

NSF AT WORK

Adapting to Change

The only constant in life, it's said, is change. To further our understanding of how humans cause, respond and adapt to change, NSF has awarded 26 grants through its Human and Social Dynamics (HSD) investment area. HSD aims to foster breakthroughs in understanding the dynamics of human action and development, as well as knowledge about organizational, cultural and societal adaptation and change. This year's HSD awards cover topics ranging from the diffusion and transmission of knowledge and ideas, to natural resource use and its impacts on human societies, to the neural interactions underlying human behavior.

Examples of HSD award topics include: the environmental impacts of shipping pallets, cell phone batteries and water delivery systems; computer-based decision support systems to respond to natural disasters; modeling community response and economic impacts of risk following a terrorist strike; modeling interactions between individual behavior networks and public policy to support public health epidemiology, and evaluating the social, economic and political aspects of U.S. ethanol policy. See [NSF's press release](#) for a complete list of award topics.



Computer-based decision support systems to respond to natural disasters are one area of research funded by NSF's Human and Social Dynamics investment area. Credit: FEMA



Major diseases like cancer, diabetes, autism and obesity are linked to genomic regions where imprinted genes have been discovered. Credit: Getty Images

"Silenced" Human Genes Mapped

In Biology 101, we all learned that babies inherit two copies of their genes--one from their mother and one from their father. With most genes, these two copies are both expressed in the child. For some mammalian genes, however, only one parent's copy is active, regardless of the child's gender. Through a process called imprinting, molecular signals "silence" the copy of the gene the child inherits from the other parent, leaving the child with only one working copy of the gene. If this only functioning copy is damaged or lost, there's no backup copy to rely on, leaving the child vulnerable to disease.

Scientists have now created the first map of human imprinted genes, revealing four times as many imprinted genes as had been previously identified. Many of the 156 newly-identified imprinted genes lie within genomic regions linked to major diseases. Researchers say that some of these genes may offer clues to better disease prevention or management.

The team validated two particularly interesting genes on chromosome 8, where none had been found before. One of those genes, *KCNK9*, is known to cause cancer and may also be linked to bipolar disorder and epilepsy. The second, *DLGAP2*, is a possible bladder cancer tumor suppressor gene. For more information on this NSF-supported research, read the [full story](#) from *Duke Med News*.

Growth States of Malaria Parasite “Written in Blood”

The malaria parasite has been studied for decades, but surprisingly, little is known about how it behaves in humans to cause disease. An international research team supported by NSF has for the first time measured which of the malaria parasite’s genes are turned on or off during actual infection in humans, not in cell cultures, unearthing surprising behaviors and opening a window on the most critical aspects of parasite biology.

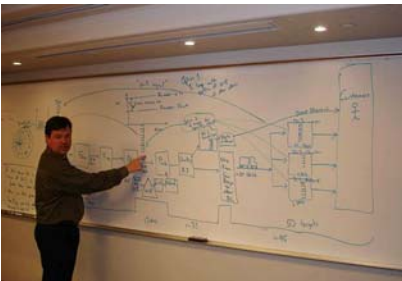


That insight springs from the genomic analysis of parasites in their natural state, derived directly from patients residing in Senegal, and also from the researchers’ use of innovative computational approaches to interpret their results. These computational methods helped to identify three distinct biological states of the malaria parasite: an active growth-based state, a starvation response and an environmental stress response, presumably related to the body’s inflammatory response to the parasite. This physiological diversity was previously unknown and may help explain the widely varying course of the disease in different patients, from mild, flu-like illness to coma and even death.

According to the Centers for Disease Control and Prevention, 41 percent of the world’s population live in areas where malaria is transmitted. Each year 350-500 million cases of malaria occur worldwide, and over one million people die. Some 1,337 cases of malaria, including eight deaths, were reported for 2002 in the United States. Credit: USGS

For more on the malaria parasite, read the Broad Institutes’ [“In blood, malaria's secrets revealed.”](#)

From Discovery to Success: Invistics Innovates Manufacturing Software Solutions



Invistics Founder and Chief Strategy Officer Tom Knight. Invistics’ software brings complex manufacturing planning from the drawing board to the PC. Credit: Invistics

The complexities of modern manufacturing present a daunting challenge to companies focused on maximizing the bottom line without compromising customer satisfaction. Software firm Invistics addresses industry’s need to function at peak efficiency by producing software and services packages incorporating the principles of “lean” manufacturing, which involve the analysis, prediction and optimization of manufacturing and supply chain processes. A number of Fortune 500 companies have adopted Invistics’ software products to slash production times and achieve on-time deliveries. The recipient of four [NSF Small Business Innovation Research \(SBIR\) grants](#) since 2001, Invistics now employs 25 and generates significant annual revenues. In 2007, it received the prestigious Tibbetts Award, given to a select group of outstanding SBIR recipients each year. The award is named for Roland Tibbetts, who began the SBIR program in 1977 as an experimental project at NSF.

DID YOU KNOW?

The Internet traces its origins to an NSF-funded computational network created to support and promote networking in education and research in the United States. Established in the early 1980’s and using the same “TCP/IP” protocol as the military’s restricted ARPANET, “NSFNET” grew quickly as people realized the benefits of open access networking. In 1987, NSF awarded a grant to IBM, MCI and a center at the University of Michigan to create a network of networks, or inter-net, and the Internet we know today was born.

See [NSF’s Special Report](#) on the Internet’s 20th anniversary.



