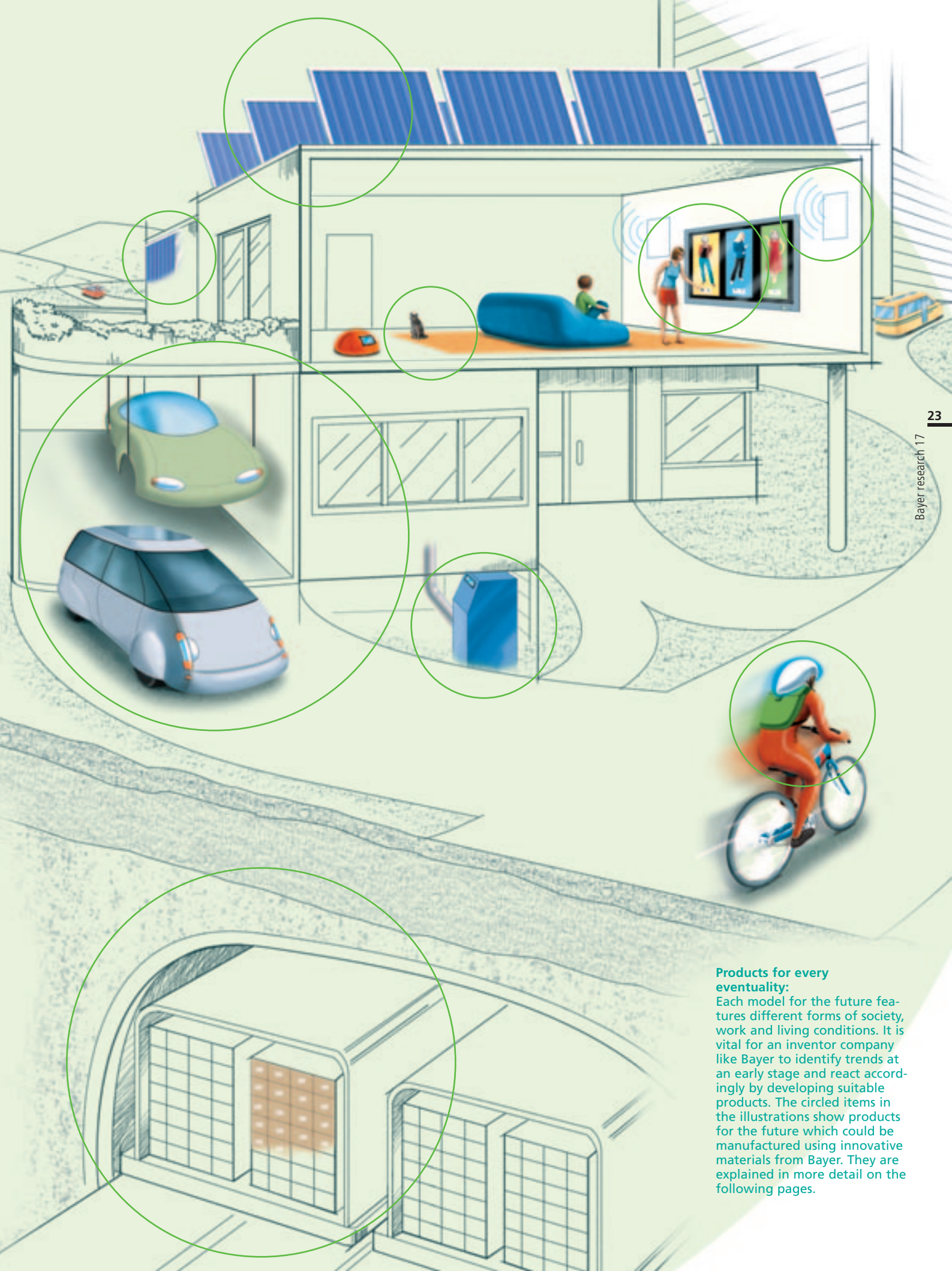


Futures researchers describe the year 2020

A picture of tomorrow

Will our cities keep growing until economic and social life is largely concentrated in megacities? Or will the trend head in a different direction? Knowing what the future holds is very important for a company, because it has to be prepared. Therefore, in collaboration with partners, the New Business department of Bayer MaterialScience has developed future scenarios of life and

