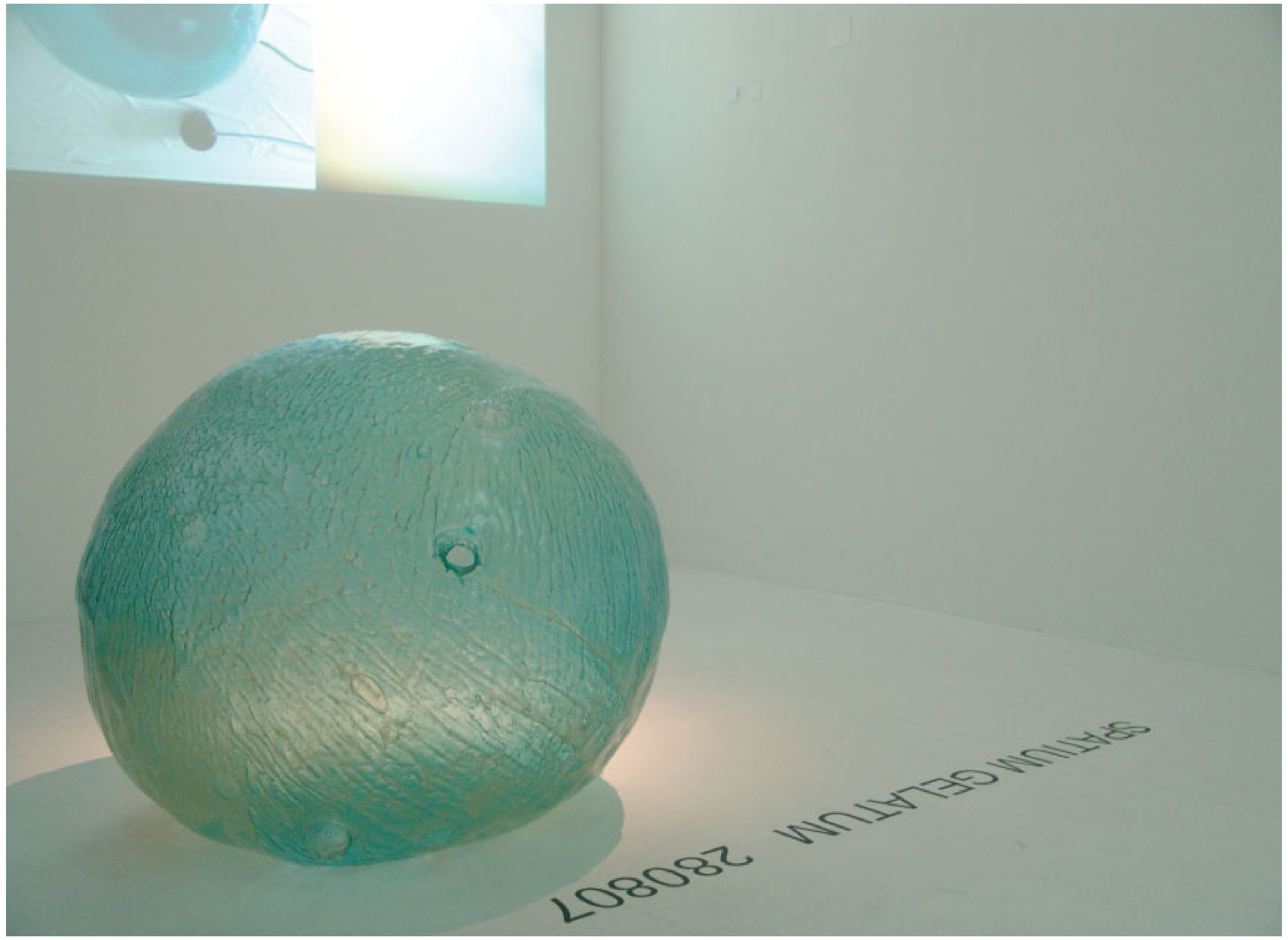


Breeding the Future

Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta. Standfirst to come. Zbigniew Oksiuta.

Zbigniew Oksiuta, Biological Habitat, Form 280807, Prix Ars Electronica, Linz, Austria, 2007
Polymer wisps on the surface of the hollow sphere emerge via self-made processes at the molecular level during the drying process and constitute the 3-D construction web of a naturally evolved filmy membrane.

Zbigniew Oksiuta, Spatium Gelatum: Form 090704, Venice Biennale, 2004
above and opposite top: Form 090704 after several spatial invaginations and deformations. Chaotic curves, deformations and invaginations of the polymer sphere are the effect of precise biological self-organisation processes combining the physical and chemical principles of order and beauty in the animated world.

