

LEWIS-BURKE

ASSOCIATES LLC

TUFTS UPDATE – APRIL 9, 2019
PREPARED BY LEWIS-BURKE ASSOCIATES LLC

Contents

Introduction	
Funding Opportunities	
National Science Foundation Releases Dear Colleague Letter on Models for Uncovering Rules and Unexpected Phenomena in Biological Systems.....	
National Science Foundation and National Institute of Food and Agriculture Release Dear Colleague Letter for Research at the Intersection of Agricultural Science, Informatics, and Smart Communities	
U.S. Department of Education Announces Teacher Quality Partnership Grant Program Application	
Defense Advanced Research Projects Agency Defense Sciences Office Announces Opportunity to Meet with Program Managers	
Agency Updates	
Department of Energy Upcoming Funding Opportunities and Future Research Directions for Applied Math, Computer Science, and High Performance Computing	
Hearing Updates	
House Committees Hold Hearings on FY 2020 NASA Budget Request	

Introduction

This edition of the Tufts Washington Update for early April includes funding opportunities, agency updates, and hearing updates. Faculty, staff, and researchers are welcome to schedule calls with the Lewis-Burke Tufts team or meet with the team when they visit Washington, DC. Contact Amber Cassady, Lewis-Burke Associates LLC, at amber@lewis-burke.com with any questions or comments related to the Update's content or for more information on updates and opportunities.

Funding Opportunities

National Science Foundation Releases Dear Colleague Letter on Models for Uncovering Rules and Unexpected Phenomena in Biological Systems

On April 3, the National Science Foundation (NSF) released a dear colleague letter (DCL) requesting proposals to develop Models for Uncovering Rules and Unexpected Phenomena in Biological Systems (MODULUS), encouraging interdisciplinary collaboration between the mathematical and biological sciences. This is a joint call with the Division of Mathematical Sciences (DMS) and the Division of Molecular and Cellular Biosciences (MCB) to “promote the realization of modeling platforms that facilitate discovery of novel biological phenomena, rules, and theories.”

Successful proposals should identify a current state-of-the-art research challenge and develop a potential solution that integrates mathematical and biological concepts. Proposals must also include interdisciplinary training opportunities for graduate students and postdoctoral researchers. Research under this call should be high-risk/high-reward and “address clearly stated biological questions or hypotheses, make a case for and develop innovative mathematical methods or integrate disparate mathematical fields, and articulate a well-defined plan for the mathematics to drive biological discovery within the funded period.”

This DCL is consistent with the agency’s prioritization of convergence research and the identification of opportunities for collaboration both within individual disciplines and across seemingly disparate directorates. The MODULUS DCL closely follows a joint DCL released from NSF and the U.S. Department of Agriculture’s (USDA) National Institute of Food and Agriculture (NIFA) that focuses on leveraging data science in agriculture. The proximity of these two releases indicates NSF’s heightened prioritization of the integration of computational and biological sciences.

Submissions under this DCL are directed to the Systems and Synthetic Biology program in MCB or the Mathematical Biology program in DMS. Proposals under the MCB program may be submitted for the Rules of Life (RoL) track but will be required to identify a second program within the BIO Division for their proposal.

Deadline: While the MCB solicitation does not have an application deadline, proposals should be submitted before **June 1, 2019** to be considered for fiscal year (FY) 2019 funding and before **April 1, 2020** to be considered for FY 2020. Proposals for the Mathematical Biology Program must be submitted between **August 20, 2019** and **September 5, 2019**.

Sources and Additional Information:

- The full DCL is available at https://www.nsf.gov/pubs/2019/nsf19054/nsf19054.jsp?WT.mc_id=USNSF_25&WT.mc_ev=click.
- The funding call for the Division of Molecular and Cellular Biosciences is available at <https://www.nsf.gov/pubs/2018/nsf18585/nsf18585.pdf>.
- Additional information on the Systems and Synthetic Biology program is available at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504863.

- Additional information on the Mathematical Biology Program is available at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5690.

