Lewis-Burke Analysis of the Federal Innovation and Commercialization Landscape

Lewis-Burke Associates LLC – April 30, 2014

Introduction

This report outlines the current federal landscape for university commercialization, innovation, and technology transfer activities, which the Obama Administration continues to emphasize as key contributors to rebuilding the U.S. economy.

Administration and congressional support for commercialization and innovation initiatives focus on reducing barriers in translating federal research investments into new products, industries, and, ultimately, jobs across a number of sectors. The Obama Administration views partnership with industry as key to progress both in terms to define research and innovations challenges, and to leverage additional resources to federal investments. Support for universities has ranged from individual awards to cultivate new entrepreneurs to institutional awards to support regional innovation ecosystems.

In addition to ongoing agency solicitations to support entrepreneurship and commercialization, 2014 presents several new or returning special initiatives, including:

- A new NIH accelerated innovation consortium-based centers program, modeled on the recently awarded NHLBI Centers for Accelerated Innovation, entitled Research Evaluation and Commercialization Hub (REACH) Awards;
- Participation of NIH in a new effort modeled on NSF's I-Corps program;
- Support from the Department of Commerce for another open round of i6 Challenge grants;
- The Department of Energy's new efforts in 2014 and 2015 to form MOUs with universities to accelerate commercialization of university inventions arising out of DOE-supported research;
- New NIST Centers of Excellence with universities around topics such as forensics science and carbon-based nanomanufacturing;
- NIH's new partnership with major drug companies and patient groups to pursue drug targets and treatments for Alzheimer's disease, type 2 diabetes, and the autoimmune disorders of rheumatoid arthritis and lupus;
- FDA's recent announcement of a realignment around commodity-based and vertically-integrated regulatory programs and the possibility for new centers of excellence in regulatory science;
- Department of Defense centers of excellence in planning which require partnerships with defense laboratories;
- Current U.S.-EU and U.S.-India partnerships which emphasize commercialization and translational research components as part of the solicitations;

- NIH and FDA's enhanced emphasis and new initiatives around medical devices, SBIR/STTR applications for platform technologies to deliver nucleic acid therapeutics, and rare diseases;
- Future national manufacturing institutes (NNMIs) which require very large teams and are awards on the order of $50-70 million each; and
- Several research agencies continue to look to private industry or foundations to co-fund or design new federal investment areas.

This document provides information on:

- Federal agency priorities related to innovation, university-industry partnerships, and technology transfer;
- Information on the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs;
- An update on innovation and commercialization priorities of the U.S. Congress and the Obama Administration; and
- Detailed analysis of funding opportunities for large center public-private partnerships (*Appendix A*).

Federal Agency Priorities Related to Innovation and Technology Transfer

This information provides context of how each agency supports commercialization and innovation activities; more detailed information on specific programs for each agency is included in appendix A. Information on the cross-agency Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs is included in the next section.

Department of Defense (DOD) – Given the DOD focus on development of new technologies and applications to support the warfighter, a significant portion of DOD research support for universities is done in collaboration with, or through contracts with industry. University-Affiliated Research Centers (UARCs) are DOD's signature mechanism for engaging universities with industry to ensure that science, engineering, and technology needs of particular importance to DOD are supported. There are currently 13 UARCs and it is unlikely in the current fiscal environment that additional centers will be established. Besides UARCs, DOD supports university-industry collaborations through the Army Collaborative Technology Alliances (CTAs) and Collaborative Research Alliances (CRAs) and Air Force and Navy supported centers of excellence. These mechanisms support collaborations between defense laboratories and centers, industry, and academia to ensure rapid technology transfer of new innovations and technologies.

In addition to these specialized solicitations, DOD has played a leading role in the implementation of President Obama's National Network for Manufacturing Innovation (NNMI)[1]; with DOD supporting the initial pilot award in additive manufacturing, and two additional awards in Digital Manufacturing and Design Innovation (DMDI) and Lightweight and Modern Metals Manufacturing Innovation (LM3I). Absent a significant new investment, we expect DOD to continue to fund between two and four NNMI projects per year for the remainder of the Obama Administration.

New activities:

- *DOD is developing ideas for new Centers of Excellence that would involve university research and would require partnership with DOD laboratories.*
- *DOD is launching two new funded consortiums for Quantum Science Research.*
- *DOD is expected to announce two further NNMI competitions in FY 2014.*

Department of Energy (DOE) – President Obama introduced the Energy Innovation Hubs in 2010 to support research and development partnerships to address specific energy grand challenges. Originally eight hubs were proposed; five have been funded and it is not expected that Congress will support further hubs. In 2009, the DOE Office of Basic Energy Sciences established 46 Energy Frontier Research Centers (EFRCs), which focus on fundamental research to develop new innovative energy technologies. In October 2013, DOE announced the competition and re-competition of the EFRCs; it is not clear how many new or renewed centers will be funded in FY 2014, but the expectation is that at least 30 centers will be supported. As precursors of the Energy Innovation Hubs, DOE established three Bioenergy Research Centers to provide the basic biological and genomic research needed to develop clean energy sources utilizing natural materials; all three centers were renewed for an additional five years in April 2013 and no new solicitations are expected. DOE has also participated in the NNMI initiative and has recently supported its first center –the Next Generation Power Electronics National Manufacturing Innovation Institute.

[1] http://www.manufacturing.gov/nnmi.html

New activities:

- *In 2014 and 2015, DOE is continuing efforts to establish memoranda of understanding (MOUs) with universities to accelerate commercialization of university inventions arising out of DOE-supported research. Once the MOUs are in place, universities will be able to market or license specific technologies through the DOE structure. In return, a no-cost six month option agreement with a small business selected for the award will be provided. Universities can participate in this process both as the developer of the technology or through small businesses spun out of the institution.*
- *DOE will announce two further NNMI competitions in FY 2014; the first has already been announced in Advanced Composites.*

Economic Development Agency (EDA) –EDA provides funding through a range of programs and mechanisms to support regional efforts that encourage job creation and increase private investments leveraging the research discoveries, facilities, and workforce based at universities and research organizations. The Public Works and Economic Adjustment Assistance (EAA) programs provide competitive funding for economic development projects with potential to expand economic activity through funding for construction, non-construction, technical assistance, and revolving loan fund projects.

New activities:

- *A key priority highlighted in the President's budget request for FY 2015 would be $25 million to support the Regional Innovation Strategies Program. The funding would be used to continue implementing inter-agency challenge competitions that are aimed at strengthening regional innovation clusters, including the renewal of the i6 Challenge competition which supports the creation of proof of concept and commercialization centers.*[2]
- *EDA anticipates the release of its next i6 competition by the end of 2014 and does not expect the topic areas to be limited. Depending on the funding available, EDA may award more than one per region.*

Food and Drug Administration (FDA) – The FDA Innovation Pathway[3] provides tools and techniques to enhance collaborations between FDA and innovators to ensure patients receive faster access to safe and effective medical devices.

New activities:

- *FDA is planning to overhaul its regulatory and compliance activities to organize them around a product-based approach, such as drugs, medical devices, or biologics, rather than the current geographical approach.*[4]

National Institutes of Health (NIH) –NIH continues to emphasize its role in fostering more effective and efficient translation of basic scientific discoveries into treatments and therapeutics that lead to improved health outcomes. NIH encourages researchers to partner with industry across its institutes. More specifically, the National Center for Advancing Translational Sciences (NCATS) was established in

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[2] http://www.osec.doc.gov/bmi/budget/FY15CJ/EDAFY2015CJFinal508Compliant.pdf.

