SEE YOURSELF SENSING

REDEFINING HUMAN PERCEPTION

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SPECULATIONS

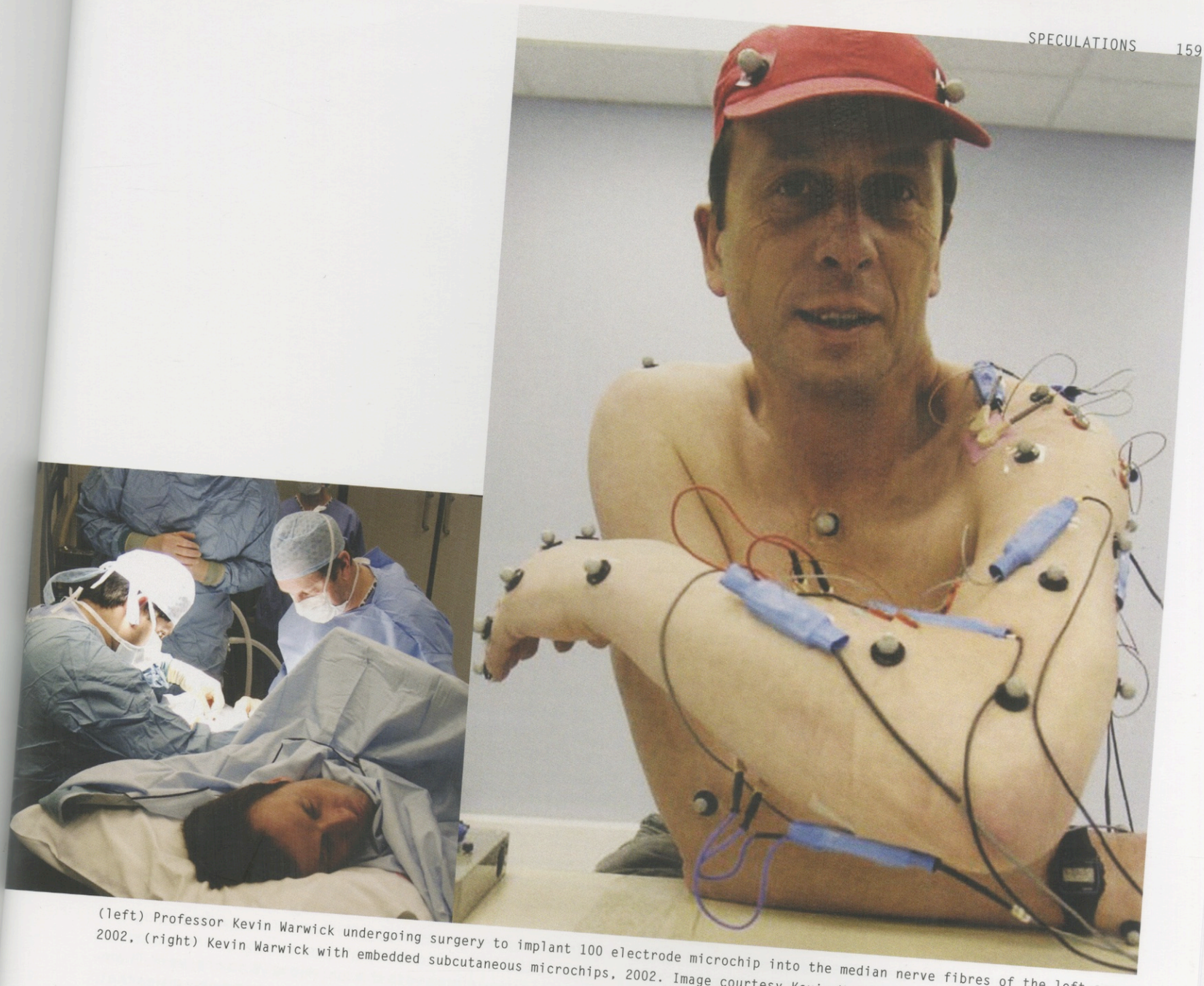
Though we *rendez-vous* with our computers and smart phones for a significant portion of the day, most of us experience ourselves as separate entities from our technological apparatus. There might be a dependency, an obsession or the occasional 'love affair' with a portable device—or the kind of emotional attachment that develops with a robotic pet—but we know where we begin and end. Then there are cyborgs like Steve Mann, for whom that line is blurry, who in time begin to incorporate technology into their body schema. Most cyborgs celebrate their hybrid human/machine status and wilfully wear sense-altering devices during waking hours. In most cases the union is external to the body. Though the wearable machine does affect and alter the sensory apparatus and hence the brain, the nervous system does not control the device directly. Then there are less wilful cyborgs—recipients of medically necessary neural, retinal, cardiovascular, cochlear implants and more. Though internal to the body these devices are intended to work automatically. The wearer cannot consciously control their functioning with the mind or nervous system.

Enter Kevin Warwick, Professor of Cybernetics at the University of Reading, England. Using his own body as an experimenting ground, Warwick underwent risky two hour surgery to implant a 100 electrode microchip into his arm, becoming the first human to connect his nervous system to a computer, to link a biological being to a machine. As predicted he found that he could make a robotic hand move through his connection to the computer, and he could feel the movement of a remote robotic hand. Everyone continues to want to know exactly what this felt like—sending electrical signals through his arm and into his brain—a process that could have created irrevocable damage to his hand or even his brain. He explains that the electrical signals running into his nervous system felt like "a charge running up his index finger"—a transferred sensation that was remote from the actual entry of pulses into his body.[1] His brain also received ultrasonic signals via sensors worn on his baseball cap and fed into his arm. "With a blindfold on, I did not know what it was but I know something was moving either nearer to me or further away and how quickly it was coming at me. I experienced an extra ultra-sonic sense, which is like a bat senses the world."[2]

Warwick underwent the surgery to see if technology could improve life for people with disabilities. Rather than controlling a prosthetic limb with another limb, he wanted to try to connect the human nervous system directly with the robotic limb. Less than a decade later implant technology has been used successfully for amputees. The *SmartHand*, for example, is a thought controlled prosthetic limb that responds much like a real hand. In 2002 the sensory ramifications of Warwick's experiment were extraordinary. Linking his nervous system to a computer meant that he could link his nervous system across the Internet to allow his brain signals to manipulate objects across great distances. He demonstrated this at Columbia University, extending his nervous system trans-continentally through the Internet to the UK where a remote hand controlled by his brain was able to pick up an egg.[3] But before you imagine him doing this in front of an Internet audience, take note of his unusual precautions. He was careful not to publicise the experiment as it was happening for fear that someone might attempt to hack into his nervous system. It is hard for the ordinary person to imagine this scenario, but if you hang with Kevin Warwick's crowd, it may be feasible and even plausible.

