

INSPIRED BY NATURE

Conference report for
the 19th European Trend Day, March 8, 2023



«Welcome in the age of biology!»

Karin Frick

Principal Researcher, GDI, p. 8

«Nature is a space of possibilities. In it we can do what we previously thought was only possible outside of it.»

Tobias Rees

Founder Transformations of the Human, p. 6

«The goal is a regenerative economy in which we design and produce as nature and for nature.»

Carole Collett

Co-Direktorin Living Systems Lab, p. 14

«Plants can hear, can learn, can remember – and we have no idea how they do it.»

James Bridle

Author and Artist, p. 10

«For us, it's about opening our imagination to all the possible values of nature.»

Joshua Kauffman

Founder Ground Effect, p. 18

«AI will soon be able to talk to animals. We just don't know if we'll understand it then.»

Aza Raskin

President Earth Species Project, p. 13

«Rewilding means letting nature take the lead. Because she's good at taking care of herself.»

Frans Schepers

Executive Director Rewilding Europe, p. 12

«Bacteria in our body have 100 times more genes than we do. From that point of view we are more bacterium than human.»

Markus Arnoldini

Lecturer in Health Sciences, p. 17

«Working with biology is quite hard and very expensive. Where does the money come from for this? From big corporations.»

Christina Agapakis

Creative Director Gingko Bioworks, p. 18

«DNA is the oldest information system system of our planet. And additionally incredibly efficient.»

Cyrus Clarke

Co-Founder Grow Your Own Cloud, p. 17

«Living structures are never completely done. If a project were finished anyway, we would have failed.»

Ferdinand Ludwig

Professor of Landscape Architecture, p. 16

Inspired by Nature – Enabled by Science

We are facing a new age, the age of biologization. Science is creating the basis for this next technology, for economy, society and nature. If you want to know where the age of biologization is taking us, you need to understand what happens in science. And how research and development is carried out all the way from the initial idea, through experiments and prototypes, to the everyday product.

Even if it sounds like «science fiction», science has already succeeded in decoding considerable parts of nature and understanding non-human life and intelligence. After decades of intensive research, biotechnology is now emerging from its infancy and is at the beginning of a new stage of development: the pace of research and development is increasing, the prices of basic technologies are falling, and the time has come for innovative start-ups to begin tinkering with marketable products. Soon, animal-free meat and leather made from mushrooms will find their way from the lab to stores.

At the Gottlieb Duttweiler Institute, we are looking at how these scientific advances will change business, medicine and consumer behavior. We

want to understand how biologization can help us to create a sustainable future with renewable materials, fuels and recyclable products.

The 19th European Trend Day at GDI provided a first glimpse and outlook on the dawning era of biologization. Experts from science and practice presented groundbreaking developments and discussed how people need to change their behavior, companies their business models and countries their policies in favor of a more sustainable way of living and doing business.

With this conference report, we want to capture some moments and «takeaways» from the Trend Day. We have summarized the contributions of all the speakers. And although developments continue at breakneck speed, it is important for us to pause briefly with the Trend Day and this conference report to take the pulse of the change. Whether you were there in person at the GDI or not, we want you to be able to say you were there.

Nature has always been a role model, but now it is even more than that: «Inspired by Nature - Enabled by Science».

