syntopia 1—soma I body

Elaine Bonavia, Jessica Farmer, Roland Halbe, Johanna Hehemeyer-Cürten, Nuri Kang, Mareike Stoll, Karola Dierichs
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• body • architecture • textiles • digital craft • augmented reality • partially ordered systems

Syntopia 1—Soma I Body is an exploration of the formation of space by the human body. Using a wearable augmented reality (AR) framework, a filament-based structure is spun by hand, gradually enveloping its maker (Bonavia, Farmer et al. 2023, Avram 2014). *Syntopia 1* is part of a collection of architectural prototypes investigating the notion of *syntopy*, a term coined in biology by Luis René Rivas in 1964. The term is a combination of the Greek words *syn** meaning together / with and **topos* meaning place (Rivas 1964). To develop *Syntopia* thus means to create designs sourced from and situated within a specific site—a *topos* (Matters of Activity). Underlying the project is also a constructive critique of the current-day use of industrial robotics in architecture, which entails a high use of material and energy resources. The project proposes a return to human handcraft through the minimal application of electronic technical devices required for data streaming (Mitterberger 2022, Bonavia, Farmer et al. 2023). This reduction of machines favors a bodily sensing of matter's own inner activity, thus fostering the interlacing of Body—Matter—Machine (Haraway 1996, Pallasmaa 2009, Ingold 2010).

Throughout the process of creating the installation, the body was present in physical and digital space (Skrzypczak 2021). Traces of the interaction between craftsperson, material, and structure were tracked with an augmented reality (AR) framework, allowing for both observing and informing the actions of the maker (Bonavia, Farmer et al. 2023). The framework envisages a feedback loop between all entities, therefore exploring a co-creation process with machines, considering cyber-physical systems in architecture as inherently embedded systems.

Syntopia 1 has been installed in the Veterinary Anatomy Theater (Tieranatomische Theater, TA T) in Berlin, where horses were dissected for medical purposes. The horses or rather their corpses were transported through a circular elevator to the auditorium—now changed into a light source above the filament-based structure. This shifts the focus onto the source of light, reminiscent of the elevator as a space of bodily movement between realms of knowledge production. The prototype was part of the exhibition *DAOULA I sheen*, which featured silk-production in West Africa (Tieranatomisches Theater 2022). The cocoon can be seen as a symbol of death and rebirth in a different form that is visually translated as moving into the light. In this context, the structure echoes with the theme of bodily transformation: horses die and are passively transformed into objects of scientific study, silkworms actively transform in their cocoons from one developmental stage to another. *Soma* (from the Greek, "body") thus becomes an entity of passive or active transformation (Ovid 2004).

The images pose the question of human agency, presence, and absence of bodies (The Warburg Institute 2025, Bredekamp 2015, Mitchell 2015). This visual essay unfolds in three layers. First, an analogue image captured in the TA T reveals how matter, space, observer, and body converge in the making of the structure. Second, layers exposing movement, material, and spatial syntax from the digital model are laid out, showing the variety and depth of the data gathered. Finally, embedded knowledge circles map tacit and explicit knowledge across disciplines and perspectives involved in *Syntopia 1—Soma I Body*.

For further information about this research project, see the article "Minimal Machines: Augmented Reality for Filament Construction of Partially Ordered Systems in Architecture": https://link.springer.com/article/10.1007/s41693-023-00109-3

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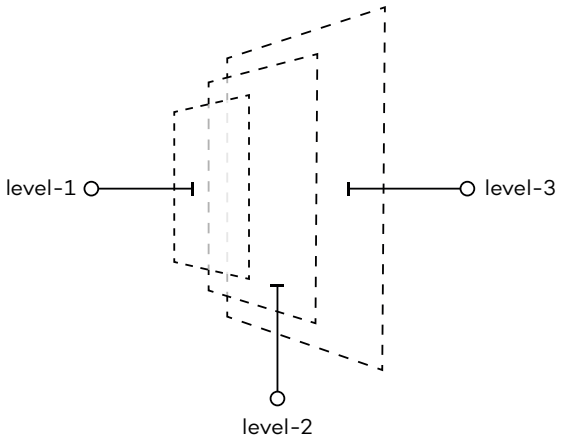

credits

authors: Elaine Bonavia,[1,2] Jessica Farme,[2] Roland Halbe, architectural photographer, Johanna Hehemeyer-Cürten,[1,3] Nuri Kang,[1,2] Mareike Stoll,[1,2] Karola Dierichs.[1,2,3]

[1] Cluster of Excellence »Matters of Activity. Image Space Material« (MoA)
[2] Weißensee School of Art and Design Berlin (KHB)
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copy editing: Bronwyn Mahoney

about the authors

Elaine Bonavia (MSc) is an experimental architect currently pursuing a practice-based PhD on *Spatial Drawing* at TU Berlin. She is interested in movement, new materialism and spatial perception and has a background in computational design. She worked as an Artistic Associate in the Textile & Material Design department of Weißensee School of Art and Design Berlin (2021- 2025).

Jessica Farmer (MA) is a guest scientist at the Cluster of Excellence »Matters of Activity. Image Space Material« and a curatorial assistant at the Kunstgewerbemuseum in Berlin.

