

Volumetric shape making and pattern cutting

CAMPBELL, Lesley Ann

Available from Sheffield Hallam University Research Archive (SHURA) at:

<http://shura.shu.ac.uk/10470/>

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version

CAMPBELL, Lesley Ann (2015). Volumetric shape making and pattern cutting. In: Shapeshifting : a conference on transformative paradigms of fashion and textile design. Textile and Design Laboratory and Colab at the Auckland University of Technology.

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>

Volumetric Shape Making and Pattern Cutting

Abstract:

This paper in light of pedagogical observations seeks to explore and examine an alternative approach to pattern cutting through volumetric shape making and a practical, process led investigation using Alien body shapes as a teaching resource.

The holistic fashion designer explores and engages with both silhouette and pattern cutting, by developing the skills of volumetric shape making. The process of pattern-cutting and volumetric shape making is an iterative translation between two dimensions and three dimensions which requires a practical, experimental approach.

A sequential series of interactive workshops have been developed using irregular shaped mannequins to facilitate and develop this process, promoting creative outcomes and a deeper understanding of pattern cutting. This hands-on improvisational approach without a known outcome allows for design to progress organically.

The above process of thinking, 'drawing' and pattern-cutting in three-dimensions can be extremely challenging and alien to fashion students who often have a pattern cutting foundation based on technical drawings and drafting principles mostly in a two dimensional format.

The aim is to explore whether a synaptic link created between hand, eye and mind through an algorithm, can assist the holistic fashion designer and enhance creativity. The vehicle of delivery for this investigation is a series of experimental workshops undertaken by all three levels of BA (Hons) Fashion Design students at Sheffield Hallam University. This dynamic working method challenges conventional teaching methods of demonstration, books and handouts and promotes enjoyment of the journey, thus reducing preconceived ideals allowing more scope for spontaneous outcomes.

Student workshops also explore morphology as a challenge to the traditional western convention of body contouring through flat pattern cutting. Morphology is explored through a series of irregular shaped, non-humanoid forms - Alien Bodies. Full-scale Alien Body mannequins are provided as a resource in the workshop on which to

apply the method of direct working in three dimensions to generate an initial pattern. Reflection, analysis and discussion of the pattern shape when transformed back to the flat plane, aims to promote comprehension and underpin the holistic designing/pattern-cutting approach. 'Alien Body - Pushing Pattern Parameters' workshops culminated in an exhibition at the Sheffield Institute of Arts Gallery where a selection of 18 garments and their flat patterns, all created by students during the previous 6 month period, were displayed..

This paper evaluates data captured and draws on anecdotal evidence gathered from students attending these workshops as well as looks at the methodologies used including process led investigation and peer review within the university environment. It forms a cornerstone for further questioning of whether the fashion designer and pattern-cutter is the same person.

Keywords – Challenging, Volumetric, Conceptual, Holistic, Experimental

Introduction

This paper will cover a 3 dimensional pattern-cutting technique devised to create voids between the inner shape, the body, and the outer shape, the garment, and thus creating volume during the process. As a fashion educator and practitioner I am constantly trying to think of new and creative ways to encourage innovative design, exploring and devising approaches and processes that may lead to unusual design and challenge fashion students not to conform to set structures and ideas. From observations within the studio environment it is apparent that many students have difficulty visualising two-dimensional (sketches & flat patterns) as three-dimensional (garments) and this can often stifle creativity. Fashion illustrations and sketches often lose some of their fluidity and volume during this translation, students can often feel frustrated during the pattern making process and disappointed with the outcome.

Why look at volumetric shape making? Fashion drawing utilises variable mediums, often fluid, enabling the visualisation of volume especially difficult. The process of creating excess volume has the potential to create interesting shapes that do not follow traditional body contours, outcomes have the potential to be less obvious, less restricting and flattering. Adapting a holistic approach of designing and pattern cutting three-dimensionally aims to help students think in a more lateral, experimental and conceptual way.

The current landscape of pattern cutting techniques

Clothing origination relies on two basic principles of pattern cutting: three-dimensional (working directly onto a mannequin) or two-dimensional (flat pattern cutting); the two approaches do not exclude each other and may be used within the same garment.