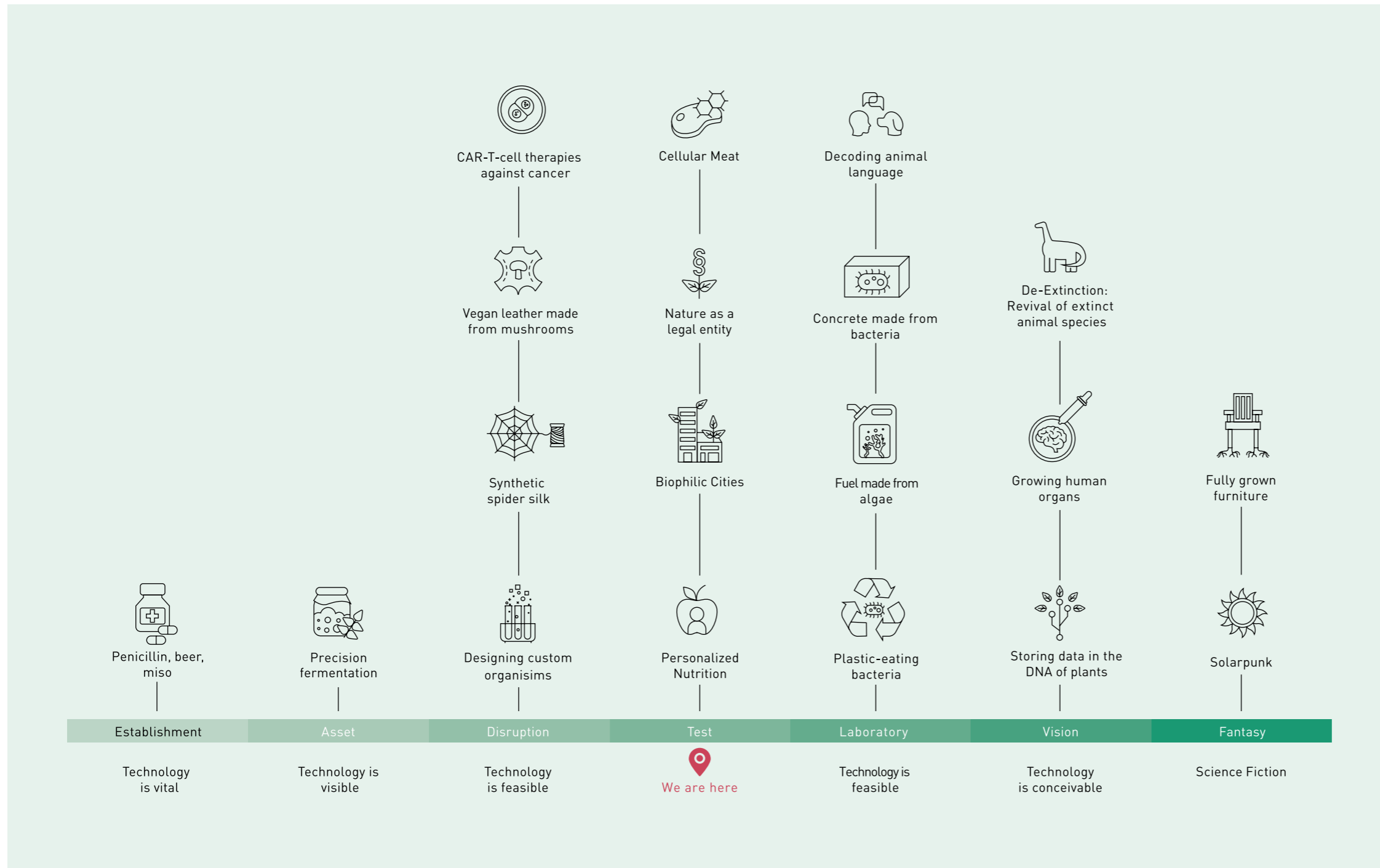


Dr. Johannes C. Bauer

Head of Think Tank and member of the Executive Board, GDI Gottlieb Duttweiler Institute

The new age of Biology

The next Megatrend



Vegan leather made from fungi, plastic-eating bacteria or data storage in plant DNA. The future belongs to biology. The bioeconomy could reach a volume of several trillion dollars in the next ten years. And that would be just the beginning. This GDI graphic shows the potential of the bioeconomy.

There are numerous indications that biology will become the basic technology and the most important driver of innovation for economic and social progress in the coming years. The age of digitization is followed by the age of biology.

Technological development has progressed so far that more and more products are making the leap from the laboratory to the market: food from the bioreactor and cell therapies against cancer are current examples of this. Further cases are shown in the diagram. However, many other bio-technologies (some examples also shown here) are still in the petri dish or seem to be pure science fiction.

Apparently there are no technical limits to what is feasible with this biological megatrend. If gigantic sequoias can grow from tiny seeds, it is also conceivable that one day plants produce chairs as fruit. Although «Jurassic Park» was produced in Hollywood, there is nothing theoretically impossible with bringing extinct animal and plant species back to life via their DNA.

If someone draws the limits of what is feasible, then it is not science, but politics and society. And so all of us. ■

Nature

– the new Leading Technology



Tobias Rees
Executive Chairman
Transformations of the Human,
(ToftH) USA

► [Website](#)

Tobias Rees is a philosopher, founder and CEO of Transformations of the Humans (ToftH). Photo: Andre Grimm

Our modern concept of reality is based on the difference between nature, humans and technology. This has always been on shaky ground, because nature is in us and technology is in nature. With synthetic biology, the separation finally becomes obsolete: nature becomes a space of possibilities - in it we can do what we previously thought was only possible outside of it.

