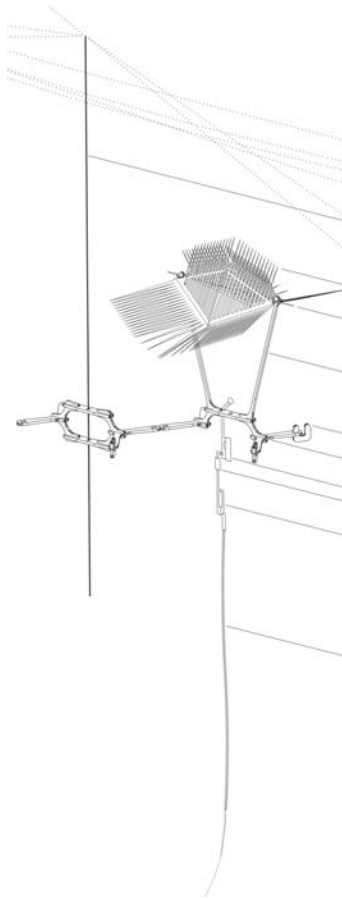


1 Digital Model of Implant Matrix, showing interlinking structure holding mylar pores

Implant Matrix

Philip Beesley and Will Elsworthy

University of Waterloo School of Architecture



2 Shape-Memory Alloy Actuated Pore Unit with spacer mount to left, mylar pore above and whisker-sensor unit below.

Implant Matrix treats an architectural building skin as a responsive textile akin to a natural system. This assembly creates mechanical functions that offer active exchanges with building occupants. The project challenges our relationship with nature by creating an artificial system that shows a mechanical empathy.

The components of this systems are mechanisms that react to human occupants as erotic prey. The elements respond with subtle grasping and sucking motions. Arrays of 'whisker' capacitance sensors and shape-memory alloy actuators are used to achieve sensitive reflexive functions. The interactive elements operate in chained, rolling swells, producing a billowing motion. This motion creates a diffuse peristaltic pumping that pulls air and organic matter through the occupied space. The result could be a hybrid ecology that digests surrounding matter and accumulates a new kind of living turf.

Implant Matrix includes capacitance sensors, shape-memory alloy wire actuators and toothed mylar filtering valves within the lightweight polymer structural system. The work uses laser cutting direct from digital models and simple interactive systems based on distributed Peripheral Interface Controller 'PIC' microprocessors. The processors, sensor and actuator systems support a primitive intelligence that animates the structure.

Preceding installations within an ongoing series of sculpture installations titled Reflexive Membranes demonstrate evolving details being incorporated within the *Implant Matrix* installation. The approach Orpheus Filter, installed at the London Building Centre in 2004, is a stratified 'reflexive' membrane that derives its strength from two overlapping geometric systems, one ordered and planar, the other pillowing and tangled. Orgone Reef, installed at the Cambridge Gallery, Ontario, 2004-5, is a hovering canopy that responds to occupants using a myriad of miniature interlinked elements.

Current work is being developed in collaboration with mechatronics specialist Rob Gorbet at the University of Waterloo, extending collaborations with systems designer Stephen Wood and interactive artist Diane Willow.

