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European Biotechnology

Life Sciences and Industry Magazine

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Interview

TWB Managing Director Olivier Rolland explains why industrial biotech is crucial to slow climate change.

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CO_2 to proteins

Cracking the climeat conflict

Spatial Multiomics

Learning to translate single-cell data into clinical decisions

Long COVID

How long-term health issues are transforming the world of work

Euro BioFairs Compass

Your guide to the most attractive events in the second half of 2022

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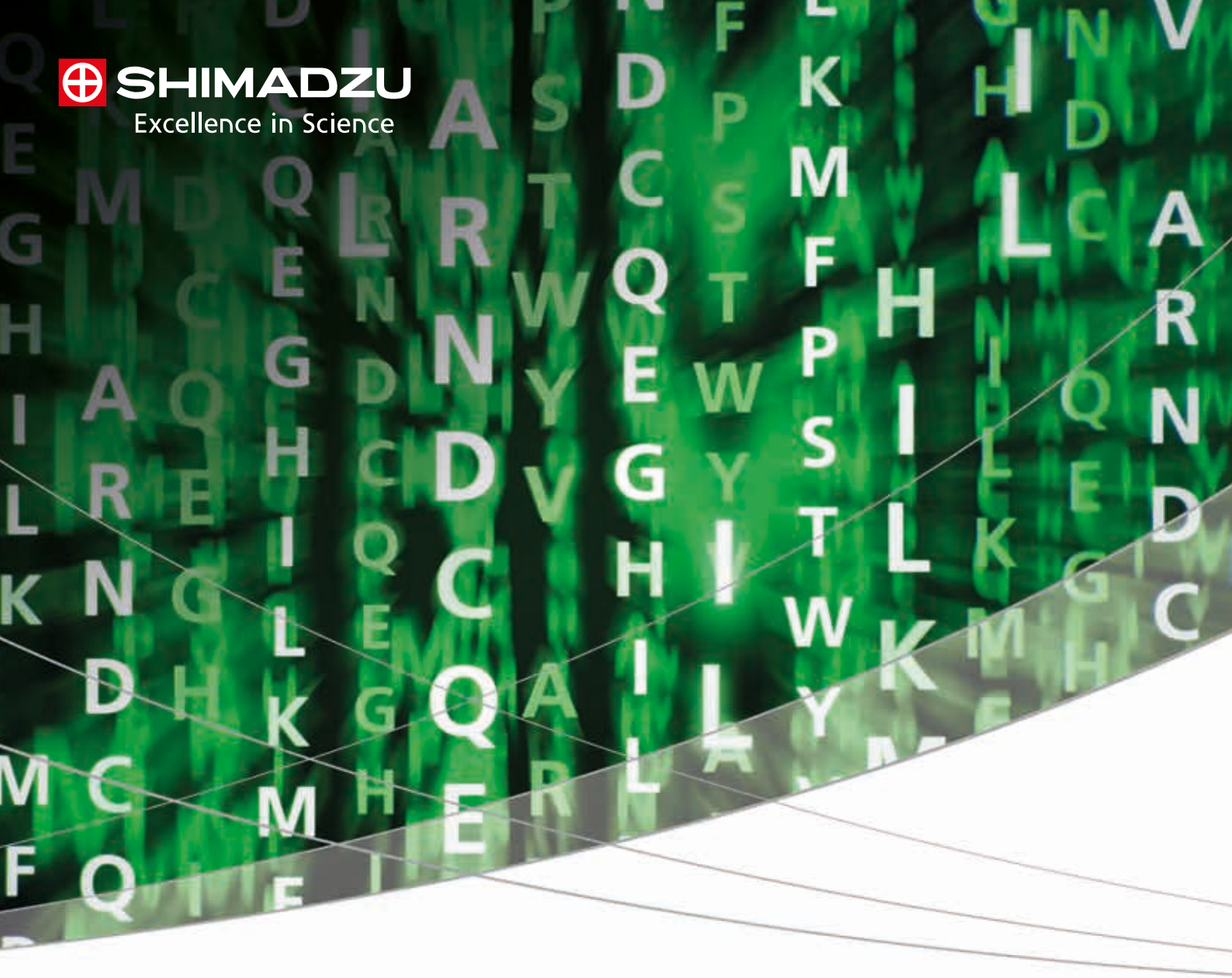

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The silent pandemic is not silent anymore

PROFESSOR DAME SALLY DAVIES, is the UK Government's Special Envoy on AMR. Dame Sally was the Chief Medical Officer for England and Senior Medical Advisor to the UK Government from 2011-2019. She is a leading figure in global health, serving as a member of the WHO Executive Board 2014-2016 and as co-convener of the UN's Inter-Agency Co-ordination Group on AMR. She has championed the need to address AMR across human and animal health, agriculture and environment globally, and now serves on the UN Global Leaders Group on AMR.

