

CHIPS for America: Execute for Success 2023 Policy and Strategy Summit

April 18, 2023



Russell Senate Office Building, 2 Constitution Avenue NE, Washington, DC



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Russell Senate Office Building, Kennedy Caucus Room

A recording of the summit, photo gallery, and list of entities attending are available at this link:

<https://engineering.purdue.edu/semiconductors/news/development-summit>

Disclaimer

This report represents summarizes the interpretation and conclusions of the summit organizers. Questions, comments, and ideas for follow up summits are encouraged. Please send them to Cristina Farmus at cfarmus@purdue.edu

Agenda

- 10.00 **Welcome, The Honorable Ian Steff**, Former Assistant Secretary of Commerce & President and CEO, mySilicon Compass
- 10:05 **Opening Remarks, Dr. Mung Chiang**, President, Purdue University
- 10.10 **Executing for Success: Government Perspectives Panel**
- **John Neuffer**, President and Chief Executive Officer, SIA, **moderator**
 - **Dr. Erwin Gianchandani**, Assistant Director of the Directorate for Technology, Innovation and Partnerships, National Science Foundation
 - **Dr. Eric Lin**, Interim Director, CHIPS Research and Development, CHIPS for America, U.S. Department of Commerce
 - **Dr. Dev Shenoy**, Principal Director of Microelectronics, U.S. Department of Defense
 - **The Honorable Ramin Taloui**, Assistant Secretary, Bureau of Economic and Business Affairs, Department of State
- 10.55 **Executing for Success: Industry Perspectives Panel**
- **Dr. Rob Atkinson**, President, Information Technology and Innovation Foundation, **moderator**
 - **Dr. Sanjeev Aggarwal**, President and CEO, Everspin Technologies, Inc
 - **Manish Bhatia**, Executive Vice President, Global Operations, Micron
 - **Keyvan Esfarjani**, Chief Global Operations Officer, Intel
 - **Satheesh Kuppurao**, Group VP for Business Development and Growth, Applied Materials
 - **Ajit Manocha**, President and Chief Executive Officer, SEMI
 - **Thomas Sonderman**, President and Chief Executive Officer, SkyWater
- 11.40 **Executing for Success: University Panel**
- **Dr. Todd Younkin**, President and CEO, Semiconductor Research Corporation, **moderator**
 - **Dr. Matt Kay**, T&AM Program Manager, Office of Deputy CTO for Critical Technologies, Department of Defense
 - **Dr. Tsu-Jae King Liu**, Dean and Roy W. Carlson Professor, College of Engineering, University of California, Berkeley
 - **Dr. Mark Lundstrom**, Don and Carol Scifres Distinguished Professor of Electrical and Computer Engineering, Chief Semiconductor Officer, Purdue University
 - **Max Mirgoli**, Executive Vice President of Worldwide Strategic Partnerships, imec
 - **Dr. Philip Wong**, Willard R. and Inez Kerr Bell Professor, School of Engineering, Stanford University
- 12.20 Lunch
- 1.00 **Fireside Chat: The Honorable Gina Raimondo, Secretary of Commerce** with Senator Young, led by Purdue President Mung Chiang
- 1.40 **Closing Remarks, Barbara Snyder**, President, Association of American Universities
- 1.50 **Closing Remarks, Dr. Mung Chiang**, President, Purdue University

Executive Summary

The **CHIPS for America – Execute for Success 2023 Policy and Strategy Summit**, held on April 18, 2023 in Washington, D.C., was co-hosted by Purdue University and U.S. Senator Todd Young. The Krach Center for Tech Diplomacy at Purdue, SEMI, and the Semiconductor Industry Association (SIA) were partners in organizing this summit. The event was attended in person by over 280 participants from 175 distinct entities (government, industry, academia, think tanks, law firms, and professional associations) from over 23 states and Washington D.C.

The theme of this summit was “Executing for Success” with a focus on executing the vision for the CHIPS Act. Three panel discussions offered perspectives from government, industry, and academia, thoughts on the challenges ahead, and ways to sustain the effort over the long term. A fireside chat with The Honorable Gina Raimondo, Secretary of Commerce, and Senator Todd Young was moderated by Purdue President, Mung Chiang, followed by remarks by Barbara Snyder, President of the Association of American Universities.