Project Collaborators

Philip Beesley and Will Elsworthy

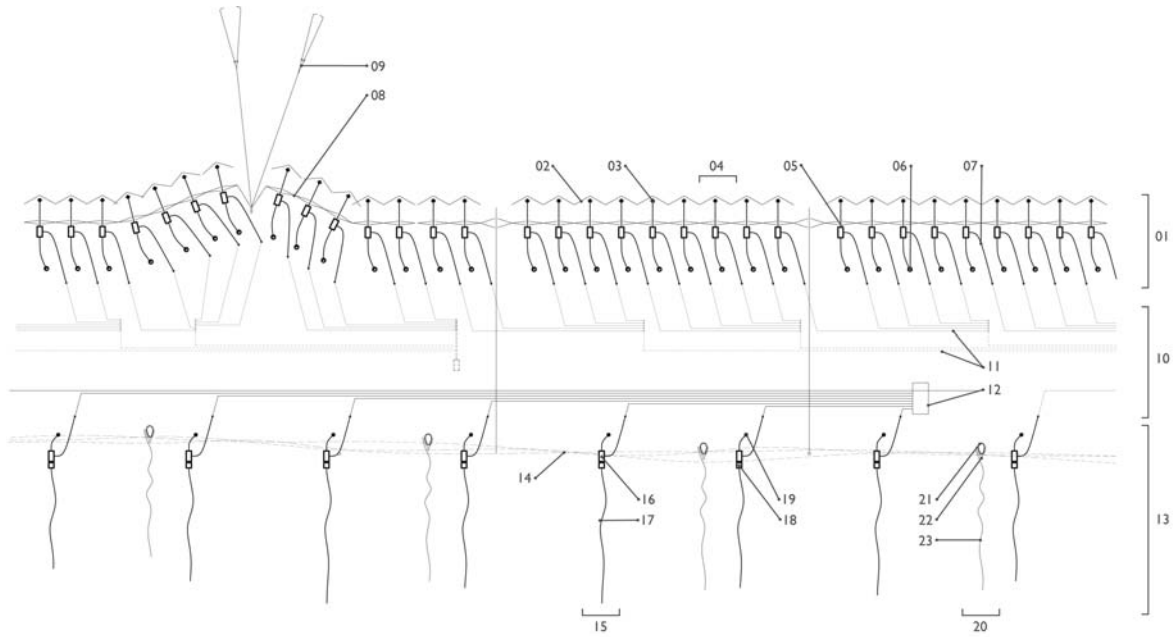
Mechatronics design: Robert Gorbet

Control systems: Steven Wood

Behaviour modeling: Eric Bury

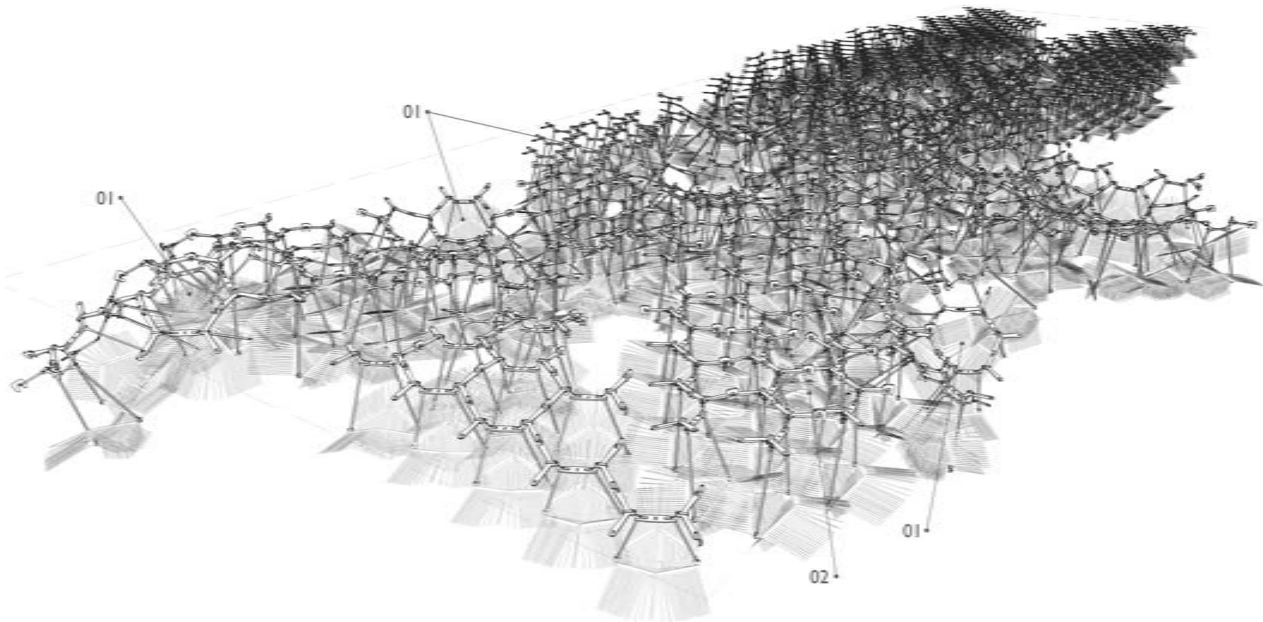
Design assistants: Liana Bresler, Jordan Darnell, Tori Foster, Miriam Ho, Alex Josephson, Coryn Kempster, Desmond Shum, Jonathan Tyrrell