From the dawn of mankind, humans have used biological matter to separate and protect themselves from their adverse environment. The construction of a spatial boundary between surroundings and interior is the basic task of architecture. Like the creation of cellular membranes in biological systems, the making of clothes or the construction of a roof over one's head are universal and primeval activities, a condition of survival, for existence and development. However, in order to build a house, or make a pair of shoes, it is necessary to cut down a tree, or to tear off the skin of an animal. Our modern industry uses increasingly fewer materials of direct biological origin. Unfortunately the costs of the new technologies are incomparably higher, and a global mega-organism – the biosphere – is the unfortunate victim.[1]

'Housing as shelter is an extension of our bodily heat-control mechanisms – a collective skin or garment.'[2] It is a natural, physiological assignment. Although in the language of civilisation we continue to talk about 'growth' and 'development', these terms 'have nothing to do with the natural processes of development. Here nothing grows, but rather materials are exploited and used to produce, build and construct dead objects. Their common feature is that they are not alive.'[3] In our minds, 'What is living is too flawed to be used in structures, whereas what is lifeless lives through the fact that it is permanent.'[4]

The transformation of man from solely a hunter and gatherer, to the introduction of agriculture 10,000 years ago, was the beginning of biotechnology. The decision to kill an animal for its meat for direct use, or to keep it alive as a tool for breeding other animals or vegetation, was a historical turning point. In modern biotechnology, plants and animals are no longer viewed nostalgically as nature, or as a source of biomass, but as extraordinary living 'tools' with the ability to breed other organisms. However, the development of biological sciences, especially genetics, will in future allow us to go a step further, to create new tools outside of natural evolution for the breeding of until now unknown organisms and biological products. The cultivation of plants and animal products for our consumption could then occur within these new semi-biological systems without victimising living orgnisms.

Though we continue to build tools, machines and houses that remain as dead objects, for the last half a century we have begun to better understand the biological processes of life: the flow of matter, energy and information. This wisdom will one day allow us to create objects, machines or architectural structures not only from dead materials such as metal, concrete or plastic, but also through growing them in biological ways. Soon we will be able to create a new 'replicator' that will open the way for a new evolution – a hybrid between nature and culture occurring at speeds previously unheard of.

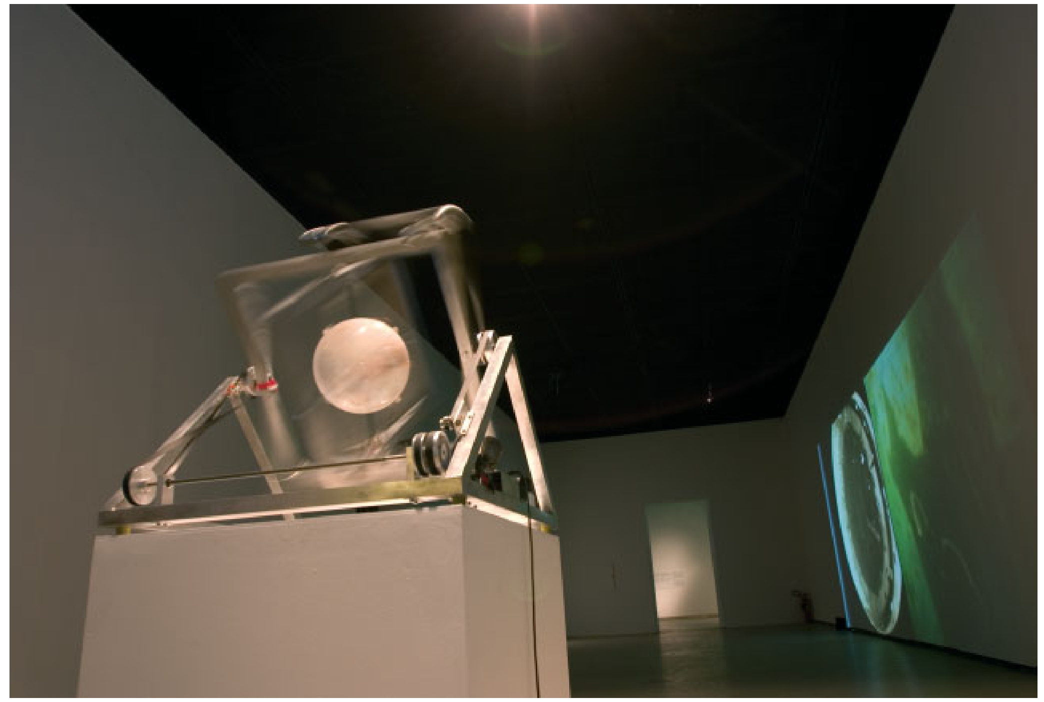
Over millions of years, using the creative potential of earthly matter, evolution has worked out methods for survival and development that greatly exceed the brief experience of mankind. These methods are based on smooth processes and are the opposite of our 'permanent' constructions. Life is a biochemical process occurring on a molecular scale. Biochemical processes can only take place in unstable matter that enables free movement and the exchange of molecules. Such matter is provided by water and semi-liquid, sticky protoplasm, and for these processes to be at all possible it is necessary to separate protoplasm from its environment. Over billions of years, evolution has developed a universal biologic membrane, a fluid partition that

Zbigniew Oksiuta, Spatium Gelatum, Form 191202, International Furniture Fair, Cologne, Germany, 2003
below: Spatium Gelatum technology studies the rules for forming liquid and congealed 3-D membranes from biological polymers. PVC balloons rotate the liquid mass in flexible, sphere-shaped forms. As the object is rolled on the surface of the water, the liquid polymer inside it is mixed. As it cools, the mass is converted into a gel state, settling on the inner surface and forming a congealed membrane.