[3] http://www.fda.gov/AboutFDA/CentersOffices/OfficeofMedicalProductsandTobacco/CDRH/CDRHInnovation/InnovationPathway/default.htm.

[4] http://www.meddevicesupplychain.com/02-04-14-HamburgMemo.pdf.

December 2011 to "transform the translational science process so that new treatments and cures for disease can be delivered to patients faster."[5]

New activities:

- *NIH recently announced a new five-year partnership with 10 drug companies aimed at pursuing new drug treatments for Alzheimer's disease, diabetes, and the autoimmune diseases of rheumatoid arthritis and lupus. Called the Accelerating Medicines Partnership (AMP), the $230 million initiative includes $118.9 million in NIH funding that is expected to be awarded extramurally later in 2014 and managed by the Foundation for NIH (FNIH).*
- *NIH recently announced a new initiative around medical devices. The "Biomedical Innovation: Identifying Challenges and Prioritizing Needs in Medical Devices Research and Development[6]" forum will bring together experts in research, development and commercialization of medical devices to discuss the major issues restricting full innovation in medical devices. The outcome of the forum will inform policy makers on ways to improve innovation going forward.*
- *The FY 2014 NIH SBIR/STTR Omnibus Solicitation highlights topics of interest to NCATS including: "the development of innovative tools, technologies and intervention (drug, device, diagnostic) platforms that would support the creation of novel therapeutics and/or diagnostics, especially for rare and neglected diseases.[7]"*
- *NIH is expected to participate in a program modeled on the NSF's I-Corps initiative.*
- *NIH has recently released a new program to support "Research Evaluation and Commercialization Hub (REACH) Awards[8]," to support proof of concepts centers. This accelerated innovation consortium-based centers program is modeled on the recently awarded National Heart, Lung, and Blood Institute (NHLBI) Centers for Accelerated Innovation[9].*

National Institute of Standards and Technology (NIST) – While most of NIST supported research is carried out at NIST laboratories, NIST has been working to raise its profile and partnerships with industry and academia.

New activities:

- *The NIST Centers of Excellence (COE) program was launched in 2013 involving universities, industry, and government to leverage and expand NIST's research capabilities across various research areas. In 2013, the first center in Advanced Materials research was funded, led by Northwestern University. In FY 2014, NIST received $15 million of funding to support additional COEs, with specific guidance to establish centers in forensic measurement science and carbon based nano-manufacturing commercialization technology.*
- *NIST is rolling out the Advanced Manufacturing Technology Consortia (AMTech), a new extramural research program focused on addressing long-term industrial manufacturing needs by supporting industry-led consortia focused on early stage technology development in manufacturing and more efficient technology transfer methods.*

National Science Foundation (NSF) – NSF supports a range of programs and activities to encourage the maximum impact of the research it funds and catalyze technology transfer towards commercialization.

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[5] http://www.ncats.nih.gov/about/about.html
[6] http://rarediseases.info.nih.gov/news-and-events/conferences/1210
[7] http://www.ncats.nih.gov/files/factsheet-omnibus-small-business.pdf
[8] http://grants.nih.gov/grants/guide/rfa-files/RFA-OD-14-005.html
[9] http://grants.nih.gov/grants/guide/rfa-files/RFA-HL-13-008.html

Programs range from individual student and investigator awards to large center funding, as well as support for entrepreneurship training, workshops, and instrumentation awards. NSF also participates in a number of interagency initiatives to support technology transfer and commercialization.

New activities:

- *NSF remains committed to interagency priorities that involve collaboration with industry including Clean Energy, Advanced Manufacturing, and Cyberinfrastructure.*
- *NSF plans to expand the Innovation Corps (I-Corps) program that supports entrepreneurial training. The plan is to build on the existing hubs through state-based initiatives and multi-state regional networks. The ability to reach a large number of entrepreneurs through a network of networks is one of the primary objectives.*

U.S. Department of Agriculture (USDA) – USDA supports university-industry partnerships though the Coordinated Agricultural Projects (CAP) Grants and the Biomass Research and Development Initiative (BRDI). CAP grants are large awards and UDSA is generally quite prescriptive in the topics it would like to fund. The BRDI program is jointly funded by USDA and the Department of Energy (DOE) and provides competitive grants for research, development and demonstration projects to support innovation and ultimately commercialization of new bioenergy technologies.

New activities:

- *The President's budget request for fiscal year (FY) 2015 includes $75 million to support three public-private innovation institutes that would partner with industry to facilitate innovation and commercialization. The three institutes would focus on: bio-manufacturing and bioproducts development (as a National Network for Manufacturing Innovation (NNMI) institute); pollination and pollinator health; and anti-microbial resistance research (AMR).*

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs (SBIR/STTR) are cornerstone investments by federal agencies to commercialize federally-funded basic research. In 2012, changes to the program were enacted through the *SBIR/STTR Reauthorization Act Of 2011*[10], which among other provisions, increased funding that agencies must set aside from their extramural research and development (R&D) budgets for small business. Now, the amount set aside for SBIR in most all research agencies (with extramural budgets greater than $100 million) will be increased by 0.1 percentage point each fiscal year (FY) until it reaches 3.2% in FY 2017. For STTR, the set-aside percent was increased to 0.35%, and will increase to 0.4% for 2014 and 2015, and to 0.45% for 2016 and thereafter.

Additionally, the Small Business Administration (SBA) released updated guidelines for award sizes, which suggested STTR awards be increased to match SBIR amounts with $150,000 for Phase I and $1 million for Phase II awards. However, awards may not exceed guideline amounts by more than 50 percent or $225,000 for Phase I and $1.5 million for Phase II.

While SBIR and STTR are generally seen as working well, policy makers at think tanks, federal agencies, and within Congress continuously explore options to better leverage the mechanism. Specifically, the National Research Council (NRC) of the National Academies is reviewing the SBIR/STTR programs at DOD, NIH, NASA, DOE, and NSF. While a report will be produced for each agency, the NRC will look to address the following issues:

1. "Review institutional initiatives and structural elements contributing to programmatic success, including gap funding mechanisms such as applying Phase II-plus awards more broadly to address agency needs and operations and streamlining the application process.
2. Explore methods to encourage the participation of minorities and women in SBIR and STTR.
3. Identify best practice in university-industry partnering and synergies with the two programs.
4. Document the role of complementary state and federal programs.
5. Assess the efficacy of post-award commercialization programs.[11]"

As part of the review, on February 5, 2014 the National Academies of Sciences held a workshop entitled, *Commercializing University Research: the Role of SBIR and STTR*. Below are some key points reflected in the discussion.

Agency Perspectives:

Department of Defense (DOD) – DOD spends approximately $900 million a year through its SBIR program through three annual solicitations. The agency has approximately $100 million for its STTR effort, which is broken up into two annual solicitations. In terms of university participation, 88 percent of STTR Phase I awards and 83 percent of Phase II awards have universities as teaming partners. A large percentage of DOD SBIR grants also feature university support; with universities as teaming partners on 18 percent of Phase I awards and 14 percent of Phase II awards.

[10] http://www.gpo.gov/fdsys/pkg/BILLS-112s493is/pdf/BILLS-112s493is.pdf
[11] http://sites.nationalacademies.org/PGA/step/sbir/

Department of Energy (DOE) – DOE is introducing a new initiative in which the agency aims to leverage the SBIR and STTR programs and university capabilities to accelerate the commercialization of innovations resulting from DOE extramural research and development. Awardees will have an opportunity to receive an SBIR/STTR grant along with an option to license new technology based on existing DOE research. The new system requires the development of a process for including university technology transfer opportunities (TTOs) in SBIR/STTR solicitations and the establishment of a Memorandum of Understanding (MOU) between the university and external organization. The Department began implementing the change in phases: in FY 2013, it applied to DOE national labs; in 2014 it will be expanded to universities under contract with DOE (e.g. Bioenergy Research Centers); and by FY 2015, it will be extended to all universities receiving DOE grants.

