NSF and the Future of Semiconductors and Microelectronics

Margaret Martonosi
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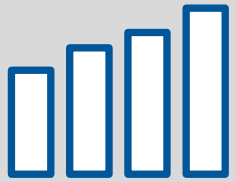
U.S. National Science Foundation

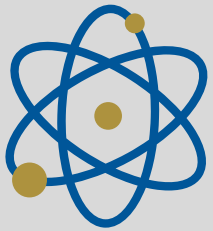
Programmatic directorates and offices supporting the NSF Mission and Vision

“CHIPS and Science” and NSF: The CHIPS side of the legislation

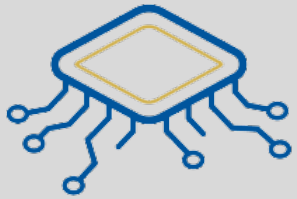


Funding: Appropriates $200 Million over 5 years

FuSE, Fab Access and Fellowships



Future Semiconductors (FuSe) Research: Co-Design across technology stack



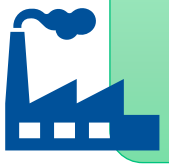
Fab Access

Fellowships & Semiconductor Workforce

NSF approach to CHIPS

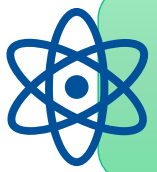
- **Leverage existing programs** to allow moving forward immediately
- **Expand fellowships and scholarships for diverse talent** in semiconductor design and manufacturing, starting with **community colleges and Minority-Serving Institutions (MSIs)**
- **Grow Research** in the future of semiconductors and microelectronics, **advancing the work of** a large cadre of **graduate students**
- Enhance access to experiential learning through **semiconductor and microelectronics fabrication and prototyping**
- Double down on our **public and private partnerships** to advance semiconductor research and workforce development

