and Profiting from Technology, Harvard Business School Press, 2003.
[4]http://wikinews.org/.
[5]See, regarding these aspects, Andrew Keen's book *The Cult of the Amateur: How Today's Internet is Killing Our Culture,* Doubleday/Currency, New York, 2007.
[6]Hans Magnus Enzensberger, "Constituents of a Theory of the Media", in John Thornton Caldwell, *Theories of the New Media,* The Athlone Press, London, 2000. p. 68.
[7]See Dan Gillmor, *We the Media: Grassroots Journalism by the People, for the People,* O'Reilly Media, 2004.
[8]According to Roberto Esposito, "if as Deleuze believes, philosophy is the practice of creating concepts appropriate to the event affecting and transforming us, this is the time to rethink the relationship between politics and life in a way that, instead of subjecting life to political leadership (which occurred over the last century quite clearly), introduces the power of life into politics." Roberto Esposito, *Biopolítica y filosofía,* Grama ediciones, Buenos Aires, 2006, p. 17.
[9]Marshall McLuhan, *Understanding Media*, McGraw-Hill, New York, 1964.
[10]Michel Foucault, *Dits et Écrits,* IV, Gallimard, Paris, 1994, p. 741.
[11]Michael Hardt - Antonio Negri, *Imperio*, Ediciones Paidós Ibérica, Barcelona, 2002, p. 43.
[12]Jean-Jacques Rousseau, *Carta a d'Alembert,* Editorial Tecnos, Madrid, 1994.
[13]Antonio Negri, "El arte y la cultura en la época del Imperio y en el tiempo de las multitudes", *Caosmosis.* [On-line], URL. Address: <http://caosmosis.acracia.net/?p=660> [Consulted on the 9th of December 2007].

NANOAESTHETICS: TRANSFIGURING CULTURAL MATTER

[Mª JESÚS BUXÓ I REY]

There is nothing new in combining science and art. Nonetheless, to explore and apply technological advances in the name of artistic innovation, and furthermore, to use their aesthetic potential to promote dialog between science and society is a novelty. At present, artistic experimentation finds inspiration in theoretical and technical know-how, it employs devices, instruments and laboratories to test, heighten and develop artistic productions and to execute installations and performances. To enter into fields such as genetic engineering, nanotechnology and robotics in search of innovative aesthetics, implies the transfiguration of materials, the renovation of techniques and new artist-audience networks, which in turn helps to bridge the gap between science, technology and society.

Within this framework, this paper focus on nanoart defined as artistic creations in the context of nanotechnology and the manner in which such productions, with the help of advanced laboratory microelectronics, aim to bring innovation into scope of aesthetic experience by recreating originally invisible landscapes. In refining public sensitivity towards techno-scientific progress, nanoart enhances knowledge accessibility and its future scenarios.

The social impact and artistic interest in nanoscience and nanotechnology emphasises the concept of invisibility, the biocompatibility of organic and inorganic materials and the interdisciplinary complexity of their theories and properties –chemistry, physics, electronics, optics, materials science, robotics and medicine among others- [1]. Most of the existing bibliography on nanoscience and nanotechnology dwells on the miniaturisation of materials and devices aimed at the manipulation of atoms and molecules in different combinations for their activation as surfaces, nanotubes and nanoparticles and placing them in very precise positions by means of assemblers. Crucial applications for industry are developed in this manner, such as

semiconductors to emit or absorb solar energy, sensors for the detection of chemical elements in the environment and mechanical stress in buildings, molecular imaging for medical diagnostic and the encapsulation of therapeutic nanobiomolecules, as well as optoelectronic networks as detection systems for infection prevention and bioterrorism.

On nanoscale, many of the properties of materials as well as their performance as instruments, their chemical and electrical reactions together with the quantum effects in their optical and magnetic behaviour, are still open for experimentation. This hinders the identification and evaluation of biomedical and biosecurity risks. So there are significant uncertainties regarding the possible toxicity risks to human health, or the suppression of immunological responses, as well as in terms of personal and insurance privacy. On the other hand, this is not a matter of future speculation, the funding and resources assigned to technological research and development in North America, Europe and Asia amounts to millions [2]. Such research and its applications are costly, involving both private and public funds. According to the editorial published in *Nature*, *Nanotechnology* (2007), the danger does not lie in nanoparticles but rather in the public's negative reactions to nanotechnology, including all the alarmist side-effects or fears that have arisen regarding other areas, such as the Human Genome Project, stem-cell research, therapeutic cloning, and at present, biomolecule chimeras.

