

Royal College of Art

N° 56

Subtraction Cutting 2014–2020

Julian Roberts

School of Design



Royal College of Art
Postgraduate Art & Design

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Submission details

Researcher(s)

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Collaborator(s)

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Output Type

'Other' – 131 Scholarly Encounters

Output Components

artefacts, exhibitions and performances evidenced in
5 international regions

Dates

January 2014–December 2020

Funding

Financial support was provided by 88 institutions
who directly participated in the research.
No public or private grant was received by the author.

Dissemination

Masterclasses, workshops, exhibitions, residencies,
a website (julianand.com), online videos and
photography shared through social media platforms
(YouTube, Vimeo, Tumblr, Facebook, Instagram).

The Output

Background prior to 2014

Julian Roberts first used the term 'Subtraction Cutting' in 2002 to describe a series of technical experiments for constructing abstract garment patterns for fashion clothing design. Examples of these artefacts won industry awards at London Fashion Week and were shared online as freely available pedagogic guides. These handwritten and illustrated instructions were accompanied by a series of masterclass demonstrations involving video projection and live performances of garment cutting, during which the author discussed the principal concepts and motivations which had inspired their development and potential use. Students and collaborators in industry then participated with Roberts in creating large-scale iterations of garment artefacts utilising these technical concepts, each of which was exhibited as an assemblage and critiqued.

Further clarification of these concepts was published in a printed booklet sold by the Centre for Pattern Design in California, USA (2008), and they were further analysed in an open-access digital publication entitled *Free Cutting* (2014), which included photographic documentation and Roberts's design manifesto.

This research 2014–2020

During the period 2014–2020 the research has evolved in response to changing research needs and opportunities worldwide, identified through a large number of international collaborations. Since 2014 Roberts has extended his Subtraction Cutting performances internationally with the support and involvement of 88 partner institutions in 25 countries, several of these events focusing on connections between Subtraction Cutting and Zero Waste fashion design.

Action Research was applied as the principal method for testing the effectiveness of live performances of garment-making with different audiences responding to local issues, customised for specific and often practical contexts.

Through these encounters research encounters have been widened substantially to allow new audiences to engage with the research for personal or professional development.

The research undertaken during this period focuses on the importance of the scholarly masterclass encounter as an intervention for challenging conventions of fashion design communication. Through physical presence and real-time performance of cutting, drawing and storytelling Roberts demonstrates how the physical body of the expert disorients a garment pattern when witnessed from the static viewpoint of an opposite and spatially separated audience. Through direct interaction with textile material the disorderly effects of movement, gesture and gravity become entangled, non-flexible tools and sizing metrics are dispensed with, and tacit connections are made between the body of the maker and those of an absent or imaginary wearer. These craft encounters have grown in reach to widen group participation and raise individual confidence in creative and technical capability, through collaborative practice involving chance and accidental discovery.



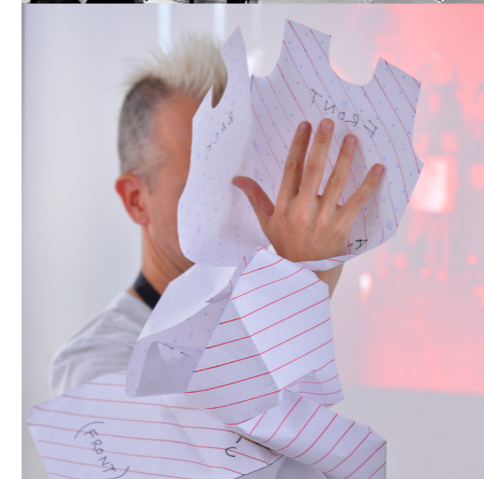
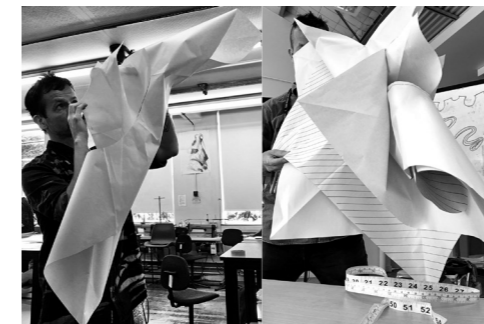
[fig. 1] Prototype research development work for Subtraction Cutting undertaken by Julian Roberts at his Brighton studio, UK. March 2014.



[fig. 2] Julian Roberts developing prototype Subtraction Cutting examples for video masterclasses commissioned by InspirerHub China. Recorded in London, UK. January 2020.



[fig. 3] An example of Subtraction Cutting Tunnel Technique applied to the development of a trouser prototype. For trouser design Roberts coined the term 'Crazy Legs' to describe the process of developing wild abstract forms from tubular structures which exert an influence on the wearer's range of movements when worn. Developed with designers at a masterclass at Chichester College, UK. February 2017.



[fig. 4] Roberts making experimental shapes using Subtraction Displacement and Tunnel techniques (Top Right) at a masterclass at London College of Fashion UK. July 2015. (Top Left) at the Geelong Fibre Forum masterclass, Australia. September 2016. (Bottom) at a masterclass in Lima, Peru. August 2018.

Research Enquiry and Methods

The action research process has involved large, mixed participatory audiences consisting of people of different cultures, ages and experiences, some with no formal academic training, often participating alongside specialist teachers and technicians, undergraduate and postgraduate art and design students, skilled craftspeople and fashion industry professionals. The research has therefore progressed in careful response to individual feedback throughout these different encounters, developing a simplified means of visual communication between these two or more groups that do not necessarily share a common language or skill set.

These different compositions of audience have allowed Roberts to test how effectively technical instruction may be both understood or misinterpreted to positive effect, and how the end results of individual interpretation become a unifying experience and shared knowledge, with a more benevolent design focus.

These responsive masterclasses require a careful layering together of video artwork, spoken narrative and live demonstration of cutting and drawing in episodic sequence. The timed sessions are encountered either as a fast two-hour performance where a ready-made garment artefact becomes 'unmade' or reverse-engineered; or during the course of a single day's shared collaboration where mimicry and interpretation are encouraged; or in greater depth over a period of two to five days where painting and gestural mark-making become incorporated into the process of pattern construction, and multiple techniques encourage bewilderment and less deliberate hybrid variation.

As an invited (and often foreign) expert Roberts has had the opportunity to repeat and refine these live performances in a wide range of different geographic locations, often requiring language interpretation and site-specific adaptation.

During Subtraction Cutting performances the audience witnesses the construction or deconstruction process with an accompanying narrative which

challenges the designer to reconsider conventional logic. These are posed not as research questions with definitive answers, but as question-provocations as an element of the action research process.

These varying and frequent questions mostly focused on technical procedure and material use, have a cumulative effect in provoking greater inquisitiveness, whilst reinforcing an appreciation for technical knowledge and innovation. Examples used during the many performances have included:

Question-Provocations regarding geometric orientation:

- Why do we design and draft garment patterns that stand upright, with a bottom and a top, most typically from an elevated viewpoint, when humans lie down, sit and move asymmetrically?
- What are the effects of gravity on the garment pattern, or the effects of interior space on exterior volume?
- Can we approach the garment pattern from an upside-down or aerial viewpoint, or from merged viewpoints within one garment pattern?

Question-Provocations regarding material flexibility:

- Why do garment patterns typically follow fabric grainlines? What happens when they don't, or when grainlines vary or clash?
- Why are garment patterns typically made of cardboard or paper, not fabric? What happens when we instead construct patterns directly into the material without following conventional templates?
- What happens when we draft garment patterns using freehand drawn lines, or develop a closer human-textile relationship?
- What happens when we paint a garment pattern with a liquid art medium, rather than draft it with a sharp drawing implement?



[fig. 5] Subtraction Cutting Tunnel dresses exhibited with gestural drawings and paintings of the garments produced with designers at SIA in Beijing and Shanghai, China. July 2017.