work in the year 2020. In the Oligo-centers Scenario (shown at left), society is highly polarized: exclusive high-tech products and materials for a small elite contrast with goods for the disadvantaged majority of the population. In the Polycenters Scenario (shown at right), the middle class is dominant. Technology and intelligent materials enjoy widespread use.



Products for every eventuality: Each model for the future features different forms of society, work and living conditions. It is vital for an inventor company like Bayer to identify trends at an early stage and react accordingly by developing suitable products. The circled items in the illustrations show products for the future which could be manufactured using innovative materials from Bayer. They are explained in more detail on the following pages.

Future thinkers: (from left) Dr. Constantin Schwecke, Dr. Daniel Rudhardt, Dr. Meike Nies-ten, Eckard Foltin (back), Dr. Rainer Hagen, and Dieter Boesveld.

Eckard Foltin can see into the future, even without the help of a crystal ball or the mysterious rituals of a fortune-teller. To put it more precisely, the head of the Bayer MaterialScience Creative Center sees not one, but several "futures". Together with InventionNet Corporate Consultants and 12 partners from the business and university communities, his team has developed contrasting scenarios to describe our economy and the way we might live in the year 2020.

The motive behind futures studies is pragmatic: "For an inventor company like Bayer, it's important to identify trends as early as possible," explains Foltin, who is an engineer by trade. "The differentiated future scenarios are based on different paths of development, which are in turn influenced by technological and social change." Timely and systematic analysis of the various interactions helps to define

concepts that show the potential demand and market opportunities for new materials and applications.

Exploring the future in different directions

But how do you differentiate between key trends and total flops? Foltin's favorite example of a bad prediction is a diagram from the turn of the 19th to the 20th century showing predicted change in modes of transportation: the "Horse" curve points steeply upwards, while the "Automobile" curve indicates only meager growth. "What would you have invested in?" the Bayer futurist asks with a challenging smile. Back then, not even the automobile manufacturers themselves expected the boom that was soon to come. Even Gottlieb Daimler said in 1901: "Global demand for motor vehicles will never exceed one million, if for no

other reason than the lack of available chauffeurs." But the future took quite a different turn: today there are 600 million cars on the roads.

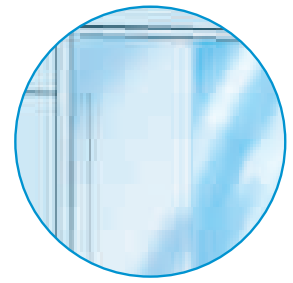
"We now know that we can't view the future simply as an extension of the present," explains physicist Dr. Rainer Hagen, one of Eckard Foltin's colleagues. If you want a rough picture of the changes to come, you have to develop complex scenarios incorporating not only technological and economic factors, but also political, cultural, demographic and sociopsychological aspects, all of which are referred to as "descriptors". "We try to define feasible alternatives for our future world," says Foltin, drawing what looks like a trumpet on a sheet of paper. "This is where we are now," he says, pointing to the mouthpiece. "The horn describes the different ways our future may unfold. The closer it is, the more certain we are about it



