THE NIH CATALYST

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ROK-Solid Research

Top Korean Scientists Visit the NIH

BY SOMA CHOWDHURY, OD

The usually unflappable NIH scientists **Minkyung (Min)** and **Byoung-Joon (B.J.) Song** were nervous and paced restlessly outside Lipsett Amphitheater (Building 10) on April 16. They were the lead organizers for an inaugural NIH-Korea symposium that was about to begin, and the 18 guests from South Korea hadn't arrived. Among the missing guests were the head of the Korea NIH (KNIH), the director of the Korean Health Industry Development Institute (KHIDI), the president of the Korea National Cancer Center (KNCC), and a representative from the South Korean Embassy. There seemed to be some confusion about which entrance to the NIH campus they were supposed to use, and they were at the wrong one. Finally, after a volley of cell-phone calls, the last-minute issues got sorted out and the guests arrived—almost on time, as it turned out—to a warm welcome. And the Songs could relax.

The symposium highlighted groundbreaking research in health issues that are common in the Republic of Korea (ROK)—also known as South Korea—and the United States: obesity, diabetes, metabolic syndromes, neurodegenerative diseases, immunological disorders, and infectious diseases. In addition, other sessions focused on stem-cell therapy, big-data analysis, cancer-drug discovery, and cancer treatments.

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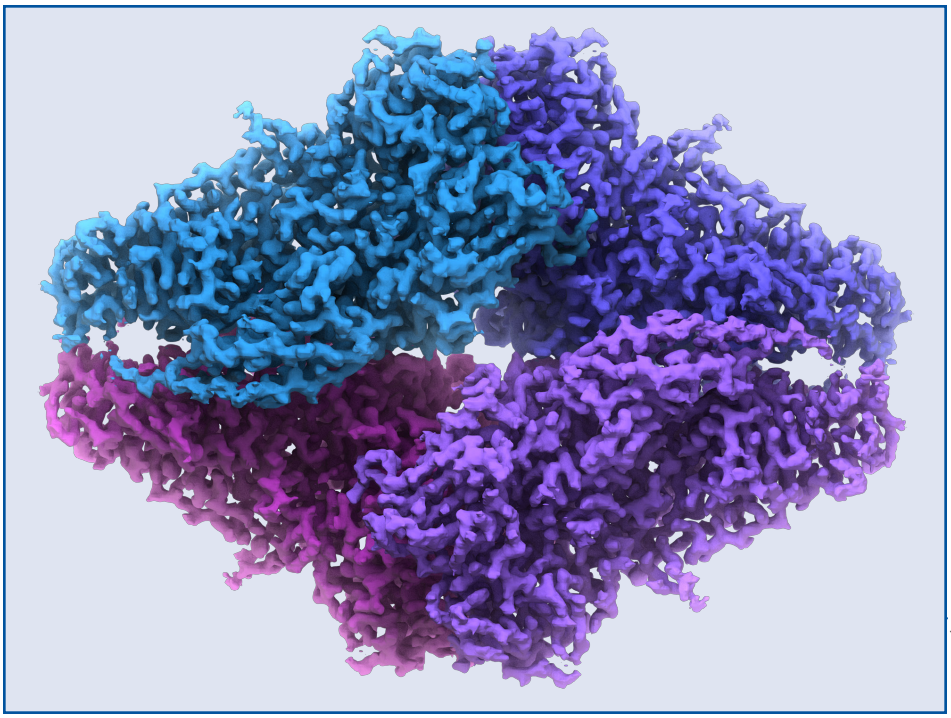
Cryo-EM Holds Promise for Drug Discovery

Technique that Provides Near-Atomic Resolution of Protein Structures

BY VIVIANE CALLIER, NCI



VERONICA FALCONIERI, NCI-CCR

NCI scientists used an imaging technique called cryo-electron microscopy (cryo-EM) to view, in near-atomic detail, the architecture of a metabolic enzyme bound to a drug that blocks its activity. Shown here, 2.2 Å resolution cryo-EM structure of the small bacterial enzyme beta-galactosidase.

In an imaging breakthrough, NIH scientists used cryo-electron microscopy (cryo-EM) to view, in near-atomic detail, the architecture of a metabolic enzyme bound to a drug that blocks its activity. This advance provides a new path for deciphering molecular structures and may revolutionize drug development, noted the researchers.

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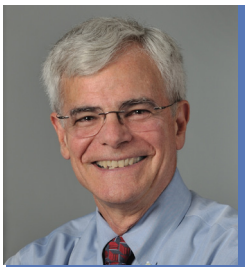


Long-Term Planning: The End of the Beginning

BY MICHAEL GOTTESMAN, DDIR

Two years ago, the NIH intramural Research Program (IRP) began the long process of long-term planning, with a 5- to 10-year event horizon. This activity was driven by the reality of a 30 percent decline in the purchasing power of intramural funds over the previous 10 years, a change in the way in which we conduct science, the need for much more workforce diversity, and a need to provide funds to maintain the NIH Clinical Center as the pre-eminent clinical-research facility in the world.

This lengthy long-term planning process included many consultations with NIH institute and center (IC) directors and scientific directors, individual recommendations from blue-ribbon panel committees established in each IC using both intramural and extramural experts, a synthesis of these ideas by the scientific directors, and a report in December 12, 2014, by an external subcommittee of the Advisory Committee to the Director (ACD), co-chaired by Cato Laurencin (University of Connecticut in Storrs) and our principal deputy director, **Larry Tabak**.

To implement the ACD report, the Office of Intramural Research assembled a response and implementation plan that has been vetted by IC directors, scientific directors, the Assembly of Scientists, and an implementation committee consisting of a broad spectrum of tenure-track and tenured intramural scientists, scientific directors, , and administrative leadership. The hard work of all of these groups led to a document that included 44 specific recommendations that was presented on June 12, 2015, to the ACD, where it was enthusiastically received.

In consequence, NIH Director **Francis Collins** has urged us to move ahead with implementation of this long-term plan, which includes many new ideas for ways in which we can support and conduct science and a summary of research areas in which the IRP is perfectly poised to make major advances.

We will kick off the NIH intramural long-term plan at the 2015 Research Festival, September 16 to 18.

The report addresses four major areas in which change is contemplated:

1) The Clinical Center (CC) will remain the centerpiece of translational research at the NIH with assured and appropriate funding, more alliances with the neighboring extramural clinical-research community, and an enhanced role in training the next generation of physician-scientists and in developing career tracks for clinical investigators. The CC is a rich repository of phenotypic data on patients with both rare and common diseases, and ensuring that genotypic data are obtained on a large cohort of CC subjects is critical to advancing genotype-phenotype correlations. The CC will be a referral center for subjects with unusual genotypes for which comprehensive phenotyping is essential to understanding their biology.

2) The NIH IRP will become a role model for improving the diversity of the biomedical workforce. We will cast the widest net possible for scientists in all research positions at the NIH; develop new pathways for career development that allow investigators to graduate more quickly to independence; develop a central program for recruitment, mentoring, and career development of postdoctoral fellows; and enhance existing entry-level programs for students from diverse backgrounds.

3) To become a dynamic research environment for new generations of imaginative scientists, we will encourage trans-NIH recruitments, such as the Stadtman Investigator and NIH-Lasker Clinical Research Scholars program; we will support the careers of staff scientists and clinicians and encourage and reward team science; and we will create new pathways to independence such as the assistant clinical investigator position and a new assistant laboratory investigator position.

4) NIH will create new pools of funds at the IC level as well as centrally to encourage flexibility of support for new programs and research opportunities. Centrally, these funds will be gradually established, as the NIH budget allows, to equal approximately one percent of the NIH intramural budget. These funds will be used to stimulate new initiatives, support new recruitments, and encourage trans-NIH collaborations.

In addition, the IC-specific recommendations for high-priority areas

led to a set of cross-cutting research areas that have been embraced by our scientific leadership and staff. One area of universal interest is the development of a technology incubator where new instrumentation for optical exploration of cells, new initiatives in structural biology (for example, use of cryo-electron microscopy for atomic resolution of protein structures), and new clinical imaging modalities could be developed. Such a resource would enable the recruitment of talented early-career investigators and provide a sabbatical cradle for nurturing new ideas.

The nine areas of cross-cutting science are described in more detail as an attachment to the response and implementation plan: chronic inflammatory diseases, gene- and cell-based therapies, the microbiome and its role in health and disease, drug-resistance in microbes and in diseases such as cancer and epilepsy, the neuroscience of compulsive brain behaviors (addictions, obsessive-compulsive behavior, and eating disorders), RNA biology and therapeutics using and targeting RNA, vaccine development, natural products, and the creation of novel animal models. Although these areas are not meant to limit basic and clinical research at the NIH, they are judged to be areas of particular promise worthy of additional support and encouragement.

We will highlight these research areas and kick off the NIH intramural long-term plan at the 2015 Research Festival (September 16–18), I look forward to seeing you there! ●

You can find the long-term reports (ACD LT IRP Working Group reports) at http://acd.od.nih.gov/meetings.htm.

NEWS FROM AND ABOUT THE SCIENTIFIC INTEREST GROUPS

NEW: EXTRACELLULAR VESICLE INTEREST GROUP (EVIG)

Human plasma contains an abundance of circulating extracellular vesicles (EVs) that regulate biological processes and contribute to the pathogenesis of diseases. EVs are promising candidates for development as therapeutic and diagnostic targets. The study of sub-micrometer biological particles, especially sub–100 nanometer exosomes, poses substantial technical challenges as well as opportunities for innovation. The EVIG aims to promote collaboration and knowledge sharing among NIH scientists who are studying EVs, with the goal of accelerating the advancement of the study of EVs.

The EVIG will meet quarterly (first meeting in September). Meetings will feature talks related to exosomes, microvesicles, and other EVs, as well the methodologies and approaches used to address biological hypotheses about EVs. The meetings and a LISTSERV (EVIG-L), will provide a forum for sharing best practices (protocols and standards) and for the mentoring and professional development of trainees who are interested in EV-related studies. To join the LISTSERV, visit https://list.nih.gov/cgi-bin/wa.exe?SUBED1=EVIG-L&A=1 or contact **Jennifer Jones** (Jennifer.Jones2@nih.gov).