To avoid conflicts of interest, university personnel cannot participate in the review and selection process for SBIR/STTR awards associated with their technologies. In FY 2014, three universities have participated, 12 TTOs have been submitted and selected, two applications have been reviewed and one Phase I award has been granted. Going forward, DOE plans to expand the number of participating universities ahead of FY 2015.

Department of Health and Human Services – HHS is second behind DOD in SBIR/STTR funding and 98 percent of SBIR/STTR support from the agency is from the National Institutes of Health (NIH). In addition, as mentioned earlier in this memorandum, NIH plans to offer I-Corps funding for its SBIR recipients to better mentor and train the awardees. In FY 2013, over $302 million was provided for SBIR/STTR proposals, which had a success rate of 16.3 percent[12].

NASA – In general, NASA tends to solicit SBIR/STTR proposals that are narrower in scope than those at other agencies as they focus primarily on the needs of NASA missions. Most of the successful organizations that compete for NASA SBIR/STTR grants have strong partnerships with major research universities. NASA is looking for more ways to support Minority Serving Institutions through this endeavor.

National Science Foundation – NSF has recently strengthened its STTR program to help stimulate the commercialization of university research. In FY 2013, NSF increased funding for Phase I STTR awards to $225,000. Additionally, NSF offers Phase II-B grants, which help SBIR and STTR Phase II grantees attract private sector support by matching up to 50 percent (up to $500,000) of third-party investments for a project. Like many agencies participating in SBIR/STTR, NSF strongly encourages the commercialization of previously NSF-funded fundamental research in their proposals. NSF also offers Technology Enhancement for Commercial Partnerships (TECP) supplements of up to $100,000 to promote discovery and encourage commercial partnerships for Phase II SBIR and STTR grantees. TECP grants aim to help the project meet additional proof-of-concept requirements a potential industry partner may require.

In addition to SBIR/STTR, one of the main programs at NSF that focuses on the translation of research into the marketplace is the Accelerating Research Initiative (AIR). AIR is broken up into two components: AIR Technology Transfer (TT) and AIR Research Alliance (RA). More information on the AIR program in included in Appendix A. In FY 2013, 41 TT projects and 6 RA projects were supported by NSF.

[12] http://grants.nih.gov/grants/funding/award_data.htm

An internal NSF evaluation indicated that a majority of SBIR/STTR Phase II project failures were due to marketing issues[13]. As such, NSF recognizes the need for investigators to understand their target marketplace and develop the right projects at the right time. In 2013, NSF took a step towards addressing this concern by launching the SBIR Entrepreneurial Boot-Camp, which focused on customer discovery and featured 69 small business participants. NSF also supports entrepreneurial training through the Innovation Corps (I-Corps) program. More information on I-Corps in included in Appendix A).

[13] http://sites.nationalacademies.org/PGA/step/sbir/PGA_086819 - see Presentation on "SBIR/STTR at the National Science Foundation" - Grace Wang, National Science Foundation, slide nine.

Update on Innovation and Commercialization Priorities for Congress and the Administration

Introduction

Presented below is an update on the White House Office of Science and Technology Policy (OSTP) Lab to Market report convened in 2013. Also included is information on several legislative activities of interest to Congress. While a number of bills to support innovation and commercialization at universities are under discussion, it is unlikely that any such new legislation will be passed in the near future. Agencies and universities are encouraged to utilize existing opportunities and develop new partnerships with industry and foundations to ensure maximum support for innovation activities.

OSTP Lab to Market Report

In May 2013, the White House Office of Science and Technology Policy (OSTP) convened the Lab-to-Market Summit to examine the current state of federal commercialization efforts. A panel of experts was called to generate a report identifying areas of collaboration as well as barriers and inefficiencies of federal lab-to-market programs across agencies. The panel focused on best practices, potential linkages with industry, metrics, and cross-agency policies and initiatives to improve current commercialization capabilities. The panel concluded that while some current federal programs are well-designed and foster innovative ideas ripe for commercialization, major barriers stand in the way of maximizing the federal government, university, and industry's potential in turning cutting edge research into commercially viable technologies. Several recommendations and observations about current federal commercialization activities contained in the report include:

- Create a high level "Office of Innovation" to oversee and coordinate federal commercialization activities to catalyze efficient cross-agency initiatives, develop incentives for federal agencies to invest in commercialization programs, and streamline public-private partnership development.
- Strengthen capital investments and resources to support the commercialization of federal-funded research; activities could include tax incentives for industry to scale up federally-funded research, creation of new investment vehicles for private and public-private support of federal R&D activities, and retooling of existing SBIR/STTR programs to incentivize innovative ideas.
- Enhance industry input, critical in designing and implementing any effective federal commercialization programs, to universities in developing innovative research and market-changing products. Large companies should be particularly involved.
- Maintain a balanced federal portfolio of basic and applied research aimed at commercialization given the varied market needs and scope of agencies and industries involved. Given agencies' broad and varied missions, flexible metrics for success are key.
- Increase incentives needed for national laboratories and federal programs to prioritize commercialization activities.

America COMPETES Act

The America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2007 or America COMPETES Act was first signed into law in August 2007 by President Bush. The COMPETES Act authorizes funding levels for the National Science Foundation (NSF), National Institute of Standards and Technology (NIST), and the Department of Energy's (DOE) Office of Science.

The purpose of the Act was "to invest in innovation through research and development, and to improve the competitiveness of the United States.[14]" In January 2011, the America COMPETES Reauthorization Act of 2010 was signed into law by President Obama.

The America COMPETES Act expired on September 30, 2013; Congress is currently working to reauthorize this legislation. While the Senate is working on a bipartisan effort to reauthorize COMPETES, House Republicans and Democrats are each working on their own versions of the reauthorization. To date, House Democrats have released a discussion draft of a comprehensive bill, whereas House Republicans are planning to move forward on two separate bills: the FIRST ACT will cover NSF and NIST; and the Einstein America Act will cover the DOE Office of Science. There are concerns in the research community that the House Republicans' FIRST ACT does not include authorizations levels as set out in the original COMPETES Act; includes significant cuts to social behavioral and economic research; and includes provisions that may impede NSF's ability to perform its mission effectively.

TRANSFER Act

The Technology and Research Accelerating National Security and Future Economic Resiliency (TRANSFER) Act of 2013 was introduced in the House in August 2013. The TRANSFER Act aims to support new approaches to technology transfer. Federal agencies would be required to set aside a percentage of their STTR funding to carry out an "Innovative Approaches to Technology Transfer Grant Program" that would support technology transfer and commercialization of federally funded research at universities, national laboratories, and other nonprofit research institutions. Discussions are underway about ways this legislation or its relevant policy sections can be included in other drafts that are moving through the committee process.

SBIR / STTR Reauthorization

The SBIR / STTR program was last reauthorized on December 31, 2011. Despite the policy recommendations coming out of the National Academies review of the SBIR/STTR program, any legislative restructuring to the SBIR/STTR program is unlikely to happen until the program's reauthorization in 2017. Instead, policy makers are calling on the agencies to utilize the increased funding caps provided to the SBIR/STTR programs to make sure programs are effectively managed and grantees are receiving the support they need to commercialize their research. University partners are also encouraged to continue to look for opportunities beyond the federal level, as several states have matching complimentary programs that are designed to catalyze entrepreneurship.