- What happens when we deliberately introduce chance or accidental discovery into the process of garment construction (as methods of abstraction)?

Question-Provocations regarding measuring and sizing:

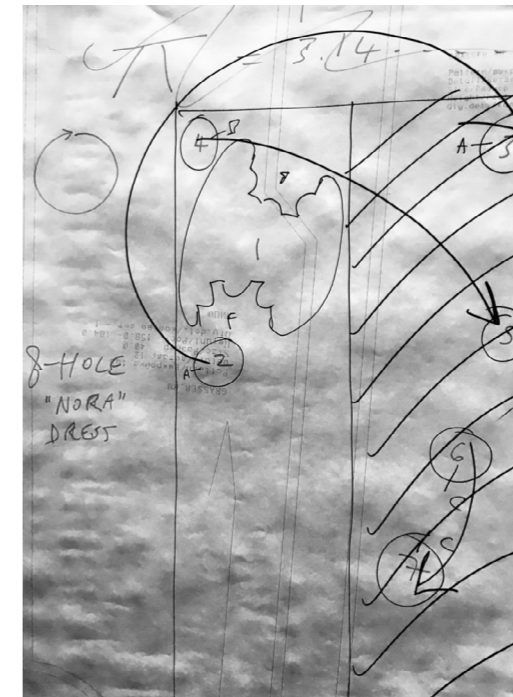
- Why use rulers and straight lines to draft garment patterns when human bodies are predominantly curved/ variable?
- What happens when we stop measuring by garment size or matrix, but instead measure in relation to our own limbs, hands, eye or movement?
- What happens if we create new tools for drawing and measuring garment patterns, or subvert existing ones?

Question-Provocations regarding whole bodies and three-dimensional human subjects:

- Why does the front view typically receive more attention than the back or side views during the design drawing process?
- Why are Back-Front garment patterns typically separated spatially?
- Why do we mirror left and right sides of the garment pattern when human bodies are asymmetrical and dynamic?
- Why are garment patterns typically gendered and sized?

Question-Provocations regarding material waste:

- How might subtractions or leftover materials be used to beneficial effect?
- How might this textile debris and waste material become more intelligently shaped and useful during the garment's lifespan?
- How might the subtraction of material used to create space (and reduce material weight) be used in subsequent or parallel designed products to utilise waste?
- When considering waste minimisation or Zero Waste strategies, what are the benefits of necessary waste during prototyping stages in perfecting a product design, and subsequently reducing wasteful reproduction?



[fig. 6] Devising variations on a common theme through the movement of negative spaces, resulting in different formations. Developed with designers at a masterclass at Grasser School St.Petersburg, Russia. November 2018.



[fig. 7] Roberts showing aerial viewpoints of a garment pattern at a live performance of Subtraction Cutting at the India Design Confluence. Organized by the Unitedworld Institute of Design, Gujarat, India. November 2018.

Findings and Insights

Over a six-year period involving a large number of scholarly encounters and performances of garment dissection, Roberts has evaluated how different audiences and groups of collaborators are inspired to engage beneficially with technical instruction that is abstract, often perplexing, geometrically disorientated, and detached from conventional numerical estimation.

Typical approaches to fashion-making which separate design and technical processes in a hierarchical sequence leading from concept drawing to construction/manufacture can often impede creative thinking by focusing too heavily on knowable and more easily reproducible design styles.

By following more abstract processes of construction, Subtraction Cutting methodologies give rise to new and often bewildering outcomes, which focus more on the unknown, in the discovery of the previously non-existent.

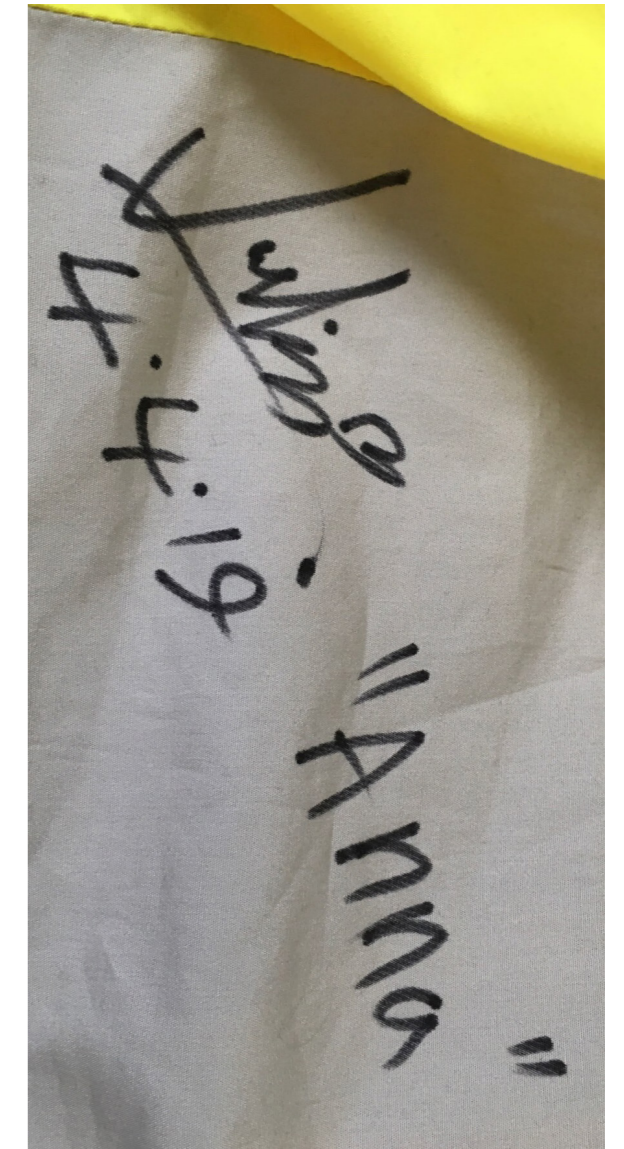
The research has developed through responding to these varied outcomes internationally and multiculturally, in a process of discovery over several years.

By moving the focus away from a traditional cardboard or paper template construction, it becomes possible to appreciate a more fluid and less rigid approach to garment geometry.

Through gestural drawing and more referential human measurement, the physical body of the maker becomes incorporated into the garment geometry and becomes a useful tool or measure for connecting the maker with that of the intended wearer, be they present or absent. This experience brings into question who the garment is intended for, and what our personal relationship with them might potentially be. It also raises important aesthetic considerations where accidental and chance outcomes reveal new proportions and distortions of material which require a period of adjustment to fully appreciate their value. Unexpected fashion design outcomes often initially appear aesthetically wrong because of narrow judgement and fear of difference, but with time and less prejudiced

evaluation the benefits of experimentation can become apparent.

Subtraction Cutting is not solely a process of perfecting product design, but rather a means of seeking new design through abstract experimentation and of building confidence in creative ability. Novice designers learn Subtraction Cutting in a supportive environment free from prejudice and discrimination. Subtraction Cutting learning activities provide them with equal opportunities to learn, share experiences and succeed. Often when a garment goes entirely wrong something very useful is revealed, and the end results are aesthetically intriguing and useful in suggesting new avenues for research development. Designers who are normally the highest achievers in the group or who regularly receive the highest praise are often surpassed in this undertaking by others who might normally underachieve or perform less consistently well, due to the fact that Subtraction Cutting involves chance discovery that produces highly unlikely outcomes, and carefulness and precision are no guarantee of superior results in the early stages of experimental discovery. This can have a levelling effect on opportunity, raising confidence in those who may otherwise lack encouragement, and inversely introducing creative challenges to those who are less often made to struggle.



[fig. 8] 'Every garment is a person'. An example of a Tunnel dress prototype cut by Julian Roberts for a designer called Anna at London College of Fashion, UK. Each prototype dress made in Subtraction Cutting performances are signed, dated and named after the person it was cut to be worn by. These personalised artefacts are then later deconstructed in front of new audiences in different locations. April 2019.