COVID-19 is the acute pandemic, while antimicrobial resistance (AMR) is a silent, pandemic. New data makes the AMR pandemic visible, with the first global study of AMR estimating that 1.27 million people die from AMR every year, making AMR the 12th-leading cause of death globally.[1] This data is a wake-up call for governments, industry, academia and the public to each play their part on AMR.AMR risks global health, economic, and food and water security, with impacts on the environment, equality, and development. Without urgent action, AMR could kill up to 10 million people each year, and leave us without sustainable medical or food supplies.[2]

With COVID-19, we have seen how powerful global action can be and how quickly industry and academia can develop solutions to solve a global challenge if governments provide the right framework and incentives. AMR demands the same level of collaboration, leadership and urgency. Our efforts to build back from COVID-19 and prepare for future pandemics overlap with the actions needed to address AMR.

I am proud of the work that the UK has done to secure AMR on the global agenda, not just as a health issue, but as a 'One-Health' issue with enormous social and economic impact. Under the UK's G7 Presidency last year, we secured commitments on innovation, access and stewardship for antibiotics. For the first time ever, G7 Finance Ministers recognised AMR as an issue for them to act upon. As they look to explore concrete market incentive options to bring new antimicrobials to patients, they are sending a signal to investors that stewardship, innovation, and access will be rewarded. This will present a significant opportunity for the pharmaceutical companies that remain active in antibiotic R&D.

The UK's world-first 'subscription' model will pay a fixed annual fee to companies rather than a price per volume of antibiotics. This will give pharmaceutical companies certain demand, embed stewardship, and ensure that patients can access the treatments they need. The proposed US PASTEUR Act would also de-link payments from volume of treatments used, and I am delighted that the EU's Pharmaceutical Strategy also commits to a pull incentive. Earlier this year, the AMR Action Fund announced its first two investments. Industry is rolling up its sleeves to protect the essential infrastructure, antimicrobials, which wider portfolios such as protein, pharmaceutical or healthcare industries depend on. This can only be the beginning. Industry must step up- investing in antibiotic innovation, enforcing limits on antibiotic pollution from manufacturing from their own and third party sites, and ensuring that all products have stewardship and access plans.

We must work together across borders and sectors to tackle the silent AMR pandemic. ■

1 https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)02724-0/fullte
2 https://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf

Pictures: Foreign, Commonwealth & Development Office, UK

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COVER STORY

The greening of the meat industry

Industrial meat production currently accounts for at least 15% of annual global greenhouse gas emissions, and occupies around two-thirds of all arable land. Lab-grown non-vegetable meat, fish or dairy alternatives produced in fermenters instead of on fields therefore have the potential to improve the negative environmental impact of traditional meat production dramatically. New gas-to-protein processes even promise to completely decouple food production from land and sea use. How sustainable are new protein production schemes?

INSIGHT EUROPE

ECONOMY

REGIONAL NEWS

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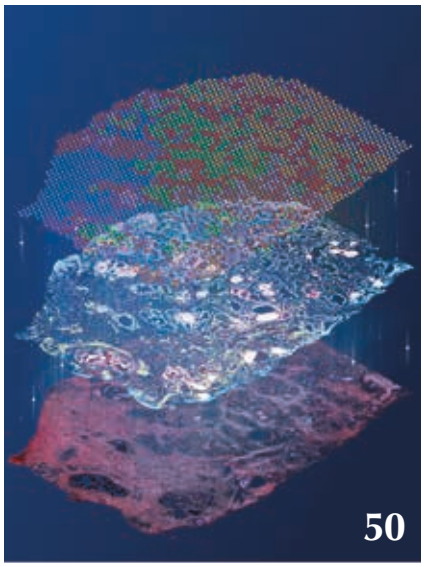
WTO

Waivers and justice

At the sold-out Swiss Biotech Day, experts from the biotech industry warned against eroding patent protection, saying a pandemic-related exception under the TRIPS waiver could quickly turn into a general stand. 100 of the 164 WTO member states are currently pushing to relax patent protections, saying it will help eliminate inequalities in the distribution of COVID-19 vaccines.

22

SPATIAL MULTIOMICS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The next Big Thing?

Single-cell approaches are coming of age, and next up is expanding our knowledge of the bigger picture with what are known as spatial multiomics. The field has been hailed for several innovations, but it's still early days. Smaller firms are fighting for a piece of the pie, while industry majors wait warily in the wings.

