ECP Broader Engagement Initiative

ASCAC Meeting

March 29, 2022

ECP Broader Engagement Task Force

speaker: Lois Curfman McInnes

Ashley Barker, OLCF
Dan Martin, LBL
Mary Ann Leung, Sustainable Horizons
Lois Curfman McInnes, ANL
Suzanne Parete-Koon, OLCF
Jini Ramprakash, ALCF
Julia White, ORNL
Jim Ahrens, LANL
Erik Draeger, LLNL
Shaun Fomby, ORNL
Yasaman Ghadar, ALCF
Rinku Gupta, ANL
Mahantesh Halappanavar, PNNL
Mike Heroux, SNL
Christopher Kelly, BNL
Mark Miller, LLNL
Hai Ah Nam, NERSC
Slaven Peles, ORNL
Damian Rouson, LBL
Dan Turner, SNL
Terry Turton, LANL

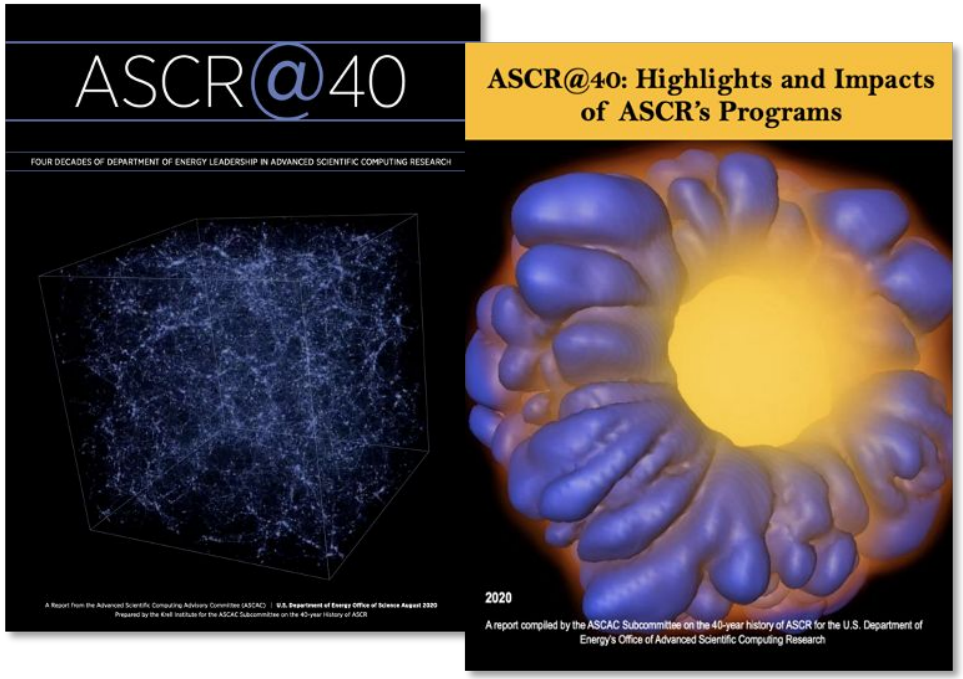
slides available via: https://bit.ly/ECP-Broader-Engagement-Initiative-2022-03

DOE computing sciences provide the foundation of discovery and innovation

ASCR@40: Highlights and Impacts of ASCR's Programs, ASCAC Subcommittee on the 40-year history of ASCR for DOE's Office of Advanced Scientific Computing Research, Hendrickson, Messina et al., 2020:

- Lessons learned
  - A compelling and consistent vision can drive scientific revolutions
  - Diverse funding models are required for diverse and impactful outcomes
  - **Workforce investments have been critical**
  - Partnerships are essential
  - Testbeds and platform access funding models are important
- Challenges of the future
  - Technology disruptions
  - Funding balance
  - Software stewardship
  - Broader partnerships
  - **Sought-after workforce**
  - New roles for computing to advance science

"The rapid growth of scientific computing and workforce training to fuel it go hand in hand."



Lesson 3: Workforce investments have been critical.

"Nothing in science is possible without the right set of highly skilled people. ASCR's vision has been ahead of the ability of academia to adapt. When trying to do things that universities were not yet embracing, ASCR had little choice but to invest in workforce development initiatives to meet its needs …"

But we face urgent workforce challenges:

We must expand the pipeline and workforce for DOE high-performance scientific computing

Image credit: Current and future workforce, R. Giles et al., *Transitioning ASCR After ECP*, Oct 2020

DOE ASCAC Workforce Subcommittee Letter, Chapman et al., 2014, https://doi.org/10.2172/1222711**,** states:

> "All large DOE national laboratories face workforce recruitment and retention challenges in the fields within Computing Sciences that are relevant to their mission. ... Future projections indicate an **increasing workforce gap and a continued underrepresentation of minorities and females in the workforce unless there is an intervention.**"

The report also states:

> "A common theme identified by many labs is that early exposure to the laboratory environment can attract better-qualified students into permanent laboratory roles."

