

## 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

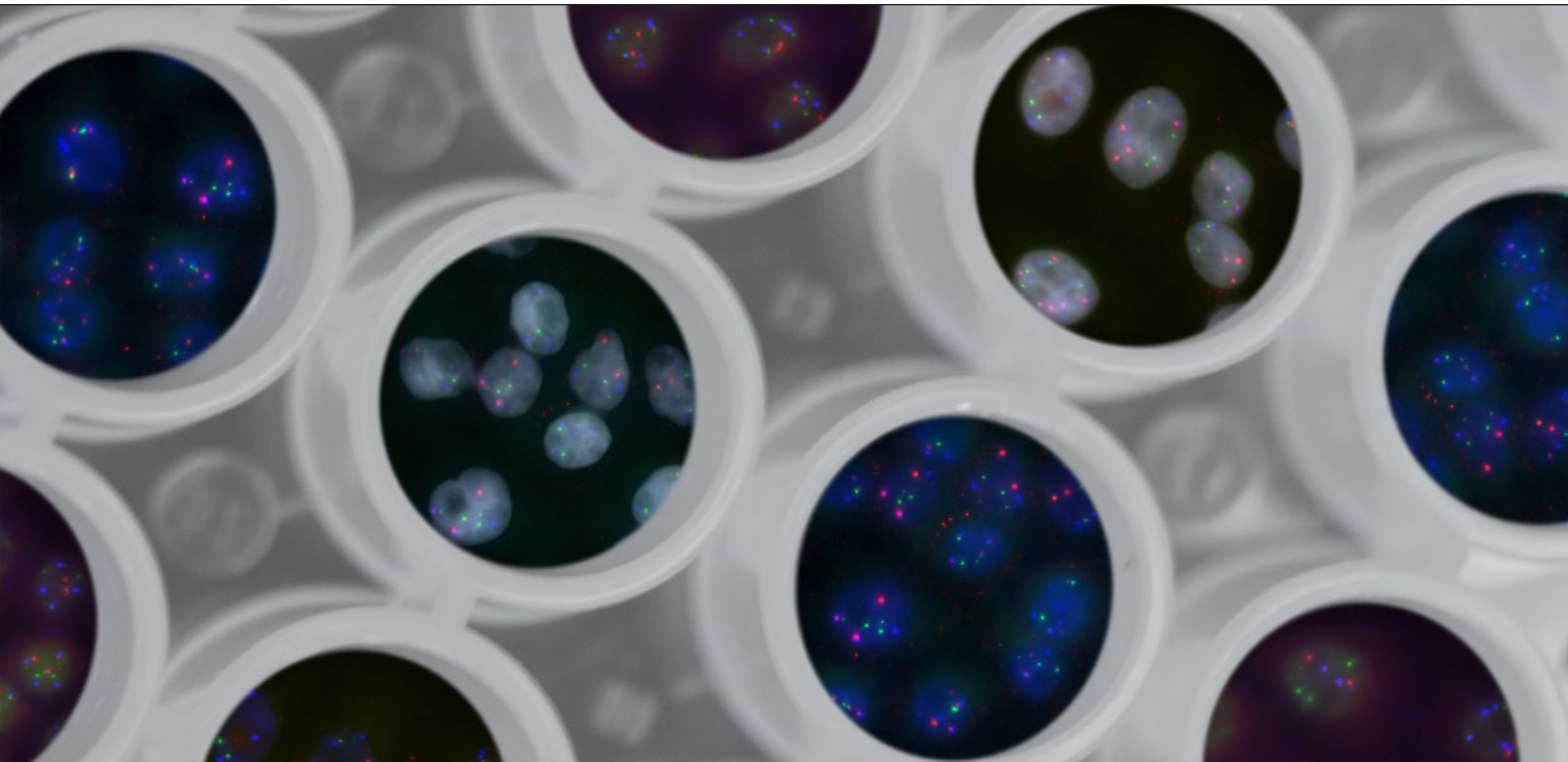
Chemicals comprise one of the basic building blocks of industry, from manufacturing, agriculture and telecommunications to pharmaceuticals, consumer goods and beyond.

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.<sup>387</sup> Asia is expected to own two-thirds of the market by 2030<sup>388</sup> and half of the top 10 chemical companies are expected to be in Asia or the Middle East.<sup>389</sup> The industry growth rate is forecast to slow down to 1% in Europe<sup>390</sup> 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.<sup>391</sup>

Throughout the last decade, the chemical industry has made efforts to reduce its impact on the environment.<sup>392</sup> Responsible for approximately 5.5% of global CO<sub>2</sub> emissions, 7% of global greenhouse-gases emissions and 10% of global energy demand,<sup>393</sup> the use of biology in materials, chemicals and energy is expected to rise to \$300 billion<sup>394</sup> 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.<sup>395</sup>

### SECTORS

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



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**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,<sup>396</sup> bacteria<sup>397</sup> 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 repair<sup>398</sup> themselves.<sup>399</sup>

### 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.