Some key points from the panel discussions were:

- To ensure sustained U.S. technology leadership, the focus must be on enhancing interagency and public-private collaboration, supporting comprehensive workforce development, and developing viable manufacturing capacity and supply chains.
- The CHIPS Act provides unprecedented support to address these priorities, but will require a sustained effort from government and industry, universities, community colleges, and K-12 educators, as well as key international partners.
- To boost competitiveness, incentives like the CHIPS program are key, but many countries around the world have announced and started to implement similar programs. The U.S. microelectronics industry must take a long-term view and recognize that it faces intense competition for global semiconductor Foreign Direct Investment (FDI) especially as other nations dramatically ramp up their subsidies.
- The need for new talent and upskilling of the current workforce is critical. A waterfall model was proposed: identify a few major university workforce development hubs around the nation, charge them to scale-up programs to have impact within three to five years, then expand the impact to more universities, and establish a national network to coordinate activities, assess and share best practices, and share content.
- There is a need to refresh and update the curriculum for a new era of semiconductor technology. For example, advanced packaging and heterogeneous integration are critical to the future but these topics are largely missing in the current curriculum.

During the fireside chat, Secretary Raimondo and Senator Young discussed ways in which the federal and state governments can support semiconductor workforce development. Robust partnerships between universities and companies, integration of community colleges and high schools, developing new pipelines for talent, and operationalizing the lab to fab concept were identified as high priorities. In her remarks, Barbara Snyder discussed how AAU members are ramping up efforts to recruit more students per Secretary Raimondo’s call to action to triple the number of semiconductor students.

Finally, President Chiang announced the Sustainability Capability for Semiconductors Index (SCSI), a quarterly report to track sustainability indicators across five dimensions of the semiconductors industry: water, power, construction, chemicals, and emissions. Purdue will work with partners such as SIA and SEMI to identify metrics and methodologies for this index.

Executing for Success: Government Perspectives Panel

Moderated by John Neuffer, President and CEO of the Semiconductor Industry Association (SIA), the Government Perspectives Panel focused on amplifying awareness of semiconductor workforce development opportunities and challenges, R&D, and policy initiatives in the U.S. Key take-aways of the government panel were:

- All critical emerging technologies depend on innovation in the chip sector; investments in the semiconductor industry and R&D will determine where the most pioneering chips are manufactured but also who will be the global leaders in microelectronics. The U.S. has taken the right step by funding the CHIPS Act and the implementation effort will require a concerted effort nationally.
- To maintain sustained U.S. technology leadership, the focus needs to be on enhancing inter-agency collaboration, supporting workforce development pathways, and developing manufacturing capacity.
- A reliable supply chain is essential to have robust chip manufacturing. The U.S. needs secure access to the critical materials that are the input to semiconductor production, so the administration needs to involve not only the private sector but also allied governments. Advanced packaging in the U.S. is essential, the industry needs to ensure sufficiently diversified and resilient capacity for downstream processing even though some production steps may still continue to take place in other countries.
- A critical aspect is to coordinate policy at national and global level; chips have important civilian and critical national security applications around the world; the U.S. government needs to ensure that policy is coordinated to maximize allied partnerships. Some examples discussed are related to building transparency in sharing critical information and developing early warning systems.
- New workforce development programs need to focus on attraction, retention, and innovative ways to train students, with more emphasis on experimental learning, including hands-on training in universities and community colleges, but also expanded internships.
- Cutting edge innovation happens when multiple disciplines collaborate; R&D and educational programs have to be designed to foster collaboration for the long term. The new funding opportunities will enhance engineering, science, technology, and education interactions, and also emphasize the importance of industry sectors cross pollination.
- The CHIPS Act provides unprecedented opportunities not only for inter-agency collaboration, but also to support universities and small and medium entities to collaborate and build an integrated between industry, academia, and government. The CHIPS Act provisions were written to leverage federal funding with private industry investments to maximize R&D, manufacturing, and innovation in the U.S.
- The role of the government is not only to allocate the CHIPS funding, but also to take a wholistic, long-term approach when coordinating the effort internally and globally. All funding agencies are energized to work on this once in a generation opportunity.

Executing for Success: Industry Perspectives Panel

Moderated by Dr. Rob Atkinson, President, Information Technology and Innovation Foundation, the Industry Perspectives Panel brought together representatives from Applied Materials, Everspin Technologies, Intel, Micron, SEMI, and SkyWater and focused on the importance of partnerships, talent development, and system approach to maintain leading edge in innovation and rebuilding manufacturing capacity. Key take-aways of industry panel were:

- Semiconductor technology has critical commercial applications as well as for national security; the CHIPS for America Act helps universities, small entities, and large companies collaborate to streamline the lab-to-fab process and accelerate innovation.
- The U.S. is strong in microelectronics innovation; the industry now needs to focus on building significant manufacturing capacity in the U.S while being cost effective.
- Key areas where the U.S. should focus are advanced logic, advanced packaging, and expanding the foundry services model.
- The supply chain is difficult to build, but the U.S. has a transformational opportunity to broadly engage the entire ecosystem from universities, material suppliers, design software, Electronic Design Assisted (EDA) equipment suppliers, fabs, packaging houses, and customers. A concerted effort will raise the chances of success.
- Workforce development is critical; by some estimates, close to 90 new fabs will be built around the world, with dozens in the U.S., which will require an estimated 100K workers. Developing competent talent is a dire need and setting up training programs in the U.S. is a priority for universities and companies alike.
- Universities need financial support for semiconductors training facilities and scaling up programs. Companies need to engage, provide expertise, and signal the developing workforce that the industry is on a growing trajectory and opportunities abound.
- Coalitions like American Semiconductor Academy (ASA), non-profit organizations like the Semiconductor Research Corporation (SRC), and universities such as Purdue are creating innovative programs for semiconductors talent development. Challenges range from attracting more STEM students, to keeping them engaged until graduation, to providing meaningful training activities so that graduates can quickly become productive once they join the workforce.
- Many countries have announced and started to implement similar CHIPS programs. To boost competitiveness, incentives like the CHIPS program are key. U.S. industry also needs take a long-term view and not make hasty changes based on quarterly results.
- The U.S. is in a privileged position to attract global talent. Scaling up workforce development programs in the U.S. has to be matched by immigration reform to make it easier for highly competent workers and international students to integrate in the American ecosystem and contribute to economic growth.
- Finally, it must be understood that the U.S. faces intense competition for global semiconductor Foreign Direct Investment (FDI) especially as other nations dramatically ramp up their subsidies.

Executing for Success: University Perspectives Panel

Moderated by Dr. Todd Younkin, President and Chief Executive Officer, Semiconductor Research Corporation, the University Perspectives Panel brought together university representatives from Purdue, Stanford, UC Berkeley, as well as imec and the Office of Critical Technologies to discuss the lack of semiconductor talent, how to engage students to pursue careers in microelectronics, and partnership models. Key take-aways of university panel were:

- The American Semiconductor Academy (ASA) example was used to emphasize some of the needs that all universities face and potential solutions, such as creating a national network for microelectronics education - a private/public partnership to bring people together, modernize and share curricular content, develop infrastructure for hands-on chip design, and properly staff existing facilities so they can be opened up to more students. Also important is the need to increase the number of faculty positions dedicated to microelectronics and advanced packaging education and R&D, and to increase R&D funding.
- Over the past 20 years, the number of students who graduated with engineering degrees has doubled, but the career opportunities in semiconductors are not being recognized by students. Universities need to showcase that the semiconductor industry is multi-disciplinary and continue to highlight the importance of microelectronics and advanced packaging to make it a more inviting area of study. It takes time to develop programs and train graduates, actions need to be implemented now to see results in a few years.
- The critical importance of advanced packaging and heterogeneous integration to the future of semiconductor technology and that fact that it is largely missing in current curricula must be appreciated.
- Actions need to be implemented at middle school early in the education cycle to create a pipeline of interested talent. High School teachers play a major role and should be made aware of career opportunities in the semiconductor industry.
- A waterfall model was proposed: identify five major university workforce development hubs around the nation, charge them to scale-up and have impact in three to five years, then expand the impact to more universities, and eventually establish a national network for coordinate activities, assess and share best practices.
- A part of the challenge is to help students understand the invisible side of the semiconductors industry, how wide the applications are, and expand the training to encompass more applied training.
- Everyone (academia, industry, government) is responsible for updating and modernizing the curriculum around semiconductors, with the need to fund and develop more hands-on training and experiential learning as a top priority. Additional effort needs to be invested in special categories, such as veterans, to attract them to the semiconductor industry.
- The CHIPS Act has proven that government agencies can coordinate for the good of the nation, industry, and society, however, there is room to streamline the collaboration between universities, industry, and organizations.

Fireside Chat

Purdue President Mung Chiang moderated a conversation between The Honorable Gina Raimondo, Secretary of Commerce, and Senator Todd Young, Indiana. The CHIPS Act is a bipartisan initiative that provides unprecedented levels of funding for any industry, a public – private partnership that enhances national security, economic growth, and trust in government.

President Chiang announced the Sustainability Capability for Semiconductors Index (SCSI), a quarterly report to track state-of-the-art sustainability indicators across five dimensions of the semiconductors industry: water, power, construction, chemicals, and emissions. Purdue will work with partners such as SIA and SEMI to identify the metrics and methodology for this index.