The report recommends:

> **"... provide a rich repository of DOE mission-oriented learning materials and engagement opportunities to attract and guide individuals towards careers in areas of DOE need."**

Computing Sciences:

- From ASCAC Workforce subcommittee letter: "We use this term throughout the document to cover multiple areas of importance to DOE including, but not limited to, Computational Science and Engineering. It includes fields such as Algorithms (both numerical and non-numerical); Applied Mathematics; Data Analysis, Management and Visualization; Cybersecurity; Software Engineering and High Performance Software Environments; and High Performance Computer Systems."
- Also includes Data Sciences, Learning/AI, Networking, Computing Facilities, etc

Recommendations from ASCAC Subcommittee on Transitioning ASCR after ECP

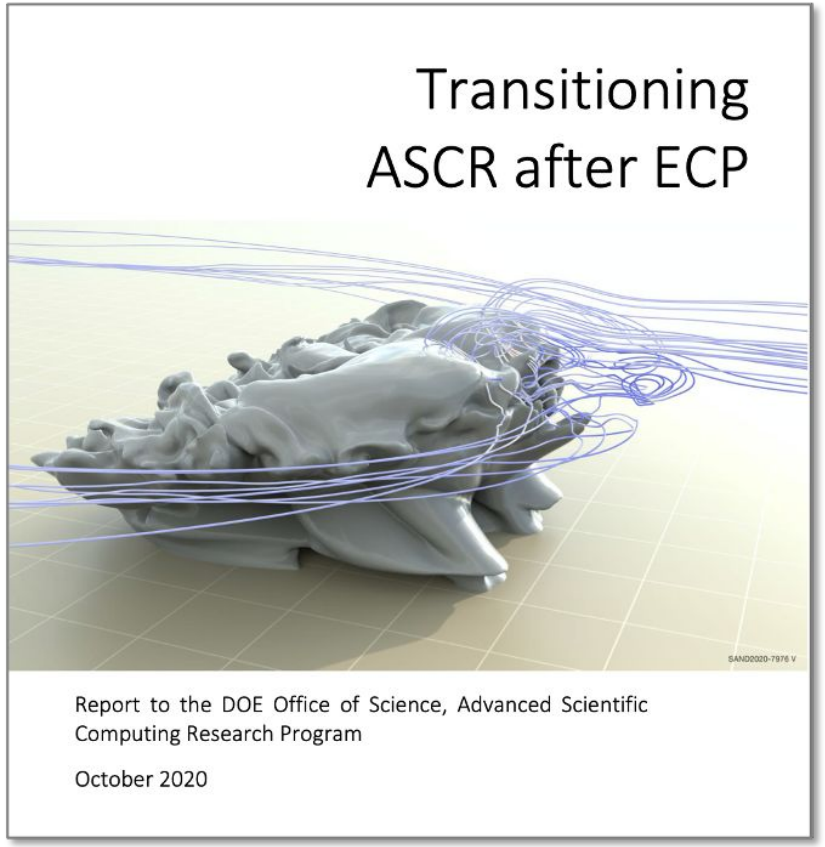
Current and future workforce: The strength and vitality of ASCR research are defined by the enthusiasm, engagement, and creativity of the talented workforce that pursues it. This workforce is essential to maintain our lead in advanced computing.

Findings:

- Finding C.1: ASCR has a skilled and motivated workforce
- Finding C.2: Retention, diversity, and opportunities are challenged beyond exascale
- Finding C.3: Diversity, equity, and inclusion are valued

Recommendations:

- Recommendation C.1: Support researchers' re-engagement in "blue sky research"
- Recommendation C.2: Retain the current workforce
- **Recommendation C.3: Strengthen ties to universities and the ecosystem**
  - "…at many academic institutions there is a dearth of parallel/high-performance computing courses; … This is a long-standing challenge, and the ECP transition is an opportune moment to address it …"
  - " Multiple project participants stressed the importance of growing internships and related programs … It is also not enough to ensure that students have experiences at the labs; the experiences must be positive ones. Multiple participants highlighted the importance of improving mentorship and engagement for Lab internship programs …"
- Recommendation C.4: Create career paths for scientific software professionals
- **Recommendation C.5: Support diversity, equity & inclusion (DEI)**
  - "The ECP transition period, as ASCR re-affirms its commitment to national and international leadership in the wide range of disciplines and communities, offers a timely opportunity to simultaneously reaffirm its commitment to DEI. Results from the prior Workforce letter, and studies across the research disciplines stewarded by ASCR, establish that programs to engage diverse students in high school and younger in STEM careers are essential, and should be supported, along with broader efforts in recruitment and retention."



R. Giles et al., *Transitioning ASCR After ECP*, Oct 2020

- A. Advancing and Building on ECP
- B. Advancing ASCR Research
- **C. Current and Future Workforce**

ECP Task Force on Broader Engagement

Partnership among ANL, BNL, LBL, LLNL, LANL, ORNL, PNNL, SNL (including ALCF, NERSC, OLCF)

Task force began in August 2021

- **Bold underline** denotes task force leadership team
- * denotes thrust lead

Jim Ahrens, LANL
ECP ST L3 for Data/Viz, ALPINE L4

Ashley Barker, OLCF
ECP L3 for Training & Productivity

Erik Draeger, LLNL
ECP AD L2 deputy

Shaun Fomby, ORNL
ECP Project Controls

Yasaman Ghadar, ALCF
ATPESC Deputy Director

Rinku Gupta, ANL
Argo & IDEAS-ECP projects, BSSw.io Editor-in-Chief

Mahantesh Halappanavar PNNL, ExaGraph L4

Mike Heroux, SNL
ECP ST L2, IDEAS-ECP co-lead

Christopher Kelly, BNL
CODAR & Lattice QCD projects

Mary Ann Leung, Founder & President, Sustainable Horizons Institute, https://shinstitute.org

