

factor<sup>y</sup>

Magazine for a sustainable economy



Topic

# TRANS-FORM

The Disappearance of Products Historically Effective: How Innovation and Technology  
Have a Transformative Impact Voluntarily, but Only Under Pressure Obligated  
to Ensure Sustainability ... but How? The Transformative Power of Science How  
Change Will Be Achieved – Transformative Design for Sustainability  
Under the Skin and into the Brain With System Leaps towards a Resource-  
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Ideas

# Change through Trans-form

There are fantastic ways to play with the factory title Trans-form. It is almost as if we were playing with the convertible action figures called Transformers. They have made it into video games and films. Transformation is part of some documentaries and dystopias. Even though the need for social change is almost an integral aspect of general knowledge nowadays, we are not capable of changing our production and consumption in a way that emissions, the use of raw materials and nature loss are reduced. This is the case despite the fact that worldwide efficiency, the number of innovations and productivity are continuously increasing. There are intelligent approaches and examples for the ecological design of products, for resource-efficient products that require less material and energy, both in their production and application. And there are also transformative and transformational products whose characteristics should bring about change towards more sustainability. However, the rebound effects, i.e. the compensation of improvements in efficiency through increased consumption, are evident. How change could nevertheless be achieved is the topic of this factory issue entitled: Trans-form. ►



Trend researcher Peter Wippermann, technology assessor Ortwin Renn and transformation designer Harald Welzer have different approaches to the interesting possibility of letting products disappear. Bert Beyers's retrospective piece demonstrates that technological development transforms societies and the way we consume. Philosopher Bernd Draser examines which boundary conditions we can choose from if we want social transformation towards sustainability. The President of the Wuppertal Institute, Uwe Schneidewind, demands an increased application of transformative science. Eco-designer Ursula Tischner shows that the transformative design of products and user behaviour can play a part in making change happen. In an interview, the neuro-economist Peter Kenning talks about the biological conditions for our consumption patterns. The futurologists Klaus Burmeister, Holger Glockner and Maria Schnurr investigate how we can achieve a resource-saving lifestyle through system leaps. Marc Hassenzahl, psychologist, and Matthias Laschke, designer, are convinced that transformational products can bring about a resource-friendly lifestyle. Finally, media artist Claudius Lazzeroni from the workshop of good ideas explains by what means transformative and transformational products can be developed.

The large number of contributions has already transformed this issue of factory. It is more comprehensive than we had planned. So we hope that you will also succeed in achieving change.

Ralf Bindel

Translated from the German by Larissa Burkart, Mareike Baudewig, Violette Beutemann, Sina Brauch, Kerstin Haep, Yvette Gossel and Catherine Zamniack





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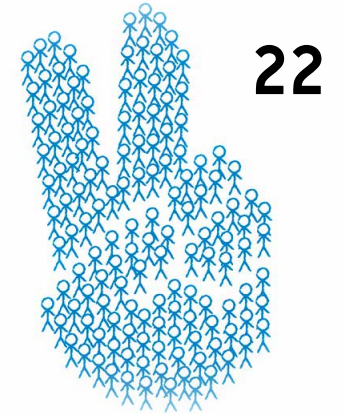


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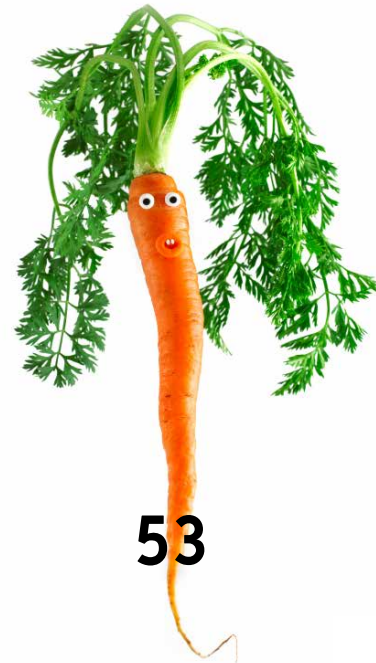
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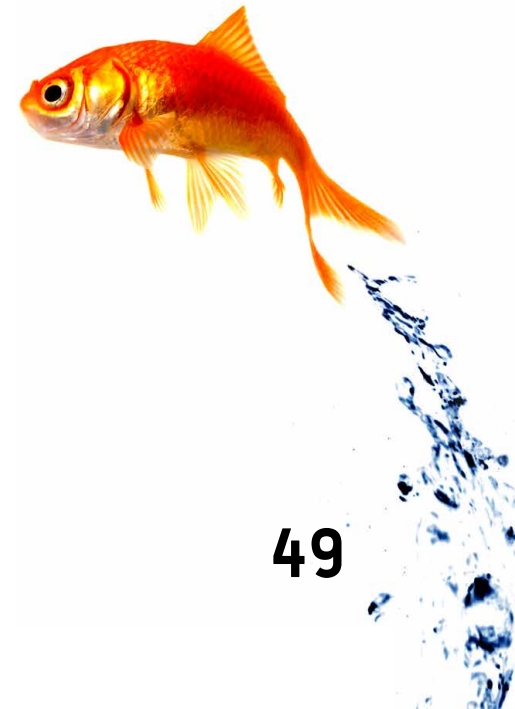
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»Before you change the world,  
it might be more important  
to not destroy it.«

Paul Claudel (\*1868, † 1955), French writer, poet and diplomat

# 11

In Germany, every person emits on average 11 tons of carbon dioxide per year. This is about three times as much as the global average of 3.8 tons, plus CO<sub>2</sub> emissions for goods produced in China and elsewhere. Thus, the annual per-capita emissions amount to 15 tons in Germany, 18 tons in Switzerland and 14 tons in Austria. If climate change is to remain manageable, we need to reduce emissions to 2.7 tons per-capita on a global scale by 2050. (Hertwich/Peters, Carbon Footprint of Nations, Environmental Science & Technology, 2009)

# 15

Provided we do not want to consume more resources than can regrow on our planet, the highest possible material consumption per person and day should not be higher than 15 kilogrammes. In reality, however, the consumption amounts to 39 kilogrammes. In Europe, it is nearly 55 kg, in North America it is 102 kg, in Asia it is 15 kg and in Africa it is 11 kg. (2004). ([www.materialflows.net](http://www.materialflows.net))

# 1,500,000,000

Every fifth person on the planet (1.5 bn) has no access to electricity. Every third person (around 2.7bn) cooks and heats with wood or dung in particular in rural areas. (Peter Hauff, Ökostrom über alles? E+Z, Vol. 52, 2011)

# 50,000,000,000

By the year 2005, over 50 bn tonnes of raw materials worldwide had been extracted, harvested and used. In addition, another 40 bn tonnes have been used up solely in the process of exploitation, without winding up in production. Overall, human consumption leads to the movement of 90 bn tonnes a year. Global raw material consumption will have doubled by 2030. ([www.seri.at](http://www.seri.at))

# 1975

People have always used raw materials. Since the mid-1970s, we have exceeded a critical limit: human consumption of natural resources continuously exceeds the reproductive capacity of the earth. More CO<sub>2</sub> is emitted than can be absorbed. ([www.footprintnetwork.org](http://www.footprintnetwork.org))

# 1,5

The value of resources consumed by the world's population has doubled since 1961 and currently amounts to 1.5 times that of the entire global production. If everyone lived like the Germans, 2.6 planets would be necessary. ([www.wwf.org](http://www.wwf.org))

# 30

According to Friedrich Schmidt Bleek, the inventor of the ecological rucksack and the MIPS concept, 30 kilogrammes of natural resources are used for the production of every kilogramme of industrial products. This means that less than ten per cent of the natural materials being moved are actually converted into useful products. ([www.nachhaltigkeit.info](http://www.nachhaltigkeit.info))

# 1,200

The classic VW Beetle from 1955 and the VW Beetle from 2005 consume almost the same amount of fuel, namely 7.5 and 7.1 litres per 100 km. The old Beetle, weighing 730 kg and powered by 30 hp had a top speed of 110 km/h. The new Beetle with a weight of 1,200 kg uses the same amount of fuel to produce 75 hp and can reach 160 km/h. ([www.wupperinst.org](http://www.wupperinst.org))

# 13

The introduction of more efficient heating systems and improved insulation resulted in a drop in heat requirements of nine per cent per square metre of living space between 1995 and 2005. The entire heating energy consumption of private households, however, rose in the same period by 2.8% as the above-mentioned saving success was offset by a 13% increase in demand for living space. ([www.wupperinst.org](http://www.wupperinst.org))

# 1,6

An empirical survey carried out in Japan showed that following a purchase of a subjectively more ecological car (e.g. with a hybrid engine), the drivers actually drove 1.6 times more kilometres than they did before with their conventional car. ([www.wupperinst.org](http://www.wupperinst.org))

# 2030

The expected power supply necessary to run the Internet in 2030 equals the current amount of electricity used by the entire world population today, says a study undertaken by the Technical University of Dresden. The current amount of CO<sub>2</sub> produced by the Internet is already equivalent to the amount produced by all air traffic, says the Institute for Applied Ecology based in Freiburg in Breisgau. All data centres together consume around 1.5 to 2 per cent of the power produced worldwide. (Ulrich Clauß, Wie das Internet zum Klimakiller wird, Die Welt, 2011)

# 10

A worldwide radical dematerialisation is required in order to achieve a sustainable material consumption allowing the ecosphere to recover over the long-term. The factor by which the resources used in advanced industrialised countries has to be reduced is at least ten. ([www.factor10-institute.org](http://www.factor10-institute.org))



»I cannot say whether things will get better if we change; what I can say is that they must change if they are to get better.«

Georg Christoph Lichtenberg (\* 1742, † 1799), mathematician and the first German professor of experimental physics.

# The Disappearance of Products

Worldwide, we use too much material and energy for our increasingly resource-consuming lifestyles. A transformation to increase sustainability via transformative products is no longer an option, but a necessity. However, there are different opinions concerning the design and effect of these products. We asked a panel of three experts for their opinion: Peter Wippermann, trend researcher, Ortwin Renn, technology assessor, and Harald Welzer, transformation designer.

By Ralf Bindel

Translated from the German by Inga Festersen

## Relationships instead of Products

In the eyes of the futurologist Peter Wippermann the smart phone is one of the transformative elements in modern society. In an interview with factory, he states that sometime soon, the smart phone will serve as the remote control for our daily life, spurred on by technological networking. In his opinion, the modern mobile phone computers are part of the overall cultural understanding and they lead to changes in resource consumption. Energy will become extremely important, he continues, but instead of the oil industry, the electronic industry will predominate.

However, transformative products play only a minor role for Wippermann. He finds it more interesting to abandon the classical idea of a product, and in fact to make it disappear. The smart phone is nothing but a device, the remote control is the display. For the trend researcher, the actual transformative product is the network. Relationships are the new big issue that will also lead to more sustainability. Wippermann ex-

plains that already today and especially in the future, everything, whether on a personal level or on a larger economic scale, is and will be about relationships. Even during the transformation process to a sustainable society, relationships play a more important role than products; the new buzzword is: the share economy.

Relationships would work everywhere where networks exist, not only in industrialised countries. He points out that no country in the world does without networks. Basically, they are the realities where transformation takes place. He is convinced that today's society is greatly influenced by networks and no longer by products, as was the case in industrial cultures.

However, networking not only restructures the energy market, it also decentralises energy production instead of centralising it, as well as linking sources and consumers via a smart grid. Wippermann sums up by saying that crowds are treated like data packets on the Internet.

He thinks that networking is the actual transformation and the crucial

step. The control and use of data, either for products in the industry 4.0, for car sharing or for the participation of the consumer as a prosumer, have had the greatest transformational effect.

The fact that the prosumer emancipates himself from the classical production and becomes more autonomous does not affect the capitalist system. Wippermann says that only the old industries have to give up their sinecure. He considers networking the decisive transformative trend: the single product combines with other products, the individual connects things he could not have connected before.

His conclusion is that products are no longer important, but their connectivity for transformation is. In the end, Wippermann defines transformative products stating that products which cannot be combined are not sustainable.

## Taking the Rebound into Account

Transformative products are products that can initiate processes of change ►

within the economy and society, such as a new means of transportation or new form of travel which would allow us to move beyond private transportation.

To be more precise: products are transformative when they help to provide services that are not only more effective, but also more comfortable than previously possible. They also provide greater sustainability when they contribute to dematerialisation or decarbonisation, hence reducing the consumption of raw materials and greenhouse gas emissions considerably. This is how Ortwin Renn defines it in an interview. He is a professor for technical and environmental sociology at the University of Stuttgart and a renowned technology assessment expert for the factory magazine.

In the interview, Ortwin Renn says that certain product concepts contribute to sustainability by creating more simplified devices, such as using a clothesline instead of a drier or recommending a shovel instead of an excavator. However, although these products promote sustainability, they are not considered to be transformative. These products are

only transformative when they perform the desired service more effectively or more efficiently, but consume less in terms of materials and energy.

Ortwin Renn, also an expert for risk research, believes that in order to address major future trends now, all products that contribute to dematerialisation and decarbonisation are transformative products.