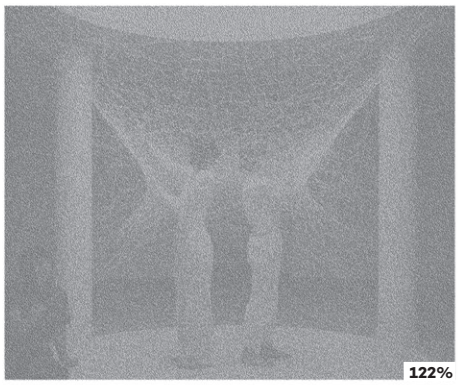
Roland Halbe has been a freelance architectural photographer since 1988. He co-founded Artur Images in 1995. His work has been shown internationally in group exhibitions in Germany, Spain, and Latin America. He works worldwide for architects such as Zaha Hadid and Jean Nouvel.

Johanna Hehemeyer-Cürten (MA) is a fashion and material designer with a particular interest in biomaterials and material innovation. She is currently a doctoral researcher at the Cluster of Excellence »Matters of Activity. Image Space Material« and the Max Planck Institute of Colloids and Interfaces (MPICI). Her work combines material science and design methods and concentrates on the properties and potentials of pine bark.

Nuri Kang (BA) is currently an MA student in product design at the Weißensee School of Art and Design Berlin (KHB).

Mareike Stoll (PhD) holds a PhD from Princeton University (United States). Her dissertation, "Schools for Seeing: German Photobooks between 1924 and 1937 as Perception Primers and Sites of Knowledge," was awarded the DGPh Fellowship for the History of the German Language Photobook in 2015.