[fig. 9] Roberts working with designers to encourage movement and dynamic testing of the garments at MasterProject Shenzhen, China. September 2019.



[fig. 10] Designers hand-painting 'Crazy Leg' trouser patterns using gestural mark-making, which has the effect of blurring the distinctions between textile surface design and garment pattern construction. Alphen Aan Den Rijn, Netherlands. September 2017.

Dissemination

This work has influenced research in creative pattern cutting globally through international performances, citation in books, theses and research publications, and its incorporation into college and university curricula in several countries.

The principal focuses for dissemination are evidenced in three case studies, followed by subsidiary focuses, pedagogical impact and citations

Case Study 1 – ‘Reverse Subtraction Cutting’ performance, November 2014.

Summary

Roberts was invited by the British Fashion Council to participate in the Creative Cutting Seminar at Somerset House, London.

The British Fashion Council invited six inspirational speakers to demonstrate a variety of ways in which the revered skill of pattern cutting could be approached across a range of garment types. The seminar was designed to show a method that every attendee would find useful as part of their design process. Designers from 30 UK colleges were invited to attend, rotated in audiences between the six events.

During the event Roberts performed a series of Subtraction Cutting dissections of garment artefacts, shown alongside a video artwork.

Analysis

The challenges of this performance were that there were six back-to-back sessions during the day, each to a new audience of 20-30 designers and lasting only 45 minutes in duration. Due to time restraints, it was not possible to construct a Subtraction Cutting garment in this short time frame, and no sewing equipment was available at the venue. In order, therefore, to convey to the audience the motivations which underpin Subtraction Cutting, it became necessary to devise a faster way of performing the

construction process. The repetition of the six sessions also meant that distinctions needed to be made between each session to make them memorable and unique to each audience, avoiding the *déjà vu* that comes from repetitive performing. It was also important for the seated audience to see the garment construction process, and all accompanying artefacts and tools used to construct it, clearly.

Conclusion

Deconstruction of ready-made garments was a solution that allowed the audience to observe the construction process in real time. Six unique prototype dresses were therefore developed in advance, each a different colour/style/construction which were then individually reverse-engineered apart (or dissected) in sequence, so that each of the six sessions became unique and different in colour/content for each of the audience groups present. The artefact dresses were taken back from 3D to their flat cloth form, to reveal and discover the 2D garment construction from which they were initially cut. An accompanying narrative during the dissection process was used by Roberts to draw attention to particular question-provocations related to conventional processes of designing, and a video show-reel of shows, exhibitions and artworks were shown on a monitor screen for the 45-minute duration, that was also used as a cue to time the start and finish of the performance.

The principal theme of Roberts’s accompanying talk was that the ‘design’ comes last, at the end of the making process, not first, as garment-making is often conventionally sequenced. Each of the six garment artefacts was cut and constructed directly into the cloth with no rehearsal or template, and with no exact idea what the finished outcome might be. To reveal this, the garments had to be disassembled to seek out the humanised cutting lines relating to the designer’s body and choices.

To further emphasise this concept of the design discovery following an experimental technical

process, the process of dissection was recorded live in time-lapse format and then edited immediately at the end of each performance so that the video could be watched in reverse direction at fast speed, instead showing the garment being made rather than unmade, creating a memorable finale. Q&As followed the session to respond to feedback, and adjustments were implemented in subsequent performances to improve delivery. The videos for each of the six sessions were later compiled and shared publicly by Roberts.

Recommendations

This adaptation of the performance of Subtraction Cutting led to further related experiments in video time-lapse, reversal and dissection, that were particularly useful for devising performances with more urgent and shorter durations or ones that were shown in theatrical venues to larger audiences where specialist garment manufacture machinery was absent. These adjustments allowed the action research to take place in locations and time frames that would not previously have been accessible, widening participation. Subsequent performances in Brazil (Dec 2014) directly after the BFC event tested these research methods further, and a video entitled ‘Reverse’ was produced by Roberts (Brighton, Jan 2015) which was released publicly and became a key feature in subsequent performances and talks through to 2019.

References

- ‘Reverse Subtraction Cutting’ video (Nov 2014) by Julian Roberts, Somerset House, London. Shared publicly: vimeo.com/subtractioncutting/reverse-subtraction-cutting
- ‘Reverse Subtraction Cutting in Brazil’ video (Dec 2014) by Julian Roberts, Orbitato Instituto in Pomerode, and the Escola da Cidade in São Paulo. Shared publicly: vimeo.com/115221136
- ‘Reverse – Flattening unit 12’ video (Jan 2015) by Julian Roberts, Brighton. Shared publicly: vimeo.com/subtractioncutting/flattening-unit10



[fig. 11] Julian Roberts performing one of the 6 live dissections at the British Fashion Council Creative Cutting Seminar, Somerset House London, UK. November 2014.

Case Study 2 – ‘Andrew Poppy dress’ artefact, video and talks, April 2018 – May 2020.

Summary

Roberts was invited by British composer and musician Andrew Poppy to produce a video for his album *Hoarse Songs* (2019, Field Radio – FRCD1519).

The album consisted of 10 songs, each with an accompanying music video commissioned to a different artist. Roberts produced the video for the song ‘Where is This Place?’ which features Poppy wearing a dress made from an abstract process of garment construction related to Poppy’s body, which Roberts describes in a later series of design talks and performances. The album launched with private screenings of the videos at The Barge House, London on 12 September 2018; Espaço Karnart, Lisbon on 7/8 December 2018; Chimeres Space, Athens on 16 February 2019; and the Capstone Theatre, Liverpool on 12 April 2019. The videos were also released publicly on YouTube.

The research produced by Roberts for this commission centres on the two artists’ bodies as human measures, exploring musical posture and gestural garment drawing, and strategies of making which minimise material waste.

Analysis

The key challenges of the project were to adequately articulate a connection between garment-making/wearing with music-making/singing, using a time-based medium, video, within the duration of a song questioning the notion of ‘place’.

Conventional modes of pattern drafting are often geometrically rigid, using straight rulers and numerical sizing matrixes which relate to generic human bodies, rather than real ones. Bespoke tailoring often utilises real human measurements and considerations of human posture during the drafting process, but the construction tools used do not resemble the real body’s shape or personality, occupation, vocation, etc. As an experimental process Roberts used the musician’s body as a tool for garment construction, abstracted in a cloth material by the distorting effects of geometry, accidental collisions of grainlines, seamlines and gravity.

Zero Waste, or ‘whole cloth’ techniques were incorporated into the making process through slicing (opening spaces) and mending (closing holes) without subtracting or removing cloth. This process of experimental making allowed Roberts to test how Subtraction Cutting may positively engage with issues of Zero Waste design, advocated by authors Holly McQuillan and Timo Rissanen.

Conclusion

Roberts decided to construct the garment from pattern templates made by directly drawing around Andrew Poppy’s physical body at a chosen time and place. These included outstretched hands covering the length of a piano octave, the posture of Poppy’s body sitting to play a piano at home, and the natural flow of his long white hair as he played music. These template measures were then reassembled into a robot-like 2D representation of the musician, and later used as measuring tools during the garment construction process.

The bright ‘poppy red’ dress designed for the music video was formed from human-shaped holes sliced into a tubular cloth surface, then stitched into the resulting garment shape, creating structural tensions caused by mending, closing and uniting negative spaces. This resulted in a wildly abstract ‘portrait garment’ where the human body of the musician becomes lost and barely recognisable within the undulating garment geometry.

Movements of the body and garment were recorded on video as Andrew Poppy fidgeted and paced around, feeling cloth, expanding and contracting into the garment and the open-air space on an empty beach in West Sussex that had been chosen by Roberts for the video location. This footage was then edited to the song soundtrack.

