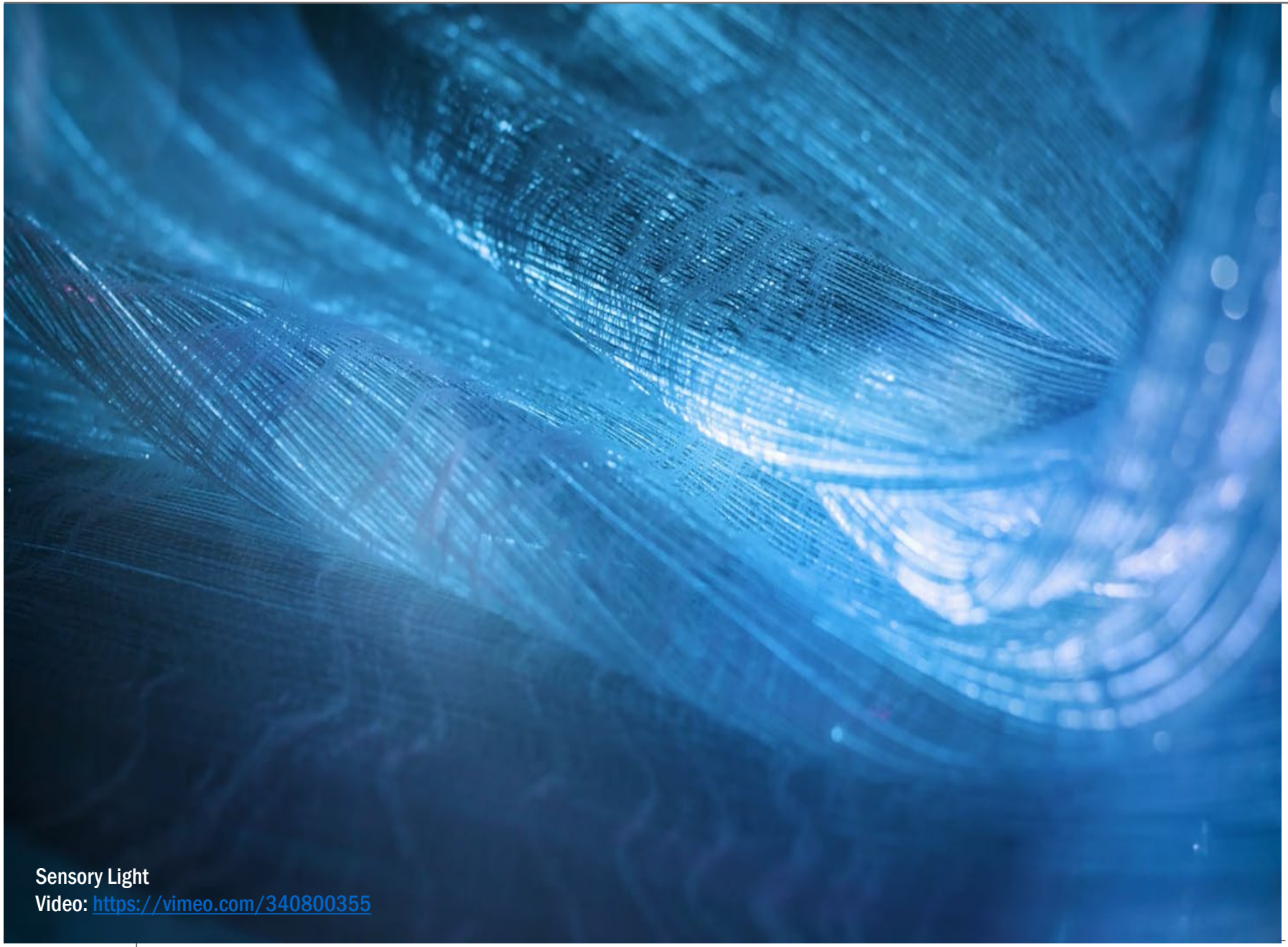


A. Current. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 12h Satin on Jacquard loom and gradient laser engraving.
B. Illuminated view of Current.
C. Drift. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 5h, 8h and 12h Satin on Jacquard loom and gradient laser engraving.
D. Illuminated view of Drift.
E. Dulcet. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 12h Satin on Jacquard loom and gradient laser engraving.
F. Illuminated view of Dulcet.
G. Flux. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 1/3 Twill, Diamond weave and 12h Satin on Jacquard loom and gradient laser engraving.
H. Illuminated view of Flux.
I. Torrent. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 12h Satin on Jacquard loom and gradient laser engraving.
J. Illuminated view of Torrent.
K. Twist. Material: 0.25 POF fibers and 150D Polyester (Weft)and 100D Polyester (Warp) . Size: 100cm x 180cm Technique: 12h warp Satin and 12h filling satin on Jacquard loom and gradient laser engraving.
L. Illuminated view of Twist.



