



## Zoirotia

In June 2021 CITA has been invited by the curators of the BioMedia<sup>1</sup> exhibition at ZKM | Center for Art and Media Karlsruhe to contribute with a new kinetic installation. The curators had conducted an international search for artists which could contribute to the Biomedica exhibition and answer this curatorial question:

*Who or what defines on what is alive and what is intelligent? Can artificial forms of life be empathetic? What does the cooperation of human beings and artificial agents look like? What ethical questions arise? The exhibition »BioMedia« invites visitors to learn about and discuss possible forms of cohabitation between organic and artificial forms of life.*

CITA was commissioned in July 2021 and developed and produced the installation at ZKM during the following 5 month. The BioMedia exhibition opened 18. December 2021 and closed 28. August 2022.

### Curators / Peer Review

- Prof. Peter Weibel, *Chairman and CEO of the ZKM, Center for Art and Media Karlsruhe*
- Sarah Donderer, *curator at the ZKM | Center for Art and Media Karlsruhe*
- Daria Mille, *curator and research associate at the ZKM | Center Art and Media Karlsruhe*

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<sup>1</sup> <https://zkm.de/en/exhibition/2021/12/biomedica>

## Description

Zoirotia is a large scale textile installation with a kinematic substructure. It consists of 88 customized CNC knitted patches of an average dimension of 1.8 m x 5 m and covers an area of 568 m<sup>2</sup> extending 25 m x 27 m and 15 m in height. Built for the Center for Art and Media Karlsruhe (ZKM) the project explores textiles as a material for a soft space. In this framework soft includes ideas of the mutable and changing. Zoirotia is animated. Incorporating a series of steered pistons, it is animated by a continual kinetic movement.



## Materials

Architectural structure and computational knit: serafil (continuous polyester filament), bending active rods: glasfibre, ropes and wires: polyester, stainless steel, compression rods, details: steel

## Reflection

Zoirotia (derived from the Greek word for vividness) explores the making of a new textile architecture creating a soft immersive space. Knitted in vivid colours, the installation creates a new sense of tactility and connection between visitors and the exhibition space as people are enveloped in a constantly transforming colour-scape. And, Zoirotia moves. Flexing and unflexing across deep timeframes, the structure moves in a

slow rhythm, recomposing the structural forces of its form-found figure. Like in nature, the structure is dynamic and changing – vivid, with lifelike behaviour.

Zoirotia asks how architecture can gain its own movement language. If architecture is traditionally understood as unchanging in time; consolidated by the compressive logics of static structures and idealised material permanence, Zoirotia pushes towards other boundaries. Here, the structural system is understood as a continual act of balancing – a negotiation of tensile and compressive stresses animated in time.

Zoirotia is made as a bending active structure supported by bespoke knitted membranes. Here, bent glass fibre rods are braced by a pre-tensioned knitted membrane. As such, Zoirotia exists as a balance between forces. The knitted membranes are graded creating a differentiation in their three-dimensionality, colour intensity and translucency. They are machine knitted in a bespoke manner meaning that each membrane is different in its shape, colour and performance. The yarns are spun from high performance polyester sourced from the furniture industry enabling the strength ratios needed for architectural application while at the same time allowing us to work with a broad palette of colours. In Zoirotia, this colour opportunity is expressed through two tempers; on the façade of the entrance light yard of the exhibition a slow grading shifting between whites, greys and blues lifts the gaze of the visitors up into the space, while in the cave a denser colour space with more abrupt transitions envelops its inhabitants in deep turquoise and yellow tones.

Although the installation changes across the façade, into the cave and through to the second light yard, it is made from repeating units. Each unit consists of four attached membranes rotating around a central axis. By variegating the scale, geometry and colour of each membrane and by turning the units horizontally a unified language is gained. This allows the curation of a spatial experience that flows from the façade to the cave and in to the second installation space.