Peter Wippermann considers networking to be transformative, but Ortwin Renn is of the opinion that networking, like decentralisation, is only a means to an end. These means are sometimes effective but not always. The key question is whether or not they contribute to decarbonisation and dematerialisation. Where they contribute to decarbonisation and dematerialisation, sustainability is not a concern. According to Renn, networking might contribute to decarbonisation, but it is not guaranteed. Networking is not sufficient to serve as a design orientation, as it is depicted by the rebound effects that are caused by the increasing use of smart phones. ►



Renn goes on to state that the 'Internet of Things' will presumably be the next wave of IT transformation and that smart phones will become loyal assistants that are able to carry out intelligent tasks on an increasingly independent basis. Yet he assumes that the effect on the consumption of materials and energy will vary.

According to Ortwin Renn, this assumption not only applies to the industrialised world. He recently spent three and a half weeks in Africa and reports that everyone there owns a modern mobile phone. He states that mobile phones have become the most widespread devices worldwide, surpassing washing machines, transistor radios and electrical pumps.

Renn, who works as a technology assessment expert, believes that we will be able to feed new technologies and forms of communication into societies of the poorest countries especially via the mobile phone culture. This is due to the fact that mobile phones represent the only infrastructure that functions consistently nationwide. In developing countries, the necessary transformation

process will be much more likely to proceed via mobile usage than in Europe. The new communication through mobile phone usage offers to the African population entirely new opportunities that would have been impossible 15 years ago. In these countries, the exchange of information through mobile communication is the key to innovation, education and development. Smart phones have become objects of prestige due to the fact that users constantly have to own the most recent models; however, according to Renn, this is not problematic. He states that as long as the drive to own the most recent model is accompanied by dematerialisation and decarbonisation, there is nothing wrong with the symbolic link between product and prestige. After all, the production of a smart phone consumes less material and energy than the production of a Mercedes.

What causes him greater concern are the rebound effects. Because of the higher consumption of materials and energy when more consumer goods are available, the rebound effects compensate for the efficiency revolution of

transformative products. This, however, causes a problem: the production of transformative products alone is not sufficient. Transformative products have to come along with lifestyle changes in order to avoid overcompensation. Although there is an increasing trend towards more public transportation and car sharing in metropolitan areas and although cars have lower fuel consumption, overall mobility is increasing. This compares similarly with other consumer markets. In Renn's opinion, the ability for transformational products to avoid the rebound effects through behavioural motivation remains a wishful thinking. He observes two effects: some people are driven by ambition to decarbonise even more when concentrating on eco-efficient products, while others act on the basis of the motto 'conservation allows for more consumption.'

## Spreading Simple Lifestyles

Harald Welzer, a sociologist and professor for transformation design at the Norbert Elias Centre for Transformation & Design at the University of Flensburg,

is also sceptical regarding the rebound effects of transformative products. He even doubts that there are products that are able to avoid rebound effects. During the interview with the factory magazine, he states that as soon as new products are created, expense increases due to production, development, trial and implementation of such products. He is calling for the consideration of expense reductions instead of putting the cart before the horse. He says that we have to consider how we can avoid the unnecessary production of new products for the world marketplace, and also how we can considerably reduce the amount of products that have already been manufactured. Otherwise he would not be able to conceptualise the ability of products to function as transformative.

Welzer's concern is the disappearance of products. Unlike Wippermann, however, he does not want to achieve this goal through digitisation and networking, but through transformation design. In his eyes, it is not the design of products that has to change, because "that just wouldn't be enough." His institute deals with the question of

how modern societies can be shaped in order to regain perspectives for the future in matters of dealing with energy and material. "Since we urgently need a transformation of our lifestyle and of the consumption of resources in order to not end in disaster, we need modelled transformation or, in other words, we need transformation design." Instead of creating a different product design, Welzer suggests designing a new social practice that is characterised by avoiding products and thus eliminating them.

Replacing "some energy feature" is not enough in transformation design. The process of social change is rather about changing sociological circumstances as well as psychological ones. According to Welzer, sustainable development has had little effect so far. The sociologist states that ever since sustainable development has been in demand, material and energy consumption have been moving in a rather unsustainable direction. "It is possible that modern societies deal with the problem in precisely this way – they increasingly talk about the topic in order to avoid having to work on the problem itself." ►



Of course, not all products will disappear due to transformation design. Those needed on a daily basis as well as food would still have to be produced under changed production conditions. However, even in the area of building and living we would have to ask how much space one is allowed to use up, says Welzer. The transformation designer is even more radical in the area of mobility. He says, "For some reason, our mobility seems to be a manifestation engraved in stone or decreed by divine command, thus being unchangeable, irreducible and irreversible." According to him, it is one of the great unsolved riddles of humankind why we constantly produce increasingly better means of communication, but have an increasing need for mobility at the same time. Even technological developments such as the Hyperloop, a sort of mega pneumatic transportation system for people, that is supposed to reduce travel time between Los Angeles and San Francisco to half an hour, are the wrong way to go in Welzer's eyes. "I believe it is a mental distortion to optimise processes in such a malformed society." According to Wel-

zer, the optimisation and adding of new technologies only lead to new problems.

However, Welzer is not a preacher of renunciation in favour of transformation. In his concept of the responsible consumer, everybody decides for himself what is needed for a high-quality lifestyle. "Contemporary consumer behaviour and all this imaginary innovation are techniques of disempowerment," he says. Certain forms of communal production and consumption would lead to a higher quality of life and to less substance and energy consumption. "I don't even know how this could possibly be considered renunciation."

In a research project entitled 'Von der Nische in den Mainstream' (from niche to mainstream), researchers of the Norbert-Elias-Center want to analyse how these resource-saving forms of production and community emerge from niche areas and transform to social dominant dimensions. Even though more and more best practice examples are developing in niche areas, the conditions for their widespread implementation and their scaling have not been examined yet. "The big issue for trans-



formation is scaling," says Welzer. Many projects can only exist in niches and are not conceivable on a mainstream scale. Other projects such as cooperative energy production are scalable without problems. "For designing transformation processes, it is highly significant to know what is adaptable to the mainstream and what is not." ■

More on the topic of transformative products and transformation design in the complete interviews with Prof. Peter Wippermann, Folkwang University Essen, Prof. Dr. Ortwin Renn, University of Stuttgart, and Prof. Dr. Harald Welzer, University of Flensburg, on [www.factory-magazin.de](http://www.factory-magazin.de).

»We can change the world or ourselves, but the latter is more difficult.«

Samuel Langhorne Clemens (\* 1835, † 1910), US American writer, better known under his pseudonym Mark Twain.

# Historically effective: How innovation and technology transform

The London underground is 150 years old. In the beginning, nobody was really in favour of this innovation in mobility that drove through the tunnels with steam and open carriages. An essay on the history of technology from creative destruction through innovation to transformation by the Internet of things.

By Bert Beyer

Translated from the German by Eva Maria Flucke and Anna-Lena Vohl

The year is 1863 when the Metropolitan Railway Company is starting to operate their first trains – underground in London. The world's first underground. England was the motherland of the industrial revolution. And London was the biggest and richest city in the world. It suffocated in traffic. Thousands of carriages, hackney coaches and horse-drawn busses congested the streets. Hundreds of thousands of labourers lived in the city's suburbs, because it was cheaper than living in the centre. Every day they had to go to the city – on foot. There was great need for a new efficient way of transportation.

But no one could imagine that trains could travel underground. Only Charles Pearson could. For years he beguiled investors, mediated between rival companies, and did PR work – which was desperately needed.

-There was no experience, study or test in this field. London was one of the most densely populated cities in the world. The construction of the underground was like open heart surgery. Pearson had a lot of problems, and his biggest one was that the trains were

running on steam power. Below ground level it smelled to high heaven. The tunnels were filled with smoke, and in the smoky tube stations, panic attacks of women and children were not uncommon.

Nevertheless, the first underground in the world was a success because it was cheap and for many people the only opportunity to get from one point to another. This is why there was a lot of money to earn with the Metropolitan Railway. It was only after 1890 – nearly four decades after the opening of London's underground – that the problem with the steam engine was solved by the invention of the electric motor.

These are innovations that change people's lives all at once. The fact that it took a lot of hard work is soon forgotten.

## Innovations destroy

The railway – or more precisely the American railway industry – was also the favourite example of the economist Joseph Schumpeter, who dealt extensively with the role of innovation and

the 'creative destruction' of the existing order. In the 1830s, the U.S. Government supported the railway companies through large land allocations. Together with the settlers, they expanded the U.S. towards the west. At the end of the 19th century, an enormous railway system covered all regions of the United States. Chicago was a child of the railway as well as Omaha, Fort Worth, Denver and many other cities. Hundreds of innovations were established, both small and large. Enormous amounts of money changed hands, and, due to the assistance of joint-stock companies, huge investments were possible. The new way of transporting goods sped up trade, and a coherent single market was created. Schumpeter considered this transformation not only as the result of technological advances but also from of historical progress – in which he was especially interested – and the changes in the markets whose parameters have to be adjusted accordingly. This reveals that technical advance is Janus-faced, because it solves problems while creating new ones at the same time. The boomerang effect was probably first de- ►

scribed by the British economist Stanley Jevons in the mid-19th century. He said that it was a complete distortion of ideas to assume that the economical use of fuel would lead to lower consumption. It was, in fact, quite the contrary, as the general rule is that new ways of economy entail an increase of consumption – in many respects. Jevons gives the steam engine by James Watt as an example. It was approximately 17 times more energy-efficient than its predecessors, but it led to an enormous increase in coal consumption.

The boomerang effect plays a central role in the opinion of the philosopher of technology Jacques Neirynck. He demonstrates that progress normally creates an increased demand on the respective technical system and nature, because the access to more and different resources (e.g. deep-sea oil drilling) becomes possible, which usually causes the prices of goods to drop. But even when falling prices in saturated markets do not make a direct impact on demand anymore, i.e. when every household has a computer, television, car etc., even

then efficiency can lead to increased consumption. Then the saved money will be invested in holidays – which is the indirect boomerang effect. At the end of the day, a tremendous and ever increasing pressure on the ecosystem of the earth remains.

## Innovations socialise

The systems theorist Franz Josef Radermacher sees in this process a fundamental pattern that can be retraced throughout history. He considers the ‘superorganism of humankind’ as a system that generates, spreads and passes on knowledge. Organisation, technology and mastery of material play a central role in this. Bows and arrows as well as the modern plane are all materialised ideas. Each technical innovation results directly or indirectly in the fact that people live longer, communicate more with each other and continue to invent. This is why nowadays we see great ideas for renewable energy sources, intelligent networks, and new concepts of mobility in cities, sustainable aquaculture, and smart materials everywhere. In addition,



there is a comprehensive informatisation of life and the world of work. The Internet of Things is already in progress and consists of everyday objects, devices and goods that become addressable and can be followed through time and space. Cars, rooms, and entire areas of production are becoming 'intelligent'. Mobile interfaces are omnipresent, and the invention of mobiles is followed by data goggles. And what happens next?

The history of technology and innovation of society and economy shows how our ancestors have repeatedly overcome limits. And despite all of the setbacks, catastrophes and wars, the number of people has continued to increase.

In the 21st century, this process is about to come to an end. The rapid increase in population over the last few centuries has already slowed down, and is expected to level out at nine or ten billion around mid-century. This will happen for various reasons: the industrialisation of the emerging countries, the scarcity of resources, and stress. Whether this will be a fairly peaceful transition is uncertain. ■

Bert Beyers is a writer and journalist in Hamburg, Germany. He frequently writes articles for Factory; his latest contribution was 'Columbus' Egg' in the factory issue entitled: BE(A)WARE.



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## Literatur:

Gunkel, Christoph. Bei Abfahrt Erstickungsanfall. 150 Jahre Londoner U-Bahn. Spiegel Online, 10 January 2013. <http://einestages.spiegel.de/s/tb/26701/150-jahre-londoner-u-bahn.html> (German) (Attacks of suffocation upon departure. 150 years of the London Underground)

Grübler, Arnulf. Technology and Global Change. Cambridge: Cambridge University Press, 1998. Print.

McCraw, Thomas K.: Prophet of Innovation: Joseph Schumpeter and Creative Destruction. Harvard: Belknap Press, 2007. Print.

Neiryneck, Jacques. Der göttliche Ingenieur. Die Evolution der Technik. expert verlag GmbH: RenningenMalmsheim, 1998. Print. (The Devine Engineer. The Evolution of Technology)

Radermacher, Franz Josef and Bert Beyers. Welt mit Zukunft. Die Ökologische Perspektive. Murmann Verlag GmbH: Hamburg, 2011. Print. (Our World's Future. An Ecosocial Perspective)

»If I had asked people what they wanted, they would have said faster horses.«

Henry Ford (\* 1863, † 1947) founded the car manufacturer Ford Motor Company.



# Voluntarily, but only under Pressure. Obligated to Ensure Sustainability – but how?

Voluntary agreements, legal requirements, moral obligations – sustainable transformation of social and economic activities will not be achieved by appealing to the goodwill of the participants. What kind of encouragement do we need to transform our actions in a way so that we will not consume more resources than conducive to our own future?