Dan Martin, LBL
ECP AD L3 for Earth & Space Science
* Lead of SRP-HPC thrust

Lois Curfman McInnes
ANL, ECP ST L2 deputy, IDEAS-ECP co-lead

Mark Miller, LLNL
ALPINE project, lead of IDEAS-ECP Inclusive Minute initiative

Hai Ah Nam, NERSC
IDEAS-ECP project, Coordinator of BSSw Fellowship Program

Suzanne Parete-Koon, OLCF
* Lead of HPC Workforce Development & Retention Action Group

Slaven Peles, ORNL
ExaSGD project

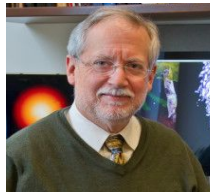
Jini Ramprakash, ALCF
Deputy Director
* Lead of Intro to HPC thrust

Damian Rouson, LBL
Flang & Pagoda projects

Dan Turner, SNL
Optimization & UQ Manager

Terry Turton, LANL
ECP ST Integration, Project Coordinator for ALPINE, SICM, Cinema

Julia White, ORNL
ECP Technical Operations Manager



David Brown, LBL
Partnered with M.A. Leung to establish the LBL Sustainable Research Pathways Program

Valerie Taylor, ANL
CEO & President, Center for Minorities and People with Disabilities in IT, https://cmd-it.org

Liaisons from the Computing Research Leadership Council

Thank you to ECP and DOE leadership for support, especially Barb Helland

Workforce development activities build on current efforts to broaden participation in HPC

SUSTAINABLE HORIZONS INSTITUTE
https://shinstitute.org

Mary Ann Leung, founder & president of **Sustainable Horizons Institute** (SHI)

Presentation at ASCAC meeting, July 2021

https://science.osti.gov/-/media/ascr/ascac/pdf/meetings/202107/ASCAC_meeting_202107_Challenges_Lessons_Expanding_CSE.pdf

Pioneering multipronged approaches to broaden engagement of underrepresented groups in HPC and computational science. Existing DOE partnerships:

- Sustainable Research Pathways (SRP) Program
- SIAM CSE Broader Engagement Program
- 2021 BSSw Fellow - Increasing developer productivity and innovation through diversity
- CRLC seminar series
- Interactions with labs

Build on ECP's unique multilab collaboration & DOE HPC community

Complement and leverage existing workforce programs (DOE-wide, lab-specific and HPC computational science community)

Examples of DOE workforce programs:

- **CRLC Seminar Series**
  - CRLC = Computing Research Leadership Council (ANL, BNL, LBL, LLNL, LANL, ORNL, PNNL, SNL)
  - CRLC partnership with SHI to deliver a monthly seminar series targeting minority-serving institutions
- **Visiting Faculty Program**
  - Seeks to increase the research competitiveness of faculty members and their students at institutions historically underrepresented in the research community
- **Minority Serving Institutions Partnership Program (MSIPP)**
  - Promotes the education and development of the next generation workforce in critical science, engineering, technology, and math (STEM) related disciplines
- **Community College Internships Program (CCI)**
  - Seeks to encourage community college students to enter technical careers relevant to the DOE mission
- **Science Undergraduate Laboratory Internships (SULI)**
  - Encourages undergraduate students to pursue STEM careers by providing research experiences at DOE laboratories
- **Mentorship for Environmental Scholars Program**
  - Collaborative effort between Pre-College University and the U.S. Department of Energy to increase minority awareness and participation in the environmental science disciplines
- **GEM Fellowship Program**
  - Seeks to recruit high-quality under-represented students looking to pursue degrees in applied science and engineering

Many impactful lab-specific programs

- leverage local and regional opportunities
- throughout all levels of the pipeline

2014 DOE ASCAC Workforce Subcommittee:

- "The DOE laboratories have individually developed measures to help recruitment and retention, yet more can be done at the national level to amplify and extend the effectiveness of their locally developed programs."

Recommendations include:

- "... develop a strategic plan with programs and incentives to pro-actively recruit, mentor and increase the involvement of significantly more women, minorities, people with disabilities, and other underrepresented populations into active participation in CS&E* careers."

*CS&E = computational science and engineering

Vision and mission of ECP Broader Engagement Task Force

- **Vision:** The DOE high-performance computing (HPC) community is a supportive and inclusive culture, where the workforce includes diverse and talented people from underrepresented communities.
- **Mission:** Establish a sustainable plan to recruit and retain a diverse workforce in the DOE HPC community by fostering a supportive and inclusive culture within the computing sciences at DOE national laboratories.
  - **Engage talented people** with the potential for strong skills and interest in HPC **from underrepresented groups**, including:
    - Black or African American, Hispanic/Latinx, American Indian, Alaska Native, Native Hawaiian, Pacific Islanders, women, persons with disabilities, first-generation scholars, people from smaller colleges & universities, and others
  - **Raise awareness of DOE activities and needs** related to scientific applications, software technologies, hardware, and infrastructure;
  - **Provide pathways for interactions,** including training, internships, collaborations, and careers;
  - **Leverage and complement** existing efforts on broader engagement (BE) and diversity, equity and inclusion (DEI) in DOE national laboratories, computing facilities, and the HPC computational science community.