Funding: Daniel Langlois Foundation for Art, Science and Technology, Ontario Arts Council

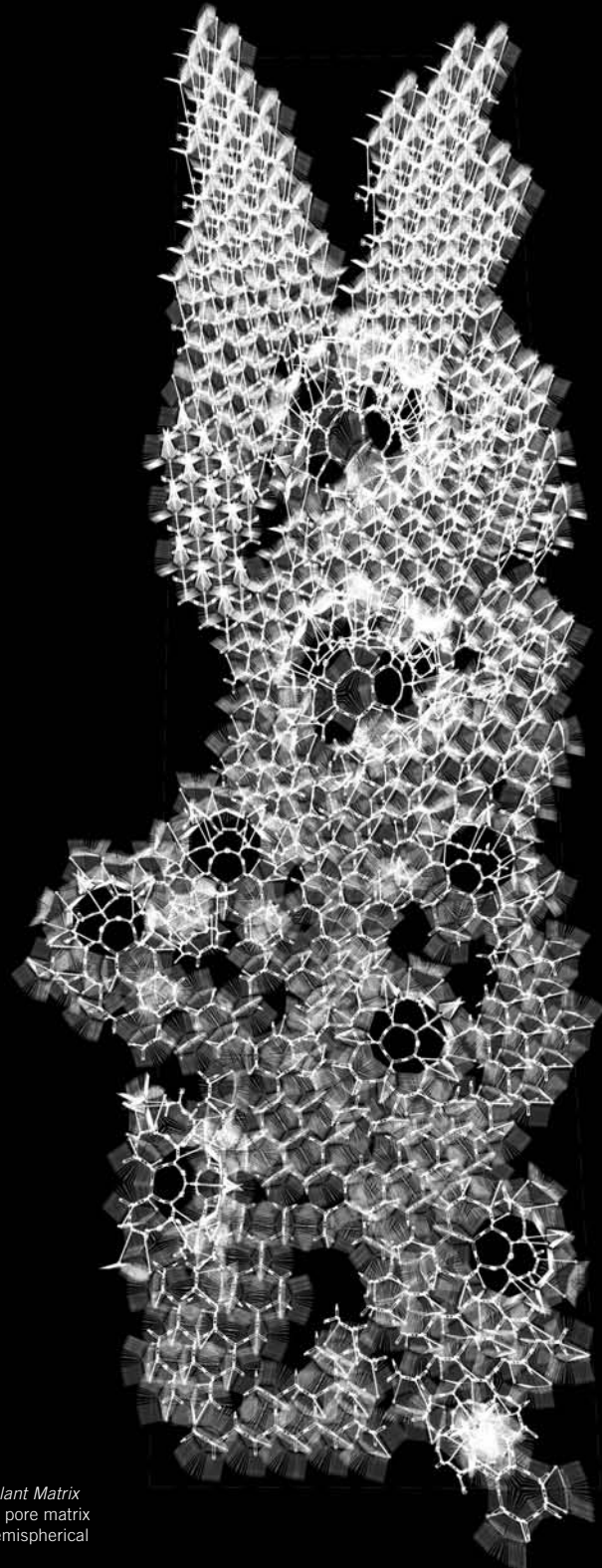


3 System Diagram showing layered assembly.

Legend: 01 - Structural Matrix, 02 - Activated 'Pores', 03 - Shape Memory Alloy (SMA) Wire, 04 - SMA Actuator Circuit, 05 - Controller Board, 06 - Light Sensor, 07 - Power Supply, 08 - Hemispherical Structural Node, 9 - Attachment Clamp, 10 - Network Matrix, 11 - Actuator Power Delivery, 12 - Sensor Control System, 13 - Filter Matrix, 14 - Filter Mesh, 15 - Sensors, 16 - Sensor Circuit, 17 - Capacitance Sensor/Actuator 'Whisker', 18 - Speed Control Motor, 19 - Light Emitting Diode, 20 - Nutrient Packs, 21 - Nutrient Reservoir, 22 - Excretion Mechanism, 23 - Trigger.



4 01: Pentagonal node: hemispherical apex for structural attachment
02: Offset standard planar array supporting shape memory alloy actuated 'pores'



5 Top view of *Implant Matrix* showing regular pore matrix distorted by hemispherical apex nodes.