Clever color choice

Throughout the world, developers are working on AI-based lab assistants. Researchers have recently achieved a breakthrough in the field of materials research

The scientists from North Carolina State University and the State University of New York at Buffalo who developed this artificial intelligence (AI) system call it the "artificial chemist." It can independently determine which reactions of which starting materials are needed in order to create substances with specific desired properties. The system's accuracy was recently demonstrated during a proof-of-concept experiment, in which the AI was tasked with finding the ideal quantum points for certain colors in LED displays. Quantum points are nanocrystals that radiate light, in TV screens, for example. The system never took more than 15 minutes to find the quantum points for a color. This success has spurred the researchers to make plans to use the artificial chemist for the development of other materials that contain liquid starting materials such as metal or metal-oxide nanoparticles.

PEOPLE & VISION

Light is the key to exploring alien worlds

THE PERSON

Lisa Kaltenegger's driving force has always been to find answers for unsolved mysteries. Kaltenegger, 42, is an astrophysicist who examines exoplanets that are many light-years away from Earth. Kaltenegger has come a long way from her home town of Salzburg, Austria: After earning her degree, she worked for the European Space Agency (ESA), from where she later switched to Harvard. She subsequently led a research team at the Max Planck Institute for Astronomy and afterwards an institute at Cornell University in Ithaca/New York, where she now conducts research. She's also written a book, titled *Sind wir allein im Universum?* (Are we alone in the universe?). Moreover, the asteroid Kaltenegger 3477 is named after her.

THE VISION

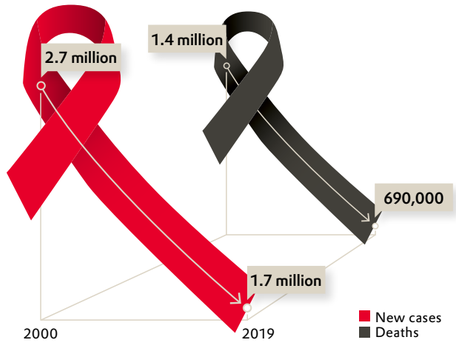
Kaltenegger is looking for alien planets so that we can better understand our own. "Earth-like planets that are in different stages of development show us how Earth has evolved and will change in the future," she says. In order to study the conditions on alien planets, Kaltenegger analyzes how starlight collides with an atmosphere. Starlight is filtered in a planet's atmosphere if chemical elements such as oxygen or hydrogen are present. "When that happens, the light our telescopes receive lacks specific wavelengths." This is proof that certain gases exist in the atmosphere and means that we might soon be able to detect life on distant planets.

Listen to the signals!

Human cells continuously communicate with one another by sending chemical signals, in the form of nitrogen monoxide, for example. If the signal paths are disrupted, this can have negative consequences for the body, such as cardiovascular diseases or muscular and retinal dystrophies. Special nanocapsules might play a mediating role between cells in the future. A research team at the chemistry department of the University of Basel and the National Centre of Competence in Research of Molecular Systems Engineering recently developed two types of capsules, each of which was filled with different enzymes that were enveloped by polymers. The researchers let the tiny containers penetrate the cells, where they latched into the signal paths. The two types of capsules cooperated: The first capsule produced nitrogen monoxide, which the second capsule received as a natural signal that it processed further. This cascade reaction boosted the signal path between the cells, thus improving their communication.

THAT'S BETTER

Less suffering



Source: UNAIDS

Don't give AIDS a chance: In the 1980s and '90s, the spread of the human immunodeficiency virus, or HIV for short, sparked a series of global educational campaigns. At the same time, medical professionals all over the world began to develop medications against the virus. Both of these measures were successful. As a result, there were around one million fewer new cases worldwide in 2019 than 19 years earlier: 1.7 million instead of 2.7 million. During the same time period, the number of AIDS-related deaths was more than cut in half—from 1.4 million to 690,000. Although there's still no cure, the drop in deaths is largely due to treatments with anti-HIV drugs. The active ingredients, which include entry and integrase inhibitors, suppress the spread of the virus in the body and thus prevent the onset of AIDS.

$630

BILLION

—that's how much *in vitro* meat is expected to generate in sales worldwide in 20 years, according to the business consulting firm A.T. Kearney. That would be four times as much as the figure forecast for 2025. The authors of the study expect vegan meat substitute products to generate sales of $450 billion in 2040.

THE DANCE OF THE ELECTRONS

Solar cells made of perovskite are considered to be especially effective. When the sun shines, ions, electrons, and the "holes" that these electrons leave behind in the mineral begin to move about. Researchers at the Max Planck Institute for Polymer Research have analyzed this "dance." The results showed that the holes move more slowly than expected. This finding might help boost the efficiency of solar cells.

GOOD QUESTION

Could 3D-printed arteries help us detect heart diseases earlier than is currently the case, Professor Wang?

Yes, that would be the case if we manage to print artificial arteries that are fully compatible with the human body. My team has successfully taken a first big step in this direction: We have developed an additively manufactured artery that consists of piezoelectric materials. These biocompatible, flexible composites emit an electrical impulse whenever the blood pressure fluctuates. These signals enable blood pressure to be monitored in real time. The cylindrical structure with its sinusoidal network also plays a key role in the detection of heart conditions. Thanks to its complex geometry, the artery can detect irregular movements, which might indicate the early stage of blood vessel blockage. This lets doctors intervene before the blockage becomes serious.

Xudong Wang is a professor at the University of Wisconsin-Madison and the co-author of a study about the uses of 3D-printed arteries