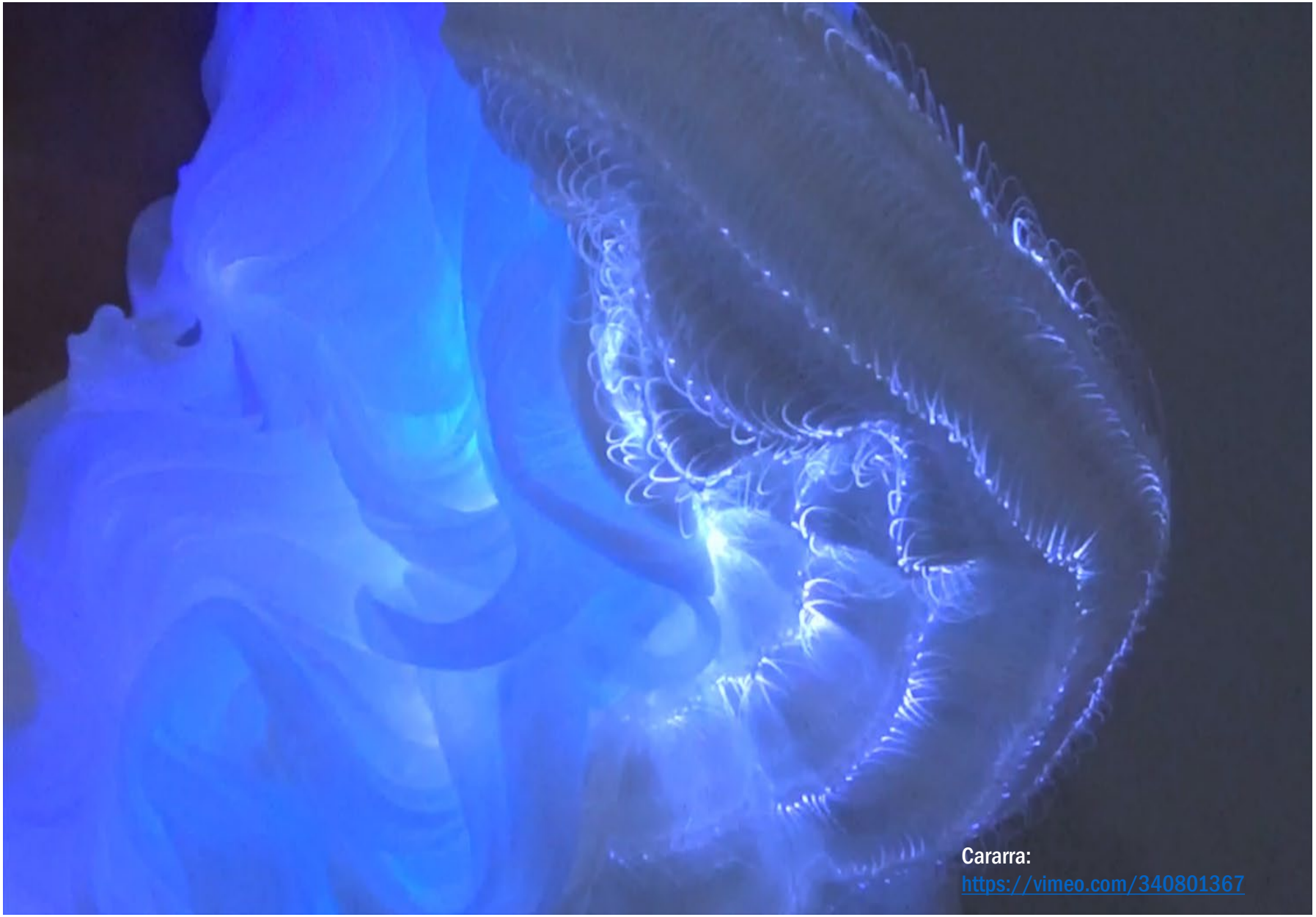
Sensory Light
Video: https://vimeo.com/340800355

Illuminated Knit

This research explores POF textiles that offer stretch and flexibility to facilitate applications for body forming fit and ergonomic designs. In contrast to Shindo's (2015) inlay method, this research's method incorporates POFs via a weft knit structure that secures the position and yet allow lateral extension. This method allows a flexible integration on the number of POFs according to the design of the garment, waste stitches can be transferred accordingly to maintain the length of the POFs for light source coupling. It reduces excess bulk and allows for more form fitting garments.

