INTERSECTIONS
Materials Research & Science Policy
News and information from the MRS Government Affairs Committee
Advancing materials. Improving the quality of life.

WINTER 2015 NEWSLETTER

Leonard Brillson
Editor, INTERSECTIONS
Member, Government Affairs Committee

WELCOME TO OUR WINTER 2015 NEWSLETTER!

The legislation that both houses of Congress passed this fall will have considerable impact on federal funding of research both in the near term and beyond. The MRS Government Affairs Committee aims to understand the dramatically changing policy environment, and its impact on materials research. In this, his first *INTERSECTIONS* article, our new MRS Washington consultant and MRS Director of Government Affairs Damon Dozier describes the significance of these events—ranging from support for federal research agencies to manufacturing innovation to federal employee travel—and how MRS has worked to highlight the importance of continued support for U.S. science and technology.

Also in this issue, our new Grassroots Subcommittee Chair, Brent Carey, describes the success of our *Materials Voice* kiosk at the 2014 MRS Fall Meeting, letter writing, and the importance of letters to our representatives to increase federal R&D funding. Kevin Whittlesey, our Congressional Science & Engineering Fellowship Subcommittee Chair, describes the strategic placements of our new MRS Congressional Fellows on Capitol Hill, the career success stories of former MRS Fellows, and the Science Policy to help MRS members advocate more effectively for continued federal investment in research. Linda Olafsen describes the Government Affairs Committee visits to legislative offices this fall during Congressional Visits Day and the substantive discussions on issues of importance to MRS members. David Norton describes the successful Government Agencies Forum at the 2014 MRS Fall Meeting and topics of high interest to each agency. These forums are great opportunities to understand the context of materials research in the missions of these agencies. Jim Tour's article on raising research funding in lean times describes an innovative approach to supporting academic research in today's challenging funding environment. Finally, the *INTERSECTIONS* article on value-added materials science in this issue features yet another success story, highlighting how investments in materials science paid off in ways that the general public and especially our elected officials can relate to.

MRS is working hard to make sure that the materials research community is being heard and that it has input in developing effective government policy for support of materials science. Here is the latest news.

A MESSAGE FROM OUR GOVERNMENT AFFAIRS COMMITTEE CHAIR

Nabil Bassim
Chair, Government Affairs Committee

Dear MRS Membership!

As Chair of the Government Affairs Committee (GAC), I hope that you enjoy the latest issue of *INTERSECTIONS*, our quarterly chronicle of all things related to federal support for materials research. 2014 has been a very active and fruitful year, with many activities at the Legislative and Executive level, which you will be able to read in the forthcoming articles. From the budgetary process, to the Materials Genome Initiative, the movement of data standards within the materials community, and the development of new manufacturing initiatives, GAC remains active and engaged on behalf of all MRS members.

The end of the year is a time to reflect on the accomplishments and transitions within our community. Our biggest transition is the retirement of Ron Kelley as our Washington, DC-based consultant, and the hiring of an MRS full-time Director of Government Affairs, Damon Dozier.

We would like to thank Ron for over 23 years of service to the MRS organization and MRS members. Ron has served as a tireless guide to the policy landscape that our Society faces, from issues relating to funding of basic and applied research, new policy initiatives like Open Access and the Materials Genome Initiative, and issues related to natural resources and

sustainability. Through all of this time, hundreds of MRS members have interacted with Ron and found him to be knowledgeable, engaged and, above all, a true gentleman. Congratulations on your retirement, Ron! You will be missed!

With a new transition, we are moving forward with Damon's full-time presence at the Washington, DC office. In the last few months, I've worked closely with Damon and found that he is very energetic and skilled in the ways of policy and politics. I know that MRS membership will enjoy working with him, too. Please welcome him at the next MRS Meeting and don't hesitate to pick his brain about important policy questions for the materials community.

Other milestones this year include the development of a Policy Subcommittee to guide the Society towards nuanced policy positions beyond research funding. Also, the continued refinement of our core programs—agency interactions, grassroots engagement, the Congressional Fellowship program and Congressional Visit Days accomplished plenty last year, and activities are in full planning stage for 2015! I would like to thank Tabbetha Dobbins for her outstanding role as Grassroots Chair, and welcome Brent Carey into the role for the upcoming year.