By Bernd Draser

Translated from the German by Yvette Gossel, Chantal Gruber, Ruthilde Gärtner and Olympia Klassen

Hardly any other word has enjoyed a proliferation as rapid as the word ‘sustainability’, which comes at the price of a somewhat porous meaning. These pores can then be filled by whomever and with whatever one considers convenient and urgent. The fact that the sustainable transformation of our actions increasingly takes the shape of a law has been looming for several decades. However, only recently has it become a predominant theme. First of all, a change in attitudes had to be achieved, as was experienced during the profound changes of the late 1960s. Concerning the change in attitudes, one thing can be said: “Mission accomplished!” This becomes particularly evident regarding the extent of promotional approaches to sustainability, be it in the area of authentic Corporate Social Responsibility or for trivial greenwashing. Because even if sustainable qualities are only feigned, this still presupposes the nature of the quality. One of the dire misunderstandings of many discourses on sustainability is the belief that reason or persuasion will entail a change in behaviour. This very German prejudice is wrong for

different reasons and, looked at more closely, proves to be an outgrowth of the Lutheran dogma that man is justified by faith alone, i.e. by his own inner conviction and assurance of salvation and not by actual actions. Considering this, sustainable living is a rather catholic practice. Our actions are important, not the right attitude towards things. Many milieu studies suggest that the more sustainable ways of life do in fact not occur where people believe in them. The reason for this is that they consider themselves liberated from acting according to their knowledge as they already have the right conviction. A sustainable way of life is much more common where ‘sustainability’ is not mentioned because people are conservative, traditional and economical.

Another fallacy may be called consumerist or object fixated. For when transformation is practised as a transformation of objects, the sustainable quality of using an object is shifted towards the quality of the object itself. Object fixation is the mother of all rebound effects. Thus, the aim should be the transformation of our lifestyles

and consumption habits, not the correction of wrong attitudes. Sustainable transformation of social, economic and individual actions will not ensue only by appealing to goodwill. A variety of encouragements and motivations is necessary to help to transform our actions in such a way that we will not consume more resources than is conducive to ensuring our own future. Let’s look at some instruments that can help achieve sustainable transformation:

## 1. The Authoritarian State

The authoritarian state acts by dint of its authority and the sanctions that it imposes. However, to be trustworthy, the authority needs to be legitimate. We consider this legitimacy to be democratic legitimisation. If a country lacks this kind of legitimacy, it has forfeited its authority. There are numerous current examples: the Erdoğan administration has democratised and liberalised Turkey to an extent that no other administration ever has. However, the minute governmental authority loses the underlying sense of legitimacy, all



earlier merits are soon forgotten. The green political party in Germany (Die Grünen) serves as another much more harmless example. During the election campaign 2013, the party presented an election programme containing several unpleasant points that were connected to substantial additional financial burdens that were accepted by the public, bearing in mind the punishment the party deserved. But the straw that broke the camel's back was the party's relatively harmless suggestion for a voluntary 'veggie day' in public cafeterias that caused an outcry from the public. The two incidents exemplify the following:

Abstract and general regulations are acceptable as long as they do not have an impact on personal issues; at that point, government intervention is no longer supported. This attitude also has to be taken into consideration concerning endeavours involving the transformation to sustainability.

## 2. Duty Ethics

According to Kant, duty ethics represent the individual part of an authoritarian

state, by deeming a particular action necessary, not out of an inclination or a desire for bliss, but out of respect for the law. Furthermore, he states that an act of good will can be detected especially by how difficult it is for the person to act that way, as morals do not result 'from inclination or fear, but from duty'. As the respect for the law, in the form of the governmental threat of sanctions is more credible if it is translated as fear, Kant invented the good will to release his categorical imperative, just like the safety catch of a firearm is released. Some of us might already have heard the essence of this categorical imperative as a reprimand: imagine everyone would act the same way as you! It is not as ridiculous as it seems, as in road traffic it actually is a categorical and therefore always valid imperative. It is doubtful if this helps in the transformation process towards sustainability – furthermore, it would have been desirable for the Kantian thinker Hans Jonas to formulate the principle of responsibility in a less duty ethical manner.

## 3. Voluntary Self-commitment

Counting primarily on the voluntary nature of players when it comes to all kinds of transformations was mainly established in economically liberal modes of argumentation. It is not as naïve as it might sound, at least not on the entrepreneurial level, because companies are profit-oriented, which can be seen as a very important quality in this economic system. As consumers obtain increased status through the use of certain brands and as this status distinction is a significant selling point, an authentic corporate social responsibility can result in a considerable competitive advantage. At the same time, however, the temptation arises to surreptitiously obtain a corporate image and the notorious greenwashing begins. Therefore, voluntary self-commitment makes perfect sense when it is governmentally driven and, in the case of failure, pecuniary sanctions are applied. In turn, in international cooperation, voluntary self-commitment is naïve as lacking supervisory authorities and national self-assertion lead to the ►

notorious paradox of the commons and the nations complying with the rules will be at a disadvantage.

#### 4. Social Distinction

On an individual level, voluntary self-commitment is hardly effective as the violation of duty can easily be concealed. On top of that, it creates the feeling of pleasure and liberation, the so-called experience of the sweet sin. Thus, it is obvious that a sustainable lifestyle does not seem very tempting. In fact, not all environments are receptive to sustainable increases in distinction, but those that risk following a temporary trend and are likely to underlie significant rebound effects by increasing distinction through the increased consumption of products, are advertised as being sustainable.

Thirdly, if self-commitment is claimed by guardians of public morals, an unwillingness to participate can no longer be avoided.

#### 5. Green Economy

Green Economy can be seen as some kind of economization of the aforementioned issue, namely the marketing of lifestyles, whose selling point is a gain of distinction that is composed of status symbols and a fair amount of moral complacency. Although this approach seems to be hypocritical, it has to be taken seriously because the idea of Green Economy is based on significant economic transformation processes and, as a consequence, more will follow. Electricity generated from renewable sources is a good example, not only for the rapid development of the sector, but also with regard to the radical changes in the infrastructure that will have to follow.

#### 6. Post-growth Economy

Opposing the never-ending pressure for economic growth can be seen as a pointed contrast to Green Economy. While the concept of Green Economy includes the opinion that the consumption of resources can be separated from

economic growth by technological and economic innovations, this approach wants to do without any growth at all. The range of strategies is remarkable although most of them are hardly experimental but have been demonstrated in historico-cultural contexts. Lifestyles of modesty and even monastic and ascetic models have to be mentioned, but also pragmatic economies of sharing, repairing and do-it-yourself of the urban and regional subsistence. Since the Ancient World these have repeatedly been popular approaches of epicurean and stoic hedonism.

The aforementioned approaches are highly effective and aesthetic transformation concepts, but they are only effective in a rather small environment of education and highly developed tastes. Even though this approach will hopefully be taken as a positive example, its impact, however, will remain low without authoritarian enforcement. ►

## The Seduction of Sustainability

The range of approaches is as wide as the opinions on sustainability. On a smaller scale, these measures are justified and have potential, but in general, their effectiveness is limited due to human nature on the one hand and authoritarian paternalism on the other. Is there any strategy that makes use of all of the above-mentioned advantages without assuming a non-existent human nature or proposing a type of society that no one could want to have?

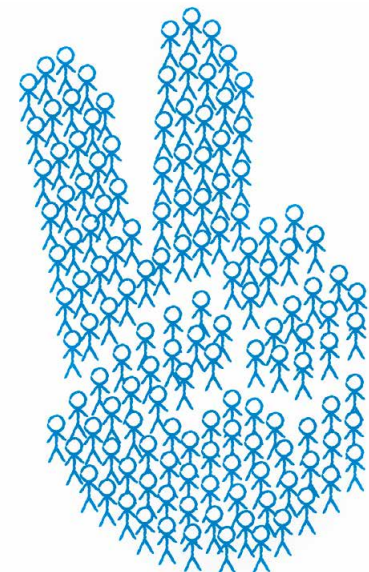
Perhaps we do not want to be persuaded either by illegitimate nor legitimate means to perform the transformation, but rather be seduced to change. For example, the German word 'Pflicht', translated as obligation in English, actually originates from the verb pflegen (meaning: to care for). This implies some kind of loving affection, revealed by expressions such as the German phrase pfleglich behandeln (treat with care). In an etymological context, there is also a note

of enmeshment, entanglement and involvement, as in the Latin word plicare. However, in addition there is a hint of legal, moral and religious commitment in the obligation, as in the Latin word obligare. The playful aesthetic dimension is also a part of the seduction. The old Germanic word plegan or plecan is the root of the English verb 'play'. Playing games is a pleasurable and seductive pastime, but these activities are also rule-based and therefore have a component that is obligatory.

Considering the moral and legal, as well as the playful aesthetic dimension, there is a new, but somehow old, perspective on the possibilities of the transformation processes, which is, so to speak, the medium of choice. There are always rites of passage. These rites have always been media of transition management when it comes to critical transitions of an individual or social nature. They are aesthetically encoded ways of acting that are deeply anchored phylogenetically and are strongly binding socially and individually, due to the fact that they are evident without compulsion.

Also because of their religious roots, rites of passage are always closely related to subject matters such as the renewal of the social, natural and cosmic order. They are common to humanity, equally rooted and credible in all human cultures and therefore easily applicable. The question arises as to what these rites of passage should look like. And who could perform them? In my opinion, this is the central question of all transformation processes. Whoever does not pose it will fail. ■

Bernd Draser teaches philosophy at the Ecosign Academy in Cologne. Recently he wrote an article about 'Chances of Utopia and Traditions', which was published in the factory issue 'Be(a)ware'.



»The difficulty lies not so much  
in developing new ideas  
as in escaping the old ones.«

John Maynard Keynes (\* 1883, † 1946) British economist, politician and mathematician.



# The Transformative Power of Science

Science often only observes processes of social change. Alternatively, it provides technological knowledge but does not get further involved. This is not enough to implement a transformation towards sustainable development. Science needs to become ‘transformative science’. It has to intervene actively in the process of social change. This influences scientific approaches and methods.

The point of view of Uwe Schneidewind

Translated from the German by Kerstin Haep, Chantal Gruber, Olympia Klassen, Christoph Ulbert, Eva Maria Flucke and Maciej Maj

To support processes of social change unerringly, three forms of knowledge are needed. *First, we need system knowledge.* This is knowledge about the interaction of technology, economy, politics and society. An example is in the context of our energy supply system. Without such system knowledge, a turnaround in energy policy is impossible. System knowledge is the classical product of science. Nevertheless, it is rarely successful in building a bridge between knowledge in technological and social science. Indeed, there are many insights into technological options of the turnaround in energy policy, but there is less information about necessary participation procedures or innovative financing models. And research that combines both aspects is extremely rare. At this point it already becomes clear that transformative science must become more interdisciplinary than it is today.

*Second: in addition, we need target knowledge.* Social transformation can only be realised if we have a conception of an aim. Such an objective would be 100 per cent renewable energy. But how

decentralised should the renewable energy generation become in the future? Which combination of renewable energy is required? How much energy should be consumed in total and how much energy needs to be conserved by 2050? Without a clear objective it is not possible to create a process of change. Generally, science leaves these questions to politics. However, science can contribute a lot to target knowledge. It can develop consistent scenarios and provide ethical justifications of targets – all of these are scientific contributions. Thus, we need a close cooperation between science and individuals from politics and society to generate target knowledge. Interdisciplinary then becomes transdisciplinary – this means a connection of scientific knowledge with the (target) knowledge of the people concerned. Only this turns science into a catalyst for transformation.

*Third: finally, we need transformation knowledge,* which is knowledge about how to provoke change.

Such knowledge must not be scientifically abstract but ‘socially robust’. This means that the players on site are given accurate information about their actions. How do I organize the energy transition in my municipality as a policy maker? How do I support new ideas for mobility in my city? These questions need answers that are tailored to the situation on site.