ECP Broader Engagement Initiative

https://www.exascaleproject.org/hpc-workforce

*R*eference: *A multipronged approach to building a diverse workforce and cultivating an inclusive professional environment for DOE high-performance computing*, response to DOE RFI on Software Stewardship, ECP Task Force on Broader Engagement, Dec 2021, https://doi.org/10.6084/m9.figshare.17192492

A multipronged initiative to expand the pipeline and workforce for DOE high-performance computing (HPC)

HPC Workforce Development and Retention Action Group

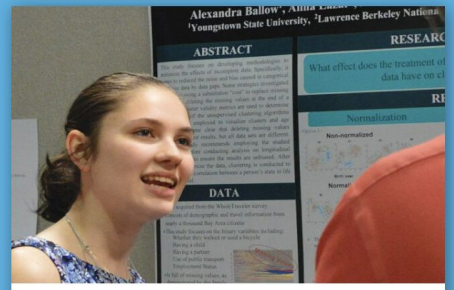
We are influencing culture in DOE labs and communities to promote the workforce pipeline for — and the retention of — a diverse DOE lab HPC workforce.

We are fostering a community, within

Intro to HPC

We are providing accessible introductory material to HPC — thereby addressing gaps in — and expanding the pipeline of — people with foundational HPC skills.

This becomes a pathway to build experience for (and interest in)



Sustainable Research Pathways for HPC (SRP-HPC)

We are establishing a multilab cohort of students from underrepresented groups (and faculty working with them), who are working side-by-side with ECP teams on world-class HPC projects:

Partnership with **Sustainable Horizons Institute**
https://shinstitute.org/srp-hpc

SUSTAINABLE HORIZONS INSTITUTE

Strongly encouraged to apply: Students from (and faculty working with) underrepresented groups (Black or African American, Hispanic/Latinx, American Indian, Alaska Native, Native Hawaiian, and Pacific Islanders, women, persons with disabilities, first-generation scholars, and other underrepresented populations)

Why ECP? Unique multilab partnership across DOE computing sciences (apps / math / CS / facilities)

- Strength in spanning multiple institutions / strength in numbers / network beyond what any individual lab could do
- Proactive outreach and deployment of DOE HPC tools and technologies to communities beyond traditional targets

HPC Workforce Development and Retention:

Influence culture in DOE labs and communities to promote the workforce pipeline for ─ and the retention of ─ a diverse DOE lab HPC workforce

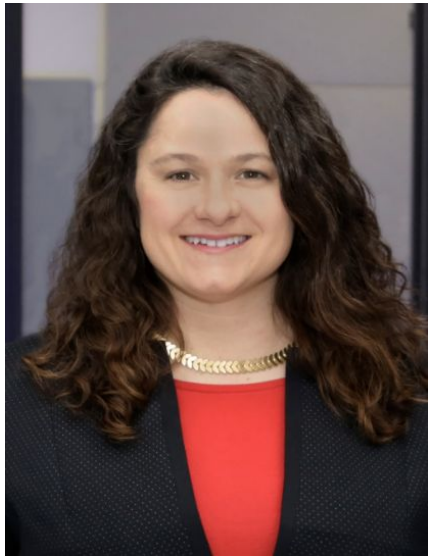
Approach: HPC Workforce Development and Retention

- **Create a HPC Workforce Development and Retention (HPC-WDR) Action Group made up of interested staff from the ECP community and DOE labs**
  - Foster a community, within the HPC community, who come together on a regular basis to share ideas and best practices and learn from each other
  - Focus: Recruit and curate content for 2 key initiatives; develop recommendations and strategies for improvement
- **Lead a new webinar series: Best Practices for HPC Workforce Development and Retention**
  - Regular webinars (open to all)
  - Topics focus on improving culture (diversity, equity and inclusion)
  - Speakers from DOE labs and broader community
  - Materials from the webinars to be curated and archived online
- **Develop a website presence: Resources for HPC Workforce Development and Retention**
  - Curate training, methodologies, best practices, and lessons learned regarding HPC Workforce Development and Retention, thus making resources available online, accessible to the community

HPC-WDR Action Group: Status and next steps

Funding for this thrust area approved in Dec 2021

- **HPC-WDR Action Group**
  - HPC-WDR Action Group Lead identified: Suzanne Parete-Koon, ORNL
  - Issued broad call for interest
    - Seeking at least one representative from each DOE lab and computing facility … More people are welcome!
    - Initial commitment: @ 3-6 hours monthly
  - First meeting of the Action Group will occur on June 9, 3 pm ET
- **Best Practices for HPC Workforce Development and Retention**
  - First webinar: ***How to be a Great Mentor***
    - Scheduled for May 24, 1 pm ET
    - Register here: https://www.exascaleproject.org/event/mentor
  - Working to line up topics for future webinars … suggestions are welcome!
- **HPC Workforce Development and Retention Resources**
  - Have appointed website gui expert to work on the project
  - One of first items of business for the HPC-WDR Action Group is to identify required elements of the new web presence



Suzanne Parete-Koon is an HPC Engineer at OLCF with a background in computational astrophysics (PhD 2008, Univ of Tennessee, Knoxville). She has experience leading user support activities at both the OLCF and ORNL's Spallation Neutron Source. She was the Deputy INCITE program manager from 2015-2018, and she is currently the training lead for OLCF. Suzanne is excited about the opportunity to facilitate a dialog about building an inclusive HPC work environment and workforce.