Flat pattern cutting:

Flat pattern cutting is a method of creating patterns for garments from technical drawings; the process applies a series of body measurements to a garment design from which a manual or digital flat pattern is created and ultimately a three-

dimensional (3D) shape (a garment) that fits a human form. It follows a set of principles of contouring the body and/or adding fullness and volume, when this process is applied by experienced pattern cutters it is an accurate and effective method of creating patterns for garments, often driven by price and production process.

Three-dimensional pattern cutting:

Working in 3D, directly onto a mannequin with fabric, is not a new concept (also referred to as draping, modelling and moulage), and can be unpredictable, time consuming and costly, often using more fabric than the 2D process because it has an inherent potential to create volume and/or drape, a draped garment has no fixed form in contrast to one derived two dimensionally and therefore has the potential of unknown and original outcomes.

Creating Volume

Caged structures such as crinolines and bustles, created volume and have been used for around 400 years to distort the female form. Many contemporary fashion designers explore the effects of exaggerated structure and distortion of the stereotypical female form; they practice conceptual fashion and challenge the viewer's normal experience and expectation. The evolution of the silhouette will undoubtedly at some stage involve working in 3D to produce outcomes that are challenging, volumetric, conceptual, holistic and experimental. Creating volume using an experimental approach to design through pattern cutting could help students gain a better understanding of garment shape making, and thus become a more accomplished fashion designer.

Problem Based Learning in pattern cutting

Problem Based Learning (PBL) is a concept where students work in small collaborative groups to identify what they need to learn in order to solve a problem. It provides an opportunity for learners to apply their shared knowledge to a relevant

problem. The teacher helps guide the learning process through open-ended questioning designed to get students to make their thinking visible. *'Educators are interested in PBL because of its emphasis on active, transferable learning and its potential for motivating students. The goals of PBL include helping students develop: flexible knowledge, effective problem-solving skills, self-directed learning skills, effective collaboration skills and intrinsic motivation'* (Hmelo-Silver 2004).

On the whole, the tools and resources that support PBL in experimental approaches to pattern cutting are limited. Existing pattern cutting books such as the widely used *Metric Pattern Cutting for Women's wear* by Winifred Aldrich and *Patternmaking for Fashion Design* by Helen Joseph Armstrong, to name but a few, are prescriptive and do not stimulate experimental approaches to pattern cutting that sit outside of set instructions. Students and practitioners may in time develop their own approach to experimental cutting but there are limited texts to support this and therefore relies mainly on self-discovery.

Adapting the PBL approach is significant and the main driver behind the Alien Body concept in that it aims to encourage learners to initiate strategies rather than follow prescriptive instructions. By using this method deeper learning and more creative outcomes could be achieved.

In 2005 Tomoko Nakamichi, lecturer at Bunka Fashion College (Tokyo) published *Pattern Magic* (the first book in a series of three), a book of 13 inspirational beautifully presented silhouettes. Designs in the book are based on 2D manipulation of a block or sloper, using a ½ scale mannequin; the book provides instructions enabling readers to re-create the garments. While the text provides some opportunities that support a process of self-discovery and development, some students appear to find it difficult applying the pattern manipulation techniques to their own work. This in part is due to the subtle nuance of the technique that is developed through the author's in depth experience of creative pattern cutting. Nevertheless the series of books are stimulating and popular.

There still appears to be an educational void in teaching materials that enable students to learn to think in 3D and further tools are needed to support the exploration and origination of new silhouettes rather than copy existing structures and forms. The Alien Body project intends to support students to engage in

experimental approaches to pattern cutting by thinking through doing as an approach to problem solving.

Introducing the Alien Body

Alien Body is an on-going project that aims through a process driven approach to provide the fashion designer with the tools to understand and become confident with complex forms, by translating the process of pattern cutting into a hands-on craft allowing physical, direct manipulation of form. Julian Roberts, creative pattern cutter and educator believes that *'Pattern cutting and design are physical activities, they extend from the hand and eye, from rotations of the wrist, elbow and shoulder, but they also flow from the mind and its perceptions of spatial awareness'* (Roberts, P13).

Delivered over a series of 3 practical workshops entitled Encounter, Envelop and Explore, the alien body process-led framework provides a mechanism for students to develop 3D pattern making skills that lead to an experimentation into unusual forms. The outcomes are unknown but a direct visual and volumetric link can be made between eye, hand, mind and process.

