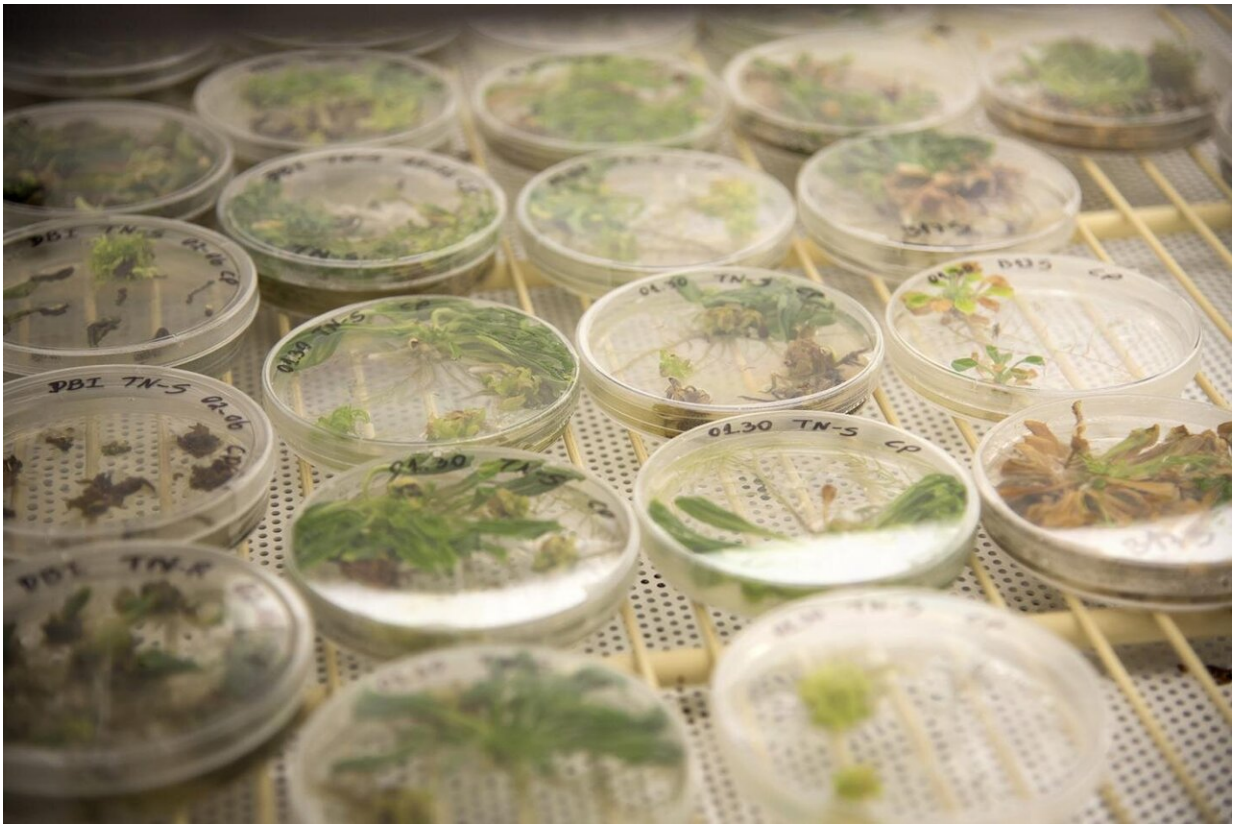
Tennessee researchers join call for responsible development of synthetic biology

October 18 2019



Engineering biology is transforming technology and science. Researchers in the international Genome Project-write, including two authors from the UTIA Center for Agricultural Synthetic Biology, outline the technological advances needed to secure a safe, responsible future in the October 18 issue of Science. Credit:T. Salvador, UTIA.

Engineering biology is already transforming technology and science, and a consortium of researchers across many disciplines in the international Genome Project-write is calling for more discussion among scientists, policy makers and the general public to shepherd future development. In a policy forum article published in the October 18 issue of *Science*, the authors outline the technological advances needed to secure the transformative future of synthetic biology and express their concerns that the implementation of the relatively new discipline remains safe and responsible.

Two researchers with the University of Tennessee Institute of Agriculture are co-authors on the piece titled "Technological challenges and milestones for writing genomes: synthetic genomics requires improved technologies." Neal Stewart and Scott Lenaghan with the UTIA departments of Plant Sciences and Food Science, respectively, join Nili Ostrov, a Ph.D. research fellow in genetics at Harvard Medical School, and 18 other leading scientists from a number of institutions and disciplines, in outlining a potential timeline for the development of what they call transformative advances to science and society.

Stewart and Lenaghan are the co-directors of the UT Center for Agricultural Synthetic Biology (CASB). Formed in 2018, Stewart says CASB is the first synthetic biology center in the world aimed specifically at improved agriculture. A professor of plant sciences in the UT Herbert College of Agriculture, Stewart also holds the endowed Racheff Chair of Excellence in Plant Molecular Genetics. Lenaghan is an assistant professor in the Department of Food Science who also holds an adjunct position in the UT Mechanical, Aerospace, and Biomedical Engineering (MABE) Department.

Synthetic biology uses computational techniques to help scientists identify genes that result in beneficial traits. In agricultural practices, these characteristics can then be triggered so that plant and animal

production is improved. In addition to improved biology, Lenaghan hopes the CASB will allow for collaborations to expand the current definition of synthetic biology beyond molecular biology tools, translating advances into synthetic and engineered constructs, such as micro/nanorobots, diagnostic devices and smart materials that can benefit society beyond the food we produce and eat.

The paper's authors assert, "A highly interdisciplinary, multinational effort from government and private sectors will help achieve and disseminate these advances to make an impact in biomedical, pharmaceutical, agricultural, and chemical industries."

Emerging technologies and improvements to existing gene synthesis methods are identified and needed, say the paper's authors, in four major areas to advance synthetic genomics within the next ten years: genome design, DNA synthesis, genome editing, and chromosome construction. But first they say substantial improvements are needed to reduce the cost and increase the speed and reliability of genetic tools.

"In a world that expects to sustain a population of more than 9 billion people by the year 2050, we will have to have more efficient and productive crop production to survive," asserts Stewart. "Writing whole plant genomes, such as the relatively small one in chloroplasts, could revolutionize crop productivity simply by making photosynthesis more efficient. This road map paper tells us how to get there safely."

More information: Nili Ostrov et al, Technological challenges and milestones for writing genomes, *Science* (2019). DOI: 10.1126/science.aay0339

Provided by University of Tennessee Institute of Agriculture

Citation: Tennessee researchers join call for responsible development of synthetic biology (2019, October 18) retrieved 8 May 2024 from https://phys.org/news/2019-10-tennessee-responsible-synthetic-biology.html

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