Second Skins: e-Textiles redefined

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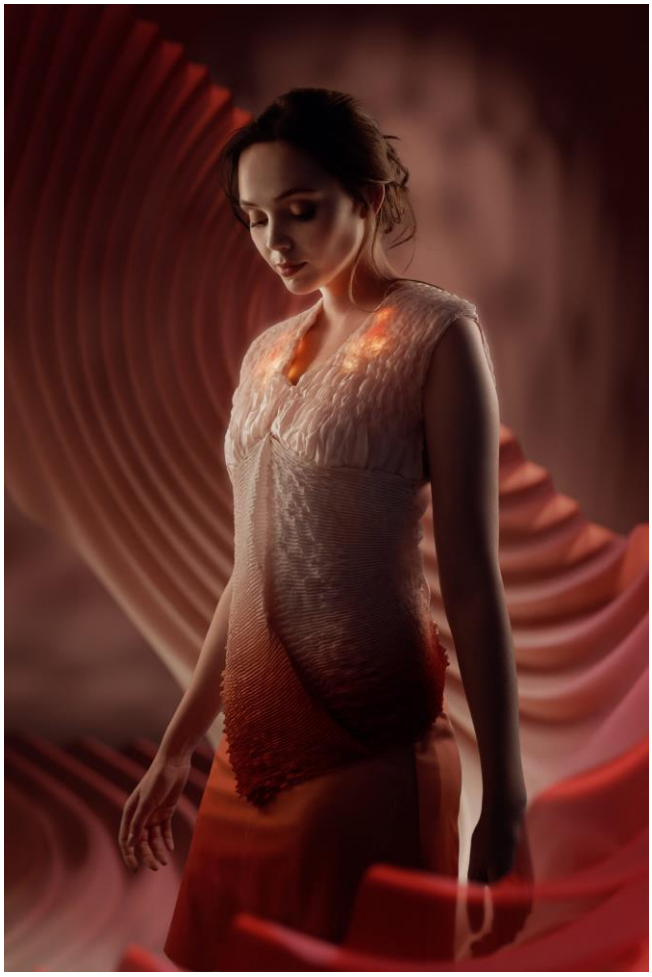
As part of the European STARTs project Re-FREAM, designers, technologists and scientists researched together on future as well as sustainable technologies for the textile industry. In the research focus area of e-Textiles, the fashion tech expert Malou Beemer from the Netherlands worked with an international team consisting of Profactor, EMPA, Wear It Berlin and Fraunhofer Institute for Reliability and Microintegration IZM on adaptive garments that can adapt to the practical and social needs of users.

Malou Beemer approaches garment sustainability though her deep understanding of the social functionality of garments. Her research reflects on how design can change the way we want, wear, and discard fashion. Could smart garments be equipped to improve and maintain their desirability? Her modular Second Skins garment system combines adaptive parts which create a personal light symphony. Its composition responds to the aesthetic need for novelty, for interaction, and for standing out.

Beemer started with deconstructing the idea of the garment itself. First, she explains, “we stepped away from the idea that a garment always has two legs or two sleeves”. Instead, the team decided to visualize it as components. The next step was researching the activation of responsive and reactive textiles elements, which could be modulated to create novelty.

Photographer & visual artist Patrick Klein Meuleman

With a main focus on evening and party wear, a category showing high single use behavior, the choice fell on color changes based on LED patterns. With her Re-FREAM partners, she conceived a garment consisting of a base layer integrating LED lights with IZM Fraunhofer, a diffuse layer which alters the light with Profactor, and a top layer which gives a final shape to the garment as well as allowing for further updates. Wearers can upload LED color patterns, then modulate them with a tap sensor. Due to the construction and modular bonding technique the garment can be repaired when needed or even completely disassembled and the end of life.



