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ECO-DESIGN DIRECTIONS: EVOLUTIONS OF THE AESTHETIC DIMENSION

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1. Towards a Lighter World

Designers, researchers and universities all over the world are nowadays committed in the search for a sustainable approach to design.
With regard to ecological impact, the building sector was initially under strict observation, but very soon the attention was turned towards the world of the objects. This world is subject to a constant evolution, and undergoes quick radical changes; it is, therefore, responsible for a huge environmental impact, both in terms of production energy and of waste and dismissal–related issues.
This brought in the latest decades the development of the new discipline of Eco-Design, seen as a combination of *product innovation* and *sustainable development*.
Eco-Design technologies, methods and experiences are spreading more and more around the world, thus proving – first of all – that there is *no single approach* to sustainability, but, rather, *numerous possible ways to follow*.
The aim of this paper is to take into consideration the diverse approaches to the issue of sustainable design, focusing in particular on some of the major problems rising from the relation of the ecological aspects with a new aesthetic sensitivity on one hand, and with social and ethical reflections on the other.
The numerous different ways that lead today to the imagination and the setting of a possible alternative world through environment-friendly design have a series of keywords in common, such as *bio-compatibility, de-materialization, flexibility, interactivity and organicity*; all these concepts provide a common code in order to provide a definition of an environment that is finally set free from the invasion of the artificial, which is on one hand undoubtedly destructive; on the other, sadly anti-aesthetic.
The specific purpose of this paper is to analyse whether and how eco-design has paved the way to a new aesthetic dimension, and which is the role played by the aesthetic factor within the different eco-design–related issues. That's why we will focus in particular on those fields of eco-design that most clearly show an aesthetic evolution.

2. In the Fields of Eco-Design

Ezio Manzini and Carlo Vezzoli recently carried out a wide explorative work on eco-design's methodologies, processes and sectors [Manzini, Vezzoli 2007]. The authors also outline the evolution of sustainability in design, identifying different levels and phases in this process, such as:

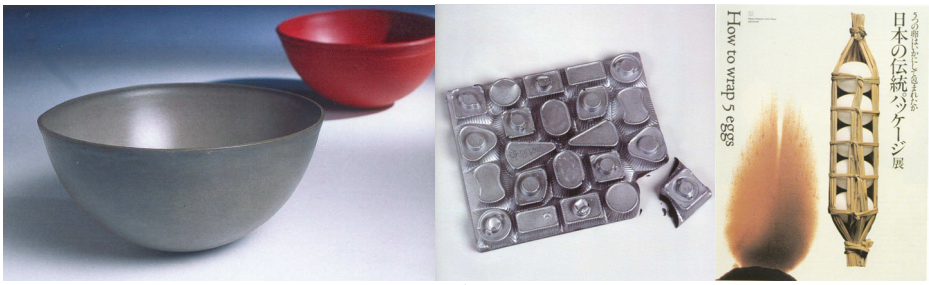
- choosing environmentally low-impact materials
- planning the life-cycle of products
- the design of eco-efficient systems

- a design respectful of social equity

Choosing environmentally low-impact resources implies a special care for materials and energy.
The major features to be considered are: non-toxicity, biodegradability, possibilities to recycle materials, the renewable character of the energy sources.
The "Design for Recycling" and the "Design for Disassembling" represent new disciplines aiming at taking into consideration the different implications of materials even after they are dismissed.
In the second half of the Nineties, the above-mentioned studies refined their own methodologies, getting to consider the object, the product in its whole *life cycle*, studying its impact in the different phases.
Nowadays, LCA (Life Cycle Assessment) methodologies consist in extremely sophisticated tools which are diverse according to the different product categories.
LCA did not begin in the field of design, but nowadays, using LCA's analyzing tools, it has been possible to identify more and more precisely a new sector which is typical of the design project, called "LCD", Life Cycle Design, or more simply "Eco-Design".
Considering wider systems, we might speak of *design of eco-efficient systems*, as a broadened point of view with respect to Life Cycle Design; in such a perspective, both the analysis and the project contemplate a system considering it not only as a simple product, but rather as an integrated ensemble of products and services.
Since the year 2000, the combination of eco-design and strategic design has been more and more often detected; the result of this fusion is a new integrated vision called *strategic design approach to sustainability*.
The notion of eco-industrial park is a good example of this approach, where different agents of the production process coordinate, thus giving rise to a sort of industrial symbiosis, sharing their resources and services, with the aim of rationalizing and broadening eco-efficiency to a wide system.
Finally, the field of the *social equity–friendly design*, which means social and ethical innovation within a sustainable development process, involves and implies the designers' responsibility in extremely wide-ranging matters, such as:

- equity principles in the resource availability;
- actions taken at an international level and international regulations for a sustainable development;
- promotion of fair economy mechanisms;
- the role of communication and promotion in new lifestyles;
- the respect for local identities and cultures.

