

Coalition for Plasma Science: Building a Workforce

Evdokiya (Eva) Kostadinova¹ & Jessica Eskew²

¹ Auburn University, CPS Chair

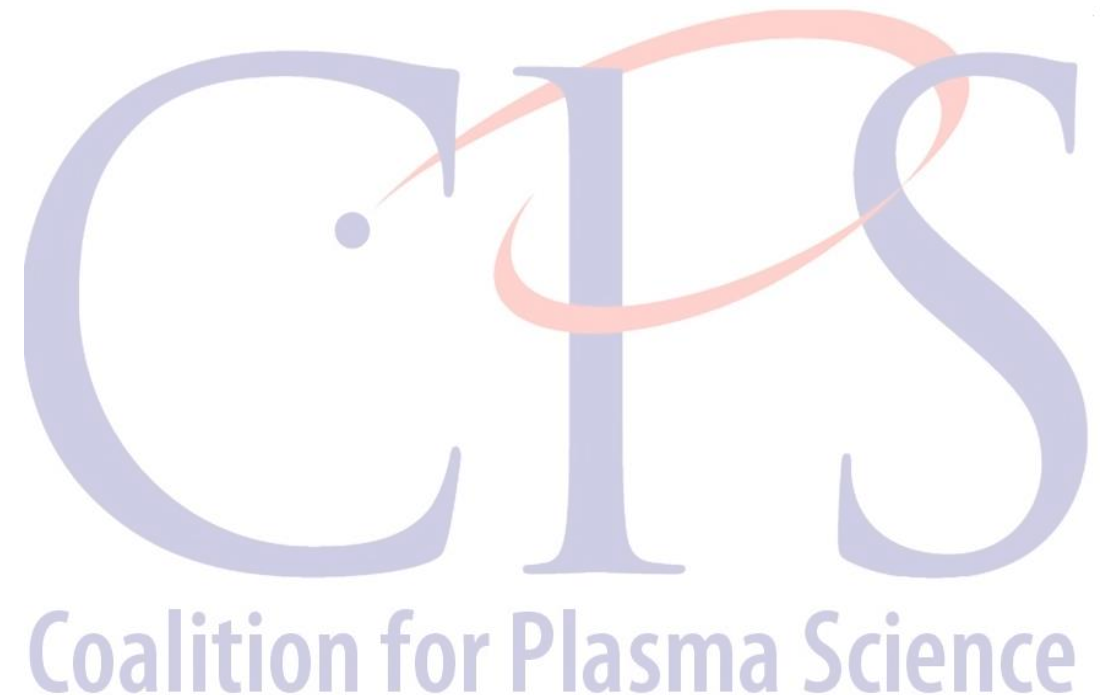
² Auburn University, APS Committee on Status of Women in Physics

Prepared by: CPS board, with contributions from Shannon Greco (PPPL), Jessica Eskew (Auburn), and leaders of the Future Technologies and enabling Plasma Processes collaboration (FTPP OIA-2148653)

Fusion Power Associates Meeting

Washington, D.C.

Dec 19, 2023

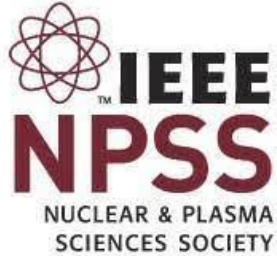


Coalition for Plasma Science



- Established in 1997 as a non-profit organization
 - Mission:** To increase public awareness and understanding of plasma science and its many applications and benefits for society.
 - Founders:** Rick Temkin (MIT PSFC), Toby Smith (MIT Washington Office), Gerald Rogoff (Sylvania, MIT PSFC), Paul Rivenberg (MIT), **Steve Dean (FPA).**

Sponsored by APS and IEEE



IEEE grant renewed until 2026.



Chair: **Eva Kostadinova** (Auburn U) Vice-Chair: **Dmitri Orlov** (UCSD)

Treasurer: **Steve Dean** (FPA)

Current leadership. Looking for a secretary.

Coalition for Plasma Science



Website:
plasmacoalition.org



Join the Coalition!