DOD Proof of Concept Commercialization Pilot Program

The National Defense Authorization Act for Fiscal Year 2014 includes language to establish a ''Proof of Concept Commercialization Pilot Program[15]'' to accelerate the commercialization of basic research innovations. The language in the bill would require eligible institutions to have an "established and proven" technology transfer or commercialization office that would be closely involved in the program. Projects would be required to have a management board that included experts outside of university

[14] http://www.gpo.gov/fdsys/pkg/PLAW-110publ69/pdf/PLAW-110publ69.pdf
[15] http://armedservices.house.gov/index.cfm/files/serve?File_id=215AC26C-A0E7-4B02-A63C-DD9D800AF2DB page 689.

research including those from industry, start-up, venture capital, technical, financial, and business. Projects must have an intellectual property rights strategy and demonstrate plans for sustainability once the award funding has expired. Awards would be a maximum of $500,000 per year to support commercialization activities, with total of $5 million available to support this pilot project. Discussions are underway within DOD about how to respond to this new initiative.

Appendix A: Selected Federal Agency Funding Opportunities for Large Center Public-Private Partnerships

Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR)

The U.S. Government's flagship programs to support innovation and commercialization of federally funded research and develop are the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Detailed information on specific SBIR/STTR competitions are available on each participating federal agency's website.

Small Business Innovation Research (SBIR)

The SBIR program supports competitive awards that support small businesses to explore the potential to develop and commercialize new technologies. Federal agencies participating in SBIR include the: Department of Agriculture (USDA), National Institute of Standards and Technology (NIST), National Oceanic and Atmospheric Administration (NOAA), Department of Defense (DOD), Department of Education (ED), Department of Energy (DOE), Department of Health and Human Services (HHS), Department of Homeland Security (DHS), Department of Transportation (DOT), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF).

SBIR supports three phases of awards:

- Phase 1 – to establish the technical merit, feasibility, and commercial potential of a new technology or innovation; award are up to $150,000 for six months.
- Phase 2 – to progress the results achieved in phase 1 SBIR awards; awards are up to $100,000 for two years.
- Phase 3 – to commercialize the results of phase 1 and phase 2 activities; SBIR does not fund phase 3.

More information on the SBIR program is available at: http://www.sbir.gov/about/about-sbir.

Small Business Technology Transfer (STTR)

The STTR program aims to bridge the gap between basic research and commercialization. STTR supports the expansion of public/private partnerships to include the joint venture opportunities for small businesses and nonprofit research institutions. STTR also has the phases of awards and projects must include formal collaboration with research institutes in phase 1 and phase 2. Federal agencies participating in STTR include the: Department of Defense (DOD), Department of Energy (DOE), Department of Health and Human Services (HHS), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF).

STTR supports three phases of awards:

- Phase 1 – to establish the technical merit, feasibility, and commercial potential of a new technology or innovation; award are up to $100,000 for one year.
- Phase 2 – to progress the results achieved in phase 1 SBIR awards; awards are up to $750,000 for two years.

- Phase 3 – to commercialize the results of phase 1 and phase 2 activities; STTR does not fund phase 3.

More information on the STTR program is available at: http://www.sbir.gov/about/about-sttr.

U.S. Department of Agriculture (USDA)

- Coordinated Agricultural Projects (CAP) Grants
- Biomass Research and Development Initiative (BRDI)

Coordinated Agricultural Projects (CAP) Grants

The largest extramural grants sponsored by USDA are the Coordinated Agricultural Projects (CAP) Grants. CAP grants are competitive grants that support large-scale, multi-million dollar projects in priority areas outlined by the Administration. Universities, national laboratories, non-profit institutions, and private entities are generally eligible for CAP grants. CAP grants have occasionally been awarded at approximately $30-$40 million over five years; however, with current budget constraints, more recently USDA has limited CAP grants to $10-$15 million over five years.

CAP grants are generally solicited as part of one of the annual funding opportunities through NIFA's Agricultural and Food Research Initiative (AFRI). USDA plans to issue AFRI funding opportunities for global food security; food safety; childhood obesity prevention; and the new water and agriculture program early in 2014. Please note that these Requests for Applications (RFA) are generally quite prescriptive in topics NIFA would like to fund. NIFA also emphasizes integrating the research, education and extension missions of NIFA

More information:
- AFRI Request for Applications schedule: http://www.nifa.usda.gov/funding/rfas/afri.html.
- Abstracts of AFRI Projects by State: http://www.nifa.usda.gov/funding/afri/afri_reports.html.
- Additional Information on AFRI: http://www.nifa.usda.gov/funding/afri/afri.html.

Biomass Research and Development Initiative (BRDI)

The BRDI program is jointly funded by USDA and the Department of Energy (DOE) at about $25 million to $38 million per year. This program provides competitive grants for research, development and demonstration projects to support innovation and ultimately commercialization of new bioenergy technologies. Such technologies can include feedstock development, the development of biobased products, and biofuels development analysis. Eligible entities include universities, national laboratories, federal or state research agencies, the private sector, and non-profit organizations, or consortia of two or more of eligible entities. Cost-sharing of 20 percent for R&D and 50 percent for demonstration and commercial projects is required. USDA and DOE generally announce the annual funding solicitation in the January to March timeframe each year.

More Information:
- USDA Energy webpage: http://www.usda.gov/wps/portal/usda/usdahome?navid=ENERGY&navtype=MS.

- DOE Office of Biomass and Bioenergy: http://energy.gov/eere/transportation/bioenergy.
- Overview of BRDI Competitive Grants Program, Catalog of Federal Domestic Assistance: https://www.cfda.gov/?s=program&mode=form&tab=step1&id=87a066f621f60d9d683102f7ff803e0c.
- Information on past funding awards and Funding Opportunity Announcements: http://www.biomassboard.gov/initiative/past_solicitations.html.

Department of Defense (DOD)

- University Affiliated Research Centers (UARC)
- Army Research Laboratory Collaborative Technology Alliances (CTA)

University Affiliated Research Centers (UARC)

UARCs are DOD's signature mechanism for engaging universities in preferred contracting for research in areas of defense need. According to DOD, "Each UARC has areas of expertise that are identified as core competencies that it must provide in support of its mission to support DOD." While UARC awards are made directly to universities, they often serve as umbrellas for collaboration between academia and industry in support of DOD needs. Further, as described by the Army Research Laboratory, "UARCs are university-led collaborations between universities, industry and Army laboratories that conduct basic, applied and technology demonstration research. " UARCs are among the highest-profile DOD contacting mechanisms for universities as it enables sole-source work. DOD must invite proposals for UARCs; the Department has recently been reluctant to create new centers given the long-term "mortgages" they create in a still austere budget environment. The newest UARC went to the University of Nebraska in 2012. There are currently 13 UARCs supported by DOD and the National Security Agency.

More information:

- DOD Engagement Guide for UARCs: http://www.acq.osd.mil/chieftechnologist/publications/docs/20130426_UARC_EngagementGuide.pdf.
- Overview of Army UARCs: http://www.arl.army.mil/www/default.cfm?page=510.
- An overview of all UARCs from the Defense Innovation Marketplace is at http://www.defenseinnovationmarketplace.mil/UARC_FFRDC.html.

