CHARBORN

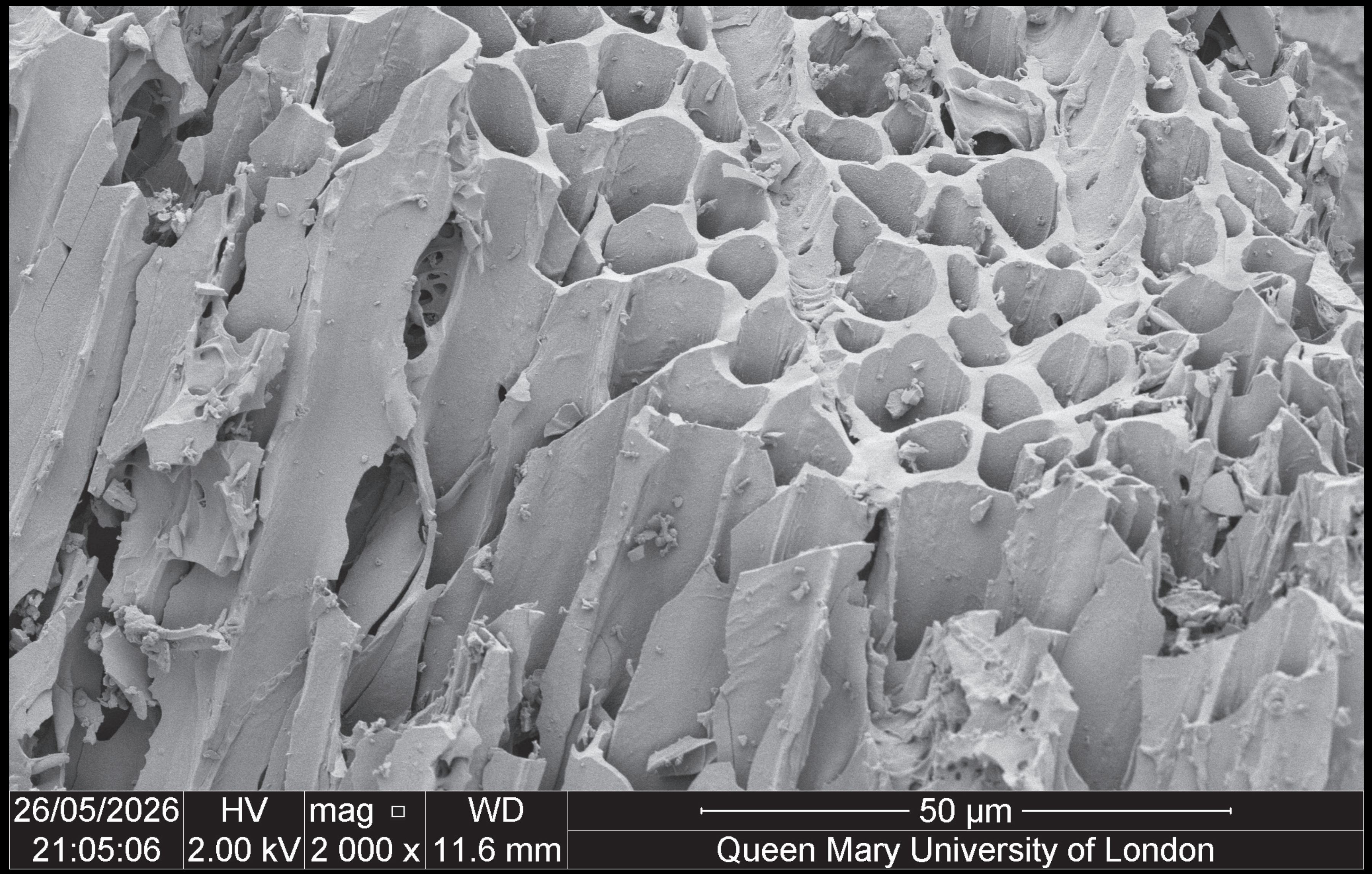
Since the earliest stages of human existence, societies have practiced death rites, embedding the passing of loved ones within emotional, spiritual, and symbolic frameworks surrounding the cycle of life (Pettitt, 2002). Yet contemporary funerary practices such as burial and cremation have become increasingly entangled with environmental challenges, contributing to carbon emissions, deforestation, land-use pressures, and water contamination (Yarwood et al., 2015), placing these rites increasingly out of tune with life itself.

