U.S. Department of Health and Human Services
NIH News
National Institutes of Health

National Institute of Biomedical Imaging and Bioengineering (NIBIB)

National Institute of Mental Health (NIMH)

For Immediate Release
Monday, October 15, 2012

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NIH Common Fund announces awards for Single Cell Analysis

The National Institutes of Health plans to invest more than $90 million over five years, contingent upon the availability of funds, to accelerate the development and application of single cell analysis across a variety of fields. The goal is to understand what makes individual cells unique and to pave the way for medical treatments that are based on disease mechanisms at the cellular level. Supported by the NIH Common Fund, NIH plans to support 26 awards as part of three initiatives of the Single Cell Analysis Program (SCAP).

Single cell analysis emerged as an important field of research after new technologies with improved sensitivity made it possible to measure cell-to-cell differences in living organisms and correlate the variation with changes in biological function and disease processes.

By profiling individual cells, researchers can identify rare cell types as well as alterations in the health or condition of specific cells that may relate to functional changes and to determine the influence of cellular organization and environment on such cells and states. The long-term goal of the SCAP is to accelerate the move towards personalizing health to the cellular level by understanding the link between cell variation, tissue and organ function, and emergence of disease.

"The development of new technologies that can detect differences between individual cells within the same tissue is crucial to our understanding of a wide variety of diseases," said NIH Director Francis S. Collins, M.D., Ph.D. "This Common Fund Program is an excellent example of how the NIH can accelerate the pace of biomedical discovery."

The Single Cell Analysis Program will support three research centers that will work together to identify patterns of gene expression in individual human cells within a variety of tissues including the brain, heart, placenta, and olfactory system. The goal is to reveal previously undetectable differences in the molecular composition of individual cells; this will offer a new way to categorize cells using a genetic signature.

The three groups have also proposed novel technical and computational approaches to identify relevant variations in gene expression among individual cells and to assess the functional consequences of these variations.

The funded groups will be managed as an integrated network to maximize collaboration. All data and protocols will be made available to the research community.

The program plans to support 15 high-risk/high-impact projects to generate new methods or significantly improve existing methods for single cell analysis. The projects propose the development of new tools to enhance measurement parameters such as sensitivity, selectivity, spatiotemporal resolution, scalability and/or non-destructive measures that preserve the integrity of the cell. The new tools will also improve capabilities for the simultaneous measurement of multiple molecular components (like genes or proteins) within a single cell.

Examples of the proposed technologies include:

- Innovative high resolution imaging and novel methods for measuring physical properties of single cells
- Improved methods for sequencing the entire genome of a single cell
- Biosensors that help scientists visualize protein activity in individual cells
- A novel platform for capturing information about secretions from single cells
- Development of platforms to increase analytical output

The final component of the program includes eight projects to accelerate the translation of promising technologies for single cell analysis from prototype into practice. This will involve taking technologies through the development and

validation process and establishing them as robust, well-characterized tools for use in a wide variety of clinical and research settings. The goal of these awards is to support multidisciplinary teams to develop these technologies so that they fill a critical biomedical need and can also be applied more broadly.

Examples of these new technologies include:

- Robots that acquire information about the structural, electrical, and molecular properties of many individual brain cells simultaneously
- Enhanced microscope and labeling techniques to increase the number of gene transcripts and proteins that can be detected in a single cell
- High resolution analysis to track single cells within complex tissues
- Platforms to assess the molecular states of immune cells with applications to immune therapy for cancer patients and early detection of active tuberculosis

For a detailed description of the funded grants as well as information about the Single Cell Analysis Program, please visit http://commonfund.nih.gov/singlecell/.

The Single Cell Analysis Program is funded through the Common Fund, and managed by the NIH Office of the Director in partnership with the National Institute of Biomedical Imaging and Biotechnology (NIBIB) and National Institute of Mental Health (NIMH), both part of NIH.

The NIH Common Fund encourages collaboration and supports a series of exceptionally high impact, trans-NIH programs. Common Fund programs are designed to pursue major opportunities and gaps in biomedical research that no single NIH Institute could tackle alone, but that the agency as a whole can address to make the biggest impact possible on the progress of medical research. Additional information about the NIH Common Fund can be found at http://commonfund.nih.gov.

NIBIB's mission is to support multidisciplinary research and research training at the crossroads of engineering and the biological and physical sciences. NIBIB supports emerging technology research and development within its internal laboratories and through grants, collaborations, and training. More information is available at the NIBIB website: http://www.nibib.nih.gov/.

The mission of NIMH is to transform the understanding and treatment of mental illnesses through basic and clinical research, paving the way for prevention, recovery and cure. More information is available at the NIMH Web site, http://www.nimh.nih.gov.

About the National Institutes of Health (NIH): 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 http://www.nih.gov.

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