This research comprise of ,

- Illuminated Shaped Knit Fabric Sweater (Filed Patent) Y/R: PAT-1200-CN O/R: EM/U20016CN00
- Carrara (Interactive Dress)


Cararra:
https://vimeo.com/340801367

Research Field and Key Works Referenced

Illuminative textiles made from optical fibres had been explored within the contexts of woven, knotted and knitted textiles. An early example was developed by France Telecom's (2001) optical fibre jacket which can display simple text and images in large grid format. The optical fibre screen is rigid and simply applied onto the front of a jacket to serve as a flexible display. The Perception Rug (Deckers, 2009) is a touch sensitive carpet with knotted conductive yarns and optical fibers. Woven POF textiles had been utilised to create large scale lighting by the French company Brochier Technologies (Brochier Technologies, 2018), bed coverings by Luminex (Luminex, 2012) and fashion by Zac Posen for Claire Danes at the Met Gala in 2016. With the exception Brochier Technologies which offer POF textiles with woven patterns, the examples by Luminex and Zac Posen had been restricted to plain woven POF textiles. In the area of knitted POFs, Shindo (2015) of Japan had developed a knitted POF material using the inlay method that integrates the POF horizontally using textile based yarns to form loops to stretch while the POFs are in place.

The cited examples had focused on the illuminative qualities of POF textiles and had focused on dense flat woven and knitted textiles with even illumination. Polymeric optical fibers have often been integrated into the fabric in straight lines, as tight bends can cause fiber breakages. This makes POF better suited to integration into woven fabrics as opposed to knitted fabric, as it can be used in place of either the warp or weft threads. Within knitted POF fabric, a similar technique is employed, referred to as Inlay, in which the POF is interlaced between the loops of the knitted fabric. However, the use of inlay can have a detrimental effect on the extensibility of the knitted fabric, as well as affecting the drape of the fabric. The POF is also not securely held by the fabric structure.

Via investigations into the use of materials, weaving and knitting techniques, this body of research had developed original methods to challenge the preconception of flat POF textiles to develop novel textiles that possess 3 dimensional structure, extensive stretch, sheer and textured tactility. Extensive weave explorations were made via Jacquard and Dobby looms, combinations of elastic materials and weft knitting technique.

References

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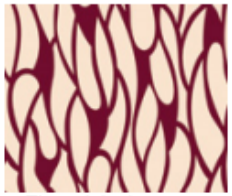
Research Methods and Materials

The research and design development involved,

- Jacquard weave design and structures to create soft three dimensional effects.
- Double cloth structures for textures and technology integration.
- Dobby weave designs with novelty yarns and thick POFs.
- Knit design to develop POF textiles with stretch and flexibility.

Range of textiles developed within this body of work.



The original pattern

The fabric without Leds

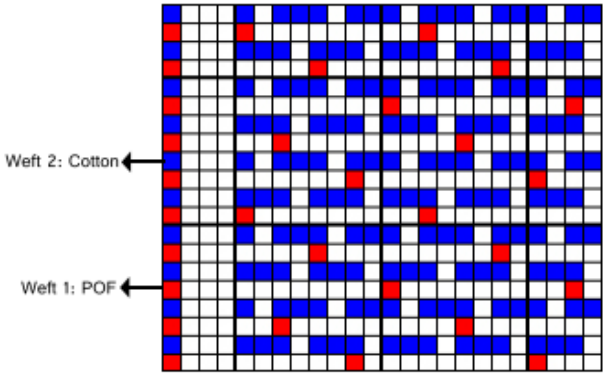


Figure 1: Structure diagram of Calyx (Light emitting section)

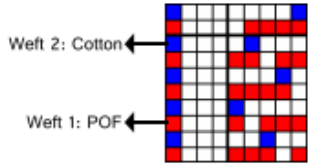
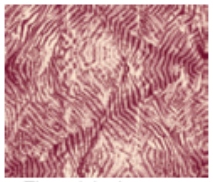


Figure 2: Structure diagram of Calyx (Non-light emitting section)



The original pattern

The fabric without Leds

	Material	Count	Yarn color	Density
Warp	Polyester	11.1 tex	White	47 ends/cm
Weft	POF Cotton	0.25 mm 10s	Transparent Off-White	48 picks/cm

Table 2: Improved weaving specifications of Halo

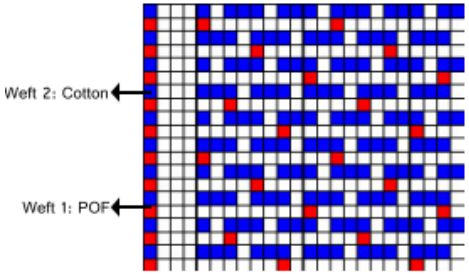


Figure 3: Structure diagram of Halo (Light emitting section)