[\[Back to Top\]](#)

National Science Foundation and National Institute of Food and Agriculture Release Dear Colleague Letter for Research at the Intersection of Agricultural Science, Informatics, and Smart Communities

On March 21, the National Science Foundation (NSF) and the U.S. Department of Agriculture's National Institute of Food and Agriculture (USDA/NIFA) released a dear colleague letter (DCL) expressing their intention to jointly fund "convergent research that combines methods in agricultural, biological, and computer and information science and engineering to address pressing challenges and opportunities in digital agriculture." The DCL steers proposals toward three solicitations and seeks to advance research at the nexus of agricultural science, informatics, and smart communities. These three solicitations align with NSF's Harnessing the Data Revolution Big Idea, aiming to prepare for large-scale investments at the intersection of computational, agricultural, and biological sciences.

This DCL seeks out projects with applications for economically important plants, animals, and their environments and the ability to transfer findings to or use findings to inform research in other agricultural application areas. The leveraging of data-science in agriculture is consistent with NSF's continued emphasis on convergence as well as the broader agricultural research communities drive toward transdisciplinary research. This also builds on NSF and NIFA's history of collaboration including the Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) program or the ongoing Plant Biotic Interactions (PBI) program.

Specific topics of interest for these projects include:

- "New methods for analyzing existing large datasets, such as artificial intelligence (AI), machine learning, and computer vision;
- Models for genetic x environment x management x socioeconomic interactions (G x E x M x S) to predict livestock, aquaculture, and plant phenotype outcomes, such as yield, environmental stressor resistance, pest and drought resistance, etc.;
- Data storage, management, and integration across a range of data to enable a systems-level approach, including real-time systems;
- Wired and wireless networking challenges in rural settings;
- Security, privacy, and management for access and sharing of farm and community data; and
- Learning science innovations, which may include development of computational skills for biological and agricultural science majors, and communities of agricultural practice for a diverse and innovative future workforce."

Proposals may also pursue the development of curriculum or "workforce development pathways" with the intent not only to expose students to cross-disciplinary approaches to agriculture and computer science but also to "improve retention and capabilities of a region's agricultural workforce."

Per the DCL, relevant proposals can be submitted to one of three programs:

Cyber-Physical Systems (CPS)

The CPS program solicitation seeks proposals that will develop the core research needed to engineer complex CPS. Core research areas of the program include control, data analytics, autonomy, design, information management, internet of things (IoT), mixed initiatives including human-in- or on-the-loop, networking, privacy, real-time systems, safety, security, and verification. Note that in a February DCL, NSF announced that for FY 2019 only it would be increasing its investment in CPS.

Information and Intelligent Systems (IIS) - Information Integration and Informatics (III) program

One of three programs funded under the IIS core programs, Information, Integration and Informatics (III) supports research “to realize the full transformative potential of data, information, and knowledge in this increasingly digital and interconnected world.” III applications should focus on contemporary applications of societal importance through advances in information integration and informatics, including the full knowledge lifecycle.

Smart and Connected Communities (S&CC)

This program supports integrative research that addresses fundamental technological and social science dimensions of smart and connected communities. These communities are defined as having geographically delineated boundaries – such as towns, cities, counties, neighborhoods, community districts, rural areas, and tribal regions – with the structure and ability to engage in meaningful ways with proposed research activities. This research supports taking the integration of technology into the natural and built environment and is encouraged to include a demonstration or pilot activities that are designed and carried out with one or more communities. Note that in the aforementioned February DCL, NSF indicated its interest in increasing its investment in S&CC next year.

All submissions under this DCL should include the prefix “DATAg” following the title prefixes required in each solicitation, where appropriate. Additional instructions are available in the DCL and in the relevant program solicitations.

Award Size: The size of awards for these funding opportunities vary by solicitation and application:

- CPS program applications have three levels: Small (\$500,000 over up to three years), Medium (\$500,000 to \$1.2 million over up to three years), and Frontier (\$1.2 to \$7 million over four to five years);
- IIS-III program applications have three levels: Small (\$500,000 over up to three years), Medium (\$500,000 to \$1.2 million over up to four years), and Large (\$1.2 to \$3 million over up to five years); and
- S&CC program applications have two categories:
 - S&CC Integrative Research Grants with two tracks: Track 1 (for budgets greater than \$1.5 million with no recommended budget limit, and for up to four years of support) and Track 2 (budgets not to exceed \$1,500,000, and for up to three years of support).