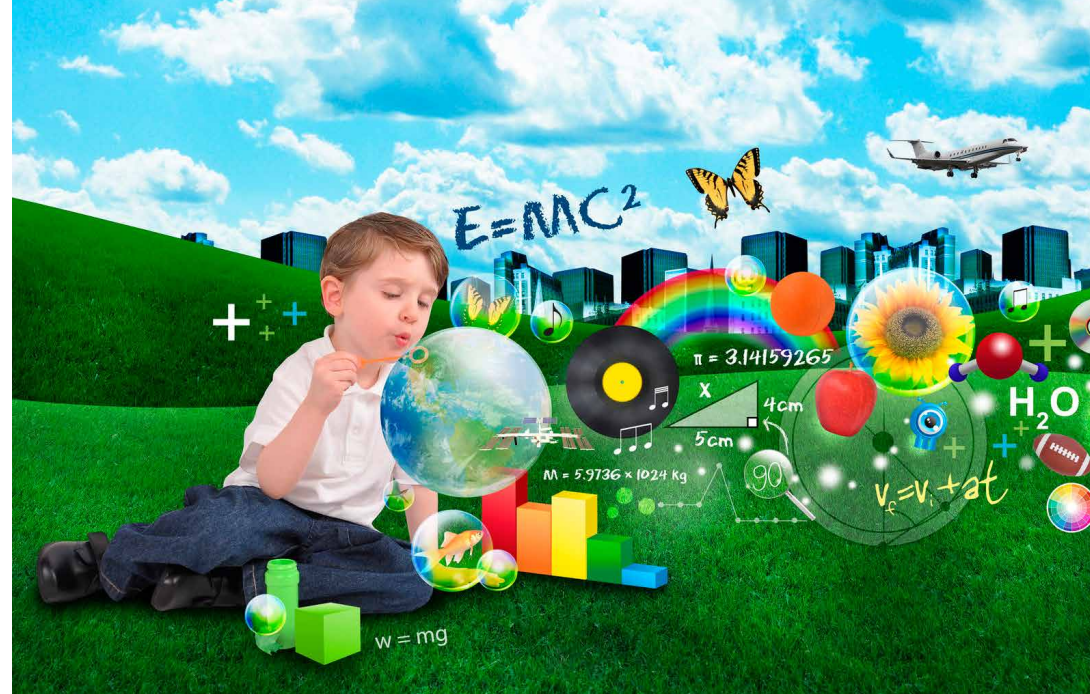
## From scientific labs to social living labs

Such transformation knowledge cannot be acquired by simply developing models in an ivory tower. Instead, just like with complex technical inventions, labs are required in which it is possible to test, work on and gradually improve new ideas. Such laboratories for processes of social change can be individual municipalities, for example, or districts as well as individual companies or sectors. In all of these ‘living labs’, processes of change can be tested, analysed and constantly optimised with assistance from scientists.



Prof. Dr Uwe Schneidewind is an economist and the president of the Wuppertal Institute for Climate, Environment and Energy.

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- ➔ Schneidewind, Uwe and Mandy Singer-Brodowski. Transformative Wissenschaft. Klimawandel im deutschen Wissenschafts- und Hochschulsystem (Transformative science. Climate change in the German science and university system). Marburg: Metropolis, 2013. Print.
- ➔ Schneidewind, Uwe. "Plädoyer für eine Bürgeruniversität" (A plea for a citizens' initiative). duz MAGAZIN Aug. 2013: 30-31. Print.
- ➔ Germany. Wissenschaftlicher Beirat für Globale Umweltveränderungen (WBGU). Welt im Wandel – Gesellschaftsvertrag für eine große Transformation (World in transition – a social contract for sustainability). Berlin: WBGU, 2011.

»Science does not have a moral dimension. It is like a knife. If you give it to a surgeon or a murderer, each will use it differently.«

Wernher Magnus Maximilian Freiherr von Braun (\* 1912, † 1977), a German and later US citizen working as a rocket engineer, was a forerunner and visionary of space travel.

# This Is How Change Will Be Achieved – Transformative Design for Sustainability

Technical solutions for long-lasting, repairable and aesthetic products are already available nowadays. Yet, transformative products – which, in terms of radical change, could have an effect on the sustainable development of society similar to the effect that the smartphone has on everyday life – are a long time coming, even though the conditions for their success are well-known.

By Ursula Tischner

Translated from the German by Maciej Maj, Kerstin Haep, and Margarita Müller

Imagine you would never have to buy a mobile phone again. Instead, a provider ensures that you will always have an efficient and biologically harmless communication device. You will only have to pay for the communication itself. This long-lasting mobile phone has a modular structure so that functions can be added or left out just as you wish. You can have it repaired and easily get a visual or trendy update by changing the cover, for example. The smartphone is operated with a tiny fuel cell that you will have to top up with a few drops of biofuel from time to time. Moreover, 80 per cent of it is made of natural materials that can be shredded after a long life and returned as nutrients to the natural cycle. The other components of the device will be checked and then reused or mechanically recycled.

Such a phone does not yet exist, but it will not take much longer. The necessary technical solutions are already available. However, they will not bring about a change in terms of sustainable production and consumption until they find greater social acceptance. Pro-

## Sustainable and transformative products meet the following criteria and are:

- useful: fulfil social functions, solve a real problem
- efficient and effective: make optimum use of resources and energy
- solar: use energy from renewable sources such as sun, water, wind, geothermal heat, physical strength or bio-fuel produced in a sustainable manner
- secure: are risk-free, healthy, 'fool-proof', ergonomic and do not harm or pollute the natural environment
- reasonably durable: are either durable or non-durable depending on their function, but always on a reasonable basis; in the case of non-durability, they must be particularly cyclic
- cyclic: are recyclable and enable technical and natural recirculation
- as regional as needed: have low transportation and packaging costs
- social: have a positive effect on the sociocultural environment, improve the quality of life, secure employment and are produced under (regionally) acceptable working conditions
- of high quality: have a reasonable price-performance ratio, are appreciated by the customer and secure the economic existence of the providers

All of these characteristics have to be considered for the whole life cycle of the product. It is often difficult to meet all criteria equally well in the development and design process, as for example regionalisation versus efficiency. As in real life, compromises have to be made. The best realisable and marketable combination of ecologic, economic and social advantages needs to be found.

viders play the most important role in this case. They have to offer these more sustainable solutions to the right customer groups at a reasonable price and explain the advantages in a logical and interesting manner because marketing departments in companies and external

communication agencies often do not understand the outstanding quality of the products. If communication and advertising are unsuccessful, the new solution will be a failure.

Developing and communicating transformative solutions for products and services is particularly important, as design and communication always have a positive or negative impact on the user behaviour. Designers of sustainable products can deliberately use and shape these effects. In product design, these approaches have been known under the generic terms of product language and product semantics (or more modern: usability) for many years. Often, designers do not really know these concepts, even though harmonious aesthetics and semantics are of major importance particularly in the case of sustainable and transformative goods, as the project “ecobi-ente – successful design (and marketing) of sustainable products” has shown.

## The Transformation of Daily Solutions

According to the European Environment Agency, the three consumption areas of nutrition/agriculture, mobility/tourism and habitation/energy consumption in buildings are responsible for around 80% of the environmental pollution in western industrial countries. Therefore, it makes sense to start with transformation in these consumption areas.

Important measures to be taken are the promotion of a diet and food low in meat, the prevention of food waste (approximately 40% of our foodstuffs are thrown away) and the redesign of cities and rural areas in order to reduce the role of the car in commuter traffic and to promote public transport instead. Furthermore, energy consumption in buildings



### FRIA, Ecologically Efficient Cooling Chamber for Domestic Use

FRIA is an energy efficient and durable combination of a pantry and a refrigerator equipped with the latest cooling technology. The cooling chamber is permanently installed in a recess in the kitchen. In winter, cold air from outside is used for cooling and in summer the small refrigerating machine can be operated by solar energy. FRIA has different compartments that can be regulated and shut down separately. In this way, the cooled volume can be adjusted to the personal needs of the user. In combination with efficient and environmentally friendly insulation, this results in an energy consumption of only about half of that of conventional refrigerators of the same size.

Due to a reduced range of materials, a replaceable refrigerating machine and exchangeable wearing parts, FRIA is a durable and recyclable product. During the estimated lifespan of a cooling chamber, 10 conventional refrigerators would have to be built, used and disposed of to achieve the same performance as a FRIA cooling chamber. Even front panels, handles and internal parts are replaceable, so that FRIA can be updated and repaired in an aesthetic and functional manner.

should be reduced by means of a better technical infrastructure (heating, air conditioning, hot water systems, thermal insulation), better devices (such as the efficient refrigerator FRIA, see box) as well as changed user habits. Several surveys, for example a study of the University of Cambridge, show that the frequency of doing laundry, that is the user's habits, has by far the greatest impact on the environment – followed by the decision of whether to use a dryer or not. Less important are the washing temperature and the energy efficiency class of the washing machine. Transformation is particularly necessary when it comes to durable products – if the life cycle of a product is sufficiently long, the most ecological behaviour is of course to continue using it. In order to prevent this, producers successfully sell products that will obviously become unfashionable (perceived obsolescence) and that have a limited lifespan (built-in obsolescence). If these two business strategies were abolished by whatever means, our consumption patterns would undergo a radical transformation towards more sustainability.

## Think Differently – Act Differently

The shift towards a sustainable society, but also towards sustainable production and consumption as well as the promotion of sustainable lifestyles requires not only more efficient products and services, but more importantly, new ways of thinking and modes of behaviour – among consumers and producers alike. But how do we accomplish this rather social innovation? How do we change our way of thinking, how do we start acting differently? In other words, how do we make our vision of a better life through sustainability an objective of future social development?

Another question would be why, despite our strong environmental awareness and the knowledge of how climate change and personal behaviour are connected, there are so few approaches to a more sustainable consumer and producer behaviour. This is known as the 'behaviour gap'. Is it laziness, convenience, or lack of time? Do we simply lack the financial resources to bring

about change? Are we perhaps stuck in non-sustainable systems and infrastructures? According to regular surveys on environmental awareness and performance (conducted, for example, by the Federal Environment Agency, the German Society for Consumer Research, or the Sinus Institute) it is a combination of all the aforementioned factors. Various impediments to different social groups also play a role.

It is important to remember that 80 percent of our behaviour is determined by routine. This is the reason why we do not think about which brands to buy when shopping; our choice of products is made almost subconsciously within the framework of acquired behaviour and without putting much energy into it (see Tischner et al. 2010 and [www.score-network.org](http://www.score-network.org)). When this routine behaviour is not sustainable, however, unlearning these mostly subconscious modes of behaviour we have acquired and practised over the years, and learning new ones is a great challenge. All change is scary at first, because it is impossible to assess the consequences



of new behaviour. Thus, change requires more effort than adhering to what we know and are used to.

According to behavioural theorists and my own studies, behaviour modification and social learning usually contains the following elements:

- the awareness that there is a problem and how one's personal behaviour is connected with it
- the motivation to (intrinsically or extrinsically) change one's problematic behaviour
- the chance to change one's behaviour, the existence of viable options and a positive environment in which new modes of behaviour can be tested
- positive reinforcement as a way of rewarding new behaviour (be it in the form of a financial, ideological, or emotional reward) and validation by one's immediate social environment as well as people and institutions that one considers important

Today, new media and the Internet are key to promoting cultural and social learning processes. They make commu-

nication and information processes and the organization of groups of like-minded individuals much faster and more far-reaching than ever before. Thus, new ideas and modes of behaviour can spread virally.

## Examples of Successful Transformation Design

How can designers promote and support transformation processes towards sustainability? By applying the aforementioned four steps of social learning, i.e. awareness, motivation, chance, and positive reinforcement, they can:

- create a better way of communicating about important sustainability-related topics. This communication needs to be clear, target-group-specific and emotionally appealing. Additionally, it needs to be truthful, authentic, transparent and as scientifically sound as possible. It needs to provide the recipients with positive solutions and give them the feeling that they are part of said solutions. To give you a few examples: Patagonia published its complete production history on the company's

website, including the ecological footprint of its products. Levi's adopted a life assessment approach and as a result puts a label on its jeans which, supported by the accompanying ad-campaign, encourages economical textile care and passing the jeans on to another person or a social institution once the person wearing the jeans no longer needs them. Toms Shoes, in keeping with its 'one for one' business model, donates a pair of shoes to a person in need for every pair of shoes sold. Needless to say, these ecologically and socially motivated (communication) strategies also help to positively distinguish the companies in the oversupplied market.

- provide motivation for behaviour modification by presenting influential role models, visualizing the advantages of new behaviour and associating it with people's needs and desires. 'Green Is the New Luxury' was the headline in a major German magazine, referring to the so-called 'LOHAS' – affluent and well-educated lifestyle groups who consume with pleasure and a clear conscience by



engaging in sustainable and socially responsible living. Bono, George Clooney, Leonardo DiCaprio and Angelina Jolie are only a few of the many celebs supporting environmental and social sustainability. Designers are particularly predestined to combine environmentally and socially friendly products with people's desires.

The challenge is to not only encourage the high-income population, but to devise sustainability strategies for low-income groups as well.

Create possibilities for changes in behaviour in the form of products, services, new infrastructures, strategies and systems. Users can test and enjoy these sustainability tools without any risk and in a positive environment through playful exercises. All of the sustainability approaches suggested in this article can be applied in this way.

Provide positive feedback and reinforcement in a variety of ways: e.g. through praise and awards, by offering particularly favourable financial options and starting user groups or customer communities that can support and ac-

knowledge their users, or by providing recognition by like-minded individuals. We all know some eco-friendly enthusiasts who have a smartphone app that monitors how much power the photovoltaic system on their roof is generating. Instant feedback on ecological interrelations through our own behaviour has a profound effect on us, especially if we can share positive results with other people. In doing so, we are promoting a kind of 'green competition.' On the other hand, smart meters used to record water and energy consumption in households have yet to be optimised by designers. They are lacking fun displays that encourage more sustainable behaviour. Another example would be the Douche Coach, a shower timer used to indicate how long the user has spent under the shower, or power cords that start glowing unpleasantly if the connected device is consuming electricity. For more information please refer to the transformational products section of the Transform issue which specifically deals with products encouraging sustainable behaviour (For They Know What They Are Doing, page 53).

