Open innovation to boost artificial biology

The project seeks to develop artificial chemical systems that imitate the behavior of living systems

Repsol collaborates in a cutting-edge project in artificial biology headed by Spanish scientist Juan Pérez-Mercader at Harvard University (United States). The research aims to produce synthetic chemical systems that imitate the behavior of living systems. A fundamental work in science from which applications in many areas can be derived, from medicine to the energy industry, such as the so-called "functional materials," molecular organizations capable of executing a function for which they were designed.

The collaboration with Harvard forms part of the R&D effort of the company, which in 2018 invested more than 84 million euros in research and "maintains 190 partnerships with leading scientific and technological institutions all over the world," highlights Jaime Martín Juez, Director of Technology and Corporate Venturing at Repsol.

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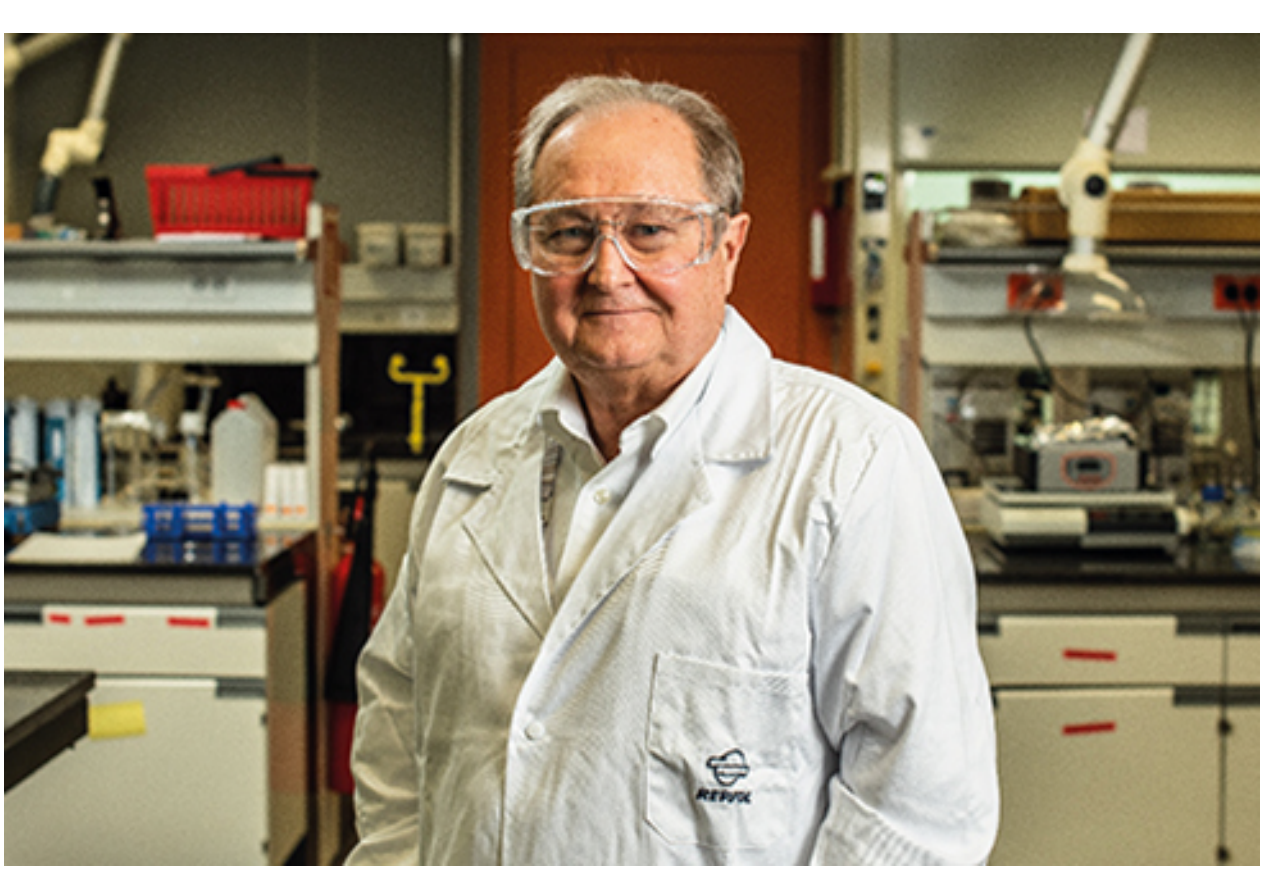


Replicating the basic properties of life

The research being led by Dr. Pérez-Mercader is based on the study of the minimum set of properties that characterize natural life: any living system handles information that allows it to construct its parts; it has metabolic activity to manage energy; it reproduces by self-replicating; and when self-replicating, it is capable of evolving to adapt to new circumstances.

With a transdisciplinary approach that combines physics, chemistry, biology, computational sciences and materials science, the team at Harvard is moving forward in developing "what we call BIChOSS," which stands for Biologically Inspired Chemically Operated Synthetic Systems. "They will be artificial chemical systems of micrometric size, measured in thousandths of a millimeter, that can replicate those properties of life," explains the scientist.