Eligibility: These programs are open to institutions of higher education, non-profit, and non-academic organizations—Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Due Date: The due dates for these funding opportunities vary by solicitation:

- For the CPS program, full Small and Medium proposals are due between **April 1 and April 12, 2019**. Frontier applications are due between **September 12 and September 26, 2019**;
- For the IIS program, full Small proposals are due between **October 31 and November 14, 2019**. Full Medium proposals are due between **September 9 and September 16, 2019**. Full Large proposals are due between **September 18 and September 25, 2019**.
- For S&CC program applications, required letters of intent are due by **August 6, 2019**. Full proposals are due by **September 6, 2019**.

Sources and Additional Information:

- The full Dear Colleague letter can be found at https://www.nsf.gov/pubs/2019/nsf19051/nsf19051.jsp?WT.mc_id=USNSF_25&WT.mc_ev=click.
- The Cyber Physical Systems (CPS) program page can be found at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286.
- The Information and Intelligent Systems (IIS) - Information Integration and Informatics (III) program page can be found at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503303&org=NSF.
- The IIS solicitation can be found at <https://www.nsf.gov/pubs/2018/nsf18570/nsf18570.pdf>.
- The Smart and Connected Communities (S&CC) program page can be found at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505364.
- The Plant Biotic Interactions (PBI) program page can be found at <https://nifa.usda.gov/funding-opportunity/nsf-nifa-plant-biotic-interactions-program-pbi>.
- The Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) program page can be found at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505241.
- The February 15 DCL on Revisions to CPS and S&CC can be found at <https://www.nsf.gov/pubs/2019/nsf19040/nsf19040.jsp>.

[\[Back to Top\]](#)

U.S. Department of Education Announces Teacher Quality Partnership Grant Program Application

On April 3, the U.S. Department of Education (ED) released a notice inviting applications (NIA) for the fiscal year (FY) 2019 Teacher Quality Partnership (TQP) Grant Program. The TQP program aims to increase student achievement, improve the quality of new and prospective teachers, enhance professional development for new teachers, and recruit highly qualified individuals, including minorities and individuals from other occupations, into the teaching force. The TQP program supports partnerships between institutions of higher education and high-need local educational agencies (LEAs) or high-need early childhood education (ECE) programs. **In the FY 2019 TQP competition, ED will only support projects that prepare teachers through the implementation of teacher residency programs.**

- **Absolute Priority:** an eligible partnership must carry out an effective teaching residency program.

- Competitive Preference Priority 1: projects designed to improve student achievement or other educational outcomes in computer science by increasing the number of educators adequately prepared to deliver rigorous instruction in STEM fields, including computer science.
- Competitive Preference Priority 2: projects submitted by applicants that meet the definition of novice applicant (as defined in the notice) at the time they submit their application.
- Invitational Priority: propose to serve children or students who reside, or attend TQP project schools, in a qualified Opportunity Zone.^[1]

Total Funding and Award Size: The estimated number of awards for this competition is 15-20. The estimated average size of awards is \$750,000 for the first year of the project. Funding for the second, third, fourth, and fifth years is subject to the availability of funds and the approval of continuation awards. ED will not make an award exceeding \$1,500,000 to any applicant per 12-month budget period. The project period may not exceed 60 months.

Eligibility and Limitations: An eligible applicant is an “eligible partnership” that includes:

1. A high-need LEA;
2. A high-need school or a consortium of high-need schools served by the high-need LEA, or, as applicable, a high-need ECE program;
3. A partner institution; (an institution of higher education)
4. A school, department, or program of education within such partner institution, which may include an existing teacher professional development program with proven outcomes within a four-year IHE that provides intensive and sustained collaboration between faculty and LEAs consistent with the requirements of title II of the HEA; and
5. A school or department of arts and sciences within such partner institution
6. And may also include state entities, businesses, nonprofit organizations, charter schools, schools or departments within a partner institution, or an entity providing alternative routes to State certification of teachers.

Matching Requirements: Each grant recipient must provide, from non-Federal sources, an amount equal to 100 percent of the amount of the grant, which may be provided in cash or in-kind, to carry out the activities supported by the grant. The Secretary may waive this matching requirement for any fiscal year for an eligible partnership if the Secretary determines that applying the matching requirement to the eligible partnership would result in serious hardship or an inability to carry out authorized TQP program activities.