In another neural interaction, Warwick's wife wore a piece of interactive jewellery that would respond to Warwick's state of remote excitation by lighting up red or blue. Though in appearance the neckpiece exhibited the reactive behaviour of many wearables, this particular piece was connecting to his brain and not to external sensors. Talk about family fun: to take the experiment to the next level Warwick further enlisted his wife. She received an implant as well (willingly I should add), allowing the couple to be the first to experience extra-sensory electronic communication between two nervous systems. He could feel when she moved her hand, and she could feel when he moved his, no matter the distance. They were connecting brain-to-brain. Warwick experienced this moment as among the great communication events in history, on par with and even surpassing his communications forefathers: Sam Morse and his telegraph system, and Alexander Graham Bell and his telephone system.[4] If Warwick's predictions are correct brain-to-brain communication signals the end of the telephone. RIP Alexander Graham Bell.

Having tested the waters of artificial intelligence, Warwick speaks with near disdain about our human limitations, and his arguments are compelling. If you find yourself disturbed by predictions of our impending cyborgian future, you might quickly become a convert. But do not be scared off by all the *Terminator* imagery that accompanies his books and videos. The *Terminator*



(left) Professor Kevin Warwick undergoing surgery to implant 100 electrode microchip into the median nerve fibres of the left arm, 2002. (right) Kevin Warwick with embedded subcutaneous microchips, 2002. Image courtesy Kevin Warwick, University of Reading.

by James Cameron happens to be among the key inspirations for future-oriented researchers, technologists, engineers and cyberneticians (at least among the people interviewed for this book) who have an affinity for science fiction. Among them no one proposes anything as radical as the *Terminator* for our future.

Warwick paints our current existence as puny and insubstantial. He points out that we have an extremely limited sensory range, estimating that we perceive only five per cent of what goes on around us.[5] This is apparent when one observes the human visible range of the electromagnetic spectrum. Becoming part machine would expand our sensory reception to UV, ultra sonic, X-ray and more.[6] He calls our memory miniscule, citing Marvin Minsky's conjecture that human memory would fit on one 650 MG CD-ROM.[7] Should we settle for one CD-ROM when we could have a networked global memory that would not fade as we aged? In lectures Warwick calls our ability to communicate with others "pathetic" and our coded messages "trivial" and "stupid".[8] Why convert complex electrochemical signals originating in the brain to coded mechanical speech (pressure-based) only to have these signals received by the ear and reconverted back to electrochemical signals the brain can understand?[9]

Warwick sees telepathic communication emerging in the next 20 years—direct brain-to-brain communication via brain implants. He predicts that we will be able to think to each other, and that ultimately we can send each other emotions, graphics, colours and complex concepts far more concisely than we can currently do so. But wait. What about the senses as we know them? What would happen to all that "coded communication?" In an email interview Warwick explained "Think there would be an evolutionary change—maybe we would still have speech as a backup (possibly not for long though)—sound might be useful under certain circumstances."[10]

But if we are so well connected and communication is so fluid, how do we know where we begin and end? How will we know the origin of a sense—say touch? Will we be able to distinguish

R&Sie(n), *An architecture "des humeurs...",* 2010. Scanning station. Photograph by R&Sie(n). Image courtesy the architect.

between our own touch and someone else's that is communicated to us? Warwick responded, "Our brains are extremely clever data processing mechanisms. They make the best sense they can of the signals they receive. I have no doubt they will be able to put different sensory input into context, even new info such as sonar and infrared. It might mean however that some senses diminish in value. Where we begin and end, though, is an interesting philosophical question—Who am I? ... all those connected would very much feel part of a collective and would value other members of the collective much more than those not connected."[11]

Recall the work of STELARC and his surgically implanted *Ear on Arm*, which is intended to have a microphone that will allow anyone connected to the Internet to hear what it hears. Though STELARC comes from the art realm and Warwick from science, both men recognise that our definition of self will change in the future. Both are engaged in ideas that are not self-serving, but are about our human future. Both have offered up their own bodies to test their convictions, enduring pain, recovery, media hype and charges of ethical abuse. "I personally find a lot of what STELARC does to be thought provoking", said Warwick, "he has a lot of good to say about the technical area. I'm not sure about scientists in general though—(I) think STELARC is quite revolutionary in comparison."[12]

Not everyone agrees with this assessment, or the value of Warwick's experiments. Some scientists accuse him of overstating our cyborgian future and hurting the field of cybernetic by generating unnecessary fear. Warwick's hero Alexander Graham Bell and his telephone were not particularly well-received or believed either. Herbert Casson, in his *History of the Telephone* describes the reaction:

> 'It is a scientific toy', said the men of trade and commerce. 'It is an interesting instrument, of course, for professors of electricity and acoustics; but it can never be a practical necessity. As well you might propose to put a telescope into a steel-mill or to hitch a balloon to a shoe-factory.' Poor Bell, instead of being applauded, was pelted with a hailstorm of ridicule. He was an 'imposter', a 'ventriloquist', a 'crank who says he can talk through a wire'. ... whatever of convenience there might be in this new contrivance was far outweighed by the loss of personal dignity; and very few men had sufficient imagination to picture the telephone as a part of the machinery of their daily work.[13]

Experimentation more often than not is met with some degree of resistance, scorn or disregard. Some celebrated technologies vanish—like Jean-François Sudre's 'Telephone'—an obscure method of communicating in which alphabet letters are conveyed by the diatonic notes of a three-octave musical scale. Others fail—like Johann Phillip Reis' pre-Bell machine, a telephone-like device that could transmit sound, but had not yet managed speech. Others 'stick'—like Bell's telephone, though not immediately, and not without the prior successes and failures of similar technologies.[14]

R&Sie(n), an experimental architecture firm based in Paris, are very engaged in the question, "Who are we?" Their responses come in the form of architecture and new cities that break with traditional 'planning' as we know it, and engage in new protocols for design. Among Kevin Warwick's arguments for augmentation is that the fact that we sense only five per cent of what is going on around us. R&Sie(n) report a different kind of deficit—the fact that we reveal only a tiny and prescribed version of ourselves in our built world.

R&Sie(n) (a homophone for the word "heresy" in French) has been focusing on indeterminacy in architecture. They are looking towards the future, attempting to envision an urban and domestic life where design decisions are no longer the domain of architects, developers, planners and politicians, but are made mathematically by algorithms driven by data collection. In a field that requires all sorts of system integration—structural, mechanical, electrical, and their control and coordination—indeterminate architecture really is heresy. It requires the invention of wholly new structural systems, fabrication systems and data sources—an entirely new way of 'reading' human

desire, human physiology and unconscious vectors or impulses like fear, irrationality, etc. R&Sie(n) recognise such contradictions and embrace them.