NEW: NIH HISPANIC HEALTH RESEARCH SIG

This SIG has been established to foster discussions on Hispanic health–related research. Topics will include the mechanisms of disease that commonly affect Hispanics and other populations, interventions to prevent chronic diseases or their complications, translational and implementation research, clinical trials, health education and communication, social sciences, bioethics, health policy, and more. These discussions aim to translate knowledge into the improvement of the health of Hispanics and the general population, identify new areas of research as well as potential trans-NIH or trans–Department of Health and Human Services (HHS) collaborations.

Larissa Avilés-Santa (NHLBI), **Jill Koshiol** (NCI), and **Ranganath Muniyappa** (NIDDK) are the SIG's co-chairs. The monthly meetings will feature experts from outside and within the NIH and HHS community; the format will range from open discussion of research questions/hypotheses to formal lectures. There will also be biannual half-day meetings to provide updates on NIH and HHS research activities.

To join the LISTSERV (HISP_HEALTH_RES_INTRST_L), visit https://list.nih.gov/cgi-bin/wa.exe?SUBED1=hisp_health_res_intrst_l&A=1. For questions, contact Larissa Avilés-Santa at avilessantal@nhlbi.nih.gov or Ligia Artiles at artilesl@mail.nih.gov.

NEW: INFLAMMATORY DISEASE INTEREST GROUP (IDIG)

The IDIG will bring together scientists at all experience levels with an interest in inflammatory disease research. Although inflammation can be a protective response, if the causative agent is persistent or the mechanisms that regulate the initiation, maintenance, or resolution of the inflammatory response become dysregulated, the inflammation can evolve into a pathophysiological response as is seen in chronic autoimmune, neurodegenerative, fibrotic, and allergic diseases. Inflammation is also a central driver of tumor progression.

The IDIG plans to encourage communication, discussion, and NIH-wide collaboration so that new treatments might be developed for chronic inflammatory and fibrotic diseases. There will be 2-3 daylong symposia each year and a bimonthly seminar series on basic and translational aspects of inflammation. The group is open to all persons within NIH and associated agencies (FDA, USDA, etc.) who share an interest in basic and translational inflammation research. To join the LISTSERV (INFLAM-DIS-L), visit https://list.nih.gov/cgi-bin/wa.exe?SUBED1=INFLAM-DIS-L&A=1 or contact **Thomas A. Wynn** at twynn@niaid.nih.gov. ●

SEE PAGE 13 FOR MORE SIG NEWS.

FROM THE OFFICE OF INTRAMURAL TRAINING AND EDUCATION

2015 Career Symposium

BY REBECCA MESEROLL, NIDDK

There is no such thing as an "alternative career," a term that is sometimes applied in a derogatory way to any career outside of academia, Office of Intramural Training and Education (OITE) Director **Sharon Milgram** reminded the audience that had gathered for the eighth annual NIH Career Symposium on May 15.

In fact, there are myriad career opportunities, all of them equally valid, for Ph.D.-bearing scientists. Many young scientists may not be aware of the variety of careers their doctoral degrees prepare them for. After all, they've been trained in academia and mentored primarily by advisors who have had personal experience only with the academic career track. The OITE has sought to remedy this situation by hosting an annual symposium at which graduate students and postdoctoral fellows can learn how to leverage their training into a career that is right for them, whether it's in academia, industry, or other organizations, or in some arena far away from the bench.

This year's daylong symposium, held at the Natcher Conference Center (Building 45), boasted more than 70 speakers and was attended by more than 1,000 trainees from the NIH intramural program and outside universities. Although the symposium panelists on 18 different panels discussed many different career options, several common themes arose. Speakers on every panel, regardless of their career path, stressed the value of networking in both finding and landing a job.

Patricia Dranchak, a research scientist at the National Center for Advancing Translational Sciences, urged the people attending the "Bench Careers in Unexpected Places" (such as nonprofit, private, and military organizations) panel to develop a concise description of their current work and career goals that they can use when talking to anyone. Some panelists recommended networking—including setting up informational interviews with people who work in the job seeker's desired field—both to gain details about what the work entails and to make personal connections.

Panelists also remarked on how being a good communicator is essential to any career. Whether someone is a professor giving lectures to students, an industry scientist talking to a team about a project's progress, or a science-policy analyst writing recommendations for legislation, the ability to communicate clearly is crucial. Panelists also recommended that trainees take an inventory of the skills and expertise they have and develop any that will be particularly important in the career path of their choosing.

Nearly all the presenters on the "Science Education and Outreach Careers" panel had gained experience through volunteer teaching or outreach, and those on the "Careers in Science Communications" panel had volunteered for writing and editing opportunities. The speakers said that for any career it is important for trainees to develop critical-thinking and problem-solving skills as well as to put time and effort into making connections, practicing communication, and gaining any additional training or experience necessary to succeed.

Yong-Jun Liu, the senior vice president for Research and Development at MedImmune (Gaithersburg, Maryland), closed the symposium with a discussion of his own career journey through academia and industry. Following answers to scientific questions took him down an unexpected path, making him realize that careers can evolve in surprising ways. This idea was echoed in other panels. John Balbach ("Science Education and Outreach Careers" panel) told how he had left an academic position at George Washington University (Washington, D.C.) to teach physics at Georgetown Preparatory School (North Bethesda, Maryland) when he realized his passions tended more toward education than research. Robert Arch (director, Takeda Pharmaceuticals), who spoke on a panel about transitioning to industry, described how he moved from his academic post to a series of industry positions.

Many of the panelists discovered during their training that doing research was not their favorite aspect of science and abandoned their pipettes for one of a multitude of other science careers. The message from the symposium was clear: Young scientists should follow their strengths and passions because there is a wide world of opportunities for them, albeit sometimes in unexpected places. ●

To see write-ups of the individual sessions, go to https://www.training.nih.gov/assets/Career_Symposium_2015_Newsletter__508.pdf. For more information about the services and resources that OITE offers, visit https://www.training.nih.gov.

WEICKER BUILDING DEDICATION REVISTED

Building 4 on the NIH Bethesda campus was dedicated on May 5 to Lowell P. Weicker Jr., former U.S. representative (1969–1971) and U.S. senator (1971–1989), the 85th governor of Connecticut (1991–1995), and longtime champion for NIH and biomedical research. This is the second time a building at NIH has been dedicated to him. The first was in 1991 when Building 36 was named for him, but it was torn down to make room for the Porter Neuroscience Building (Building 35).

"Buildings come and buildings go, but reputations—and sometimes solidly built historic buildings—actually endure," said NIH Director **Francis Collins**. "This one does." The recently renovated Building 4 is one the original six buildings. It now houses laboratories for the National Institute of Allergy and Infectious Diseases (NIAID).

"We were in the trenches together [with] HIV," said NIAID Director **Anthony Fauci**, who has known Weicker for more than 30 years and was on hand as one of the speakers at the dedication. Senator Weicker was one of the few and the brave "politicians [who was] courageous enough to support the scientific and public-health measures necessary to address a newly recognized disease that affected mostly the disenfranchised."

ERNIE BRANSON

NIH's Building 4 was dedicated in May to Lowell P. Weicker Jr., a longtime champion for NIH and biomedical research. Weicker, pictured here, was a former U.S. representative and U.S. senator, and the 85th governor of Connecticut.

The dedication recognizes him for his support for "basic biomedical research [and for giving] courage to others to continue the fight for the public support of the National Institutes of Health and its mission," said former U.S. Senator Tom Harkin (D-IA), who served with him on the Senate Appropriations Committee.

Weicker was one of the first senators to hold hearings on AIDS and sought $46 million in funding to test the then experimental drug zidovudine. When he was chairman of the Senate Appropriations Subcommittee for Labor, Health, and Education, the NIH budget grew from $4.3 billion to $6.7 billion in five years. In 1988, Weicker received a Lasker Public Service Award for his "compassion and dedication in the fight to eradicate disease and disability through federal funding of medical research and public health programs." In 1989, he was the founding president of Research!America, the nation's largest not-for-profit public-education and advocacy alliance working to make research to improve health a national priority.

The crowd welcomed Weicker with a standing ovation when he came to the podium. "The campus of health and hope almost wasn't in the early 1980s," he said. But progress will continue to be made, "not because of buildings named after ex-politicians, but because of the people who reside in these buildings who are plodding along day after day and because citizens participated in their government." He hopes that in Building 4, "generations [will] bring their skills [and] their talents together in the interest of life." ●

To watch a video of the dedictation, visit http://videocast.nih.gov/launch.asp?19038.

ALAN ALDA AND ROGER ROSENBLATT VISIT NIH

On May 21, actor/director/writer Alan Alda and writer Roger Rosenblatt joined NIH Director **Francis Collins** on the Masur Auditorium stage for an informal, funny, and entertaining conversation about communicating science.

Alda, who is best known for his role as Captain Hawkeye Pierce on the hit television series *M*A*S*H* (1972–1983), has always loved science. From 1993 through 2005, he hosted PBS's *Scientific American Frontiers* and interviewed hundreds of scientists. He realized that although they had good stories to tell, they had a hard time explaining their work so others could understand it. He began using improvisational theater games to coach scientists and in 2009, helped create the Alan Alda Center for Communicating Science at Stony Brook University (Stony Brook, New York). He leads workshops that use improvisational theater games to help scientists communicate their research in an personal and engaging way

One bit of advice that Alda shared was to avoid using PowerPoint presentations to simply read what is on the screen. "That's not communication, that's *ex*communication," he laughed. ●

For more communications tips from Alda and Rosenblatt, watch the videocast (NIH only) at http://videocast.nih.gov/launch.asp?19016. You can also read an article in the June 19, 2015, issue of the *NIH Record* at http://nihrecord.nih.gov/newsletters/2015/06_19_2015/story1.htm.

Guidelines for Your Personal Social Media Accounts

There's Much You Can Do

BY *THE NIH CATALYST* EDITORS

Many of NIH's Institutes and Centers (ICs) as well as the Office of the Director are using Internet social-media platforms—such as LinkedIn, Facebook, Twitter, Pinterest, Tumblr, and blogs—to communicate with the public. For these official uses, anyone working for or on behalf of the federal government must be sure that their use of social media is in compliance with applicable laws and policies such as the criminal conflict-of-interest statutes, the government-wide Standards of Conduct regulations (http://www.oge.gov/Laws-and-Regulations/Employee-Standards-of-Conduct/Employee-Standards-of-Conduct/), and NIH policies on official-duty activities.