Due Dates: Full proposals are due **May 20, 2019**. Applicants are encouraged to submit a notice of intent to apply by **May 3, 2019**.

Pre-Application Webinars: The Office of Elementary and Secondary Education intends to post pre-recorded informational webinars designed to provide technical assistance to interested applicants. These informational webinars will soon be available on the TQP [webpage](#).

^[1] An Opportunity Zone is an economically-distressed community where new investments, under certain conditions, may be eligible for preferential tax treatment. Localities qualify as Opportunity Zones if they have been nominated for that designation by the state and that nomination has been certified by the Secretary of the U.S. Treasury.

Sources and Additional Information:

- More information regarding the FY 2019 competition is available at <https://www.federalregister.gov/documents/2019/04/03/2019-06493/applications-for-new-awards-teacher-quality-partnership-grant-program>.
- The TQP program website can be found at <https://innovation.ed.gov/what-we-do/teacher-quality/teacher-quality-partnership/>.

[\[Back to Top\]](#)

Defense Advanced Research Projects Agency Defense Sciences Office Announces Opportunity to Meet with Program Managers

The Defense Advanced Research Projects Agency (DARPA) Defense Sciences Office (DSO) announced an opportunity to meet with DSO program managers (PMs) through a Request for Information (RFI) for research interests. Meetings between potential performers and DSO PMs will be held in conjunction with the Discover DSO Day on **June 18-19, 2019** in Arlington, VA, which provides an overview of DARPA and DSO and is open to anyone, regardless of submitting an executive summary for one-on-one meetings. Registration for the Discover DSO Day is expected to be released in Spring 2019.

This RFI is an opportunity for university researchers to secure a meeting to discuss mutual research interests with DSO PMs. To be considered for a meeting, potential performers must submit an executive summary describing “innovative approaches and technologies that enable revolutionary advances” that align with DSO’s mission, which focuses on high-risk, high-reward research in science and engineering, although exceptional summaries that cover other topics may be considered. Current DSO research areas include “frontiers in math, computation and design, limits of sensing and sensors, complex social systems, and anticipating surprise.” DSO will then review the executive summaries and choose respondents for a limited number of in-person meetings based on context and DSO’s general interest in the executive summaries. Proposers must also provide a one-sentence response to the Heilmeier Questions specified in the full RFI.

Due Dates: Executive summaries in response to the RFI are due on **April 15, 2019 no later than 4:00pm EST**. Respondents are expected to be notified by May 9, 2019 if selected for a meeting with a DSO PM.

Sources and Additional Information:

- The full RFI can be found at www.fbo.gov under solicitation number “DARPA-SN-19-33.”
- Information regarding DSO’s mission and current focus areas may be found at <http://www.darpa.mil/about-us/offices/dso>.
- The full set of Heilmeier Catechism questions can be found at <https://www.darpa.mil/work-with-us/heilmeier-catechism>.

[\[Back to Top\]](#)

Agency Updates

Department of Energy Upcoming Funding Opportunities and Future Research Directions for Applied Math, Computer Science, and High Performance Computing

The analysis below provides advance intelligence on upcoming funding opportunities and future research directions for the Department of Energy Office of Science in applied math, computer science, and high-performance computing. The analysis is based on information from the March 26-27 Advanced Scientific Computing Research Advisory Committee (ASCAC) meeting and discussions with DOE program managers. This Advisory Committee provides advice to the Office of Science to advance the research and infrastructure priorities of the Advanced Scientific Computing Research (ASCR) program.

Upcoming Funding Opportunities

Within the next two months, ASCR plans to release four FY 2019 funding opportunity announcements open to research universities and national laboratories:

- **Quantum algorithms.** ASCR would like to fund additional quantum algorithm teams to build on the FY 2017 awards. DOE will be seeking basic research proposals that exploit advances in quantum simulation and machine learning algorithms that focus on key topics of most relevance to the Office of Science, such as quantum simulation of quantum field theories, hybrid and multiscale simulations, simulation of non-equilibrium dynamics and thermodynamics, and quantum machine learning algorithms that combine methods from quantum information science (QIS) and machine learning. DOE anticipates up to three awards at \$1 million a year over three years.
- **Quantum networking.** This is a new area of investment for ASCR focused on early investments to develop scalable and adaptable quantum network infrastructures that can support the transmission of diverse types of quantum information. One of the main goals is to deploy new quantum networks that can co-exist with DOE's existing Energy Science Network (ESnet), which allows the national labs and major research collaborators to share scientific information and resources over 13,000 miles of coast-to-coast dedicated optical fiber. The first funding call is likely to focus on novel quantum network architectures, including photonic quantum networks and optical fiber systems and quantum network devices and subsystems, including transduction devices, quantum repeaters and routers, and quantum frequency conversion. DOE recently completed a workshop report on "Quantum Networks for Open Science" which provides more details on future research directions and is available at https://science.energy.gov/~media/ascr/pdf/programdocuments/docs/2019/QNOS_Workshop_Final_Report.pdf.
- **Scientific machine learning and uncertainty quantification.** The focus of this funding call will be on developing uncertainty quantification methods for scientific machine learning applications that consider the reliability and usability of data that are noisy and uncertain and often incomplete, sparse, and only partly informative. There is interested in using machine learning for discovering correlations in data sets and uncertainty quantification can add significant robustness and realism to those applications.

- **Co-design center for artificial intelligence, machine learning, and data analytics.** DOE Co-Design centers are partnerships between national laboratories and research universities to develop hardware, software, and algorithm solutions to help solve specific scientific problems. In this case, a team of vendors, hardware architects, system software developers, domain scientists, computer scientists, and applied mathematicians would work together to design and understand the various tradeoffs of artificial intelligence and machine learning applications on system architectures, hardware, software, and algorithms.

Funding Outlook for ASCR

In FY 2019, Congress appropriated \$936 million to this program, an increase of \$289 million or 45 percent above FY 2018. The increase was primarily driven by the needs of the exascale computing initiative which aims to deploy the first two exascale computing systems at Argonne and Oak Ridge National Laboratories in 2021 and 2022, respectively. Additional funding was also provided to expand research efforts in QIS and artificial intelligence and is reflected in the funding opportunities listed above.

The FY 2020 President's budget request for ASCR is \$921 million, a decrease of \$15 million or two percent below FY 2019. The funding decrease is primarily driven by the end of peak funding for the exascale computing project and the program is planning to use carry over funding reserved in prior years as contingency for the exascale project to pay for facility upgrades at Argonne and Oak Ridge National Laboratories. The primary focus in FY 2020 is to grow applied mathematics and computer science research funding to support artificial intelligence, machine learning, QIS, and other beyond Moore's law technologies. The FY 2020 budget request proposes a \$16 million or 12 percent increase to applied mathematics and computational science research. The table below provides detailed budget information. To further grow fundamental research, ASCAC formed a Subcommittee on Transition from the Exascale Project to provide advice on new research priorities for applied mathematics and computer science, chaired by Dr. Roscoe Giles from Boston University, that will restore and shift funding from the exascale project into fundamental research, maintain the software, hardware, and applications for exascale systems, and further develop the workforce. This subcommittee plans to release a draft report in September that will guide future budget discussions.

	FY 2018		FY 2019	FY 2020 Request		
	Enacted Approp.	Current Approp.	Enacted Approp.	President's Request	Request vs. FY 2019 Enacted	
Mathematical, Computational, and Computer Sciences Research						
Applied Mathematics	34,104	34,720	28,206	41,500	+13,294	+47.1%
Computer Science	29,508	27,342	22,000	38,700	+16,700	+75.9%
Computational Partnerships (SciDAC)	49,910	51,402	75,667	60,959	-14,708	-19.4%
SBIR/STTR	4,301		4,768	5,347	+579	+12.1%
Total, Mathematical, Computational, and Computer Sciences Research	117,823	113,464	130,641	146,506	+15,865	+12.1%
High Performance Computing and Network Facilities						
High Performance Production Computing (NERSC)	94,000	94,000	104,000	85,000	-19,000	-18.3%
Leadership Computing Facilities						
Leadership Computing Facility at ANL (ALCF)	110,000	110,000	140,000	150,000	+10,000	+7.1%
Leadership Computing Facility at ORNL (OLCF)	162,500	162,500	199,000	210,000	+11,000	+5.5%
Total, Leadership Computing Facilities	272,500	272,500	339,000	360,000	+21,000	+6.2%
Research and Evaluation Prototypes	24,260	24,260	24,452	39,453	+15,001	+61.3%
High Performance Network Facilities and Testbeds (ESnet)	79,000	79,000	84,000	80,000	-4,000	-4.8%
SBIR/STTR	17,417	...	20,701	21,194	+493	+2.4%
Total, High Performance Computing and Network Facilities	487,177	469,760	572,153	585,647	+13,494	+2.4%
Subtotal, Advanced Scientific Computing Research	605,000	583,224	702,794	732,153	+29,359	+4.2%
Exascale Computing						
17-SC-20, Office of Science Exascale Computing Project (SC-ECP)	205,000	205,000	232,706	188,735	-43,971	-18.9%
Total, Advanced Scientific Computing Research	810,000	788,224	935,500	920,888	-14,612	-1.6%