Dan Lockton has collected a variety of similar examples for his "Design with Intent" cards. They offer strategies with which designers can encourage users in a more or less authoritative or fun way to act more sustainably. For example, there is the recycling bin that looks like a chicken. Every time you put recyclables in it, it looks like you are feeding it. This is intended to evoke positive emotions. There is also a coffee chain labelling its products 'fair trade' in order to clear its customers' guilty conscience. In this way, drinking coffee does not leave a bad taste in people's mouths. A disordered light switch can be used to encourage aesthetically oriented people to switch off the lights by recreating the proportional order of the light switch. The display function also plays a role in the design of dual-flush toilets. You push a big button for a full flush and a small one for a half flush, thus wasting less water. ►

Other more conventional strategies include numerous awareness campaigns in traditional media like ads and advertising posters. Nowadays, however, viral campaigns in the new media are much more effective. For example, the stunning Canadian ‘Recycling a bottle, flash-mob style!’ video ([www.youtube.com/watch?v=GYnd5JRu86E](http://www.youtube.com/watch?v=GYnd5JRu86E)) has already been viewed over 1.2 million times.

The so-called ‘carrot mobs’ go beyond raising awareness of sustainability-related topics and towards activism and politically motivated consumerism ([www.vimeo.com/2913530](http://www.vimeo.com/2913530) and [www.carrot-mob.org](http://www.carrot-mob.org)): a large group of consumers

offer companies to purchase their products or services in significant quantities if they in turn agree to produce that products or services in a sustainable manner or improve certain features.

As their name suggests, fun theorists incorporate fun into their strategies. They use gaming elements in their sustainability campaigns to encourage people to exercise more, separate waste, obey the speed limit etc. ([www.thefuntheory.com](http://www.thefuntheory.com)). The Sustainable Dance Floor in Rotterdam also promotes sustainability in a fun way: it makes use of piezoelectric sensors to generate electricity for the lighting through movement on the

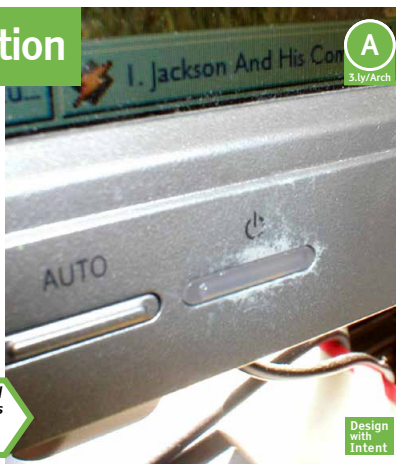
dance floor ([www.studioroosegaard.net/project/sustainable-dance-floor/info/](http://www.studioroosegaard.net/project/sustainable-dance-floor/info/)).

Now one might say that these are merely gimmicks that contribute little or nothing to transformation. This is not the case, however. Through the fun theory campaigns, 60 to 70 percent of pedestrians have changed their behaviour, more than twice as much waste has been collected in public parks and bottle banks have been used more often. The fact that the fun theory website and the fun theory awards were an initiative of Volkswagen, and the fact that companies such as BMW now implement com- ►

## Feature deletion

What would happen if you simply took away features you don't want people to use?

Various politicians have proposed simply removing standby buttons from consumer electronic products, to reduce energy use



## Role-playing

What happens if your system gives users particular roles to play, or makes them feel like they're playing a role?

Tim Holley's Tio encourages children to become 'energy champions' for their household, influencing parental behaviour



## Emotional engagement

Can you design your system to engage people's emotions, or make them emotionally connected to their behaviour?

The open beak of these 'baby bird' litter bins at a city farm (visited by lots of children) suggests that they are hungry and would like to be fed



## Simplicity

How simply can you structure things, to make it easier for users to do what you'd like them to do?

EcoButton allows a user to put a computer into a low-power state with just one press, making it much easier for users to save energy.



## Perceived affordances

Can you design the form of your system to suggest particular actions (or constraints on action) to users?

Reshaping the holes on bins to match the 'form' of different types of waste has been shown to increase recycling levels significantly



## Desire for order

Can you use people's desire for tidiness to influence them to rearrange elements or take actions you want them to?

The AWARE Puzzle Switch, a light switch design by Looe Broms and Karin Ehrnberger, is visibly 'disordered' when in the 'on' position



munity-based services and applications by other developers in their vehicle software shows that these sustainability campaigns are part of a powerful and influential movement. We should keep in mind that transformation design is not just about prompting the affluent elite to change their behaviour. It is about encouraging as many people as possible to live sustainably and future-oriented, thus maximising benefit for the sustainability.

## Investing in Transformation Together

Inspiring changes are often brought about by movements that start from within the population. Neighbours, activists, or groups of like-minded individuals solve their problems by implementing social innovations that appear radical or inaccessible at first. They improve their quality of life by co-operating with each other. Car sharing started out as such a social movement and now has more than 270,000 users in Germany alone (<http://de.statista.com/themen/1437/carsharing/>).

Other examples include buying groups for organic products, Community Supported Agriculture, i.e. agricultural production communities where consumers support farmers, and even entire Local Exchange Trading Systems (LETS) that establish barter economies parallel to the monetary economy. In such local economic systems based on points or alternative currencies, socially disadvantaged people as well as dentists, lawyers and others trade one service for another. These systems are more successful when they are being supported by designers, and a professional form of organisation is assumed with increasing success and size.

Some designers already specialise in such bottom-up innovations, which are termed ‘social innovations’ or ‘social design.’ The DESIS network ([www.desis-network.org](http://www.desis-network.org)) is a great example of this.

In times of economic and financial crises, it is only natural that more and more consumers search for and test new lifestyles and alternative models of consumption outside the prevalent market economy. The numerous ecologically and socially motivated business start-ups are yet another indication that many people distrust pure, profit-maximising and growth-orientated capitalism. They are convinced that we should not be waiting for the traditional institutions, the government, banks and companies to start structuring life more sustainably.

This idea developed into a very interesting movement called the Maker Movement, a modern DIY culture that employs computers and rapid prototyping machines (3D printers) that can print self-made product designs in no time. Factory magazine even dedicated

a whole issue to this movement (Do-It-Yourself, No. 3/2012). At the same time, new approaches of Open Innovation, of crowd sourcing and crowd funding grew in popularity. These approaches consist in companies and other stakeholders outsourcing innovation tasks to Internet platforms, so that interested members of the public (i.e. the crowd) can participate in solving the tasks. Far-sighted companies such as Heineken, Starbucks, Fiat and Dell already use Open Innovation systems.

If the financial means to realise the best ideas are not available, members of the public can fund these ideas through crowd funding or invest in them via crowd investing.

The EU-funded Sustainability Maker Project ([www.sustainabilitymaker.org](http://www.sustainabilitymaker.org)) puts these new and extremely effective tools exclusively at the service of sustainability. On the online platform [www.innonatives.com](http://www.innonatives.com), active since October 2013, people can post challenges which are relevant to sustainability in order for the international crowd to collectively

develop a solution. The most promising approaches are selected by crowd voting and a jury of experts, and are then implemented through crowd funding and/or an online marketplace for sustainable solutions.

The sales figures of the American crowd funding platform Kickstarter ([www.kickstarter.com](http://www.kickstarter.com)), which since its foundation in 2009 has funded 46,000 creative projects with over USD 735m by 4.6 million donors, show the potential that is hiding in these new tools. By utilising this potential to implement sustainable innovation, we can realise many ideas that have previously failed due to the inertia of traditional institutions. The market opportunities of these innovations are expected to be very positive, especially since innovative activity starts with an actual demand or problem that many people have and that is important to them. If this weren't the case, they would not support the project. Thus, these transformative and transformational solutions satisfy the people's needs and solve their problems, while at the same time being relevant to the market. ►

On top of that, they often are resource-efficient. Companies are recommended to take an interest in these developments and to primarily work with advisors and designers who pay attention to such more radical innovations. This way we can come much closer to the transformation to sustainability in much less time. ■

Ursula Tischner is a designer and runs econcept, an agency for sustainable design based in Cologne. She had been working as a professor at the Savannah College of Art and Design for three years and has returned to Germany in mid-2012.

## Sustainability Maker Convention:

The EU-funded Sustainability Maker Project introduced the Open Innovation Platform for Sustainability [www.innonatives.com](http://www.innonatives.com) at the Sustainability Maker Convention, the world's first conference on Open Innovation, Crowd Sourcing and Crowd Funding for Sustainability on 15 October 2013 in Cologne.

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## Sources:

- European Environment Agency. "Environmental Pressures from European consumption and production." EEA publication TH-78-07-137-EN-D. 2007.
- Kanfer, Frederick H. / Schmelzer, Dieter. Wegweiser Verhaltenstherapie: Psychotherapie als Chance. 2nd ed. Berlin: Springer, 2005.
- Klemisch, Herbert / Simbriger, Angelika / Tischner, Ursula et al. "Nachhaltige Güter erfolgreicher gestalten und vermarkten. Ein Praxisbericht für Unternehmen." KNI Papers Sonderheft 2005. Klaus Novy Institut, Cologne, 2005.
- Allwood, Julian M. / Ellebæk Laursen, Søren / Malvido de Rodríguez, Cecilia / Bocken, Nancy M. P. Well Dressed? The present and future sustainability of clothing and textiles in the United Kingdom. University of Cambridge Institute for Manufacturing, 2006.
- Tischner, Ursula, Stø, Eivind, Kjærnes, Unni, and Tukker Arnold, eds. System Innovation for Sustainability 3: Case Studies in Sustainable Consumption and Production – Food and Agriculture. Sheffield: Greenleaf Publishing Ltd, 2010.
- Watzlawick, Paul, et al. Menschliche Kommunikation. Formen, Störungen, Paradoxien. Bern: Hans Huber Verlag, 2011.

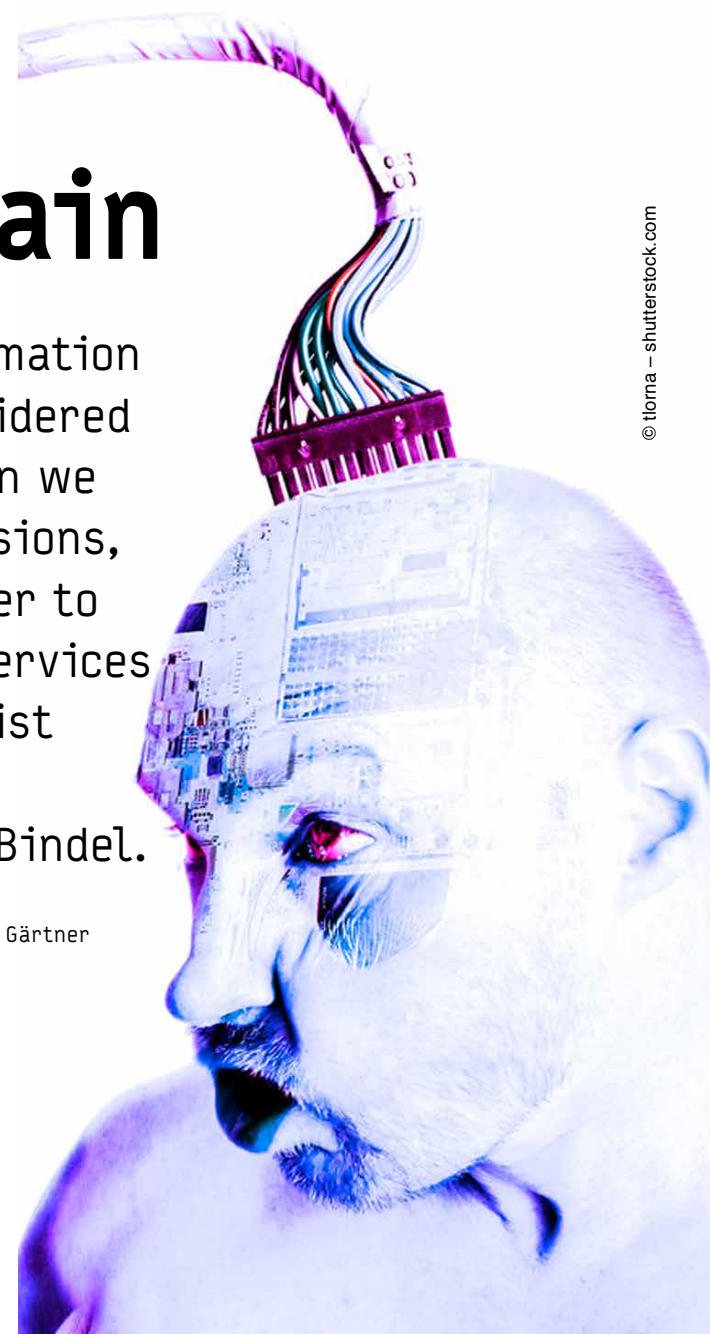
»Gradual change doesn't work if major changes are needed. If your change isn't big enough, the bureaucracy can beat you.«

John Francis „Jack“ Welch Jr. (\* 19. November 1935), CEO of General Electric from April 1981 to September 2001.

# Under the skin and into the brain

What are our chances for a transformation leading to more sustainability, considered on a purely ecological basis? How can we change our conventional buying decisions, what do companies have to do in order to make transformative products and services attractive for us? The neuro-economist Peter Kenning gave answers to these questions in an interview with Ralf Bindel.

