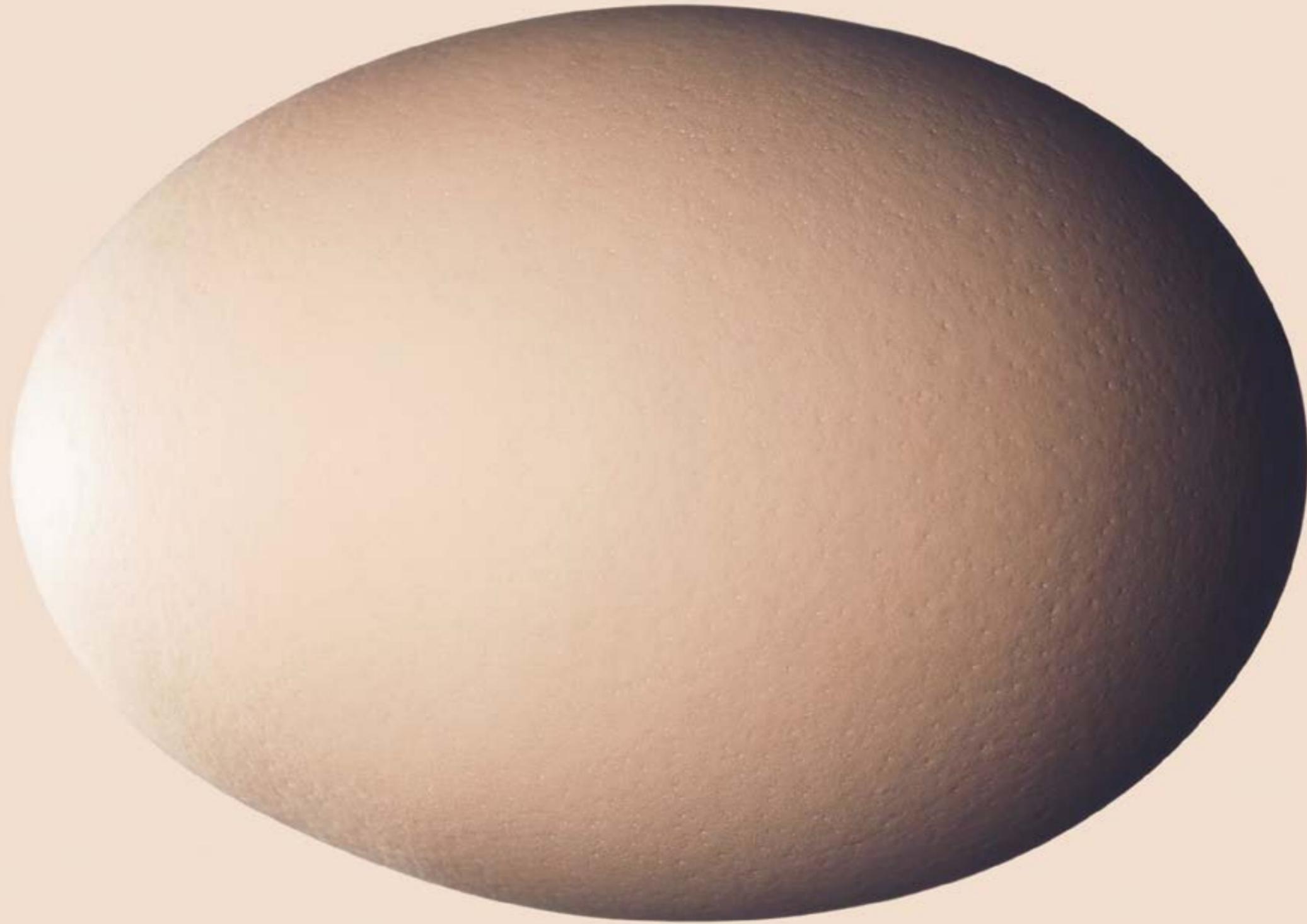


**ROOSTER OR HEN?**

In chicken farming, the gender issue can have existential consequences: Because male chicks won't eventually lay eggs and are not suitable for meat production, millions of them are killed. The Dutch startup In Ovo, in which Evonik holds shares, is combating this practice by offering a method that makes it possible to detect a chicken's gender while it's still inside the egg. In this process, a tiny hole is bored in the eggshell and a sample of the egg's contents is checked for biomarkers with a mass spectrometer. This enables early sorting and avoids subsequent suffering.