Source: DOE

Future Research Priorities and FY 2020 Funding Opportunities

The two main research priorities over the next 18 months are:

- **Artificial intelligence and machine learning.** The FY 2020 President's budget request proposes \$36 million for artificial intelligence within ASCR, an increase of \$23 million or 177 percent above FY 2019. The focus is on addressing basic research needs in scientific machine learning and extremely heterogeneous systems. The major funding opportunities in FY 2020 are likely to be:
 - Foundational research in applied mathematics for scientific machine learning. The focus is on improving the reliability, robustness and interpretability of big data and artificial intelligence technologies and start to develop new algorithms, methods, and software tools for extracting information from scientific and engineering data. DOE recently released a report on *Basic Research Needs for Scientific Machine Learning: Core Technologies for Artificial Intelligence*, which is available at <https://www.osti.gov/biblio/1478744>. The contents of this report will form the basis for DOE's future investments in scientific machine learning. DOE is particularly interested in using machine learning to derive scientific discovery from the data generated by its user facilities and the exascale computing systems that will soon be deployed. In order to realize this vision, the report identifies six Priority Research Directions which are equally divided between two themes: foundational research, which corresponds to domain awareness, interpretability, and robustness; and capability research, which focuses on data analysis, machine learning-enhanced modeling and simulation, and intelligent and

automated decision-making. The table below summarizes future research priorities and directions.

- Co-Design Center for a Distributed Computing Ecosystem. A new Co-Design center that would develop hardware, software, and algorithms needed to integrate big data to support the large-scale computing and data requirements for machine learning.
- **QIS**. The FY 2020 President’s budget request proposes \$51 million for QIS within ASCR, an increase of \$17 million or 50 percent above FY 2019. The major funding opportunities in FY 2020 are likely to be:
 - Quantum networking. Another funding call to build on FY 2019 awards on quantum networking, as discussed previously.
 - Quantum science and technology center. The FY 2020 President’s budget request provides funding for at least one quantum science and technology center authorized by the National Quantum Initiative Act. DOE is hoping that Congress will provide additional funding to support up to five centers, but currently funding is included for only one center. These five-year, multi-disciplinary centers with funding of up to \$25 million a year would focus on addressing scientific grand challenges related to advancing quantum applications in quantum computing, sensing, networking, and communications.

Long-Term Scientific Computing Research DOE Applied Math Themes

ASCR Criteria for Themes I - III	I. Adaptive High-Performance Algorithms & Solvers
Basic research will develop & sustain 1. Computational Leadership 2. Discovery-Enabling Technologies 3. S/W Tools, Prototypes, Ecosystems 4. High-Tech DOE Workforce in advanced scientific computing.	Adaptive HPC solvers & Scalable data analysis. Forward, Inverse, & Optimization problems. Post-Moore computational motifs/patterns. * Massively parallel, Asynchronous, Ensembles * Preconditioners, Statistics, Learning from data * Randomization, Graphs, Black/Gray boxes * Poly-algorithms, Adaptive precision
II. Predictive Multifaceted Modeling & Simulation	III. Integrated Capabilities
Predictive scientific computing. Hierarchical, coupled, & hybrid simulations. Novel formulation, meshing, & interfaces. * Smart machine learning-enhanced models * Data-driven models, Surrogate sub-models * Uncertainty & Error propagation, Validation * Forward, Adjoint, & Parameter sensitivities	Intelligent automation & decision-support. Complex systems, processes, & infrastructure. Effective human-AI collaboration. * AI-enhanced scientific method & discoveries * Optimal experimental design, Outer loop * Systems resilience, reliability, & control * Automated performance optimization