Every setback in the transmission and transparency of such know-how tends to generate, not only mistrust, but also a lot of science fiction, among others, the fantasy of auto-replicating nanomachines or "grey goos". Fascinating, indeed, but they neither help to improve understanding nor public acceptance. Hence, the importance of nanoart, as an innovative form of expression, which by creating tension, awe and pleasure, stimulates interest and proximity to invisible matter, biocompatibility and bodily intensification.

Wikipedia defines nanoart as a new discipline of art, related to the creation of micro/nanosculptures or paintings through chemical and/or physical processes which can be visualised or controlled with powerful microscopes and electronic scanning devices. Nanoart is not to be confused with microphotography, which is performed using a high-resolution optical microscope with a photographic camera attached to it, rendering flat images at low magnification. As electrons penetrate deep inside the structures, these electrically charged particles create images with greater depth, with a more natural 3D-look than photographic images produced by photons or light particles.

From 2005 to the present day, the Web has hosted numerous international exhibits and calls for proposals in the name of nanoart. Among the participating artists and scientists, we can highlight the work of Alessandro Scali and Robin Goode who create nanosculptures and nanolithographies that are invisible to the naked eye in collaboration with the Polytechnics of Turin. Better known is Cris Orfescu's pioneering work whose biography underlines the fact that he has been working for over a decade in the field of nanotechnology as scientist and running the Caleb Technology analytic laboratory in Torrance, California. His technique consists in capturing realistic images from natural nanostructures with a high-resolution scanning electron microscope. He thereby obtains images that display electrons or negatively charged particles in black and white that are later digitally manipulated, adding colour with Photoshop, to produce a piece that satisfies his artistic sensitivity. Subsequently, the digitally scanned images are transferred onto canvas or fine art paper with especially designed long-lasting inks, producing high quality and giclée-type prints in colour. One of his creations is entitled, *In Pieces*, a microscopic image of a colloidal graphite particle frozen in liquid nitrogen,

which creates angles when cracked. The artist, creating a vision of metallised reflections in purple, yellow and blue covers these in gold. His pieces are available on the Cris Orfescu Web page: (www.crisorfescu.com)[3].

On the 6th of March 2008, the Spanish newspaper "El País" devoted an entire article to Orfescu, entitled "The Scientific Artist". In this article people was invited to participate in a second edition nanoart contest on Internet and vote for their favourite pieces out of the 121 pieces by 37 nanoartists from 13 different countries. Among the participants were renowned artists such as Antonia Denkova, David Kerr and Teresa Majerus, who work with chloride molecules and process them with Photoshop, thus producing semitransparent layers that create a universe of nanocrystals. These pieces are available on the following Web page: www.nanoart21.org.

Cris Orfescu's discourse on nanoart, as well as that of some of his colleagues in art galleries and contests, stresses that it aims to be a meditation on technological evolution, implying that it tackles the synthesis and manipulation of matter on a nanometric scale, and its impact upon our lives. He therefore considers that scientific images become works of art that can be catalogued. Simultaneously as creative, attractive and acceptable images, nanoart is an effective manner of communicating with the general public. As is quoted on his Web, he hopes that these works of art:

"*will help shed some light on the value nanotechnology offers for quality of life improvements by making "nano-things" more appealing and accessible.*"

He even compares himself with other scientist-artists:

"Other scientists working in nanoart are concerned with the science in their images more than the art. For example, some scientists provide extreme close-ups of samples for scientific journals. But I have been trying to go towards art, if you look at my work, most of the images have lost most of the scientific information."

Given that these images are striking for the public, they awaken curiosity, lead to the formulation of questions and open the door to the debate on nanoscience and nanotechnology. All of which benefits the transfer of knowledge and, ultimately, the capacity of the general public to take informed decisions regarding risks and benefits.

This approach to nanoart clearly adheres to the AST (Art-Science-Technology) guidelines. AST implies an emerging field for innovation in the knowledge economy, the so-called *creative industries*, as well as the development of democratic policies for the promotion of free knowledge -*common property*- between research bodies and the citizenry. In 2005, Spain's Science and Technology Foundation (*Fundación Española Ciencia y Tecnología*) drafted a White Paper, published in 2007, which states that the Art-Science-Technology (AST) crossover and its initiatives allow for the renewal of artistic practices, with the incorporation of new visual media and image treatment through digital technologies. Similarly, they also enable the emergence of new productions by applying laboratory devices and electronic scanners. Furthermore, the influence of these productions in the collective imaginary, distributed throughout the social fabric by means of new media mechanisms, facilitate the circulation of scientific knowledge avoiding inadequate or alarmist perceptions as well as bridging the division between science and humanities which inspires a new humanism.