Following the launch screenings of the video Roberts developed a series of live talks describing the process of making the dress, and the motivations for working in video. These talks included cross-disciplinary audiences of designers from fashion, textiles, fine art, visual communication, product design and interior design specialisms. During these performances, garments were dissected live, documentary photographs and video were shown, live drawings made and the garment patterns and tools devised during the making process

were analysed. The accompanying narrative focused the attention of the audience on particular question-provocations related to conventional processes of designing and craft making. The principal theme of these talks was the concept of human measurement in garment-making, and concerns of material waste and time waste during experimental prototype design. Q&As followed each session to respond to feedback, and adjustments were implemented in subsequent talks to improve delivery.

An online video version of the talk, including a dissection of a dress, was developed during the 2020 Covid-19 pandemic lockdown and entitled *Artefact Dissection* (2020), which was shared publicly by Roberts to widen participation.

Recommendations

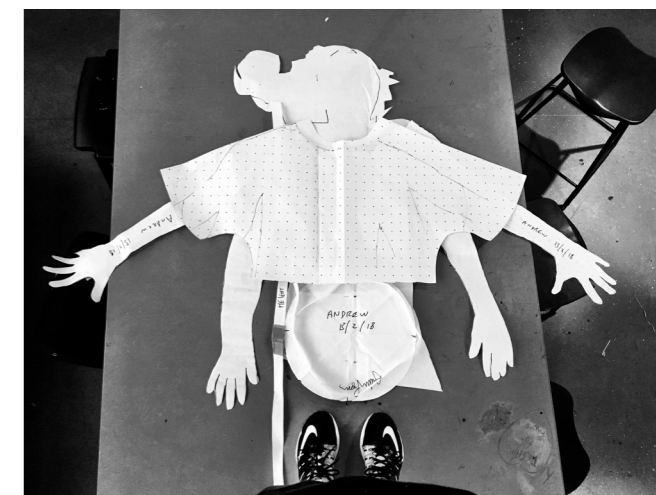
The adaptation of the Andrew Poppy dress video into a series of design talks and performances led to wider international involvement in action research which explores Roberts’s use of abstraction in garment construction, utilizing gestural drawing, tool-making and Zero Waste fashion design. Subsequent talks about the Andrew Poppy dress took place at TasTAFE in Launceston, Tasmania (March 2019); Schneiderei-Markt in Vienna, Austria (April 2019); School of Fashion Technology in Pune, India (April 2019); MasterProject International in Shenzhen, China (August 2019); Geelong Fibre Forum in Australia (September 2019); TaF.tc in Singapore (November 2019); AME/University of Huddersfield UK (February 2020); and the Royal College of Art ‘Artefact Dissection’ lecture (May 2020), shared publicly.

References

- Andrew Poppy – ‘What is This Place?’ (Sep 2018). Video and garment artefact by Julian Roberts. Shared publicly: [youtube.com/watch?v=bLiUM1CbHSw](https://www.youtube.com/watch?v=bLiUM1CbHSw)
- Rissanen, T. and McQuillan, H. 2016. *Zero Waste Fashion Design*. London: Bloomsbury Press.
- Artefact Dissection lecture (May 2020) by Julian Roberts. Shared publicly: youtu.be/klx-70jBkk3I and vimeo.com/417023663



[fig. 12] The Andrew Poppy dress development process showing the patterns made which measure the musicians ‘musical reach’; the cutting and sewing development process involving human-shaped holes sliced open and mended closed; and the final dress worn by Poppy in the video for his album *Hoarse Songs*, London and Worthing, UK. April-August 2018.



[fig. 13] Paper patterns derived from Andrew Poppy’s body and ‘musical reach’ which were used to measure the dress during its development, Chichester, UK. April 2018.

**Case Study 3 – ‘Body Language’
Zero Waste masterclasses,
July 2019 – June 2020.**

Summary

Roberts developed a series of international masterclasses for both live and online performance aimed at encouraging creative risk-taking as a means of design discovery, involving making demonstrations for audiences with limited access to materials and specialist equipment. Many of these presentations were adjusted for free online delivery during the 2020 Covid-19 pandemic lockdown, in order to reach a wider international audience of designers separated from their usual studio and educational resources. The collaboration and dissemination of this action research involved over 1000 artists and designers at 17 institutions in 10 countries.

The masterclasses extend research developed by Holly McQuillan for Zero Waste fashion design practice by creating a series of practical experiments inspired by McQuillan’s incorporation of typographic words into intuitively made garment forms (2010), redeveloped for this purpose for use by cross-disciplinary artists and designers in a wide range of materials.

Analysis

Although Subtraction Cutting performances have in the past involved cross-disciplinary collaboration with architects, mathematicians and fine artists, the primary beneficiaries of Roberts’s Subtraction Cutting research in the period 2014–2019 have been fashion and textile designers. In order to further widen participation in exploratory approaches to 3D shape construction, a series of masterclasses were developed involving more diverse cross-disciplinary groups of designers – product, interiors, visual communication, fine art, costume, fashion and textile designers.

Due to changing conditions which affect how the talks could be delivered during 2019–2020, the sessions were required to be short, engaging and accessible, both to audiences present with Roberts in a studio environment and online to remote audiences at home in different time zones.

Adjustments were made to incorporate language translation in some performances, and to work effectively in blended learning and online-only teaching environments.

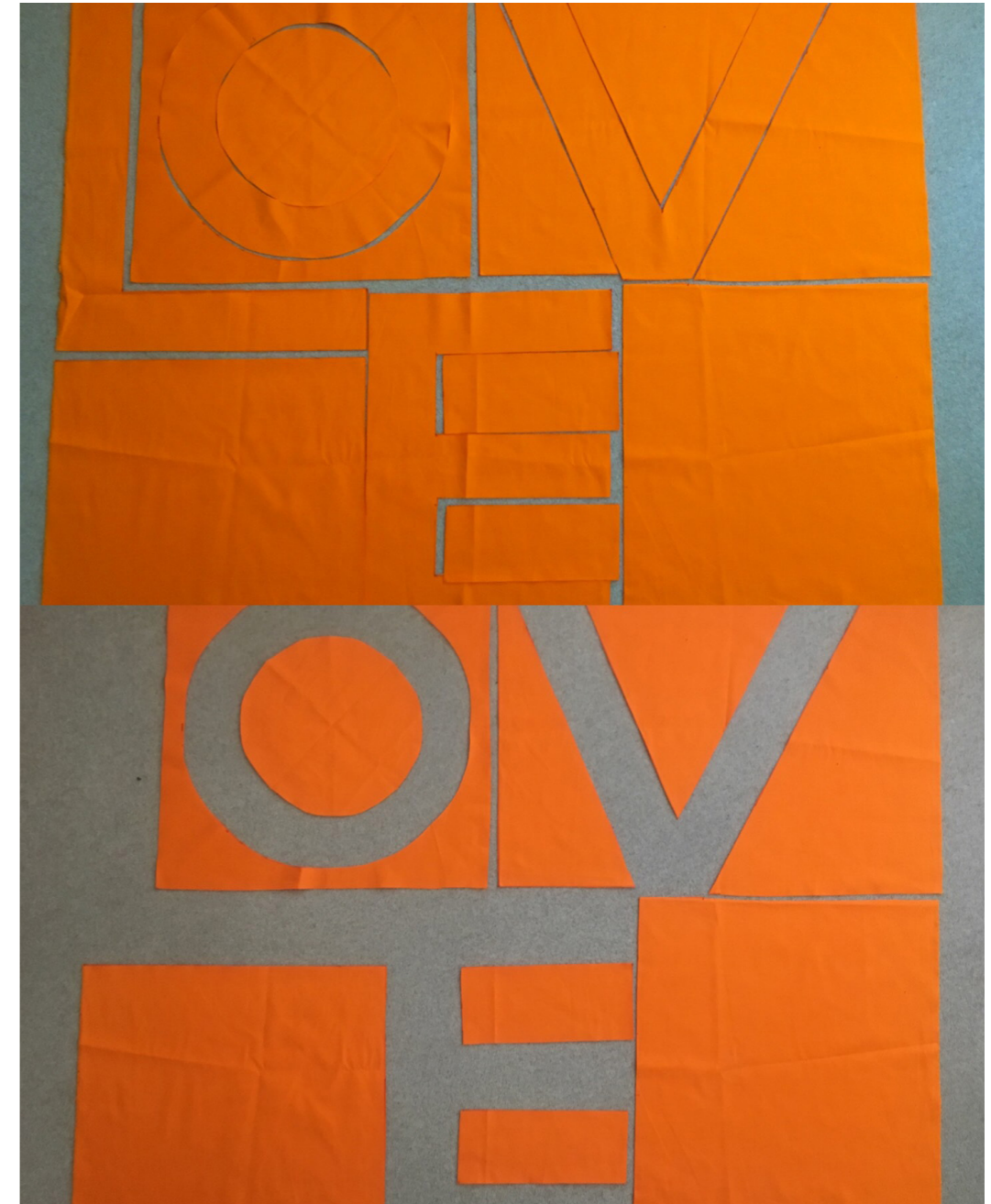
In order to inspire a wider range of approaches to sculptural making and 3D construction, a series of images are shown during Roberts’s presentation as example precedents. These include two key works by Holly McQuillan which demonstrate fast and accessible methods of generating 3D form using Zero Waste fashion design principles: ‘War/Peace’ Twinset developed for the Fashion Art Biennale in Seoul, Korea (November 2010); and the subsequent ‘RISK’ dress pattern produced freehand by McQuillan and witnessed by Roberts at their ‘Cutting Circle – Risk and Fashion Design’ collaboration at Massey University in Wellington, New Zealand (July 2011). Both of these works use typographic letters in their flat construction patterns, making good use of all the negative spaces (waste material) between the letters to help form the resulting garments, which McQuillan describes as outcomes appearing ‘at the intersection between my hand, typography and chance.’