SPECIAL

Biofairs Compass

EDITORIAL

A new world order

The true priorities of EU politicians remained largely in the shadows for years, but the war in Ukraine has now cast them into the glaring spotlight. And the first thing the politicians did in it was to cancel the once loudly proclaimed Green Deal due to worries about an "impending famine" conjured up by the media. But Europe is not threatened by starvation, or even hunger, because the EU is self-sufficient in cereals. Why aren't wealthier countries instead finally mobilising investments comparable to those raised to fight COVID-19 to help the millions of people who have been regularly dying of hunger in the Global South for years? At first glance at least, newly re-elected French President Emmanuel Macron calling plans "unrealistic" to halve nitrogen input with artificial fertilisers within the framework of the EU's "Farm to Fork" strategy looks more like cynical angling for French farm votes than solidarity with the starving.

The refusal to act on climate is a missed opportunity, as biotech companies have come up with a host of intelligent solutions that promise to reduce emissions of greenhouse gases like CO_2, for example by binding it with microbes to produce meat substitutes (see p.14). The facts on climate change have essentially been on the table since the 1970s. But given political dithering, consumers and the market would be wise to take the matter more into their own hands.

Thomas Gabrielczyk
Editor-in-Chief

Pictures: 10xGenomics Inc. (upper right), Ute Kilger (left), Brazhyk - Billionphotos - Freepik.com, BIOCOM AG (right)


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beef

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The greening of the meat industry

BIOLOGISATION Gas-to-protein processes could help decouple food production from land and sea use. If such platforms can overcome production cost hurdles to compete with products like soybeans, peas and other protein-rich legumes, the market opportunities are huge. But there are still quite a few problems to solve in the race from fermenter to plate.

We have just three more years. By then at the latest, according to accepted models, global greenhouse gas emissions must fall to keep our planet from heating up by more than 1.5°C above pre-industrial levels. "If we do not succeed, a catastrophe causing wars, epidemics and water shortage will be inevitable," stressed experts from the Intergovernmental Panel on Climate Change (IPCC) at the beginning of April in their recommendations to policymakers for action. The IPCC's 6th Assessment Report also highlights another inconvenient truth, however: solutions don't lie solely in the hands of politicians. Changes in consumer behaviours in the G20 countries responsible for 80% of global greenhouse gas (GHG) emissions can cut the total output by 40%-70% , the experts stressed. "A prime example is meat consumption – its potential really surprised me," says Prof. Dr. Felix Creutzig from the Mercator Research Institute on Global Commons and Climate Change, one of the IPCC report's lead authors.

Current industrial meat production produces at least 15% of all annual global GHG emissions, and accounts for around two-thirds of all arable land (see Fig 1, p. 16). That fact alone means lab-grown non-vegetable meat, along with fish or dairy alternatives produced in fermenters instead of on fields, have the potential to improve the negative environmental impact of traditional meat production significantly. A study published in May by Florian Humpenöder from the Potsdam Institute for Climate Impact Research and colleagues from the University of Göttingen estimates that replacing 20% of the beef consumed globally per person with fermenter-grown microbial protein by 2050 could cut annual deforestation and associated CO_2 emissions by 56% compared to a non-substitution scenario. "According to an independent Life Cycle Analysis study by CE Delft, cultivated meat production could reduce climate impact by 92%, air pollution by 93%, use 95% less land and 78% less water when compared to industrial meat production," Cindy Gerhardt told EUROPEAN BIOTECHNOLOGY. The Managing Director of Planet-B.io at the Biotech Campus Delft cautioned however that "we have to realise that most of today's numbers are still estimations that need to be proven when production processes are worked out in more detail. Final benefits of products produced by cellular agriculture will differ per type of product and the production process individual companies use."