In this paper I will discuss a study conducted at Sheffield Hallam University in England. The project begins with the development of six distorted forms that are constructed with calico and wadding. The forms are designed to fit over a UK size 12 studio female mannequin; they are zipped on to the form like a body suit. Heads are also incorporated into the form, of which three of these in the pilot study project took a conventional human form and three did not.

The design of the Alien form derives from research of mutated humanoid forms, three are symmetrical and three asymmetric. Vertical seaming is used wherever possible to construct the irregular mannequins to suggest a relationship to the traditional mannequin form. The concept of 'Alien' has been selected to challenge the notion of convention in the human form; in terms of pattern cutting the alien form is unfamiliar, foreign, different, outcast, it challenges convention and social prejudice; it is a departure into the unknown. Alien can be viewed as armour - hiding what is

underneath, providing protection from others and showing an implied image of something different. Alien is a purposefully grotesque form to force the mind to look past preconceived ideas of body contouring synonymous with western culture and the additive nature of surface decoration.

Observing the Alien Body workshops in action: A case study

Six Aliens mannequins (figure 1) were developed for a pilot project, as a method for testing and exploring pattern cutting responses to shape and silhouette. The individual body forms were created to provide different opportunities, challenges and outcomes for the user. The initial themes for the body forms used in the pilot study came from body deformities, insects and aliens depicted in popular culture. These themes were applied to the silhouettes to explore different challenges around conventional parts of the human female form.

The Alien Body workshops:

The aim was to explore thinking through making as an overarching theme to all the workshops, which reiterates Charles Eames's quote that: 'Art resides in the quality of doing, process is not magic'. This manifested itself in three workshops Encounter, Envelop and Explore, during which the students were required to investigate:

- Voids – exploring the space between the inner shape and the outer shape and how those shapes interact with the body
- Translation – exploring the transition from 3D shapes into 2D flat patterns
- Seams – exploring the visual effect of 3D seam positioning

Students were encouraged to respond in adventurous 3 dimensional ways that were dynamic and unrestricted, that were quick and did not necessarily involve precision, a prototype could be seen whilst design decisions were evolving. I felt that using a freer and non-prescribed approach might promote confidence through doing and create a starting point to develop a more unusual and less obvious garment.

The workshops involved the participation of 110 BA (Hons) Fashion Design students from Sheffield Hallam University (SHU). The students, from across all the three years of the programme, participated in the workshops, from October to December 2011. The workshops required six groups so that each could have an Alien Mannequin, participants were asked to self-select groups. The outcomes for the workshops were structured and modified to accommodate the learner's prior garment construction and flat pattern making knowledge.

The First Year group of students were organised into six groups of 6/7 students to produce an initial alien block and toile (prototype garment); each group then produced one garment, producing 6 final garments.

The Second Years worked in six groups of 6/7 students to produce an initial alien block and toile, then sub-divided into groups of 3/4 to produce a garment, producing 12 final garments.

The Third Year group of students worked in six groups of 5 students to produce an initial alien block and toile; each student then produced a garment, thus producing 30 individual final garments. The workshops were delivered over six weeks through three x 3-hour workshops alternated with weekly individual and group tutorials.

Workshop 01 – Encounter: Introduction, Conception, and Initial Pattern

The first exercise involved the student participants working independently to securely and closely wrap a potato in paper, they were asked to use as little paper as possible. Students drew (seam) lines on the covered potato, notched and cut along the marked lines to create a flat pattern. The process was repeated three times, and on each occasion participants had to vary the seam lines and create a different flat paper pattern for the same silhouette (figure 2). A group discussion on how the positioning of the cut lines had informed the flat pattern shape followed.

Students then formed into their self-selected groups and one member of the group chose an Alien Mannequin which were shrouded in white specimen covers, the selection process, group discussion and anticipation was exciting, the studio space felt creative and students were eager to learn the next step in the process.

Jankowska & Atlay (2008) discuss the importance of creative space in enhancing student engagement with the learning process, their motivation to explore, experience and discover, capitalising on a sense of novelty and surprise.

Each group was then asked to select an A4 sealed envelope containing a fabric swatch, again this was a random selection as was the choice of mannequin. 6 Fabrics were selected for the project, all black, in differing weights, three natural fibres and three synthetics, each having a very different characteristic. Each fabric would produce a very different response as design decisions were applied, demonstrating the complex reality of 3D translation with a variable medium. With this in mind students discussed the characteristics of their allotted fabric before commencing 3D patternmaking decisions.