In response to this research a series of words were chosen by Roberts to demonstrate in practice how they may potentially become transformed from flat 2D shapes into more complex 3D sculptural forms, which were then tested on Roberts’s body to discover different ways of wearing or inhabiting them.

In order to encourage intuitive making practices across a wide range of art and design disciplines with differing access to materials and making tools, it became necessary to reinterpret these demonstrations in a wide range of art materials and scales that was not limited to fashion-textile materials and sewing.

Conclusion

In these masterclasses Roberts uses a slideshow of engaging photographic images and prepared samples to demonstrate connections between language, sculptural objects and the human body. Through a process of experimentation and testing the shapes of letters, symbols and codes become joined or interlinked in flexible 3D materials to create new and unpredictable sculptural forms.



[fig. 14] An example demonstration by Julian Roberts for the Body Language masterclass, showing the transformation of the word ‘LOVE’ into a potential wearable garment explored by the artist’s body. This process of using typographic shapes has been used by researcher Holly McQuillan as a means of minimizing material waste by viewing every piece of the reassembled puzzle as equal in value. London, UK. July 2019.

These abstractions of language give rise to new aesthetic considerations and potential practical uses, through a process of accidental discovery and analysis.

An accompanying narrative during the masterclass is used by Roberts to draw attention to particular question-provocations related to conventional approaches to design making. By encouraging designers to document the process of how they manipulate and physically handle sculptural work, the resulting forms develop a closer relationship with the limb that crafted them, and it becomes feasible to imagine how the work may become designed to be held, carried or worn by the body, or made spatially inhabitable by human users. These experiments can be very useful for developing speculative prototypes for refinement into more finished works. The outcomes are not limited solely to the analogue manipulation of real materials; they may also be extended using digital tools for 3D modelling and image manipulation.

Three 'Body Language' masterclasses were developed for artists and designers at the Royal College of Art in London, UK (July 2019, April 2020 and August 2020), all shared publicly online through photographic documentation.

Recommendations

Changes to travel plans caused by the 2020 Covid-19 pandemic border closures and regional lockdowns, which had the effect of preventing live masterclasses and teaching in colleges from taking place resulted in the masterclasses being redeveloped for online dissemination during 2020.

A live performance of the 'Body Language' masterclass took place at TaF.tc in Singapore (March 2020), and a series of free online artist talks entitled 'Free Cutting' were broadcast in weekly episodes with the artist Mari Bendeliani during the April–June 2020 lockdown period, all of which included the 'Body Language' masterclass.

These two-hour-long sessions reached out to artists and designers in lockdown at NTU and HKDI in Hong Kong; SwissMode in Switzerland; University of Primorska in Slovenia; Kolding Design School in Denmark; Edinburgh College of Art, Cardiff University and Colchester Institute in the UK; Parsons New School in the USA; and TR Cutting

School in Romania. For India an initiative was developed with designer Sanah Sharma, entitled 'Cutting Across Borders', for participants at Pearl Academy, NIFT, MIT Pune and Karnivati University in India. The final session in this online series took place at IQRA University in Pakistan, with a 'Free Cutting' video recording of the 'Body Language' masterclass shared publicly (May 2020).

References

- 'Free Cutting' video including 'Body Language' (May 2020) by Julian Roberts. Shared publicly: youtu.be/Tba8C01-Tal
- McQuillan, H. (2010) *Twinset: War/Peace*. Wellington, New Zealand. URL: hollymcquillan.com/2010/07/15/twinset-warpeace/ [Accessed: July 2010].
- McQuillan, H. (2011) *RISK dress*. Wellington, New Zealand. URL: hollymcquillan.com/2011/11/10/risk-dress/ [Accessed: November 2010].
- Rissanen, T. and McQuillan, H. 2016. *Zero Waste Fashion Design*. London: Bloomsbury Press.



Subsidiary focuses evidencing the international reach of this research output:

November 2019 – Exhibition and performance ‘Speed of Thought’ exhibition, Newington Gallery, The Art Academy, London UK. Curated by Alison Hand and Isabel Young – Hand+Young Projects.

In this group exhibition, which included drawings, sculptures and artefacts by artists, architects, scientists and musicians, Roberts was invited to exhibit a sculptural painting entitled ‘Pluto Dress’. This artefact hung in the exhibition for a week before then being dissected on a human body during a live performance at the exhibition’s practitioner talk. It was then exhibited as a flattened pattern/painting for the duration of the exhibition.

October 2019 – Artist Residency. Ria Keburia Gallery artist residency, Kachreti Georgia.

During this residency Roberts collaborated with artist Mari Bendeliani and designers from the Tbilisi State Academy of Arts to produce an exhibition of hand-stitched garments in the grounds of the Ambassadori Kachreti Golf Resort. This involved a live performance dissection of a garment artefact, and a masterclass demonstrating Subtraction Cutting techniques.

During the residency Roberts also collaborated with Mari Bendeliani to produce an artwork for exhibition in London entitled ‘Pluto Dress’, which took the form of a sculptural painting made into a dress by joining selected cuts which respond to the gestural paint marks from the artists’ bodies.

September 2019 – Exhibition. Geelong Fibre Forum, Geelong Grammar School, Australia

Working for a week in collaboration with textile artists and craftspeople at the Geelong Fibre Forum in Australia, Roberts was invited as an international guest artist to lead a Subtraction Cutting masterclass, with a curated exhibition of garments and paintings/drawings produced by Roberts and the participants over a five-day period. The exhibition evolved during the production of the work, with a private view for the public on the evening of the final day.