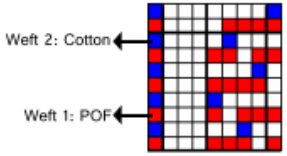
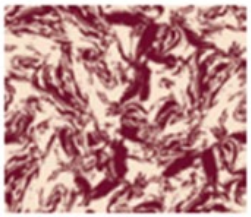


Figure 4: Structure diagram of Halo (Non-light emitting section)



The original pattern

The fabric without Leds

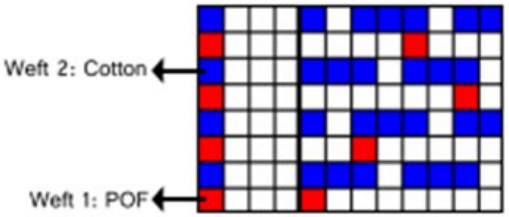


Figure 7: Structure diagram of Mystic (Light emitting section)

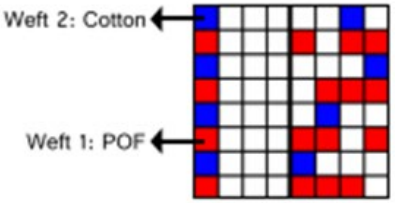
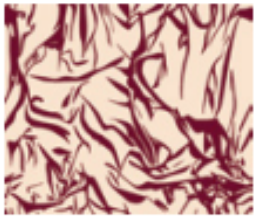


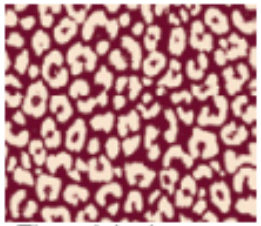
Figure 8: Structure diagram of Mystic (Non-light emitting section)

Weave pattern development for Dimensional Illumination.



The original pattern

The fabric without Leds



The original pattern

The fabric without Leds

The original pattern

The fabric without Leds

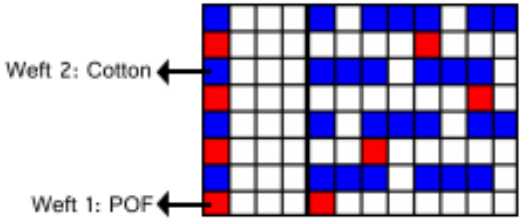


Figure 5: Structure diagram of Scion
(Light emitting section)

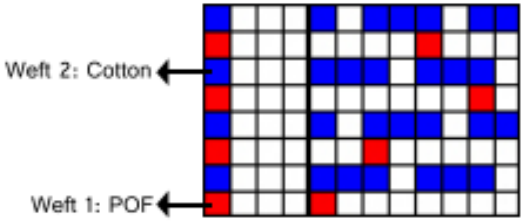


Figure 9: Structure diagram of Bloom
(Light emitting section)

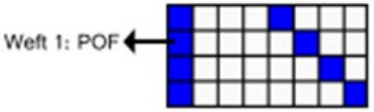


Figure 11: Structure diagram of Bamboo
(Light emitting section)

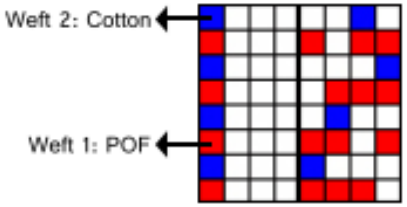


Figure 6: Structure diagram of Scion
(Non-light emitting section)

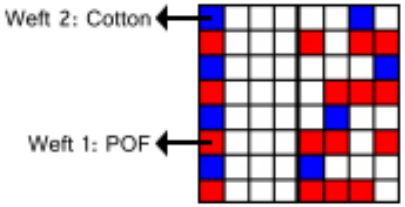


Figure 10: Structure diagram of Bloom
(Non-light emitting section)