If you are interested in participating in GAC, you are most welcome. Please contact us at publicaffairs@mrs.org. We hope that you enjoy the rest of the *INTERSECTIONS* newsletter. All the best for 2015!

WHAT'S HAPPENING IN WASHINGTON

Damon Dozier
MRS Director of Government Affairs

With only hours to spare before a potential government shutdown, Congress approved and sent a 1.1 trillion dollar spending bill to the President, who approved the measure shortly after receiving it. The spending measure allows the government to operate until September 2015. The bill has frequently been referred to as the "CRomnibus," a term used to describe the unique form of the spending bill. While the legislation does fund federal agencies – the omnibus part of the bill – part of the law provides funding for the Department of Homeland Security only through February 27 to allow lawmakers to revisit President Obama's executive order on immigration. Notably, the law abides by the spending limits of the 2013 Ryan-Murray Bipartisan Budget Act discussed in previous issues of *INTERSECTIONS*.

Federal funding for research and development would generally increase (as compared to last year's funding) under the appropriations set forward in the spending bill. Department of Defense science and technology program funding will see an increase of about three percent overall, which includes a decrease of almost 1 percent in applied research. The National Science Foundation (NSF) will receive a 2.4 percent increase and the National Institute of Standards and Technology (NIST) would see a slight increase as well. The DOE Office of Science will be funded at the same level as last year. For a detailed review of the funding bill, please see here.

One item included in the spending bill that has long been a legislative priority for MRS is the Revitalize American Manufacturing and Innovation Act (RAMI). RAMI authorizes funding of $300 million over seven years for the Secretary of Commerce to establish several Institutes for Manufacturing Innovation (IMIs), collectively known as the National Network for Manufacturing Innovation (NNMI). Four IMIs have already been established, and these centers are designed to accelerate innovation through investments in advanced manufacturing processes with the intention of making American manufacturers more competitive in the global marketplace.

An additional provision in the spending bill, unfortunately, extended for an additional year restrictions on federal employee travel. MRS continues to make the case before Congress and the Administration that such restrictions have deleterious effects on scientific research, researchers and technological innovation. MRS continued in 2014 its legislative and regulatory advocacy around a number of key issues including energy critical elements and critical materials, federal data policy and the Materials Genome Initiative (MGI).

Congress continues to work on the reauthorization of America COMPETES legislation—an initiative that includes, among other things—the NSF and NIST reauthorization. MRS remains committed to advocating for your interests to see that these agencies are reauthorized in the manner that best serves the materials community and are funded at adequate levels.

As the President's budget proposal is submitted to Congress in the first quarter of 2015, MRS expects there will be many policy debates around some of the issues mentioned above (e.g. MGI and federal data policy), and MRS will work with all of our science partners to ensure that your voice is heard in the conversations on Capitol Hill and the White House.

This past year also marked a time of transition as Ron Kelley, who represented the Society for 23 years, announced his retirement, and Damon Dozier took over as the MRS Director of Government Affairs, opening a new office in Washington, DC. We wish Ron the very best of luck in his future endeavors and thank him for his outstanding service to MRS and the community at large.

LOCAL CONGRESSMAN VISITS MRS HEADQUARTERS

Damon Dozier
MRS Director of Government Affairs

On a local level, MRS hosted Congressman Keith Rothfus (R-PA) as he visited the organization's main headquarters in

Warrendale, PA on October 27, 2014. The purpose of the visit was to meet MRS staff, learn more about the Society and establish a relationship with the Member's District office.
During the visit, MRS staff took the opportunity to educate the Congressman on our mission and goals, present information about our membership and also talk about the signature public initiatives and programs of the organization. Staff also spoke about our interests in federal agency funding programs beneficial to our membership.

Left to right: Todd Osman, Damon Dozier, Congressman Rothfus, and Ron Kelley.