Army Research Laboratory (ARL) Collaborative Technology Alliances (CTAs)

According to ARL, "Collaborative Technology and Research Alliances are partnerships between Army laboratories and centers, private industry and academia that are focusing on the rapid transition of innovative technologies to the Warfighter to enable the Army's Future Force." CTAs are mechanisms designed to promote collaboration between academia and industry on research in support of defense priorities. ARL uses CTAs to drive the development of "complex technologies" to solve some of the Army's most complex challenges. While the CTA mechanism dates to the early 1990s, there are four active awards. The most recent CTAs were awarded in Electronic Materials and in Materials in Extreme Dynamic Environments. ARL is also set to award a Cyber Security CTA in the near future. Universities interested in CTAs should contact Kelly Foster at ARL. Contact information is included at the link below.

More information:

- ARL overview of CTA mechanism: http://www.arl.army.mil/www/default.cfm?page=93.

Department of Energy (DOE)

- Energy Innovation Hubs
- Energy Frontier Research Centers (EFRCs)
- Bioenergy Research Centers

Energy Innovation Hubs

The Department of Energy has funded five of the eight originally proposed Energy Innovation Hubs, and no further Hubs are expected to be funded by Congress. The Hubs are large, multi-disciplinary groups of researchers tasked with a specific grand energy challenge. The Hubs are modeled after the large and successful science programs of the Manhattan Project and the AT&T Bell Laboratories, which brought together basic and applied research and engineering into integrated teams to advance scientific research. Each Hub is generally supported at $120 million over five years with an opportunity for an additional five-year extension of funding.

The five Hubs include the Nuclear Energy Modeling and Simulation Hub led by Oak Ridge National Laboratory; the Fuels from Sunlight Hub led by the California Institute of Technology (Caltech); the Energy Efficient Buildings Hub led by The Pennsylvania State University; the Critical Materials Institute led by Ames National Laboratory; and the Batteries and Energy Storage Hub led by Argonne National Laboratory. President Obama also proposed an Electricity Systems Hub, but Congress has not funded it.

More Information:

- Energy Innovation Hub website with links to each Hub can be found at: http://energy.gov/science-innovation/innovation/hubs.

Energy Frontier Research Centers (EFRCs)

The DOE Office of Basic Energy Sciences established 46 Energy Frontier Research Centers (EFRCs) in 2009. These centers involve universities, national laboratories, industry and other partners. These small multi-investigator, multi-disciplinary centers focus on fundamental research to overcome barriers to the development of new innovative energy technologies and accelerate use-driven research to address energy needs. The centers are funded at $2 million to $5 million per year for an initial five-year period.

On October 1, 2013 DOE announced the competition and recompetition of the EFRCs. The Obama Administration has proposed $100 million in annual base funding to support 30 centers and an additional $68.7 million to fully fund an additional five centers for five years. DOE anticipates making awards of from $2 million to $4 million per center per year for a five-year period, or from $10 million to $20 million per center in total. Congress has not yet completed action on the fiscal year (FY) 2014 Energy and Water Development Appropriations bill that funds DOE, so it is not clear how many new or renewed centers will be funded in FY 2014, but the expectation is that at least 30 centers will be supported.

Letters of Intent for both new and recompeted centers were due on November 13. There is a series of Basic Research Needs reports and "Grand Challenges" reports informing the EFRC recompetition. The Administration indicates that EFRC proposals should address how the proposed research plan aligns with and addresses the research challenges outlined in these reports. Eligibility for the EFRC recompetition was very broadly defined to include U.S. citizens and lawful permanent residents; colleges and universities; non-profit and for-profit organizations; State, local, and tribal government entities; and DOE National Nuclear Security Administration (NNSA) national laboratories. Other Federally Funded Research and Development Centers (FFRDCs) and non-DOE laboratories and federal agencies (other than DOE) can be members of a project team.
Full proposals are due by January 9, 2014, and DOE recommends early submission of full proposals.

More information:

- More information is available on the EFRC web page available at: http://science.energy.gov/bes/efrc/.
- The announcement of the recompetition and link to the FOA is available at: http://energy.gov/articles/energy-department-award-100-million-energy-frontier-research-centers.
- Technical summaries of the existing EFRCs can be found at: http://science.energy.gov/~/media/bes/efrc/pdf/efrc/ALL_EFRC_technical_summaries.pdf.

Bioenergy Research Centers

A precursor of the Energy Innovation Hubs, DOE established three Bioenergy Research Centers to provide the basic biological and genomic research needed to develop clean energy sources utilizing natural materials. The three Centers are the Great Lakes Bioenergy Research Center led by the University of Wisconsin-Madison; the BioEnergy Science Center led by Oak Ridge National Laboratory; and the Joint BioEnergy Institute (JBEI) led by Lawrence Berkeley National Laboratory. DOE established the three Bioenergy Research Centers in 2007 to carry out the basic research needed by the biofuels industry. The three Centers were funded at $25 million per year for an initial five-year period. The Centers are tasked with three grand challenges, including developing the new bioenergy crops; tackling biologically-based conversion methods; and exploring innovative ways to create biologically-based biofuels. All three centers were renewed for an additional five years in April 2013.

More information:

- DOE Bioenergy Research Centers webpage at: http://genomicscience.energy.gov/centers/.
- DOE Office of Biological and Environmental Research (BER) website at: http://science.energy.gov/ber/.

Department of Homeland Security (DHS)

Centers of Excellence

The Centers of Excellence (COE) program is the flagship research account for universities at DHS. DHS competitively awards universities COEs across various fields to meet DHS's S&T needs. Centers are led by universities and bring together many university, industry, national laboratory, and non-profit partners to conduct research and development activities and training programs. DHS expects centers to

address both short and long term S&T needs. There are currently 11 COEs and they are recompeted on a staggered basis; three COEs were recompeted in 2013.

More information:

- An overview of the program can be found at http://www.dhs.gov/homeland-security-centers-excellence.

Department of Transportation (DOT)

University Transportation Centers

University Transportation Centers (UTC) program is DOT's signature research program for universities and funds multi-year, university-based research and education centers. DOT expects centers to advance U.S. transportation expertise and technological capability through research, education, and technology transfer while also addressing next generation transportation workforce needs. Center partners include universities, industry, state and local governments. UTCs focus on DOT's five strategic goals for the program: safety, economic competitiveness, environmental sustainability, state of good repair, and livable communities. DOT encourages multimodal, multidisciplinary centers that address rail, maritime, highway, pipeline, and transit research issues, but centers may choose to focus activities around one mode of transportation. Successful UTCs will have strong research portfolios and well-established track records in transportation research and education activities.

More information:

- An overview of the program and current centers can be found at http://www.rita.dot.gov/utc/.

Economic Development Agency (EDA)

- The i6 Challenge
- Public Works and Economic Adjustment Assistance (EAA) programs
- Investing in Manufacturing Communities Partnership (IMCP)

The i6 Challenge

The i6 Challenge is a multi-agency program to support regional projects that accelerate innovation and commercialization, establish new venture formation, job creation, and economic development. I6 supports the establishment of Proof of Concept (POC) centers to accelerate the commercialization of research and new ideas. For previous i6 competitions, $6 million of funding was available to support six centers for two years each, one in each EDA region. To date three i6 Challenge competitions have been held: Inaugural i6 Challenge in 2010; i6 Green in 2011; and open i6 Challenge in 2012. A new i6 Challenge is expected to be released in 2014 to support new proof of concept/commercialization centers.

More information:

- The I6 Challenge: Office of Innovation and Entrepreneurship webpage: http://www.eda.gov/challenges/i6/.