In response, this project proposes a bio-integrated burial rite that reimagines death not as preservation, but as transformation and return. At its center is CHARBORN, a capsule crafted from a novel plastic, developed in collaboration with Imperial College London. The material is born from waste streams: PHA, a bioplastic fermented by microbes from plant residues, enriched with biochar. Biochar is made by pyrolyzing waste wood into a stable form of carbon. The production process is energy neutral, and the resulting material is therefore carbon-sequestering. Blended and shaped into a capsule, the material becomes both medium and message. This vessel accompanies the human body through different states of existence: carrying it throughout life in the form of a chaise longue, receiving it in death as a coffin, and returning it to nature by aiding its decay. Fully biodegradable, the piece offers an intimate enclosure while quietly nourishing the soil, made possible by the regenerative properties of the embedded biochar.

> “We are citizens of two worlds: the present and the imagined. Out of this antithesis, the future is born.” (Polak, 1973)

Chaise longue on natural burial site

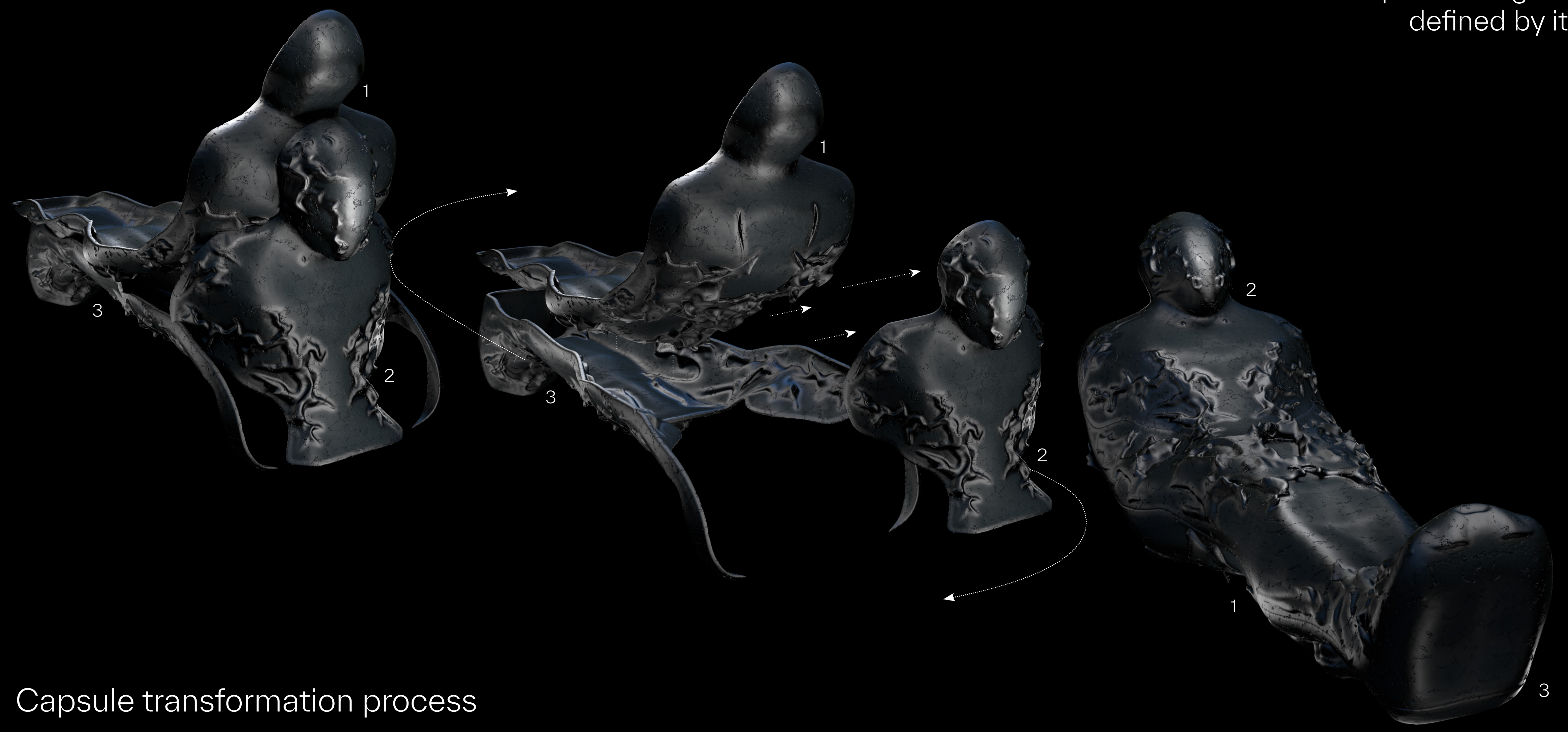
The CHARBORN composite biodegrades in soil in as little as 40 days, leaving behind the embedded biochar, which serves as a soil amendment. Biochar’s highly porous structure makes it an effective habitat for microorganisms (Bolan et al., 2023). It has been shown to promote bacterial growth and enhance the production of extracellular polymeric substances (Yu et al., 2023). Furthermore, its inorganic mineral content, including carbonates and phosphates, generally imparts an alkaline character, enabling it to increase soil pH (Ning et al., 2025).