You may know that federal workers are allowed to have personal social-media accounts. But you may not realize that activities associated with your personal account have to comply with certain guidelines, too. On April 9, 2015, the United States Office of Government Ethics issued a legal advisory describing how the ethics rules are applied to personal social-media use (http://1.usa.gov/1S1ONtK). These guidelines apply to all federal government employees and trainees.

Here is what you need to know. Keep in mind that the ethics rules apply whether or not you are using social media. For questions and clarification, consult with the ethics office for your IC.

1. Use of Government Time and Property to Access Personal Social-Media Accounts

- Use of government time and property must follow agency or institute policies. NIH has a limited-use policy, so some limited access to your personal accounts from your NIH computer during the work day is likely permissible. (http://oma1.od.nih.gov/manualchapters/management/2806/).
- Supervisors may only ask subordinates to perform government work, so they may not, for example, ask a subordinate to work on his or her personal social-media account.

2. Reference to Government Title of Positions and Appearance of Official Sanction

- NIH e-mail addresses should not be used to establish personal accounts or as an identifier during participation in personal or otherwise unofficial social-media activities.
- There is no violation if an employee merely includes his/her title or position in an area containing biographical information, but no official logo can be reflected on your personal page.
- A violation could occur if you refer to your connection to the NIH in a way that suggests that the NIH sanctions or endorses your personal social-media activities.

3. Recommending and Endorsing the Skills of Others on Social Media

- You are allowed, in your personal capacity, to make endorsements or recommendations of the skills of others.
- If making an endorsement (such as on LinkedIn), your title may appear in a biographical section.
- A violation could occur if, within the recommendation, the endorser references their title or position or NIH specifically. It is not, however, a violation if the social-media service automatically adds your name, title, and employer.

4. Seeking Employment through Social Media

- You may seek employment through social media, but you must comply with the applicable disqualification requirements (see 5 C.F.R., 2365.601 et. seq.). The disqualification requirements come into play if you are working on a matter that involves the potential employer.
- The term "seeking employment" encompasses actual employment negotiations as well as more preliminary efforts to obtain employment, such as sending an unsolicited resume.
- "Seeking employment" does not include posting a resume/summary of professional experience on your personal account or rejecting an unsolicited employment overture.

5. Disclosing Nonpublic Information

- Standard rules against disclosing nonpublic information apply to social media.
- Employees may not accept any compensation for statements or communications made over social media that relate to their official duties.

6. Personal Fundraising

- It's okay to use your personal social-media accounts to fundraise for nonprofit charitable organizations, but you must comply with the appropriate section of the Standards of Conduct for fundraising (5 CFR 2635.808): http://www.oge.gov/Laws-and-Regulations/OGE-Regulations/5-C-F-R--Part-2635---Standards-of-ethical-conduct-for-employees-of-the-executive-branch/
- You may not personally solicit funds from a subordinate or a prohibited source (such as an entity doing or seeking to do business with the NIH).
- Different rules apply to political fundraising. Please carefully review those rules because a violation of the Hatch Act may trigger a criminal violation: https://osc.gov/Resources/Social%20Media%20and%20the%20Hatch%20Act%202012.pdf.

7. Official Social-Media Accounts

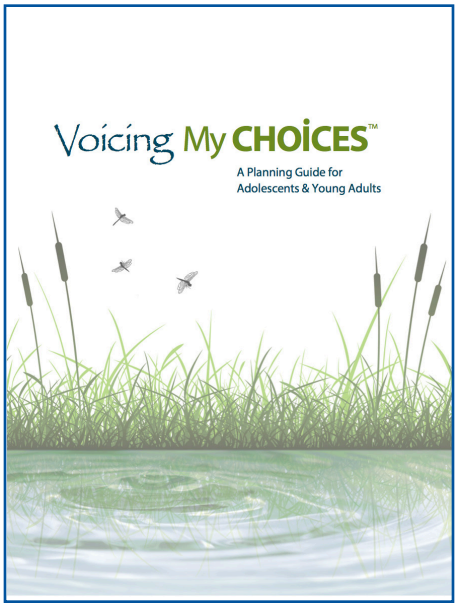
- Follow the NIH Social Media Policy: http://www.nih.gov/socialmediapolicy. ●

For questions, contact your IC's ethics office (https://ethics.od.nih.gov/contacts.html).

Voicing My Choices

Terminally Ill Teens and Young Adults Express Their Wishes

BY LIAM EMMART, SPECIAL VOLUNTEER



More than 11,000 adolescents and young adults (AYAs; 15 to 34 years old) die each year from cancer and other terminal illnesses. But they usually are not involved in planning their own end-of-life (EOL) care. Decisions are often left up to grief-stricken parents who have no idea what their children want. And the AYAs are afraid of hurting their parents, so they may refrain from expressing their wishes.

NIH researchers have developed an age-appropriate advance-care planning guide, "Voicing My Choices," that aims to open communications with terminally ill teenagers and young adults. The guide was developed by staff scientist and social worker **Lori Wiener** (National Cancer Institute, NCI), pediatric psychologist **Sima Zadeh** (NCI), and child and adolescent psychiatrist **Maryland Pao** (National Institute of Mental Health). It was the culmination of a two-phase study with cancer- or HIV-positive AYAs (*Pediatrics* **130:**897–905, 2012).

In the second phase of the study, the researchers assessed the usefulness of two advance-care planning guides: "Five Wishes," which is geared to older patients, and "My Thoughts, My Wishes, My Voice," a modified guide geared to young people based on what was learned through focus groups in an earlier phase of the NCI study. Randomly ordered pages from the two guides were presented to 52 AYA volunteers who had metastatic or recurrent cancer or human immunodeficiency virus (HIV) infection (acquired at birth or early in life). The participants were asked to rank 25 items based on several factors.

The study found that AYAs with life-threatening illnesses want to be able to determine the kind of life-support treatment they do and don't want; how they would like to be cared for; information they'd like their family and friends to know, and how they would like to be remembered. Crucially, AYAs displayed something both Wiener and Pao had long believed to be true: The AYAs thought about EOL decisions and were prepared to have conversations about care and treatment options.

Following the second phase of the study, the researchers used the qualitative and quantitative data from the AYAs to design the planning guide, "Voicing My Choices." It's a tool that helps providers "find the words to talk about the patients' preferences for their care should they become very ill," said Pao. Whether presented in its entirety or one page at a time, the guide is meant to be a way to break down the discomfort that surrounds the discussion of EOL topics.

We gave "providers the language with which they could address these hard questions," said Pao. We "are trying to bring these discussions to the forefront of EOL decision-making by including AYAs in a discussion they have long had very little input in."

Since it was introduced in 2012, more than 26,000 copies of the guide have been ordered, and it has been translated into Spanish, Italian, French, and Slovak.

The researchers recently published another paper that provides advice on how health-care providers can effectively use the "Voicing My Choices" guide when attempting to engage in EOL discussions (*Palliat Support Care*, **13:**591–599, 2015). The paper offers "guidelines on how to: incorporate EOL planning into the practice setting, identify time points at which a patient's goals of care are discussed, and address how to empower the patient and incorporate the family in EOL planning."

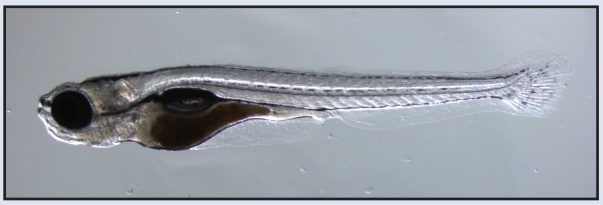
Finally, AYAs and their families have a way to break the silence around the most painful of topics—death. ●

To download a copy of the "Voicing My Choices" guide, go to https://www.aging-withdignity.org/voicing-my-choices.php.

NEW MEHODS

The *NIH Catalyst* is always looking for stories about new methods that have been developed by NIH researchers. If you developed a method within the past year—or you know of someone who did—please contact the editors at catalyst@nih.gov or 301-402-1449 to see if we might feature it on these pages.

Intramural Research Briefs



S. BURGESS, NHGRI

NHGRI scientists are homing in on specific genes in zebrafish as a way to better understand the function of genes in people.

NHGRI: A NEW ROLE FOR ZEBRAFISH—LARGER-SCALE GENE-FUNCTION STUDIES

A relatively new method of targeting specific DNA sequences in zebrafish (*Danio rerio*) could dramatically accelerate the discovery of gene function and the identification of disease genes in humans, according to NHGRI scientists. They reported that the gene-editing technology known as CRISPR/Cas9 is six times as effective as other techniques at homing in on target genes and inserting or deleting specific sequences. The study also demonstrated that the CRISPR/Cas9 method can be used to target and cause mutations in multiple genes at the same time to determine their functions. CRISPR stands for "clustered, regularly interspaced, short palindromic repeat," referring to a pattern of DNA sequences that appears frequently in bacterial DNA. Scientists believe the CRISPR sequences reflect evolutionary responses to past viral attacks. (NIH authors: G. Varshney, W. Pei, M. LaFave, J. Ido, L. Xu, V. Gallardo, B. Carrington, K. Bishop, M. Jones, M. Li, U. Harper, S. Huang, A. Prakash, R. Sood, and S. Burgess, *Genome Res* DOI:10.1101/gr.186379.114)

NIDDK, NIDA: APPETITE-REGULATING NEURAL PATHWAY IDENTIFIED IN MICE

A team that included NIDDK and NIDA researchers discovered a neural circuit in a mouse brain that controls appetite. Using an array of multidisciplinary techniques, the team found that neurons interacting with a specific receptor in a part of the brain called the hypothalamic paraventricular nucleus and the signals of those neurons to another part of the brain–the lateral parabrachial nucleus–regulate food consumption. Temporarily switching off these neurons in mice that are full makes the mice eat as though they were hungry. Turning the neurons on reduces food consumption in hungry mice, making them behave as if they were full. Activation of this same satiety-promoting circuit in the absence of food alleviates the unpleasant physical sensations associated with hunger. The findings suggest a potential research approach that could lead to treatments for people who are obese and could lay the foundation for the development of a drug to reduce food consumption as well as the disagreeable sensation of hunger. (NIH authors: C. Li, E. Webber, O. Gavrilova, and M.J. Krashes, *Nat Neurosci* **18**:863–871, 2015)

NIAAA: ALCOHOL-USE DISORDER ON THE RISE

NIAAA researchers reported recently that nearly one-third of adults in the United States have an alcohol-use disorder (AUD) at some time in their lives, but only about 20 percent of them seek treatment. The study also revealed a significant increase in AUDs over the past decade. The researchers conducted more than 36,000 face-to-face interviews of U.S. adults as part of the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions III (NESARC-III). NESARC III is a continuation of the largest study ever conducted on the co-occurrence of alcohol use, drug use, and related psychiatric conditions. The original NESARC survey was conducted in 2001–2002.