In a project called *I've heard about...*, R&Sie(n) devised a speculative, perforated city that resembles coral, in which the form is determined by "unpredictability and uncertainty as operating modes"[15]. "Can we write the city based on growth scripts and open algorithms porous to a number of real-time inputs (human, relational, conflictual and other data) rather than trying to design an urban future formatted by rigid planning procedures?"[16] "The public sphere is everywhere, like a pulsating organism driven by postulates that are mutually contradictory and nonetheless true. The rumours and scenarios that carry the seeds of its future mutations negotiate with the vibratory time of new territories."[17]

To accomplish the knotted, variable, hive-like network, they designed and fabricated a robotic machine (the VIAB) that would secrete the city in concrete, dropping it into place (there is no formwork as in typical construction) and allowing for the real-time splitting and metamorphosing that data inputs would dictate. Get out your Dramamine.

To support the ideas of *I've Heard about...* R&Sie(n) constructed a fragment of the city matrix. The *Hypnosis Chamber* is an elongated ganglion-like structure that represents a room-scaled portion of the coral hive. The *Hypnosis Chamber* alters one's perceptions on the physical level. Typical cues for proprioception are absent (parallel walls, horizontal floors), so one must constantly readjust body posture, line of sight and weight. The construction requires psychological adjustments as well. R&Sie(n) developed hypnosis sessions with Benoît Durandin that would link people together in some shared alternate reality, something akin to the Internet but on a more unconscious level. Ultimately this hypnotic community would reverberate in real communities.

While Kevin Warwick is working to facilitate direct brain-to-brain contact and therefore direct emotion, R&Sie(n) are more interested in tapping into dreams and desire. They find inspiration in liminal states like somnambulism and unusual historical political movements.

In their most recent project, *An architecture of "Humeurs"*, R&Sie(n) propose using nanotechnology to uncover hidden desires via samplings of body chemistry. They also collaborate with the mathematician François Jouve to devise systems that permit such data to drive architecture.

> Until now the collection of information involved in the residential unit protocol has been based on visible and reductive data (area, way of life, number of rooms, mode of access, neighbourhood frontiers).
>
> In contrast, this experiment will provide the occasion for an interrogation of the shadowy 'emission of desires' through the scanning of certain physiological signals, and the implementation of a chemistry of the moods of future purchasers taken as inputs generating a diversity of habitable morphologies and the relationships between them.[18]

Exhibited at the Laboratoire in Paris, Jeanette Zwingenberger described the experience:

> On entering a cabin, the spectator is invited to take a seat facing a screen and a person dressed in white says in a soft voice: 'Please place your hand in this receptacle.... Over the next 30 seconds it will assess the balance of your body. Your body will thus become the vector of your emotions. During the test a harmless vapour will be released to help us record any evolution in your emotional state. Please allow this vapour to flow through your body. Breathe in deeply. This vapour is in no way harmful.... I will absorb the same substance simultaneously. Facing you is a constructive machine, a robot. It will act as both your guide and at the same time an indicator of the state of your emotions. It is a dynamic portrait of you.... Its movements are directly affected and influenced by the nanoparticles that you will be inhaling and exhaling.' This protocol is an extract from a scenario

R&Sie(n), *An architecture "des humeurs..."*, 2010. Image courtesy the architect.

> concerning the collection of physiological data through the use of nanotechnology.[19]

The result of this touch screen/inhalation/robotic interaction is the distillation of your four hormone-based moods: dopamine, adrenalin, seratonin and cortisol, which modulate your pleasure, energy, melancholy and stress respectively. The architects propose that these will be the keys to the configuration of the architecture, because they will reveal:

> familial socialisation (distance and relationship between residential areas within a single unit), neighbourhood socialisation (distance and relationship between residential units), modes of relations to externalities (biotope, light, air, environment, and also seeing, being seen and hiding), modes of relating to access (receiving and/or escaping, even self-exclusion) and the nature of the interstices (from closely spaced to panoptic)".[20]

All measures of the space have meaning—spatial projections of fears, hatreds, paranoia, exhibitionism or what R&Sie(n) call human "misunderstandings" or "*malentendu*".[21] Talk about wearing your heart on your sleeve or airing your dirty laundry in public. In this city of the future all dimensions and geometries are an extension of one's inner life.

Why include a chapter called "Speculations" in a book full of speculative work? Because among the fantastic sensory projects emerging in all disciplines, arenas, and technologies, some projects are ahead of the curve. Some scientist is pushing the envelope. Someone or some group is trying something new. Someone is putting himself on the line—risking personal comfort, professional acceptance, and accepted norms to experiment.

This book aims to reveal a cross-section of innovations regarding the senses. It is meant to inspire, to inform and to spark new speculations. The senses are such an extraordinary medium and the scale and scope of projects is infinite. There are profound projects about tiny moments, like Hamilton's pinhole camera for the mouth and the resulting *Face-to-Face Series* and projects with societal significance like the *BrainPort*. All of the projects in their own way ask, "Who are we?" One thing is for sure: we are in flux.

Inspired by Kevin Warwick's depiction of our ability to take in only five per cent of what is going on around us, this book presents its own challenge: provide incredible explorations for a sequel to *See Yourself Sensing: Redefining Human Perception* to be called: *See Yourself Sensing: The Other 95 Per Cent*, and after that: *Feel the Other Sensing: Redefining Collective Perception*. These are books I would like to have the opportunity to write.

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Carsten Höller

Carsten Höller's work seems straightforward—a pair of eyeglasses, a series of light bulbs, a slide—but once the spectator engages the installations the alchemy begins. Höller engineers his work to penetrate through space and into the spectator's brain causing shifts in perception or heightened awareness of the act of perceiving. Though many artists dabble in sensory-bending explorations, perception is Höller's currency and his repertoire is extraordinary.

The *Kit For the Exploration of the Self* includes the *Upside Down Glasses* and a structural backpack that uses mirrors to allow you to see yourself from behind as though you are walking toward yourself. If also includes various pills and hormones that will leave you denying your own existence. The *Upside Down Glasses* require a time commitment. If you wear them for only a short period, the inverting lenses will make the world appear upside down. Your hand, for example, will seem to be coming from above. According to the psychologist George Stratton—who experimented with a similar device in the nineteenth century—short stints with such glasses will make the wearer believe that the upside down image is a figment and not reality. In an intermediate state, one will begin to accommodate the upside down image and actually believe that it is reality. Finally, after eight days the brain will adjust and the wearer will experience the world as it once was—right side up.[1]

It is one thing to read about such a device, and another to take up Höller's offer and try it—to feel your own eye-to-brain connection. But in the event that you did not try it, and you forgot that our brain receives the world upside down, Höller reconstructed the experience in his *Upside Down Mushroom Room*, a loopy installation that includes lights in the floor and oversized spinning mushrooms hanging from the ceiling.