Karola Dierichs (Dr.-Ing.) is a researcher integrating the fields of materials design and minimal machines for architectural construction. The main goal is to establish architecture as sourced from and embedded in a given environment. For this, methods of science and art are interlaced to establish a novel paradigm of fundamental research.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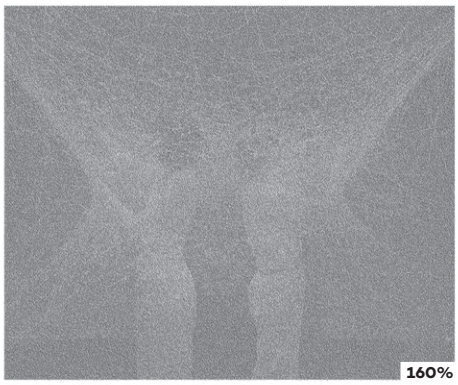
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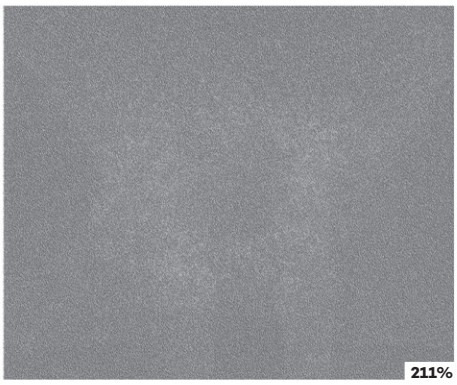
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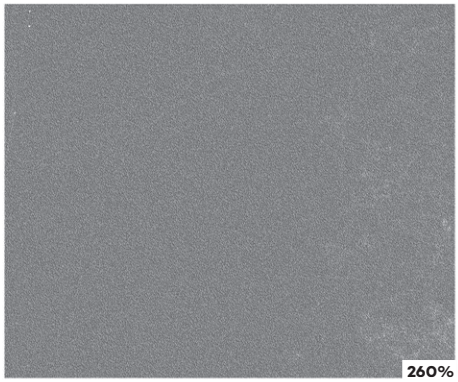
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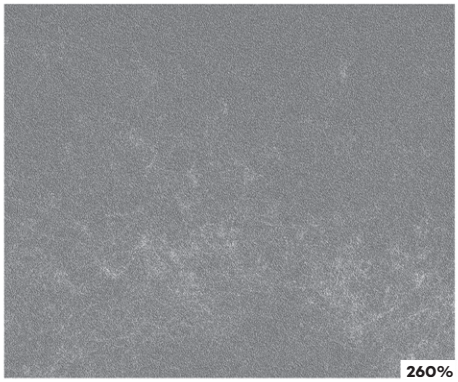
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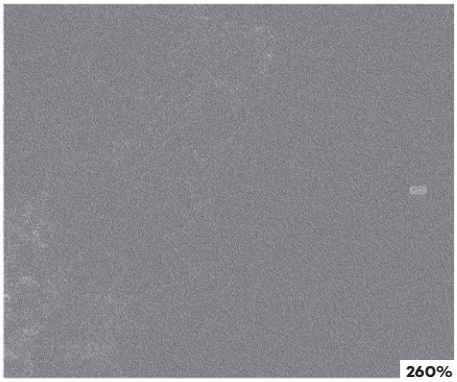
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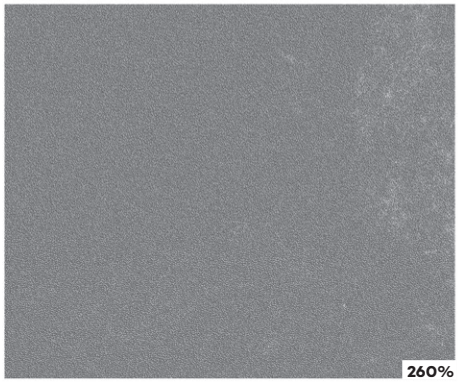
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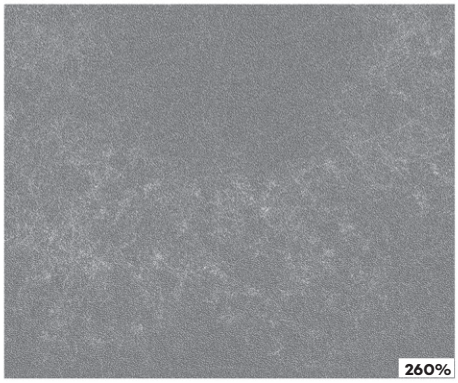
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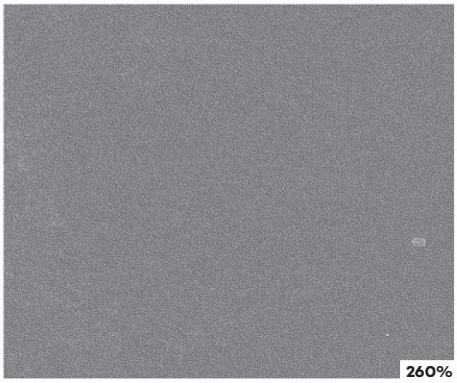
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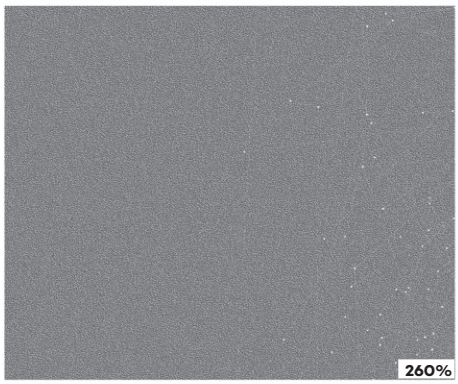
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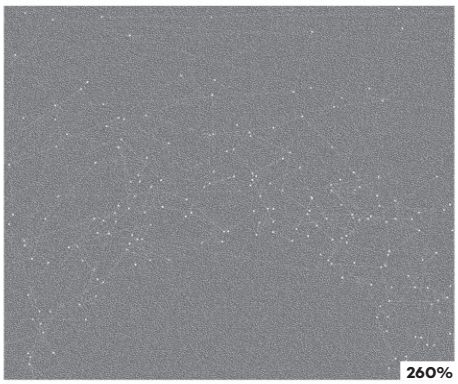