ECP EXASCALE COMPUTING PROJECT

Home | About | Research | News | Podcast | Training | Library | Contact

HPC-WDR Action Group: Website (mock-up, in progress)

⇛ Marketing for the SRP-HPC program with goal of encouraging students to apply

Sustainable Research Pathways for High-Performance Computing (SRP-HPC)

Based on the highly successful SRP@Berkeley Lab, Sustainable Research Pathways for High-Performance Computing (SRP-HPC) is designed to connect students from (and faculty working with) underrepresented groups with Department of Energy (DOE) National Laboratory scientists to encourage lasting collaborations and jump start careers. CLICK HERE

⇛ Sharing information about workforce-related events happening in the community

Community Calendar

- ❑ March 22: Normalizing Inclusion by Embracing Difference, DiveRSE event, Mary Ann Leung
- ❑ March 29, 1 pm ET, Achieving Equitable Representation for Women of Color at our National Labs
- ❑ April 19-22: Vive la Différence - Research Software Engineers, Lorentz Center, Netherlands (and online)
- ❑ June 2022: Advancing Scientific Computing Across the Globe Through DEI, PASC22 minisymposium

Community Resources

- ❑ DiveRSE: Supporting Equity, Diversity and Inclusion within the Research Software Engineering (RSE) community: https://diverse-rse.github.io
- ❑ BSSw.io: Articles relating to scientific software productivity and sustainability, including topic of inclusivity
- ❑ DOE Office of Science Community DEI informational resources
- ❑ And more …

⇛ Information supporting the Workforce webinar series

How to be a Great Mentor

May 24, 2022

The DOE Exascale Computing Project (ECP) HPC Workforce Development and Retention Action Group organizes a webinar series on Workforce Development. As part of this series, we offer webinars on topics related to developing a diverse and inclusive work environment.

Intro to HPC:

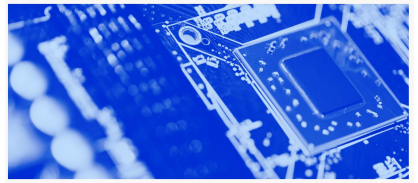
Address gap in — and expand pipeline of — people with basic HPC skills

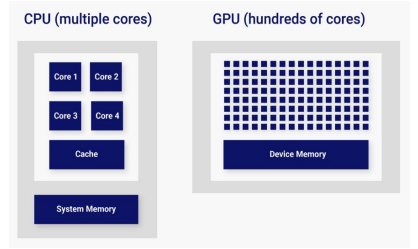
Pathway to build experience for (and interest in) advanced programs (ATPESC, CSGF) and HPC careers

Motivation: Build skills in basic HPC for future workforce

- **Basic HPC skills are prerequisites** for advanced computing programs (ATPESC, CSGF) and HPC careers. E.g., ATPESC requires
  - MPI / OpenMP / ML experience
  - Experience running on HPC systems

  But basic HPC is not typically taught at early stages of students' careers





A gentle introduction to GPU programming, M. Rosso and A. Myers, BSSw.io blog article, May 2021

- Capacity and knowledge of HPC (including scalable AI & analytics) at many institutions is limited
  - Most HPC (including scalable AI & analytics) courses (if) offered are electives
  - Graduation requirements often don't leave bandwidth to take electives
- DOE lab computing complex has expertise, capabilities, and long history of cross-lab coordination on joint efforts

Two-pronged approach for Intro to HPC

Meet students where they are and provide HPC pathways

Lead: Jini Ramprakash, ALCF

- **Direct to students approach:** National labs regional “Intro to HPC”
  - Two-week intensive HPC/AI course held by national labs, providing exposure to topics that will enhance applications to graduate programs
  - Targeting advanced undergrads (juniors and seniors), students in gap years, and early grad students in underrepresented groups
  - Collaboratively develop curriculum, including hands-on HPC (across labs, DOE community)
  - Materials to be freely available online for community use (by faculty in courses, by labs at start of internships, for individual self study, possibly online venues such as Coursera, etc)
- **Through universities:** Intersect workforce needs with capabilities
  - Conduct listening session with Minority Serving Institutions (MSIs) and EPSCoR states to iterate on understanding challenges and how to address them
  - Work with administrators and faculty at universities to implement the program at their institutions

Intro to HPC: Status and Next Steps

Funding for phase-1 work for this thrust area approved in Dec 2021

- **Direct to students approach:** National labs regional “Intro to HPC”
  - Issued broad call for interest and identified potential contributors from across ECP/ lab staff
  - Leveraging ANL’s Education Department experience and framework to determine plan for program
  - Held multiple interview/listening sessions with a subset of the computational postdoctoral population at ANL to uncover HPC topics that were (1) useful and (2) missing from their undergrad and early grad education
  - Collecting existing content across the DOE complex to leverage in new program
- **Through universities:** Intersect workforce needs with capabilities
  - First listening session scheduled for April 21
  - Narrowed down invitation list based on full list of MSIs (770+ institutions) - starting with universities offering 4-year degrees in 50 US states with CS or related departments
  - Event logistics - issuing invitations in progress