Translated from the German by Meike Padutsch, Viktorija Tapai, and Ruthild Gärtner



*Professor Kenning, your chair for marketing at the Zeppelin University in Friedrichshafen, Germany, is to become the first economical one with an explicitly neuro-ecological orientation. What are you exactly working on there?*

We are working on the systematic integration of neuroscientific methods, theories and knowledge into economic research. By means of these methods we are trying to identify behavioural patterns and decision processes of economical significance. In the special research area of Consumer Neuroscience, we tackle the question of which brain areas are involved in buying decisions, for example. Clients are thus able to understand and actively transform their own behaviour.

*Companies have high hopes for neuro-marketing. Do you receive many research assignments from industry?*

Neuro-marketing is very fashionable at present. However, the term does not really make sense. Marketing is a management concept and the brain just cannot be managed like a company.

This is why we speak of Consumer Neuroscience, which focuses on the neurobiological explanation of consumer behaviour. In fact, it is only in a few selected cases that we work together with companies. Our work rather focuses on basic research and we are primarily interested in theory. Nevertheless, we receive many requests, which, however, mostly fit with advisory firms rather than scientific institutes. Thus, we pass on a lot of these 'how questions' to advisory firms who have the necessary resources for company-specific knowledge transfer.

*How have we been able to do without neuro-economic knowledge for such a long time?*

There are various reasons. With respect to competition it has not been relevant until now, because nobody had access to it. The corresponding imaging techniques have existed for only a little more than twenty years. And it was just around the turn of the millennium that they were first used for the examination of economic questions. Now they reach the companies, the general public, and

politics. The techniques are still developing, too.

*How widespread are neuro-economic techniques at present?*

The functional magnetic resonance imaging (fMRI) is probably the best-known technique at the moment. It is broadly used in scientific areas as well. According to recent studies, two to three fMRI-publications are released each day at present.

*This factory issue deals with transformation and transformative products. Are these imaging techniques a product, which is not necessarily sustainable, but at least able to lead to social changes?*

That is certainly possible. The imaging techniques advance the theorisation of human behaviour from a neurobiological perspective. Corresponding concerns that a new reductionism will reduce us to the interaction of molecules are linked to it as well. These concerns lead to discussions on basic terms like 'consciousness' and 'freed will'.

Whether these terms are biologically determinable, however, depends on their definition. If one understands, for example, the term 'consciousness' in a collective sense of a swarm intelligence, however it might be organized, individual-neurobiological categories have a relatively low scientific value. Nevertheless, the imaging techniques definitely feature a transformative structure. After all, it is thanks to them that we are experiencing a renaissance of emotions.

*Are emotions an opportunity for our sustainable transformation?*

Well, the term emotion is close to hedonism and therefore tends to be problematic in the normative area, because sustainability is at first sight characterized as being rather rational. Emotions tend to be impetuous as well as being oriented towards rewards and pleasure, which seems to be contrary to that. At the same time it can also be a pleasure to use a sustainable product. Consider for example the drivers of electric cars, who are consciously taking a step towards CO<sub>2</sub> avoidance. They en-

joy it, search for recognition and receive it as well.

Thus, they are being rewarded for a seemingly rational decision on a collective level causing positive emotions. This would have an emotionalising effect that produces a transformative momentum.

According to the psychopharmacologist Felix Hasler, who wrote the book *Neuromythologie - Eine Streitschrift gegen die Deutungsmacht der Hirnforschung* (neuromythology – which speaks against the power of interpretation of brain research), the hype surrounding neurosciences is already over.

This interpretation reminds me of an observation in the field of operational technology research. In the beginning, new technologies are often largely overestimated by management. Then comes the disillusionment associated with a period in which these technologies are just as widely underestimated. The discussion over the power of interpretation in neurosciences is similar and in my opinion often makes use of a straw man argument. A hype is constituted as a straw man only to be invali-

dated again later on. I think that these are normal correction processes and that brain research will establish itself in economics and social sciences just as psychology did.

*If neuroeconomics is about analysing the consumption decisions in the brain, can you explain how advertisements work?*

Successful marketing campaigns generally have a rewarding effect on the buyer. This sense of reward is coded in the striatum. Processing the price information linked with the buying decision, however, works aversively in the brain. This price pain is processed and generated in the insular region. These two impulses – sense of reward and price pain – come together in the prefrontal cortex where executive control and self-control are located as well. Big labels that can influence the buying decision once again also affect this area. ►

*Does this also work for good designs?*

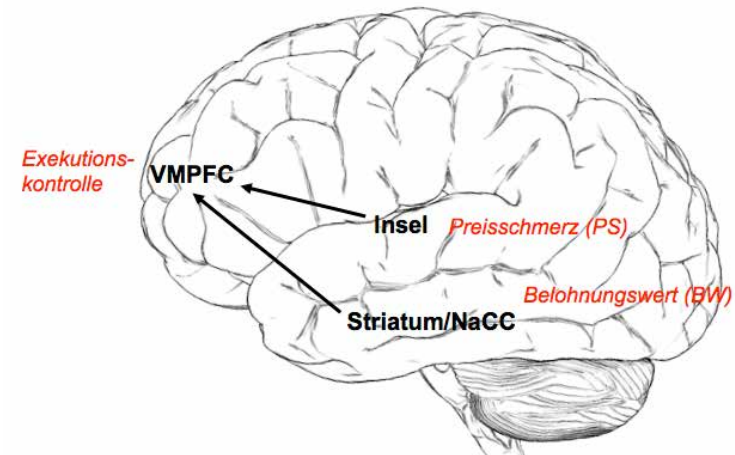
Good designs primarily influence buying decisions by evoking a positive reaction in the striatum. This increases the sense of reward for a product and makes it more attractive.

*What do you recommend for the promotion of transformative products?*

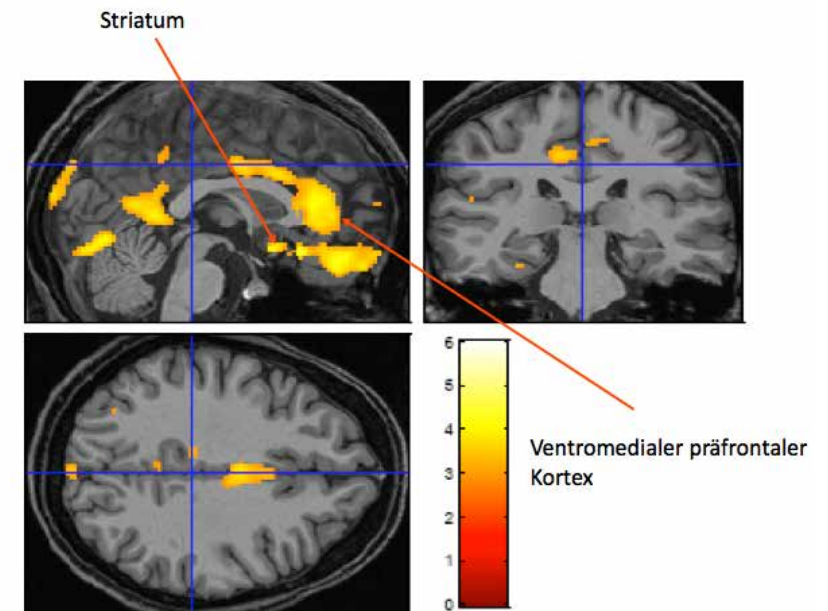
Communication should not only take place on a rational, but also on an emotional level, products should be designed as rewarding as possible and possibilities to reduce the customers' price pain as far as possible should be sought.

*How does this work for products that are often more expensive due to their fair and ecological production, for example organically produced foods?*

If the sense of reward produced by a product is not enough for a customer to reduce the price pain, you could try to relativise it with measures that aim at the price. Consider reference pricing, for example. The customer is shown what the product would normally cost. In that case, you could also communicate the external costs of alternative products for comparison.



*In a normal buying decision, the sense of reward should be greater than the price pain ( $SR > PP$ ). Image: P. Kenning.*



*Neural effect of an attractive package design.  
Image: P. Kenning*

*Do you think that this is enough?*

This type of price communication is not easy to understand and it might possibly take a long time for the customer to learn it. It would be easier if the prerequisites for such an understanding were already established at school. An alternative would also be to apply regulatory measures in order to adjust any incorrect price relations as the external effects of some products are not perceived correctly.

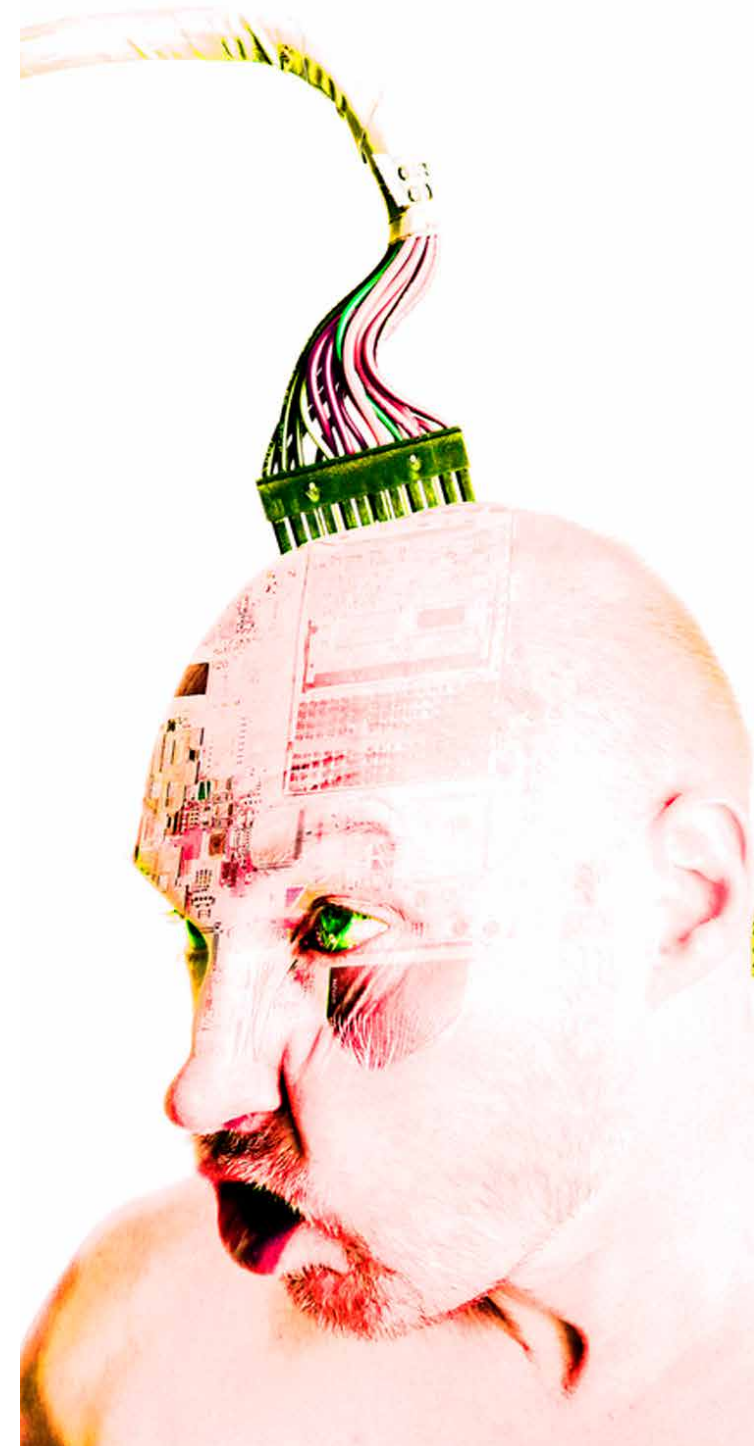
*Why does our brain choose cheap products that have a shorter life span over products that have significantly better eco-balances and in the long-term also a better economic balance?*

I do not think that this is the case. Only about ten per cent of people focus on new products. Such novelty-seekers make up a small part of the market. More important in this context is the aspect of differentiating. How do I point out to the customer that this product is more sustainable? If the customer cannot see this additional benefit right away, the positioning will be difficult.

An example would be automotive advertising, where neither Mercedes Benz nor Volkswagen or any other company advertises with longevity. This is a market niche that companies have to explore further. Life span and reparability as distinguishing features, however, become more and more interesting as the sense for repairing things and doing things yourself grows in society. ■



Prof. Dr. Peter Kenning holds the chair of marketing at Zeppelin University in Friedrichshafen on Lake Constance, Germany. He was one of the first scientists in the world to use imaging techniques to research economically relevant decisions.