PASI VAINIKKA CEO, Solar Foods Oy, Helsinki, Finland

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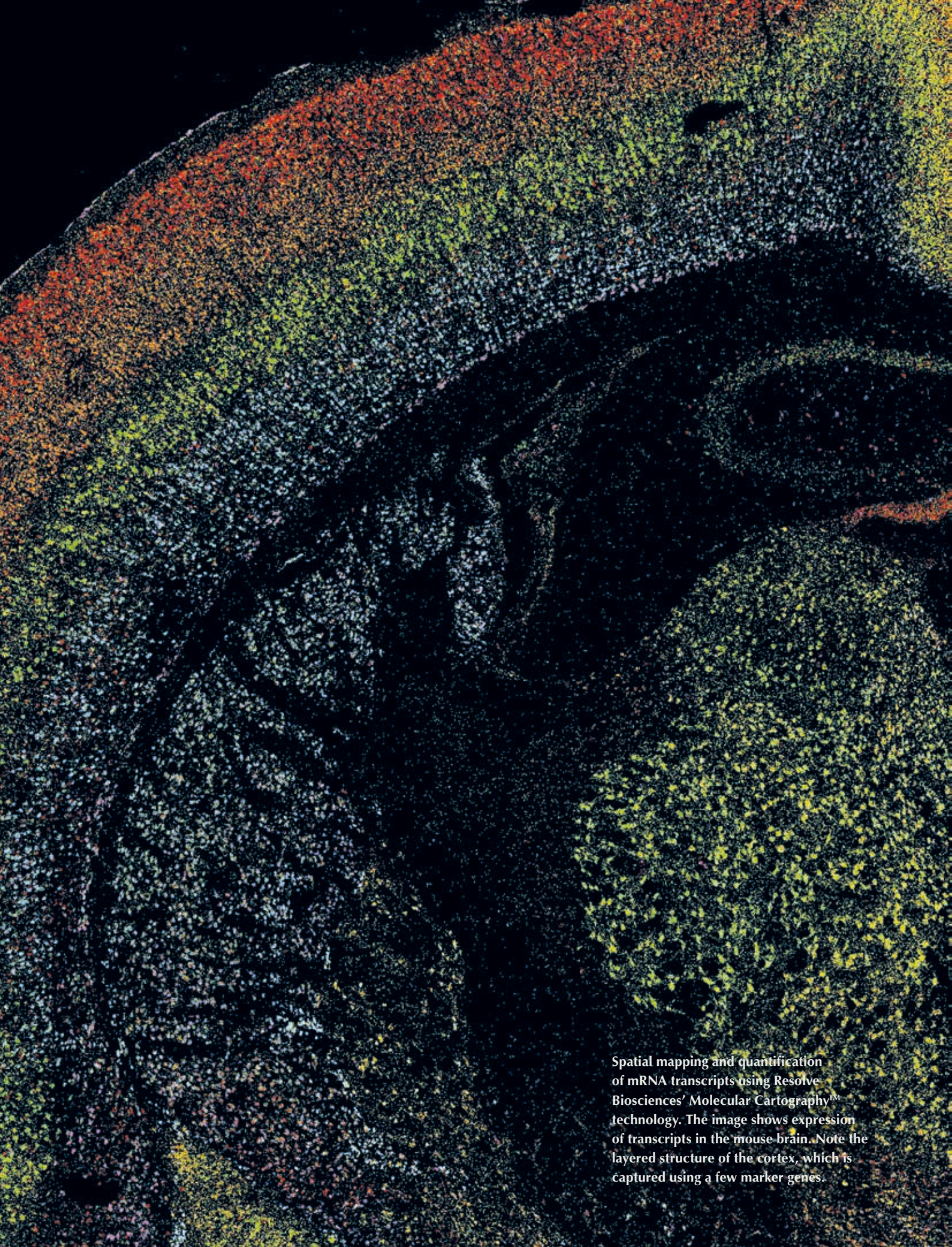
"Production of cellular agriculture products in bioreactors provide a far more controlled environment than in free-living animals."

"Cell-based production processes undoubtedly require less space and time

›› **Read the full story in the printed issue.**

Pictures: AdobeStock/Happy monkey, AdobeStock/laufer (Collage left), Solar Foods Oy (right)



Spatial mapping and quantification of mRNA transcripts using Resolve Biosciences' Molecular Cartography™ technology. The image shows expression of transcripts in the mouse brain. Note the layered structure of the cortex, which is captured using a few marker genes.

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Spatial multiomics – the next Big Thing?

TRANSLATING SCIENCE When it comes to development, molecular biology is at a crossroads. Especially in medical molecular biology, failed molecule-centered approaches are far more numerous than success stories, although they have attracted much greater attention and thus shaped mindsets surrounding the sector. The field is in flux, but looks set to change some fundamental paradigms.

Some scientists focus on a holistic view of ecosystems. For example they look at the entire interplay of organisms that makes up what we call 'biodiversity'. Many more researchers, however, dive into labs in an attempt to fathom the nature of individual pieces of the puzzle by examining ever-smaller units. In an extreme form, this can lead to a narrow, winnowing simplification. Looking only at the interaction between for instance two macromolecules like proteins ignores the world in which they exist, which is influenced by countless factors – among them neighbouring pathways, other metabolic processes, organ-typical relationships, how organs are embedded in the overall biological system, evolutionary comparisons with close biological relatives, and the distinction between male and female, just to name a few. Higher levels of complexity remain hidden or are simply ignored. Consciously or unconsciously, researchers are often forced by reasons of experimental accessibility or economic expediency to try to make quick discoveries.