Sustainable Research Pathways for HPC (SRP-HPC):

Multilab cohort of students from underrepresented groups (and faculty working with them), collaborating with ECP teams, including mentoring, community building, and promoting inclusion

Build on Sustainable Research Pathways (SRP) at LBL

(ref: Leung ASCAC presentation, July 2021)



David Brown
Mary Ann Leung
Silvia Crivelli

Sustainable Research Pathways Program

- Build relationships centered on research collaborations
- Recruit
  - Faculty working with underrepresented students
  - Students from underrepresented backgrounds
- Provide opportunities for staff scientists
  - Research collaborations
  - Learn/contribute to diversity and inclusion efforts
- Supplement existing D&I Laboratory programs

Winner of 2021 HPCwire Workforce Diversity and Inclusion Award

- Started in 2015 at LBL, has expanded annually
- Steady pipeline of examples of successful pathways to DOE
- Expanding as multilab ECP partnership (SRP-HPC program, summer 2022)

Berkeley SRP Alumni


Professor Chris Paolini, San Diego State University (HSI)

- Participated in SRP@LBL (2019, 2020, 2021)
  - student Angel Boada all 3 years
- ECP AD Subsurface project with lab mentor David Trebotich

Alexandra Ballow, Youngstown State University

- First-generation undergraduate in economically challenged community
- Conducted research through SRP@LBL in 2018 in John Wu's group
- Took advantage of SIAM CSE19 BE Lightning Talks to prepare for poster blitz for over 1000 SIAM community members
- Presented research through BE@CSE19; met Ann Almgren (Guided Affinity Group leader); returned to SRP@LBL in 2020
- Presented research at BE@CSE21
- Awarded 2021 DOE Computational Science Graduate Fellowship!

And more …

Sustainable Research Pathways for HPC

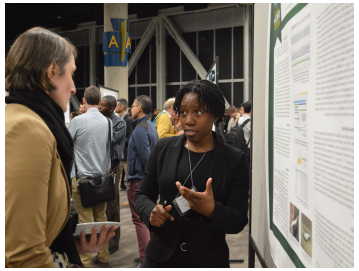
Broadening participation of underrepresented groups

https://shinstitute.org/srp-hpc

Collaborate with ECP teams

Two tracks*

- Faculty/student teams
- Students on their own



* **Students from and Faculty working with underrepresented groups** (Black or African American, Hispanic/Latinx, American Indian, Alaska Native, Native Hawaiian, and Pacific Islanders, women, persons with disabilities, first-generation scholars) **are strongly encouraged to apply.**

Inclusive recruiting: Underrepresented groups wherever they are: historically black colleges and universities (HBCU), hispanic-serving institutions (HSI), community colleges, liberal arts, public/state, high-research institutions

SUSTAINABLE HORIZONS INSTITUTE

Build relationships based on R&D collaborations, with these goals:

- Jump-start and boost careers
- Foster a welcoming and inclusive HPC community
- Provide learning opportunities to advance diversity, equity, and inclusion
- Normalize inclusion, that is, help people learn how to work together and un-learn biases so that inclusion becomes a normal practice

Explore cutting-edge R&D opportunities at DOE labs, which provide the foundation for exciting careers and broad societal impacts

Students from underrepresented groups (and visiting faculty working with them) whom ECP projects identify and fund separately (e.g., through lab visitor programs) are welcome to join the “SRP-HPC Summer Experience” cohort activities.

SRP-HPC matched projects and mentors recommended for funding

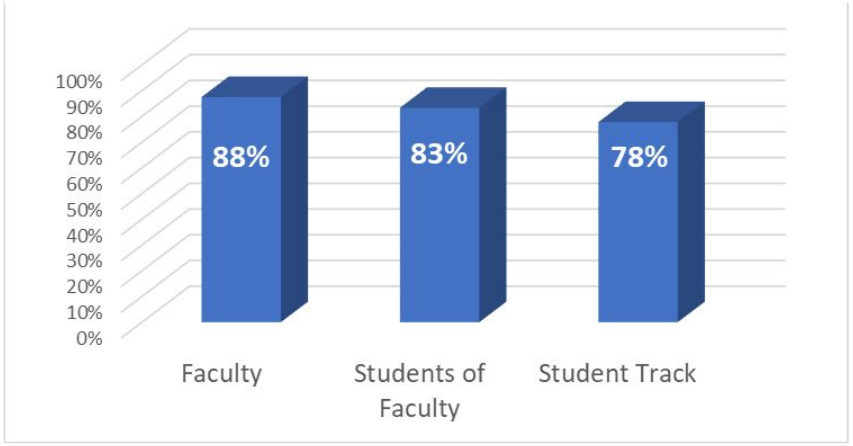
Total: 64 people: 18 student track, 16 faculty track (+ 30 students)

