

# NAE Report

## *A New Vision for Center-Based Engineering Research*

### Workshop

Hilton Mark Center, Alexandria, VA

November 3, 2017





# Background

Since 1986, the National Science Foundation (NSF) has funded more than 70 Engineering Research Centers (ERCs) to the tune of \$3-5 million dollars per year for up to 10 years. ERCs exist to bring industry and academic partners together to develop multidisciplinary engineering systems. This program has gone through three generations so far. Gen-1 ('85-'90) required interdisciplinary research at a single university with industry partners. Gen-2 ('94-'06) added an additional requirement that the lead university engage with partner universities, including at least one minority-serving university. Finally, Gen-3 ('08-Present) now requires foreign partnerships, in addition to the previous requirements.

In 2017, the National Academy of Engineering (NAE) released the report *A New Vision for Center-Based Engineering Research*, making recommendations for the fourth generation of ERCs. The central proposal is that Gen-4 ERCs focus on the idea of convergence: an “approach to research that brings together teams of experts from multiple disciplines who collaborate deeply.” The best way to understand convergence is to think of disciplinary integration along a spectrum, going from **multidisciplinary** to **interdisciplinary** to **transdisciplinary (convergent)**.

An offshoot of the recommendation that ERCs move to becoming Convergent ERCs (CERCs) is a recommendation that CERCs focus on Grand Challenge-like problems. This differs from the current approach of pursuing interesting early-stage technologies. The report proposes three possible center models and recognizes there are more possibilities:

- The Grand Challenge-based Model: a CERC would choose one NAE Grand Challenge and pursue an element of it. By framing their work this way, they make clearer the societal benefit, and may be more likely to collaborate with other CERCs working on the same Challenge.
- The Prize-based Innovation Model: a CERC would work with NSF and industry to manage prizes encouraging the reaching of core technological milestones. Such prizes have the potential to inspire a new generation of innovators to tackle important problems and potentially increase project impact.
- The Federal-State-Local Partnership Model: a CERC would receive funding from NSF and a regional partner (city, state, or other economic interest) to pursue regionally specific technological solutions. These projects would directly benefit the local economy as well as ensure interaction amongst a wide number of stakeholders.

This workshop, hosted by the **American Society for Engineering Education**, aims to benefit from the experience of its participants (from current and alumni ERCs) and garner insights from the ERC community with respect to (1) recommendations from the aforementioned NAE report *A New Vision for Center-Based Engineering Research* and (2) the Gen-4 ERC program.

# Workshop Program

Friday, November 3, 2017

7:30 AM	-	8:30 AM	<b>Registration and Breakfast</b>	Plaza Foyer
8:30 AM	-	8:45 AM	<b>Welcome and Introduction</b> Dawn Tilbury, Assistant Director, Engineering Directorate, National Science Foundation	Ballroom BC
8:45 AM	-	9:45 AM	<b>Plenary</b> Darryll Pines, Dean and the Nariman Farvardin, Professor of Aerospace Engineering at the Clark School, UMD	Ballroom BC
9:45 AM	-	10:00 AM	<b>Instructions for Facilitated Discussion I</b>	Ballroom BC
10:00 AM	-	10:15 AM	<b>Break</b>	Plaza Foyer
10:15 AM	-	11:15 AM	<b>Facilitated Discussion I: What is the Role of ERCs in Building the Engineering Community/Workforce of Tomorrow?</b>	Breakout Rooms
11:15 AM	-	11:45 AM	<b>Report-out from Facilitated Discussion I</b>	
11:45 AM	-	1:15 PM	<b>Lunch Keynote</b> M. K. (Ram) Ramasubramanian, Vice President for Research, University of Virginia	Ballroom BC
1:15 PM	-	1:30 PM	<b>Instructions for Facilitated Discussion II</b>	Ballroom BC
1:30 PM	-	2:15 PM	<b>Facilitated Discussion II: What is the Role of Convergence?</b>	Ballroom BC
2:15 PM	-	2:30 AM	<b>Break</b>	Plaza Foyer
2:30 PM	-	3:30 PM	<b>Panel: Different Methods of Center Team Formation</b> <ul style="list-style-type: none"> <li>• Cecilia Conrad, Managing Director, MacArthur Foundation</li> <li>• Jim Pinkelman, Senior Director, Microsoft Research</li> <li>• Ravinder Chona, Senior Scientist, Air Force Research Laboratory</li> </ul>	Ballroom BC
3:30 PM	-	4:30 PM	<b>Facilitated Discussion III: How Should Centers be Formed?</b>	Breakout Rooms
4:30 PM	-	5:00 PM	<b>Report-out from Facilitated Discussions III</b>	Ballroom BC
5:00 PM	-	5:30 PM	<b>Wrap-up and Closing Remarks</b> Don Millard, Acting Division Director, EEC Division, National Science Foundation	Ballroom BC

# Session Guiding Questions

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10:15 AM - 11:15 AM **Facilitated Discussion I: What is the Role of ERCs in Building the Engineering Community/Workforce of Tomorrow?** Breakout Rooms

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1. How do your Center's educational and workforce development programs fit in with/compare to those of your University at large?
2. How does your Center's diversity and culture of inclusion-related work fit in with/compare to that of your University at large?
3. How could Centers better evaluate innovative pedagogy and disseminate successful models as part of their core function?
4. How might Centers further engage in discipline-based educational research on the learning that takes place in the innovative settings provided by the Centers?
5. What should the role of an ERC be in building the future engineering workforce?
6. What should the role of an ERC be in shaping the culture of Universities and the larger engineering community?

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1:30 PM - 2:15 PM **Facilitated Discussion II: What is the Role of Convergence?** Ballroom BC

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1. Explore the idea of convergence and the varying definitions of convergence.
2. How is convergence already playing out in ERCs and across Institutions?
3. What role should it play in future centers?
4. Should the name of the program be changed to include the word *convergence*?
5. How would this idea of convergence have impacted the way your center would have formed?

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3:30 PM - 4:30 PM **Facilitated Discussion III: How Should Centers be Formed?** Breakout Rooms

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1. How might guided topics, such as the NAE Grand Challenges or NSF Big Ideas, affect the way a center is formed?
2. Should the Gen-4 ERCs address only guided topics, such as the NAE Grand Challenges or NSF Big Ideas?
3. How could the process of team formation be facilitated by NSF?
4. How might NSF facilitate the selection of accomplished leaders as possible Gen-4 ERC Center Directors?

# Venue Map

## Hilton Alexandria Mark Center

### Meeting Room Floor Plan





Founded in 1893, the **American Society for Engineering Education (ASEE)** is a global society of individual, institutional, and corporate members. ASEE seeks to be the pre-eminent authority on the education of engineering professionals by advancing innovation, excellence, and access at all levels of education.

ASEE engages with engineering faculty, business leaders, college and high school students, parents, and teachers to enhance the engineering workforce of the nation. We are the only professional society addressing opportunities and challenges spanning all engineering disciplines, working across the breadth of academic education, research, and public service.

- We support engineering education at the institutional level by linking engineering faculty and staff to their peers in other disciplines to create enhanced student learning and discovery.
- We support engineering education across institutions by identifying opportunities to share proven and promising practices.
- We support engineering education locally, regionally, and nationally by forging and reinforcing connection between academic engineering and business, industry, and government.



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