We are living in wild times. We are living in poetic times.

«Alles ist nicht es selbst», Everything is not itself, writes Rainer Maria Rilke in the Duino Elegies: the very nature of things is that they can become something completely different. This is what we experience in the world we live in: what was solid and unchangeable becomes a mere concept. Fundamental certainties are falling apart. We know this for our relationship to politics, business and

society. But it will also apply to our relationship with nature and technology – and also to nature itself. Everything is not itself.

Our basic certainty in relation to nature is difference: nature is a closed space, humans are not part of it, but somehow different. We go into nature, into the forest or the mountains, and we go out again, into our own space. This difference between humans and nature is the western concept. It has helped us to define ourselves as human beings – in contrast to nature.

When technology was given a leading role in the Industrial Revolution, the triad of the modern concept of reality was complete:

Nature Human Technology

Nature comes first, mankind separates from it, technology assists by working on or conquering nature. And just as man defines himself through the difference to nature, technology is also no part of nature, but somehow different.

This is a concept. But it's not the reality. The fact that humans are not separated from nature is shown simply by looking inside ourselves: at our microbiome. Countless species of microbes live in our gut. What they do or don't do there has a crucial impact on our being human. We cannot separate ourselves from this nature within us, even if we wanted to.

And the technology? It is not different from nature, it is always *in* nature. This even applies to breathtakingly new technologies such as CRISPR gene editing. It wasn't invented by humans a decade ago, but by bacteria about 3.5 billion years ago.

With synthetic biology, a new field of cooperation between technology and nature is now opening up. Synthetic biology creates something new – but it creates nature. With it we are taking the path from «biology in technology» to «technology in biology». We can biologize industry.

This is how we change nature. It is no longer iden-

tical with itself. It can become something completely different. But that, again, is – its nature. The infinite combinatorial diversity of DNA describes a space of possibilities: there could be many more things than there are.

Nature is a space where things can be done that we always thought could only be done outside of nature. But when nature is within us and technology is within nature, there is no outside anymore. ■

► [Video interview with Tobias Rees](#)

Takeaways

- **Separated** The difference between nature, humans and technology is a construct, not a reality.
- **United** Just as nature is in us (e.g. in the microbiome), so is also technology in nature.
- **Change** Synthetic biology creates a new nature – which has always been possible.

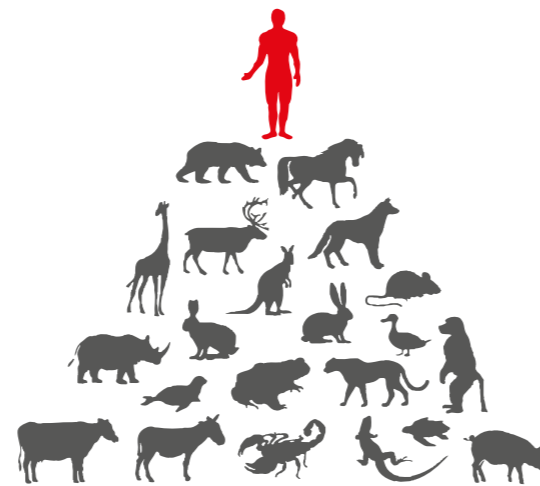
Ecocentric worldview

Biologization will be at least as important and influential for the economy and society as digitization. During this process, a new relationship between humans and nature must be developed. A survey by the GDI shows that this change has already begun.

The biosphere is finite, unlike the infosphere. When nature becomes scarce, we have to develop a new understanding of it: a «biophilia», i.e. a love for the living. Until now, such an attitude stood for a tendency to want to go back to nature and produce and live like we did 100 years ago. What is new is that, with the help of new technologies, one is moving forward to nature and «the artificial» becomes natural.

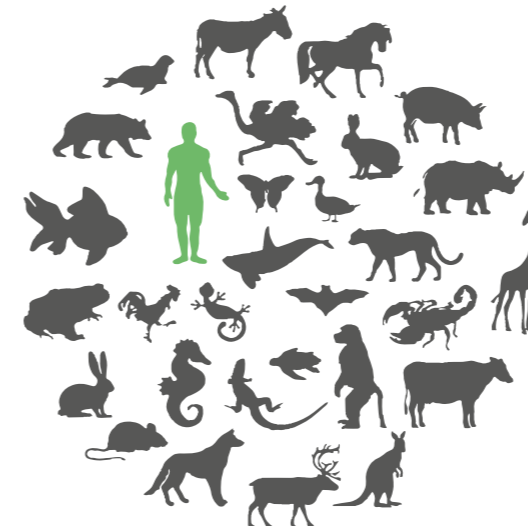
We are observing a change in values, away from an anthropocentric to an ecocentric worldview in which humans see themselves as part of nature. A current survey by the GDI shows how far this change has already progressed. A kind of democratization of all living things is taking place, more and more rights are being demanded for all living beings, plants and animals. In the future, diversity and inclusion will also include animals and plants.