SEM image of wood-derived biochar, showing the characteristic honeycomb-like cellulosic pore architecture inherited from the parent wood matrix
Image courtesy of Roberto Volpe

Wood pyrolysis

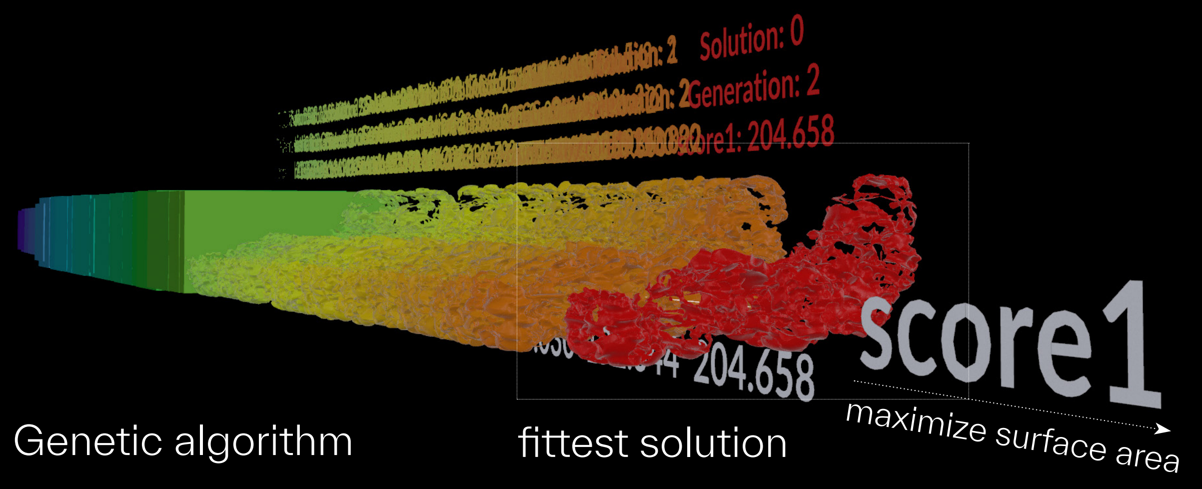
Capsule cover FDM printed with CHARBORN filament



Capsule transformation process

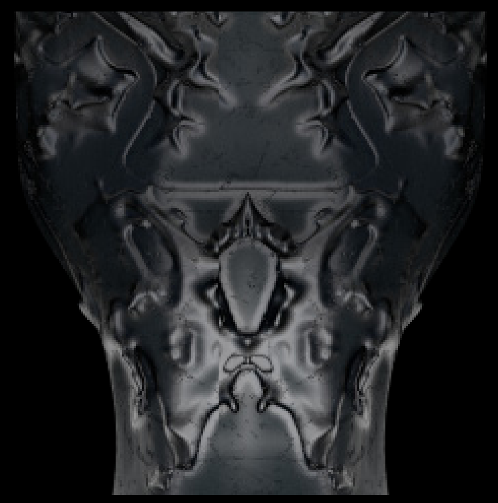
CHAISE LONGUE → TRANSFORMATION → COFFIN

The capsule design is driven by four factors defined by its changing life cycles:



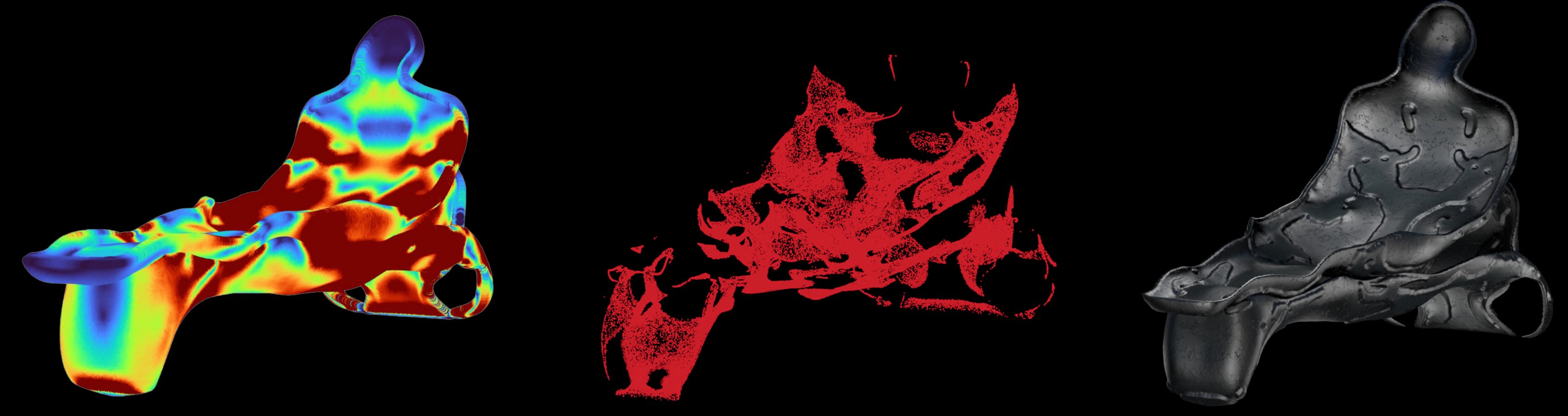
Genetic algorithm

fittest solution



1 Ergonomic shape
— molded to a 3D scan of the owner's body

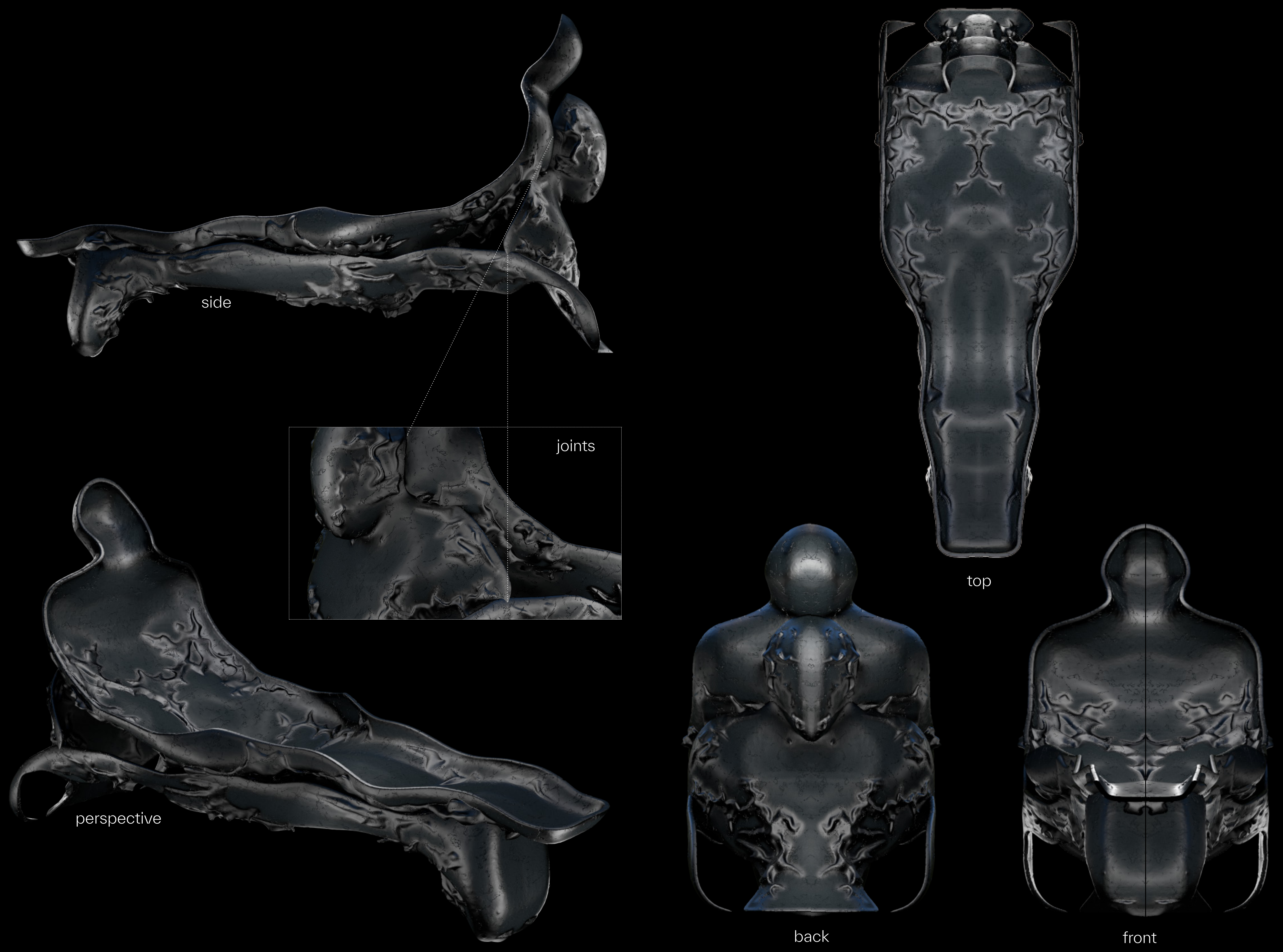
2 Minimal material use