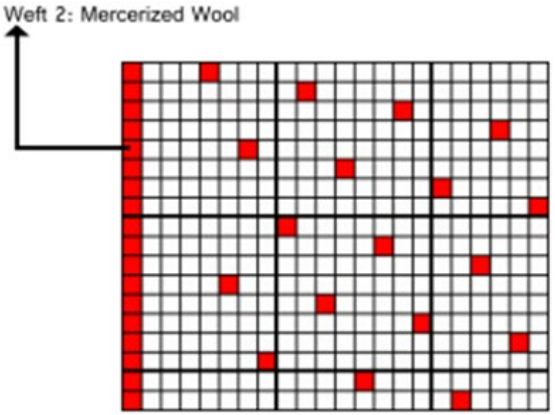
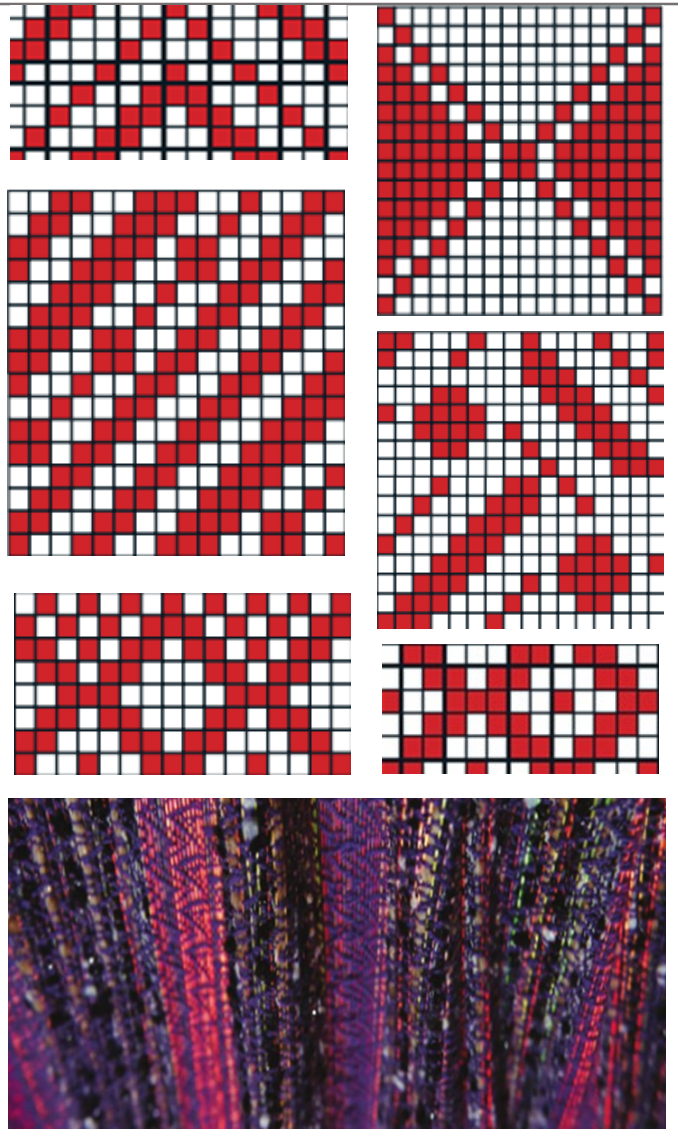


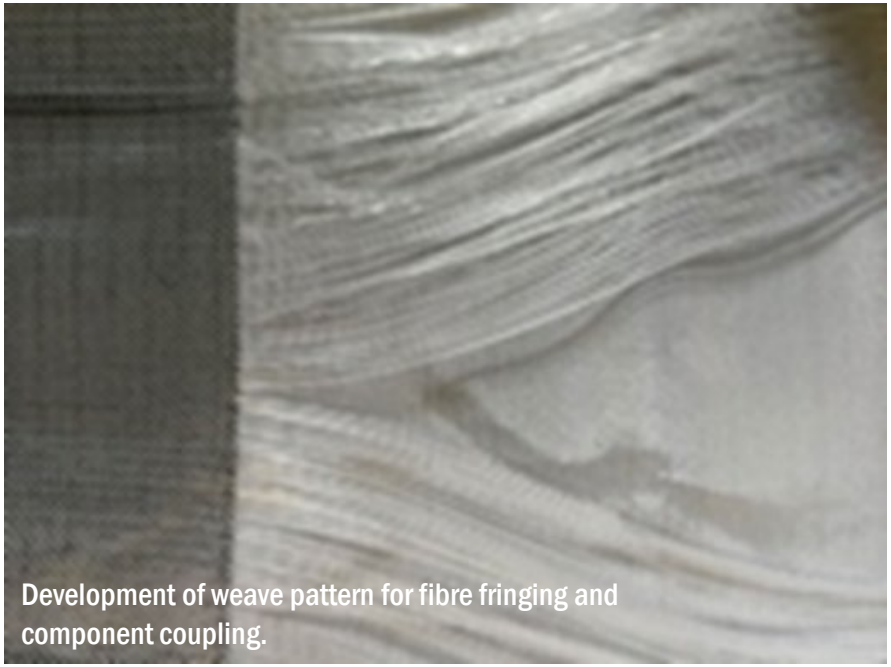
Figure 12: Structure diagram of Bamboo
(Non-light emitting section)

Weave pattern development for Dimensional Illumination.