Within such a frame, therefore, it's extremely important that design fields its own strategies in order to find its best placement, being able to develop new work visions and to provide new regulation answers.



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a) a 100% biodegradable new material, "zelfo", made from cellulose derived from wood, hemp, bamboo, jute, without additives. The material is warm and presents an attractive patina; it can be used to make all types of objects normally made from conventional wood b) design strategies to reduce the impact of the packaging systems: a Martì Guixé project of an edible packaging, presented in Foodwork. La Sala Vinçon, Barcelona 2001; c) traditional japanese packaging system: how to wrap eggs using only a natural material, the straw.

Figure 1. Eco-design: traditional and innovative materials

3. Technology/Eco-Design/Aesthetics

Eco-Design enjoys nowadays the fundamental support offered by technological evolution, namely: the research on innovative materials; the research on energy efficiency in buildings and products; the opportunities offered by Information Technology (IT).
Carrying out a reflection on the relations between technology, aesthetics and sustainability in the field of design implies, therefore, focusing on a series of aspects of technological evolution which nowadays exert a considerable influence on the project. These aspects may be summarized as follows:

3.1 Eco-Design and Materials

Research on materials represents an extremely interesting sector for eco-design.
Today, we observe on one hand the reappraisal of natural raw materials, on the other the use of highly innovative materials.
The global diffusion of cold, dull, neutral, (so-called) rational products, has been the outcome and the expression of the Modern Movement's thrust towards making codified quality accessible to everyone. With the transition to post-industrial age, therefore, the ideal of precise, clean, "scientific" objects has faded, whereas soft, ambiguous, wet, diaphanous, and even "dirty" materials – with their accompanying characteristics of auto-regeneration and auto-organization – have come to the fore.
Starting just from this cultural evolution, then, the eco-design reconsiders its relation with materials boosting the aesthetic value of Nature, making use of materials and phenomena taken at their primary state, such as, for instance, the earth, the green, the humid, the burned
Innovative materials providing environment-friendly performances represent nowadays an extremely wide research field. Recyclable materials, biodegradable products, solution that uses the least amount of materials, materials that contribute to reduce the greenhouse effect, alternative plastic materials, are the most important contemporary research directions [Ritter 2007].

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a) Kengo Kuma, Building Z58, Shanghai. The project transforms and converts an old watch factory on three levels. Kuma's architectural strategy is condensed into three main dividing structures: the plant wall, the blade of water and the glass "box".The plant wall is a linear sequence of steel boxes with a mirror finish containing tiny plants.The reflections of their surroundings reveal the plants' natural movement; b) from natural to artificial processes: an example of matter exchanging smart material, hydroabsorber foils; c) "Terra", the grass armchair designed by Nucleo Design: a series of die-cut-cardboard panels that slot together to form a skeleton; the disposable materials act as a series of cells into which soil and grass seeds are added creating a grass chair.