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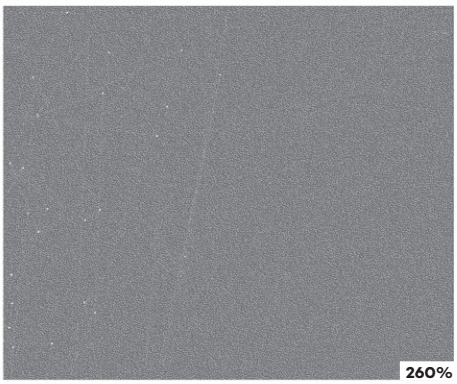
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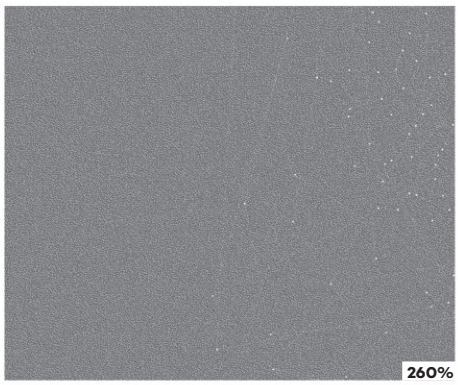
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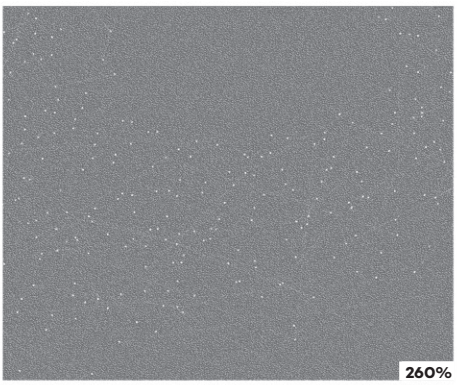
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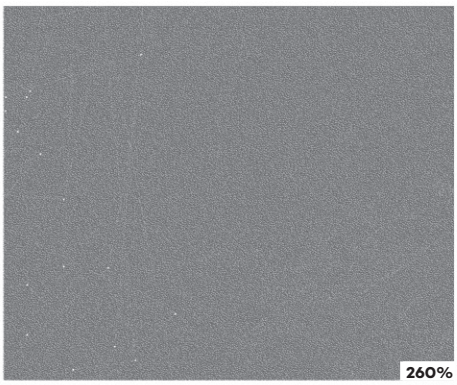
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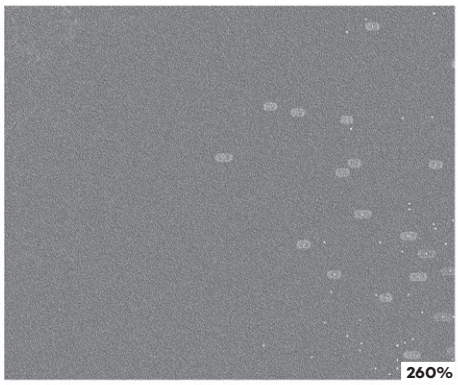
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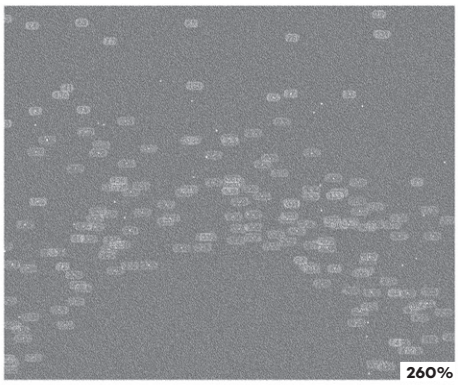
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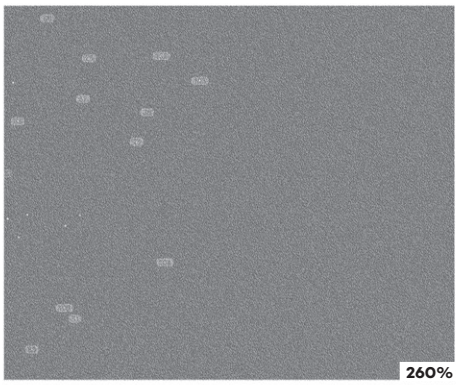
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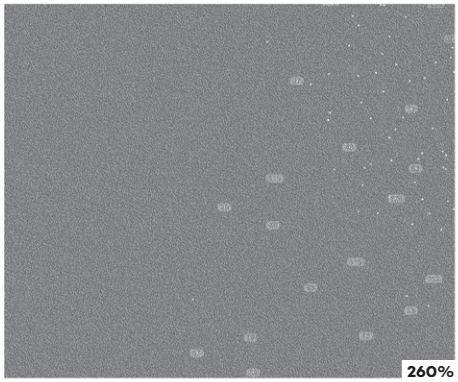
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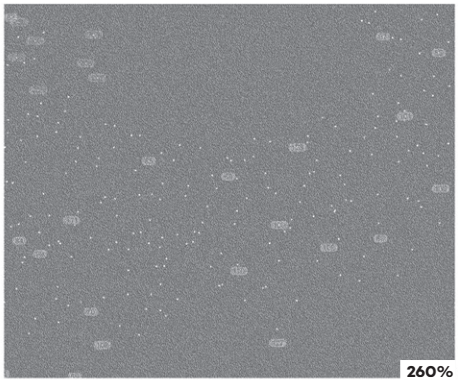
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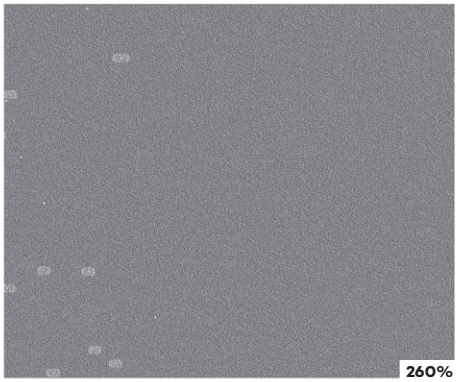
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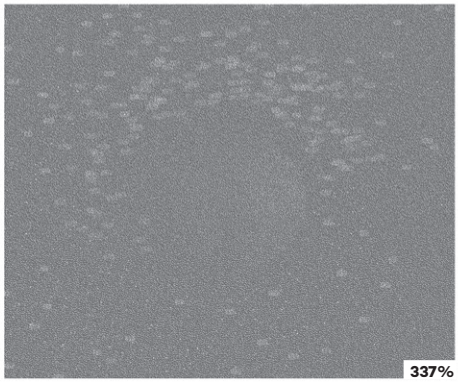
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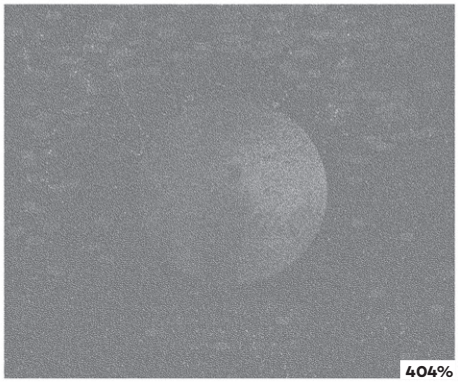
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Overlay of physical and digital material systems of Syntopia I