Nanoart is clearly endowed with the power of innovation and this coincides with the international commitment on the AST crossover. However, having said this, it is less convincing and even quite surprising the way artists and affiliated critics try to interpret and express the piece's abstract qualities by pointing out recognisable or emerging figures such as a fallen leaf, a bird of paradise and

others. This inevitably conjures up memories of those tourist guides who in the enchanted city of Cuenca or in the mountains of Montserrat, or in any art exhibit, long to see concrete figures and to extract realistic interpretations or readings.
This can be somehow summed by Orfescu's comment when he claims that his goal is to create a parallel with the world at macro scale:

"I'm trying to make a parallel with the macro world, the one we see with the naked eye."

It is therefore far more appealing the views expressed by art historian Pilar Irala, in an introduction to a nanoart exhibit presentation in the Espacio Kubico in Madrid (2007). She defined nanoart as a new context that delves into the world of minuscule matter and aesthetics. In this sense, nanoart is the natural step that scientific progress must take in the search for beauty within itself. Irala does not develop this idea, yet we consider that it highlights the specific point where we must search. What are the specificities and potentials of nanoaesthetics?

The transfiguration of cultural matter

Remembering Bateson's definition in *Mind and Nature* (1980) "*By aesthetic, I mean responsive to the pattern which connects*", I presume that two connective dimensions of conscience and matter concur in nanoaesthetics: 1) the link between micro and macro and 2) the capacities of transformation and transfiguration between themselves. Regarding the former, we can state that the issue is as ancient as philosophy itself, conscience as a replica of the cosmos. The miniaturised replica of the universe is a recurrent theme that can be traced back to Heraclitus of Ephesus who explained that the soul is an atom or a spark of the substance of the stars. Furthermore, Democritus refers to the soul as being composed of atoms, identifying certain adjustments between the atoms with ideal states of mind. Hence, *euthymy*, the intervals in which the soul experiences harmony, as occurs in musical theory where the correct conjugation of intervals produces harmony. Throughout the Middle Ages and the Renaissance, many thinkers equated internal and external universes: numbers, spirals, frequencies and cycles intertwined with music, alchemy, chemistry and physics, and these with emotions and feelings. Taking a leap in time, Heisenberg polishes the idea by stating that the observer, the microcosm, is a part of what is being observed, the macrocosm.
Moreover, once we can establish that the internal and external universes unite within conscience, what is the connecting pattern of the aesthetic experience? Towards the end of the 19th Century, several thinkers attempted to clarify the physical bases of the aesthetic response. In his treatise on Aesthetics (1903-6), Theodor Lipps focuses on the concept of empathy, defining it as an internal imitation, that takes place in one's conscience when observing, this occurs when the spectator's capacity, his or her personality, is projected onto the object that is being contemplated. Furthermore, in *The Beautiful* (1913), Vernon Lee defines empathy as the tendency to blend the activities of the perceiving subject with the qualities of the perceived objects.
This form of behaviour as if one were putting oneself in the place of the object or person, living through their experiences and feelings, constitutes a symbolic displacement that concurs in the creation of symbols and metaphors, but it is more than this, as it produces a vital pleasure: aesthetic empathy. In this sense, Arnheim (1986) mentions that in aesthetic production neither the mind nor the body aim to imitate objects, but rather to project original forms of vitality towards the exterior, following an ideal of independence and perfection. Indeed, he suggests an isomorphism, or a correspondence, between what is neurophysiological, the electrochemical processing, and the bodily and physical metaphors that activate complex feelings and emotions comprising