The often-difficult decision of fabric selection and colour from an almost infinite choice was removed, black is the absence of colour and was the main reason for its selection allowing students to concentrate on form.

The fabrics were: Cotton Organdie, Coated Linen, Wool Serge, Viscose Satin, Nylon/Polyester Ripstop and Quilted Nylon.

Each group was then required to tightly wrap their alien, including the head, in pattern paper, adding seam lines, notches and annotation to enable an initial block to be made. When drawing the seam lines on the paper wrap students were asked to think about what they were trying to communicate through shape, for example: was it fluidity or severity etc., students were also challenged to provide minimal seam lines that were not too complicated or contrived whilst ensuring there were enough seam lines to enable the paper to lay flat when forming the 2D block, relating this back to the 'potato exercise'. This process began the thinking around 3D to 2D translation. Seam line positioning was also discussed and considered in relation to any pre-conceived notions, an added dimension to this process was the consideration of seam lines in relation to the allocated fabric and its properties.

When the drawn-on seam lines were cut up to create flat patterns it aided students in understanding the importance of where to place the seam lines over undulations to enable the pattern to lay flat (figure 3). The potato exercise discussed earlier helped to prepare the students for this process with a more complex shape. This began the

process of moving away from the preconceived ideas of human form and established seam and dart positions. For example a student remarked later on in the process when working with Alien Body 04 *'when is a bust dart not a bust dart, when it's a big nose!'*

Workshop 02 - Envelop: Construction, Conclusions and Development

Information on the process was given to students at the beginning of each of the workshops, this retained an element of anticipation and also inhibited forward planning as outcomes were intended to be spontaneous to promote thinking through doing.

The next task required students to use the alien block (initial flat pattern) to construct a toile in the allocated fabric, all students in the group took part in the making process, collaborating to distribute tasks according to skill level to get the toile constructed as quickly and effectively as possible. The toile was then fitted on a UK size 12 studio mannequin. The aim of this was to explore the space between the inner and outer shape for example, is the shape collapsing or does it have structural properties, and understanding whether this is a result of the fabric choice or the seam line position, or a combination of the two. Students then explored if the void could be maintained with less seams, were the seam position and amount contrived? Students were guided through the process using the PBL approach.

The shape and silhouette created by the voids was also considered and discussed. Following this static process the toile was then tried on a person to explore the effects of movement on the voids. This also aided students in understanding the difference between trying garments on mannequins and trying garments on moving people when designing. Whilst being worn the toiles were analysed to explore emotional response, aesthetic consideration and functionality with a view to developing a prototype garment.

Workshop 03 – Explore: Statement Piece

The final part of the process in Workshop 03 saw students developing the initial 2D flat pattern in response to their observations from the previous workshop. Some students worked individually and others in groups. The aim was to create a contemporary, functional and sculptural statement piece. Although students were developing the pattern in 2D, they were encouraged to constantly try pattern pieces onto the size 12 mannequins, rapidly switching from 2D/3D. A process of toiling, tutorials and further development then followed.

The project concluded with a presentation of the whole process to peers including the alien mannequin, alien block toile on a size 12 studio mannequin, the finished garment on a size 12 studio mannequin, and final garment pattern. A group discussion followed centred around the flat pattern shapes and how these translated into 3D and what part had the allocated fabric played.

Exhibition: 28th January -19th February 2012

18 of the final garments were selected to exhibit at the Sheffield Institute of Arts Gallery within SHU (figure 4).

The reasoning for the selection focused on creative and original outcomes, three garments from each of the six Alien Mannequins to create a balance of form and communication of the complete range of fabrics used.

In addition to the 18 contemporary outcomes the original Alien Mannequins were displayed, 2D digital flat patterns in the form of floor to ceiling hangings from six of the outcomes (one from each Alien base shape) together with supporting photographic imagery, text panels and vinyl wall sticker quotations. These helped to give a context to the project and guide the viewer through the process.

During the three weeks the exhibition attracted 980 visitors, monitored via an electronic eye. Visitors were invited to complete feedback cards, when asked: 'what did you think of the exhibition? A selection of comments included: extremely creative, thought provoking, challenging, wonderful stuff, innovative, intriguing...