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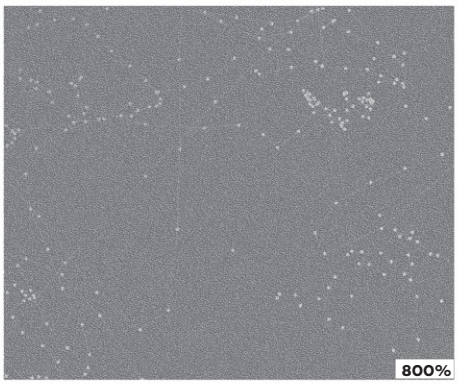
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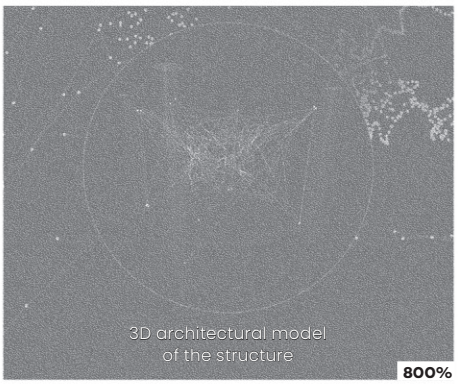
3D architectural model of the structure
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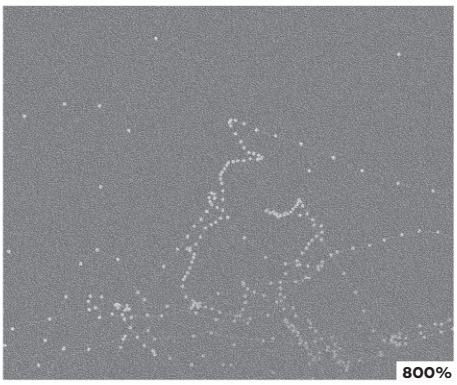
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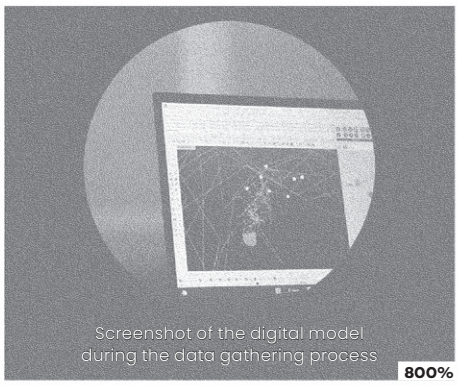
Screenshot of the digital model during the data gathering process
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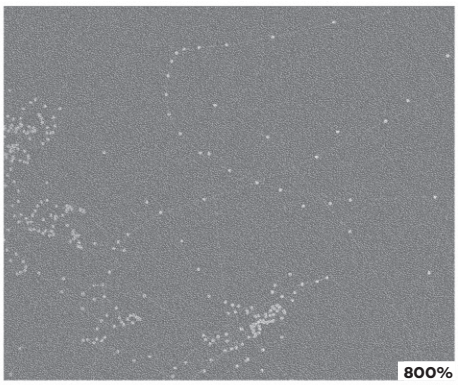
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Wearable augmented reality framework recording knots as data points
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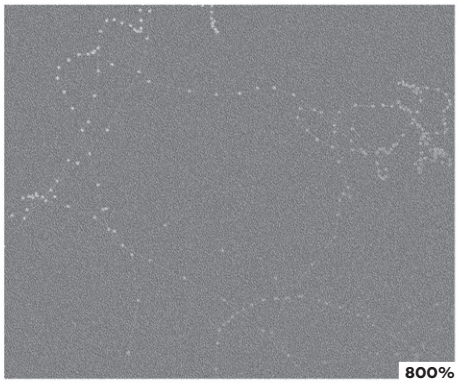
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Skein of wild silk
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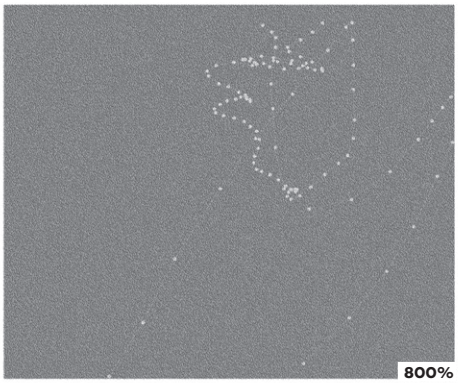
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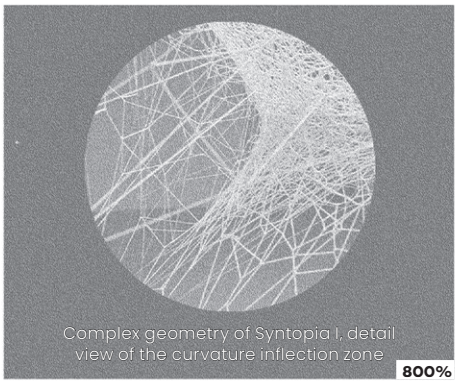
Complex geometry of Syntopia I, detail view of the curvature inflection zone
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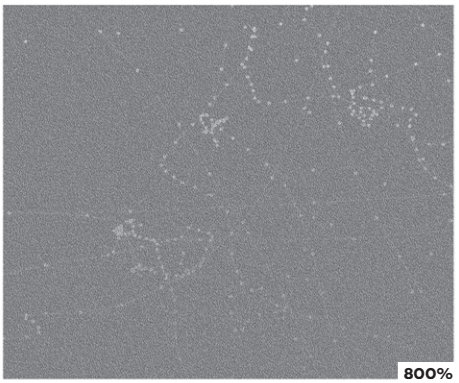
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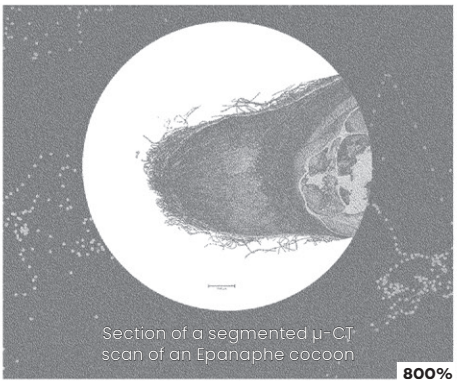