In NESARC III, researchers assessed alcohol problems using diagnostic criteria set forth in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* in 2013. They found that 13.9 percent of adults met AUD criteria for the previous year, while 29.1 percent met AUD criteria at some time in their life. Only 19.8 percent of adults with lifetime AUD sought treatment or help, while 7.7 percent of those with a 12-month AUD sought treatment. In addition, the study saw large increases in AUD rates over the past decade. Past-year and lifetime AUD rates for NESARC III participants were 12.7 percent and 43.6 percent, respectively.

By comparison, NESARC participants in 2001 through 2002 reported past-year and lifetime AUD rates of 8.5 percent and 30.3 percent, respectively. The study also found that rates of AUD were greater among men than women and that age was inversely related to past-year AUD diagnosis. Among adults between ages 18 and 29, more than 7 percent had had an AUD within the past year, suggesting a need for more effective prevention and intervention efforts among young people. More broadly, the researchers note the urgent need for efforts aimed at educating the public about AUD and its treatment and at destigmatizing the disorder. (NIH authors: B.F. Grant, R.B. Goldstein, T.D. Saha, S.P. Chou, J. Jung, H. Zhang, R.P. Pickering, W.J. Ruan, S.M. Smith, and B. Huang, *JAMA Psychiatry* DOI:10.1001/jamapsychiatry.2015.0584)

NIAMS: POTENTIAL BIOMARKER FOR PREDICTING TREATMENT RESPONSE IN VASCULITIS PATIENTS

NIAMS scientists, in collaboration with the Immune Tolerance Network and the Vasculitis Clinical Research Consortium, have discovered a potential biomarker for predicting which patients with a disease known as anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV) are more likely to respond to treatment. AAV is a systemic autoimmune disease that

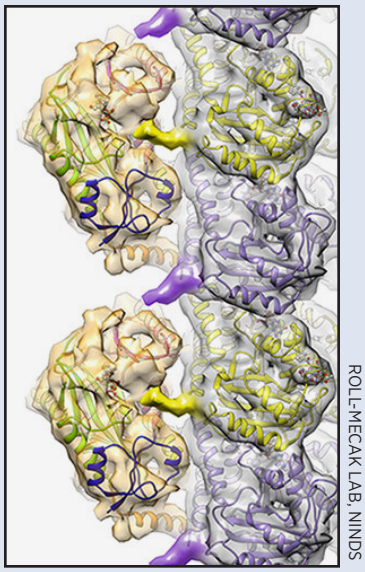
CONTRIBUTORS: KRYSTEN CARRERA, NIDDK; KIMBERLY MARTIN, NCI-CCR

causes inflammation in the blood vessels. There are few known biomarkers that can predict which patients with AAV will respond to which therapy, and none of these markers can reliably guide treatment decisions. Identifying biomarkers and novel therapeutic targets could help determine an individual's treatment response and lead to more personalized medical decisions.

The researchers conducted experiments using samples from the Rituximab in ANCA-Associated Vasculitis (RAVE) trial, which compared the standard therapy for AAV—a combination of the chemotherapy drug cyclophosphamide plus the corticosteroid prednisone—with the biologic agent rituximab plus prednisone. Rituximab is sometimes used to treat cancer and rheumatoid arthritis and other autoimmune diseases. In the recent study, the researchers analyzed blood samples of a subset of patients and concluded that an increased expression of a distinct group of neutrophils known as low-density granulocytes (LDGs) is associated with severe symptoms and a decreased response to treatment. The researchers concluded that LDGs play a key role in the progression of the disease and may affect treatment response. Future efforts will focus on further understanding the function of LDGs. (NIH authors: P. Grayson, C. Carmona-Rivera, and M. Kaplan, *Arthritis Rheumatol* DOI:10.1002/art.39153)

NINDS, NHLBI: SCIENTISTS UNRAVEL THE MYSTERY OF THE TUBULIN CODE

Cellular structures called microtubules are tagged with a variety of chemical markers that influence cell functions; the pattern of these markers makes up the "tubulin code." Using advanced imaging and biochemical techniques, NIH scientists and their colleagues at the Scripps Research Institute (La Jolla, Calif.) have uncovered the mechanism and three-dimensional structure of one of the main writers of this code, tubulin tyrosine ligase–7 (TTLL7).



ROLL-MECAK LAB, NINDS

Cellular code writer: TTLL7 (gold structures on the left) affects cell function by binding to microtubules (silver structure made up of purple and yellow subunits) and adding chemical markers to the surface.

TTLL7, one of nine proteins that make up the TTLL family, adds glutamate tags onto microtubules. The study represents the first time that scientists have identified the atomic structure of any member of the TTLL family. The researchers were able to see that TTLL7 positions itself on the microtubule by grabbing onto the microtubule tails.

The most common microtubule marker in the brain is glutamate. One of the signatures of damaged cells in cancer or blunt trauma is a change in the pattern of these microtubule markers. In addition, mutations in genes for TTLLs have been linked to several neurodegenerative disorders.

This study may lead to the development of small molecules that can regulate activity of TTLL proteins, which may have implications for several degenerative disorders linked to mutations in genes for TTLLs. (NIH authors: C.P. Garnham, A. Vemu, I. Yu, A. Szyk, A. Roll-Mecak, *Cell* **161**:1112–1123, 2015)

Read expanded briefs online at http://irp.nih.gov/catalyst/v23i4/research-briefs.

NCI: SPLICING MODULATION AS A POTENTIAL TREATMENT FOR VEMURAFENIB-RESISTANT MELANOMA

More than half of melanomas contain mutations in the B-raf proto-oncogene (BRAF) serine/threonine kinase. The most common mutation, BRAF(V600E), leads to excessive activation of the mitogen-activated protein kinases (MAPK) proliferation pathway. Vemurafenib is a potent kinase inhibitor with remarkable clinical activity in BRAF(V600E)-positive melanoma tumors.

Although patients initially respond to treatment with vemurafenib, they inevitably develop resistance. One known resistance mechanism is the aberrant splicing of *BRAF* RNA. To understand the molecular mechanism of *BRAF* mis-splicing, NCI researchers set out on a molecular investigation to identify the mechanism behind the generation of the vemurafenib-resistant BRAF isoforms. Their findings point to splicing inhibitors as a novel therapeutic strategy to overcome vemurafenib resistance.

The researchers started out by examining the C3 cell line, which was generated by chronically exposing patient-derived BRAF(V600E)-mutated cells to vemurafenib. To test whether splicing modulation is a viable therapeutic strategy for vemurafenib-resistant tumors in vivo, the scientists used a xenograft model and found that splicing modulators prevented vemurafenib-resistant tumor growth and halted the growth of already formed vemurafenib-resistant tumors.

These results strongly support further exploration of RNA splicing modulators, possibly in combination with MAPK inhibitors, as therapeutic agents in drug-resistant melanoma. (NCI authors: M. Salto, W.K. Kasprzak, T. Voss, B.A. Shapiro, and T. Misteli, *Nat Commun* DOI:10.1038/ncomms8103) ●

The Organ Prophet

Hannah Valantine Can Predict Heart-Transplant Rejection Before It Happens

BY BRANDON LEVY, NIMH

It was a chance encounter with a falling apple that inspired Sir Isaac Newton to develop his theory of gravity. A chance encounter inspired NIH cardiologist **Hannah Valantine**, too. But it wasn't with a piece of fruit. It was with a 2008 research paper published in the *Proceedings of the National Academy of Sciences U.S.A.* by Stanford biophysicist Stephen Quake. And the theory it inspired had to do with a new way to detect the rejection of transplanted hearts.

"I remember precisely the moment," recalled Valantine, who at the time was director of the Heart Transplantation Research Program at the Stanford University School of Medicine (Stanford, California).

The current method for diagnosing heart-transplant rejection is invasive—and expensive—and involves taking and analyzing a biopsy of the new organ post-transplant, after the rejection process has begun. Quake's paper, however, gave Valantine an idea for a better, noninvasive, and quicker way to detect rejection. He described a method for sequencing fragments of DNA—called cell-free DNA—from a fetus, which can also be found in the mother's blood, for prenatal diagnosis of genetic abnormalities such as Down syndrome (*Proc Natl Acad Sci USA* **105:**16266–16271, 2008).

"I thought, 'The heart transplant is essentially like a fetus,'" Valantine said. As it turned out, Quake had been thinking the same thing. The two began working together and discovered that in heart-transplant patients, cell-free DNA from the donor heart enters the recipient's bloodstream and can be detected months before a biopsy would show signs of rejection damage.

Valantine presented the fruits of their collaboration at the 2015 Anita B. Roberts Lecture in NIH's Lipsett Amphitheater (Building 10) on April 21. She described how she and Quake sequenced the genomes of 65 heart-transplant patients and their donor hearts before surgery. Afterward, they extracted cell-free DNA from the patients' blood and calculated how much of it was from the donor and how much from the patient. The percentage of cell-free DNA, which is elevated after the transplant, declines during the week after surgery and remains low if the organ is accepted. But when patients reject their donor heart, the percentages of donor DNA rise and remain elevated unless the rejection is treated. The findings suggest that elevated percentages of donor DNA could serve as a noninvasive tool to predict organ rejection. (*Sci Transl Med* **6:**241ra77, 2014)

Being able to monitor donor cell-free DNA in transplant patients might allow clinicians to treat organ rejection before there is damage to the heart muscle. Valantine hopes a blood test might eventually eliminate the need for biopsies.

The next step in Valantine's research is to reproduce the findings in a larger population. To that end, she has established a prospective, multi-center extramural-intramural research consortium—the Genome Research Alliance for Transplantation (GRAfT)—that includes NIH's National Heart, Lung, and Blood Institute (NHLBI) and five local transplant centers in the Washington, D.C., metropolitan area, all of which have pre-transplant and post-transplant clinics. Valantine's research lab is in the National Heart, Lung, and Blood Institute.

