EXPLODING FASHION – FROM 2D TO 3D TO 3D ANIMATION

Exploding Fashion is a research project which unpicks and pulls apart twentieth-century fashion and then puts it back together again, in order to understand it better. Like an exploded-view drawing, or artist Cornelia Parker’s sculpture Cold Dark Matter: An Exploded View (1991), the project deconstructs five dresses by key twentieth- century fashion designers invested in pattern-cutting. Delving into the museum archive and working backwards, it reverse-engineers these historical dresses by making patterns, toiles and films: moving from 2D to 3D to 3D animation. In the process, it unmasks some unique design and construction processes of fashion.

Pattern-cutting involves a technical, conceptual and creative transformation: it turns two-dimensional cloth into three- dimensional garment form, changing fabric into fashion, which can then be applied to a body in motion using 3D animation. As if looking through the wrong end of the telescope, this approach foreshortens historical distance and allows us to see fashion history anew by uncovering the processes of its creation. It brings to life surviving dress from the museum archive, showing how it was originally designed and how it once moved on the body.

The research team brings an unusual combination of experts into dialogue: professional pattern cutters, a historian, a curator, a digital lead, a project researcher, a fit model, and a contemporary dancer. Situated at Central Saint Martins, University of the Arts London, the project bridges fashion design practice and academic history and theory, drawing on expertise in both areas to produce innovative fashion thinking.

*Exploding Fashion* makes, unmakes and remakes twentieth- century fashion for a digitally-driven, visually-led twenty first century.

**STARTING POINTS**

These five exhibition catalogues represent the first engagement with the selected dress designs for the project, and objectify the role of exhibition histories in building knowledge about fashion history through forms of genealogy and interconnection.

# CHARLES JAMES

The couturier Charles James (1906–1978) who designed this 1945 dress also developed his own system of pattern-cutting, and designed a dressmaker’s mannequin range. This mannequin is a modern 3D printed copy of his ‘Jennie’ mannequin. Its measurements are based on a number of James’s clients, one of whom the dress was designed for.

The museum dress can’t be worn, so the pattern cutters measured the dress flat on the table. The method is known as lifting a pattern, and is chiefly used for copying a garment where no pattern exists, or where it cannot be accessed. The method is commonly employed by designers who use vintage garments as the basis of contemporary fashion designs. Dress historians also sometimes take patterns from surviving dress in order to understand cut and construction.

The life-size ‘stitched’ photograph of the dress was made as a visual reference for the pattern cutters, using digital software to create a composite image. The way the multiple images are patched together echoes how a dress is stitched together. It visualises a pattern cutter’s technical understanding of dress construction as more complex than a single viewpoint. Once the pattern pieces were drawn, they were cut out and assembled on a mannequin to test how they might fit on a body.

**REVERSE-ENGINEERING**

After the museum research trips, the research team returned to Central Saint Martins to begin remaking the museum dresses. In reverse-engineering each museum object, the pattern cutters expertly worked out how the pattern pieces would assemble into a facsimile of the original. From the garment’s measurements they drafted a paper pattern, comprising separate pieces. From them, they cut calico pieces which they sewed into a ‘toile’, or prototype dress. This test garment was then ‘fitted’ on a model and adjustments were made to its cut and construction in a process known as ‘toiling’. These adjustments were transferred back to the patterns and a remade dress was sewn in the final fabric, based on the original dress material.

Constructing the remade dress revealed aspects of the dress design that could not be seen in the museum. For example, the hang of the skirt of the Charles James dress is achieved by coin weights sewn into the hem, and by the way it is pressed for finishing. Dressing the fit model in the remade Comme des Garçons dress was illuminating too. The dress was designed to be worn in different ways, and the remade dress allowed the team to experiment with this.

**COMME DES GARÇONS**

Throughout her career, Rei Kawakubo (b. 1942) of Comme des Garçons has worked with a team of pattern cutters whose interpretation informs her design process. Her instructions to them are abstract, and what each pattern cutter makes in response is iterated and interpreted in many ways.

The pattern of the Comme des Garçons dress designed in 1983 is very simple — just a long rectangle and a sleeve — but once the panels are sewn together, they produce multiple silhouettes that loop around the body. The design is a crystalline example of how two-dimensional geometric forms in fabric transform into complex shapes when draped in three dimensions on the body.

Naoya Hatakeyama’s photograph of the dress laid flat reveals its underlying geometric shape, but the dress behaves very differently on a body in motion.

When tested on the fit model, the loops of fabric bounced around the body and between the legs, describing circles. Testing the dress on the contemporary dancer accentuated the dynamism of the body. Hans Feurer’s photograph informed how the team choreographed the walk for the 3D animation. It reveals that the dress shows its construction (formed from two looped panels) more clearly in motion than when it is still.