In the 2000 exhibition Synchro System at the Fondazione Prada, *Light Wall* preceded the *Upside Down Mushroom Room* along Höller's predetermined circuit. Consisting of a grid of 1,000s of bulbs that switched on and off in a precise rhythm, *Light Wall*'s visual and aural intensity immediately worked its way into the mind. Höller had set the rhythm to alternate between a frequency just above 7.8 Hz—the threshold after which an epileptic seizure can occur—and just below it.[2] Such synchronicity with human brain activity triggered hallucinations when one closed one's eyes. If the hallucinations and the after images that followed did not bat home Höller's perceptual alterations, then the more literally inverted project in his sequence—the giant mushrooms—would.

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Upside Down Mushroom Room, 2000. Polystyrol polyester, wood, colour, metal, metal construction, electrical motors, plaster board, neon light, glass, acrylic paint, iron structure, 480x1230x730cm. Photo Attilio Maranzano. Image courtesy Fondazione Prada, Milan.

Jenny Tillotson

The *Smart Second Skin* is a dress that senses the wearer's mood and compensates by delivering atomised fragrances to areas of the body via a circulatory system embedded in the dress. Medical micro-tubes deliver the aromas stored in scent reservoirs, and a cabling system sends electronic messages to parts of the body to activate the smell centres. The dress aims to promote well-being and emotional stability through the power of smell and its ability to connect to emotional centres of the brain.

Jenny Tillotson's *Scentimental Space* expands the therapeutic environmental qualites of the *Smart Second Skin* into architectural space, interfacing the dress with responsive electronic wallpaper. Clothing reacts to human emotions and in turn, the wallpaper transforms, changing colour, smell, temperature and other variables to support the desired emotional state and frame of mind. Well-being, it turns out, can be enhanced by adjusting the stimuli to a combination of human sensory apparatus. Colour, for example, can enhance the perceived efficacy of a mood-altering aroma. Moody individuals would sense the world changing before their eyes, nose and ears. For the more stable among us, the environment might remain much the same. If the *Scentimental Space* turns out to be as fun as conveyed in the images, it might even 'inscentivise' moodiness.

1 *Smart Second Skin Dress*, 2004. Photo Guy Hills. Image courtesy the artist.

2 *Scentimental Space*, 2005. Image courtesy the artist.

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2

Philips Design, Design Probes

Philips Design Probes is a research initiative of Philips Design aimed at predicting mainstream technological design beyond 2020. *Skin: Dresses* and *Skin: Tattoo* are both sense-based projects that react to the mood and emotions of the wearer and communicate this state on the outside of the body through clothing or second skins that transform through variations in light, colour or electronic graphics.

The *Bubelle: Blush Dress* uses biometric sensors on the inside layer to read the wearer's emotional state. The outer layer reacts to this information by adjusting colour and light. Frisson's biometric sensors measure excitement and light up LEDs in response. Both dresses extend internal states into the environment.

Skin: Bubelle Dress. Image courtesy Philips Design.

ENVIRONMENTS

Shrink-wrap anyone? Artist Lawrence Malstaf invites you to join him in experiencing touch to the nth degree. *Shrink* is a startling translucent environment in which Malstaf hangs from the ceiling of a gallery in the fetal position, shrink-wrapped between two layers of PVC, squeezed so tightly that his skin ripples into elephantine wrinkles. His entire perimeter is in touch, except for those involuted nooks between the toes and genitals and under the arms. A breathing tube is his only lifeline. Touch is so extreme here that his attempts to move are slug-like and primordial. "If you're able to let go of the first fear", Malstaf explains, "it becomes very relaxing and comfortable. You feel protected inside, a feeling of weightlessness and pressure."[1] Maybe from the inside. But from the outside Malstaf's piece hovers somewhere between poetry and science fiction, and it is hard to take your eyes off of him. Exceeding the normal limits of touch makes Malstaf look fragile, like a helpless organism being prepared for a microscope. The piece reminds one that humans are, after all, not much more than a sensate sack of flesh. We cannot return to the safety of the womb no matter how hard we try. Or maybe *Shrink* does not evoke a womb, but a cell in some efficient human hive. We are a commodity, like a piece of supermarket fruit or the powerless human drones of futuristic societies in the film *The Matrix*.

Malstaf's experiences are designed for public interaction. You can line up to try *Shrink*. Malstaf has also created a series of sensorial rooms that are designed expressly for allowing the viewer in and creating a disjunction between looking and being within. In *Nemo Observatorium* Malstaf again uses industrial plastic for mimicking a force of nature. He deploys a transparent cylindrical PVC enclosure and five fans to fabricate a tornado of Styrofoam. The visitor enters alone and sits in a comfortable chair at the centre of the enclosure. The fans whip the Styrofoam from the ground and into the air, causing conditions reminiscent of a blizzard. Participants describe the experience as mesmerising, meditative and visually and aurally hypnotic. One is lulled by a waterfall-like sound. Chaos seems manageable. From the outside, though, things do not seem as safe. Through the unstable white wisps the visitor appears fragile and overwhelmed.

You do not have to penetrate a tornado or have yourself shrink-wrapped in order to become acutely aware of environmental sensation. Environments come in vastly different scales, shapes and materials, and they trigger perception using a range of mechanisms. They focus on the sounds, sights, smells and touch between the body and another surface and the space in-between, across which the sensory experience is enacted. Sometimes sensation is generated by the proximal nature of the container and the triggering of neurons via body hair. Other times the senses are stirred by the intermediate air itself. They can be second skins, human-sized containers, pneumatic bubbles, light arrays, immersive installations, responsive architecture, and other spatial realms that surround the body and impact the senses. They may be as small as eyeglasses or the human head, and as large as whole buildings. Some environments reach out and touch, others alter or engulf the body. They provoke questions about the nature of space, enclosure, privacy, control, community and autonomy using traditional static means—external walls, floors and ceilings; or mechanical means—moving parts that blur the line between space and perimeter; or by physiological means—manipulating body chemistry via hormones, light and temperature—sparking sensation from the inside out.

It has been 50 years since the Soviet Cosmonaut Yuri A Gagarin became the first man in space, 44 years since Haus-Rucker-Co created *Flyhead*, *Mind Expander* and their series of small perception-enhancing architectural pods and headgear influenced by all things 1960s: space travel, television, psychedelia, the Cold War, Transcendental Meditation, LSD, psychology and sexual experimentation. *Flyhead* is a transparent bulbous green helmet containing audio-visual filters. *Mind Expander* facilitates the shared experience of new sensations. *View Atomizer and Drizzler* pulsate and strobe respectively to create optical effects. Despite the passage of nearly a half century these experimental environments have not lost their vitality or influence. Haus-Rucker-Co and their Viennese and British colleagues—Walter Pichler, Hans Hollein, Coop Himmelb(l)au, Archigram, Superstudio and others—have spawned new pods, mind spaces and environments that hover between skin and space, body extension and architecture, machine and shelter.