# Hands-on Art

The mosaic in the new subway station at the former World Trade Center is protected by PROTECTOSIL®

The artwork covers an area of 402 square meters along the subway platforms



The trains of the New York subway system serve 472 stations all over the city—now once again including the Cortlandt Street station in lower Manhattan. This station, which is located under the former World Trade Center complex and was destroyed by the terrorist attack on September 11, 2001, has been reopened. The location’s significance is highlighted by the mosaic stretch-

ing along both walls of the station. Titled “Chorus,” it was created by the multimedia artist Ann Hamilton. In raised script formed by countless chips of white marble, the mosaic displays passages from the Declaration of Independence of 1776 and the United Nations’ Universal Declaration of Human Rights of 1948. Hamilton hopes that subway passengers will touch the letters of the texts

as they read them. To make sure this work of art, whose value is estimated at more than US\$1 million, is not damaged in the process, and to protect it from graffiti and dirt, it was treated with PROTECTOSIL® products from Evonik. “We are very confident that travelers and commuters will be able to enjoy ‘Chorus’ for many years,” says Pete DeNicola, Head of Marketing Americas at Evonik.

# 18

PERCENT

growth was posted by the **3D printing market** in 2018. According to the industry analyst Smartech Publishing, the sales of software, hardware, and materials for additive manufacturing were almost **€8.2 billion** worldwide.

## POWER-TO-X BRINGS RELIEF TO GRIDS

The transformation of electrical energy into heat, chemical products or fuels (power-to-X) can be used to relieve the burden on the electrical grid. That conclusion was reached by a consortium of seven research institutes in North Rhine-Westphalia at the end of a three-year research project. The aim was to find out how this technology can be used to ensure a stable power grid and supply security while increasing the use of renewable energy sources. The research results: [strom-zu-gas-und-waerme.de/aktuelles/](http://strom-zu-gas-und-waerme.de/aktuelles/)

THAT’S BETTER

## The Dustbin of History



What happens to household waste in the EU’s 28 member countries, per capita

In 2017 each EU citizen generated 467 kilograms of **household waste** on average, 74 kilograms more than in 1995. But behind these figures there’s a hidden improvement. Much of the rubbish that is being collected today was previously disposed of illegally—especially in the EU’s new members from Eastern Europe. In addition, the volume of rubbish that goes into landfill has been reduced by 62 percent, and **175 percent more rubbish is being recycled or composted.** These figures are still growing.

Source: Eurostat

GOOD QUESTION



### “Professor Stadler, Why Do We Understand Texts on Paper Better Than on a Screen?”

There’s a lot of evidence indicating that when we read printed factual texts we use different reading strategies than those we use for reading displays. We’re accustomed to reading challenging texts on paper intently and thoroughly. This strategy results in an in-depth understanding of the text. By contrast, we’ve learned to take in a flood of short texts from our displays, such as pop-ups and instant messages. We can manage this flood more effectively if we merely skim these texts. If we transfer this rather superficial reading method to difficult texts, things become problematic. In several studies, subjects who read factual texts under time pressure showed less understanding of the texts if they were on a display. We assume that they continued to use their superficial reading strategy, even though concentrated reading was required.

Prof. Marc Stadler is a professor of education at Ruhr-Universität Bochum

# Rewards and Punishments

What AI researchers are focusing on today

Reinforcement learning is playing a growing role in the field of artificial intelligence (AI). This was pointed out by an article in the MIT Technology Review whose authors had analyzed 16,625 scientific papers written over a period of 25 years. The authors analyzed the texts to find out which keywords were used especially often. Around 2000, the frequency of concepts related to machine learning (“data,” “network,” “performance”) started to increase. After the breakthroughs in the field of visual recognition, the increased frequency of related terms showed a shift of interest to neural networks. Recently there’s been a boom in articles on “reinforcement learning,” in which an algorithm learns through rewards and punishments how to behave in certain situations. This trend received a major boost when the AlphaGo program beat the world champion in the strategy game Go in 2015.

PEOPLE & VISIONS

## “We Want the First People on Mars to Have a Flourishing Greenhouse Waiting for Them”



Paul Zabel also raises cucumbers near the Antarctic research station Neumayer III

THE MAN

**Paul Zabel** has been a science fiction fan ever since he was a little boy. His fascination with space led him to study aerospace technology at Technische Universität Dresden and to make aeronautics his career. For the past eight years he has been working at the German Aerospace Center (DLR). In his work, he combines research in the area of space travel with a field of study that is much more down-to-earth: modern agriculture. Zabel specializes in the development of farming methods that produce maximum amounts of food in small spaces with a minimal input of energy.

THE VISION

Paul Zabel and his team grow **vegetables in the Antarctic**—more precisely, in a greenhouse that is surrounded by a hermetically sealed container. Although the outdoor temperatures can drop to -43°C, inside the greenhouse lettuce, tomatoes, and cucumbers are being cultivated under artificial light. The team calculates that if the vegetables can thrive under these conditions, in the future people may be able to grow a supply of fresh food on the moon or Mars. The researchers have already posted initial results: In 2018 they harvested more than 200 kilograms of vegetables.