# HALSTON

Roy Halston Frowick (1932–1990), known as Halston, refined evening- wear through radical economy of construction and a reductive aesthetic, exemplified by this one-seam dress designed in 1976. It is a three-ply column dress made of three layers of chiffon cut on the bias, hung from the bust line and knotted in a sarong style, worn with a separate, free-floating scarf.

The pattern pieces are so large that Halston’s pattern cutters had to cut them on the showroom floor. Halston worked with Italian fabric mills to produce silk 300 cm wide. The Central Saint Martins pattern cutters could not source this width today, so a small additional section had to be added to the pattern. It also meant the paper pattern had to be cut in two panels.

Halston designed with motion in mind. Disco inspired him to dress women in clothes that moved sensuously around them when they danced. When the dress was measured in the museum, the three layers of chiffon meant it moved around on the table, making it hard to handle. The simplicity of the pattern, and the apparent ease with which the dress hangs from the body, result from Halston’s rigorous command of materials. In remaking the dress, the pattern cutters found it the most demanding design of all.

**MADELEINE VIONNET**

Madeleine Vionnet (1876–1975) designed this dress in 1921, and these three design registration photographs from 1921 show how it was worn by her model. The triptych shows three views of the front, back and side of the dress giving

a 360-degree impression of the fit, drape and behaviour of the garment on

the body. It illustrates how Vionnet experimented with fabric in three directions, exploiting length, breadth and bias. Vionnet’s triptych inspired the research team’s thinking throughout the project, and helped them to investigate the translations between 2D and 3D in fashion. They made their own triptychs to chart the progress of the remade dresses, to analyse the role of pose and gesture, and to suggest how the model might walk in each design.

In order to develop a historicised walk for each dress, they collected representations of model poses, gestures and movements from each historical period. For the Vionnet dress they drew upon surviving newsreel fashion films from the 1920s. They trialled the Vionnet walk in the college theatre, where they made a black box lab inspired by ‘chronophotography’ from the 1880s — still images of movement by the French scientist Etienne-Jules Marey. They did their first motion-capture tests using a 3D scanner there. Seeing the Vionnet dress in motion was a revelation. On the stand it looked geometric and austere, but on a body in movement it became fluid, sensual and dramatic.

# CRISTÓBAL BALENCIAGA

Cristóbal Balenciaga (1895–1972) regarded design as the logical consequence of experimenting with structure and material, and his mastery of pattern-cutting enabled the sculptural line of his clothes. The Balenciaga dress designed in 1966 is explored here through different digital visualisation experiments.

The pattern drawn on the left vitrine was used as data to generate the 3D exploded-view drawing on the right vitrine, which shows the pattern pieces suspended mid-air, as if in the act of fusing to become the remade dress.

The toile on the left can be compared to the composite images on the right. These use a range of different digital imaging techniques to picture the Balenciaga dress in the museum.

The photographs and films tell a third story. The left-hand triptych shows the toiling stage, while the right-hand triptych shows the contextual references that informed the poses and gestures of the contemporary dancer. In the motion capture studio, the contemporary dancer performed a stylised walk wearing a bodysuit and heels covered in motion sensors. The motion capture data was later used to generate the walk on an avatar (a digital rendering of a human figure) wearing the remade dress. Like Vionnet’s triptych brought to life, this triptych vividly unpacks the way in which the Balenciaga

dress would have moved on the body.

**3D-ANIMATION**

Vionnet established her approach to pattern-cutting through a unique form of experimentation. She worked on a half-scale wooden articulated mannequin, placed on a rotating piano stool, and used half-scale toiles to drape with. This allowed her to manipulate and handle the cloth more easily, and to develop her design ideas more directly onto a body form. The research team employed Vionnet’s idea of a revolving mannequin in the final rendering test for the 3D animation to show the dress design in rotation. It is followed by a catwalk of the five remade dress designs as digital 3D animations.

**CONCLUSION**

In Two Women Meeting and Passing Each Other (1887), Eadweard Muybridge photographed two fashionably dressed women in bustleback tailored suits, greeting each other in passing. One of his studies of human locomotion, the research team studied it for what it revealed about fashion in motion in the Victorian age.

Muybridge’s ‘stop-frame’ chronophotograph served as inspiration for the project’s motion capture — the team imagined it as a proto-fashion catwalk. So they animated Two Women Meeting and Passing Each Other as a tribute, both to the two unknown women featured in his photographs, and to the two Exploding Fashion models.

When selecting the footage for the final 3D animations, the researchers chose from both models so that the avatar might walk one way using the fit model’s movements, and then turn and return using the contemporary dancer’s. Some walks had up to six motion clips sequenced together. The avatar was, therefore, never based on one performer or the other, but was, rather, an amalgam of both: part fit model, part contemporary dancer. As in Muybridge’s composite photograph, it was at the moment they ‘passed’ each other that the overlay of the avatar’s movements was revealed.