Section of a segmented µ-CT scan of an Epanaphe cocoon
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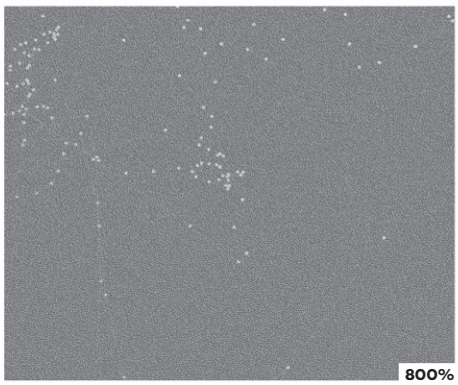
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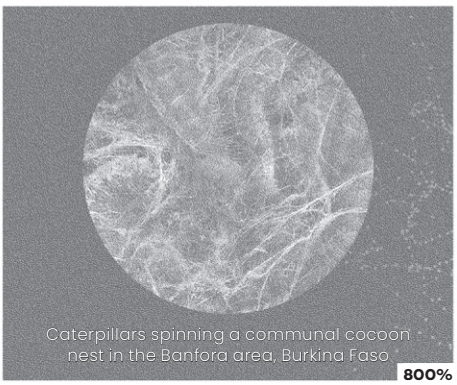
Caterpillars spinning a communal cocoon nest in the Banfora area, Burkina Faso
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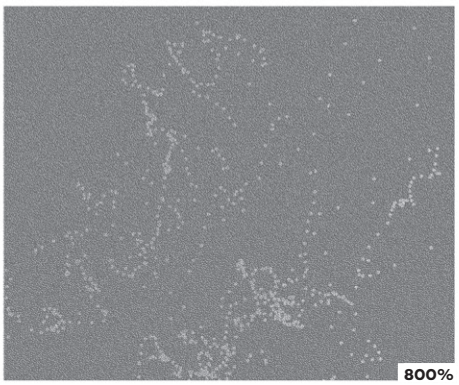
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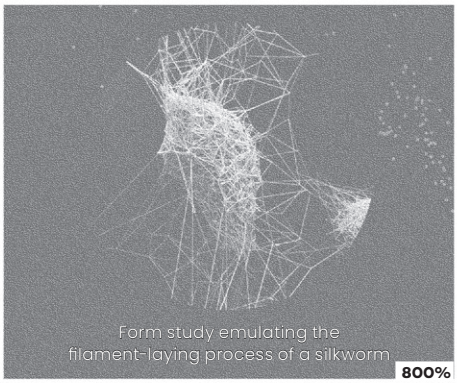
Form study emulating the filament-laying process of a silkworm
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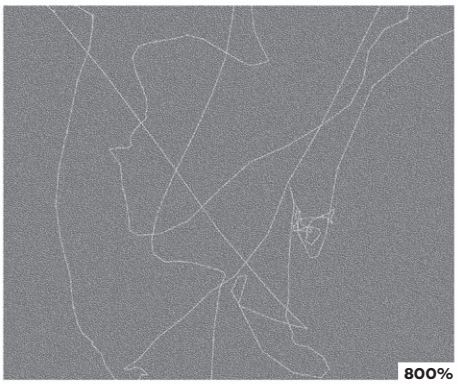
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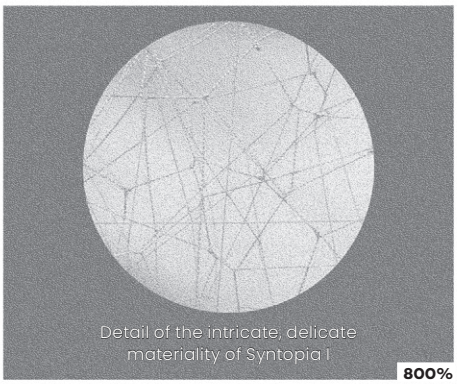
Detail of the intricate, delicate materiality of Syntopia I
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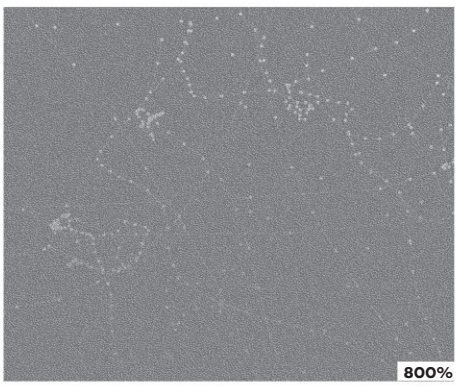
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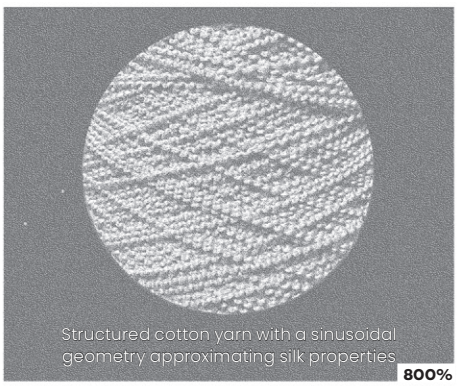
Structured cotton yarn with a sinusoidal geometry approximating silk properties
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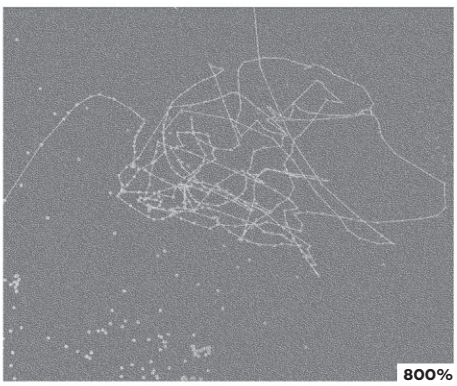
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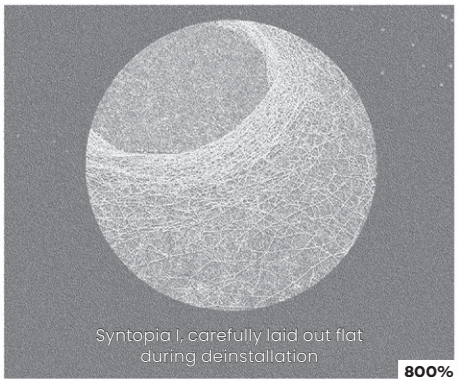