»There is a hidden transformation somewhere in our brain that makes a molecule out of a thought. This transformation happens immediately and takes place in no specific area – it takes place due to a simple impulse that arises in the nervous system.«

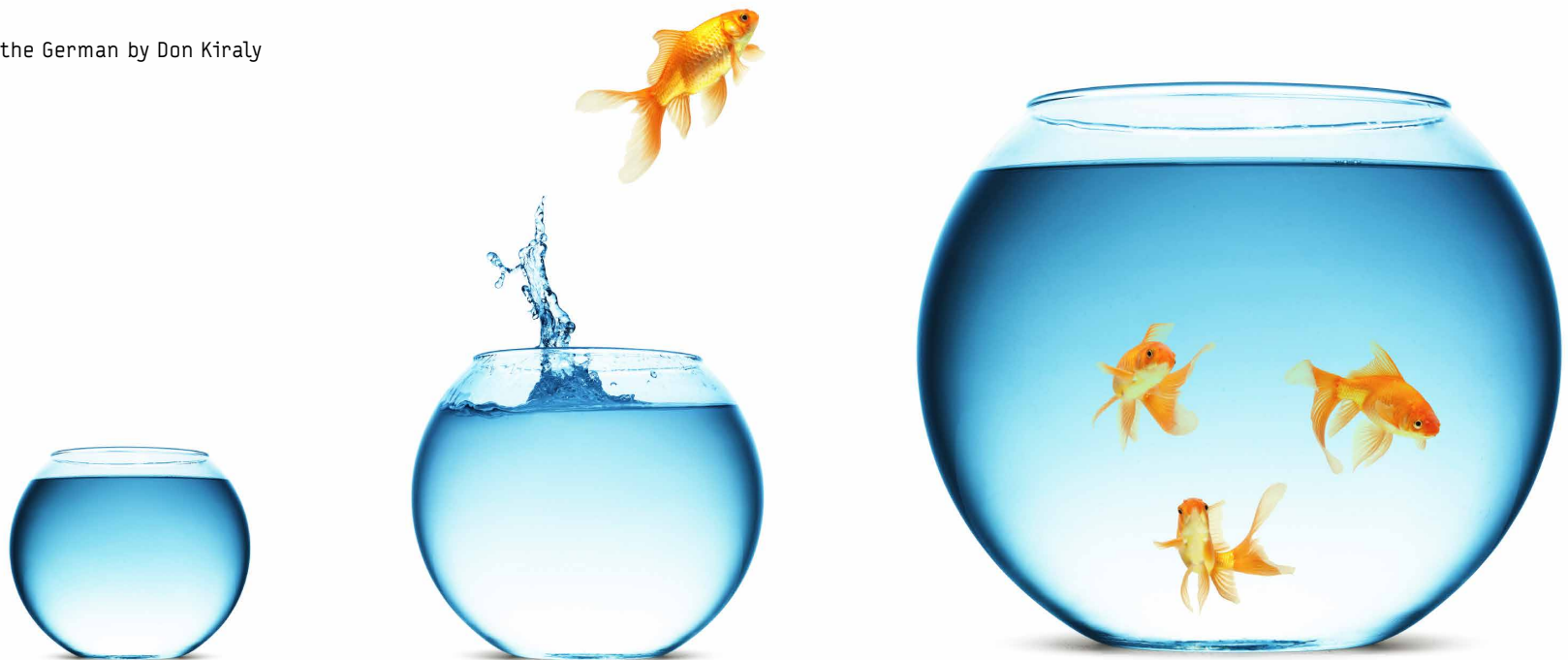
Deepak Chopra (\* 22. Oktober 1946), internist, endocrinologist and popular contemporary author of books about spirituality, alternative medicine and Ayurveda.

# With System Leaps Towards a Resource-Saving Society

The great transformation has become a key topic in the sustainability debate. The global two-degree target to reduce global warming to a sustainable level by the year 2100, is looking precarious because of the continuously increasing rate of CO2 emissions. Breaking through normative constraints and a radical change in habits could allow us to achieve the necessary change sooner.

By Klaus Burmeister, Holger Glockner, Maria Schnurr

Translated from the German by Don Kiraly



It is not the prevention of climate change but rather regional strategies for adapting to it that are currently acquiring increasing importance in strategic sustainability policymaking. It is not the reduction of resource consumption but rather the search for and exploration of new sources of resources that are increasingly in the focus of attention. Hence, after 20 years of intense debate, the global issues related to our resources and climate still remain urgent and unresolved. Given the growing global population, the economic growth in the threshold and developing countries and the associated increase in industrialisation as well as the trend towards catching up with first world consumption in those less developed countries, there is still no quick or pervasive solution on the horizon. In addition, signs are increasing that economic development will remain volatile over the long term.

Accompanied and driven by socio-cultural and economic policy implications of the pervasive involvement of information technology in the work and life in general, further major upheavals in

the global economic exchange processes are expected.

Measures and strategies implemented to date to slow climate change and mitigate the limited nature of our resources must be considered inadequate against the backdrop of the above-mentioned factors. In particular, efforts to increase the efficiency of resource use are inadequate because of the rebound effects. The increases in efficiency achieved so far are more than compensate for by increases in consumption; they are too feeble to initiate the radical change needed throughout society.

Against this backdrop, the question as to how social systems can deal proactively with these uncertainties and how long-term transformation processes can be established on a policy level have acquired a significant and dramatic importance. The pressure on policymakers to act is increasing. The question of how much time we have left to bring the consequences of climate change and resource scarcity under control – which can surely not be answered with any certainty – have led to

the consideration of whether and under what conditions system leaps might lead to a resource-light society.

## Ten tonnes are light

It is precisely this question that is the focus of a research project started this summer by the German Federal Office of the Environment on 'Conditions for the success of system leaps and guidelines for a resource-light society'. The project is being carried out under the direction of the Wuppertal Institute for Climate, the Environment, Energy and with the participation of Z\_punkt: The Foresight Company. The clear focus of the study is on the possibilities for change in lifestyles and daily routines.

According to the definition of the Wuppertal Institute, to achieve a resource-light society, we must modify our lifestyle in such a way that our total material consumption (TMC) is reduced on average to ten tonnes per capita and per year. The TMC includes all renewable and non-renewable resources as well as soil erosion due to agriculture



that consumption in a country consumes or causes. In Germany, per capita consumption currently amounts to 60 tonnes per year, in Italy 30 tonnes, in the US 75 tonnes and in the EU on average 45 tonnes.

The possible paths to a resource-light society are marked by the well-known features of increased efficiency. They are to be expanded and made extendable to increase the options for sustainable lifestyles or the focus of our production and consumption patterns on cyclical approaches (for example cradle-to-cradle). In addition to these – clearly not trivial – technological and organisational changes, a transformation on this massive scale is dependent on comprehensive social change. Often, the breaking out of routines and social constraints is necessary to achieve the necessary starting point for dramatic transformation.

## Light life isn't difficult

It is decisive for the acceptance of transformative ideas that there be a set of principles that the pioneers of transformation adopt themselves and also de-

mand from society. Here it is important to win over the citizen and consumer not as an object but as the subject of system leaps towards a resource-light society. Initial support can be provided by experimenters who are already living today the world of tomorrow and who are prepared to share their stories of success in networked communities with others. Whereas Robert Jungk was an early pioneer in proposing the collaborative design of the future with his „Catalogue of Hope“, today Harald Welzer works toward the same goal with his FuturZwei Stiftung (future two foundation), as does Niko Paech with his post-growth economy model.

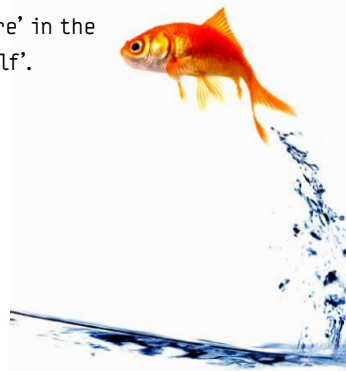
Examples, like spending a year using just 100 instead of the usual 10,000 possessions, drinking water from the tap instead of bottles, or replacing company cars with company bicycles, demonstrate already in a small way how major change can be conceived of on an individual scale.

It's a question of changes in everyday routines, embedded and supported by overall concepts, which are not based

on renouncement or regression, but which define a new form of quality of life. We can therefore already find the seeds of a society that uses as few resources as possible today. Whether and how such approaches can lead to system leaps, and what examples and experiences there are for this are the focus of the upcoming analyses.

The big transformation towards a society that uses as few resources as possible is a historically unique experiment. For this, we need creative learning processes and a flexible adaptation of measures and objectives jointly created by key players from politics, industry and civil society. ■

Klaus Burmeister and Holger Glockner are members of the Management Board of Z\_punkt The Foresight Company in Cologne. Maria Schnurr works there as Foresight Consultant with the key areas mobility and sustainability strategies. Holger Glockner wrote the article 'DIY – Contours of a new social and economic culture' in the Factory issue entitled 'Do-It-Yourself'.



»Exceedingly few people are good  
at influencing causes.  
Most people waste their time with  
the hopeless attempt to change  
effects.«

Peter Hohl (\*1941), German journalist, publisher, editor, moderator and aphorist.

Source: 'Lieber ein Optimist, der sich mal irrt...' (it's better to be an optimist who is wrong from time to time)



# For They Know What They Are Doing

Transformational products reduce resource consumption. They invite users to lead a resource-saving lifestyle, but do not force it. They are responsive to habits and offer alternatives. They show how product design can transform behaviour.

By Matthias Laschke and Marc Hassenzahl

Translated from the German by Anna-Lena Vohl, Annika Wagener, and Rebecca Brookes

Be it electricity consumption, water for a hot shower or petrol for the all too practical car, it seems clear to all users that it is necessary to reduce such consumption. But the 'how' is a matter of argument. One strategy is the use of 'sustainable' technologies and products. Energy-saving light bulbs, water-saving showerheads or fuel-efficient cars fall into this category. They are supposed to ensure that resources are used as efficiently as possible. Unfortunately, efficient technology does not automatically lead to sustainable use. Household appliances, for example, have become increasingly efficient since the 1980s.

Nevertheless, energy consumption has increased in this product category. Consumers acquire larger or even more devices because they are so efficient now. Sustainable technologies have an effect similar to absolution. Moreover, they prevent people from learning how to behave in a resource-efficient manner, from deeming such behaviour valuable and from applying it to other situations. Technology-driven sustainability tries to compensate for 'bad habits' instead of establishing 'good habits'

or even promoting awareness. There is indeed an enormous technological potential for sustainability, but in the end it is the individual behaviour that really is the decisive factor.

### From an obligation to awareness ...

Thus, the central question is: How can we encourage people to deal with resources in a sustainable way? There are different strategies for this. One possibility would be to dictate and punish (see also Bernd Draser in this factory issue, page 20). The consequence usually is reactance. Accordingly, the German news magazine *Der Spiegel* is currently criticising the 'nanny state', which has lost all confidence in its citizens and regulates every triviality. Furthermore, in the German weekly newspaper *Die Zeit*, the green starry-eyed idealists are ridiculed for their proposal of a compulsory 'Veggie Day' for German canteens.

Another strategy is to inform. Here, especially interactive technologies are of interest since they give individual feedback about one's own behaviour. They

register information, display it and thus draw attention to it. They literally want to give insight into one's own behaviour and its consequences. An example for this is the Swedish Energy Aware Clock by Broms and colleagues (Photo 1). It documents the electricity consumption of the household and displays it. The mere understanding, however, that too much electricity is consumed, often does not suffice to concretely change a particular behaviour. How and when should I behave in a different way? This watch cannot tell me that either.

### ... to Transformational Objects

This is where our transformational objects come into play. These objects represent helpful strategies (e.g. riding the bike instead of driving the car), which are beneficial to certain objectives (e.g. producing less CO<sub>2</sub> emissions). We 'materialise' these strategies in the form of objects because objects determine how we interact with the world. With a fast car we are of course able to indulge in our 'wish' of sporty driving. But at the



same time it is the fast car that brings us to the idea that sporty driving could be fun in the first place. Transformational objects know our 'bad habits' and are aware of when we tend to indulge in them. It is in these moments that these objects comment on our behaviour and confront us with alternative courses of action.

Transformational objects know our 'bad habits' and when we are susceptible to them. It is in these moments that the objects react to this behaviour and offer alternative courses of action. This generates friction. This needs to be accomplished in a way that makes it possible to perceive the 'objections' of the device not only as justified but also as friendly and appealing. Transformational objects do not give instructions and they are not know-it-alls. They are naïve and small but also powerful things – because they do not address abstract problems and numbers but everyday behaviour and specific ways to change it. It really is a long way, for example, from knowing about global warming and the daily choice between car and bicycle.