This change in values is put to the test when it comes to the acceptance of new products. This debate is currently taking place in the food sector, where more and more food no longer comes from the field but from the laboratory. Two other economic sectors that are also advanced are pharmaceuticals and fuels. Acceptance is high when it comes to healing or repairing environmental damage; loss of control is seen as the main risk. Not every concern may be justified - but if we don't include people into our journey, the development towards the age of biology will not take place. ■



13,3 %

of the Swiss population see humans as the top of a natural hierarchy and as superior to other living beings.



63,4 %

see themselves as part of a natural community, just like other living beings.

Takeaways

- ▶ **Inclusion** no longer refers only to people - but to all living beings.
- ▶ **Approval** for new biotechnologies is high where repair or healing is involved.
- ▶ **Distrust** of biotech is particularly prevalent where there is a fear of loss of control.



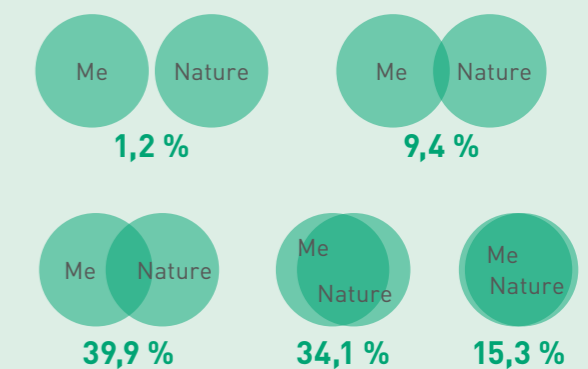
Karin Frick
Principal Researcher Gottlieb Duttweiler Institute, Switzerland
▶ [Website](#)

GDI-survey

Our relationship with nature

In addition to technical innovations, the age of biology also requires social change - a mind shift. A survey by the GDI shows where Switzerland stands today.

How connected are you to nature?



Democratization of all living things

Plants and animals have basically the same rights to exist as humans



- tend to agree or fully agree
- partly, partly
- tend not to agree or disagree at all

Source: Representative survey of 1000 people living in Switzerland, GDI/Intervista, January 2023

Forward to Nature

Infinite Intelligences

Our world view is strongly influenced by our own horizon. In the industrial age, we understood the world as a machine; today, we understand the world as something that can be calculated – as a computer. But this is a very narrow, literally binary world view; and we are currently in the process of programming this limited perspective into artificial intelligence.

Our notion of intelligence is a glaring example of this limitation. When we use the term, we always mean our human intelligence, abstract and focused on the brain. But all around us there are infinitely more types of intelligence: in plants, in animals, in fungi, intelligences with and without brains. Even if we don't understand how they work – they exist, since many million years.



James Bridle
Author, Artist and
Technologist, Great
Britain / Greece
► [Website](#)



Gibbon Intelligence

In the bait-stick animal intelligence experiment, you place some food out of the animal's reach and give it a stick to get there. Apes usually succeed in doing this, but gibbons simply don't react. But not because they are stupid, as was shown when the stick was not placed in front of the gibbon but above it, where in the wild most of its food is found. The task was solved in a matter of seconds.



Cress Hearing

Researchers recorded the sounds of caterpillars feeding on the leaves of cress plants, and then they took the caterpillars away, and played the plants the sounds again. The plants reacted in exactly the same way – flooding their leaves with chemical defences – as they did when actual caterpillars were present. Plants, it turns out, can hear.



Mimosa Memory

Researchers dropped mimosa plants into their pot from a short distance to elicit a shock response. When the mimosas are touched or shaken, they quickly curl up – but after a few drops they just stopped doing so. The mimosa had learned to ignore this particular, harmless stimulus. And they still behaved the same way when they were tested weeks or months later. So plants can learn and remember.



Squid Sharp-Sightedness

Cuttlefish, octopus and squid belong to the zoological class of cephalopods. The structure of their eyes is similar to that of humans – however, they do not have a blind spot like we do. Experiments have shown that cephalopods can distinguish people from one another based on their appearance. It is much more difficult for us to distinguish individual cephalopods.