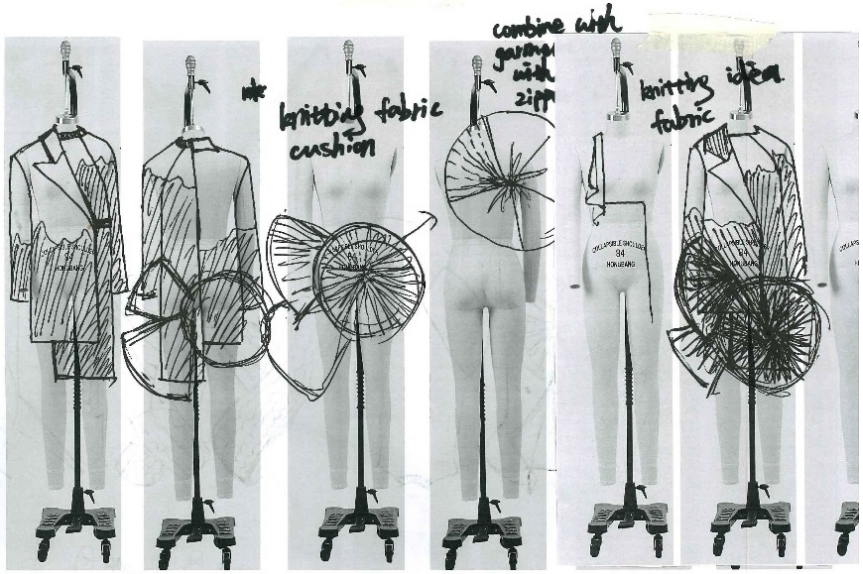
Weave pattern development for Crafting Photonics.

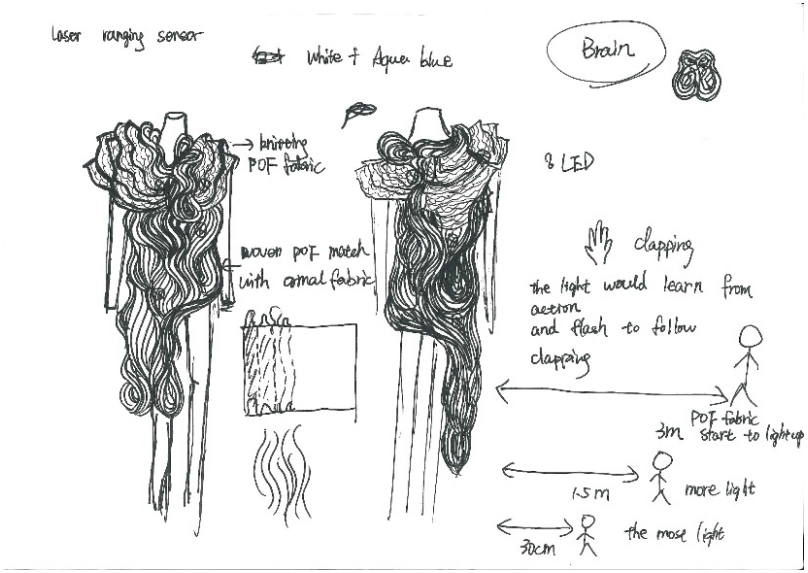
Development of component integration within material structure.