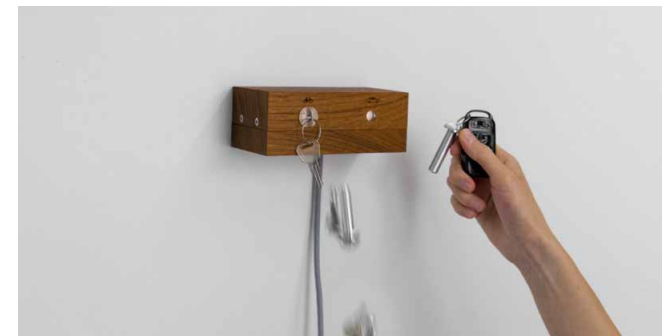
What do these objects look like and what do they do? The Not So Hungry Caterpillar consists of an extension lead and a fabric pouch that is attached to the end with the plug. In order to consume less electricity, it would be helpful to switch off all appliances that are on stand-by. The caterpillar is installed between the wall socket and the load in stand-by mode, e.g. a TV. The caterpillar has three modes. During regular energy consumption due to normal usage, the caterpillar breathes calmly. When the load switches into stand-by mode, the caterpillar begins to writhe – it suffers due to the waste of energy. It is only possible to help it by switching the television off completely. The principle behind the caterpillar is based on the human need to care for living, 'suffering things'. It catches the consumer in a concrete situation in which they are acting in response to a bad habit and strongly suggests a helpful strategy while still remaining appealing. Nevertheless, the caterpillar leaves it to the consumer to decide its fate (and consequently the fate of electricity). The consumer can choose freely whether they want to end



*The Energy Aware Clock indicates the energy consumption throughout the day. Photo by Interactive Institute*



*The Not So Hungry Caterpillar is writhing. It hates unnecessary electricity consumption.*



*The Keymoment shows us that we have a choice.*



the caterpillar's suffering or keep wasting electricity. Our studies show that the caterpillar elicits a higher emotional response and also has a higher potential for change than a multiple socket with an on/off switch.

## The Objects' Objection

The Keymoment is another example. People who want to do something good for the environment should ask themselves before every car ride whether it would not also be possible to take the bicycle. Unfortunately, the question does not even arise most of the time. People habitually grab their car keys and drive off. This is where the Keymoment comes into play. The bicycle and car keys are next to each other on the key hooks. When the bicycle key is taken from the hook, everything is fine. But when somebody grabs the car key, the bicycle key is thrown right in front of their feet. Naturally, they will pick up the key. Now, holding both keys at the same time, the decision has to be made once again – there is a key moment. Is there a good reason to take the car? The

objection raised by the key hooks generates friction. But the hooks are also 'understanding'. Once the decision has been made, both keys can be put back on their hook – no justification, no pressure. The keys could even be switched on the hook in order to deceive the system. These opportunities to cheat exist on purpose, because this is how people learn that while they may be able to deceive the system, they cannot deceive themselves.

The transformational objects mentioned above are all based on the 'aesthetics of friction'. Habits are broken and alternatives given, but that needs to happen in an appealing manner, as people like to be given advice by things or people they are fond of. The research questions that arise from looking into attitude and behaviour change conveyed via technology are numerous. For example, we, in cooperation with BMW, are researching the possibilities of promoting mindful and respectful behaviour on the streets. Sustainability research naturally opens up a lot of possibilities here. Ultimately, human behaviour has to become more

sustainable and consumption patterns have to change. However, this is primarily a psychological challenge and only secondary a technological one. ■

Matthias Laschke is a research assistant in the working group Erlebnis und Interaktion (experience and interaction) at the Faculty of Design of the Folkwang University of the Arts in Essen, Germany. Prof. Dr. Marc Hassenzahl is a psychologist and head of the working Erlebnis und Interaktion group.



»Change does not resemble walking on a level road. It is the ascent of a mountain on paths mostly untravelled by anyone.«

Michail Sergejewitsch Gorbatschow (\*2 March 1931) at the Central Committee Plenum in January 1987.

[illegible]

Translated from the German by Sandra Walter, Inga Festersen and Ruthild Gärtner

*Professor Lazzeroni, you have a workshop at Folkwang University. What do you do in this workshop?*

It's an interdisciplinary workshop which tries to introduce the latest technologies to the different disciplines. We have, for example, an old knitting machine. It's from the 1980s, but it's programmable. With this machine, we can quite easily use algorithms to produce images, which can not only be displayed on a screen, but can also be transferred onto other media like fabrics.

*What's the point of knitting on this machine?*

One of my students, Nora Peters, is currently using the knitting machine for her diploma thesis. On a website, you can commission the machine to knit tube scarves with short messages, symbols and ornaments, which then decorate lamp posts and trees. As the scarves have unusual patterns and text on them and as they are knitted very elaborately, they have an extraordinary effect. They seem strangely perfect for this tradition-

ally handcrafted work, but at the same time they are somehow absurd and interknit with the cityscape. They both irritate and communicate.

*Is the workshop a kind of technology hacker lab?*

The knitting machine is just one part of it. There are also a laser cutter and a 3D printer, and you can work with clay, metal or wood. When we use something, it's always in the context of electronic, generative design. The actual implementation is mostly analogue and results in real-world, three-dimensional, kiln-fired, knitted or cut objects. It's a haptic and tactile experience, but the design process is digital. We also work a lot with sound, sound objects...

*And interdisciplinary means that...*

... art teachers, photographers, communication designers, electronic musicians, dancers, everybody studying at a University of the Arts like Folkwang, can also work, in an interdisciplinary manner, with technologies different



© Nora Peters

from those which they typically use within their own discipline.

*Are the works that result from this more of an experimental and artistic nature or do they also have something to do with real, useful, sellable products?*

I myself am a media artist. I teach artistic methods to my students, a sort of doctrine of perception, the fundamen- ►

tals of craftsmanship and design, how to spark creative processes, how to question things and so on. What they make of it is totally different. Some of them become artists because that's the reason why they studied at an arts school. But there are also others who get good jobs in renowned agencies or those who decide to work as a freelance designer.

*And why is that?*

Nowadays, employers want people who have a special view on things, but there are only few young professionals who have good ideas, who approach new topics or who can handle the media and communication in an extraordinary way. In this respect, I have had the experience that graduates who have undertaken experimental work have always been positively received by the business world.

*Does an artistic, experimental education lead to better products?*

It's certainly not possible to generalise about that, but I know what it means to handle big projects for customers and to know that you can only

invest three percent of your innovative abilities because your customers are afraid to ask too much of their target group. It's obvious that there won't be much left at the end of the day, but it's very important to start with a certain degree of innovation.

*Could you give us an example?*

One example are the transformational products that are being developed in the workshop 'Experience and Interaction' as part of the new graduate programme. Professor Marc Hassenzahl is a psychologist, I'm a media artist, and we train designers who develop their master's thesis in the context of 'Experience and Interaction'. The students work on specific problems, but because those problems are being approached differently, they are also solved differently. Just like the Keymoment (see page 55) or upgrading the driver assistance system of BMW to a social, context-sensitive communication system.

*Many people say we don't need any more products that waste materials and resources, but instead, we need services to prevent this waste and that we actually have to try to reduce material consumption.*

That's all included. By using smart fabrics, an old ghetto blaster can be converted into a modern hi-fi system, while the old system is recycled. By using new kinds of fabrics and electronics, we have also designed a glove that makes sign language audible, helping mute people to communicate. If I decide to use my bike more frequently at the Keymoment, I protect the environment. The new upgrade for BMW would clearly be a service because nothing new has been produced, but an already existing product, produced at relatively high costs, has been updated. Our products are not products in the classic context. ►

*How do the students cope with the challenge of developing resource-efficient products?*

Today's students study far too early. There's no longer any mandatory military service, no mandatory year of social service, and only very few young people do an internship before starting university. The reduction of the number of years that pupils have to attend school also exacerbates the problem. The students have no idea of life. Many don't even know the difference between industrial and communication design. And then, some of them come along and just want to design cool cars ...

*Really? I thought those days were long gone.*

They go to the seminar and design front spoilers. And then, you have to get across to them that private transport might be on the wrong track. That really is so absurd. It's my task to make them aware that there is something else out there, something they haven't learned about from our mediatised world. I hope that at least some of them will take it in. The rest of them will still want to design

cool cars. The thing is that people need to be willing to listen in the first place.

*So you're saying that working on transformational products makes better designers create better products?*

Experience has shown that those who have worked on transformational products have good jobs now.

*Disruptive products such as the nightingale that sings during the day or the piano staircase are designed to achieve change through irritation. Is it possible to make people think about certain lifestyles through irritation?*

That's a very positive way of thinking. First of all, we get people to use their iPhones to take pictures or videos, which are then uploaded to YouTube or Facebook and commented with 'cool'. Only a very small minority will also think about what they have seen, but even those who do, will do so in a way that no one notices. In a business context, this is a very old strategy. Irritation in advertising is used to somehow catch

people's attention, to make them look at the brand again and again. Just think of Benetton's blood-smeared t-shirt campaign. Nowadays irritation has become somewhat more selective, as also small target audiences can be reached directly by technological means, but the basic principle is still the same. I draw attention to the brand by triggering a light bulb moment. This is quite simple and I don't think that this will initiate a reflection process.

*So this is more about entertainment than reflection?*

We live in a society that yearns for the ultimate entertainment. The majority of people perceive disruptive products as entertainment. There is a small minority that show a conscious reaction, but not the majority.

*What would be the way to more transformation, other than through the minorities that understand transformational or irritating products?*

The most important thing to do would be to improve our miserable



school system. We would have to strengthen pupils' perceptive and reflective abilities, and we would have to encourage schools to also discuss anti-consumerist topics. Parents are unable to cope with this, but addressing these issues at school is absolutely necessary. If these things were implemented, that would be phenomenal. It really would change things in the long run. It would make people reflect on this whole issue, but would not be limited to the small minorities that I encounter in my daily life.

*Not an aesthetisation or culturalisation of society by irritation, but an increased imaginative and reflective ability of the youngest.*

Those who have these abilities can perceive things differently because they know what they can do.

*But irritation and disruption also play a role in the products designed in your workshop, don't they?*

I have a lot of projects that use irritation, but all of them serve didactic

purposes. Let's for example consider small photovoltaic modules that are coupled with a sound generator. They're worth EUR 2.50 apiece, they are tiny, coupled with a magnet and can be thrown, for example, onto a bridge, like a throwie. When the sunlight hits the modules, some start to sing like birds, others are charged and then sing at night.

*Electronic birds' twittering?*

I know, you could say that doesn't improve the world, but it's a didactic concept to learn something as dry as programming with fun. If this were taught at school, in physics, for example, pupils would learn how to create electronic circuits and get them to sing like birds. The children would love it. They like watching people who are confused because they hear birds singing at night. They would learn so much about electronics, programming and physical principles, simply because they would enjoy it. At the same time, their perceptive ability would be improved. What is this actually about? Have you ever realised

that in cities there are birds that sing at night because it's as bright as day?

*A convertible bond for the future.*

There are so many things that could be done. Later on, we could build on that in a whole new way, for example in further education. The tasks could be more complex. You could, for example, connect tasks to questions of different disciplines or those of an employer for whom you design a product. It's more of a didactic concept than a plea for more irritation in the world. ■



Prof. Claudius Lazzeroni is a trained photographer and has a diploma in media design. He worked as creative director for Pixelpark and his agency im stall oscillated between art and commerce. Since 1999, he has been a lecturer at the Folkwang University of the Arts.

# factor<sup>y</sup> – the Magazine for Sustainable Economy

Although the word 'factory' is mostly associated with the manufacturing industry and industrial production, it can also refer to 'factor Y', the factor by which energy consumption needs to change so that future generations will find themselves living in similar conditions. Such an understanding of sustainability implies that all aspects of economic activity need to be addressed with sustainability in mind, including consumer practices as well as the manufacturing and services sectors.

factor<sup>y</sup> highlights the role of businesses in sustainable development and aims to draw the drivers of the economy into the public debate. Such development entails resource efficient economic practices for both producers and consumers as well as educating and informing them about sustainability issues.

factor<sup>y</sup> is a free magazine that is published four times a year in PDF format as well as on the magazine's website [www.factory-magazin.de](http://www.factory-magazin.de).

factor<sup>y</sup> - The Magazine for Sustainable Economics ISSN: 1860-6229, 9th year of publication: 3.2013

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[www.rabeuero.de](http://www.rabeuero.de)  
Advertising pricelist January 2012 currently valid

## Publishers:

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## Design Concept:

Oktober Kommunikationsdesign GmbH, Bochum  
[www.oktober.de](http://www.oktober.de)

## Product realisation:

ubb Kommunikation, Bochum  
[www.ubb-kommunikation.de](http://www.ubb-kommunikation.de)

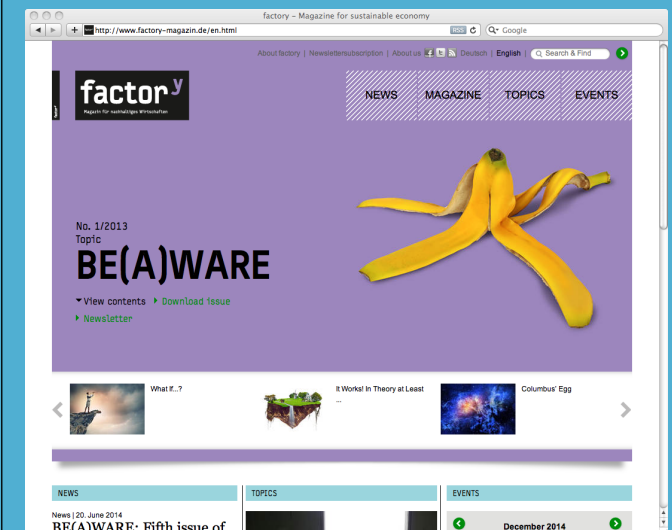
## Translation:

Done benevolently by advanced students of translation under the guidance of  
Dr. Don Kiraly, Johannes Gutenberg-Universität Mainz

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