— reinforcement of highest stress areas identified with finite element analysis



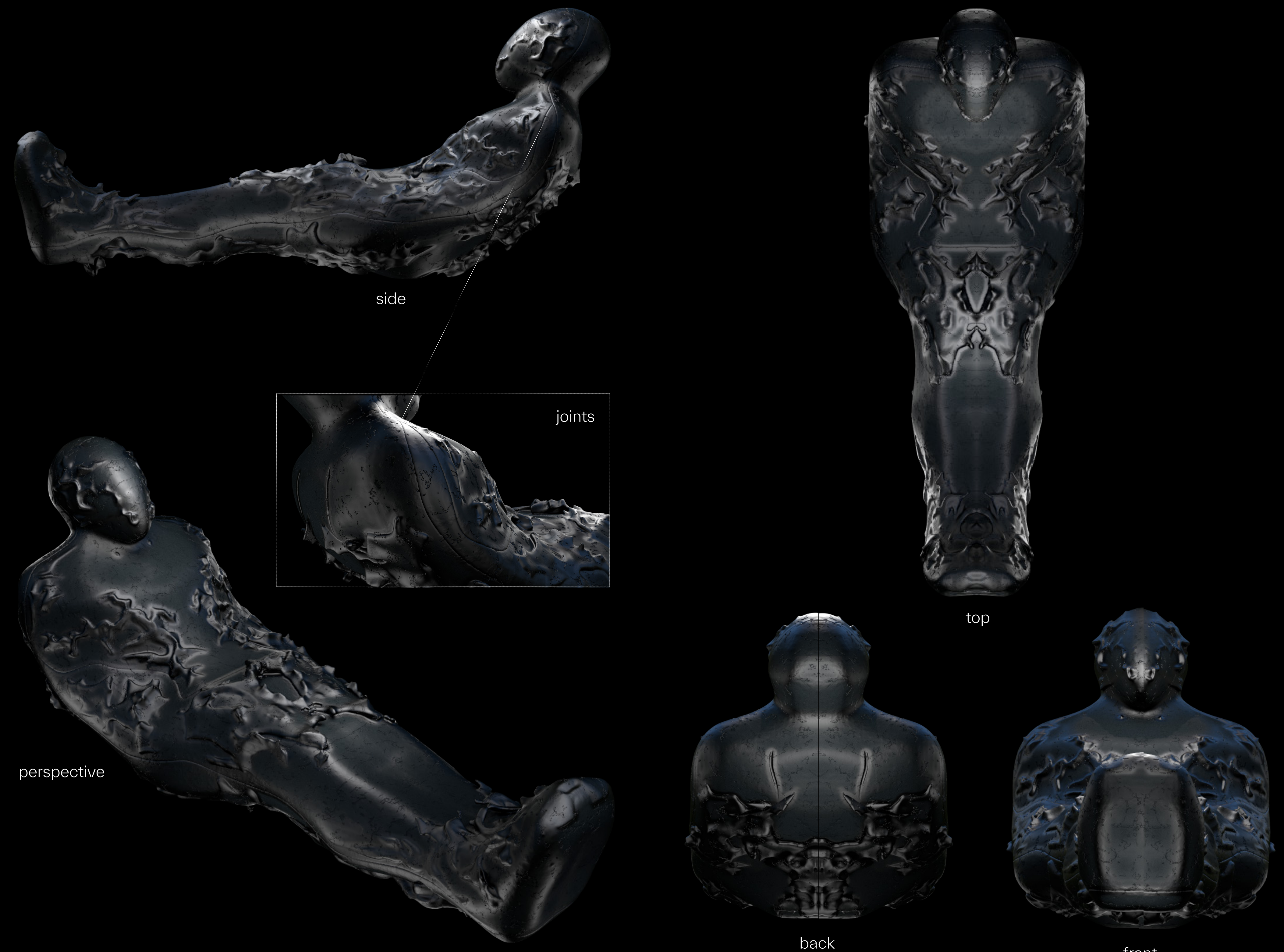
3 Even biodegradation
— surface-enlarging patterns applied to the reinforced areas