physical forces of attraction and repulsion, surprise and disillusion, sublimity and repulsion. In other terms, a transformation or metamorphosis of the sensitiveness that inspires the transfiguration of cultural matter.
The history of ideas and of art reveals the relentless construction of literary and pictorial narratives that express isomorphisms and transfigurations, which, in turn, generate pleasure, enjoyment, vision, inner vision and illumination. The Lord's transfiguration on Mount Tabor demonstrates the ineffable and inaccessible vision of divinity, which is physically and humanly invisible for the disciples. A quantum transformation that is poetically expressed by a face that shines like the sun and clothing as white as the light, which overwhelms the disciples, filling them with fear and joy. Lévy-Bruhl (1978) points out that mystical experience is just as valid as sensory experience, thus explaining the ease with which transformations of human beings into animals and objects, or vice-versa, are so readily accepted and abundant in mythology and folklore. They compose a fluid world that may be incompatible with the logical conditions or laws of nature, but they enable us to question the empathic origins of pleasure. Reawakening this mysterious and fluid world that brings to light the actions of invisible and supernatural forces, distances us from rational attitudes producing tranquillity, pleasure and enjoyment.
Neuroscience adds interesting data on empathy through the discovery of mirror neurons (Rizzolatti and Craighero, 2004). Distributed in key areas of the brain (premotor cells), mirror neurons are activated when an action is carried out, but also when observing how another person or object carries out this action. This implies that the action is being mentally rehearsed, executed, or even imitated when observing dancing or smiling, for example. This form of activation extends to the understanding of other people's feelings, their intentions, their use of languages, imitating actions and understanding their meanings. Indeed, it would appear that they can be activated for therapeutic functions, redundancy and imitation may possibly bind or even substitute connections that are necessary for action: listening to songs is used for aphasia, in the same manner as the metronome's rhythm or rhythmical music is used for walking.
Our neural system and cultural expressions have gradually structured themselves to create a proportionate and scaled world. We construct this world to live in, but also to develop other imaginative skills that help us to abandon it, albeit only sporadically. When the visible cultural matter is insufficient, cognition employs other tricks, such as abstraction, metaphors, or numbers to refer to the unknown; similarly, instruments are invented that allow us to penetrate into external space and internal matter. In this case, aesthetics are related neither to unique situations or strange and rare productions, nor even to the educated world, concepts that claim that art gratifies the body and soul, or that it connects us to spiritual truths. Instead, it is guided by self-organizational theories in which isomorphisms and empathies between mind and matter establish the bases of nanoaesthetics: the experience of being something more, something new and different.
Therefore, when the social and technological reality that we have created is poor, corrupt and immoral, nano-aesthetics may contribute to stimulate moral imagination. It is on this concern that we would like to put an end to this paper. If we wish to transfer complex technoscientific knowledge through the ritual ceremonies of art and beauty, we must employ the empathic backdrop to involve humanity as a whole, together with equity and the redistribution of profits. Thus ensuring, that the fruits of knowledge, the creative commons, be truly destined for all.

Notes

[1] According to the definition of the Commission of the European Communities (12.5.2004) this is a new field for research

and development. The aim is to control the behavior and fundamental structure of matter at the molecular and atomic scale. Metric definitions are also contemplated, such as that of the National Nanotechnology Initiative, of the United States, that defines nanotechnology as the interaction of structures whose size is less than 100 nanometers. A nanometer (nm) is a billionth of a meter. A nanometer is approximately 1/80,000 of the thickness of a human hair. The average width of a human hair is of 100,000 nanometers. Objects and nanonavigators are being produced in sizes comprised within 1 and 100 nanometers. This kind of research is therefore carried out on a micrometric and sub-micrometric scale, that allows for the manipulation of matter at the level of nanometric resolution, and to direct the chemical reactions of living organisms that take place within the cells, and which are thoroughfares for components such as drugs and chemical mediators, as well as acting on bacteria and viruses.

[2] In the year 2008, the EC has awarded 403,000 million euros to study and regulate such research. The potential market projection for the year 2014 is of approximately 2 million euros.

[3] Article published: Friday, 8th of April 2005 in Pasadena Star News and Monday, 11th of April 2005 in U-daily bulletin of Los Angeles Newspaper Group.

Other articles:

"Small Wonder Nanotechnology", article published Monday, April 11, 2005 in U-daily bulletin of Los Angeles Newspaper Group.

"NANOART selected for the 2006 International Digital Exhibition", article published Thursday, February 23, 2006 in IT'S ART Magazine, France.

"Technology enables cutting-edge curating for 'Softcopy'", article published Tuesday, April 11, 2006 in The Northern Light, Anchorage, Alaska.

"Nanoart: des oeuvres d'art grâce au microscope électronique", article published on March 17, 2006 in Futura Sciences, France.

"Le NanoArt: un nouveau courant artistique?", article published on March 19, 2006 in Generation Nouvelle Technologies, France

"Nano art: Molecular-level creativity", article published on Wednesday, May 24, 2006 by Associated Press

"Arts Pionniers", article published in the September 2006 issue of Stuff magazine in France.

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Architecture in Virtual 2.0 Communities

[Alberto T. ESTÉVEZ*]

Summary

This text presents some conclusions regarding the kind of architecture that we can find in virtual communities in the Internet's parallel universe. These conclusions have been reached after much research by a large team of the ESARQ (School of Architecture at the Universitat Internacional de Catalunya), under the direction of Prof. Alberto T. Estévez. From the onset, we can highlight the enormous naïveté in architectural creation