ERNIE BRANSON

One benefit of a consortium approach is that about 40 percent of the patients enrolled in the study will be African-American, whereas most clinical studies are less diverse. Compared with Caucasians, African-Americans have poorer health outcomes including higher rates of rejection and death after organ transplants. Valantine plans to investigate whether there is a genetic basis for the racial gap.

Valantine is also interested in eliminating the barriers that prevent minorities from pursuing biomedical careers. In fact, she was recruited to NIH in 2014 to be its first chief officer for Scientific Workforce Diversity. In that role, she is leading NIH's efforts to diversify the biomedical-research workforce by developing a vision and a comprehensive strategy to expand recruitment and retention and promote inclusiveness and equity throughout the biomedical-research enterprise. Before coming to NIH, she was the senior associate dean for Diversity and Leadership and a professor of cardiovascular medicine at the Stanford University School of Medicine.

"I really believe that diversity in the biomedical workforce itself will enhance the quality and outputs of science," she said. ●

To watch a video of Hannah Valantine's April 21, Anita Roberts lecture ("Precision Medicine in Action: Applying Genomic Tools to Improve Patient Outcomes after Organ Transplantation"), go to http://videocast.nih.gov/launch.asp?18956. Read more about her on page 18.

Defending the Honor of the Y Chromosome

2015 Nirenberg Lecture with David Page

BY EMILY PETRUS, NINDS

"Sex differences in incidence and severity are not the exception—they are in fact the rule," said Whitehead Institute Director David Page at the 2015 Nirenberg Lecture held at NIH in May. "For every affected man, there are two or three women affected with rheumatoid arthritis. Flip it around and take autism spectrum disorders—for every girl diagnosed with an autism spectrum disorder, [there are] about five or six boys diagnosed." Page's work focuses on the evolution of the Y chromosome and its role in reading and regulating gene expression not just in the gonads, but throughout the body.

The regulation of gene activity can be similar to the conflict between a strong central government and states' rights, Page explained. The traditional view of body politics features a "strong central gonad," which means sex chromosomes have influence only over sex-specific regions of the body. His research points to a more widespread influence of sex chromosomes, which may underlie the variability we observe in rates and treatment success of diseases.

This research lends further support to the 2014 editorial in the journal *Nature* by NIH Director **Francis Collins** and Associate Director for Research on Women's Health **Janine Clayton**: "Policy: NIH to balance sex in cell and animal studies," which highlights the importance of including both sexes in basic and clinical studies.

Gender-determining chromosomes are a recent evolutionary trait that appeared only about 300 million years ago. Pre-chromosome alternatives to sex determination can still be observed today. For example, in turtles and other reptiles, egg-incubation temperatures determine the sex of the offspring. A special characteristic of the mammalian Y chromosome is what Page calls its "demure and diminutive" stature, which is the result of genetic deterioration that has left it with only 17 of the original 649 genes found on the ancestral autosome. These surviving 17 genes are important for reading genetic code and are widely expressed throughout the adult body. The hypothesis about why these last few genes have not deteriorated is that they play an important role in reading genetic code throughout the body, not just in sex-specific domains.

Page and colleagues also examined the homology of human Y chromosome to that of various species, including mice, monkeys, and chickens. His work suggests that mice have the least-comparable Y chromosome (with only 7 of the human's 17), whereas the genes on the rhesus monkey Y chromosome match every gene on the human Y. These findings highlight the challenges scientists encounter when translating basic research into clinical results, which can be complicated by variability between both species and sex.

Page is the director of the Whitehead Institute for Biomedical Research (Cambridge, Mass.), a professor at Massachusetts Institute of Technology (Cambridge), and a Howard Hughes Medical Institute Investigator, but he began his career in research at NIH in the laboratory of **Robert T. Simpson** (1977–1978). Simpson was a lab chief in the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and studied the role of histone-DNA interactions in chromatin structures. Their studies of the chromatin structure of genes was influenced by **Marshall Nirenberg's** work. Page spent the first few minutes of his presentation reminding the NIH community of Simpson's excellent mentorship. In fact,

BILL BRANSON

in Page's first publication (*J Biol Chem* **255:**3629–3637, 1980), the postdoctoral fellow was the first author, Page was last (senior) author, and Simpson wasn't listed at all. "Bob's rule was that he would not list his name on a paper unless he himself had done an experiment," said Page.

Because the Y chromosome has lost so many genes over the course of evolution, some scientists think it may eventually become unnecessary in future generations. In response to these theories Page says, "Truth be known, I've spent the better part of my career defending the honor of the Y chromosome in the face of insults to its character and future prospects." ●

Marshall W. Nirenberg, a Nobel Prize–winning biochemist and geneticist, served NIH for 48 years as head of the section of biochemical genetics at NHLBI. The lecture series honors him and others who have made significant contributions to the study of genomics. To watch a video of Page's May 20 lecture ("Lost in Translation: Do Males and Females Read Their Genomes Differently?"), go to http://videocast.nih.gov/launch.asp?19013. Another Nirenberg lecture is scheduled for September 30, 2015, with Timothy Ley from Washington University in St. Louis.

Cryo-EM

CONTINUED FROM PAGE 1

The protein imaged in this study was a small bacterial enzyme called beta-galactosidase; the drug to which it was bound was an inhibitor called phenylethyl-beta-D-thiogalactopyranoside (PETG), which fits into a pocket in the enzyme. Understanding what an enzyme looks like, both with and without a drug bound to it, allows scientists to design new drugs that can either block that enzyme's function (if the function is responsible for a disease) or enhance its activity (if lack of activity is causing a problem).

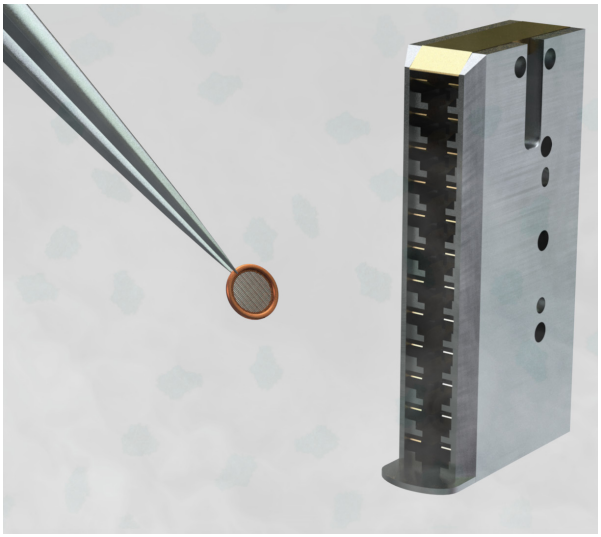
Sriram Subramaniam of the National Cancer Institute's (NCI) Center for Cancer Research led the study, which was published online in *Science Express* (http://www.sciencemag.org/content/348/6239/1147).

"This represents a new era in imaging of proteins in humans with immense implications for drug design," said NIH Director **Francis Collins**. "This near-atomic level of imaging provides detailed information about the keys that unlock cellular processes."

Drug-development efforts often involve mapping contacts between small molecules and their binding sites on proteins. These mappings require the highest possible resolutions so that the shape of the protein chain can be traced and the hydrogen bonds between the protein and the small molecules it interacts with can be discerned.

In this study, the researchers were able to visualize beta-galactosidase at a resolution of 2.2 angstroms (or Å—about a billionth of a meter in length), which is comparable to the level of detail that has thus far been obtained only by using X-ray crystallography. At these high resolutions, there is enough information in the structure to reliably assist drug design and development efforts.

To determine structures by cryo-EM, protein suspensions are flash-frozen at liquid nitrogen temperatures (–196° C to –210° C, or –320° F to –346° F) so the water around the protein molecules stays liquid-like. The suspensions are then imaged with electrons to obtain molecular images that are averaged together to discern a three-dimensional (3-D) protein structure.



VERONICA FALCONIERI, NCI-CCR

Carbon grid with frozen protein sample prepared for loading into cryo-electron microscope cartridge.

"The fact that cryo-EM technology allows us to image a relatively small protein at high resolution in a near-native environment, and knowing that the structure hasn't been changed by crystallization, that's a game-changer," said Subramaniam.

In the study, using about 40,000 molecular images, the researchers were able to compute a 2.2 Å resolution map of the structure of beta-galactosidase bound to PETG. This map not only allowed the scientists to determine the positioning of PETG in the binding pocket but also enabled them to pick out individual ions and water molecules within the structure and to visualize in great detail the arrangement of the amino acids that make up the protein.

Subramaniam and colleagues recently used cryo-EM to understand the functioning of a variety of medically important molecular machines, such as the envelope glycoproteins on human immunodeficiency virus and glutamate receptors in brain cells. Their new finding, however, represents the highest resolution that they or others have achieved to date for a structure determined by cryo-EM.

"Cryo-EM is positioned to become an even more useful tool in structural biology and cancer drug development," said NCI Acting Director **Douglas Lowy**. "Even for proteins that are not amenable to crystallization, it could enable determination of their 3-D structures at high resolution." ●

REFERENCE:

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To see a video of "Near-atomic Resolution of Protein Structure by Electron Microscopy," go to https://visualsonline.cancer.gov/details.cfm?imageid=10033.

Natural Products as Weapons Against Lethal Viruses

BY KATHLEEN MEISTER, NCCIH

Many natural products are turning out to be promising treatments for human diseases. The Natural Products Scientific Interest Group (SIG) aims to showcase the work of researchers who are making discoveries in the natural-products arena. On May 22, German researcher Ruth Brack-Werner presented her research at one of the SIG's seminars, held in Lipsett Amphitheater (Building 10). Brack-Werner, a scientist at the German Research Center for Environmental Health in Neuherberg, Germany, is developing anti–human immunodeficiency virus (HIV) drugs and other antiviral drugs from natural sources.

Brack-Werner and her colleagues are especially interested in investigating natural products that are sold as herbal medicines or dietary supplements for two reasons: There's already clinical and safety information available for some, and some products are known to have activity against viruses.

Her group developed a screening method called EASY-HIT (for exploratory assay system for the discovery of HIV inhibitors) that uses a HeLa cell line—engineered to express the genes for two HIV proteins that represent different stages of the viral replication cycle—as well as a red fluorescent reporter gene. Substances can be screened for inhibitory activity against HIV and according to whether they inhibit early or late stages of the viral replication cycle.