Syntopia I, carefully laid out flat during deinstallation

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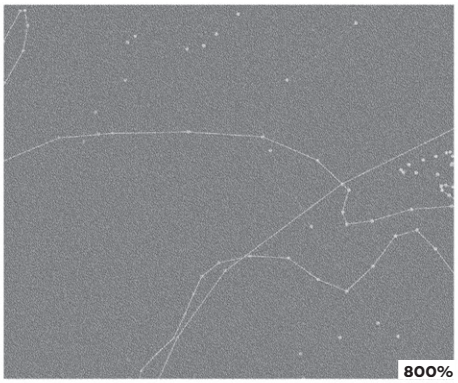

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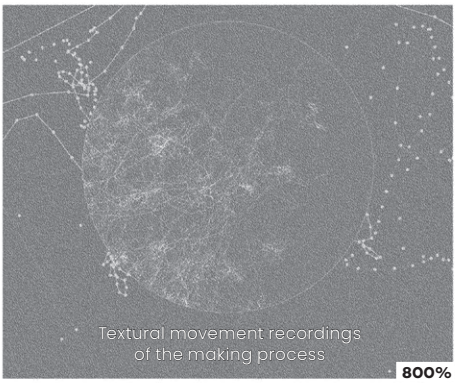

Textural movement recordings of the making process

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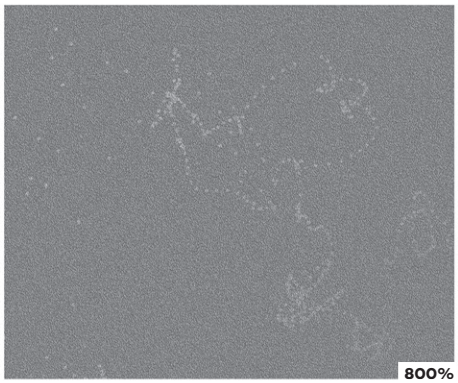

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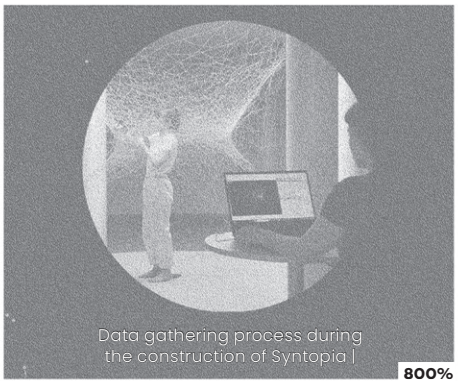

Data gathering process during the construction of Syntopia I

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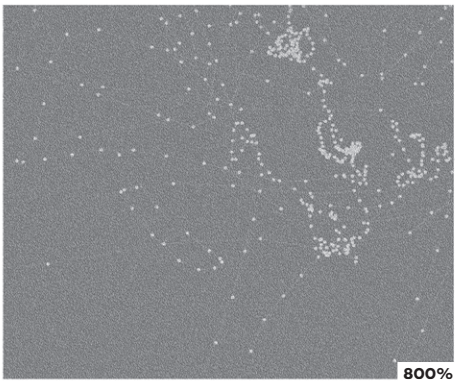