NSF supports an interconnected research portfolio



Future Manufacturing
$130 M

Resilient & Intelligent Next-Gen Systems
$40 M



Quantum Leap Challenge Institutes
$150 M

Systems

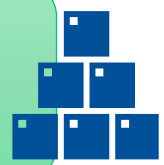
Devices

Materials

Co-designing Future Semiconductors (FuSe)
$40 M with industry

National AI Research Institutes
$500 M

DMREF: Designing Materials for the Future
$280 M

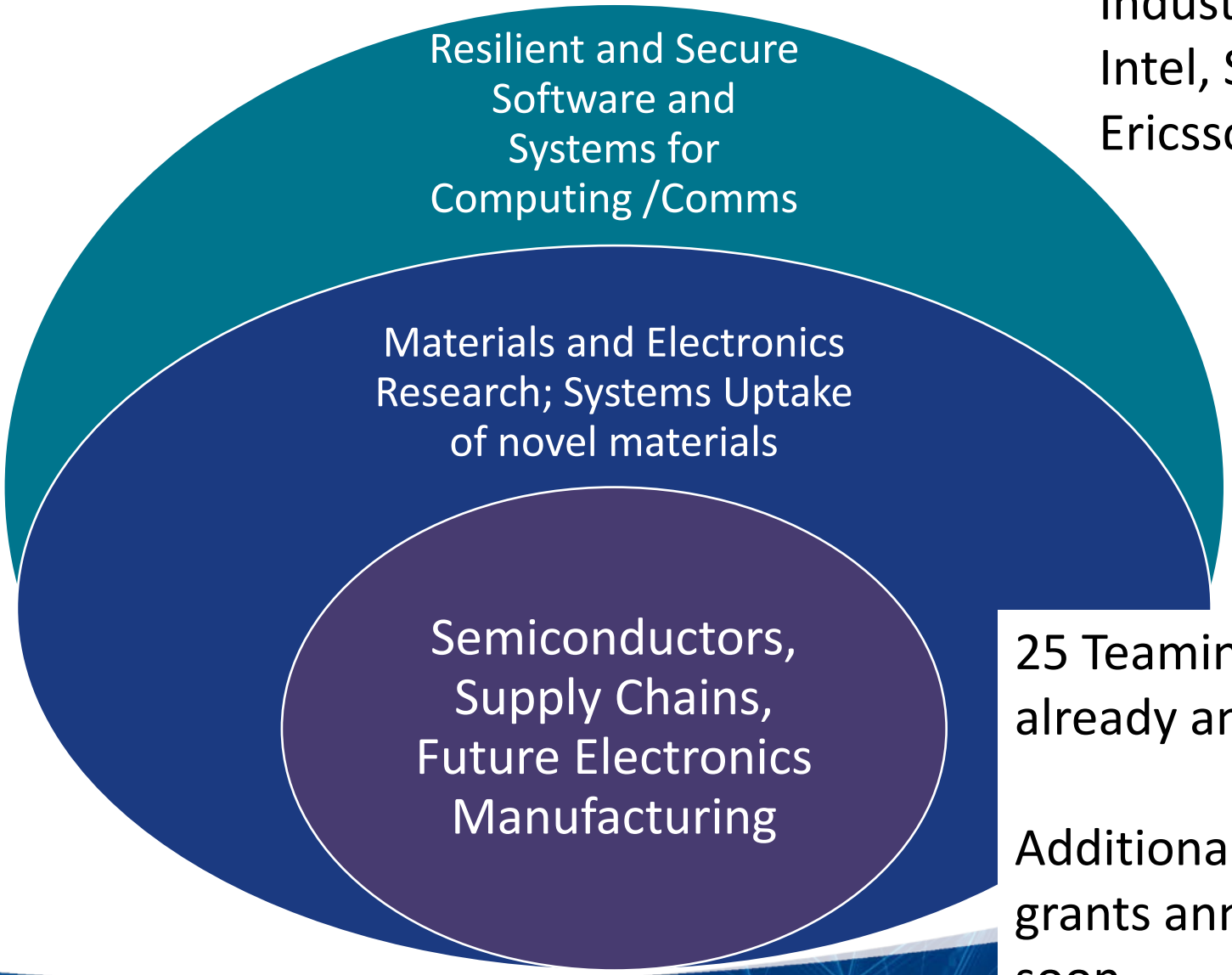


(investments to date and thru FY 2023)

(+ Significant further investments through core research programs)

FuSe: Future of Semiconductors
Multi-Directorate Partnership + Industry

- Semiconductor scaling and fab challenges are driving a seismic shift in computer and communications system design
- Goal: FuSe Innovations for resilient and secure electronic systems from materials to applications
- Strategy: Co-design across topic areas



Industry partners: Intel, Samsung, Ericsson, and IBM

25 Teaming Grants already announced.

Additional larger-scale grants announced soon

Facilitating Chip Fab Access for Research Prototypes

Goal: Enhance pathways for NSF-funded computing researchers to fab chip prototypes as part of their research

Approach:

- Supplements on wide range of NSF-funded projects:
  - https://www.nsf.gov/pubs/2022/nsf22113/nsf22113.jsp
- New projects in collaboration with researchers from Taiwan
  - https://www.nsf.gov/pubs/2022/nsf22636/nsf22636.htm

Dear Colleague Letter

Supplements for Access to Semiconductor Fabrication (ASF)

August 16, 2022

Invites supplemental funding requests from current awardees of NSF's ENG or CISE directorates or NSF's Division of Materials Research to support fabrication of research devices and systems through standard semiconductor fabrication facilities.

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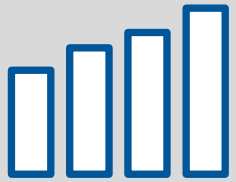
FuSE, Fab Access and Fellowships



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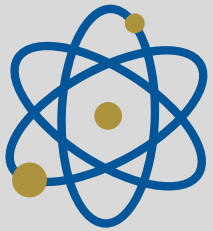

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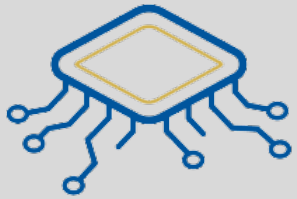

Fab Access

Fellowships & Semiconductor Workforce

NSF Partnerships on Semiconductor Workforce

Dear Colleague Letter

Enhancing Engineering Technology and Advanced Semiconductor Manufacturing Technician Education (ETSTE)

September 8, 2022

Encourages proposals to two programs supporting workforce development efforts at institutions of higher education. Proposals must build on or leverage strong industry-academic partnerships to strengthen the semiconductor manufacturing workforce.

NSF News

NSF announces $10 million partnership with Micron to support semiconductor design and manufacturing workforce development

October 28, 2022

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/ NSF announces $10 million partnership with Intel Corporation to train and build a skilled semiconductor manufacturing workforce

NSF announces $10 million partnership with Intel Corporation to train and build a skilled semiconductor manufacturing workforce

September 8, 2022

https://beta.nsf.gov/funding/opportunities/enhancing-engineering-technology-and-advanced-semiconductor-manufacturing

ExLENT: Experiential Learning for Emerging and Novel Technologies

Program promotes partnerships between organizations in emerging technology fields and those with expertise in workforce development to expand practical learning opportunities for individuals interested in entering or gaining more experience in emerging and novel technology.

Funding up to **$1 million** over **3** years
Next deadline: Sept 14, 2023

Opportunity available to:

- Academia
- Business & Industry
- Government
- Nonprofits

https://new.nsf.gov/funding/opportunities/experiential-learning-emerging-novel-technologies

CSGrad4US Fellowship Program

Goal

Enhance number and diversity of US citizen and permanent resident graduate students in computing fields

Target

Bachelor's degree holders returning from industry into Ph.D. programs

Fellowship

1-year mentorship program: graduate school application, process, and research success

3 years of full tuition and stipend funding

	2021	2022
Demographics		
Women	32%	44%
Hispanic/Latinx	9%	16%
Black/African American	3%	10%
Disability	15%	24%
Current Status		
Enrolled in graduate school	47%	-
Applying this year	29%	98%

https://www.nsf.gov/cise/CSGrad4US/


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