A visualization of the NSFNET T1 backbone in 1991. Credit: Donna Cox and Robert Patterson, NCSA and the Board of Trustees of the University of Illinois

In the Face of a Growing Threat: One Scientist Targets the Marine Environment of Drug-resistant Staph Bacteria



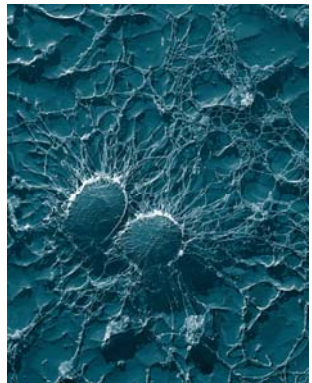
Professor Lisa Plano of the University of Miami School of Medicine. Credit: Aileen Chen

Methicillin-resistant *Staphylococcus aureus* (MRSA) causes “staph” infections that are resistant to treatment with the usual antibiotics. According to data from the Centers for Disease Control and Prevention (CDC), approximately 43% of all hospital-reported staph infections are related to MRSA. The recent media frenzy surrounding localized outbreaks of this potentially deadly infection throughout the nation has highlighted the need for increased research in the field of bacteriology.

The Small Grants for Exploratory Research (SGER) program is one mechanism NSF uses to support fundamental science and engineering projects whose results may enable our country to better mitigate, prepare for, respond to and recover from catastrophic events, such as disease outbreaks.

One [recently funded SGER study](#), led by Professor Lisa Plano at the University of Miami, is evaluating a possible connection between the microbial density of *S. aureus* and symptoms of infection reported in beachgoers, as well as the possibility of person-to-person transmission through ocean water. Plano’s research will focus on the recreational marine waters along the coast of South Florida.

The real-life implications of this study reach well beyond the waters of southern Florida. Establishing a link will provide a method for risk analysis in the presence of this bacteria. New health and hygiene recommendations, established using results from this study, may help to prevent infection at crowded beaches or, at the very least, better inform the public of the risk they assume when they spend an afternoon at the beach.



According to the CDC, methicillin-resistant *S. aureus* was associated with nearly 19,000 hospital-related deaths in the United States in 2005. Credit: Erbe, Pooley: USDA, ARS, EMU



Coastal water quality monitoring and hygiene practices at crowded beaches may be informed by Plano’s research. Credit: Jupiter Corporation



Like hospitals, marine environments may also be prime locations for MRSA bacteria to spread to humans. Credit: Jupiter Corporation



The presence of MRSA bacteria may serve as an indicator of human impact on recreational waters. Credit: Jupiter Corporation

NSF IN THE NEWS

NSF Day in West Virginia Wows Congressman (*Dominion Post, Morgantown, W. Va. 12/4/2007*) -- Congressman Alan B. Mollohan, D-W.Va., attended a recent NSF Day held in W. Va. that provided an overview of NSF to the local community. “It is always a good thing to facilitate dialogue and interaction between agencies that supply research generally with those who do the research,” Mollohan said.

Math and Science Partnerships Fuel Success (*Washington Post 12/26/2007*) -- NSF, along with the Department of Education, is breathing new life into K-12 math and science through a program aimed at pairing teachers with college faculty to improve their math and science knowledge. Participants in the Math and Science Partnerships program gathered in Washington D.C. in December to discuss strategies for improving student achievement.



The Aurora Australis--the Southern Lights--are seen over NSF's new Amundsen-Scott South Pole Station. Credit: Jonathan Berry, NSF

Celebrating New World-Class Facilities at the South Pole

Where: Earth's South Pole (90°S)

When: January 12, 2008

In January 2008, a century after Norwegian Roald Amundsen erected the first man-made structure--a small tent--at the South Pole, NSF will dedicate the third and newest U.S. scientific station at the Earth's southern extremity.

The dedication also marks two historic occasions: the 50th anniversary of the International Geophysical Year, when scientists took up residence in the first South Pole station, and the International Polar Year 2007-2008, a global scientific field campaign.

Notes from the Road...

Dr. Arden Bement, NSF's Director, joined U.S. Ambassador to Hungary April Foley and American Association for the Advancement of Science (AAAS) CEO Dr. Alan Leshner in representing the United States at the World Science Forum (WSF) held in Budapest, Hungary, on November 8-10, 2007.

Attracting more than 400 scientists from over 60 countries, as well as government officials and non-government organizations, the WSF is a joint event of the Hungarian Academy of Sciences, UNESCO and the International Council for Science. Its goal is to promote dialogue and the exchange of ideas on key issues relevant to scientists and policymakers alike.

In his address to the attendees, Bement stressed the importance of international cooperation. He said, "Nations around the globe now recognize the increasing necessity of reaching across borders to form partnerships that enrich the common base of knowledge and innovation. Through partnerships with other nations, we leverage the impacts of our investments, providing a firmer foundation for addressing global problems and diversifying the global talent pool."



Credit: Sam Kittner

Save the Dates!

NSF's Open House

Where: National Science Foundation, 4201 Wilson Blvd. Arlington, Va. 22230 (Ballston Metro)

When: Monday, February 4, 2008, 11 a.m.-5 p.m.

Join NSF-supported scientists, engineers and educators from across the nation as they showcase their work in hands-on exhibits and demonstrations.

2008 AAAS Annual Meeting

Where: Hynes Convention Center, Boston, Mass.

When: February 14-18, 2008

Register now for AAAS's 2008 Annual Meeting. This year's theme: Science and Technology from a Global Perspective.



Two young visitors interact with a robot at the 2007 Open House. Credit: Curt Suplee, NSF



The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science with an annual budget of nearly \$5.92 billion. NSF funding reaches all 50 states through grants to over 1,700 universities and institutions. Each year, NSF receives about 42,000 competitive requests for funding and makes over 10,000 new funding awards. The NSF also awards over \$400 million in professional and service contracts yearly. Contact [NSF's Office of Legislative and Public Affairs](#) for more information, to unsubscribe or for permission to reuse newsletter images.