The staff presentation began with a general overview of MRS vision, mission and goals, led by MRS Executive Director Todd Osman. Osman discussed the organization's membership profile, its publications and public outreach efforts through its foundation and also gave a brief history and overview of materials research as a discipline and area of research.

Next, Ron Kelley and Damon Dozier discussed how federal investment is key to materials science research, highlighting that science needs sustained, predictable and interdisciplinary federal funding; federal investments in R&D enhance our quality of life and directly support the training and education of the next generation of scientists, mathematicians, and engineers; and federal research employees are a critical component of the R&D enterprise in the US, and their work is enhanced when they collaborate/network with their disciplinary peer groups.

After the staff presentation, Congressman Rothfus addressed the MRS staff and spoke about his policy priorities – securing American competitiveness and creating a stable workforce, securing investment in science and manufacturing and lowering the tax burden on American workers. He personally greeted all of the headquarters staff, and promised to return to learn more about MRS.

Rothfus represents the 12th District of Pennsylvania, which includes all of Beaver County, and parts of Allegheny, Cambria, Lawrence, Somerset and Westmoreland Counties. MRS is located in the northwestern corner of Allegheny County.

KICKING OFF A NEW YEAR IN MATERIALS ADVOCACY

Brent Carey
Chair, Grassroots Subcommittee

I am honored to have been asked to Chair the Grassroots Subcommittee in 2015, and first want to thank Tabbetha Dobbins for her steadfast leadership over the past several years. I will look forward to her continuing contributions as a member of our active group!

During 2015, we aspire to expand our reach and engage new audiences to increase participation. Policy is shaped by communication and consensus, and for materials to be on the agenda of our legislators, we need to consistently remind them R&D is important to society as a whole as well as in each of their constituencies. The more our representatives hear from us, the more motivated they are to enact change.

Someone once explained it to me this way: if you are one of a handful of people who write a letter to your representative promoting increases in federal R&D funding, yet dozens of your neighbors send an email asking for their potholes to be fixed, guess what gets action first? Our elected officials want to represent their constituencies, and it's on us to direct their attention to the important issues.

Participation at our *Materials Voice* kiosk at the 2014 MRS Fall Meeting was encouraging. To-date, over 2,000 letters have been sent to our elected representatives on the topics of 1) sustaining federal basic research funding, 2) encouraging the relaxation of travel restrictions for government employees (e.g. to conferences), and 3) promotion of the Revitalize American Manufacturing and Innovation (RAMI) Act. Our voice matters, and helps to drive change.

Let's continue the momentum!

MRS CONGRESSIONAL SCIENCE & ENGINEERING FELLOWSHIP CORNER

Kevin Whittlesey
Chair, Congressional Fellow Subcommittee

The MRS Congressional Fellows have once again secured excellent placement offices in which to conduct their fellowship years. Jimmy O'Dea, the 2014-2015 MRS/OSA Congressional Fellow, is spending his year in the office of Senator Brian Schatz (D-HI) working on climate and energy policy. Adria Wilson, the 2014-2015 MRS/TMS Congressional Fellow, is spending her year in the office of Senator Bernie Sanders (I-VT) working on energy and environmental issues.

A new and significant contribution by the GAC to the 2014 MRS Fall Meeting program was the development of a Science Policy Forum. This was a two-hour session designed to educate MRS members about the federal research budget and the ways by which scientists can help advocate for continued federal investment in research and other issues important to the materials community. Representatives of the Fellowship Subcommittee worked closely with representatives from the Policy Subcommittee and the GAC Chair to develop the agenda and recruit speakers for the session. The GAC was able to bring in a renowned federal research budget expert from AAAS in Washington, DC, Matt Hourihan, to present. The session also included participation from the Grassroots Subcommittee as well as the MRS Washington Office so many of the GAC's key Subcommittees and their activities were represented. The session covered interesting and important topics such as the value of constituent letters to a Congressional office and the ways in which science is utilized in policy development. I hope we will see a similar session at another MRS meeting in the near future.