Slime Mold Design

Slime molds of the genus *Physarum polycephalum* will spread to any food they can reach. In one experiment, researchers made a map of the Tokyo region by placing oat flakes where the region's major cities are located. The routes the mold took to get to the flakes corresponded pretty closely to the region's main transport routes. The mold can even solve complex network problems – like the «Travelling Salesman problem» of finding the shortest way between a given number of cities: For computers, the complexity increases exponentially with the number of connections – the slime mold continues to grow linearly.

Takeaways

- **Arrogant** Accepting just our intelligence as the real one.
- **Ignorant** Denying intelligence to animals and plants
- **Narrow** Programming AIs only in analogy to human intelligence.

For a wilder Europe



From Portugal to Romania: Rewilding Europe has already brought ten landscapes closer to their natural state.

The more people and agriculture withdraw from an area, the better nature can be restored there – and on a large scale.

For the first time in many centuries, there are landscapes in Europe without agriculture and grazing. This gives us the opportunity to bring back nature in large regions, which had been suppressed by man.

The most important reason for this is urban growth and rural exodus. Because if people leave

the land, the forests return – and with them the wild animals. And where they come back, some young people also come, who want to live in harmony with nature, not against it.

Rewilding tries to start this process – and then let nature take the lead. Because nature can take care of itself. In the ten rewilding regions spread across Europe, the task is therefore more to avoid problems between wild animals and people. ■

► [Video interview with Frans Schepers](#)

Takeaways

► **Forests** grow all by themselves everywhere in Europe as soon as fields and pastures disappear.

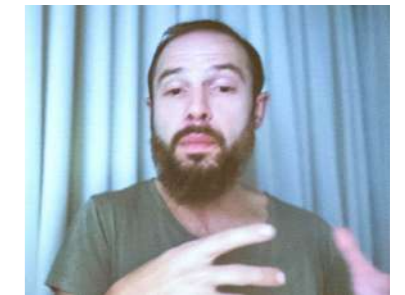
► **Wild animals** from lynx to bison to bears can be reintroduced into rewilding areas.

► **Villages** can come to terms with wildlife—even with bears.

Frans Schepers
Executive Director
Rewilding Europe,
Netherlands
► [Website](#)



Decoding aid: The Rosetta Stone, found in 1799, made it possible for the first time to decipher Egyptian hieroglyphs.



Aza Raskin
Co-Founder and President
Earth Species Project, USA
► [Website](#)

Talking with animals

Artificial intelligence opens up a new way to understand the languages of animals and to communicate with them. Even if it may only be the AI that will master this, not us humans.

Until now, the translation of unknown human languages required a link, such as the Rosetta Stone, which made it possible to decipher the hieroglyphs. No such links exist for animal languages. In 2017, however, AI researchers found a way to get by without a Rosetta Stone: They discovered a geometric structure for languages.

These structures arise from the relationships between the words in a language: which words are often used in connection with a specific word. This creates patterns – and for a word like «dog», these patterns are very similar in English, Spanish, Finnish and Japanese.

In this way, animal languages can also become translatable in principle. Though animals have other environments and cultures than we humans, they share many social concepts with us: like caring, love, sadness, curiosity.

The Earth Species Project works simultaneously with the languages of many species, but only in social animals such as whales. There's no Dr. Doolittle moment yet, but soon AI will be able to respond to an animal by predicting the next step in a communication. However, it is not yet clear whether we will then understand the response given from the AI to the animal. ■

Takeaways

► **Related** are words that are often used together.

► **Comparable** are the structures of such relationships.

► **Social Concepts** such as caring or curiosity connect animal and human languages.

Technobiology

Biofabrication

Biofabrication will transform both textile production and the fashion industry in this century. Circular economy and biosynthetic materials are becoming a prototype for a regenerative luxury that combines ecology and creativity.

Today's economy operates in a degenerative manner: it reduces or degrades the resources that go into the production process. The anthropocentric approach of extracting everything that benefits us from the earth, from the animal and from the plant kingdom leads to climate change and a collapse of biodiversity.

We need to move toward a biocentric approach that is not only people-friendly but life-friendly in general. For the economy, this means the transition to a regenerative economy in which resources are conserved. Design and production do not exploit nature, but work *like* nature and *for* nature.