Source: DOE

With the exascale computing project nearing completion and the end of Moore's Law quickly approaching, DOE had charged ASCAC with identifying opportunities and challenges for future high-performance computing capabilities and recommending areas of research and emerging technologies that need to be given priority in the future. ASCAC released its report on *Future High Performance Capabilities* on March 20 and it is now available at https://science.energy.gov/~media/ascr/ascac/pdf/meetings/201903/Future_High_Performance_Computing_Capabilities_ASCAC_20903.pdf. The report recommended that ASCR explore and fund future research in six areas:

- Reconfigurable logic,
- Memory-centric processing,
- Silicon photonics,
- Neuromorphic computing,
- Quantum computing, and
- Analog computing.

The Advisory Committee emphasized that there will be a period of uncertainty over the next decade on the future trajectory of high-performance computing and a number of approaches may be highly disruptive. In addition, the future of computing in the post-exascale and post-Moore eras will be defined by extreme heterogeneity. The challenges and opportunities in an era of extreme heterogeneity are highlighted in a recent report available at https://science.energy.gov/~media/ascr/pdf/programdocuments/docs/2018/2018-09-26d-Extreme_Heterogeneity_BRN_report.pdf. One of the main recommendations to DOE is greater investments in applied math and computer science to be ready for this new era of computing and recruiting, growing, and retaining a future workforce.

[\[Back to Top\]](#)

Hearing Updates

House Committees Hold Hearings on FY 2020 NASA Budget Request

In the wake of the President's fiscal year (FY) 2020 budget request, National Aeronautics and Space Administration (NASA) Administrator Jim Bridenstine testified before the House Commerce, Justice, Science, and Related Agencies (CJS) Appropriations Subcommittee and the House Committee on Science, Space, and Technology (HSST) on March 27 and April 2, respectively. Although CJS is responsible for NASA's annual appropriations, HSST provides oversight and policy direction to the agency. Major topics addressed in both hearings included STEM education, Vice President Mike Pence's recent statements about a human mission to the Moon, and the importance of NASA's Earth science research. Though the hearings were mainly focused on large projects, Administrator Bridenstine emphasized that NASA will work to maintain a balanced portfolio of small and medium projects alongside the flagship missions like the James Webb Space Telescope and WFIRST.

Despite the collegial atmosphere, both committees were concerned about the funding cuts included in the President's budget request. The proposed elimination of the Office of STEM Engagement and reductions to Earth science funding prompted Members to ask if these cuts would harm student outreach activities, particularly for women and underrepresented minorities, and research into climate change. Administrator Bridenstine maintained that NASA provides educational outreach across the agency and the Office of STEM Engagement only supports a small portion of such activities. He also noted that NASA strongly values Earth science research and that funding for the Earth Science Division provided by Congress in FY 2019 is at a historical high.

Both committees spent much of their hearings discussing Vice President Pence's recent announcement that the U.S. would return humans to the Moon by 2024, four years earlier than originally planned. Several Members from each committee asked how much the accelerated plan would cost, what it would take to get the Space Launch System ready in time, and if the plan would negatively impact other NASA projects. Administrator Bridenstine explained that NASA is currently amending its budget request to reflect the 2024 deadline and is forming a plan to develop and test launch systems concurrently to save time. Though it is likely NASA will ask Congress for more money than what is currently in the budget request, other agency programs should not be affected by the shortened timeline and increased costs. Administrator Bridenstine also emphasized that partnerships with industry and universities will be vital to meeting Vice President's deadline.

Sources and Additional Information:

- The full March 27 hearing from the House CJS Appropriations Subcommittee can be found at <https://www.youtube.com/watch?v=Bpkpd8gk1hc&feature=youtu.be>.
- The full April 2 hearing from the House Science, Space, and Technology Committee can be found at <https://science.house.gov/hearings/a-review-of-the-nasa-fy2020-budget-request>.

[\[Back to Top\]](#)