In medical molecular biology in particular, molecule-centered approaches fail far more often than they succeed. That fact alone creates a self-reinforcing spiral, and has shaped mindsets in the field to simplify rather than complexify. It encourages researchers to seek to achieve insights into successful intervention in human biological systems in clever ways that often turn out to be useless or even dangerous. But as a rule, there are no simple answers even to seemingly simple disorders. Deaths or severe side reactions within early trials with interferons, tumour necrosis factor, and some interleukins or their antagonists have shown that.

> "Spatial biology is to know which biological events are happening where. It provides that spatial context to the underlying molecular machinery."
> Nachiket Kashikar, ESBC

The lesson we need to learn from them is that in our efforts to better understand individual organs and/or systems – whether it's the immune system, nervous system, or metabolic systems – we need to recognize that molecular interactions also involve the interaction of different cells inside and outside an organ. Interestingly, every once in a while, new cell types or even new organlike subcompartments in the human body are identified, even today. That leaves room for discoveries, but also plenty of space to misinterpret what we do know. In recent years, studies on the immune system have seen the most progress here, extending to the relatively new ability to genetically modify T cells. That allows us to now control them to some extent from the outside, amplifying a patient's normal response many times over. CAR-T technology has just celebrated its 10th anniversary.

Single-cell tech coming of age

In other words, this is still very young technology. If you compare developments to what happened within the first decade of the invention of the automobile, for example, you can see it's still very early days. In order to be successful with CAR-T and upstream research, technologies and investigation methods had to be developed that could recognise, sort and analyse individual cells. The door to the broad field of 'single-cell' technologies has therefore only been open a little longer than it took the first CAR-T cell therapy to reach the clinic. In the last two decades, the aims there have been to accomplish the separation of the cell mixtures technologically on the one hand, and on the other to carry out the analysis of the cells and their sorting – according to the markers –

›› Read the full story in the printed issue.

Picture: NachiketKashikar, ESBC, with kind permission

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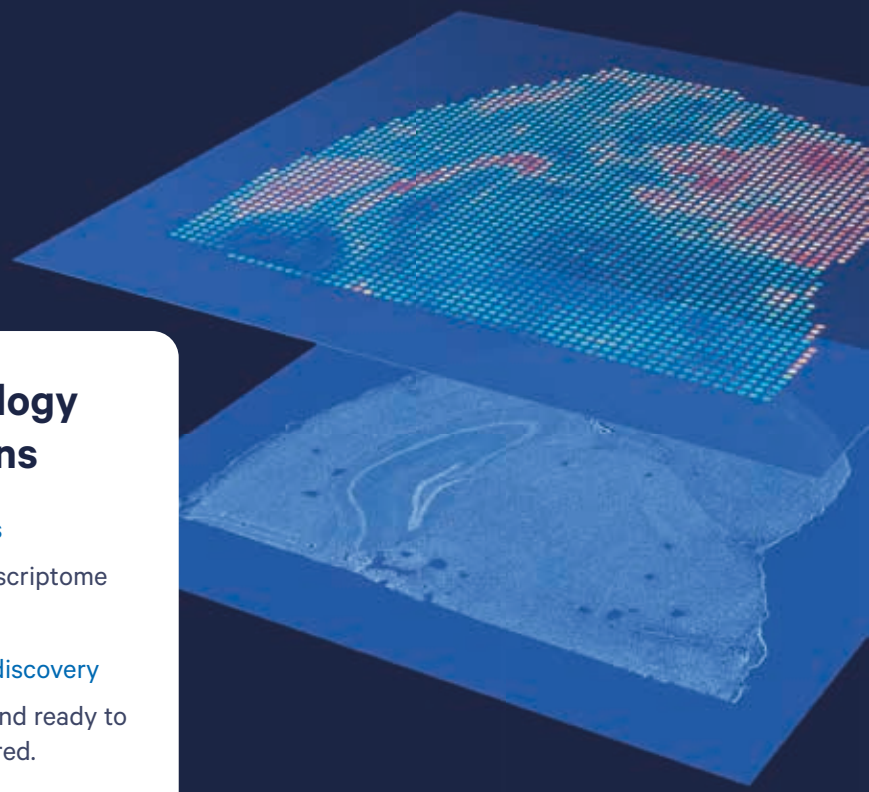

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