November 2018 – Performance. India Design Confluence speaker performance, Ahmedabad, India

Roberts was invited as an international guest to give a talk and live performance of Subtraction Cutting at the IDC conference organized by the Unitedworld Institute of Design in Gujarat, India. This involved dissecting a garment artefact and showing video artwork to an audience of 500 guests. The event was followed by a Subtraction Cutting masterclass with designers at UID, resulting in a collaborative exhibition of work and critique.

September 2016 – Performance. BEAMS Arts Festival, Sydney Australia

Roberts was invited as an international guest to lead a Subtraction Cutting masterclass with designers at the University of Technology Sydney. Roberts worked collaboratively to produce a collection of experimental fashion garments, which were then worn by the makers during a performance choreographed by Dr. Donna Sgro in the Sydney streets. This event involved Roberts performing a public dissection of a garment artefact, accompanied by a travelling showcase of design work weaving through Chippendale Creative Precinct on the evening of September 17, 2016.

April 2016 – Industry masterclass. NIKE Inc. masterclass, Beaverton WHQ, Oregon USA

Roberts was invited to lead a Subtraction Cutting and drawing masterclass for Nike apparel and shoe designers in the ‘Hive’ development space at the Nike World Headquarters in Oregon, USA. Roberts instigated a body of collaborative work that involved abstraction and experimental pattern cutting, which was later critiqued.

Roberts then gave a Subtraction Cutting dissection performance for teachers and students at the nearby Oregon College of Art and Craft, and the Art Institute of Portland.

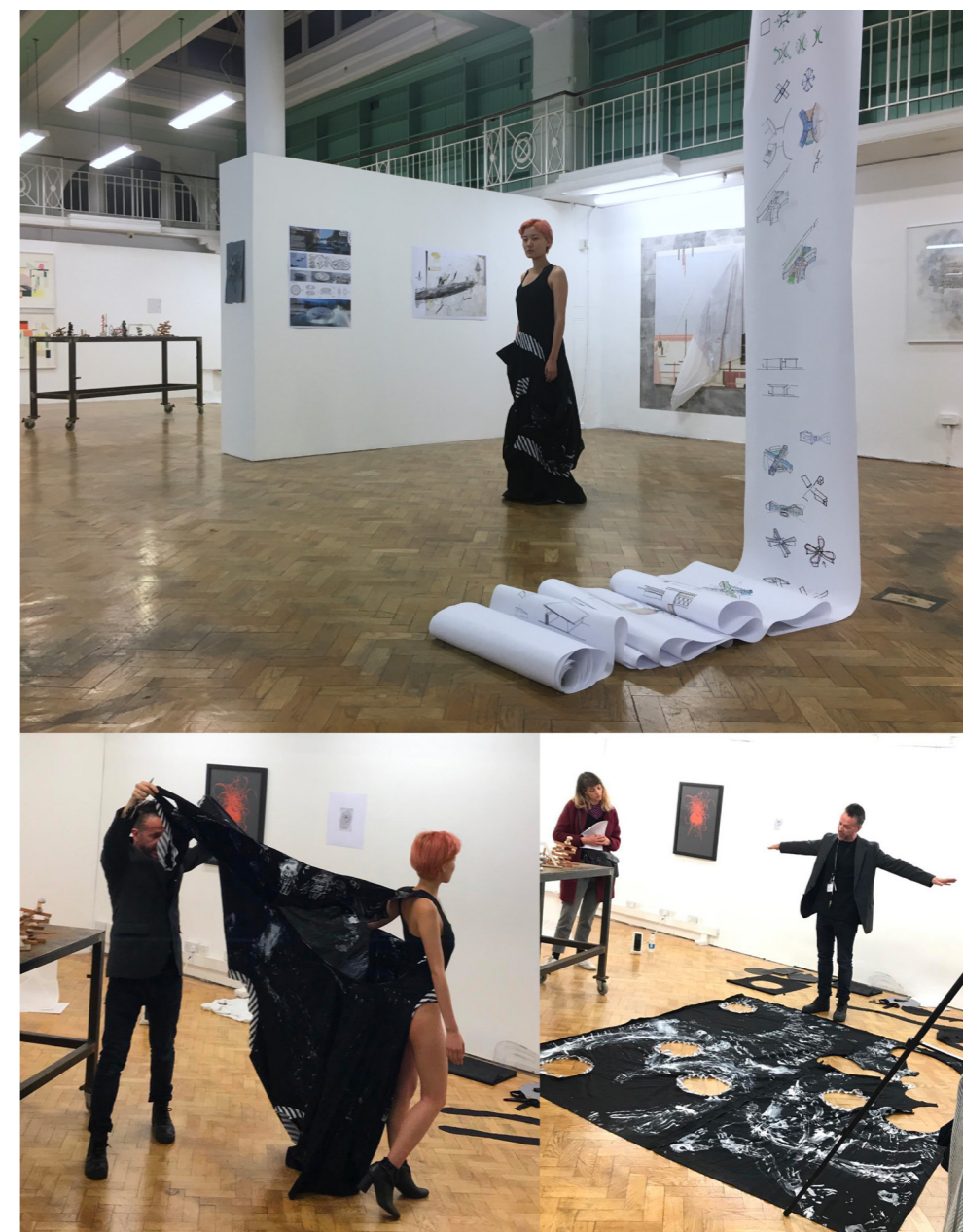
November 2015 – Artist Talk. Gray’s College of Art artist talk, Aberdeen, Scotland

Roberts was invited to perform a Reverse Subtraction Cutting dissection of a garment artefact alongside video artwork at the Sir Ian Wood Building Amphitheatre for an audience of designers at Gray’s College of Art, as part of their visiting artist Guest@Grays lecture series.

December 2020 – Forthcoming publication. Abstract Pattern Cutting as a Design Tool: Accidental Cutting and Subtraction Cutting methodologies (2020). Dr. Eva Iszoro Zak and Julian Roberts.

A contributor agreement was signed on 5 December 2020 and the chapter accepted for publication in Eugenia Paulicelli, Veronica Manlow and Elizabeth Wissinger (eds.). 2021. *Routledge Companion to Fashion Studies*. London: Routledge.

This co-authored book chapter focuses on two garment construction methodologies, Subtraction Cutting and Accidental Cutting, which apply abstraction and abstract, random or accidental tools within the design process, enabling the generation of speculative end results, focused on expanding, rather than merely reaching, known outcomes. [See Appendix 1 – Book chapter contract, Routledge Press.]



[fig. 15] The Pluto Dress made in collaboration with Mari Bendeliani, exhibited and then dissected live to reveal the painting inside it. The performance of the dissection took place during the practitioner talk at the ‘Speed of Thought’ exhibition in the Newington Gallery, The Art Academy London, UK. November 2019.



[fig. 16] Live dissection of a Subtraction Tunnel dress with Maria Bendeliani during the Ria Keburia Gallery artist residency in Kachreti, Georgia. October 2019.



[fig. 17] Exhibition of garments and drawings following 5 days of collaboration with crafts makers at the Geelong Fibre Forum Australia. September 2019.



[fig. 18] Choreographed dancing by the makers during the BEAMS Arts Festival, with each designer wearing their Subtraction Tunnel dress made during the masterclass, Sydney, Australia. September 2016.



[fig. 19] Live dissection of a Subtraction Tunnel dress worn by one of the designers during the BEAMS Arts Festival, Sydney, Australia. September 2016.