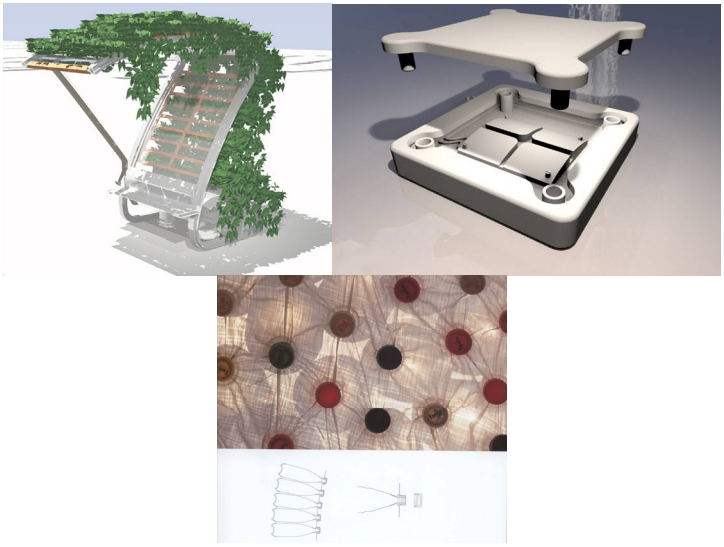
Figure 2. Green as material

3.2 Bioclimatic Design and Energy Design

Arising as a new discipline around the Seventies, bioclimatics has acquired today a broad and solid development both in technological and aesthetic terms, and often even a full integration in the architecture.
Watching recent works such as Renzo Piano's California Research Centre is enough to realize how high-quality architecture has been assuming eco-sustainability as one of its basic parameters.

If we observe some bioclimatic technological details, we will discover that the aspects of sustainability, of technological innovation, of the research on materials are fused together with a higher aesthetic quality.
The new building skins are actually able to assure energy efficiency on one hand, and on the other, when observed through the magnifying glass of design, they reveal an extreme care to details.
Sun shadow devices, smart windows, steerable Louvres, innovative solutions for photovoltaic and thermal solar energy: in all these elements we find that design is present with more and more sophisticated tools.
Energy design, on the contrary, is a younger research sector, specifically related to products which are designed according to a vision of a rational use of energy.
Energy design develops products which are based either on energy optimization principles, or on the use of alternative and renewable energies, getting – in some cases – to recover pre-industrial technologies.
Energy design also includes themes such as:

- local energy production by means of innovative technologies (photovoltaic and wind energy);
- innovation opportunities – through design – deriving from domestic energy production and use;
- the re-designing of already existing energy-related technological elements, in order to achieve a more harmonious insertion into natural environment (for instance, electricity pylons or sails of windmills).



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a) a green shading system, based on the principles of the "design for disassemblyng": the different material (aluminium and woood) can be easily separated; the project includes a storage and reuse system of rain waters; b) energy producing tile: the tile is based on a piezoelectric system, converting the mechanical energy of the steps in electrical power; c) M. Johl, R. Joswiak; C. Ruppel, space for the summer, translucent bioclimatic envelope, based on the reuse of plastic bottles. (Projects a-b have been developed at the Industrial Design Degree Course, IIth University of Neaples. prof. F. La Rocca, students N. Cimino; L. Iovino, A. Abate)

Figure 3. Bioclimatic and energy design

3.3 Design and Information Technology (IT)

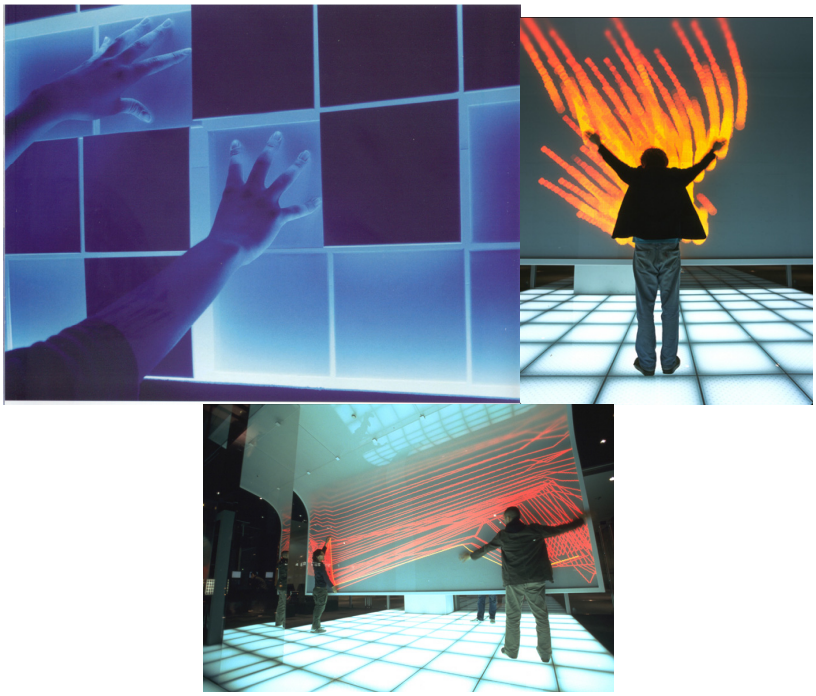
Generally speaking I.T. has illuminated a very important route towards sustainability for us-that of an *extension of the conscience.* This is based upon the possibility of *understanding* and controlling the environment in a better way, given that our capability of elaborating and managing information has

increased greatly. The efficacy of human intervention has increased in an exponential manner through the development of I.T. and data transmission, without necessitating large movements of materials or energy consumption. This extension of the conscience perspective appears to grant forms of control which are more sophisticated and less invasive upon nature. Michel Serres considers *the search for a power over our powers, of a gentle command over our tough commands* as a distinctive sign of our times.