More than 25,000 compounds have been screened so far with the method, and the best hit is a natural product that has high activity and a new mode of action. (The information on this product is still confidential.) Using EASY-HIT, the researchers have identified other novel anti-HIV agents including an extract from the marine brown alga *Lobophora variegata* that inhibits HIV when it enters cells and an extract from the South African medicinal plant *Pelargonium sidoides* that inhibits the attachment of HIV to cells.

Brack-Werner's laboratory has also focused on another medicinal plant (called Ci here because the data are not yet published), which grows in the Mediterranean region. Ci is available as a tea and an herbal medicine in Germany and is known to inhibit the influenza virus. Commercial products made from Ci and extracts from laboratory-grown plants were found to have anti-HIV activity by inhibiting viral entry into cells. Efforts are being made to isolate the most active fractions of the extracts.

Brack-Werner's research "illustrates the great potential of natural products to help solve some of our toughest medical challenges," said **John Williamson**, a branch chief in the National Center for Complementary and Integrative Health. ●

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• S. Kremb…R. Brack-Werner, et al., "Aqueous extracts of the marine brown alga Lobophora variegata inhibit HIV-1 infection at the level of virus entry into cells," *PLoS One* 9:e103895 (2014).

To join the Natural Products SIG's LISTSERV, go to https://list.nih.gov/cgi-bin/wa.exe?A0=natural-products-sig-l&A=1.

SEE PAGE 3 FOR MORE SIG NEWS.

NIH ABBREVIATIONS

CBER: Center for Biologics Evaluation and Research, FDA
CC: NIH Clinical Center
CCR: Center for Cancer Research, NCI
CDC: Centers for Disease Control and Prevention
CIT: Center for Information Technology
DCEG: Division of Cancer Epidemiology and Genetics, NCI
FAES: Foundation for Advanced Education in the Sciences
FARE: Fellows Award for Research Excellence
FelCom: Fellows Committee
FDA: Food and Drug Administration
FNL: Frederick National Laboratory
IRP: Intramural Research Program
HHS: U.S. Department of Health and Human Services
NCATS: National Center for Advancing Translational Sciences
NCBI: National Center for Biotechnology Information
NCCIH: National Center for Complementary and Integrative Health
NCI: National Cancer Institute
NEI: National Eye Institute
NHGRI: National Human Genome Research Institute
NHLBI: National Heart, Lung, and Blood Institute
NIA: National Institute on Aging
NIAAA: National Institute on Alcohol Abuse and Alcoholism
NIAID: National Institute of Allergy and Infectious Diseases
NIAMS: National Institute of Arthritis and Musculoskeletal and Skin Diseases
NIBIB: National Institute of Biomedical Imaging and Bioengineering
NICHD: Eunice Kennedy Shriver National Institute of Child Health and Human Development
NIDA: National Institute on Drug Abuse
NIDCD: National Institute on Deafness and Other Communication Disorders
NIDCR: National Institute of Dental and Craniofacial Research
NIDDK: National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS: National Institute of Environmental Health Sciences
NIGMS: National Institute of General Medical Sciences
NIMH: National Institute of Mental Health
NIMHD: National Institute on Minority Health and Health Disparities
NINDS: National Institute of Neurological Disorders and Stroke
NINR: National Institute of Nursing Research
NLM: National Library of Medicine
OD: Office of the Director
OITE: Office of Intramural Training and Education
OIR: Office of Intramural Research
ORS: Office of Research Services
ORWH: Office of Research on Women's Health
OTT: Office of Technology Transfer

NIH-Korean Symposium

CONTINUED FROM PAGE 1

GEON-KOOK LEE, KOREA NATIONAL CANCER CENTER

The poster session—with posters presented by 54 NIH postdoctoral fellows—at the NIH-Korea Symposium was a big hit. The South Korean visitors "took those abstracts for oral and poster presentations to Korea, and they are going to share them with the larger scientific community," said Min Song, who hopes this sharing might inspire future collaborations.

"This is the first but certainly not the last" gathering of NIH and South Korean scientists, Deputy Director for Intramural Research **Michael Gottesman** told the audience at the beginning of the two-day event.

"The core value of the symposium is collaboration and sharing our knowledge and experience," said Min-Soo Park, who spoke on behalf of the Honorable Ho-Young Ahn, South Korea's ambassador to the United States. "This kind of collaboration and sharing leads to [the success] of the next generation."

There are already several ongoing collaborations—with promises of more—between the two NIHs, said KNIH Director General Joo-Shil Lee, who also explained the structure and mission of her organization.

One of those collaborations is between South Korea and the National Institute of Allergy and Infectious Diseases' (NIAID) Global Research Program, which, since 2003, has focused on tuberculosis (TB). **Clifton Barry**, chief of NIAID's Tuberculosis Research Section in the Laboratory of Clinical Infectious Diseases, and South Korea's National Masan Tuberculosis Hospital worked together to conduct clinical trials testing the combination of two existing drugs to treat drug-resistant TB.

Other NIAID investigators are working on the human and *Mycobacterium tuberculosis* genomes to understand the specific mechanisms leading to drug-resistant bacterial infection in TB patients. NIAID senior investigator **Alan Sher**, one of the speakers at the symposium, is also investigating the immunological aspects of and therapeutic options for multidrug-resistant TB.

Cancer is another area in which NIH and South Korea researchers are collaborating. The National Cancer Institute (NCI) Center for Global Health and the Division of Cancer Treatment and Diagnosis have been facilitating these collaborations. The scientists can study the genomic profiles that are specific to Korean people as well as distinct molecular differences—relative to other ethnic groups—in cancer sites and pathogenic pathways.

As a result of the differences, "U.S. drugs with low efficacy may be more suitable for Korean subpopulations with better responses," said **Craig Thomas** (National Center for Advancing Translational Sciences) in his talk on the discovery and development of cancer therapies. Min Song, an NCI program director, has been promoting the repurposing of U.S.-made drugs for use in South Korea as cancer treatments.

Another health issue of concern to both countries is obesity. It is becoming a problem in South Korea as the traditional diet of fish and vegetables slowly shifts to a more Westernized high-fat and high-sugar diet, said B.J. Song, a senior investigator in the National Institute on Alcohol Abuse and Alcoholism.

"With the Westernization of diets, and changes in lifestyle and behaviors, including heavy drinking and/or smoking, we [Koreans and Americans] have increasing examples of common chronic diseases, like obesity, diabetes, cardiovascular disorders, and aging-related diseases, that may share pathogenic pathways," said Min Song. NIH and Korean scientists could collaborate to investigate those pathways.

About one third of the population is obese in both South Korea and the United States, but there are only a handful of modest therapeutic options available, said symposium presenter **Marc Reitman**, chief of the Diabetes, Endocrinology, and Obesity Branch in the National Institute of Diabetes and Digestive and Kidney Diseases. Obesity contributes to type 2 diabetes, cardiovascular disease, and other co-morbidities.

Scientists from the Korea NIH (KNIH) and other South Korea health organizations participated in the NIH-Korea Symposium, held at the NIH in Bethesda, in April. Pictured here: Michael Gottesman (center) and Joo-Shil Lee, Director General of the KNIH (second from left), and other KNIH scientists.

Neuroscience is another field ripe for collaboration. National Institute on Aging senior investigator **Mark Mattson** and South Korea neurologist Duk L. Na (Samsung Medical Center, Sungkyunkwan University, South Korea) met at the symposium and have started working together. Mattson reported on his findings that intermittent fasting and exercise bolsters brainpower in animal models for Alzheimer and Parkinson diseases. Na's presentation was on the benefits of using mesenchymal stem-cell therapy for Alzheimer disease in animal models, and a phase 1 clinical trial with encouraging results.

Jong Wook Chang, also from South Korea's Samsung Medical Center, pointed out that his country has strong information-technology resources and less-stringent government regulations for stem-cell research. Both countries, he said, could share the "know-hows" of each field and work together as a team to develop therapeutic candidates for Alzheimer disease and other common diseases.

KNIH researcher Seong Beom Cho gave an overview of the "Korean Reference Genome Variation Project," which has revealed novel genomic variations specific for the Korean population that differ from other Asian populations. As Koreans are almost a homogeneous population genetically, Korean genome information can be beneficial to researchers who want to understand the ethnic variability in the human genome and facilitate the discovery of genotype-phenotype relationships.

The oral presentations on the first day were followed by a session in which 54 NIH postdoctoral fellows presented posters on research done in common disease areas. Awards for outstanding research were given to 18 fellows. The Korean visitors "took those abstracts for oral and poster presentations to Korea, and they are going to share them with the larger scientific community," said Min Song, who hopes this sharing might inspire future collaborations.

The NIH and KHIDI have supported many fellows from South Korea; when they return home, they have become successful in their fields, with some attaining high-ranking positions. This success is an inspiration for the younger generation to come to NIH and exchange valuable knowledge, said B.J. Song.

The "exchange is a two-way street," said Gottesman near the end of the symposium. He hopes to overcome the common barriers in biomedical research by "comparing the tech-transfer issues and through many more fruitful collaborations."

The symposium also had an unforeseen benefit. Both the Songs were delighted to see second-generation Korean-Americans participate in the symposium and relate to their Korean identity. "Many of them came to the symposium and were proud to be a part of the Korean community," said Min Song.

The Songs have already started planning for the next symposium, which will take place in South Korea next year. "We are learning and trying to get topics of mutual interest based on a scientific agenda," said NIAID Scientific Director **Kathryn Zoon**. She and Gottesman were, according to B.J. Song, the most enthusiastic NIH scientists who made the symposium possible.

The symposium was just "the beginning," said B.J. Song. "I hope it will expand to include participation from several other Korean biomedical research institutes to foster NIH collaborations with the best Korean scientists." ●

For more information on the symposium, go to http://wals.od.nih.gov/us-korea/.

Doing Science Differently

The Korea National Institute of Health (KNIH) and the U.S. National Institutes of Health (NIH) are alike in name only. The two organizations differ significantly in the way they conduct research.

"Korea has a different system [than] the U.S.A., particularly in the part of health R[esearch] and D[evelopment] governance," said KNIH Director General Joo-Shil Lee. "The U.S. NIH has the authority to allocate funds for intramural and extramural research."