How does nature produce something? It works at ambient temperature, it uses locally available re-

sources plus solar energy, and it produces in a closed loop system in which all end products become starting products for other processes. This also corresponds to the biomanufacturing approach: Products are manufactured by living cells such as bacteria or mycelia in biological processes using locally available resources.

Our production processes are currently still very far from this state – but as a species we are very good at changing systems. The graphic below shows this human characteristic using the example of textile production: From the 100 percent natural-based manufacturing in all of human history before the Industrial Revolution, not much was left in the 20th century. Synthetic fibers and petro-

leum-based dyes played a major role in textiles and fashion.

A similarly serious transformation has already begun – to bio-circular textile production. Nature uses living organisms to create a variety of fibers and fabrics, from spider silk to tree bark fleece. Now it's up to us to integrate biological principles into the production and design process. An example of this adaptation is the production of leather from mycelia, i.e. mushrooms: ten years ago, mycelia leather was a pioneering product – today, the first Hermès bags are made from this material.

Because biofabrication works with living cells, its use requires ethics and transparency. And that's going to be the real challenge for the fashion industry; because it has never been very good at transparency. ■

Takeaways

- ▶ **Biofabrication** means production of products from living cells, such as fungi or bacteria.
- ▶ **System change** has always been one of the core competencies of mankind.
- ▶ **Bio-design** combines the use of locally available resources with a circular system.

Bark fleece made by *lagetta lintearia*



Carole Collet
Professor of Design for Sustainable Futures
Central Saint Martins
UAL in London,
Great Britain
▶ [Website](#)



Technobiology Biodesign

Living with nature and in nature is not a unique feature of hermits and lumberjacks. In the Age of Biology this is much more a characteristic of every society and of many products. This requires not only a rethink but also a redesign – of value chains, of business models and of production processes. At the Trend Day, examples were presented from the fields of architecture, medicine and information technology.

Takeaways

- ▶ **Plants** are masters of adaptation. We can work with them instead of against them.
- ▶ **Bacteria** are our most underestimated body part. For now, because research is catching up.
- ▶ **DNA** could store data 1000 times more efficiently than the cloud.



Living Buildings

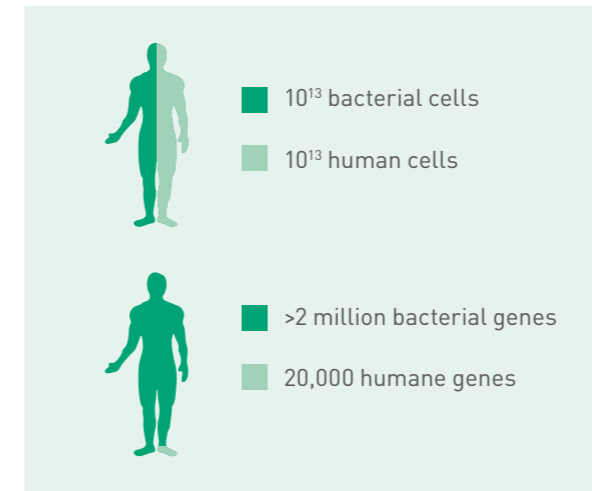
In our culture, there is actually no intersection between architecture and botany – it is an either/or. Not so with the Khasi people of north-eastern India. They live in the rainiest region in the world – with up to 26,000 millimeters of rain per year. Any bridge there would rot away or be swept away by the water.

The Khasi's solution are living bridges: they are planted from rubber trees (*ficus elastica*), which are intertwined as they grow. There is no fixed construction plan. Every year you talk to the tree, to see how it is doing and where it wants to grow.

Since 2012, we have also been following this example for projects in Germany, for example connecting avenue trees with steel roofs or in houses with living exterior walls. Unlike traditional architecture, living structures will never be completely finished: when a project is finished, we have failed. ■



Ferdinand Ludwig
Architect and Professor of Green Technologies in landscape architecture, Technical University of Munich, Germany
▶ [Website](#)



Microbe Boom

Bacteria form the second largest biomass on the planet: after plants, before animals. And they also form the second largest biomass in humans, after humans themselves: Every second cell in the human body is a bacterial cell. Some areas of the body are kept largely free of bacteria by the immune system, such as blood and urine. In other places however, such as the skin and intestines, the immune system acts much more relaxed.

When it comes to genetic variability, bacteria are clearly superior to us: they have 100 times more genes in our bodies than we do, with a correspondingly greater variability of functions. Genetically, we are more bacterium than human.