The MRS Fall Meeting also featured, once again, an informational session for potential applicants to learn about the MRS Congressional Science and Engineering Fellowships program. Joining me in hosting the session were not only the two current Fellows, Adria and Jimmy, but also Ashley White (2010-2011 MRS/OSA Congressional Fellow) and Brian Holloway (1997-1998 MRS/OSA Congressional Fellow) who each shared some of their experiences and how the Fellowship has benefitted their careers. The five of us, therefore, represented a nice cross-section of individuals at different points in our careers relative to our respective Congressional Fellowships so could comment on the range of ways in which this unique opportunity to work in the Legislative Branch can affect one's career trajectory. As usual, the information was well attended by potential applicants. Applications were due on January 2, 2015 for the 2015-2016 Fellowship cycle. I look forward to seeing yet another robust pool of competitive applications.

The 2013-2014 Fellows, Sydney Kauffman and Megan Brewster, were both selected for executive branch placements with the AAAS Science and Technology Policy Fellowship Program. Sydney is conducting her AAAS Fellowship at the U.S. Department of State, while Megan is at the Department of Energy in the Advanced Manufacturing Office within the Office of Energy Efficiency and Renewable Energy. Once again, we see a consistent pattern of MRS Congressional Fellows being offered interesting and important career development opportunities.

CONGRESSIONAL VISITS DAY, BROADER IMPACT

Linda J. Olafsen
Chair, Congressional Visits Day Subcommittee

The Congressional Visits Day (CVD) Subcommittee organized a fall visit to Capitol Hill on October 7-8, 2014 with participants from the MRS Executive Committee and Board of Directors, as well as Government Affairs Committee leadership. Four teams of two or three individuals visited the offices of members of Congress from the states of Illinois, Indiana, Maryland, New Jersey, New Mexico, New York, Pennsylvania, Texas, and Washington. While visits typically tend to be scheduled when Congress is in session, members were at home campaigning for the election, so even more so than normal, meetings were with staff members that remained in Washington, DC. Because of this timing, CVD participants generally enjoyed a more relaxed environment on Capitol Hill, and staff members were very generous with their time, engaging in longer meetings and more lively discussions than occur during the hectic schedule when members are in town and Congress is in session.

In this photo, framed by the Capitol, from left to right are MRS Board member Loucas Tsakalakos (GE Global Research), Linda Olafsen, and MRS Board member Eric Stach (Brookhaven National Laboratory).

In addition to discussing federal funding of scientific research, participants also took the opportunity to inform Congressional staff about issues and consequences associated with federal employee travel restrictions. As representatives and leaders of the society, participants were well acquainted with this issue and enjoyed the opportunity to educate and increase the awareness of these staff members.

This fall CVD event is a chance to showcase to the MRS Board of Directors one of the important advocacy efforts of GAC.

The CVD Subcommittee welcomes Damon Dozier, who enjoyed a baptism by fire with his first CVD a few weeks after assuming his new role as MRS Director of Government Affairs. The quality of the CVD visits led to several opportunities for follow up by Damon, GAC Chair Nabil Bassim, and others. These follow up opportunities always are valued and speak to the effectiveness of the messaging from the CVD participants as well as the reputation and relationships being built between MRS and Capitol Hill.

The group had the benefit and privilege of Ron Kelley's participation in advance of his retirement. The CVD Subcommittee is very grateful for Ron and his professionalism and impact, particularly regarding the development of training, organization, and strategy for Congressional visits. We wish him the happiest of retirements.

2014 MRS FALL MEETING: Conversations with the Government Agencies Regarding Funding in Materials Research

David P. Norton
Chair, Government Agency Subcommittee

At the 2014 MRS Fall Meeting in December, the Government Agency Forum featured invited speakers describing research programs of significant interest to the materials research community. Presentations were scheduled the evenings of Tuesday and Thursday so as to be accessible to MRS attendees who would otherwise be attending the daytime scheduled technical sessions.

The Government Agency Forum presentations were very well attended. Linda Horton from the Department of Energy (DOE) Basic Energy Sciences (BES) described the various fundamental research programs that support the DOE's missions in energy, environment, and national security. Her talk included specific efforts in materials, chemical sciences, biosciences, and geosciences, emphasizing the importance of understanding, predicting and controlling matter and energy at electronic, atomic and molecular levels. Horton described the various programs that support the core BES mission which is to support fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels; provide the foundations for new energy technologies to support DOE's missions in energy, environment, and national security; and plan, construct, and operate world-leading scientific user facilities for the Nation.