KNIH conducts only intramural research and is under the umbrella of the Korea Centers for Disease Control and Prevention (KCDC) under the Ministry of Health and Welfare, which is similar to the U.S. Department of Health and Human Services (HHS). Although NIH and the U.S. CDC are both part of the U.S. HHS, they work independently. A large portion of NIH's research is public-health oriented, but many labs at NIH study basic science as well as translational and clinical sciences. On the other hand, KNIH's mission is to strengthen research and development capacity in public health, and so it emphasizes epidemiology-based research.

Byoung-Joon (B.J.) Song and **Minkyung (Min) Song**, along with few other scientists, initiated the idea of a series of NIH-Korea joint symposia. The first one was held on April 16 and 17, 2015, in Lipsett Amphitheater (Building 10). They plan to bring the best researchers from the NIH and the Korean biomedical research institutes together "so that they learn from each other and advance the fields together," said B.J. Song. In addition, Min Song said she hoped the event would be a great opportunity for the Korean leaders to gain more knowledge about translational and clinical sciences, and possibly lead to an increase in South Korea's funding for translational and clinical research.

But the Songs are not done building scientific bridges. As Min Song said, "We are always thinking about the gaps and barriers and how to fill those gaps by leveraging and facilitating collaborations." ●

Recently Tenured


PHILIP E. BOURNE, NLM-NCBI


GEORGE F. KOOB, NIDA


XIAOLING LI, NIEHS


JON R. LORSCH, NICHD


HANNAH A. VALANTINE, NHLBI

PHILIP E. BOURNE, PH.D., NLM-NCBI

Senior Investigator, National Center for Biotechnology Information, National Library of Medicine

Education: Flinders University, Adelaide, South Australia (B.Sc. in chemistry; Ph.D. in chemistry)

Training: Postdoc training in biochemistry, University of Sheffield (Sheffield, U.K.)

Before coming to NIH: Professor and associate vice chancellor for Innovation and Industry Alliances, Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California–San Diego (La Jolla)

Came to NIH: In 2014

Selected professional activities: NIH associate director for Data Science, Office of the Director; founding editor-in-chief, P*LOS Computational Biology*; editor, *Database*

Outside interests: Motorcycling; flying planes; hiking

Research interests: My research over the past 35 years has been in structural bioinformatics, systems pharmacology, immunology, cell signaling, scholarly communication, and evolution. Currently, I am focusing on three areas: protein fold space and its implications; systems pharmacology; and scholarly communication.

My lab staff and I have been designing and extending algorithms to address the question of the evolutionary and functional implications of protein fold space (the tiny fraction of three-dimensional space occupied by protein structures in nature as opposed to what is theoretically possible). We are building a three-dimension-based connectivity network of all known proteins from which we can overlay functional and other properties to address such questions as do gaps in fold space serve a purpose; what are the functional implications of symmetry; and can evolutionary events be traced back to protein structure?

We are using systems-pharmacology approaches to understand how medicines work on different systems of the body. The paradigm of one-drug-one-receptor to treat one disease has been replaced by the notion that a single small-molecule drug binds to multiple targets. We have tried to model this new notion using highly simplified systems in ways that are both static and dynamic. As a result we have been able to predict the side effects of drugs, suggest repurposing options for approved drugs, and suggest chemical modifications to make drugs more effective. At the heart of our approach is an understanding of the structural basis of the drug-target interaction, its implications for affected networks of interactions, and the changes to the dynamics of a living system. We use structural bioinformatics algorithms we have developed, network tools developed by others, and flux-balance analysis models developed by a collaborator.

In our scholarly communication work, we are developing tools and using the Internet to disseminate and comprehend science. Prior work involved being an advocate for new modes of communication and developing tools deployed through the Protein Data Bank and elsewhere. Going forward we hope to explore and understand data-usage patterns; build citation networks for data with the goal of highlighting that data availability is underappreciated; and explore the impact of data on innovation by association with the patent database and beyond.

GEORGE F. KOOB, PH.D., NIDA

Senior Investigator, Section Chief, Neurobiology of Addiction Section, National Institute on Drug Abuse

Education: Pennsylvania State University, State College, Pa. (B.S. in zoology); Johns Hopkins University, Baltimore (Ph.D. in behavioral physiology)

Training: Postdoctoral training in experimental psychology, University of Cambridge (Cambridge, U.K.) and the Medical Research Council Neurochemical Pharmacology Unit (Cambridge, U.K.)

Before coming to NIH: Professor and chair, Committee on the Neurobiology of Addictive

Disorders, Scripps Research Institute (La Jolla, Calif.)

Came to NIH: In 2014

Selected professional activities: Director, National Institute on Alcohol Abuse and Alcoholism; neuropsychopharmacologist with a focus on understanding the neurocircuitry of alcohol and drug addiction; author of a definitive text on the neurobiology of addiction

Outside interests: Gardening (particularly the cultivation of fruit trees); traveling; enjoying art; cooking

Web site: http://irp.drugabuse.gov/Koob.php

Research interests: My research focuses on understanding the neurobiology of drug and alcohol addiction. In my earlier work, I contributed to the understanding of the neurocircuitry associated with the reinforcing effects of drugs of abuse. More recently I studied the neuroadaptation of the reward circuits and the recruitment of the brain stress systems associated with the transition to dependence. My lab studies how cellular and molecular changes produce alterations in neurocircuits to convey negative emotional states that contribute to the motivation to seek drugs and alcohol.

We are also exploring the relationship between pain and emotional systems in the context of the same neurocircuitry. The neurocircuitry under study is in the basal forebrain and involves the extended amygdala—the central nucleus of the amygdala, bed nucleus of the stria terminalis, and elements of the ventral striatum including the shell and core of the nucleus accumbens. We are identifying the molecular elements that load such circuits and neurotransmitter system function, the cellular interactions between brain stress systems, and the role that outputs to the brain stem (for example, the hypothalamus) play in the expression of negative emotional states.

Our research will provide key information not only about the neurobiology of addiction, pain, and stress but also about the neurobiology of motivational and emotional systems in general. Ultimately, by understanding the underlying brain changes that foster the compulsive use of drugs and alcohol, we hope to accelerate the development of new, targeted treatments that will help individuals who suffer with addiction.

XIAOLING LI, PH.D., NIEHS

Senior Investigator, Metabolism, Genes, and Environment Group, Signal Transduction Laboratory, National Institute of Environmental Health Sciences

Education: Peking University, Beijing (B.S. in biochemistry); Chinese Academy of Sciences, Beijing (M.S. in molecular biology); Johns Hopkins University School of Medicine, Baltimore (Ph.D. in biological chemistry)

Training: Postdoctoral research fellow at the Massachusetts Institute of Technology (Cambridge, Mass.)

Came to NIH: In 2007

Selected professional activities: Editorial board of the *Journal of Metabolomics and Metabolites* and the *Journal of Geriatric Cardiology*; Phi Beta Kappa; American Society for Biochemistry and Molecular Biology; American Society for Microbiology

Outside Interests: Skiing; hiking; enjoying music and art with her kids

Web site: http://irp.nih.gov/pi/xiaoling-li

Research interests: My group's long-term goals are to understand the molecular-signaling pathways that coordinate the gene-environment interactions in homeostasis and to investigate how the dysregulation of this coordination contributes to disease and aging. We study a family of proteins called sirtuins, which are key cellular metabolic sensors that regulate metabolism, stress response, and possibly longevity. Understanding how sirtuins are regulated, as well as how they modulate energy metabolism and stress responses, may offer new therapeutic strategies against human metabolic diseases.

Our efforts have focused on the role of SIRT1, the most conserved mammalian sirtuin, in energy metabolism, inflammation, and stress response, as well as the molecular mechanism underlying environmental regulation of SIRT1 activity. Using a combination of biochemical, molecular, cellular, and genetic approaches, we uncovered several novel targets of SIRT1 in several cell types and tissues. We have demonstrated that SIRT1 is not only a pivotal regulator of metabolism and inflammation in response to nutrient signals and environmental stress, but is also critical in the regulation of embryonic stem-cell pluripotency, differentiation, and animal development. In addition, we elucidated a novel mechanism that activates SIRT1 in response to environmental stress.

JON R. LORSCH, PH.D., NICHD

Senior Investigator and Section Head, Laboratory on the Mechanism and Regulation of Protein Synthesis, Eunice Kennedy Shriver National Institute of Child Health and Human Development

Education: Swarthmore College, Swarthmore, Pa. (B.A. in chemistry); Harvard, Cambridge, Mass. (Ph.D. in biochemistry)

Training: Fellowship in biochemistry at Stanford University (Stanford, Calif.)

Before coming to NIH: Professor, Department of Biophysics and Biophysical Chemistry, Johns Hopkins University School of Medicine (Baltimore)

Came to NIH: In 2013

Selected professional activities: Director, National Institute of General Medical Sciences

Outside interests: Cooking; gardening; biking

Web site: http://annualreport.nichd.nih.gov/lorsch.html

CONTINUED ON PAGE 18

Recently Tenured

CONTINUED FROM PAGE 17

Research interests: My lab studies the translation of genetic information into proteins. Proteins are the body's workhorses and are necessary for almost every activity, from muscle movement to brain function, digestion, and oxygen transport in the blood. If translation is not properly controlled, cells can grow unchecked and form cancerous tumors. Translation is also a security vulnerability: Viruses infect our cells by hijacking the machinery responsible for translation, forcing it to assemble viral proteins instead of cellular ones. We are studying how translation begins. To make a new protein based on the information encoded in a messenger RNA (mRNA), the cell assembles a ribosomal complex that reads the mRNA and synthesizes the corresponding protein. We are investigating how this apparatus is assembled and how the process is regulated.

To do this, we use the yeast *Saccharomyces cerevisiae* as a model system and employ a range of approaches—from genetics to biochemistry to structural biology—in collaboration with other NICHD labs and several research groups around the world.

For example, in collaboration with Alan Hinnebusch's lab (NICHD), we probed the functions of conserved identity element bases in the initiator transfer RNA (tRNA). Our data indicate that each region of the tRNA plays important roles in start-codon recognition. The start codon is the first codon of an mRNA translated by a ribosome. In collaboration with Hinnebusch's and Venki Ramakrishnan's (Medical Research Council, U.K.) labs, we also determined the three-dimensional structure of a ribosomal complex initiating on an mRNA using cryoelectron microscopy.

HANNAH A. VALANTINE, M.D., M.R.C.P., F.A.C.C., NHLBI

Senior Investigator, Laboratory of Transplantation Genomics, National Heart, Lung, and Blood Institute

Education: Chelsea College of Science and Technology, University of London, London (B.Sc. in biochemistry); St. George's Hospital Medical School, University of London (M.B.B.S.); Royal College of Physicians, London (M.R.C.P.); University of London (M.D.)