Secretary Raimondo reinforced ways in which the U.S. can support semiconductors workforce development, such as robust partnerships between universities and companies, integration of community colleges and high schools, involving industry in training, developing new pipelines for talent, and operationalizing the lab to fab concept to maximize efficiencies. The U.S. has a critical task to develop talent for the national security sector by attracting students to STEM disciplines and embedding them in microelectronics defense programs.

Purdue and Indiana provide good models to fill the estimated 100K technicians and engineers gap in the semiconductors industry. Examples include developing innovative ways to attract and train students, innovative curriculum, partner with other universities and community colleges, and investing in facilities. Purdue announced a planned \$100M enhancement of the Birck Nanotechnology Center, with phase one of \$49M approved by the Board of Trustees on April 14, 2023. Indiana has already funded a \$5M workforce development grant to support semiconductors curriculum development in collaboration with Ivy Tech Community College. The Indiana based Naval Service Warfare Center, Crane Division, employs over 1,000 people developing next generation technology for the Department of Defense, playing an increasingly important role in microelectronics. One third of the nation's engineers are educated in Indiana or surrounding states; reliable utilities, friendly government, and stable business environment are just a few reasons why SkyWater and MediaTek chose to locate in Indiana.

The CHIPS funding process starts with facilities and leading edge first, will involve existing and mature nodes, to culminate with a focus on supply chain. Over 200 statements of intention have been received for the funding opportunities already announced. The Department of Commerce has recruited experts in many fields, including semiconductors, engineering, and finance to ensure a thorough and fair evaluation of the applications. Another initiative under consideration is a permanent implementation of IRS Tax Code Section 174 to allow for R&D investments to be expensed immediately, with beneficial implications especially for small and medium enterprises.

To sustain innovation and competitiveness, the U.S. has to build and grow partnerships with like-minded nations and take a global approach to semiconductors supply and demand. Investments in building manufacturing capacity have to be matched by sustaining R&D activities and talent development programs.

The entire nation, government, industry, and academia alike, need to stay focused on implementing the CHIPS Act, find ways to remove barriers, optimize processes, and continue to provide feedback for progress.

Closing Remarks, Barbara Snyder

Closing remarks were given by Barbara Snyder, President of the Association of American Universities (AAU). AAU is committed to advocate for critical funding to ensure that the U.S. retains the competitive edge on the global stage. There are not enough STEM workers to meet the industry demands. Universities need to work together to attract more students, guide them towards choosing STEM fields, and training them to meet the challenges of the industry today.

AAU members are ramping up efforts to recruit more students, per Secretary Raimondo's call to action to triple the number of semiconductor students. Funding needs to be allocated not only to build and expand commercial manufacturing facilities, but also for educational facilities, equipment, staff, and maintenance. Universities and community colleges need to partner, share best practices, develop curriculum, maximize utilization of facilities, and chart new pathways especially for under-represented categories. R&D funding is critical to ensure a vibrant talent ecosystem and continuous innovation.

Immigration reform also has to be part of the solution. Many students come to study in the United States and after graduation they can't find a domestic job because of work restrictions. To address the critical shortage of qualified workers for the semiconductors industry, the government should also consider how to integrate them to contribute to the U.S. economy.

Closing Remarks, Mung Chiang

In his closing remarks, Purdue President Mung Chiang thanked all speakers representing government, industry, and academia, not only for their participation in the CHIPS for America – Execute for Success Summit, but also for their work to execute the vision of the CHIPS Act. To build the momentum of such impactful legislation Purdue is implementing a few initiatives such as launching the *Global Roadmap to 6G* taxonomy report in May 2023, in collaboration with Cisco, Dell, Ericsson, Intel, Nokia, and Qualcomm. Purdue has also hired industry, government, and academia veteran Mark Lewis as the CEO for the Purdue Applied Research Institute (PARI), the non-profit applied research arm of Purdue University. PARI extends the reach and impact of Purdue's deep research strengths and top-ranked academic programs in engineering, agriculture, science, and technology.

Purdue is establishing a permanent presence in D.C., with offices adjacent to the Krach Institute for Tech Diplomacy at Purdue, on the third floor in the Washington Post Building at 1301 K Street NW. This will enable several Purdue programs such as PARI and the C-SPAN [Boilers Go to D.C. program](#) to grow in scale and scope, connecting D.C. based alumni, as well as government and agency partners, with current students and faculty, providing internship, networking and engagement opportunities. To showcase these initiatives, Purdue is launching the www.purdue.edu/DC website.

President Chiang announced the Purdue Manufacturing Gateway Initiative and will convene a forum of industry, government, and academia in fall 2023 in Washington D.C.