



Breakthrough: Toward personal microclimate: Sustainable heating through smart clothing

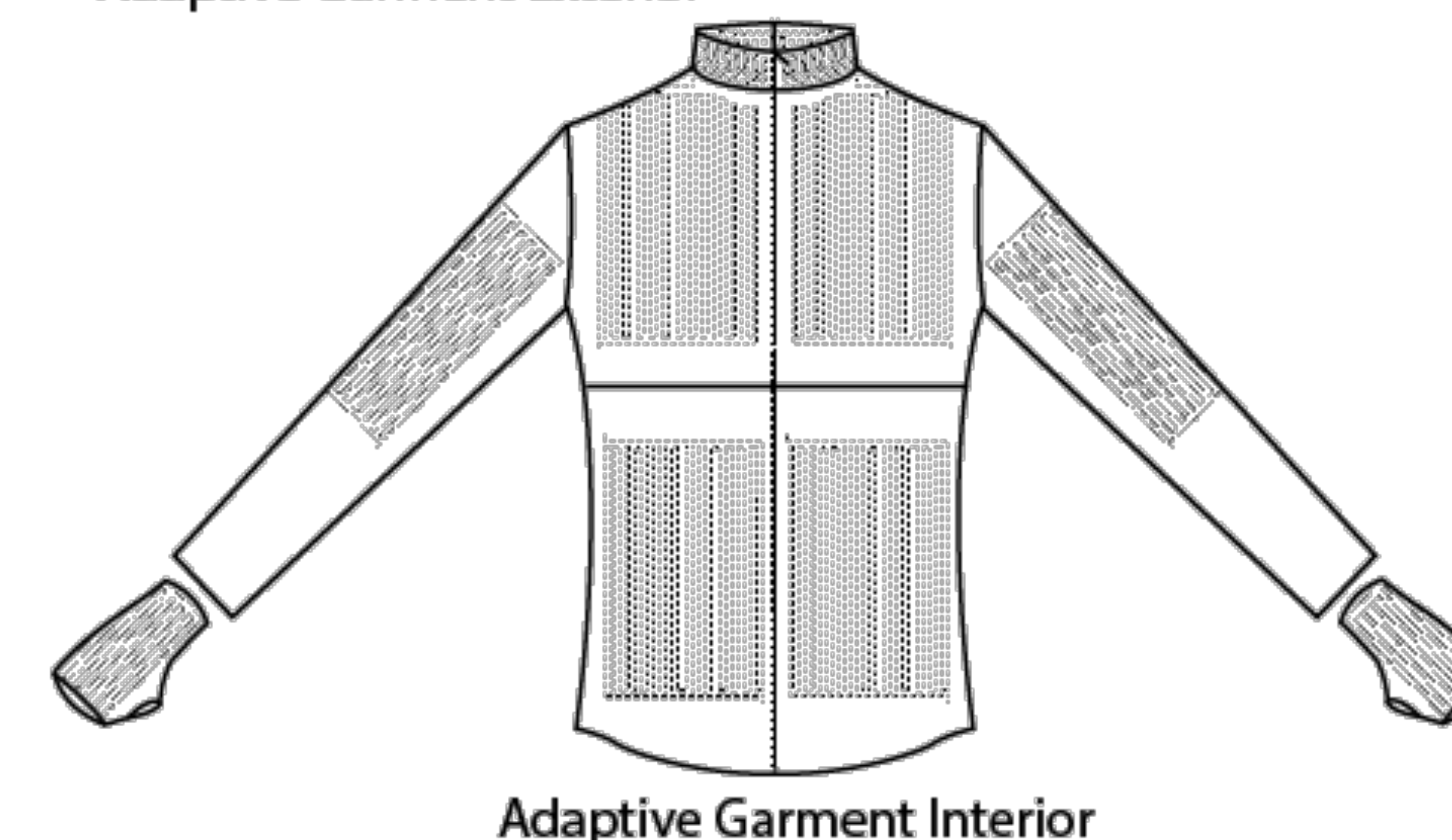
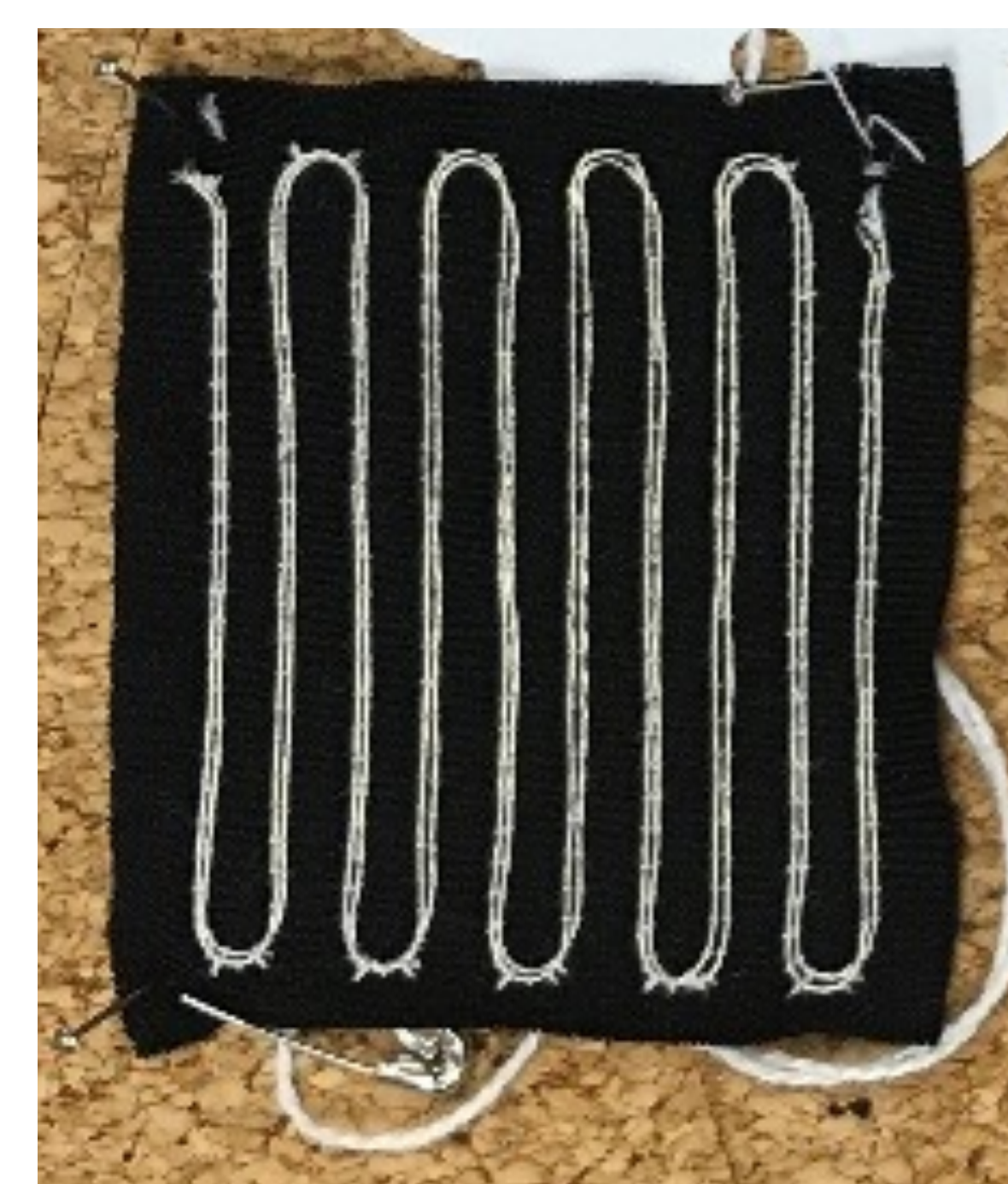
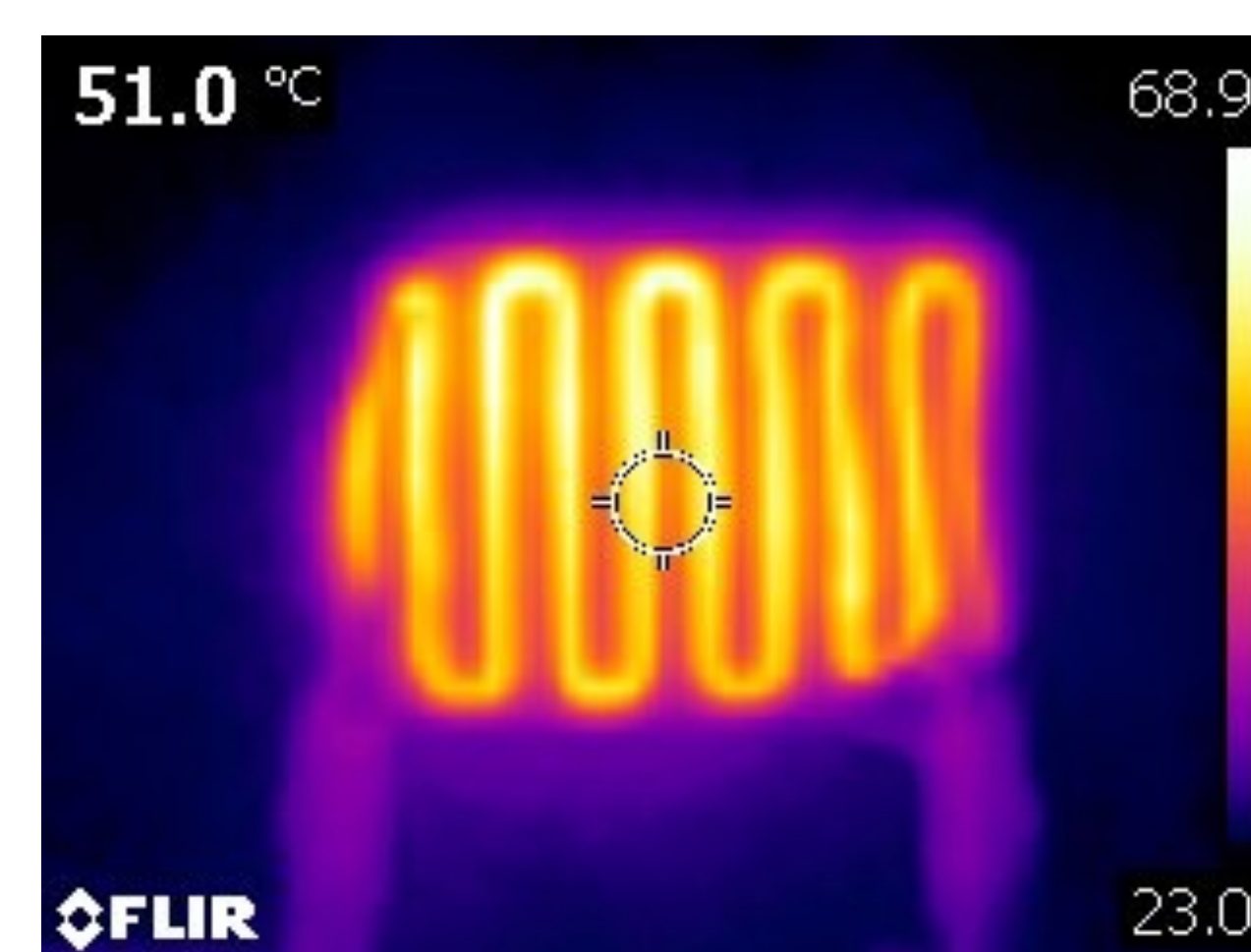
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Challenge:

- Reducing energy spent heating environments by supplementing with tailored on-body heating
- Moderating thermoneutral experience
- Developing textile-based heaters and garments

Solution:

- Custom e-textile stitched heating actuators
- Tailored heating through on-body zone control
- Pursuing adaptive smart heating and integration with building HVAC



Scientific Impact:

- Development of closed-loop systems driven by human physiology, using textile-based electronics
- Understanding thermal experience in the thermoneutral zone

Broader Impact:

- We estimate ~20% energy savings in some environments with on-body supplemental heating
- Human performance improves with good thermal balance
- Interdisciplinary project team from ~8 different fields, 60% women

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