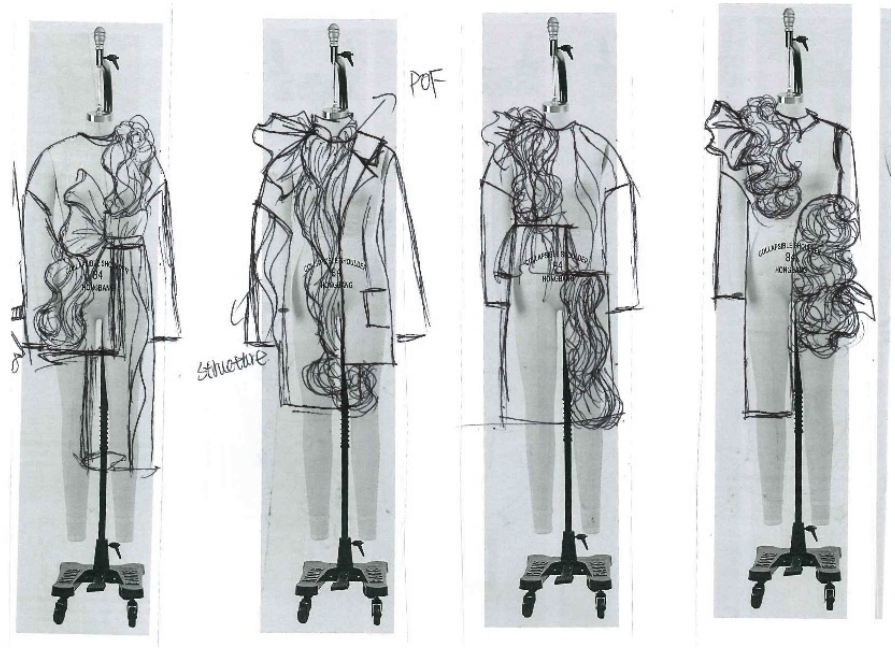


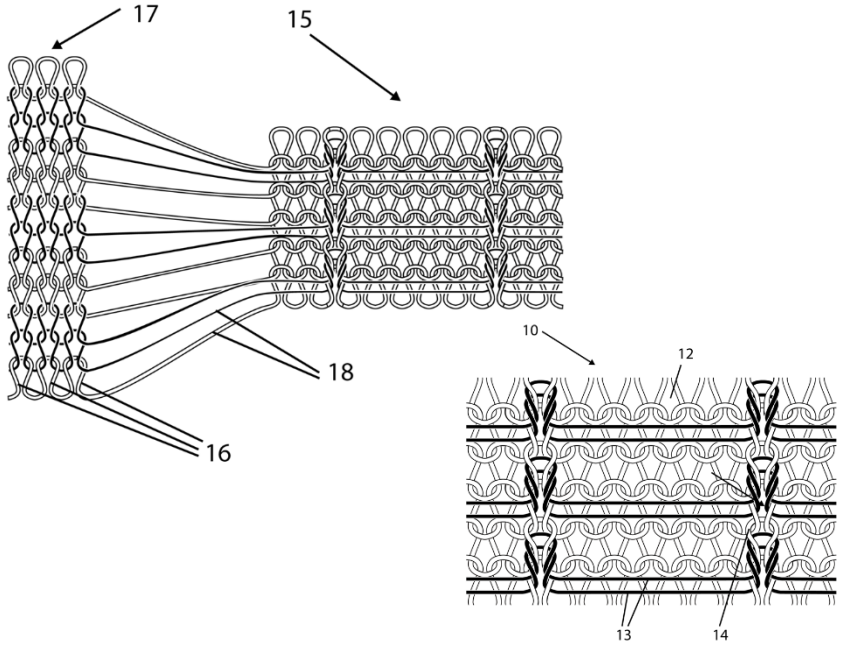
Development of weave pattern for fibre fringing and component coupling.

Design sketches for textile design.









Design sketches and fabric structure development.

Research Conclusion

- Expand possibilities for POF textiles via weave, structure and knit design and development.
- Developed novel POF textiles with 3 dimensional structures, craft aesthetic, sheer and lightweight characteristics and stretch ability.
- Developed novel laser engraving gradient technique to enable even illumination on sheer POF textiles.
- Developed novel method of weaving floats on outer edges of the POF textiles to remove laborious manual fringing for component coupling.

Dissemination

(2 exhibition books; 2 journal publication; 1 filed patent;12 exhibitions; 3 public lectures; 1 international designer residency)

Year	Exhibition Books
2015	Tan, J. (2015) Crafting Photonics. Hong Kong: The Hong Kong Polytechnic University. ISBN: 978-962-367-793-6.URI: http://hdl.handle.net/10397/63018
2014	Tan, J. (2014) Dimensional Illumination. Hong Kong: The Hong Kong Polytechnic University. ISBN: 978-962-367-780-6. URI: http://hdl.handle.net/10397/76734

Dissemination

Year	Journal Paper
2019	Chen,A., Tan,J., Henry, P. & Tao, X.M. (2019) The design and development of an illuminated polymeric optical fibre (POF) knitted garment, The Journal of The Textile Institute, DOI: 10.1080/00405000.2019.1661937

Dissemination

Year	Journal Paper
2015	Bai,Z.Q., & Tan,J. (2015) "Connexion: Development of interactive soft furnishings with polymeric optical fibre (POF) textiles", International Journal of Clothing Science and Technology, Vol. 27 Issue: 6, pp.870-894. DOI: https://doi.org/10.1108/IJCST-05-2014-0058

Dissemination

Year	Patent
2019	China Utility Model Patent Application No. 201920218259.1 Title: Illuminated knit fabric and illuminated apparatus Applicant: The Hong Kong Polytechnic University Inventors: 1.Jeanne Tan; 2.Amy Chen Filed on: 21 February 2019