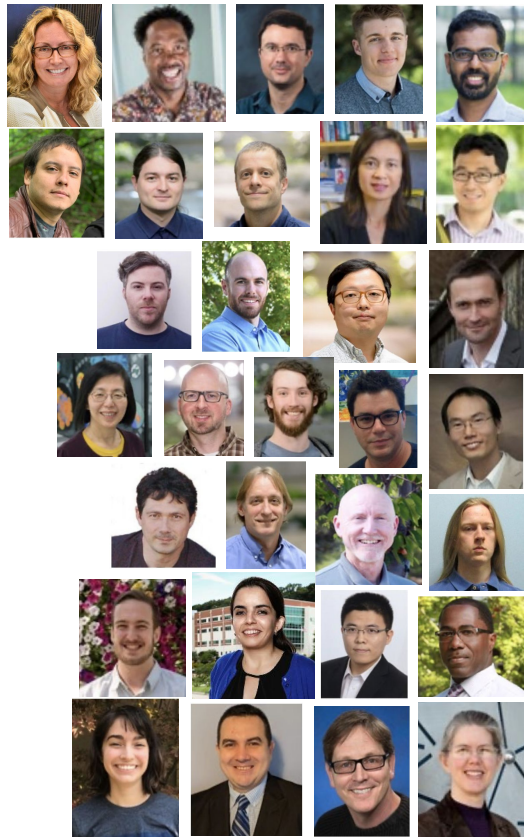
- **ECP Application Development:**
  - 16 matches: 9 student track, 7 faculty track (+ 17 students)
  - L3 areas: materials & chemistry, energy, Earth & space, co-design, data analytics and optimization
- **ECP Software Technology:**
  - 14 matches: 7 student track, 7 faculty track (+ 10 students)
  - L3 areas: development tools, math libraries, data & visualization
- **Facilities:**
  - 4 matches: 2 student track, 2 faculty track (+ 3 students)

Matches for all participating labs:

- Ames: 1 match (student track)
- ANL: 8 matches (3 student track, 5 faculty track)
- BNL: 6 matches (2 student track, 4 faculty track)
- LBL: 8 matches (5 student track, 3 faculty track)
- LLNL: 3 matches (1 student track, 2 faculty track)
- ORNL: 6 matches (4 student track, 2 faculty track)
- PNNL: 1 match (student track)
- SLAC: 1 match (student track)

All faculty/student teams (and 83% of applicants recommended for funding) represent at least 1 element of diversity.



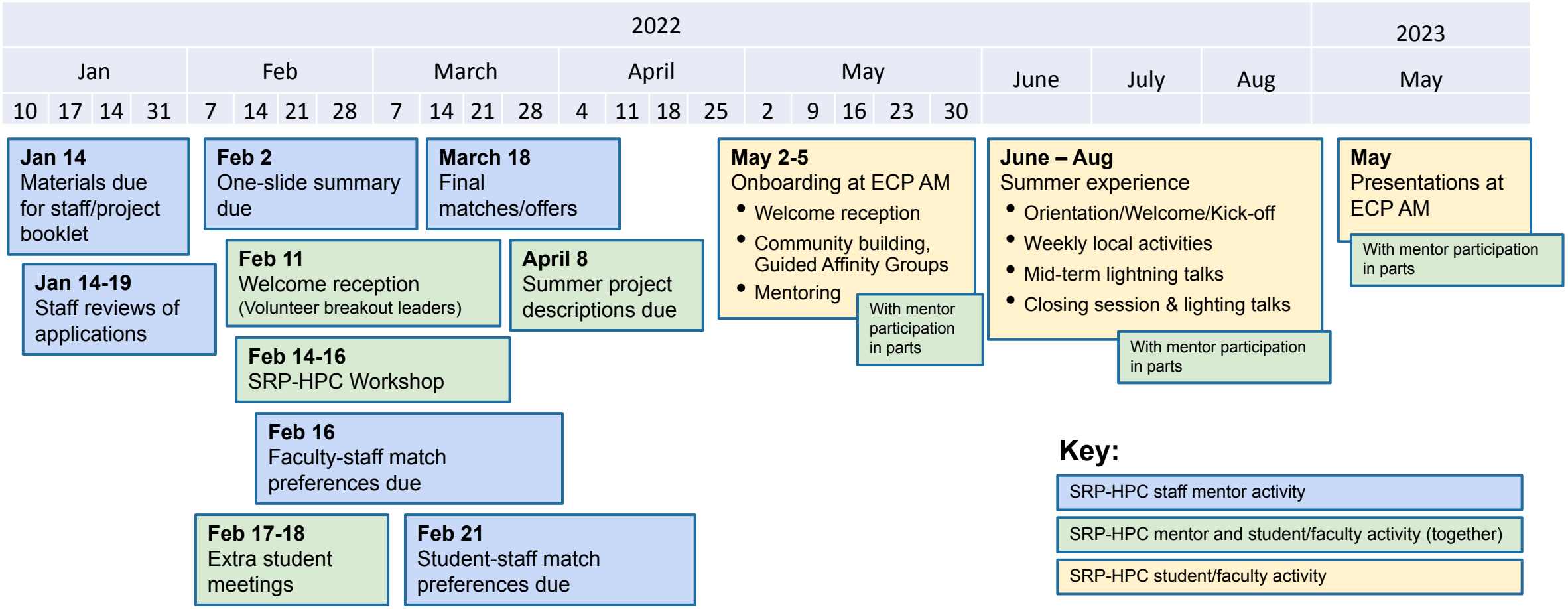


SRP-HPC mentors/co-mentors

Dan Martin, LBL
SRP-HPC thrust lead for ECP

Keisha Moore, SHI
SRP-HPC Program Coordinator

Putting it all together: SRP-HPC timeline of activities and deliverables



* Detailed planning and confirmed funding for 2023 SRP-HPC cohort must begin in spring 2022 in order to have sufficient time for broad outreach to underrepresented groups