These bacteria are used therapeutically in stool transplants. The benefit after a clostridial infection has been proven. However, the effectiveness of stool transplants is also being researched for many other diseases. ■



Markus Arnoldini
Lecturer Department of Health Sciences and Technology, ETH Zurich, Switzerland
▶ [Website](#)



Data Forests

The data industry consumes 2% of the world's energy and produces 4% of the world's CO₂ emissions – and often uselessly: 60% of the data stored in the cloud is never used again.

Storage in the world's oldest information system, the DNA, would be orders of magnitude more efficient. It allows an extremely high density: all the stored data in the world could fit in a delivery van. Plant DNA is long-lived and de facto immaterial, requires little energy, absorbs CO₂ and can multiply – a great way to back up data.

Is it ethical to use DNA to store data? An experiment from 2018 provides an answer. We opened a shop in Copenhagen in which we simulated data storage in plants. No one asked ethical questions; and everyone was keen to take their plant home with their personal data stored in it. ■



Cyrus Clarke
Co-founder Grow Your Own Cloud, Great Britain
▶ [Website](#)

Technobiology

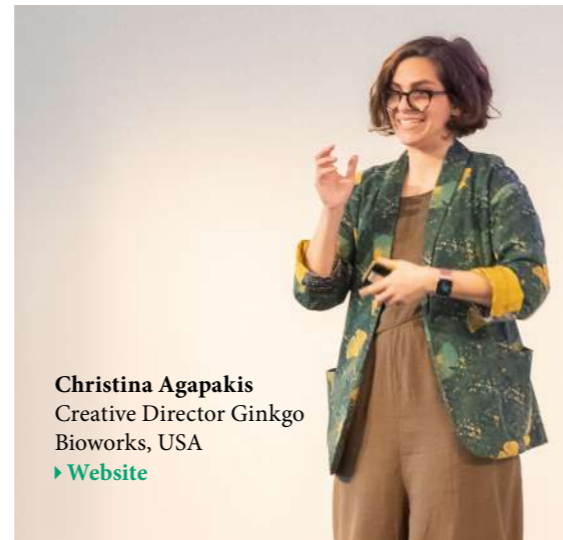
Bioeconomy

When a new era dawns, an almost infinite number of business opportunities arise, not all of which, however, become successful on the market. At the same time, the transformation threatens virtually all existing business models, although not all of them will actually disappear. The transitional phase that we are currently in is correspondingly dynamic and volatile. The Trend Day presented a biotech start-up that is already listed on the stock exchange and one investor who focuses on biophilia.

Takeaways

- ▶ **Investments** in Biotech research often come from big Corporations that care more about innovation than about transformation.
- ▶ **Valuation** of nature must also take into account the concerns of nature itself. But the methods for this are often not yet available.

Organism Industry



Christina Agapakis
Creative Director Ginkgo
Bioworks, USA
▶ [Website](#)

Good Money



Joshua Kauffman
Founder Ground
Effect, Switzerland
▶ [Website](#)

In industry, there is still an oil-based logic and logistics. Synthetic biology, on the other hand, is very open to the synthesis not only of bioproducts, but also the synthesis of technology and nature. As attractive as that sounds, it will be, or rather become, complex and confusing.

We are not yet at the stage where we have biological technology on an industrial scale. But we want to be able to get there. For this we should consider two things: First, there is not only one such «there», but there are many possible «theres». And second, the way from her to these theres will not be a straight line. The process may contain many detours or even steps backwards.

Biophilia is when people feel the body of the earth as their own. We will experience it: Civilization is on the way from controlling nature to triumphing as nature.

At Ground Effect, we are about to reunify humans as nature. This is not easy to measure with financial investments. For this we would need new definitions of wealth and returns that do not yet exist in a generally accepted form. That's why at So at Ground Effect we are committed to opening our imaginations to all the possible values of nature, and to explicitly embed them in human decision-making. Every investment is consciously based on this theory of change.

An example of our investments is a venture capital fund called Superorganism, the first fund dedicated exclusively to biodiversity. Why biodiversity? Because it is the best measure we have of the health of our planet's life.

Working with synthetic biology is really hard and costs a lot of money – especially when it goes beyond the lab and into industrial scaling. Where does this money come from? From big corporations. They are not interested in major transformations at all: They want more or less the same as before – just a little bit better. That will certainly not be what we end with, but you can start working with it. It is the crack that opens a door; what's behind the door we'll find out when we open it. ■

▶ [Video interview with Christina Agapakis](#)

The market for biodiversity is quite small, but is anticipated to grow to be several times larger than the market for carbon-based products. In addition, the damage to the global economy caused by the loss of biodiversity is estimated by the OECD at more than 4 trillion dollars.