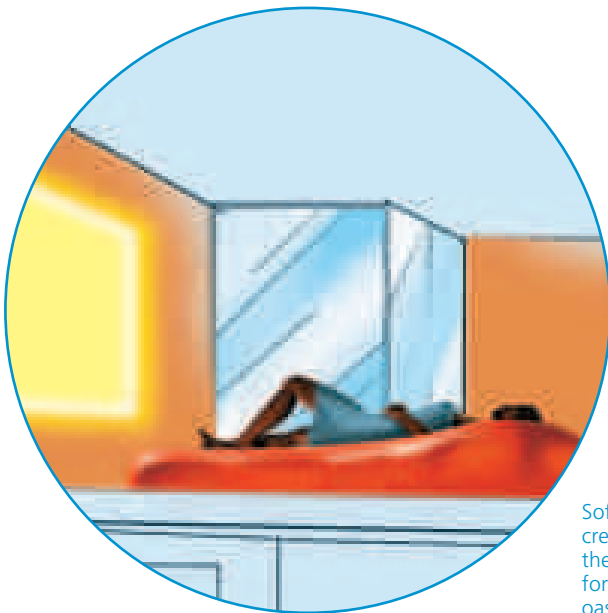
Saving energy without rebuilding: thermal insulation systems, just a few centimeters thick and bonded to the outer roughcast layer, can make low-energy homes the standard, even if they are old.



Enter at the blink of an eye: doors are unlocked with a plastic card containing, for example, an image of the iris encoded in the form of a hologram. Only when the eye of the cardholder looks into the scanner does the door open.



Transparency on/off: a partition wall made of frosted glass and coated with a conductive plastic becomes transparent at the push of a button, making a room look larger.



Soft light: luminescent film creates ambient lighting for the bathroom and transforms it into a wellness oasis.



3D experience: watching movies in 3D is possible even without special glasses, making home cinema a dramatic experience.



Relaxing in your armchair: viscoelastic polyurethane foams effectively distribute pressure over an entire surface area. The high-tech cushions make for particularly comfortable lounging.

today. But just a few years from now, the possibilities start to vary significantly. Right now, we are therefore concentrating on two, very distinct scenarios."

Foltin calls the two scenarios "Oligocenters" and "Polycenters". The first, which is the most probable from today's standpoint, is characterized by the dominance of few societal groups (taken from the Greek "oligarchy", meaning "government by the few"). In the second scenario, a number of societal forces are well represented (from the Greek "poly", meaning "many").

Oligocenters Scenario: market for exclusive, high-tech products

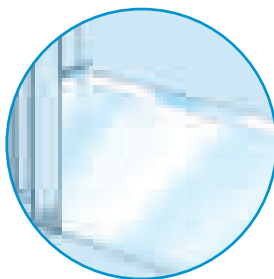
The oligocenters represent a world dominated by just a few megacities, which are enormous in size but very similar to one another. This trend can already be observed today in Tokyo or

Mexico City. The activities of people in these conurbations are governed by efficiency and economic benefit. The overall economy is growing, but uncontrolled capital flows and occasional financial overheating repeatedly lead to regional crises. As a result, companies must react extremely flexibly in their business segments and locations.

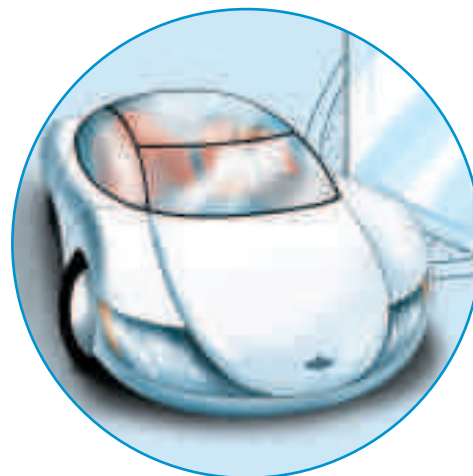
A large number of people follow these economic shifts, thereby becoming "global job nomads". It is difficult for them to form fixed social ties. As socially networked singles, they reside only temporarily in a given city, meaning that relatively few residential buildings are built new. High-quality building materials are primarily used to renovate existing structures. They help job nomads turn their apartments into comfortable homes to which they gladly retreat – provided that they can afford it, of course. In this future society, the population is sharply divided

into two groups based on income and wealth: a small, highly qualified management class versus a broad, rather impoverished majority. On account of high debt service, the government is poor. The general level of education is declining. Companies must provide for the training of their own technical and management employees.

