Woven change

When a façade reflects research

The Ecole Polytechnique Fédérale de Lausanne (EPFL) is widely acknowledged as one of the finest universities founded anywhere in the world over the last 50 years. This reputation attracts top students from across the globe to Lausanne, with the campus situated to the west of the city center. As a result, the EPFL is one of the fastest-growing universities with space requirements to match. In the required new buildings and refurbishments, the institution places a consistent emphasis on iconic constructions in order to also develop the architectural charisma it needs to prevail in the globally competitive university sector. The extension of the existing Institute for Mechanical Engineering (ME) designed by Dominique Perrault, which was merged with the Centre for Neuroprosthetics (CNP) founded in 2008, is the latest evidence of this. The *Pôle de bio-ingénierie* owes its unique appearance to a three-dimensional zig-zag façade consisting of 630 horizontally sliding solar protection elements made of metallic fabric from GKD – Gebr. Kufferath AG. Their lively topography reflects the flexibility and dynamism with which the university is constantly reinventing itself.

The EPFL was founded in 1969 and has seen constant expansions since 1978. Since 2002, all of its institutes have been situated on the 59-hectare site in Ecublens. On the road to giving the university a modern public image befitting its importance, the first milestone was the opening of the Rolex Learning Center in 2010. In 2013, the former central library building was refurbished and transformed into an administration and service center (BI) designed by Perrault, featuring an illuminated striped dress bordered by

black coated stainless steel fabric. This series of architectural flagship projects on the campus was continued in 2014 with the SwissTech Convention Center. Halfway between the Rolex Learning Center and the SwissTech Convention Center, Perrault has now taken a step into the future of integrated research concepts with the renovation and extension of the former Institute for Mechanical Engineering. This is where the professors for robotics and orthopedics will work together with the Center for Neuroprosthetics to explore the broad field of bioengineering. Research activities are focused on the treatment of spinal injuries, the restoration of motor and sensory functions after amputations and control of robots with the human brain. The interdisciplinary research and cooperation, which will be further intensified through the joint location, aims to combine fundamental knowledge with applied science in a synergetic manner.

A picture of energy efficiency

State-of-the-art offices, seminar rooms and laboratories over 3000 square meters lay the foundations for interdisciplinary research. For their construction, the key was to take into account the highly diverse energy requirements of the various fields of application while ensuring a high degree of flexibility. Perrault responded to the associated functional variables with an extraordinary four-story façade. As part of his urban reorganization of the campus, this underlines the new dynamic of the center. 630 individual panels, each measuring 1,100 x 3,600 millimeters, form a vertical and horizontal zig-zag pattern spanning the entire building like awnings. The panels are alternately affixed at the top and bottom and are made of natural-colored, anodized Escale aluminum fabric, which is fixed in place by means of a stable frame construction using clip bolts. The panels are arranged in groups of three, with two of each group being motorized and moving on rails behind the fixed element in a telescopic manner. When they are closed, the

panels guarantee efficient solar protection, free workplaces from the glare of the sun and grant unhindered views of the outside surroundings. Yet the open structure of the fabric also allows natural daylight into rooms and enables natural ventilation, thus making the building a pleasant environment for employees. This in turn increases productivity and minimizes energy requirements for artificial light and air conditioning. In terms of the holistic sustainability of the building, the panels can be adjusted on a room-by-room basis and thereby flexibly according to the room usage and the time of the year. Furthermore, thanks to the protection from undesired heating through the sun in summer and the utilization of heat generated by sunlight entering the building in winter, the fabric supports energy-efficient climate management throughout the building.

A multilayered interpretation of Mediterranean lightness

For Perrault, however, the decisive factor in the choice of material was its special visual appearance. Its spirals, each measuring seven millimeters wide and 150 millimeters long, reflect sunlight particularly intensively and lend the panels a Mediterranean lightness despite the solid nature of the material. This effect makes them the perfect means with which to express Perrault's intention to create a building without visible walls. Even their subtle presence transforms a place without dominating it, while engaging in permanent exchange with their surroundings. This makes the building both a backdrop and the star of the show – and exactly this effect is the reason why Perrault has already used this fabric type in many of his successful projects. For the ground floor of the *Pôle de bio-ingénierie* he chose the Escale 7 x 2 fabric, whose two-millimeter-thick flat wire offers greater protection from vandalism. Perrault opted for Escale 7 x 1 for the three upper stories – the same mesh type that was used in the BI building just a stone's throw away. The entrance in the middle of the elongated construction faces toward the Rolex Learning Center, visually breaking the bidirectional zig-zag structure of

the panels in three vertical rows through an enlarged projection angle. The groups of three elements in this area therefore appear to have been pushed upward by the hand of a giant – an impression further strengthened by the lowest three groups of panels fixed at different angles. This produces an overhanging canopy divided into three parts, seemingly hovering over the entrance and underlining the light and airy feel of the façade.

Dynamic change statically balanced

For static reasons, a stainless steel Escale fabric was chosen for the entrance area. The delicate lateral bars and thin, round supports upon which the frame is mounted on one side also carry enormous loads at the canopy. In order to allow for the snow load that is typical of the region, additional central fastening fixtures were added to the panels at the overhang and fixed to the fabric using special brackets. Although the complexity of the façade geometry and the size of the partially motorized individual elements place tough demands upon the bearing structure, Perrault made a conscious decision to go without rear anchoring of the panels. Instead, his design envisages a frame structure that carries the entire load of the frame and fabric. Because the building is situated in a mountainous region in the immediate vicinity of Lake Geneva, it was important to take increased wind and snow as well as freezing temperatures into account for the static calculations. In order to verify the static planning, Perrault subjected three prototypes of these elements to real conditions for one year. Thanks to its visually subtle fastening means, the finished façade reminds the viewer of a fragile house of cards. This experimental character is a stark contrast to the technically sophisticated feel of the metallic shell. The interplay of these contrasting elements bears witness to the new spirit of optimism around the interface between life sciences and engineering, the ***Pôle de bio-ingénierie.***

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Picture 1: The *Pôle de bio-ingénierie* owes its unique appearance to a three-dimensional zig-zag façade consisting of 630 horizontally sliding solar protection elements made of metallic fabric from GKD.

Picture 2: Their lively topography reflects the flexibility and dynamism with which the university is constantly reinventing itself.

Picture 3: 630 individual panels, each measuring 1,100 x 3,600 millimeters, form a vertical and horizontal zig-zag pattern spanning the entire building like awnings.

Picture 4: The panels are alternately affixed at the top and bottom and are made of natural-colored, anodized Escale aluminum fabric, which is fixed in place by means of a stable frame construction using clip bolts.

We will be happy to send you the desired images in printable resolution by e-mail.

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