Huge financial, scientific and entrepreneurial forces are rushing in here. And many technologies have yet to be developed, from how we sense, measure and monitor biodiversity, to how we value biodiversity, securitize it and then bring it to market. This gets us right into the thick of the trickiest ethical questions about how we value nature and financialize it in terms that balance not only human demands, but also the interests of nature beyond human beings. ■



Trend Day Conversations



Leaders of tomorrow: Villars Fellows Emily Ringger, Matteo Markel and Kate Chakravarty in conversation with Tama Vakeesan (left to right)

Three fellows from the Villars Institute, which was founded in 2022, were invited to engage in dialogue between the generations. So much desire for change gives hope, said Matteo Markel: «In today's world, we usually reap the fruits of trees planted yesterday. It's good to see people here planting trees today whose fruits we can harvest tomorrow.»

Photos: André Grimm



Left: Angelika Kölle (Kölle Consulting and Training), Francesco Benini (CH Media) and Roman Koller (Koller pr & event management)
Right: Marcel Gabriel, Christa Augsburg and Silvio Tschudi (SHL Swiss Hotel Management School Lucerne)



Left: Martin Mayrl (TK Architekten AG)



Right: Thomas Angehrn (AFH Angehrn AG), Corinna Rutschi (Bühler AG) and Christian Witt (E. Breuninger GmbH & Co)



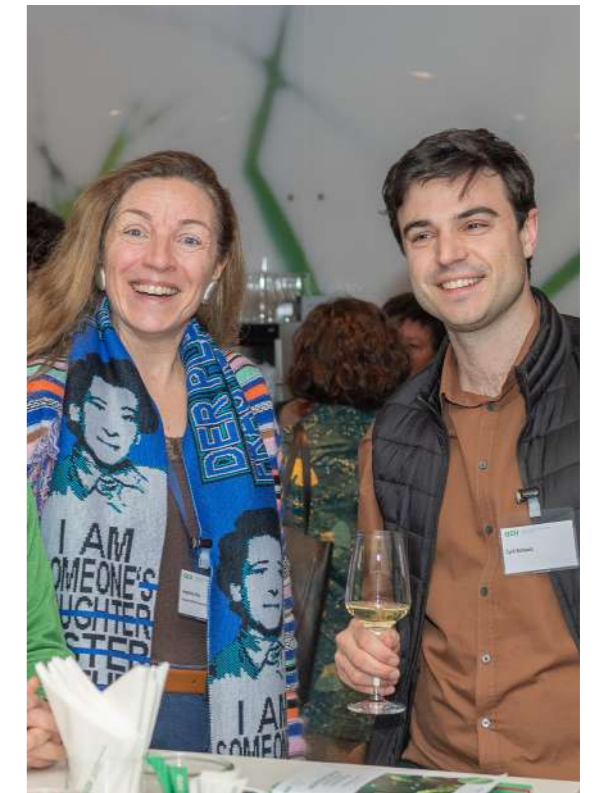
Left: Michael Mettler (Mettler Architects), Ayan Abukar (Grow Your Own Cloud), speakers Cyrus Clarke and Tobias Rees;
Right: Wolfgang and Paulina Spang.



Left: Tania Ineichen (GDI) and Dominique v. Matt (Jung von Matt / brand identity);



Right: Kerstin Klausner and Hedy Graber (Federation of Migros Cooperatives), Johannes Bauer (GDI)



Speakers in conversation: Christina Agapakis and Joshua Kauffman with Erwin Meier-Honegger (Ernst Meier AG), Jan Gsell (University of Konstanz) and Felix de Rosen (Polycultura)

Left: Alexa Firmenich (Ground Effect); Right: Angelika Kölle and Cyril Schwarz



Left: Hubertine Underberg-Ruder (Underberg AG), Antonia Ruder, Markus Seitz (St. Gallen University of Teacher Education); Right: Roman Koller and Silvia Gemperle (Energy Agency St. Gallen GmbH)



save the date

June 21, 2023
3rd International Food
Innovation Conference

September 7/8, 2023
73rd International
Retail Summit

March 14, 2024
20th European
Trend Day

Information and registration:
[▶gdi.ch/en/events/conferences](https://gdi.ch/en/events/conferences)



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