Public Works and Economic Adjustment Assistance (EAA) programs

The Public Works and Economic Adjustment Assistance (EAA) programs provide competitive funding for economic development projects with potential to expand economic activity. Funding supports construction, non-construction, technical assistance, and revolving loan fund projects. This funding opportunity is available to universities amongst others and cost sharing is required. Though partnering is not required, EDA is focused on building public-private partnerships and is thus most interested in collaborative arrangements with multiple stakeholder input that promise transformative economic change. EAA proposals should align with EDA's six investment priority areas, which include: Collaborative Regional Innovation; Public/Private Partnerships; National Strategic Priorities; Global Competitiveness; Environmental/Sustainable Development; and Economically Distressed and Underserved Communities. In FY 2013, EDA allocated $111.6 million for the Public Works program and $50 million for the EAA program, with average award sizes of $1.4 million and $820,000 respectively.

EDA runs four funding cycles for its Public Works and Economic Adjustment Assistance programs. Proposals must be received by the date listed for the applicable funding cycle. The upcoming due dates for proposals are as follows:

- March 14, 2014 for funding cycle 3 of FY 2014;
- June 13, 2014 for funding cycle 4 of FY 2014; and
- October 17, 2014 for funding cycle 1 of FY 2015.

Additional information on the EAA funding opportunity is available at:
http://www.grants.gov/web/grants/view-opportunity.html?oppId=248297

Investing in Manufacturing Communities Partnership (IMCP)

Investing in Manufacturing Communities Partnership (IMCP) was introduced by EDA in 2013 to support the national manufacturing landscape. IMCP supports both smaller strategy implementation grants and larger IMCP grants to regions that demonstrate best practices in attracting and sustaining industry to specific regions. Through the December 2012 solicitation, EDA will select 12 regions to be designated as "Manufacturing Communities" for a period of two years; this provides preferential consideration to numerous funding streams from multiple federal agencies. Pending program funding, it is expected nearly $1.3 billion will be made available for the EDA Manufacturing Communities. Agencies participating in the IMCP program include: Department of Commerce (DOC), EDA; Department of Defense (DOD); Department of Education (DOED); Appalachian Regional Commission; Delta Regional Authority; Department of Energy (DOE); Department of Housing and Urban Development (HUD); Department of Labor (DOL), Employment and Training Administration; Department of Transportation (DOT); Environmental Protection Agency (EPA); National Science Foundation (NSF); Small Business Administration (SBA); and the Department of Agriculture (USDA).

More information:

- IMCP webpage: http://www.eda.gov/challenges/imcp/.

National Aeronautics and Space Administration (NASA)

- Space Technology Mission Directorate (STMD)
- Science Mission Directorate (SMD)

The National Aeronautics and Space Administration (NASA) funds both large and small-scale research primarily focusing on Earth and space sciences.

Space Technology Mission Directorate (STMD)

The Space Technology Mission Directorate (STMD) develops new technologies and capabilities to support the agency achieve current and future missions. STMD has many programs designed for technologies at varying stages of readiness, from small-scale support to explore innovative concepts to large technology demonstration missions. STMD involves NASA centers, academia, and industry to rapidly research, develop, and demonstrate new technologies and innovations to develop new technologies that can be applied across NASA mission directorates to revolutionize both human and robotic space flight. Technology areas of interest to NASA include: space power and energy storage; communication and navigation; human health, life support, and habitation; human exploration destination systems; science instruments and sensors; entry, descent, and landing; nanotechnology; modeling, simulation, and information technology; materials and manufacturing; ground and launch systems processing; and thermal management. STMD has an annual umbrella solicitation for all programs.

More information:

- More details on these technology areas can be found in NASA's Strategic Space Technology Investment Plan at: http://www.nasa.gov/sites/default/files/files/space_tech_2013.pdf.
- More information STMD is available at: http://www.nasa.gov/directorates/spacetech/home/index.html#.Usr_WNJDv3U.
- The FY 2014 solicitation can be found at http://nspires.nasaprs.com/external/solicitations/summary.do?method=init&solId={AF744F6D-1342-1FF8-77C8-FB1D41B8237E}&path=open.

Science Mission Directorate (SMD)

NASA engages in a wide range of scientific research and missions in order to better understand the Earth, the Sun, our Solar System and its planets, and the Universe. The Science Mission Directorate (SMD) is the main NASA mission directorate for non-human exploration. SMD is divided into four divisions: Earth Science, Planetary Science, Astrophysics, and Heliophysics. Much of SMD's funding is directed towards developing and operating large flagship missions that are chosen through a decadal survey process run by the National Academy of Sciences (NAS). However, NASA also funds investigator-driven research and smaller investigator-led missions that are more accessible to universities. Investigator-led missions are generally led by teams of researchers that include industry partners. For Astrophysics and Heliophysics, these missions are part of the Explorer program, while the Discovery program supports these missions in Planetary Science. In response to the NAS 2007 Earth Science decadal survey, NASA created a similar program in Earth Science, called Venture Class missions. More information on the Explorer, Discovery, Venture and New Frontiers programs within SMD are provided below. More information on SMD can be found at: http://science.nasa.gov/about-us/.

- **Venture Program –** The Venture Class program is open to all Earth-science themes and supports three types of missions: full orbital missions; instruments for orbital missions; and suborbital projects. Earth Venture solicits one or two types of missions each year. The full chart of planned solicitation releases is at: http://science.nasa.gov/about-us/smd-programs/earth-system-science-pathfinder/. Total mission cost including access to space is up to $94 million for Venture Class Instrument missions, up to $30 million for Venture Class Suborbital missions, and up to $150 million for Full Orbital missions.
- **Discovery Program –** Since 1992, the Discovery Program has been assembling teams of scientists and engineers from across academia, NASA centers, and industry to design and lead planetary science investigations. The program complements NASA's larger planetary science flagship missions with its smaller missions that have a shorter development time and use fewer resources. Competitions are held every few years and the next solicitation is expected in early 2014. Total mission cost excluding the cost of the launch vehicle is $425 million. More information is available at: http://discovery.nasa.gov/index.cfml.
- **Explorers Program –** The Explorers Program supports the fields of heliophysics and astrophysics and it has launched 92 missions since its inception in 1958. Just like the Venture and Discovery programs, the missions are led by PIs who assemble teams of scientists and engineers from across academia, NASA centers, and industry to design and implement the investigations. NASA announced its latest Explorers mission solicitation in 2012, but no proposals were selected due to a lack of funding. Total mission cost, excluding the cost of the launch vehicle, is $200 million. More information is available at: http://explorers.gsfc.nasa.gov/index.html.
- **New Frontiers –** New Frontiers missions explore the planets within our solar system. Similar to above, the program follows the same model as Discovery, Explorer, and Venture class missions. Although Discovery and New Frontiers are both planetary science missions, New Frontiers is designed for medium-class missions that fall between Discovery missions and flagship-class missions in size. Both American and international scientists are encouraged to submit proposals for New Frontiers missions. The next solicitation is planned to be released in 2016. Total mission cost, excluding the cost of the launch vehicle, is $650 million. More information is available at: http://discoverynewfrontiers.nasa.gov/index.cfml.

National Institute of Standards and Technology (NIST)

- Centers of Excellence (COEs)
- Advanced Manufacturing Technology Consortia (AMTech)

Centers of Excellence

NIST launched its Centers of Excellence (COE) program earlier in 2013. COEs will involve universities, industry, and government to leverage and expand NIST's research capabilities across various science and technology (S&T) areas. Centers are also expected to increase technology transfer activities through industry collaboration and training activities. The first center in advanced materials was announced in December 2013. This is the first COE to be announced and will be run as a pilot for future centers. Other focus areas for future centers NIST is considering include: forensic science, advanced communications, advanced manufacturing, biomanufacturing, cyberphysical systems, human-robotic integration, and quantitative biology.

More information:

- The COE homepage can be found at http://www.nist.gov/coe/.