International masterclasses, exhibitions and talks, 2014-2020:

Europe and Russia

22 Events – 11 Countries – 15 Colleges/Organisations:

October 2019	Ria Keburia Gallery masterclass , Kachreti, Georgia
April 2019	Schneiderei-Markt masterclass , Vienna, Austria
April 2019	Schneiderei-Markt cutting performance , Vienna, Austria
March 2019	TR Cutting School masterclass , Bucharest, Romania
December 2018	WEF masterclass , A Coruña, Spain
November 2018	Grasser School masterclass , St. Petersburg, Russia
November 2018	Fresh Blood masterclass , Moscow, Russia
May 2018	Bielefeld University masterclass , Germany
March 2018	Kristina Tretiakova Lab masterclass , Grasser School, St. Petersburg, Russia
March 2018	Fresh Blood masterclass , Moscow, Russia
March 2018	British Higher School of Art & Design masterclass , Moscow, Russia
March 2018	CreativityUnlimited masterclass , Gothenburg, Sweden
September 2017	Alphen Aan Den Rijn masterclass , Netherlands
June 2017	Tbilisi State Academy of Arts masterclass , Tbilisi, Georgia
May 2017	University of Primorska masterclass , Ljubljana, Slovenia
November 2016	Escuela de Arte Almería masterclass , Almería, Spain
November 2016	Bilbao International Art & Fashion Festival / INEDI masterclass , Bilbao, Spain
November 2016	Escuela Superior de Diseño de La Rioja (EASD) masterclass , La Rioja, Spain
April 2016	WEF Madrid masterclass , Spain
October 2015	Yulia Balle School of Sewing masterclass , Moscow, Russia
April 2015	School of Form masterclass , Poznan, Poland
August 2014	TEKO Via University masterclass , Herning, Denmark

Far East Asia, South East Asia, India and Middle East

17 Events – 6 Countries – 14 Colleges/Organisations:

March 2020	TaF.tc masterclass , Singapore
November 2019	TaF.tc masterclass , Singapore
August 2019	MasterProject International masterclass , Shenzhen, China
April 2019	SOFT masterclass , Pune, India
January 2019	IDeA masterclass , Bangalore, India
November 2018	Unitedworld Institute of Design masterclass , Ahmedabad, India
November 2018	India Design Confluence talk and cutting performance , Ahmedabad, India
August 2018	F.A.C.E. masterclass , Ho Chi Minh City, Vietnam
August 2018	F.A.C.E. masterclass , Hanoi, Vietnam
October 2017	Hong Kong Design Institute (HKDI) masterclass , Hong Kong (Visiting Fellow)
August 2017	Bunka Gakuen University masterclass , Tokyo, Japan
August 2017	ESMOD Tokio masterclass , Tokyo, Japan
July 2017	SIA Cutting masterclass Tour , Beijing–Shanghai–Guangzhou–Chengdu, China (Chair Professor)
August 2016	Vietnam Fashion Academy masterclass , Ho Chi Minh City, Vietnam
January 2016	Hong Kong Design Institute (HKDI) masterclass , Hong Kong (Visiting Fellow)
April 2015	Creative Space Beirut masterclass , Beirut, Lebanon
January 2015	Nanyang Academy of Fine Arts (NAFA) masterclass , Singapore

Australia

15 Events – 11 Colleges/Organisations:

September 2019	Geelong Fibre Forum masterclass , Australia
September 2019	University of the Sunshine Coast masterclass , Australia
September 2019	TAFE Queensland masterclass , Australia
March 2019	TasTAFE Launceston cutting performance , Tasmania
March 2019	TasTAFE Launceston masterclass , Tasmania
September 2016	Geelong Fibre Forum masterclass , Geelong, Australia
September 2016	QUT Brisbane/ University of Canberra masterclass , Brisbane, Australia
September 2016	UTS masterclass & BEAMS Arts Festival cutting performance Sydney, Australia
September 2016	RMIT masterclass , Melbourne, Australia
September 2016	Boxhill Institute masterclass , Melbourne, Australia
April 2014	Sydney Institute St. Georges College masterclass , Sydney, Australia
April 2014	University of Technology Sydney masterclass , Sydney, Australia
April 2014	Royal Melbourne Institute of Technology masterclass , Melbourne, Australia
April 2014	Beautiful Silks masterclasses Melbourne, Australia
April 2014	Holmesglen TAFE masterclass , Melbourne, Australia

South America and USA

14 Events – 4 Countries – 11 Colleges/Organisations:

August 2018	Marisol Fernández masterclass , Lima, Peru
June 2017	CIME Moda masterclass , Guadalajara, Mexico
May 2017	Casa Díaz C masterclass , Mexico City, Mexico
November 2016	Michigan State University masterclass , Lansing, USA
August 2016	Instituto di Moda Burgo cutting performance , Mexico City
August 2016	Casa Diaz masterclass , Mexico City
August 2016	CIME Moda masterclass , Guadalajara, Mexico
April 2016	Oregon College of Art and Craft masterclass , Oregon, USA
April 2016	Art Institute of Portland masterclass , Oregon, USA
April 2016	NIKE Inc. Cutting and Drawing Masterclass , Beaverton WHQ, Oregon, USA
December 2014	Escola da Cidad masterclass , São Paulo, Brazil
December 2014	Orbitato Instituto masterclass , Pomerode, Brazil
August 2014	CIME Guadalajara masterclass , Mexico
August 2014	Parsons The New School masterclass , New York, USA

United Kingdom

63 Events – 45 Colleges/Organisations:

October 2020	Beijing Institute of Fashion Technology Zoom masterclasses , China/UK
October 2020	Tbilisi State Academy of Arts Zoom masterclasses , Georgia/UK
April – June 2020	'Cutting Across Borders' Zoom Artist Talk series during the Covid 2020 Lockdown , UK – NTU & HKDI Hong Kong, SwissMode Switzerland, University of Primorska Slovenia, Pearl Academy & NIFT & MIT Pune & Karnivati University India, Kolding Design School Denmark, Edinburgh College of Art & Cardiff University & Colchester Institute UK, Parsons New School USA, IQRA University Pakistan and TR Cutting School Romania.
February 2020	University of Huddersfield/ AME masterclass , Huddersfield, UK

January 2020 **University of Northampton masterclass**, Northampton, UK
 December 2019 **University of West London masterclass**, London, UK
 November 2019 **Royal College of Art Graduate Diploma masterclass**, London, UK
 November 2019 **'Speed of Thought' exhibition and performance**, London, UK
 October 2019 **Leeds University cutting performance**, Leeds, UK
 October 2019 **Royal College of Art Graduate Diploma cutting performance**, London, UK
 May 2019 **Royal College of Art Graduate Diploma masterclass**, London, UK
 April 2019 **Fashion Retail Academy masterclass**, London, UK
 April 2019 **London College of Fashion (UAL) masterclass**, London, UK
 March 2019 **Royal College of Art cutting performance**, UK
 February 2019 **Royal College of Art Reverse cutting performance**, London, UK
 January 2019 **Fashion Retail Academy masterclass**, UK
 December 2018 **University of West London masterclass**, London, UK
 December 2018 **Northbrook College masterclass**, Brighton, UK
 November 2018 **Royal College of Art masterclass**, London UK
 November 2018 **Central St. Martins (UAL) Zero Waste masterclass**, UK
 October 2018 **Leeds University cutting performance**, Leeds, UK
 April 2018 **London College of Fashion (UAL) masterclass**, London, UK
 February 2018 **Loughborough University cutting performance**, Loughborough, UK
 February 2018 **Northumbria University cutting performance**, Newcastle, UK
 January 2018 **Royal College of Art cutting performance**, London, UK
 January 2018 **Chichester College masterclass**, UK
 October 2017 **Leeds University cutting performance**, Leeds, UK
 October 2017 **Central St. Martins (UAL) Zero Waste masterclass**, London, UK
 August 2017 **London College of Fashion (UAL) masterclass**, UK
 March 2017 **Doncaster College of Art & Design masterclass**, Dobcaster, UK
 March 2017 **Royal College of Art Textiles masterclass**, UK
 February 2017 **Hong Kong Design Institute (HKDI) masterclass**, RCA, London
 February 2017 **Instituto Marangoni masterclass**, London UK
 February 2017 **Chichester College of Art & Design masterclass**, UK
 December 2016 **Fashion Retail Academy masterclass**, London, UK
 October 2016 **Central Saint Martin's (UAL) masterclass**, London, UK
 October 2016 **University of Bedfordshire masterclass**, Bedford, UK
 October 2016 **Anglia Ruskin Cambridge College of Art masterclass**, Cambridge, UK
 April 2016 **Portsmouth University masterclass**, Portsmouth, UK
 July 2016 **London College of Fashion (UAL) masterclass**, London, UK
 March 2016 **Royal College of Art Textiles & Fashion Knitwear masterclass**, London, UK
 February 2016 **London College of Fashion masterclass**, UK
 February 2016 **Glasgow Clyde College Cutting masterclass for teachers**, Glasgow, UK
 January 2016 **Chichester College of Art & Design Cutting masterclass**, Chichester, UK
 November 2015 **London College of Fashion (UAL) masterclass**, London, UK
 November 2015 **Instituto Marangoni masterclass**, London, UK
 November 2015 **Grays College of Art cutting performance**, Aberdeen, UK
 November 2015 **University of Edinburgh masterclass**, Edinburgh, UK
 October 2015 **Derby University masterclass**, Derby, UK
 October 2015 **University of West London masterclass**, London, UK
 September 2015 **Royal College of Art Interior Design cutting performance**, London, UK
 August 2015 **Brighton University Outreach masterclass**, Brighton, UK
 July 2015 **London College of Fashion (UAL) masterclass**, London, UK