The future of DOE computing sciences depends on sustainable workforce interventions

ECP Broader Engagement Initiative

- Solid start as a multipronged, multilab community partnership to change the culture and demographic profile of DOE HPC
- But we face substantial challenges
  - ECP concludes in 2023
  - Need collaboration across the DOE HPC community (not just ECP)
  - Need sustainability of workforce interventions for DOE HPC
- We welcome all feedback/suggestions/input

How are we addressing recommendations of the 2014 DOE ASCAC Workforce Subcommittee Letter? Chapman et al, https://doi.org/10.2172/1222711

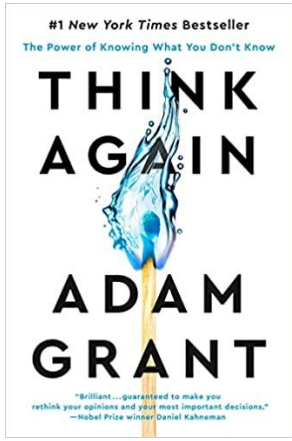
"All large DOE national laboratories face workforce recruitment and retention challenges in the fields within Computing Sciences that are relevant to their mission. ... Future projections indicate an **increasing workforce gap and a continued underrepresentation of minorities and females in the workforce unless there is an intervention.**"

We must acknowledge the importance and urgency of DOE HPC workforce challenges

- Expansion of HPC in discovery, decision making & more / Explosion of HPC opportunities in industry / HPC transitions

We must do more: Prioritize sustainable workforce interventions for computing sciences

- **Get involved!**
  - Whoever you are: early-career, mid-career, senior … and beyond
- We need a variety of complementary sustained interventions at all levels
  - Beyond (undergrad / grad / faculty) programs – including K-12 education, extracurriculars and outreach
- Including partnerships with other agencies, professional societies, community groups, etc



Call to Action: Get involved!

Sign up to learn more details and participate

ECP Broader Engagement Initiative: Interest signup sheet

Interested in learning more about the ECP Broader Engagement Initiative and how you can participate as a member of the DOE HPC community? Sign up here!

While this initiative started within ECP, our goal is to work toward a sustainable initiative acrosss the DOE HPC computing sciences community.

See overview info (March 2022): https://bit.ly/ECP-Broader-Engagement-Initiative-2022-03

Name	Institution	Email	ECP project(s)	Which thrusts interest you? Check all that apply			Any comments, suggestions, pointers, etc?
				Culture	Intro to HPC	SRP-HPC (internships w. community/mentoring)	We welcome your ideas/input!

We welcome all input/suggestions/feedback … and we encourage involvement of the DOE HPC community … Let's all work together.

References

- B. Chapman et al., *DOE ASCAC Workforce Subcommittee Report*, 2014, https://doi.org/10.2172/1222711
- R. Giles et al., *Transitioning ASCR After ECP*, Oct 2020 Report to the DOE Office of Science, Advanced Scientific Computing Research Program
- *Best Practices for Diversity and Inclusion in STEM Education and Research: A Guide by and for Federal Agencies*, White House Report by National Science and Technology Council, September 2021
- Diversity demographics of the 17 DOE National Laboratories https://nationallabs.org/staff/diversity/
- D.L. Brown, S.N. Crivelli and M.A. Leung, *Sustainable Research Pathways: Collaborations Across Communities to Diversify the National Laboratory Workforce*, The Collaborative Network for Engineering and Computing Diversity (CoNECD), Washington, D.C., 2019, American Society for Engineering Education, Paper ID #24706, https://www.asee.org/public/conferences/148/papers/24706/view
- M.A. Leung, *Developing Sustainable Methods for Broadening Participation by Transforming Mainstream Science and Technology Communities Through the Normalization of Inclusion*, American Behavioral Scientist, 62(5), 683–691, 2018
- M.A. Leung and C.L. McNeely, *Opening Doors to Communities of Practice: Programmatic Interventions for Inclusion in the Computing Sciences*, Proceedings of Research in Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT), 2015
- M.A. Leung, D. Rouson and L.C. McInnes, *Increasing Productivity by Broadening Participation in Scientific Software Communities*, BSSw.io blog post, Sept 2020
- M.A. Leung, *Diversity and Inclusion Through Leadership During Challenging Times*, CiSE, Nov-Dec 2020
- T. Whitney and V. Taylor, *Increasing Women and Underrepresented Minorities in Computing: The Landscape and What You Can Do*, Computer, vol. 51, no. 10, pp. 24-31, 2018
- *A Multipronged Approach to Building a Diverse Workforce and Cultivating an Inclusive Professional Environment for DOE High-Performance Computing*, response to DOE RFI on Software Stewardship, ECP Task Force on Broader Engagement, Dec 2021, https://doi.org/10.6084/m9.figshare.17192492
- *Transforming Trajectories for Women of Color in Tech,* E. Hammonds, V. Taylor and R. Hutton, editors, National Academies of Sciences, Engineering, and Medicine, The National Academies Press, 2022