Zbigniew Oksiuta, Breeding Space, Botanical Institute of the University of Cologne, Germany, 2006
Forming an agar layer in the 3-D bioreactor and preparation of the sphere for the growing of organisms within. The transparent agar membrane contains all of the substances necessary for a self-sustaining miniature world.

Zbigniew Oksiuta, Transgenic Habitat, Uncontrolled Biological Growth, Max Planck Institute for Plant Breeding Research, Cologne, Germany, 1990
A callus, a shapeless mass of non-differentiated and rapidly dividing cells. Recorded examples demonstrate natural genetic techniques used by microbes to disturb the natural rules of development and to cause morphological anomalies and deformations. The project studies the possibilities of using the DNA code for creating new plant objects.

Part of a sterile plant callus culture showing white embryogenic structures, pale leaves and transparent root tips. Providing uncontrolled processes with a spatial structure on the polymeric 3-D spheres and scaffolds, created using Spatium Gelatum technology, could enable the development of new plant spaces in architectural dimensions.



Zbigniew Oksiuta, The Cosmic Garden, Random Positioning Machine (in motion), Centre for Contemporary Art, Ujazdowski Castle, Warsaw, Poland, 2007
The Cosmic Garden project is a universal self-sustaining system in space, containing organisms in a transparent polymer sphere that interact and survive using solar energy. The Random Positioning Machine is a device for simulating microgravity and studying the sensitivity of organisms to the impact of gravity (geotropism). The rotating spherical bioreactor in the middle of the machine is a model of the Cosmic Garden in its weightless condition.

effectively protects the precious contents of every living cell so that these biochemical processes can take place.[5] Because they are unstable, such processes have enormous potential for development, thus their evolution can be based on coincidence, physical and chemical instincts instead of conscious decisions. The instability of living systems makes for the stability of evolution.

The work featured here acts as a crossover between architecture, art, biological and space sciences. The general aim of the research is to create the conditions for the development of a biological habitat, as a kind of 3-D bioreactor. The projects thus examine dynamic systems that transfer information and energy through liquid mediums, using biological polymers as building materials to develop liquid, jelly-like and rigid 3-D membranes at a human scale under different gravitation conditions: on earth, underwater and in space. The membranes are used as a scaffolding for the growing of plant tissues and as biological fabricators for breeding plant objects to create conditions for plant biological systems that use the energy of the sun for the breeding of semi-living objects.

In the near future, the processes of creating will be decentralised, occurring biologically and on site without the need for the global transport of materials and tools. Only information will act globally, as 'matter' will transform locally. Energy from the sun will activate information embedded in the living matter in the bioreactors to start biological self-organisation processes, which will be controlled by global information – a new kind of 'biological internet' that will encapsulate our planet. This will have unforeseen consequences for our civilisation, as it has the potential to change our social and economical structures, including our systems of producing, distributing and using energy.

This vision has nothing to do with our familiar, romantic notion of nature. Each of us will be the owner of a personal biological fabricator connected to our body that will permit us to breed the things we need. As an incubator or artificial womb, this new extension of the body might have different dimensions – the size of a cell, a pill, a fruit, a house or even a biosphere – and as the new cradle of life allow us to cultivate food, tools and new shelters. 'The Future of life may exist only inside ecological enclosures, a kind of biological miniaturized world.'[6] Such personal biological 'replicators' could be miniature biospheres. They could even be sent into space, as universal sperm, to inseminate the cosmos with life. AD

Notes

1. See Zbigniew Oksiuta, 'Forms, Processes, Consequences', Exhibitions catalogue, Arsenal Gallery, Bialystok, and Centre for Contemporary Art, Ujazdowski Castel, Warsaw, 2007.
2. Marshall McLuhan, *Understanding Media: The Extensions of Man*, Mentor Books (New York), 1964, p 117.
3. Herbert Gruhl, *Das irdische Gleichgewicht*, Deutscher Taschenbuch Verlag (Munich), 1985, p 22.
4. Ernst Bloch, *Das Prinzip Hoffnung*, Suhrkamp Verlag (Frankfurt), 1959, p 844. (The Principle of Hope, The MIT Press 1995)
5. Zbigniew Oksiuta, op cit.
6. Dorion Sagan, *Biospheres: Reproducing Planet Earth*, Bantam Books (New York), 1990, p 8.