Case Study Results and Observations

Experimenting with form: An educator's perspective of the Alien body approach

All students stayed within the parameters and restrictions of the body part locations within their final garment and used the Alien forms to emphasise shapes in the garment in the same locations on the body. Garment type was unrestricted however all students created torso coverings which represented conventional garment types of coats, dresses and shrugs. No students used the torso of the Alien Body mannequin as a starting point for a lateral interpretation of a garment onto a different body part, for example trousers. This illustrates that although students were challenged outside of their conventional comfort zones they were still seeing a torso as a torso, albeit a different shape, minimal lateral thinking was evident. In this instance, and using the PBL approach the tutor could guide the learners to explore the possibilities of using the torso toile in other body locations e.g. as a trouser leg or as a sleeve.

A high percentage of final garments had hoods, which I initially found unusual but relate this to that fact that all the alien base shapes had heads and again students were using this body part as a human head. Often studio mannequins don't have head attachments so perhaps offering this stimuli/base shape invited a response.

From personal observations the six Alien mannequins varied in their creative outcomes, some inspiring more creative outcomes than others:

- AB06 was the most popular form in the workshops; it appeared to be the student's first choice and sparked imagination. Perhaps this is because it was the most visually attractive and on initial inspection appeared to be the least disfigured. It could be likened to an exaggerated female form, almost corset like. It was perceived to be the easiest Alien to work with and the easiest to develop and translate into a garment. However this Alien did not always produce the most creative outcomes, I feel this is because it is the most closely related to a human form.
- AB02 was the least popular amongst the students in the workshops; the form is not as visually stimulating as the other mannequins, the lack of obvious

undulation created less interest from the students. The asymmetry and bulbous form made it difficult to work with. Most of the final outcomes with this Alien were unsuccessful. This is in part could be due to the lack of undulation and difficulty of working with an asymmetric form that lacked obvious contrast. A re-design of this form introducing more contrast and undulation in form would benefit future projects.

- The most successful outcomes were from AB04, 05 and 06, these had the least contrived starting points and the linear design of each of these Aliens was easier to work with.

The AB01, 02 and 03 were the most difficult alien mannequins to initially construct and interestingly this translated through the whole process into the final garments.

This series of workshops stepping away from the prescriptive nature of the existing context has been successfully delivered to 1st, 2nd and 3rd year Fashion Design students. From experience of running the project with different year groups it appears that it can be delivered to a group with any level of experience at any level of their education however, from observations the optimum time within the BA programme for delivery would be the beginning of the second year so that students had some experience and understanding of basic methods of 2D pattern making whilst it was not too late to integrate the techniques into their holistic design work if appropriate. Although not apparent in a BA group experienced pattern-cutters may find their knowledge stifles creativity, this would need to be managed by the facilitator moving forward.

The project ran over 6 weeks but with a total facilitated workshop time of 9 hours plus self-directed work and tutorials, however the project could be condensed to run over one week when students were totally immersed in this one project. I feel this would strengthen and reinforce the continuity of the thinking through making.

The student perspective of an Alien body approach:

A questionnaire was given to participants to ascertain if the aims and objectives for the project had been met, 110 students completed the survey after the Alien Body

experience; the results illustrate the initial success. The questions were kept to a minimum and were based around enjoyment, creativity and spatial awareness. A snap shot of responses are demonstrated in figure 5. Confidence building was one of the objectives of the exercise, 87% of students said they had gained in confidence, this may be in part because students were challenged and encouraged to take risks, this empowered their decision making moving forward. *'When you explore new techniques and methods of making, you deal with chance, luck and hope'*. (Roberts 2013)

The Alien Body process seemed particularly successful for students who find it difficult to express themselves and their ideas through drawing, the thinking through making process enabled the creative focus to be directed into the development of the 3D pattern. The emphasis of the project was on the doing and idea rather than on high quality manufacturing, garments were quickly assembled which gave students time to think about shape and concept. Some interesting voids were created within the finished garments when worn on sample size 12 female body shape, these voids (the space between the inner and outer form) would have been difficult to visualise and achieve without using the alien base shapes as starting points.

99% of students said it helped them think more 3 dimensionally. It encouraged more creative seaming and darting decisions through working 3 dimensionally on abstract shapes and having a solid base shape to work over. In summary the students said they found it: Interesting, Exciting, Thought provoking, Relevant, Fun and Useful.