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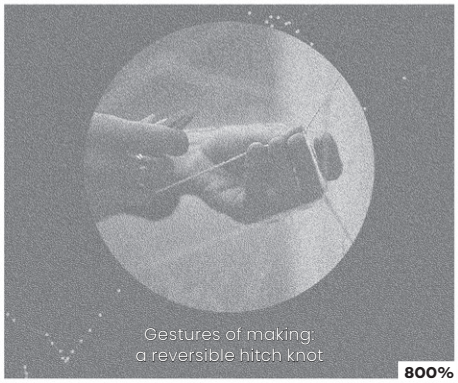

Gestures of making: a reversible hitch knot

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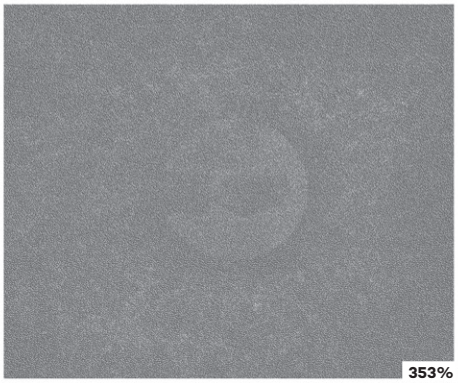

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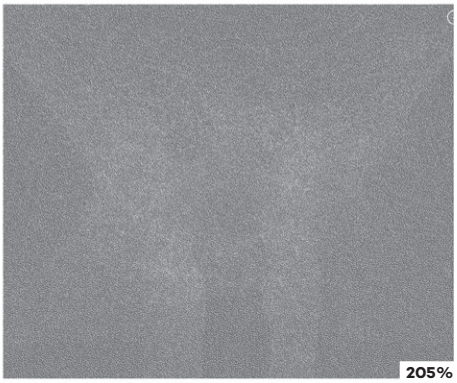

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illustrations rights and references

analogue image:
The first layer shows the image of the analogue structure in the TA T. This image was created in the encounter of matter, space, observer, and body.

(i) *Matter*: The wool-based structured yarn was found to be a close match to the silk spun by the silkworm—both in terms of elasticity and fineness. It was brought into the exhibition space to visually match its colors.

(ii) *Space*: The Tieranatomische Theater (TA T) in Berlin induced the theme of a central light source as a symbol of passage between bodily stages.

(iii) *Observer*: In the act of photographing the structure with the models, the photographer arranges matter, body, and space—maybe intuitively—to narrate the story of *Syntopia 1—Soma I Body*.

(iv) *Body*: The models are persons who have been or will be directly involved with the making of the structure. Therefore, they have an intimate bodily relation to it. Another aspect was the introduction of the models' outfits, selected mainly so that their colors match the surroundings: red ocher, yellow ocher and white.

digital model:
The second layer dives into the digital model recorded while making the installation and shows three top views extracted from the variety of data gathered. The resulting image is a spread of discrete layers of information: the filament layer, the movement layer, and the syntax layer, each with a central portal suggested at the central zone of the installation space—a void created by the body in movement. Images related to the embedded knowledge associated with the project eventually appear as circles through each portal, leading to the proceeding layer.

(i) (Left) The filament layer shows an architectural framework of the structure, recorded by the maker using the wearable AR framework.

(ii) (Center) Traces of bodily movement appear condensed in the image, recorded by an inside-out tracking component of the wearable AR framework. Red and yellow ocher are integrated into the images of the movement layer, giving a sense of physicality in the virtual.

(iii)(Right) A point cloud model view showing a blend between syntax numbers and recorded tracked points. The syntax and points are the foundation for visualizing the filament layer.

embedded knowledge circles:
The third layer opens up the spectrum of knowledge embedded in *Syntopia 1—Soma I Body*, blurring the boundaries between explicit and tacit knowledge. Different aspects of the project correspond to the left and right zones accessed from the previous layer, with the central zone blending the two together. Beneath the filament layer, images generated in the disciplines of biomaterials science, anthropology and textile design are shown. Beneath the syntax layer, images related to the digital materiality, architectural design, and construction process are more present.

additional information:
Photos of *Syntopia 1—Soma I Body* by Roland Halbe—Roland Halbe Photography.

Creative Direction and Graphics by Elaine Bonavia—Matters of Activity.

Detail photos of *Syntopia 1—Soma I Body* by Karola Dierichs, Jessica Farmer,and Elaine Bonavia—Matters of Activity.

Scans of the African cocoon by Nikolai Rosenthal—Max Planck Institute of Colloids and Interfaces.

Photos of the African cocoon by Salif Sawadogo—Matters of Activity.

Skein of wild silk © The Trustees of the British Museum. Shared under a CC BY-NC-SA 4.0 licence.

Form study emulating the filament-laying process of a silkworm. Process model in cotton yarn by Sara Hassoune © Michael Pfisterer // khb weißensee, MoA.

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