Carol Bessel, Acting Division Director within the National Science Foundation (NSF) Division of Materials Research (DMR) described DMR's interest in supporting fundamental research in materials and condensed matter physics. She discussed specific efforts related to the Designing Materials to Revolutionize and Engineer our Future (DMREF), a program whose aim is to accelerate materials discovery and development by building the fundamental knowledge base needed to design and make materials with specific and desired functions or properties from first principles. Bessel also described the Materials Innovation Platforms (MIP), a new midscale user facility program in which the Platforms conduct research through iterative "closed-loop" efforts among the areas of materials synthesis, characterization, theory, and the application of theory through modeling and/or simulation.

Aivars Lelis from the Army Research Laboratory (ARL) described research activities at ARL, specifically focusing on activities within the Sensors and Electron Devices Directorate. He discussed the new ARL Open Campus concept for robust and synergistic university, industry and government laboratory research.

On the international research front, Brian Holloway, Associate Director, Office of Naval Research Global, described how this organization identifies, encourages and funds international basic research that is in support of the Office of Naval Research mission. Holloway described the primary funding mechanisms for international scientists and explained how research proposals from outside the United States are prioritized.

Hugh DeLong from the Air Force Office of Scientific Research (AFOSR) described the basic science interests for future Air Force needs. His presentation included an overall view of materials-related research in AFOSR along with specifics in complex materials and devices. DeLong described his agency's interest in fundamental and integrated science that provides novel options that increase operational flexibility and performance relevant to the Air Force.

Finally, Claire Muhoro from the U.S. Agency for International Development (USAID) described the USAID PEER program, an international grants program to bring researchers funded by U.S. federal science agencies together with scientists and engineers in developing countries to addresses global development challenges.

RAISING RESEARCH FUNDING IN LEAN TIMES

James M. Tour
Rice University

It is possible for Congress to directly improve the research enterprise in U.S. universities, increasing access to research funding, and mitigating the current brain-drain of our best and brightest scientists and engineers. And this can be done without commitment of any new federal or state allocations.

There has been a dramatic and untenable loss of research funding to U.S. universities, on a per investigator basis, since the outpouring of the stimulus funds in 2009. The U.S. formerly had been the recipient of the world's most talented students and faculty, but now many postgraduates are returning to their home countries and top professors are moving abroad in order to keep their programs funded.

This brain drain is not something from which the U.S. can recover—the impact of what has already been lost will last decades. As university research programs shrink substantially or close, there will be a diminishing supply of U.S.-trained and U.S.-national scientists and engineers. The lack of highly trained scientists and engineers is already felt, and it will grow far worse.

Managing a large research laboratory—over 35 graduate students and postdocs—my research funding situation is as good as it has ever been. In 2008, my program was 90% federally supported and 10% industry supported; the norm for

many research groups. Then, for the first time in my 26-year career as a faculty researcher, I could no longer survive. One federal grant after another was unfunded. Federal programs would attract 300 initial applicants, 150 full proposals, and then only have enough to fund 5 research groups. Federal organizations would post programs for proposal submissions. I would submit a proposal, only to learn that they would shut down the program without even reviewing a single proposal. There was no recognition of the time I had already spent in writing proposals—the atmosphere became terribly disrespectful to the researchers' efforts.

Having the good fortune of being in Houston where many oil companies are headquartered, I was successful in showing them how our nanotechnology research could address the technical needs in their industry. We do basic research in nanoscience, and then parlay that into applied nanotechnology research that can benefit companies. More than 15 companies have stepped up to fund the work of my group.

If a company gives a monetary gift to a university, they can get a healthy tax deduction yet cannot request a report on the outcome of gift-supported research. However, if the company grants money though a sponsored research agreement, they can require reports of the work and even request milestones, yet the intellectual property still resides with the university. While the intellectual property cannot be "pipelined" to the company, the university can license – even exclusively – to the company sponsoring the work. A letter of intent to license is oftentimes sufficient to give assurance that the company could be the recipient of the funded work.

