

PRESS RELEASE

Scientists at the Foundation for Applied Molecular Evolution Awarded One of Eight Nationwide Transformative Research Awards

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Alachua FL

The National Institutes of Health announced today that one of eight Transformative Research Awards granted each year nationwide will be received by the Foundation for Applied Molecular Evolution (FfAME) in Alachua, Florida. This award, totaling ~ \$3.5 million, was established in 2009 to promote cross-cutting, interdisciplinary research to meet challenging problems in the biomedical sciences. It is granted to laboratories that propose research that could potentially create new or challenge existing paradigms. The project will be directed by Dr. Steven Benner at the FfAME.

This award recognizes three decades of pioneering work in the Benner Laboratories that helped established the fields of "synthetic biology" and "paleomolecular biology". Synthetic biology seeks to connect biochemical molecules to behaviors seen in living organisms, including the ability to respond to their environments, reproduce, adapt and evolve. It does so *not* by dissecting living systems, but rather by constructing living systems from the bottom up. This approach forces scientists away from tightly scripted "hypothesis based research" in ways that lead to new discoveries and new paradigms.

Using this research strategy, the Benner laboratory re-invented DNA, creating new genetic systems that encode information with as many as 10 different building blocks, far more than the four building blocks found in natural DNA. This work has transformed our understanding of DNA and genetics in general. It is currently guiding NASA in its search for extraterrestrial life on Mars, Enceladus, and elsewhere in the solar system. Further, this expanded DNA is allowing the generation of proteins with more than the 20 amino acids found in natural proteins. Under controlled laboratory conditions, the system can adapt under the guidance of molecular scientist to produce new receptors, ligands and catalyst having biomedical impact. This transformative research award will allow the full potential of synthetic biology to be realized.

The transformative research project that the NIH will support in the Benner laboratory will create cells that exploit this expanded genetic alphabet. "Constructing cells that use synthetic genetic systems is the ultimate "grand challenge" in biomolecular science," said Prof. Benner. "In addition to creating new technology, we expect that this work will lead to a deep understanding of biological systems, and how their parts work together to create a 'whole' in a living cell."

Already, this synthetic biology work has had practical medical value. The artificial DNA manufactured at the FfAME supports diagnostics products for HIV, hepatitis B and C, and respiratory disease viruses, as well as tests for cystic fibrosis used in genetic counseling. Synthetic DNA from FfAME supports kits for public health surveillance for mosquito-borne viruses, noroviruses, and coronaviruses (e.g. SARS, MERS). The expanded DNA is also supporting a new phase in biotechnology where DNA molecules are synthesized, in a revolution that may soon match the revolution in medicine that was created by low-cost easy DNA sequencing.

This award also reflects discoveries about evolution made using synthetic biology. FfAME scientists, in collaboration with the group of Prof. Weihong Tan at the University of Florida, have shown that these artificial genetic systems can be replicated, evolve, and adapt in the laboratory. This laboratory evolution has delivered new molecules that bind to breast cancer cells, liver cancer cells, and proteins from anthrax. Work with Firebird Biomolecular Sciences LLC, also in Alachua, and the laboratory of Brian Paegel at The Scripps Research Institute (Jupiter FL) is promising to develop a new class of drugs that not only bind to proteins that cause diseases, but also destroy them.

The Transformative Research Award program is one of four programs run from the NIH "Common Fund", two of which are directed at early stage researchers. "I continually point to this program as an example of the creative and revolutionary research NIH supports," said NIH Director Francis S. Collins, M.D., Ph.D. "The quality of the investigators and the impact their research has on the biomedical field is extraordinary."

What is remarkable about this particular award is its venue. "The other Transformative Awards went to established institutions, specifically, UCLA, MIT, Columbia, Rockefeller, Harvard, CalTech and the University of Washington," noted Nigel Richards, Professor at Cardiff University and a member of the Board of Directors of FfAME. "This is excellent company for FfAME, which received the only Transformative Award nationwide granted to a private foundation. This shows the depth and breadth of the science being done at the FfAME today."

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About the Foundation for Applied Molecular Evolution

The FfAME was founded in 2001 as a non-profit research organization to address “big questions”, from the extent of life in the cosmos to the molecular biology of human disease. FfAME scientists also use insights made by addressing big questions to solve practical problems, including the diagnosis and treatment of disease, the extension of healthy life spans in humans, and application of the molecular sciences, bioinformatics, and engineering to commerce.

Supported by philanthropy, technology transfer, and grants and contracts from public and private organizations, including the John Templeton Foundation and the Templeton World Charity Foundation, the FfAME is one of the few non-profit, private scientific organizations in North Central Florida. Its accomplishments in technology include the development of materials to measure the load of viruses in infected patients, surveillance of public spaces for Zika, norovirus, and other infectious agents, whole genome sequencing, and new catalysts for human therapy.

On the more exotic side, FfAME scientists perform “Jurassic Park” experiments that resurrect genes and proteins from now-extinct organisms, using these to understand the evolution of life on Earth in its changing environment. FfAME is a long-standing member of the NASA Astrobiology Institute, where it has contributed to the search for biology on Mars, Titan, and elsewhere in the Solar System.

FfAME is committed to public outreach and education. The book: *Life, the Universe, and the Scientific Method*, teaches scientific methods by seeking answers to “big” questions such as: Does alien life exist? FfAME staff lecture on space exploration at Cape Canaveral and elsewhere, and give public lectures across the country and around the world. Find more information at: www.ffame.org.

About the NIH Common Fund:

The NIH Common Fund encourages collaboration and supports a series of exceptionally high-impact, trans-NIH programs. Common Fund programs are managed by the Office of Strategic Coordination in the Division of Program Coordination, Planning, and Strategic Initiatives in the NIH Office of the Director in partnership with the NIH Institutes, Centers, and Offices. More information is available at the Common Fund website: <https://commonfund.nih.gov>.

About the National Institutes of Health (NIH):

The NIH, the nation's medical research agency, includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. NIH is the primary federal agency conducting and supporting basic, clinical, and translational medical research, and is investigating the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.

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Main announcement

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- @NIHDirector's Transformative Research awardees may overturn scientific paradigms. 2017 awardees: <https://go.usa.gov/xnccd> #NIHHighRisk
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- The NIH Director's Transformative Research award supports unconventional research projects with the potential to overturn fundamental scientific paradigms. Meet the 2017 awardees: <https://go.usa.gov/xnccd>
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- The NIH Director's Early Independence award allows early career scientists to skip the postdoc and enter independent research positions. Meet the 2017 awardees: <https://go.usa.gov/xnccy>