

OPPORTUNITY #39

WHAT IF BIOLOGY REPLACED CHEMISTRY?

DESIGNER CELLS

Bio-derived solutions replace chemicals in ways that transform industries, the environment and consumer habits

WHY IT MATTERS TODAY

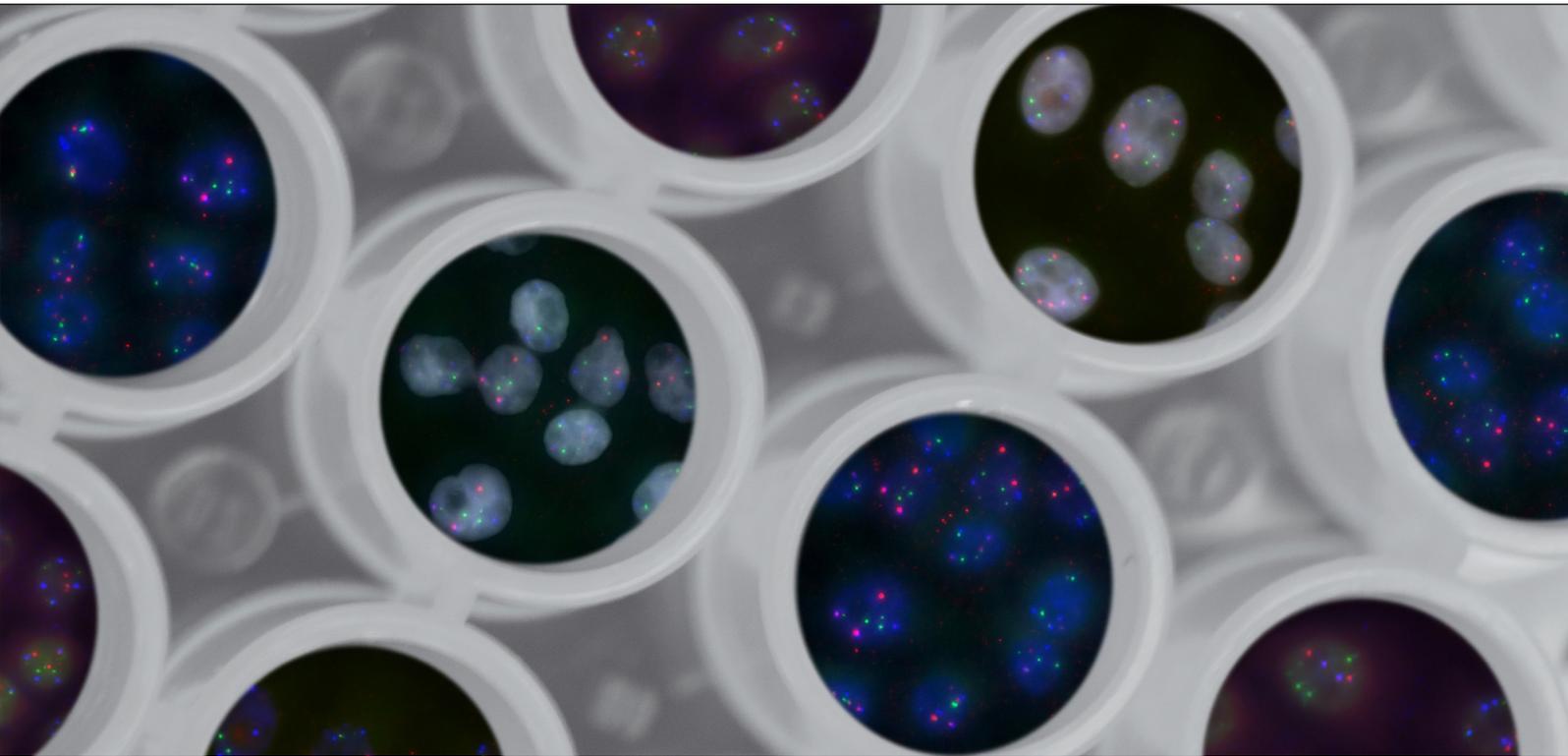
Chemicals comprise one of the basic building blocks of industry, from manufacturing, agriculture and telecommunications to pharmaceuticals, consumer goods and beyond.

The chemicals industry is expected to grow at around 3% annually for the next 20 years, largely driven by growth in Asia and the Middle East.³⁸⁷ Asia is expected to own two-thirds of the market by 2030³⁸⁸ and half of the top 10 chemical companies are expected to be in Asia or the Middle East.³⁸⁹ The industry growth rate is forecast to slow down to 1% in Europe³⁹⁰ and, with the simultaneous focus on sustainability and decarbonisation, European players are expected to seek leadership in alternative energy sources, improved energy storage and intelligent materials.³⁹¹

Throughout the last decade, the chemical industry has made efforts to reduce its impact on the environment.³⁹² Responsible for approximately 5.5% of global CO₂ emissions, 7% of global greenhouse-gases emissions and 10% of global energy demand,³⁹³ the use of biology in materials, chemicals and energy is expected to rise to \$300 billion³⁹⁴ and, more specifically for chemicals, the market for bio-based chemicals is expected to grow from the current 2% of the total chemical market to 22% by 2025.³⁹⁵

SECTORS

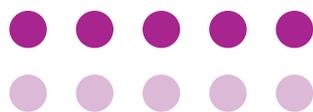
AGRICULTURE & FOOD · ADVANCED MATERIALS & BIOTECHNOLOGY · AUTOMOTIVE, AEROSPACE & AVIATION · CHEMICALS & PETROCHEMICALS · ENERGY, OIL & GAS · INFRASTRUCTURE & CONSTRUCTION · MANUFACTURING · METALS & MINING



The market for bio-based chemicals is expected to grow from the current

2% → 22%

of the total chemicals market by 2025



Half of the top 10 chemical companies are expected to be in Asia or the Middle East by 2030

THE OPPORTUNITY TOMORROW

Advances in biology offer the potential for solutions and materials that replace chemical-based products and processes. These materials can replace chemicals as inputs for consumer goods, healthcare, material and waste handling. Besides natural materials, cells, animal and plant DNA,³⁹⁶ bacteria³⁹⁷ and fungi make the future of biomaterials promising and expansive.

Such biomaterials will be manufactured in ‘biofoundries’ – integrated and highly automated facilities that undertake genetic engineering of living cells for specific applications, from the production of novel biomaterials or biofuels to cell-based meat. Industrial-scale biofoundries could make biomaterials that have the characteristics of plastics, metal and concrete, while being biodegradable and able to grow and repair³⁹⁸ themselves.³⁹⁹

BENEFITS

Greater availability and lower price volatility of raw materials for making these new bio-solutions lead to more diverse and resilient supply chains. The shift from chemical to biological waste reduces pollution.

RISKS

Risks include mishandling of biowaste, increasing emissions of methane and the accidental creation of novel biohazards. Malicious risks include biohacking or intentional damage to biofoundries and processing plants.