Dissemination

Year	International and Local Juried Exhibitions
2019	Tan, J.(2019) Carrara at Designing Future Techstyle 2019 Exhibition. The Mills, Hong Kong. 28 June- 26 August 2019.
2018	Tan, J.(2018) Carrara at The Korea Fashion and Culture Association 2018 International Fashion Art Biennale at KIA Beat360, Seoul, South Korea. 19 – 26 October 2018.
2018	Tan, J., Lan, G. (2018) Twist at ANBD Munich Special Exhibition. Museum Fünf Kontinente, Munich, Germany from March 3 to 13, 2018. Organised by Asian Network Beyond Design Association, Korea.
2018	Tan, J., Lan, G. (2018) Twist at the Junichi Arai's Textile Anthology Exhibition held at the Innovation Gallery, Jockey Club Innovation Tower, The Hong Polytechnic University, HKSAR. December 2017 to January 2018.
2017	Tan, J., Lan, G. (2017) Current at "FIBER ART VIII" International Biennial Fiber Arts Exhibition in collaboration with Surface Design Association. Sebastapol Center for the Arts, California, USA. 28 July-3 September 2017.
2017	Tan, J., Lan, G. (2017) Torrent at Future Tech Work Exhibition, FABI 17th International Exhibition at Hong-Mun Hall, Hongik University, Seoul, South Korea. Organised by the Korean Society of Fashion Business. 21 October 2017. http://www.fashionfabi.co.kr/
2014	Tan, J., Zhao, C.C. (2014) Scion at TEXTILE ART OF TODAY 2015 Triennial of Textile. Historical Museum Bratislava (Bratislava Castle), Slovakia, Tatra Gallery Poprad, Slovakia, Museum Historyczne, Bielsko-Biala, the Republic of Poland, Rómer Flóris Művészeti és Történeti Museum, Győr, Hungary and Moravian Museum, Uherské Hradiště, Czech Republic. September 2015-January 2017.
2014	Tan, J., Zhao, C.C. (2014) Luminescent Waves at the 8th Lausanne to Beijing Fiberart Biennale. 1895 Creative Cultural Park, Nantong, China. 30 September-16 October 2014.

Dissemination

Year	International Solo Exhibition
2016	Tan, J. (2016) Crafting Photonics. Exhibition Hall, Burapha University, Chonburi, Thailand. 17-19 March 2016.
	Tan, J. (2016) Crafting Photonics. Fashion Gallery, Nanyang Academy of Fine Arts, Singapore. 31 March-22 April 2016.
2016	

Dissemination

Year	Peer Reviewed Solo Exhibition
2016	Tan, J. (2015) Crafting Photonics. The Hong Kong Museum of Medical Sciences, 1-10 December 2015. Reviewed by Professor Clemens Thornquist (Professor in Fashion Design, the Swedish School of Textiles, University of Boras, Sweden)
2014	Tan, J. (2014) Dimensional Illumination. The Hong Kong Museum of Medical Sciences, 2-9 December 2014. Reviewed by Anne Smith (Dean of Academic Programs, Central Saint Martins)

Dissemination

Year	Invited Public Talks and International Designer Residency
2018	Tan, J. (2018) “Interactive Textile Design” 6th Rangsit University International Design Symposium. Rangsit University, Bangkok, Thailand. 4 May 2018.
2017	Tan, J. (2017) “Challenges of Materiality” Royal College of Art, London, UK. 25 October 2017.
2017	Tan, J. (2017) “Crafting with Technology” at Design and Art. Meaning & Form International Conference by Asia Society of Basic Design and Art. Asia Culture Center, Gwangju, Korea. 17 August 2017.
2016	Tan, J. (2016) Designer Residency at Nanyang Academy of Fine Arts, Singapore. 31 March-22 April 2016.

Others

Year	Media (International and Local Media)
2016	• Media coverage of 'Scion' (Dimensional Illumination) at the Textile Art of Today Trienale in Slovakia, Poland, Hungary and Czech Republic on https://www.facebook.com/textileartoftoday/?fref=ts
2015	• Media coverage of Dimensional Illumination on WGSN http://drjeannetanresearch.com/wp/wp-content/uploads/2015/01/Screen-Shot-2015-01-12-at-3.00.11-PM.png
2015	• Media coverage of Dimensional Illumination on Harper's Bazaar HK. http://www.harpersbazaar.com.hk/fashion/editors-picks/leds-fabric
2014	• Media coverage of Luasanne to Beijing Biennale (Luminescent Waves)

Others

Year	Award
2016	• Excellent Award for Textile. Slyvan at the 6th International FABI Exhibition organized by The Korean Society of Fashion Business in Soongsil University, Seoul Korea . October 2016.
2016	• Excellent Award. Scion at TEXTILE ART OF TODAY 2015 Triennial of Textile at Slovak National Museum 18 September – 13 December 2015.
2015	• Excellent Award. New-Utopia, “Zhang Qian Bei” Home Textile Contest organized by China Council for the Promotion of International Trade (CCPIT TEX), Messe Frankfurt (HK) Ltd, Nantong Government. China. July 2015.
2014	• Outstanding Award. Luminescent Waves at the 8th Lausanne to Beijing Fiberart Biennale. 30 September 2014.