Interaction design is a field of research in which electronic technology and data transmission combine their forces to achieve sophisticated aesthetic qualities from the point of view of visual experimentation. These qualities are lightness, evanescence, and variability- they make design something more than a performance, an experience made up of information and image fluxes, the creation of a 4 dimensional space rather than a defined object.

With the intent of promoting new social relations cultures, Tobi Schneider of the Stockholm Interactive Institute is in the process of putting together sensitive materials and telecommunication technologies within the sphere of ancient and modern influences.

In general the integration of temporal networks and electronic connection cannot offer themselves in any way whatsoever as a sufficient and alternative surrogate to a situational entrenchment or to relationships to objects. A dual level of the plan may keep track of virtual relationships and of environmentally directed ones. Why don't we introduce information into places, connect information to a place and perceive it as if we were to actually find it there, wonders Jim Spoher . Information may be bound into its geographical and true material context, *superimposed onto the real world like a veil*, determining more than a virtual reality, an *enhanced reality.* This perspective opens up some very interesting byways for new design aesthetics [Rheingold, 2003].



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a) Rogier Sterk, "tiled light wall", an interactive system consisting of ceramic tiles and fluorescent lighting; b) Klein&Dytham and Toshio Iwai, ICE, interactive installation at the Bloomberg headquarters of Tokyo. The wall is constantly processing virtual information and physical information about human presence and converting the input it receives from the large number of electronic sensors behind the screen.

Figure 4. Interaction design

The plan thought up by Spoher, *WorldBoard*, was conceived in order to *blend the virtual world with that physical one* on a planetary scale and as an integral part of everyday life. Picture, if you will, entering an airport and seeing a virtual red carpet which leads you to the departure gate; imagine seeing it from the ground, seeing the transmission wires and sunken cables, moving along the pathways of nature seeing virtual signals side by side with plants and rocks. Imagine finding yourself face to face with "bytes" that are at last tangible.
German architect Tobi Schneidler, with his team at the Smart Studio of the Interactive Institute in Stockholm, Sweden, fuses digital media and physical space. He sees interactive media and network technologies as key ingredients in a new sustainable design, thinking about connected, real-world spaces. Schneidler integrates interactive media and network technologies within spatial environment and specifically in furniture and objects of the house. In this case information technology is not merely hardware and software, but an essential tool that can create "mediating device for a social statement" says Schneidler [Bullivant, 2005].
The project of the "OLPC computer" hopes to bring the change in opportunities and education that are needed by many children in every country of the world. The OLPC Association focuses on designing, manufacturing, and distributing laptops to children in lesser developed countries. Notable characteristics of the OLPC computer include a battery that easily lasts 10 hours, alternative power sources such as solar panels and string-pull generators.
I.T. and electronic micro-technologies therefore represent a borderline sector, in which the contribution of design is fundamental, right down to the aim of conceiving and elaborating new systems of objects, new communication, ethic and aesthetics frontiers .

