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Oak Ridge National Laboratory

BIOMANUFACTURING LICENSING OPPORTUNITIES

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U.S. DEPARTMENT OF ENERGY

OAK RIDGE National Laboratory

Biomanufacturing Licensing Opportunities at ORNL

ORNL researchers are working with the US Department of Energy (DOE), industry, and academia to understand complex biological systems to enable development of industrially relevant bioproducts that create new bioenergy solutions and support improved human health. ORNL is leading the way in advancing the use of plants and microbes for next-generation bioproducts and biofuels. Our techniques incorporate high-performance computing, artificial intelligence (AI), and genomic algorithms to uncover networks of genes contributing to complex traits that are critical in bioenergy, human health, and other focus areas. ORNL scientists have full access to the Spallation Neutron Source, allowing them to explore and uncover structures and interactions inside cells. They also examine the way proteins fold and how the cycling of disordered proteins between various 3D shapes affects gene expression. ORNL expertise leads to key innovations for biomanufacturing, synthetic biology, agriculture, bioenergy, and treatment of human diseases.

Synthetic Biology

While studying complex natural biological systems, ORNL researchers develop synthetic biology tools and approaches and engineer a variety of hosts for biomanufacturing. They pioneer tools that simplify and accelerate microbial engineering in diverse organisms and optimize microbial pathways to produce bio-commodities and biofuels. ORNL scientists characterize the role of genes in cellular function and regulation for a range of hosts, and these characterized systems benefit from the Laboratory's expertise in data integration approaches; analytics on Summit, the world's fastest supercomputer; and Genome Wide Association Study (GWAS) gene libraries. As our researchers map cellular systems, they drive additional discoveries across species—from microbes to plants to humans. ORNL innovations in synthetic biology deliver improved crops, efficient biomanufacturing, clean energy, and enhanced human health.

AI and Computational Biology

ORNL hosts the fastest supercomputer in the world, and the Oak Ridge Leadership Computing Facility accelerates scientific discovery in biomanufacturing and other important research areas. ORNL integrates AI with common health care practices, using AI methods to manage data-intensive tasks ranging from the mapping of eye movements of radiologists interpreting diagnostic images to developing new systems for improved diagnostic imaging. In addition, our researchers incorporate AI methods as they discover genes and pathways to improve plant productivity and sustainability. ORNL's rich history in developing and deploying algorithms for scientific applications—along with our unique data and computing infrastructure—makes the Laboratory an ideal setting in which to realize the potential of AI in the biotechnology, pharmaceutical, and energy industries.

Agriculture

As the lead for DOE's Center for Bioenergy Innovation, ORNL offers the most powerful GWAS population for identifying targets to optimize plants, such as poplar and switchgrass, for biofuel production. Our scientists have applied their findings to commercial crops to improve growth, pathogen resistance, and drought tolerance for food and forage crops and forestation. ORNL researchers are also advancing agriculture by genetically optimizing plants for productivity and resilience and by developing biostimulants for crop health and growth. A new greenhouse being constructed at ORNL will expand our plant phenotyping capabilities: up to 500 plants can be grown on its conveyer belts, and the system will have seven imaging modalities and the ability to control water and fertilizer treatments.

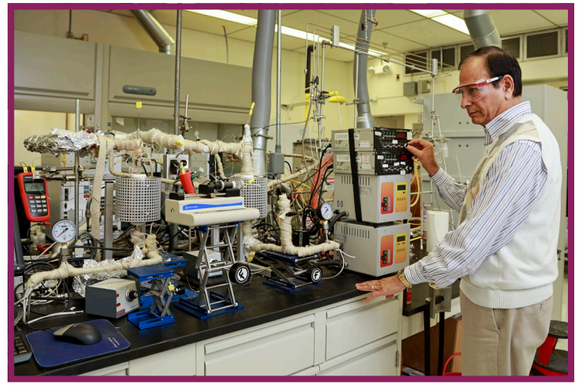
Bio-Based Products and Biofuels

ORNL-developed innovations alleviate critical cost barriers to sustainable, economically viable production of bio-based products and advanced biofuels. Our researchers focus on high-yield feedstock plants and use genetic technologies, bioengineering, and tailored, scalable production systems to deliver bio-based products. Clean energy research at ORNL develops tools to simplify microbe engineering and advanced processes to simultaneously break down and convert plants into specialty biofuels. Our research also aims to generate valuable byproducts from lignin left over from biomass processing. ORNL's cross-collaboration between biosciences and materials science researchers facilitates further development of these bioproducts for advanced manufacturing, low-cost carbon fiber, and 3D printing.

For a list of ORNL technologies available for licensing, please visit biomanufacturing.ornl.gov.

Licensing Success Story:

Vertimass
Transformative fungible biofuels.



Vertimass LLC licensed ORNL's novel catalyst technology for the conversion of ethanol into jet fuel, diesel fuel, and gasoline blendstocks that are compatible with today's transportation fuel infrastructure. The company seeks to commercialize the technology to overcome obstacles that limit ethanol use in gasoline for light-duty vehicles and to open up new ethanol markets for aircraft and heavy-duty vehicles.

"Vertimass is very pleased to be partnering with ORNL to commercialize this revolutionary technology that can broaden the market for alternative fuels," said Vertimass chairman William Shopoff. "We have assembled a team of industry and technology leaders, including Dr. Charles Wyman, our president and CEO, who will take this novel catalyst from the lab to the marketplace. We see this technology as a significant step in moving the United States toward energy independence."