Advanced Manufacturing Technology Consortia Program

In addition to being involved in policy discussions across the agencies and leading the NNMI program, NIST is rolling out the Advanced Manufacturing Technology Consortia (AMTech), a new extramural research program focused on addressing long-term industrial manufacturing needs by supporting industry-led consortia focused on early stage technology development in manufacturing and more efficient technology transfer methods. NIST seeks to close the gap in R&D activities and implementation of technological innovations in manufacturing and production; consortia will develop roadmaps for addressing long-term research and technology needs and issue sub awards for research at universities, national laboratories, and private businesses. NIST expects winners to be industry-led teams with universities serving as partners. For FY 2013, NIST issued planning grants ranging between $250,000 and $500,000 per award. Implementation awards are expected to follow pending congressional appropriations. The most recent deadline was November 14, 2013.

More information:

- Information about AMTech and the recent solicitation can be found at http://www.nist.gov/director/amtech-072413.cfm.

National Institutes of Health (NIH)

- NIH Research Evaluation and Commercialization Hub (REACH) Awards (U01)
- National Cooperative Drug Discovery/Development Groups (NCDDG) for the Treatment of Mental Disorders, Drug or Alcohol Addiction (U19)
- National Cooperative Reprogrammed Cell Research Groups (NCRCRG) to Study Mental Illness (U19)
- Limited Competition for NIH-Industry Pilot Program: Discovering New Therapeutic Uses for Existing Molecules (UH3)
- Partnerships for Development of Diagnostics for Biodefense (proposed R01, not active)

NIH hopes to stimulate research that will result in the more effective and efficient translation of basic scientific discoveries into treatments and therapeutics that lead to improved health outcomes. To accomplish this – especially within the current environment of constrained budgets – NIH is looking for research applicants to demonstrate the willingness and capability to work with industry partners. NIH does not construct academia-industry partnerships *de novo* on behalf of individual investigators; instead, solicitations require or encourage applicants to approach NIH for funding after industry collaborators have already been identified and a relationship established.

The following is a sampling of active solicitations and expired programs that we expect to be renewed, but this list is not exhaustive.

NIH Research Evaluation and Commercialization Hub (REACH) Awards (U01)

The REACH program will support proof-of-concept centers to encourage the translation and commercialization of biomedical innovations to improve patient care and enhance health. The REACH Hubs will provide initial funding to assist qualified institutions develop new technologies. REACH will fund: infrastructure to identify most promising new technologies; product definition studies e.g. feasibility studies, prototype development, or proof-of-concept studies; access to relevant expertise; and entrepreneurship skills development. Partnership with industry is essential to the success of the REACH Hubs. Letters of intent are due May 26, 2014, and full proposal are due June 26, 2014. Only one proposal per institution may be submitted.

- More information is available at: http://grants.nih.gov/grants/guide/rfa-files/RFA-OD-14-005.html.

National Cooperative Drug Discovery/Development Groups (NCDDG) for the Treatment of Mental Disorders, Drug or Alcohol Addiction (U19)

Partnerships between academia and industry are strongly encouraged for this program that seeks to create multidisciplinary research groups or partnerships for the discovery of pharmacological agents to treat and study metal illness or drug or alcohol addiction. Supported by the National Institute of Mental Health (NIMH), National Institute on Alcohol Abuse and Alcoholism (NIAAA), and National Institute on Drug Abuse (NIDA), applications are sought to advance the discovery, preclinical development, and proof of concept testing of new, rationally-based candidate agents to treat these areas.

- More information is available at: http://grants.nih.gov/grants/guide/pa-files/PAR-13-086.html.

National Cooperative Reprogrammed Cell Research Groups (NCRCRG) to Study Mental Illness (U19)

The purpose of this program is to create groups among academia and industry to develop validated platforms for identifying novel targets and developing new therapeutics and tools to reduce burden of mental illness. The collaborations will be *pre-competitive* - at the interface between basic academic research and proprietary industrial research and involve cooperation between groups that might otherwise be competitors - with a focus on optimizing tools and measures needed for successful translational research.

- More information is available at: http://grants.nih.gov/grants/guide/pa-files/PAR-13-225.html.

Limited Competition for NIH-Industry Pilot Program: Discovering New Therapeutic Uses for Existing Molecules (UH3)

The National Center for Advancing Translational Sciences (NCATS) launched this initiative, commonly referred to as the drug repurposing program, to match pharmaceutical companies' drug candidates and associated data with the best ideas for new therapeutic uses. The first nine projects were announced in June 2013[16] and depending on success of these and available funds, there is likely to be another call for applications. NCATS also provides services to facilitate academic-industry partnerships, including negotiating standards forms and models agreements to enable technology transfer.

[16] http://www.ncats.nih.gov/research/reengineering/rescue-repurpose/therapeutic-uses/projects-2013.html

More information:

- Information on the UH3 activity is available at: http://www.ncats.nih.gov/research/reengineering/rescue-repurpose/rescue-repurpose.html.
- More information on NCATS services to facilitate academic-industry partnerships is available at: http://www.ncats.nih.gov/research/tech-transfer/alliances.html.

Partnerships for Development of Diagnostics for Biodefense (proposed R01, not active)

This program was approved by the National Institute of Allergy and Infectious Diseases (NIAID) Advisory Council at its June 2013 meeting, so a funding announcement is expected in the coming year. Participation with industrial labs will be required for this initiative that will support milestone-driven projects focused on advancing candidate diagnostics and diagnostic platforms to be used in primary healthcare settings to detect agents and pathogens where antimicrobial drug resistance is of clinical concern.

- More information on this and other proposed NIAID projects that require partnerships is here http://www.niaid.nih.gov/researchfunding/council/concepts/pages/cmid0613.aspx.

National Science Foundation (NSF)

- Science and Technology Centers (STC): Integrative Partnerships
- Engineering Research Centers (ERC)
- Materials Research Science and Engineering Center (MRSEC)
- Major Research Instrumentation (MRI)
- Centers for Chemical Innovation (CCI)
- Industry/University Cooperative Research Centers (I/UCRC)
- Partnerships for Innovation (PFI)
- Innovation Corps (I-Corps)

Science and Technology Centers (STC): Integrative Partnerships

The Science and Technology Centers (STC): Integrative Partnerships program supports large-scale, longer-term awards that are innovative, potentially transformative, and involve complex research and education projects. STCs are multi institutional public-private partnerships that carry out research at the interface of disciplines and / or take new approaches to existing disciplines. STCs involve any area of science or engineering that is supported by NSF, and are expected to involve groups underrepresented in science and engineering. STCs must also undertake activities to support knowledge transfer.

The last solicitation was released on January 18, 2011, for which, up to $30 million was available to support three centers awarded in fiscal year (FY) 2013. The STC competition is very competitive, with the statistics from the previous competition being 247 preliminary proposals received, 45 full proposals invited, 11 sites visited, and 5 new centers funded. The next STC competition is expected to be announced in FY 2014 with projects awarded in FY 2016 (when the 2005 and 2006 Class of STCs graduate).

More information:

- STC webpage: http://www.nsf.gov/od/iia/programs/stc/index.jsp.
- Last STC solicitation: http://www.nsf.gov/pubs/2011/nsf11522/nsf11522.htm.

Engineering Research Centers (ERC)

The Engineering Research Centers (ERC) support large interdisciplinary research projects that promote partnership between industry and universities. ERCs also train the next generation of engineers with a range of skills and expertise to become leaders in industry, academia, and government. ERCs focus on transformational engineered systems, with solicitations sometimes focusing on specific topic areas and sometimes allowing for any engineered system.