4. Eco-design and emergent changes in aesthetic concepts

In which way has the necessity for an ecological turnaround determined a change in the aesthetic dimension? We can single out some directions in which this has taken place:
- *More ethics, less aesthetics*
An established slogan in several events connected to design, m*ore ethics, less aesthetics* doesn't only express an evaluation of the aesthetic dimension, but one also of the centrality of ecological efficiency with respect to formal considerations. This approach can be witnessed above all in the incipient phases of eco-design and can be explained under different guises. First of all, the theme that sustainability is a stringent necessity for the plan and the ecological liabilities can be therefore assimilated by other necessary essential functions.
In second place, as has already happened for ecological and bioclimatic architecture, eco-design products are slowly taking on a more sophisticated aesthetic appearance with respect to the initial experimental forms.
- *Sustainable /ethic/aesthetic identification*
The tendency to acknowledge the social and ethic value of ecological design often causes us as a result to more readily accept the aesthetics. Products which would never have been offered formerly for aesthetic discernment are not only accepted today for the above mentioned considerations, but they themselves are starting to bring about a change in the self same aesthetic concepts. We can for example unconsciously perceive certain products of eco-design as a distant hark back to pop art; others, above all those based on the reuse strategy ,lead us to appreciate the product as a sort of collage or of to-go art. In this way sustainability inevitably brings about a change in our aesthetic parameters.
We can therefore come to an initial conclusion. Understanding design from the internal part of an image which automatically proposes correlations among sustainability, ethics and aesthetics is dangerous because it is limiting and most definitely the beginning of a misunderstanding. A vision of this type in which technical, economic and aesthetic efficiency are intrinsically connected in objects which would take us back , back towards a totalizing paradigm as were for certain aspects those of an extreme rationalism .
New ecological-industrial aesthetics may be born only out of a critical approach which stresses the distance which however exists between nature and strictly human values. Only the conscience of this distance is that which, amongst other things, has historically allowed nature to have a profound aesthetic value.

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a) Tobi Schneidler and Smart Studio: RemoteHome, Science Museum, London, and Raumlabor, Berlin, May 2003. The RemotHome is an apartment that exists in two countries at the same time. The two spaces in London and Berlin were designed with matching elements, to relay tactile, evocative communication between the two via furniture and wall surface. It responds to changing cultures of living: Schneidler is exploring how IT will inform new cultures of dwelling as well as social relationship, and thereby the design of architecture to come.
b) a prototype of the OLPC computer: the computer developed by the *One Laptop per Child* a non.profit association which has employed information and communication technologies to design a unique machine with features created specifically for children of the emerging world. This includes developing both hardware and software to suit special needs of the sustainable project like low-power consumption.

Figure 5. I.T., sustainability and social innovation

4.1 Misunderstandings of eco-efficiency

In the '80s, eco-efficiency became an operative principal which was assimilated by industries, blending it in with technical and economic efficiency. From a simple "commitment" for an industry, the environmental question was gradually considered as an opportunity to rationalize productive systems, and also as a chance to obtain a competitive advantage for extending itself into the market of "green" products. The reduction of environmental impact for units of produced goods is a principal and it induces industries into an economic position of management of raw materials and of transformation processes.

Insomuch as it is fundamental today, the same concept of eco-efficiency runs the risk of going along with the paradoxical directions of that project unless it is subject to a continual critical value. Flooding the world with thousands of objects and committing itself to plan them so that they reintegrate into the environment is, for example, something tantamount to an fervently worded advert for a type of food with low calorific value, aimed at a bulimia sufferer. This is a situation which borders on the grotesque.

The society of growth has been defined as one dominated by an economy based on the principal of a productivity race, allowing itself to be swept away by this race. In Serge Latouche's opinion, this economy dominion which reigns over all other lifestyles including our own mindsets is long due for an overhaul. Associating an improvement in our way of life to growth, we are overlooking an important element-just how many "free" assets such as water, air, livable cities, green spaces and sunshine must be substituted in order to have these mercantile assets?

In order to reconcile the two contradictory imperatives included in productivity growth and respect for the environment, experts think they have found the *magic potion* in eco-efficiency- a crucial concept