83% of students said they would consider using the techniques of padding the stand in future. Upon completion of the 3rd year workshop one of the final year students, felt it had radically altered her approach to design thinking and decided to use the process for her final graduate collection later in the year.

Two final year students currently working on their 2014 Graduate Collections at SHU and have adopted the principle of padding the stand to achieve unique shapes inspired by their themes of mutation and circular structures. The garments are made in various weights of neoprene and foam giving structural integrity and emphasising the shapes and voids.

Interdisciplinary Work

After witnessing the positive effects the workshops had on fashion students I began to wonder about the transferability of the knowledge into other disciplines that work with 2D and 3D volume translation, this led me straight to architecture. A one-day pilot workshop was recently undertaken at the University of Newcastle in England with post-graduate Architecture students, facilitated by Rachel Currie (an Architect) and myself. The one-day workshop proved interesting and inspiring to the student architects. More work is needed in adapting the workshops for other disciplines however the findings hold potential for future project development.

Conclusions

The results and observations discussed within this paper strongly suggest that the alien body process is enjoyable, successful and benefits students in 2D/3D translation.

The format, timescale and delivery of Encounter, Envelop and Explore, the three sequential workshops proved exciting and inspiring, however improvements could be made by modifying or redesigning 01 and 02 Alien Mannequins for reasons discussed earlier. Learners also need more assistance from the tutor in being encouraged to steer their 3D thinking away from conventional body parts, as discussed. Alien Body aims to continue generating intrigue and discovery in volumetric shape making, illustrating its powerful creative potential.

Moving forward the process could be developed and applied to Menswear and other market sectors. Advanced workshop could be developed and delivered combining alien and stereotypical blocks. Exploration of transferable skills and knowledge with other disciplines such as architecture, packaging design, etc could be developed to encourage lateral thinking. The process has opened up many possibilities for further investigation that I hope to explore and disseminate in future research projects.

References

Bolton, A. (2011), *Savage Beauty*, New York: Metropolitan Museum of Art.

Bradley, Q. (2003), *The Fashion of Architecture*, London: Berg.

Chirico, S. (2012), 'Cages to Cushions: 19th Century Foundation Garments Revisited', <http://sandrachiricocouture.weebly.com/1/post/2012/12/cages-to-cushions-19th-century-foundation-garments-revisited.html> (Accessed 10 February 2014).

Cooper, C. (2011), *18th-Century Fashion and Fashion Exhibitions*, Presented at Concordia University, Montreal, Canada.

Evans, C. & Frankel, S. (2008), *The House of Viktor & Rolf*. London: Merrell Publishers Ltd.

Fukai, A. & Vinken, B. & Frankel, S. & Kurino, H. (2010), *Future Beauty, 30 Years of Japanese Fashion*, London: Barbican Art Gallery.

Hmelo-Silver, C. E. (2004), *Problem-Based Learning: What and How Do Students Learn?* Educational Psychology Review, Vol 16, No. 3, September 2004.

Hodge, B. & Mears, P. & Sidlauskas, S. (2006), *Skin + Bones, Parallel Practices in Fashion and Architecture*, London: Thames & Hudson.

Jankowska, M. & Atlay, M. (2008), *Use of Creative Space in Enhancing Students' Engagement. Innovations in Education and Teaching International*. 45 (3), pp. 271–279.

Joseph-Armstrong, H. (2000), *Patternmaking for Fashion Design*, New Jersey:

Prentice Hall.

Nakamichi, T. (2013), *Pattern Magic*, London: Laurence King.

Polan, B. (2012), written introduction to an exhibition at Huddersfield Art Gallery, England - *Insufficient Allure: the Art of Creative Pattern Cutting*.

Roberts, J. (2013), *Free Cutting*, <http://www.julianand.com/> (Accessed 10 March 2014).

Starting Point (2010): *Teaching and Learning Economics, Why Teach with an Interdisciplinary Approach?* <http://serc.carleton.edu/econ/interdisciplinary/why.html> (Accessed 9 March 2014).

Sudjic, D. (1990), *Rei Kawakubo and Comme des Garçons*, London: Fourth Estate Ltd.

Winton, A. (2000), *Charles Eames, Heilbrunn Timeline of Art History*, New York: Metropolitan Museum of Art.

http://www.metmuseum.org/toah/hd/eame/hd_eame.htm (Accessed 7 February 2014).