R&Sie(n)'s *Hypnosis Chamber* (see "Speculations" chapter) uses hypnosis to link people within a fictional somnambulist environment. Mariko Mori's 2003 *Wave UFO*, the follow-up to her Plexiglas meditation chamber *Body Capsule*, uses brainwave technology to observe the state of mind of the visitor and then unite them with her computer rendered dream world. Though

Lawrence Malstaf, *Shrink*, 1995. Galerie Fortlaan 17, Gent. Image courtesy Galerie Fortlaan 17.

both rely more on technological mediation than the capsules of the 1960s, they engage in Haus-Rucker-Co's "PHY-PSY", a term they coined to describe their spatial agenda of linking mind and environment, of conquering "Inner-Space"[2].

Haus-Rucker-Co's 1968 description of the *Mind Expander* captures the zeal of their sensory mission and the romanticism of the immersive and transcendental experience:

> The armchair has a buck seat for two, a man and a woman, over it a PVC-balloon which reaches down over the heads of the two seated. You help the girl climb in. Then you climb in. The girl sits just a bit higher than you, her legs across your right thigh. You pull the balloon down and turn on the rhythm machine. The heartbeat of the rhythm machine is quiet and steady; your eyes follow the balloon's red and blue lines. The air you breathe gradually streams through your body; your heart begins to beat more slowly. The girl next to you breathes just as you are breathing, easily and very steadily. You have forgotten whether the girl is a blond or a brunette. Her legs are weightless, you feel absolutely nothing. You do not feel her skin, do not feel the arm she has placed around your shoulder. She is simply there, without you thinking about it. Deep and flowing. Everything begins to flow. The girl is in your breath and in your eyes. You concentrate on breathing. You feel as though you yourself are being breathed in. Pink dots circle before your eyes. Your eyes move to the rhythm of your breathing. Over red and blue lines. The lines become rhythm: the rhythm becomes breathing. The circle begins to close. You are glad. The journey has begun.[3]

With *Mind Expander* the journey had only just begun. Responsive architecture—environments that use technological means to make spaces seem alive and self-motivated—has ignited a new wave of interaction between the body and space, and made the

Philip Beesley, *Hylozoic Grove*, Musée des Beaux-Arts de Montréal, Québec, 2007. Image courtesy Philip Beesley Architect.

ambition of osmotic flow between humans and architecture a reality. Responsive environments extend elements of the room out to make contact with the visitor or retreat in reaction to motion, temperature or colour. Like Robert Neumayr's *Topotansegrity*, they can be designed to track the usage of public space over time, and to adjust topography and landscape on a moment-by-moment basis or according to patterns formed over the course of a 24 hours. These types of projects—"rooms that lurk"—shift the balance between living and inert. When they trigger anxiety they promote the secretion of adrenaline and, in turn, an even higher level of perception.

Many current responsive environments uses shape metal alloys—metals that are thermoelastic, which is to say that they adjust shape yet preserve a memory of their original shape, and they respond to changes in temperature or electromagnetic fields. Less cumbersome and more fluid than other actuators—hydraulic, motorised or pneumatic mechanisms—shape metal alloys foster movements that are more organic and life-like. Philip Beesley's *Hylozoic Soil* and Rob Ley and Joshua Stein's *Reef* both have an organicity more plant-like than machine.

Architect Philip Beesley's *Hylozoic Soil* is a biological lattice of kinetic parts whose uncanny movements trigger delight and discomfort at the same time. Remember those childhood anxieties that one sometimes never outgrows—that there might be something lurking behind us, or under the bed, or something reaching out in the dark? *Hylozoic Soil* does just that. One enters a room full of a dense organic network of delicate illuminated acrylic tendrils that slowly extend out to touch the visitor and respond to their movements. Like an intelligent feather, or ET's probing finger, Beesley's architecture tracks your movement, merges toward you, extends then retreats on its own terms.

Like many of the designers working on responsiveness, Beesley based his installation on a natural system—group and individual pulsations and fluctuations found among coral reefs. The technology to make the project seem alive is impressive, from the digital fabrication of the crystalline parts, to the precise sensors and actuators that are controlled by a distributed network of microprocessors that enable movement at both an intimate and collective scale.[4] There are tendrils that sense an electric charge, and muscle-like actuators made of shape-memory alloy. All of this technology results in real time sensation—the expectation of touch, empathy, eye-tracking. There is a strong unconscious undercurrent too—a hair-raising sense of wonder mixed with a foreboding—a fear of loss of self, of being overtaken by the system, of becoming enmeshed and prodded by a unrecognisable living being. Such squeamishness is hardwired. We react with a mixture of suspicion and awe to living forms we don't recognise.

Other architects and artists aim for a more physically transformative environment—some for nomadic bodies and some for bodies in stasis. Small rooms for the head like Walter Pichler's *TV Helmut (Portable Living Room)* sequester the majority of the sensory apparatus and alienate the wearer. Second skins mimic

Ernesto Neto

Ernesto Neto's installations are 'sites of sensation'—the slow, unconscious primordial kind.[1] They do not assault one's subjectivity. Instead they ease and morph, encompass and extrude, collapse and alight in ways that glide the body through space, and into a state of relaxation and wonder. Described as organic, sexual, labyrinthine, corporeal, anatomical, womb-like, psychological, immersive and otherworldly, the installations all have skins, thresholds and taut gravitational forms: "There is always an edge between one thing and another—a membrane", Neto says. "My work is very much about this limit between one side and the other." Neto speaks of the Copacabana beach in Rio de Janeiro, where he lives and works, in much the same way. "The beach is a border, it is the edge, the skin, the limit. It is where you cannot go any further on."[2]

The experience of his installations starts far outside the gallery, with the first whiff of tumeric, cumin, ginger, black pepper, clove or lavender that Neto binds in his "copulas"—long tensile epiglottis-like weights that hang from the ceiling in stretchy stocking-like nylon. Some copulas contain polystrene, sand, or other non-aromatic materials.

Priming the visitor with olfaction is perfect for Neto's agenda. Olfaction is the slow-poke among the senses. To function the nose relies on particles wafting by the nostrils at the speed of the local air currents, not the speed of light or sound. But smells get to the brain faster than the other senses. It has a direct path, unlike sight and sound, and it is received in the portion of the brain that brews emotions and houses memories. No wonder Neto often begins here. What better way to connect the visitor to the unconscious, to the continuity of time and memory.[3]

Once primed, Neto's installations beg one to touch, to see through and beyond, to lounge and sink in. They wrap and enmesh, threaten to fall, but remain tenuous and weightless. Sometimes it feels like one is traveling within some indeterminate or enormous body, other times one feels oneself shrunken and traveling within a human, like the travelers in *Fantastic Voyage*, 1966, who were reduced to a microscopic size and journeyed through the human blood stream to save a life. In Neto's work, nothing is so dire.

