Alliance for Nanomedical Technologies

Positioning New York State As a Premier Site for a New Industry

The Alliance for Nanomedical Technologies, established in 2001, brings together academia and the private sector of New York State to develop the next generation of medical devices. The New York State Office of Science, Technology, and Academic Research (NYSTAR), awarded the Alliance $2.8 million over two years to establish a new Center for Advanced Technology (CAT). Cornell University, University of Rochester, the Wadsworth Center of the New York State Department of Health, and Tompkins County Community College, as partners in the Alliance, seek to exploit the interface between engineering and biology, and to harness microfabrication techniques in order to build integrated devices.

Collaborative teams of academic scientists and industrial affiliates explore the design and fabrication of novel nanomedical devices. The Alliance also aims to create user facilities and to help formulate programs that will train workers whose skills are needed to establish New York as the premier location for this new industry.

The product of the Alliance will be micro- and nanoscale devices for biomedical research and diagnosing disease. The beneficiaries of this Alliance include not only the public and private partners but also the citizens of New York and others through the development of improved medical devices. A significant outcome will be the establishment of "nanoBioFab," a state-of-the-art fabrication facility that will be built specifically for handling biomaterials. nanoBioFab will serve as a model for satellite facilities that could be built around the state to support the private-sector and to serve as training facilities.

Remote Cardiac Monitoring

Kevin T. Kornegay, Electrical and Computer Engineering; Robert T. Gilmour, Biomedical Sciences; David Christini, Medicine (Cardiology), Weill Cornell Medical College, and Physiology and Biophysics, Weill Cornell Graduate School of Medical Sciences

This project provides real-time monitoring of vital patient parameters, such as temperature, blood pressure, heart rate, and electrocardiogram (ECG). The device utilizes three technologies: advanced semiconductor technology from IBM to provide long-range high-rate data transmission; pulse oximetry, which is a noninvasive sensing technology from Welch Allyn; and sophisticated signal processing algorithms for early cardiac alarms developed by the Alliance's team of cardiology experts. The wearable wireless device will have the capability to transmit ECG and pulse oximetry data as raw data for processing by a cardiologist or process it locally to detect abnormalities in cardiac state.

Opportunities for Private-Sector Members of the Alliance's Collaborative Research Teams (CRTs)

- Opportunity to participate in the evaluation and selection of Alliance projects for funding
- Opportunity to directly support Alliance research programs
- Thirty-day "first-look" at any new inventions arising from the Alliance
- Opportunity to negotiate placement of a scientist into one of the Alliance-supported laboratories
- Access to the Alliance-supported core facilities
- Free registration for short courses and workshops offered by the Alliance
- Receipt of scientific reports
- Participation in symposia and seminars

"Researchers are exploring the capabilities for radiographing objects of interest to the biological, medical, and veterinary sciences."

Field Effect Transistors

Emmanuel P. Giannelis and George G. Malliaras, Materials Science and Engineering

This team aims to fabricate a low-cost biosensor based on organic field effect transistors. The biosensor can sense charged species (for example, DNA), without the need for attachment of fluorescent labels. Specificity is achieved by attaching on one of the electrodes (GATE) chemical units that recognize specific target species. The output of the detector is an electrical signal, proportional to the amount of the detected species. The basis of this detection scheme is a Thin Film Transistor (TFT), in which the current that flows between two electrodes (SOURCE and DRAIN), is controlled by the amount of charge on a third electrode (GATE). Organic semiconductors, like pentacene, offer similar performance to amorphous silicon and can be deposited on a variety of substrates, including plastic, glass, and even paper. Using plastic insulators, the whole sensor can be fabricated using low-cost processes on substrates kept at room temperature. The researchers will provide proof-of-concept by fabricating a prototype biosensor on glass. They will test the sensor by attaching on the Au GATE electrode self-assembled monolayers with complementary DNA. The researchers will evaluate the sensitivity of the sensor for detection of DNA molecules.

X-ray Sources for Biological Imaging

David A. Hammer, Electrical and Computer Engineering; Rodney L. Page, Clinical Sciences

This project seeks to develop the scientific and engineering knowledge needed to design and build a truly portable X-pinch-based, high-resolution, soft x-ray radiography system. The researchers are exploring the capabilities for radiographing objects of interest to the biological, medical, and veterinary sciences. X-pinch x-ray sources have been demonstrated to be effective in generating images with extraordinary resolution superior to traditional x-ray sources. This technology may allow the diagnosis of a number of potential diseases at a much earlier stage than previously possible.

"The Alliance for Nanomedical Technologies brings together academia and the private sector of New York state to develop the next generation of nanomedical devices."


Robert Barker/CU

Carl Batt
Project Leader, Alliance;
Food Science

These CRTs are composed of one or more academic scientists collaborating with private-sector affiliates. They set goals and milestones that are achievable within an initial period of two years. The private-sector affiliates agree to review progress toward these milestones with an eye toward how their business might benefit from the research.

The success of any economic development effort depends on the availability of a skilled workforce. The Alliance is partnering with Tompkins Cortland Community College (TC3) to survey the expected workforce needs of this nascent industry. TC3 will use this information to develop prototype training courses for incumbent and new workers. By closely coupling the scientific discoveries of the Alliance with technology transfer and private-sector development, a significant economic impact is anticipated, which will result in the creation of high-quality jobs in upstate New York.

Carl A. Batt
Project Leader and Liberty Hyde Bailey Professor of Food Science

CRTs are composed of one or more academic scientists collaborating with private-sector affiliates. These teams are the principal means through which scientific discoveries are made within the Alliance.


Robert Barker/CU


Image Lab/Vet Med

Remote Cardiac Monitoring

Kevin Kornegay, (l.),
Electrical and Computer Engineering

Robert Gilmour Jr., (r.),
Biomedical Sciences, Veterinary Medicine


Doug Hicks


Nicola Kountoupes/CU

Field Effect Transistors

Emmanuel Giannelis, (l.),
Materials Science and Engineering

George Malliaras, (r.),
Materials Science and Engineering


Charles Harrington/CU


Image Lab/Vet Med

X-ray Sources for Biological Imaging

David Hammer, (l.),
Electrical and Computer Engineering

Rodney Page, (r.),
Clinical Sciences, Veterinary Medicine

Radiograph of a fruit fly/CU

For more information:

Alliance for Nanomedical Technologies
130 Biotechnology Building
Cornell University
Ithaca, NY 14853
(607) 255-0114, anmt@cornell.edu
http://www.research.cornell.edu/anmt