May 2015 **London College of Fashion (UAL) masterclass**, London, UK
 March 2015 **Architectural Association masterclass**, London UK
 March 2015 **Royal College of Art MA Textiles masterclass**, London UK
 February 2015 **Royal College of Art MA Fashion Womenswear masterclass**, London UK
 January 2015 **Cleveland College of Art & Design masterclass**, Hartlepool, UK
 November 2014 **British Fashion Council Creative Cutting Seminar**, Somerset House, London, UK
 October 2014 **Carmarthen College of Art & Design masterclass**, Camarthen, UK
 May 2014 **Graduate Fashion Week masterclass**, London, UK
 March 2014 **Chelsea College of Art (UAL) Zero Waste lecture**, London, UK
 January 2014 **Leeds College of Art & Design masterclass**, Leeds, UK
 January 2014 **Ravensbourne University masterclass**, London, UK

Pedagogical impact – examples of institutes that have incorporated Subtraction Cutting into their course curriculums:

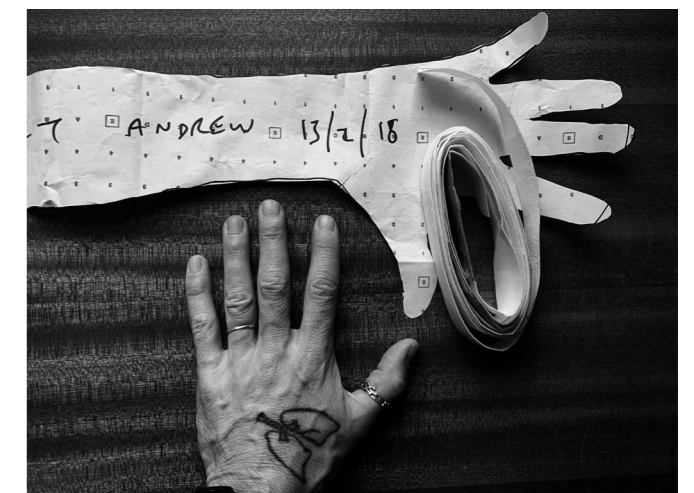
- Colchester Institute, UK – BA Fashion & Printed Textiles (tutor: Val Jacobs)
- University of Northampton, UK – BA Fashion Zero Waste Pattern Cutting project
- University of Technology Sydney, Australia – BA Fashion & Textiles Design (tutor: Donna Sgro)
- Parsons The New School New York City, USA – MBA and BFA Fashion (tutors: Timo Rissanen and Francesca Sammaritano)
- Swedish School of Textiles, University of Borås, Sweden – MA Fashion Design (tutor: Holly McQuillan)
- Chichester College, UK – BTEC ND (tutor: Georgina Hooper)
- LISAA School of Design Bangalore, India – BA Fashion (tutor: Smitha D. Rao)
- Yeditepe University Istanbul, Turkey – BA Fashion (tutor: Heidi Babb)
- IQRA University, Pakistan – BA Fashion (tutor: Shakeela Arif)
- TR Cutting School Budapest, Romania – Fashion short course (tutor: Irina Akkaya)
- Craven College, Skipton, UK – UAL Foundation Diploma in Art & Design (Fashion)
- Bournemouth & Poole College, UK – UAL Foundation Diploma in Art & Design (Fashion)

Key citations in books, theses and research publications:

[See Appendix 2 – Key citations]

Author's Website and social networking platforms used for dissemination:

- Website: julianand.com
- Free Cutting publications and lectures: linktr.ee/freecutting
- Instagram photos/videos: [instagram.com/subtractioncutting](https://www.instagram.com/subtractioncutting)
- Vimeo videos: vimeo.com/subtractioncutting
- YouTube videos: [youtube.com/user/JULIANAND](https://www.youtube.com/user/JULIANAND)
- Tumblr blog/photos (2011-2019): subtractioncutting.tumblr.com



[fig. 20] Patterns derived from Andrew Poppy's body, analysed during an Artefact Dissection lecture, shown next to Julian Roberts's left hand, Chichester, UK. May 2020.

Appendices

Appendix 1

Book chapter contract – Routledge Press

- Book Chapter contract
- Link redacted for public dissemination -
Book published here: <https://www.routledge.com/The-Routledge-Companion-to-Fashion-Studies/Paulicelli-Manlow-Wissinger/p/book/9780367209568>

Appendix 2

Key citations in books, theses and research publications

- McQuillan, H. (2020). Zero Waste System Thinking: Multimorphic Textile-Forms. Sweden: University of Borås Studies in Artistic Research No. 37 2020. ISBN 978-91-89271-5-0 (printed) ISBN 978-91-89271-06-7 (PDF). Pgs. 32–3. URL: hb.diva-portal.org/smash/get/diva2:1478307/FULLTEXT01.pdf
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- That Sewing Blab ep.166: Interview with Julian Roberts & Discussing Subtraction Cutting. December 2019 – youtu.be/JNyOeqvKx3g
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- Rissanen, T. and McQuillan, H. (2016). Zero Waste Fashion Design. London: Bloomsbury Press. ISBN 978-1-4725-8198 (pbk.) and ISBN 978-1-475-8199-0 (epdf). DOI: 10.1111/fcsr.12255
- Lindqvist, R. (2015). Kinetic Garment Construction – Remarks on the Foundations of Pattern Cutting. Sweden: University of Borås – Studies in Artistic Research No.13. ISBN 978-91-87525-41-4. DOI: 10.13140/RG.2.1.3275.2161
- Cho, S., & Lee, J. H. (2015). Development of Zero Waste Fashion Design Process Guideline from an Educational Perspective. Journal of the Korean Society of Costume, 65(4), 91–108. DOI: doi.org/10.7233/jksc.2015.65.4.091

Publications by the author

- Abstract Pattern Cutting as a Design Tool: Accidental Cutting and Subtraction Cutting methodologies (2020). Dr. Eva Iszoro Zak and Julian Roberts. Routledge Companion to Fashion Studies (forthcoming 2021*). Edited by Eugenia Paulicelli, Veronica Manlow, and Elizabeth Wissinger. London, UK: Routledge Press. [*See Appendix 1]
- Free Cutting (2014) 2nd edition, Julian Roberts. Online UK (<https://researchonline.rca.ac.uk/3060/>) Official URL: mediafire.com/?10d8kgb1yxc88 [Accessed: January 2014].

Appendix 3

Example letters of invitation

- Example letters of invitation
- Link redacted for public dissemination

Appendix 4

Example event posters

- Example event posters
- Link redacted for public dissemination

Colophon

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