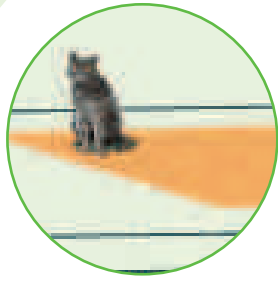
Consumption has high priority in both population segments. Therefore, markets are split into affordable mass-produced articles and luxury goods. For example, automotive suppliers must adjust to the fact that most people prefer low-priced cars with spartan equipment, while the wealthy demand exclusive, high-tech products, which for a corresponding price fulfill the most unusual customer requests. You can tell by the expression on their faces that the two Bayer futurists, Eckard Foltin and Rainer Hagen, prefer a future world like the one described in



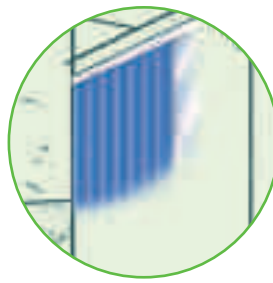
Clear limits: security fencing made of transparent but hard plastic protect residential properties while giving them an open and inviting look.



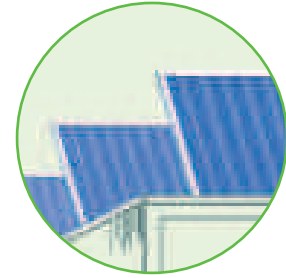
Right of way: roadway traffic is dominated by cars. Cheap, mass-produced products stand in contrast to exclusive, high-tech, custom-made vehicles. Those who can afford it use private roads to avoid the traffic jams on public thoroughfares.



Reactive rug: sensors in rugs detect smoke and fire, or determine by pressure whether the presence prowling through the house is the cat or an intruder.



Solar heating: even the façade exploits solar energy. The light passes through a transparent to a dark plastic layer. The air in the hollow space in between is warmed and drawn off to heat the house.



Cheap solar power: thanks to new methods of plastic sheathing, solar cells are more affordable and widely used.

the Polycenters Scenario. "In a world of oligocenters, people and companies are under a great deal of pressure," Eckard Foltin points out.

Polycenters Scenario: large middle class uses technology

One prominent characteristic of the Polycenters Scenario is the networking of cities in regional associations. People have much greater control over municipal life: regions are deliberately promoted as counterweights to the big cities. Capital flows are regulated. Companies are successful if they adapt their products and market strategies to local conditions. If they succeed, they can enjoy a degree of stability in these locations. In turn, the people who work for them benefit from a fairly stable job market and thus from the opportunity to plan their lives on a long-term basis. As a consequence, building activity is

extensive, but geared to cost-effective structures. High priority is given to saving energy and using solar power. High-tech products that enhance comfort and safety, or help to save time, are ubiquitous. The market for intelligent materials is large thanks to the buying power of a well-educated middle class, which plays the leading role in society.

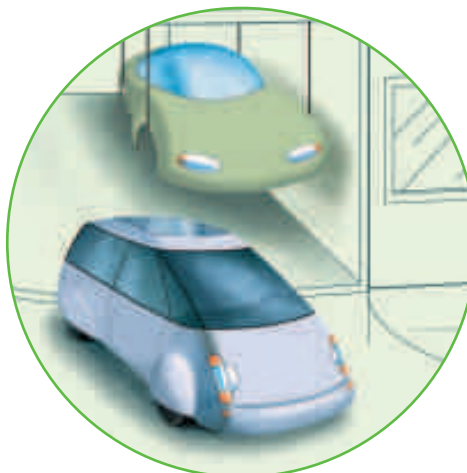
Economic development is driven by the innovative capacity of businesses and scientific institutions. Life-long, independent and multimedia-based learning is common and supported by employers. On the other hand, communications technologies and virtual work processes enable most people to freely select their place of work and to set flexible work hours. The separation of work and recreation is less distinct. Work is largely project-oriented. Project teams are constantly regrouped, thus giving individuals more free time,