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1. Gonçalves, Lisabeth Rebollo, "Ernesto Neto: Sensation and Time", *Art News* 2.48, 2003, p. 50.
2. Gayford, Martin, "Ernesto Neto Interview for Festival Brazil: Realm of the Senses", 28 May 2010, *The Telegraph*, 12 December 2010.
3. Angier, Natalie, "The Nose, an Emotional Time Machine", 5 August 2008, *The New York Times*, 3 January 2011, http://www.nytimes.com/2008/08/05/science/05angier.html?scp=1&sq=the%20nose%20an%20emotional%20time%20machine&st=cse.

1 *anthropodino*, Park Avenue Armory, New York, 2009. Commissioned by Park Avenue Armory for Wade Thompson Drill Hall. Photo Jean Vong Photography. Courtesy the artist and Tanya Bonakdar Gallery, New York.

2 *Leviathan Thot*, 2006. Lycra tulle, polyamide fabric, styrofoam balls, dimensions variable. Installation view: Le Festival d'Automne, Pantheon, Paris, 2006. Photo Marcus Wagner. Courtesy the artist, Tanya Bonakdar Gallery, New York and Galeria Fortes Vilaça, São Paulo.

3 *Walking in Venus blue cave*, 2001. Stocking, styrofoam, buttons, incandescent lights, 396x777x812cm. Installation view Tanya Bonakdar Gallery, New York 2001. Collection Denver Art Museum.

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Marepe

Acoustic Head is at once an object and an environment, an instrument and a listening device. Made out of found industrial objects—two wash basins hinged together and a cooking utensil Marepe found in Bahia, Brazil where he lives and works—the device amplifies singing, a Bahian cultural tradition. Photographed by the ocean, *Acoustic Head* has mixed associations: seashell listening, Duchamps's *Readymades* and Ann Hamilton's *body object series*. In its agenda to create socially interactive performance and shared sensation it is allied with the work of another Brazilian—Lygia Clark—who in various stages of her career created projects like *Diálogo: Óculos (Dialogue Goggles)* that were only complete when engaged by two bodies at the same time.

Cabeça Acústica (Acoustic Head), 2001. C-print, 72x49cm. Image courtesy Anton Kern Gallery, New York.

Janaina Tschäpe

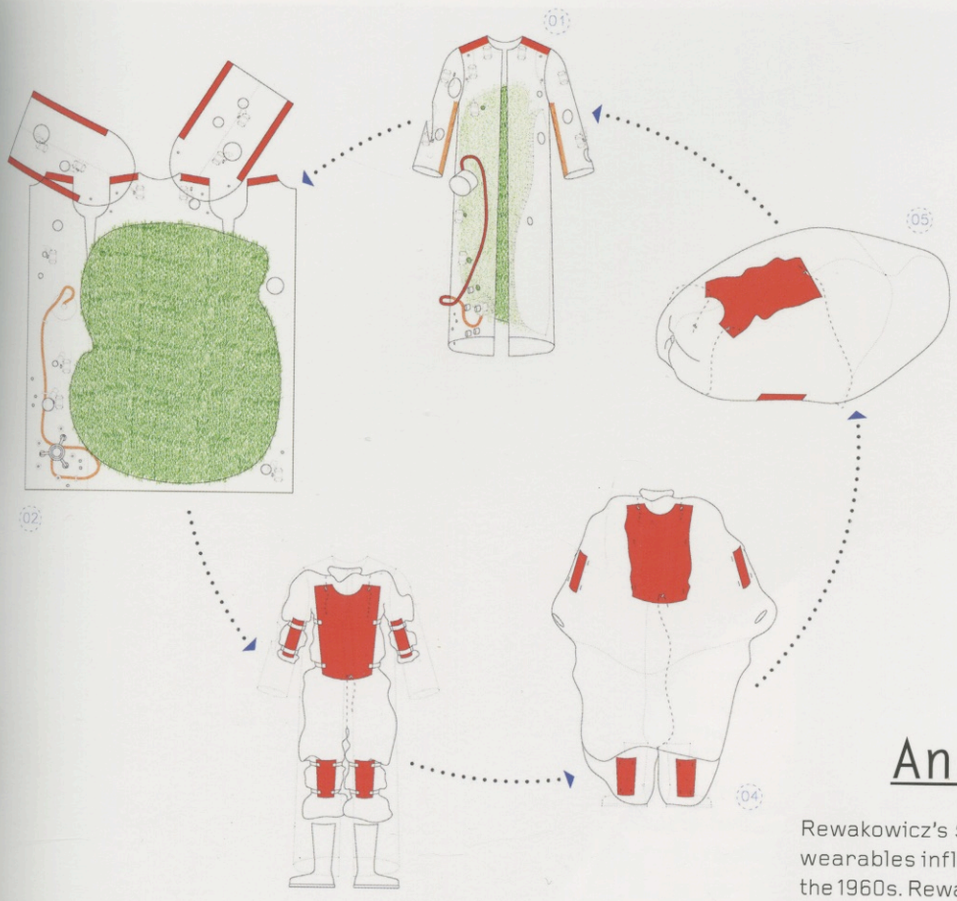
Janaina Tschäpe's transmogrification of the woman in *Juju I* is biological not technological. She is halfway between a landscape and a person, a water-born creature and a human and she is encased in a lycra integumen akin to the mucus that keeps aquatic invertebrate eggs together. *Juju I* reads as both a fairytale and a nightmare. She might be a beached sprite or a mass of multiplying cells; a playful floating creature or an exaggerated breast. The work brings to mind the iconoclastic Brazilian artist Lygia Clark's sensorial experiments using shrouds, nets and ectoplasm-like connections between bodies, and the figure of Artemis of Ephesus, a fertility goddess, whose chest bares rows and rows of ovoid shapes that have been variously identified as representations of breasts, eggs and bull testicles.

Juju I, part of the series *The Sea and The Mountain*, 2004. Cibacrome, 102x127cm. Image courtesy the artist.

Andrés Jaque

The wearer of Andrés Jaque's *Tejido Automático* is a new urban nomadic character—a service professional who provides diverse city visitors an architectural setting in which to stimulate a cultural, lingistic, or imtimate relationship. Jaque imagines the character as a hostess—a "technogeisha of the twenty-first century", one who creates space through the manipulation of her clothing. Her first transformation—the removal and unfurling of her coat—creates a tiny urban park including real grass and dirt. If and when she wishes it, she can transform her inner rip-stop garment into a small tent, inviting guests into a more intimate setting. It is at once private, and closer to her skin. Her upper torso remains on the outside, hovering just outside the temporary fabric womb.