which doubtlessly singles out a pressing necessity. However, if ecological efficiency has improved, the mad race towards growth continues and is accompanied by the progressive degradation of the planet. If on one hand the environmental impact per each unit of a produced asset has fallen, then this statistic is systematically cancelled out by the increase in productivity, with a type of "rebound effect" to boot. The new, more "immaterial" economy then also tends to round out rather than substitute the traditional economy [Latouche 2003].
However, another point should be emphasized regarding the relationship between industrial culture and planning: however little an ecological product may tell us about design contents, it is a virtuously eco-technical work of inescapable necessity which doesn't go farther than this. As Hugo Haering has warned us, the technical product (those which are the main informers) *does not express itself upon the form*. Ecology comes into the design of the artificial with the objective of adjusting its interference upon the natural sphere. However, the first role of design is that of expressing values of a cultural nature, *others* therefore with respect to the simple survival of nature and so in some way *external* to the evaluation of eco-efficiency [La Rocca 2006].
In the Von Gerkan's *Pavilion of Christ* architects von Gerkan and Zais achieved the improbable: the creation of a sacred spiritual space by means of a modular prefab design and the use of various basic natural materials and waste objects. The surrounding "cloister" is indeed equipped with a double glass facade, used as large-scale showcases. In building Christ Pavilion lamps, tea strainers, audio tapes, tooth brushes, thermometers – those objects fill the central space between two panes of glass. These are small obsolete technical objects which rather than disappear as trash in a rapid consumer cycle, redeem their standing as non-objects. Repeated and multiplied as cast-offs of daily use, they carry the project to the shelter of an icy-cold world of a presumed ecological optimization thanks to their existential value. It is often claimed that divinity can be found in even the simplest and most ordinary objects of everyday life: in this case the combination of light, nature and wastes is the key ingredient of an ethic-aesthetic experiment.
Eco-design is therefore a continual research and critical state of mind and not an environmentalism offshoot product. Also it does not form part of business culture which interprets eco-efficiency as a homologating password whose singular formal consideration does not place itself under the absoluteness of *total quality.*

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a) Von Gerkan's Pavilion of Christ, internal view of the double envelope; b) the space between the glasses, filled with materials of various origins: from nature with coal, rush, bamboo, wood strips, feathers etc; from technology with toothed wheels, tea-strainers, hoses, lighters, lamps, one-way syringes. Depending on the filling the walls are more or less translucent, partially also transparent; consequently the light atmosphere is modified and varies dramatically along the cloister.

Figure 6. Reuse, ethic and aesthetic values

4.2 Non-place and non-thing

However, it is impossible to deny that there is a tendency to create an inextricable connexion between sustainability, ethics and aesthetics taken that imagining a detail of the environment and places in the modern phase effectively presupposes the consideration of all of these three dimensions.

But can sustainable design be a decisive instrument for reaching this quality? I believe that it can if we cross reference it to a series of presuppositions. First of all, design has historically always sought after in the internal areas of industrial logic, for a solution for building a world of objects which might exceed that "technical chill" attributed to mechanised production.
"At first nearly everything gives us an empty gaze" writes in 1909 Ernst Bloch accusing industrial production of having bestowed coldness into the human environment, from the smallest step right up to the city. "How could it be anything else and where would a living, well-made usable object come from when there is no-one left who knows what long-lasting living might be or who is capable of making one's own house robust and warm?" Industrial production has made objects inanimate such as houses and the city: the very sense of living has been lost in the name of the "washable nature" of the world.
In order to define the anonymity of the modern landscape, Marc Augé speaks of *non-places*. Presumably however, non-places are made up of non-objects as well as displaying a lack of nature and landscapes. Gilbert Simondon speaks about these objects as not having the right to exist in a world of meaning, objects such as technical ones. For Vilèm Flusser modern objects are increasingly taking on the status of non-things: the mountain of useless frippery which is produced does not deny but actually confirms in no uncertain terms the death of objects. According to Flusser, that which is happening in our society and economy is that we are injecting information into automatic machines in such a way that they spit out rubbish in enormous quantities at a ridiculously low price [Flusser 2003].

4.3 New identity of the things

Tackled this way, putting together the face of meaning of places and things in productive ways and above all the unbearable mass of objects which are submerging our world, the issue forces us to formulate a question that effectively involves the ethic, social and aesthetic sphere as a single entity. Therefore, if the problem isn't put forward in global terms, *the ecological object runs the risk of finishing up with a much emptier look than ever before.* On the other hand, the most interesting and innovative results of modern design never fade away into a mere ecological virtuosity, even when respecting environmental issues to the utmost.
However, only when proposed in such a sense does the issue invest the person operating in the field of design not only generically, but also specifically. Only in such a sense can the person responsible for design today be called upon to answer a precise question: *is eco-design capable of producing things, pushing aside the mad, chaotic production of non-things?* This is certainly the most ambitious challenge in the union of design, ethics and aesthetics.
Only by starting off from a deep-reaching clarification in such a sense, from that self-same conscience of its own properties, can design realistically put itself on the road towards that which up to yet has been largely insufficient- namely, *a great project energy for change.* A design culture which is not only ready with increasingly sophisticated instruments to get to the heart of the matter, but one which is also in a position to *change the change*.

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