Here is where Congress can help. If the company funds research at an academic institution through a sponsored research agreement, then the company loses the benefits of a significant tax deduction through their allocation of funds. On July 29, 2014, I testified to the House Energy and Commerce Subcommittee on Commerce, Manufacturing and Trade on a proposal that would incentivize industry to fund academic research universities and non-profits by granting companies with a total or significant taxable deduction for their university research investment. If I can explain to industries that there will be a complete or significant tax deduction for the sponsored research agreement, then I can sell my research to them with the utmost attractiveness.

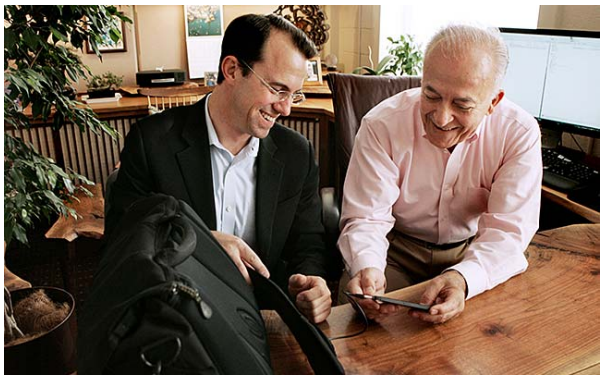
Some researchers might argue that basic research will suffer at the expense of applied research. Not so. I always tell industries that their investment will be used, in part, to expand upon the basic research scope while still delivering upon the applications. We file patents regularly to secure the intellectual property, and then we publish as usual in the academic literature. The protocol works, and it would require no new federal allocations while incentivizing industry to fund research where the federal government has been deficient. If we can attain further industrial investment into academic research, it could mitigate the brain-drain while spawning enhanced transitions of scientific advances into the marketplace.

A VALUE-ADDED MATERIALS RESEARCH STORY

Faculty-Student Collaborations Spark Business Ventures

Ilhan Aksay
Princeton University

Research with commercial value emerges continually from university labs, in this case, from Ilhan Aksay's lab at Princeton University. Often students and postdoctoral researchers play key roles in bringing the ideas to market. An example is Vorbeck Materials, which sprang from a visit to a laboratory in Aksay's laboratory in Princeton's Engineering Quadrangle. Indeed, the faculty-student bond became material for a new company. Shown below, Professor Aksay (right) and his former student John Lettow (left) co-founded Vorbeck Materials based on research conducted in Aksay's lab. (Photo by Frank Wojciechowski).



John Lettow, who graduated from Princeton in 1995 with a degree in chemical engineering, returned in 2004 to the laboratory of his former professor with questions about materials science. Lettow was looking for information on fuel cells, but his visit changed the course of his business.

"Ilhan had been working on several different technologies," Lettow recalled. The conversation quickly moved to graphene—a sheet of carbon that is just one atom thick. "The breadth of graphene technology is enormous."

Over the next year, the pair formalized a new company that would become Vorbeck Materials. The idea was to develop Aksay's insights into graphene into a variety of industrial and commercial uses.

"I remember saying to John that this is like standing at the edge of a cliff and we will either succeed or fall off," said Aksay, who is a professor of chemical and biological engineering. "He said, 'Have you ever seen anyone accomplish something big without taking risks?'"

Today, Vorbeck's manufacturing facility in Maryland makes products ranging from advanced batteries to wearable circuitry

(www.vorbeck.com). The company also has a research and development lab outside of Princeton that frequently consults with Aksay's research group.

"Ilhan has contributed to the company all the way through," Lettow said. "We would have had a very difficult time without him." (Based on original article by John Sullivan.)

FEEDBACK

We welcome your feedback and invite you to submit topics for consideration in future issues of this newsletter. If you have or know of stories that illustrate how an investment in materials research paid off in real dollar terms, please send your suggestions to *INTERSECTIONS* Editor, Len Brillson, at brillson.1@osu.edu. Please send your comments to publicaffairs@mrs.org.

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