

News Release

V&A reveals new installation fabricated by a robot for first ever Engineering Season

Elytra Filament Pavilion

Supported by Volkswagen Group

With additional support from Tideway

Part of the V&A Engineering Season

18 May – 6 November 2016

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Today, the V&A marks the start of its Engineering Season with the unveiling of the new installation, *Elytra Filament Pavilion*. The pavilion is the outcome of four years of ground-breaking research on the integration of architecture, engineering and biomimicry principles. The project explores how biological fibre systems can be transferred to architecture. The 200m² pavilion structure is inspired by lightweight construction principles found in nature – the fibrous structures of the forewing shells of flying beetles known as elytra.

Elytra's components have been fabricated by a robot at the University of Stuttgart and assembled on site in the V&A's John Madejski Garden. The pavilion will grow and change its configuration over the course of the V&A Engineering Season in response to anonymous data on how visitors use and move under the canopy. This, as well as structural data, will be captured by real-time sensors installed in its canopy fibres. Throughout the season the data will be mapped and made available online. On 17 and 18 June and 22 September, visitors will be able to see the pavilion evolve as new components are fabricated live in the garden by a Kuka robot.

In what is their first public commission in the UK, experimental architect Achim Menges with Moritz Dörstelmann, structural engineer Jan Knippers and climate engineer Thomas Auer have pioneered a unique robotic fabrication technique developed by the University of Stuttgart's Institute of Computational Design (ICD) and Institute of Building Structures and Structural Design (ITKE). This technique, developed by the team over several years of prior research,

involves a novel way of winding composite materials by a robot arm. This innovative winding method has been designed to harness the material properties of carbon fibres to give them strength as woven structural components. A series of these individual cell-like modules have been used to create the pavilion's distinctive shape. This production method integrates the processes of design, engineering and making and explores the impact of emerging computational and robotic technologies on these disciplines.

Elytra's canopy is made up of 40 hexagonal component cells. On average they weigh 45kg each and take an average of three hours to make. These cells and the pavilion's seven supporting columns were created by a computer-programmed Kuka robot in a four-month construction process at the ICD's Fabrication Hall in Stuttgart. To make each component, the robot wound resin-soaked glass and carbon fibres onto a hexagonal scaffold, before hardening. Each cell and column is individual. Its final form of densely-knit fibres is a direct result of the changing stress conditions determined through structural simulation and testing carried out in advance by the ITKE. This enables an exceptionally lightweight structure that weighs less than 9kg per m², which equals 2.5 tonnes for the entire pavilion.

Achim Menges said: *“Advances in the technologies of making have always been a catalyst for design innovation, which is nowhere more evident than at the V&A. With Elytra Filament Pavilion we aim to celebrate a truly contemporary and integrative approach to design, engineering and production, resulting in a distinctive spatial and aesthetic experience. Based on the biological structure of beetles' hardened forewings, we have created a novel architectural system that covers parts of the John Madejski Garden with an intricate, extremely lightweight structure made entirely from glass and carbon fibres. The canopy grows from an onsite robotic fabrication unit in response to real-time sensing data, showcasing the profound impact of emerging technologies and related new alliances between the fields of design, engineering and natural science. Through this we seek to provide visitors with a unique experience of the garden that offers a glimpse of novel architectural and engineering possibilities, which may transform our built environment in the future.”*

Elytra Filament Pavilion is one of the highlights of the V&A's first ever Engineering Season, which is curated by Maria Nicanor and Zofia Trafas White of the Museum's Design, Architecture and Digital department. The season is complemented by the exhibition *Engineering the World: Ove Arup and the Philosophy of Total Design*, which opens on 18 June, as well as a series of other displays, events and digital initiatives dedicated to global engineering design. The V&A Engineering Season highlights the importance of engineering in our daily lives and consider engineers as the 'unsung heroes' of design, who play a vital and creative role in the creation of our built environment.

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Notes to Editors

- *Elytra Filament Pavilion* is created by Achim Menges with Moritz Dörstelmann (ICD University of Stuttgart / Achim Menges Architect), Jan Knippers (ITKE University of Stuttgart / Knippers Helbig Advanced Engineering) and Thomas Auer (Transsolar Climate Engineering / TUM). Commissioned by the V&A, it will be on display in the John Madejski Garden from 18 May – 6 November 2016. Admission is free.
- The exhibition *Engineering the World: Ove Arup and the Philosophy of Total Design* is supported by Volkswagen Group, with additional support from Tideway. It runs from 18 June – 6 November 2016 and is made possible with the cooperation of Arup. Admission £7 (concessions available). V&A Members go free. Advance booking is advised – this can be done in person at the V&A; online at vam.ac.uk/EngineeringSeason; or by calling 0800 912 6961 (booking fee applies).

About Volkswagen Group

Comprising twelve brands, the Volkswagen Group is one of the world's largest producers of cars, trucks, buses and other systems for the mobility sector. The Group is fully committed to its corporate social responsibility, which includes substantial support for forward-looking initiatives within the field of culture and the arts, two fundamental elements of a dynamic society. Volkswagen strives to enable as many people as possible to interact with culture and thus inspire their creativity. Working together with partners, Volkswagen is oriented towards encouraging a cross-generational debate with the arts and culture, which encompasses new technological potential and changing social needs.

About Tideway

Tideway is the company that will finance and deliver the Thames Tideway Tunnel, a 25km sewer tunnel urgently required to tackle sewage pollution in the tidal River Thames. Approximately the width of three London buses, the main tunnel will be up to 65 metres deep and run from Acton to Stratford, where it will connect with the Lee Tunnel (completed by Thames Water in January 2016) to transfer the excess sewage to Beckton for treatment. Tideway directly employs 400 people. In total the project is expected to create 4,000 direct sustainable jobs. One in every 50 site jobs will be an apprenticeship.

For further PRESS information about the V&A's Engineering Season please contact Laura Mitchell in the V&A press office on +44 (0) 20 7942 2503 or email l.mitchell@vam.ac.uk (not for publication).

A selection of press images are available to download free of charge from pressimages.vam.ac.uk



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