Beemer uses the customization of garment colors, patterns, and structures to enhance garment lifespans. She defines sustainability through longevity: the goal is garments that update, perhaps for decades. Her wearable tech designs also aim to enhance social interactions with others. A particularly innovative aspect of her concept is her aim for new levels of garment agency. She envisions clothing which cares for us, according to our social and aesthetic needs. Instead of passive and polluting garments, Beemer envisions fashion as a second skin, with different layers which can shift properties. Allowing for such inbuilt versatility gives garments an active role in their survival, as well as in ours.

Together with the Fraunhofer team, Beemer created two undergarments integrating PCBs (printed circuit boards) and LEDs: one that centered more around the neck, and one more centered around the ribs, below the bust. The Second Skins project uses hardware modules developed by IZM. IZM developed an Arduino-based modular hardware platform that enables easier, more flexible and more reliable integration of e-textile prototypes and small series into textiles. Modules already available include various sensors (temperature, proximity, pulse, IMU) as well as actuators, RGB LEDs, ADC, µC, Bluetooth and more. In addition to the conventional sewing of the modules using electrically conductive yarn, all modules also offer the possibility of integrating them mechanically and electrically in a single step using the proprietary e-Textile Bond technology developed at IZM.

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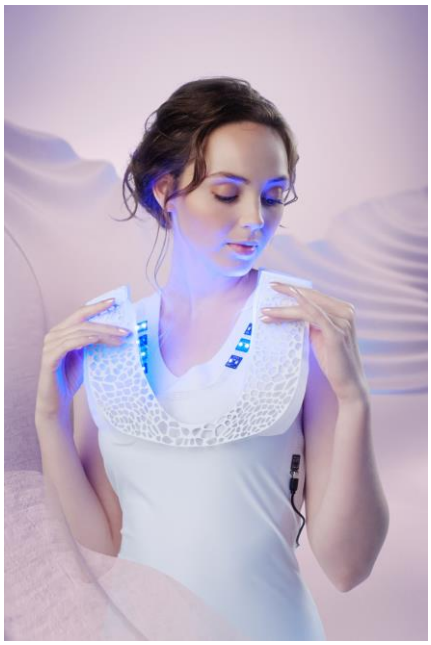

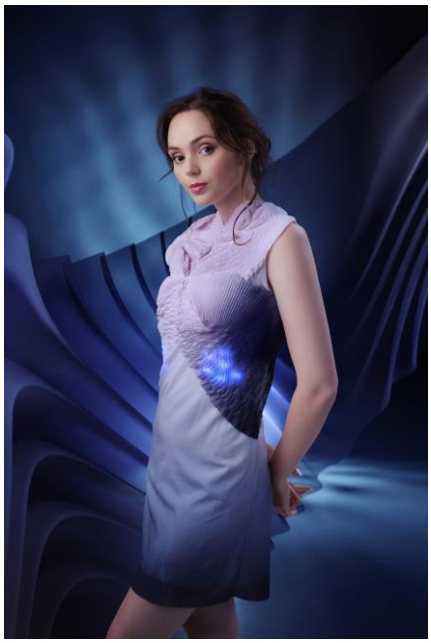

Here, for example, Smart IMU modules record the wearer's body language and movement data, and proximity sensors are also integrated. The sensor data obtained can be used to control individual lighting effects of the RGB LED display, through which the wearer communicates non-verbally with her surroundings. All modules can be freely placed on the garment during the design process. For power supply and communication with the process unit, a textile 4-wire IIC bus conductor made of a thermoplastic insulated hybrid conductor of stranded material and reinforcing textile fibers is embroidered onto the undergarment, thus connecting the modules. The electrical connection between the module and the textile bus is then made using the e-Textile bonding technology described above, which provides reliable but also repairable contacting without the need for additional additives such as pastes, fluxes or the like. Due to the remeltability of the thermoplastic adhesive, the module can also be thermally removed from the carrier again. The inner layer between the upper and lower garment contains thin textile layers that allow masking of the lighting effects by means of 3-D printing or lamination, thus allowing the user to customize the lighting design.

Further Links:
https://www.maloubeemer.com/project/second-skins-re-fream/
https://re-fream.eu/pioneers/second-skins/
https://www.izm.fraunhofer.de/en.html

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