4 Bioremediation of toxins released by decomposing body
— biochar embedded throughout the capsule

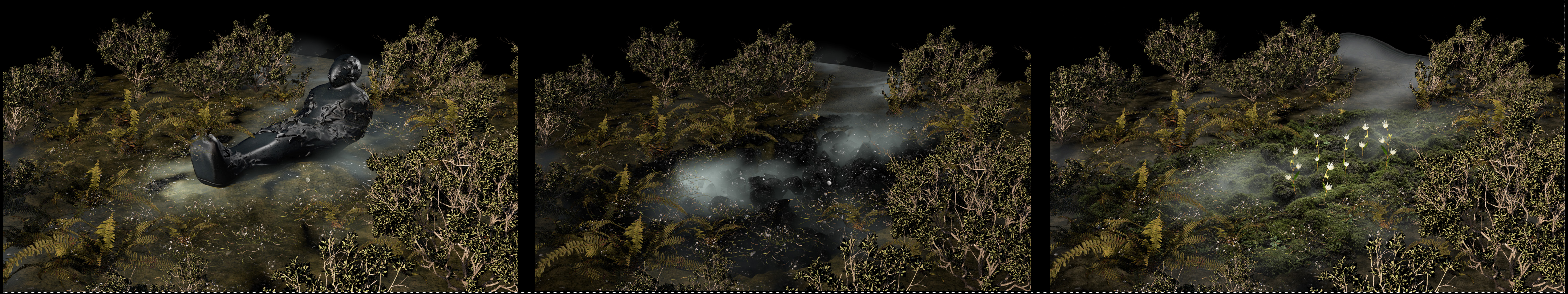
Perspectives of chaise longue



Perspectives of closed coffin



Stills from burial animation



Coffin biodegradation simulation

month 0

month 6

month 12

	5% biochar	10% biochar	15% biochar	0% biochar sample	5% biochar sample	10% biochar sample	15% biochar sample	unamended soil
germinated seeds	3	3	3	2	4	2	2	3
leaf count	7	10	7	4	7	5	5	7
maximum leaf height	5.8cm	5cm	5.2cm	8cm	8cm	6cm	5.8cm	6.5cm

Ecotoxicity testing on *Valerianella locusta* (L.) Laterr in CHARBORN-amended soils

PROJECT VIDEO

https://youtu.be/mpYZXjcszHo?si=4nVoaOk5EG6XBXeW

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IMAGERY

All images, unless otherwise stated, are created by me.