Tejido Automático, 2003. Image courtesy the artist.

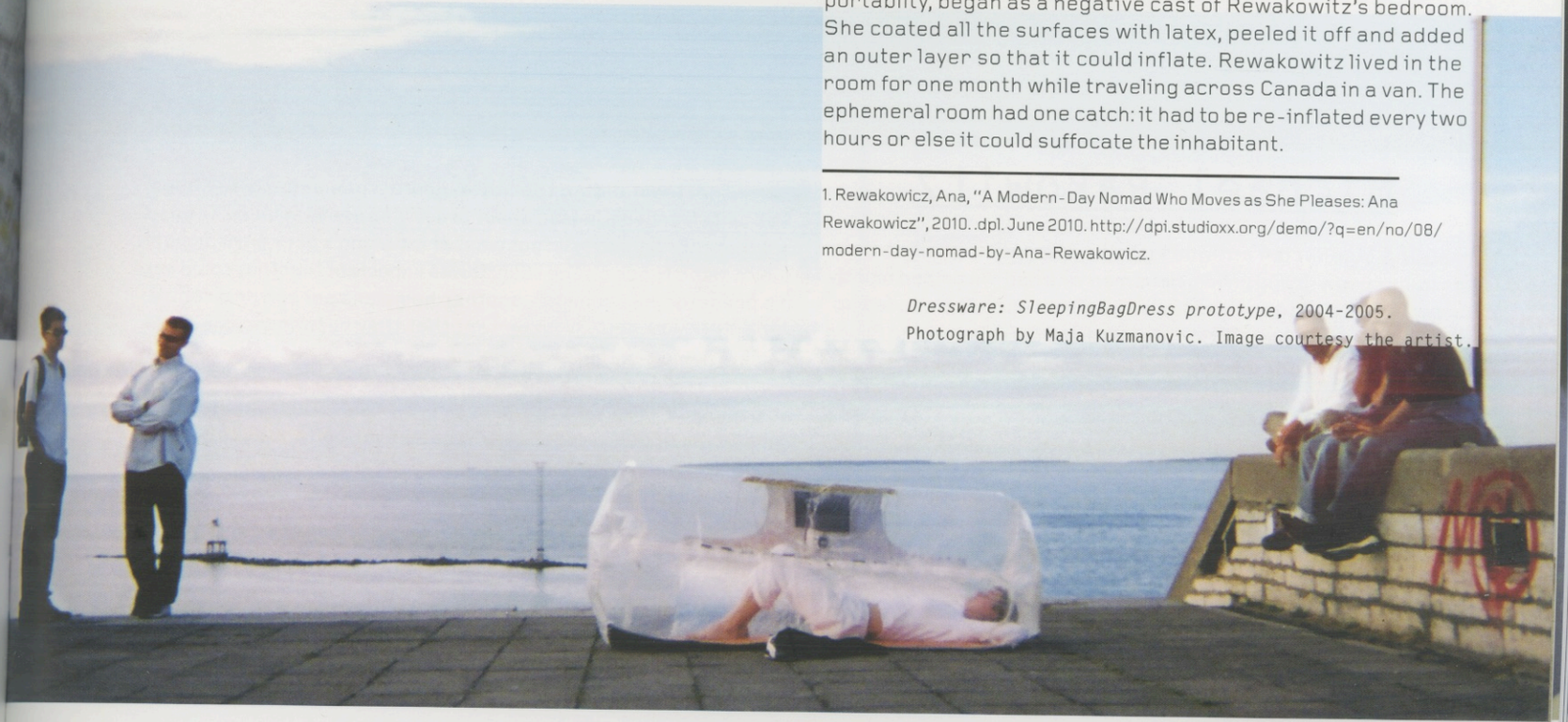


Ana Rewakowicz

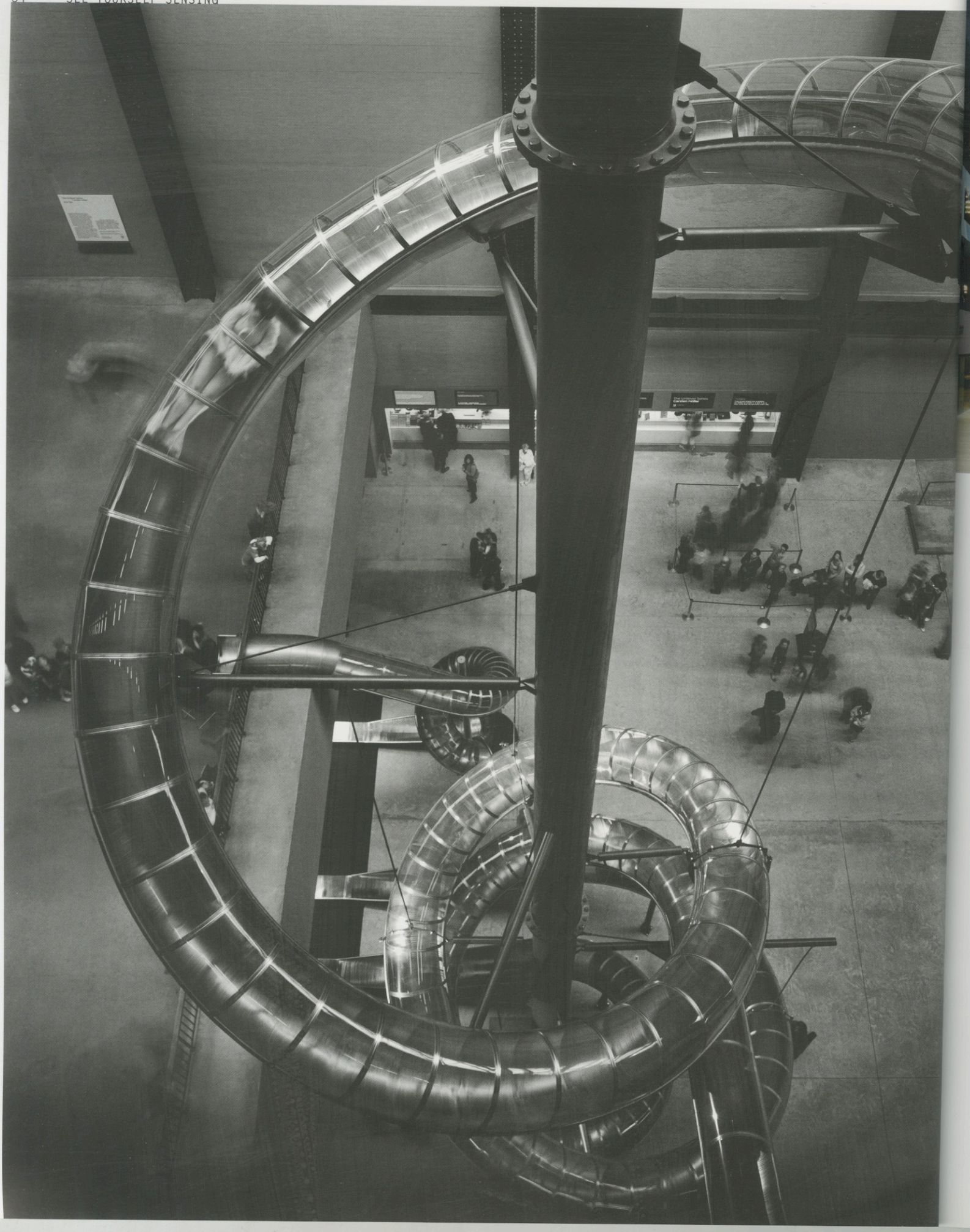
Rewakowicz's *SleepingBagDress* is part of a wave of pneumatic wearables influenced by the nomadic experimental shelters of the 1960s. Rewakowitz writes, "The ideas of identity and belonging have shifted as we move into fast growing globalisation and technological advancements. My work... denies the dream of a homeland with the result that home, being portable, is available everywhere."[1] The *SleepingBagDress* is a plastic kimono that can inflate into a cylindrical shelter for one or two. The kimono incorporates a slim mattress pad into its back, and a solar panel that is used to recharge small NiMH batteries that powers a fan.