Training: Residencies in general medicine and cardiology at hospitals in London; cardiology clinical training at the Royal Postgraduate Medical School, Hammersmith Hospital (London); postdoctoral research fellowship in cardiac transplantation at Stanford University School of Medicine (Stanford, Calif.)

Before coming to NIH: Senior associate dean for Diversity and Leadership, director of Heart Transplantation Research, and professor of medicine at Stanford University School of Medicine

Came to NIH: In 2014

Selected professional activities: Chief officer for Scientific Workforce Diversity, Office of the Director; member of the National Research Council's committee on the Science of Team Science; member of the NIH Featured Panel: Science of Team Science, Diversity of Teams; past president of the American Heart Association's Western States Affiliate Board

Outside interests: Enjoys spending time with her husband, who has a background in information technology, and their two daughters; traveling; sailing; fine dining; and exercising

Research interests: Since the beginning of my cardiology research career, I have been interested in the causes of heart-transplant rejection. Why do transplants fail? What injury does the failure cause? How can we improve patient outcomes? Most recently, I have been investigating noninvasive methods to monitor heart- and lung-transplant rejection.

This work hinges on the notion that an organ transplant is akin to a genome transplant. My lab showed previously that the detection of increasing amounts of donor-derived circulating cell-free DNA in a transplant recipient's blood—taking a "liquid biopsy"—can indicate damage of the transplanted organ and ultimately organ failure.

My lab and I are now assessing the broader clinical utility of this method in graft-rejection surveillance: My lab has established a prospective, multicenter extramural-intramural research consortium—the Genome Research Alliance for Transplantation—that leverages the intellectual capacity of extramural clinical centers with the NIH Intramural Research Program's cutting-edge genomic approaches. The consortium includes five local transplant centers in the Washington, D.C., metropolitan area, all of which have pre-transplant and post-transplant clinics.

Future projects in my lab will explore the utility of cell-free donor DNA detection for identifying infection and degree of immunosuppression. Currently, these two outcomes are difficult to distinguish in a clinical setting but require distinct treatment paradigms. Measurement of circulating cell-free donor-derived DNA may also open a new window to investigating early immunologic markers associated with antibody-mediated rejection and acute cellular rejection. ●

FOR MORE ABOUT HANNAH VALANTINE, SEE PAGE 10.

NIH DIGITAL SUMMIT

Optimizing Digital Media to Reach Scientists, Clinicians, Patients, and the Public
Monday, October 19
(time to be determined)
Lipsett Amphitheater (Building 10)
Registration required: http://www.nih.gov/news/events/digital-summit.htm

The summit will explore how digital media are being used to communicate information on health and science. For up-to-date information and registration details, visit the registration Web site. For questions, contact Yasmine Kloth at Yasmin.kloth@nih.gov.

FAES GRADUATE SCHOOL FALL 2015

Online Registration: July 6–September 7
Late registration to Sept. 30 (late fee)
Open House: August 20, FAES Academic Center (Building 10)

The FAES Graduate School offers over 120 evening credit-bearing courses held on the main NIH Bethesda campus. To enroll online and to view class and tuition information, visit http://www.faes.org/grad, e-mail registrar@faes.org, or call 301-496-7976. The FAES Graduate School Office is located in Building 10, Room 1N241 (close to Masur Auditorium).

WALS RETURNS ON SEPTEMBER 2

Wednesdays, 3:00–4:00 p.m.
Masur Auditorium (Building 10)
Web site: https://oir.nih.gov/wals

The 2015–2016 Wednesday Afternoon Lecture Series (WALS) resumes on September 2 with neuroscientist Edward Boyden, the founder of and principal investigator at MIT's synthetic neurobiology group. The season schedule will be posted on the WALS Web site.

NIH RESEARCH FESTIVAL

Wed., September 16–Fri., September 18
Masur Auditorium, Lipsett Amphitheater, and FAES classrooms (Building 10)
Web site: http://researchfestival.nih.gov (to be updated soon)

This year's Festival will feature the nine scientific initiatives outlined in the intramural long-term plan. There will be three plenary sessions (technology development; global health emergency response; and chronic inflammation) and six concurrent workshops: gene- and cell-based therapies; microbiome and drug resistance; RNA biology and therapeutics; vaccines; natural products; and neuroscience and compulsive behaviors. For questions, contact Jacqueline Roberts at researchfest@mail.nih.gov or check the Web site.

ADVANCING SCIENCE, IMPROVING LIVES

NINR's 30th Anniversary Scientific Symposium and Poster Session
Tues., October 13, 2015; 8:00 a.m.–3:30 p.m.
Natcher Conference Center (Building 45)
For information and to register (required): http://www.ninr.nih.gov/30years

This special event marks the beginning of a yearlong observation of the National Institute of Nursing Research's first 30 years at NIH. The symposium will feature keynote addresses, scientific presentations, a panel discussion, and a poster session. It will highlight many of the accomplishments of NINR and its scientists and showcase the positive impact that NINR's science has had on the lives of millions of Americans. Please note: The Council for the Advancement of Nursing Science's 2015 Special Topics Conference is scheduled for Wednesday, October 14, 2015, in Washington, D.C.

POSTDOCTORAL RESEARCH ASSOCIATE (PRAT) PROGRAM

Accepting Applications
Deadline: October 2, 2015

The National Institute of General Medical Sciences' Postdoctoral Research Associate (PRAT) program is accepting applications through October 2. PRAT fellows conduct research in scientific areas within the institute's mission while in an NIH intramural research program (IRP) lab. Before applying, applicants must identify a potential preceptor in the NIH IRP and develop a research proposal. PRAT fellows receive three years of stipend support and additional benefits such as health insurance, a travel allowance, and professional-development training activities, including a monthly seminar series designed for fellows. For more information, visit http://www.nigms.nih.gov/Training/Pages/PRAT.aspx or contact Jessica Faupel-Badger at badgerje@mail.nih.gov.

PRAT 50TH ANNIVERSARY SYMPOSIUM

Friday, Nov. 6, 2015; 8:30 a.m.–4:30 p.m.
Natcher Conference Center (Building 45)
Registration requested (through October 30): https://meetings.nigms.nih.gov/Home/Index/19247

NIGMS' Postdoctoral Research Associate (PRAT) program will host this all-day event, which is open to the public. The objectives of this symposium are to recognize the research contributions of PRAT alumni; highlight the role of the PRAT program in the career path of alumni; and provide an opportunity for PRAT alumni to network with each other and current fellows. The event will be video cast live at http://www.videocast.nih.gov.

PLURIPOTENT STEM CELLS IN NEUROSCIENCE: RESEARCH AND APPLICATION

Mon., Oct, 26, 2015; 8:30 a.m.–5:30 p.m.
Rooms 620-640, Porter Neuroscience Research Center (Building 35A)
For information/register: https://meetings.ninds.nih.gov/meetings/PSCinNeuro

The symposium, presented by NINDS, will feature talks by Kristen Brennand (Mount Sinai), Kevin Eggan (Harvard), Steven Finkbeiner (Gladstone Institute), Ron McKay (Lieber Institute for Brain Development), and Edward Wirth (Asterias Biotherapeutics). Contact Barbara Mallon for more information at mallonb@mail.nih.gov or 301-402-8246. ●

Read more announcements online at http://irp.nih.gov/catalyst/v23i4/announcements.

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CATALYTIC REACTIONS?

If you have a photo or other graphic that reflects an aspect of life at NIH (including laboratory life) or a quotation or confession that scientists might appreciate and that would be fit to print in the space to the right, why not send it via e-mail: catalyst@nih.gov; fax: 301-402-4303; or mail: *The NIH Catalyst*, Building 1, Room 333.

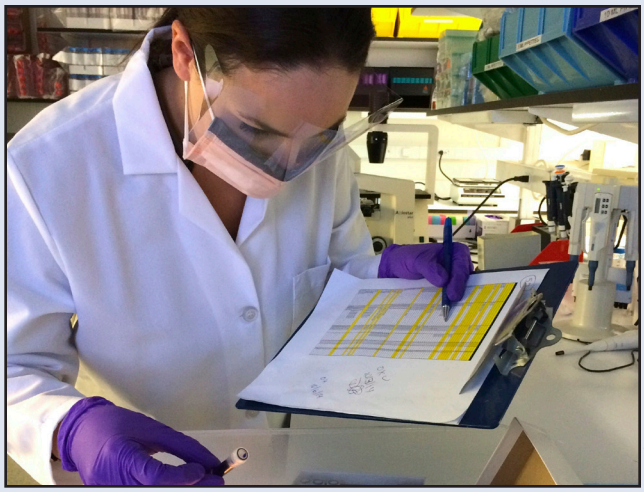
Also, we welcome "letters to the editor" for publication and your reactions to anything on the *Catalyst* pages.

READ MORE ARTICLES, AND EXPANDED VERSIONS OF THE ONES IN THIS ISSUE, ONLINE AT http://irp.nih.gov/catalyst/v23i4

PHOTOGRAPHIC MOMENT

From Biospecimens to Hard Hats

The team of Diane Poole (NCI) and **Amanda Vandeveer** (NCI) won first and second places in the fourth annual "In-Focus Safe Workplaces for All" photography contest. First place honored their photo depicting a scientist making a careful inventory of biospecimens (shown); second place went to their photograph of a crew of workers demonstrating hard-hat safety. Poole, who snapped the photos, recently retired from NCI's Laboratory of Tumor Immunology and Biology, where she had worked as a biological laboratory technician for 37 years. Amanda Vandeveer, the "Safety Girl" model in both photos, is a third-year postdoc in the same lab. Third place was awarded to staff scientist **Dale Lewis**, in NCI's Laboratory of Molecular Biology, for his photo demonstrating a fireman wearing safety gear. For more about the contest, sponsored by the Division of Occupational Health and Safety in the Office of Research Services, go to http://www.ors.od.nih.gov/sr/dohs/HealthAndSafety/infocus. To see the other winning photos, go to http://irp.nih.gov/catalyst/v23i4/photographic-moment. ●



DIANE POOLE AND AMANDA VANDEVEER, NCI

The NIH Catalyst is published bimonthly for and by the intramural scientists at NIH.

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