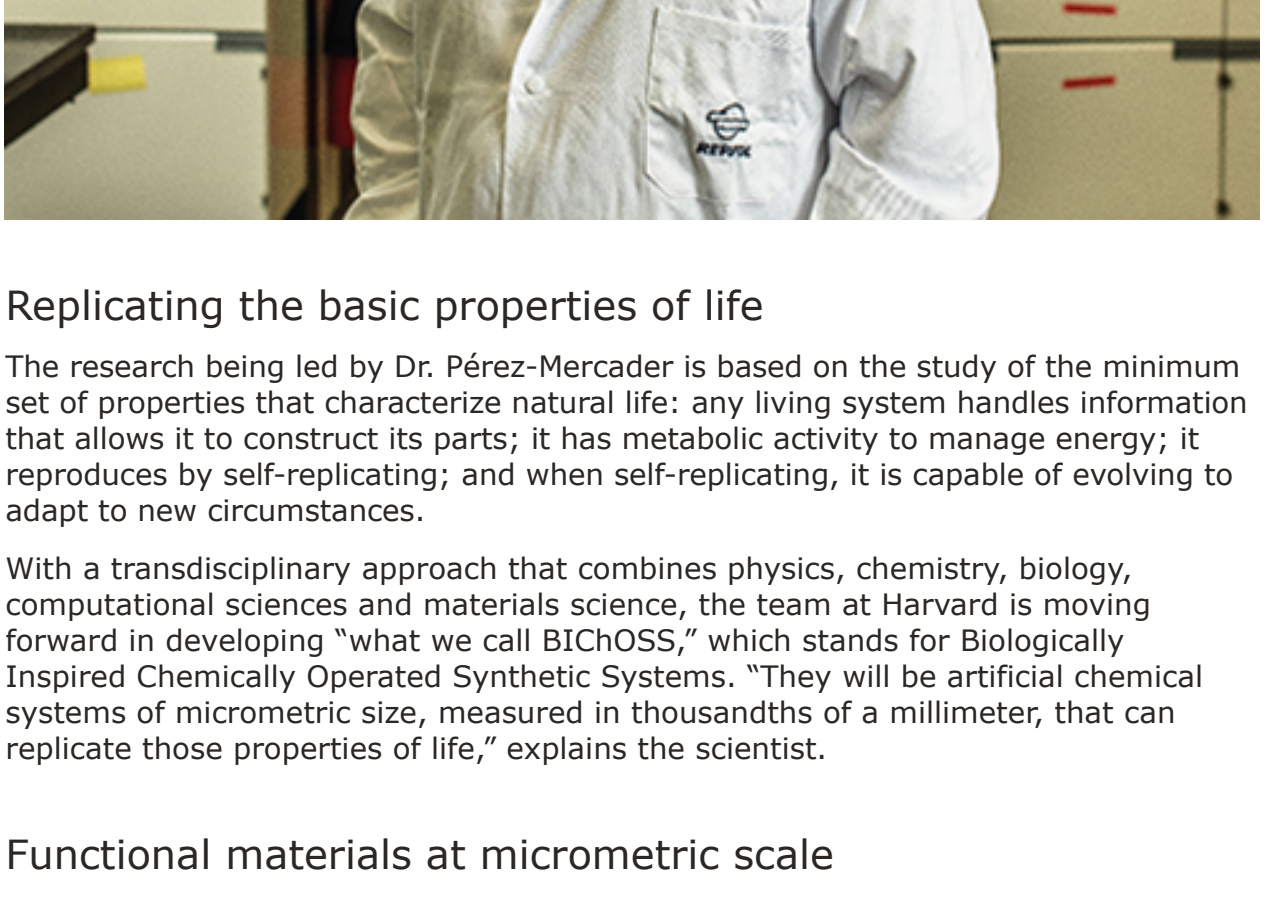
Functional materials at micrometric scale

This achievement can be translated into the development of functional materials designed to display different behaviors in response to stimuli like changes in light or temperature, Dr. Pérez-Mercader further explains.

"People have been designing them for years, but very significant progress is being made," with materials capable of changing color to alert to a situation or of self-organizing to execute a collective function. Applications for them might be found in different parts of the energy value chain, in both oil and gas, as sources of alternative energies, as well as in other highly innovative sectors like health and medicine.

A scientist with a prestigious and lengthy career, Juan Pérez-Mercader, since 2010, has been the Principal Investigator in the project "Top-down Synthesis of an Ex-novo Chemical Artificial Living System" in the Department of Earth and Planetary Sciences and the Origins of Life Initiative at Harvard. Among other honors, he has received the NASA Public Service Medal, the highest distinction this organization grants to individuals not employed there.

The collaboration with Harvard includes the integration of Repsol investigators into Pérez-Mercader's team



Open innovation for cutting-edge science

The agreement between Repsol and Harvard to pursue this project, which will continue until 2022, "involves continuous interactions that will enable the flow of information between basic scientific research and applied research," asserts Martín Juez. This collaboration follows the open innovation model adopted by the energy company "to accelerate the incorporation of innovative technologies and the anticipation of high-potential future scenarios," which includes collaborations with prestigious companies, universities and technology centers all over the world.

The work is being undertaken in parallel at the Repsol Tech Lab in Móstoles (Madrid) and at the laboratories of Harvard, and they include the integration of several investigators from the energy company into Pérez-Mercader's group, where they are immersed in an environment of scientific excellence.

In this company-university collaboration, "Repsol is involved in a science problem that has a vast number of ramifications in very diverse fields. At the university, it gives us a technology partner for seeking applications that contribute to social and industrial progress," concludes Dr. Pérez-Mercader.

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