Inside Out, another exploration into notions of home and portablity, began as a negative cast of Rewakowitz's bedroom. She coated all the surfaces with latex, peeled it off and added an outer layer so that it could inflate. Rewakowitz lived in the room for one month while traveling across Canada in a van. The ephemeral room had one catch: it had to be re-inflated every two hours or else it could suffocate the inhabitant.

1. Rewakowicz, Ana, "A Modern-Day Nomad Who Moves as She Pleases: Ana Rewakowicz", 2010. .dpl. June 2010. http://dpi.studioxx.org/demo/?q=en/no/08/modern-day-nomad-by-Ana-Rewakowicz.



Dressware: SleepingBagDress prototype, 2004-2005.
Photograph by Maja Kuzmanovic. Image courtesy the artist.



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1 + 2 *Test Site*, 2006. Installation views Unilever Series: Turbine Hall, Tate Modern, London. Image courtesy the artist.

3 *Kit For the Exploration of the Self*, 1995. Image courtesy the artist.

4 *Upside Down Glasses*, 1994-2004. Image courtesy the artist.

Ann Hamilton, *body object series #13 · toothpick suit/chair*, 1984-1993. Photograph, 11x11cm. Image courtesy Ann Hamilton Studio.

(suitably positioned) was the last time that Hamilton would face the viewer for more than a decade until her *Face to Face Series*, but it was that very moment of being inside of the piece, immobilised and vulnerable, part live/part object hybrid, an integral part of the spatial continuity, present yet removed, that began her addiction to being present in her installations, usually performing some difficult or repetitive task tied to the themes of the work.

For the next 15 years her presence in installations would be less approachable. One could go near her, but not within her cone of vision. So began a stream of works in which the body and the body's senses are restricted or forced to work over time at a job normally done by another part of the body. In *lids of unknown positions*, another graduate school installation, Hamilton included two humans with heads in extreme positions. One body was positioned on a lifeguard chair that was too big for the room. The person's head poked up into a hole cut in the ceiling. The ceiling served as an uncanny blindfold or afforded the spectator a peek into the secret space between the ceiling and the roof. The other body was flopped onto a wood table, the head buried in a mound of sand. Despite the evocation of death, Hamilton's images don't read literally. Hamilton took *lids of unknown positions* out-of-doors to Yale's Beineke Plaza, to express her solidarity for a massive ongoing anti-apartheid demonstration. Meanwhile in the gallery the spectator, the only one whose head is still viable, gets to puzzle out the meaning of another seaside ingredient: an entire wall clad with local blue/black oyster shells—including a cantilevering lawn roller in their midst—that filled the room with the smell of the harbour.

In the *body object series*, Hamilton photographed her body with a range of mundane objects replacing a key body part—a paddle, a door, a shoe. In *Untitled (body object series) #5-bushhead*, 1984–1993, Hamilton's head is replaced by a dense bush. Her hands and legs stand out for their fleshiness in this hybridised form. Though the bush is mute, silent, and un-body-like, somehow the image makes sense. The viewer is left to wonder about the implication. Should the image be taken at face value—as humourous, surreal or disturbing—or should we read into it questions about embodiment and sensation, and attempt to reason out the body's new functionality? It is almost impossible to avoid the latter. Habit prompts us to imagine embodiment in even the most vaguely recognisable human images. We cannot help but wonder about the bush head's muted senses and imagine a scenario where the body moves using touch alone.

Another reframing trend in Hamilton's work is the use of one part of the body for an extraordinary or unusual purpose, or to replace another body part. The mouth has been an ongoing site for Hamilton's art. In the *untitled (aleph)* the fourth in a series of four videos from 1993, Hamilton is filmed struggling to talk with her mouth stuffed full of smooth marbles. In *malediction* her mouth is a workhorse, helping to produce dough imprints of its negative space for an entire month. *malediction* refers to local Soho history of immigrant labour and sweatshops, exploited workers and clothing manufacturing. Her mouth imprints—teeth marks and all—are carefully piled in a casket-shaped basket until it becomes full. In the background one hears an ongoing murmur of two Walt Whitman poems—"Song of Myself" and "The Body Electric", from *Leaves of Grass*, poems that praise the body and speech, even as the artist, with her back to the gallery-goers, continues her repetitive work, her mouth otherwise engaged.

For her *Face to Face Series* Hamilton invented a pinhole camera for the mouth. She first used the device to photograph herself, aiming to take a picture of her face in that vulnerable moment where one is completely engaged, and the mouth hangs open unselfconsciously. She was also interested in a form of sensory substitution—in the idea of taking a picture at the orifice where speech emerges, thereby replacing speech with vision. What she did not realise, until the pictures were developed, was the extent to which the mouth aperture mimicked the perimeter of the eye, and how the image of herself would appear to be like the pupil with some hazy reflection in it. Not only was Hamilton seeing herself sensing, she was tasting herself sensing. She then turned the mouth camera onto friends, colleagues and landscapes. The photographs are mysterious and varied due to the changing aperture of her fleshy shutter lips and to the affects of the long exposure, which give the subjects a blurred or ghostly border.

Ann Hamilton, *body object series #17 · toothpick suit*, originally part of the installation *(suitably positioned)*, 1984-2006. Photograph, 11x11cm. Image courtesy Ann Hamilton Studio.