There are currently 20 ERCs which are grouped in the following research areas: Manufacturing; Biotechnology and Health Care; Energy, Sustainability, and Infrastructure; Microelectronics, Sensing, and Information Technology; and Nanosystems. ERCs are large multi-institutional, multi-regional collaborations with industry. The number of universities involved in current ERCs ranges from two to eight, and the average number of university participants is 4.3. There are between one and six states involved in current ERCs, with an average of 3.5 states per center. The latest ERC solicitation was released on April 24, 2013, outline proposals have been submitted and eight full proposals have been invited. Up to $13 million is available to support the first year or four new centers. The next solicitation is not expected to be released before 2015 at the earliest.

More information:
- ERC webpage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5502&org=EEC&from=home.
- Last ERC solicitation: http://www.nsf.gov/pubs/2013/nsf13560/nsf13560.htm.

Materials Research Science and Engineering Centers (MRSECs)

Materials Research Science and Engineering Centers (MRSECs) support interdisciplinary materials research and education to address fundamental questions in science and engineering. MRSECs are campus-based interdisciplinary research centers that promote collaboration across universities and with industry and others.

The latest MRSEC solicitation was released on April 15, 2013, with up to $25 million available to support seven to ten centers in FY 2014. Only one MRSEC proposal may be submitted by an organization as the lead. Proposals that include research in several groups should submit a single MRSEC proposal with between two and five Interdisciplinary Research Groups (IRGs). The next solicitation is not expected to be released before 2015 at the earliest.

More information:
- MRSEC webpage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5295&org=DMR&sel_org=DMR&from=fund.
- Last MRSEC solicitation: http://www.nsf.gov/pubs/2013/nsf13556/nsf13556.htm.

Major Research Instrumentation Program (MRI)

The Major Research Instrumentation (MRI) Program aims to increase access to shared science and engineering instruments for research and education at U.S. universities and higher education organizations. MRI proposals may request support for the acquisition (Track 1) or development (Track 2) of a single research instrument for shared use. Projects that involve the private sector are encouraged. Projects must in the range of $100,000 to $4 million (proposals less than $100,000 are accepted for mathematics or social, behavioral and economic sciences and from non-Ph.D.-granting institutions of higher education for all NSF research areas). Cost sharing of 30% is required.

The latest MRI solicitation was released on November 20, 2012, with up to $90 million available to support up to 175 awards across a range of scales. MRI is an annual competition with proposals due in January.

More information:

- MRI webpage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5260&org=DMR&sel_org=DMR&from=fund.
- Last MRI solicitation: http://www.nsf.gov/pubs/2013/nsf13517/nsf13517.htm.

Centers for Chemical Innovation (CCI)

The Centers for Chemical Innovation (CCI) program supports research centers that focus on long term, transformative and innovative chemical research challenges. CCIs can partner with industry and other organizations, and fully integrate research, education, and activities to broaden participation of underrepresented groups. The CCI program is a two-phase program; Phase I supports the formation and development of new centers; Phase II provides sustained funding.

The latest solicitation was released on August 22, 2013 for Phase II proposals only. Up to $8 million is available to support new/renewal Phase II awards in FY 2014. It is not clear when the next solicitation for Phase I projects will be released.

More information:

- CCI webpage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13635&org=CHE&sel_org=CHE&from=fund.
- Last CCI solicitation: http://www.nsf.gov/pubs/2013/nsf13590/nsf13590.htm.

Industry/University Cooperative Research Centers (I/UCRC) Program

The Industry/University Cooperative Research Centers (I/UCRC) Program supports partnership between universities and industry to carry out high quality, industry driven research, as well as to train the next generation of innovative students. I/UCRCs are supported in all NSF research areas, and together they leverage 10 to 15 times the NSF investment. There are currently around 60 I/UCRCs, with NSF funding of around $15 million in FY 2011.

Initial NSF funding of between $80,000 and $90,000 annually for an initial five year period is awarded to the lead site of a multi-university Center with $60,000 annually to each center Site. After that, NSF may support the center with funding for two subsequent five year periods for Phase 2 and Phase 3 operation

at a reduced level. There are regular solicitations for I/UCRCs at various stages, most of which have two deadlines per year.

More information:

- I/UCRC webpage: http://www.nsf.gov/eng/iip/iucrc/.
- Last I/UCRC solicitation: http://www.nsf.gov/pubs/2012/nsf12516/nsf12516.pdf.

Partnerships for Innovation (PFI)

The Partnerships for Innovation (PFI) program have annual solicitations and supports three tracks:

1. Accelerating Innovation Research: Research Alliance (AIR:RA)
2. Accelerating Innovation Research: Technology Transfer (AIR:TT)
3. Partnership for Innovation: Building Innovation Capacity (BIC)

The PFI- AIR:RA program aims to accelerate the transfer of new research discoveries into competitive technologies and commercial realities by leveraging NSF investments and catalyzing academic innovation ecosystems. The goal is for these public-private partnerships will make strong contributions to regional economies. Third party funding is required to accelerate the innovation toward commercialization. Projects are supported up to $800,000 for three years. The latest solicitation is available at: http://www.nsf.gov/pubs/2013/nsf13591/nsf13591.htm - letters of intent were due December 13, 2013.

The PFI-AIR:TT program supports research discoveries to be translated towards commercialization while engaging faculty and students in entrepreneurial and market-oriented thinking. AIR:TT supports innovative ideas that help the translation of NSF supported research to market-valued solutions. The program supports investigators to conduct the necessary research to develop a proof-of-concept, prototype, or scale-up of the prototype to address real world problems. AIR:TT supports approximately 35 - 40 awards per year at $200,000 for 18 months per award. The latest solicitation is available at: http://www.nsf.gov/pubs/2013/nsf13575/nsf13575.htm - letters of intent were due October 7, 2014.

The PFI-BIC program supports academia-industry partnerships to focus on post-discovery, academic-led research. The team involves one academic institution and at least one industry partner to work on interdisciplinary research that includes at least the following three components: engineering; computer science; and social, behavioral, and/or cognitive science. Project must have the potential for significant economic and societal impact and must have a strong education component. There is a single funding competition each year to support projects of up to $800,000 for three years. The current topic for BIC proposals is “Key platform technologies that enable "smart" service systems.” The latest solicitation is available at: http://www.nsf.gov/pubs/2013/nsf13587/nsf13587.htm - letters of intent were due November 18, 2013.

More information:

- AIR:RA webpage: http://www.nsf.gov/eng/iip/pfi/air-ra.jsp.
- AIR:TT webpage: http://www.nsf.gov/eng/iip/pfi/air-tt.jsp.
- BIC webpage: http://www.nsf.gov/eng/iip/pfi/bic.jsp.

Innovation Corps (I-Corps)

The Innovation Corps (I-Corps) program at NSF supports a range of activities and programs to train scientists and engineers with entrepreneurial skills they need to transfer the technology developed in their laboratories and broaden the impact of NSF-funded, basic research projects. I-Corps supports three components:

- I-Corps Teams – include a principal investigator, an entrepreneurial lead and a mentor. The I-Corps team provides technical, entrepreneurial, and business know-how to help launch technological innovations.
- I-Corps Nodes – provide education and infrastructure to support the I-Corps team and regional innovation.
- I-Corps Sites – support multiple, local teams to transition their technology concepts towards commercialization. Sites provide infrastructure, advice, resources, networking opportunities, and training.

More information:

- The I-Corps website is at: http://www.nsf.gov/news/special_reports/i-corps/index.jsp.
- Information on the three I-Corps components is at: http://www.nsf.gov/news/special_reports/i-corps/components.jsp.