which they can use, for example, to take extended leave and raise a child. Most city centers are off limits to personal vehicles and accessible only via public transportation systems. The car is increasingly replaced by flexible vehicle solutions, such as a "car on demand". Hydrogen and fuel cells are starting to replace gas and diesel engines to drive vehicles.

Oligocenters or polycenters: this is what our world may look like in the future. As a raw materials manufacturer for the building industry, it is important for a company like Bayer to know whether future demand will focus on affordable renovation work or intelligent, high-tech building materials. As an automotive supplier, Bayer is interested in discovering what the major car markets of tomorrow will demand: inexpensive family cars or exclusive technology vehicles. How will the agricultural industry produce



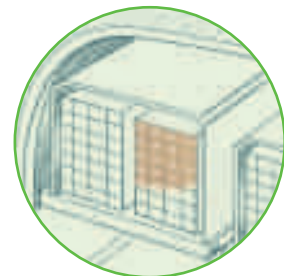
Luminescent safety film: conductive plastics in three-dimensional shapes make bike helmets glow. Two-wheelers are a major means of personal transportation.



A car for all seasons: modular vehicles offer maximum flexibility. The body and engine of a family vehicle or a sports car can be mounted on one and the same chassis. Cars are used for trips to outlying areas, because the city centers are off limits to personal vehicles.



Central control panel for the entire house: homes will be highly networked; e-shopping as well as the intelligent lighting and heating systems are controlled centrally. Increasingly small transistors enhance the performance of microchips and flat screens.



RFID chips control the distribution of goods: new plastic sheaths will make radio frequency identification (RFID) chips so inexpensive that they can be used everywhere in freight transport. Goods are delivered underground in automated conveyor systems. In supermarkets, you can leave your purchases in the cart when checking out.

food for the people in the future? How will we manage health and care for the sick? How well-trained will future applicants be for a job at Bayer? All of these questions are critical to the work of Bayer's Research, Product Planning, Marketing and even Human Resources departments.

Farsighted product development secures the future

The scenarios point to alternative ways of estimating the demand for new materials and technologies. Engineer Eckard Foltin expands his drawing of the "future trumpet" by adding lengthwise paths inside the expanding trumpet horn: "It's important for us to recognize when a development begins, in what direction it's heading, and when the direction changes," he explains, giving one of the paths a sudden downward turn.

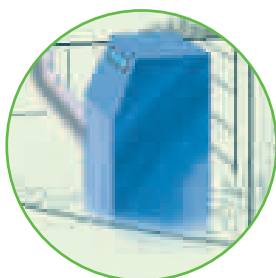
For this reason, the futurists repeatedly examine whether or not their scenarios are still realistic. "We naturally can't predict exactly what will happen in the end," Foltin says. However, that is not their objective. The goal is to identify alternatives and systematically prepare for the various possibilities that we all will face. "The value of our work lies in our ability to set the scenes for the development of products that will be needed in the future. That means that we have to deal intensively with tomorrow today."

www.izt.de/english
Information on various research projects conducted by the Institute of Futures Studies and Technology Assessment in Berlin.



Invisible loudspeakers: panels made of a special polyurethane and installed inside the wall function as loudspeakers. You can listen to music or the radio without boxy loudspeakers.

A glowing way to save energy: Eckard Foltin (left) and Dr. Rainer Hagen with an LED flat lamp.



Electricity from hydrogen: high-temperature fuel cells made of ceramic materials generate electric power from hydrogen. Hot water vapor is the only byproduct, and its energy is likewise used for heating.