Zoirotia is light-weight and resilient. The material system operates through measures of redundancy. It can absorb energy and shape change in response. Actuated by a series of hydraulic motors mounted up over the main façade structure, the structure slowly changes recalibrating its embedded balance. The pulse of this movement is set below our immediate perception. Instead, the movement is perceived as a continual resonance with a material change.

A central part of the creation of Zoirotia has been the building of new workflows between architectural design and textile production from which a new bespoke material practice emerges. Zoirotia is knitted using a continual grading between to stitch types; double jacquard – normally used for garments – and an open jacquard in which the stitch is allowed to unravel in a controlled manner and stretch the fabric to create the three dimensional protrusions that form a structural bow-shape unit. The interfaces enable the informing of the membranes in stitch-by-stitch manner. This allows control the geometry of the individual membranes and tune them to their structural performance. The graded control of the unraveling creates a situated translucency that continually shifts in intensity across the installation.

## Context

Zoirotia follows previous interdisciplinary collaborations of CITA with textile design and structural engineering, which resulted in large scale textile and CNC-knit structures, such as Vivisection (2006), Hybrid

Tower (2015 and 2016) and Isoropia (2018). These works examine new workflows that enable the integration of simulation and form-finding as well as fabrication data for CNC knitting production.

## Documentation and Reflection of the Artistic Research

The artistic research project has been reflected and disseminated through:

Main event:

- Exhibition at ZKM | Center for Art and Media Karlsruhe 18. December 2021 - 28. August 2022.

Primary dissemination:

- A book by the curators, which is currently under publication. The book features Zoirotia with reflections by the CITA team as well as the ZKM curatorial team. The book will be released in 2022. A pre-print is attached as a pdf.
- Videos documentation of the installation:
  - [https://vimeo.com/686041446?embedded=true&source=vimeo\\_logo&owner=2445983](https://vimeo.com/686041446?embedded=true&source=vimeo_logo&owner=2445983)
- Process documentation of fabrication:
  - <https://www.instagram.com/stories/highlights/18058900972292618/?hl=en>

Further media presentations:

- Interviews of members of the team with the curatorial team under COVID restrictions
  - ▶ [Artist Talk with Mette Ramsgaard Thomsen | Art me Anything @ZKM Karlsruhe](#)

Publications

- Y. Sinke, M. Ramsgaard Thomsen, M. Tamke, and M. Siskas, "Strategies for encoding multi-dimensional grading of architectural knitted membranes," presented at the DMS Design Modelling Symposium Berlin, Towards Radical Regeneration, Berlin, Germany, 2022, pp. 528–542.
- Y. Sinke, M. Ramsgaard Thomsen, D. S. S. Albrechtsen, and M. Tamke, "Design-to-production workflows for CNC-knitted membranes," ACADIA, Philadelphia, USA, 2022. (to be published)
- M. Ramsgaard Thomsen, M. Tamke, Y. Sinke, "Architectural Knitted membranes" Bloomsbury Encyclopedia of World Textiles", Volume 10: Textile Futures, Edited by Janis Jefferies, Kinor Jiang, Lucy Norris. Bloomsbury Publishing PLC. (to be published)

## Project Participants

CITA: Centre for IT and Architecture: Martin Tamke, Mette Ramsgaard Thomsen, Yuliya Sinke

Team: Simona Hnídková, Martynas Siskas, Nihit Borpujari, Viktoria Millentrup  
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Team ZKM: Christofer Gutmann, Ronny Haas, Martin Häberle, Martin Mangold, Thomas Schwab

With support of the team of essential art solutions: Raphael Dobler, Manuel Dück, Cim Jubke, Peco Kawashima, Hans Kohls, Raoul Muck, Johannes Niehus, Lothar Schmidt, Nemo Schmidt, Jost Schneider, Yannick Schwendemann. Knit fabrication: Viola-Stils SIA, Kobleder GmbH, Karl Mayer Stoll Textilmaschinenfabrik GmbH

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