CPS has four main goals

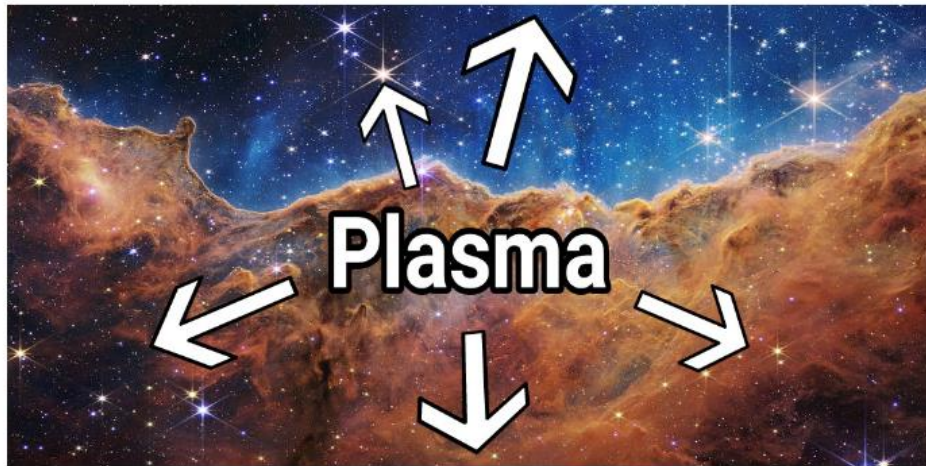


1. Unite the plasma research community behind a **common message**

2. Promote **plasma-focused K-12** education and engagement

Just Say Plasma

A white paper submitted to the Solar and Space Science Decadal Survey 2024-2033 on the importance of including the word "plasma" in public outreach, news articles and educational material from the solar and space sciences and beyond.



CPS has four main goals



3. Broaden support for **plasma research, education, and training** at colleges and universities, national labs and industry

4. Maintain a website to **show the wonder, utility and diversity** of plasmas.

Physics of Plasmas PERSPECTIVE pubs.aip.org/aip/pop

Summary report from the mini-conference on workforce development through research-based, plasma-focused activities

Cite as: Phys. Plasmas **30**, 060601 (2023); doi: 10.1063/5.0144847
Submitted: 1 February 2023 · Accepted: 4 May 2023 ·
Published Online: 1 June 2023

[View Online](#) [Export Citation](#) [CrossMark](#)

Evdokiya G. Kostadinova,^{1,a),b)} [ORCID](#) Shannon Greco,^{2,b)} [ORCID](#) Maajida Murdock,³ Ernesto Barraza-Valdez,⁴ Hannah R. Hasson,⁵ [ORCID](#) Imani Z. West-Abdallah,⁵ Cheryl A. Harper,⁶ [ORCID](#) Katrina Brown,⁷ [ORCID](#) Earl Scime,⁸ [ORCID](#) Franklin Dollar,⁴ [ORCID](#) Carl Greninger,⁹ Bryan Stanley,¹⁰ [ORCID](#) Elizabeth Oxford,¹¹ [ORCID](#) David Schaffner,¹² [ORCID](#) Laura Provenzani,¹³ Chandra Breanne Curry,¹⁴ [ORCID](#) Claudia Fracchiolla,¹⁵ [ORCID](#) Shams El-Adawy,¹⁶ [ORCID](#) Saikat Chakraborty Thakur,¹ [ORCID](#) Dmitri Orlov,¹⁷ [ORCID](#) and Caroline Anderson¹⁸

HOME ABOUT PUBLICATIONS EDUCATION

Coalition for Plasma Science

The Coalition for Plasma Science is a group of institutions, organizations, and companies joining forces to increase awareness and understanding of plasma science and its many applications and benefits for society. We hope that by visiting this Web site you learn some new things about plasmas in our world, in our society, and in our economy.

[More about CPS](#) [More about Plasma](#)

CPS activities focus on 4 main goals



1. Unite the plasma research community behind a **common message**

➤ “Just Say Plasma” white paper (*Solar and Space Science Decadal Survey 2024-2033*)

➤ 2024 Workshop on Plasma Communication → ***sponsors/presenters welcome***

2. Promote **plasma-focused K-12** education and engagement

➤ CPS table at APS DPP Plasma Student Expo

➤ [APS PhysicsQuest](#) Plasma kits → ***donate to buy more kits***

3. Broaden support for **plasma research, education, and training** at colleges and universities, national labs, and industry

➤ Workforce mini-conference (2022) → ***report published in 2023 in PoP***

➤ Workforce sessions at DPP (2023) and MagNetUS (2023)

➤ Workforce panels (LaserNet 2023)

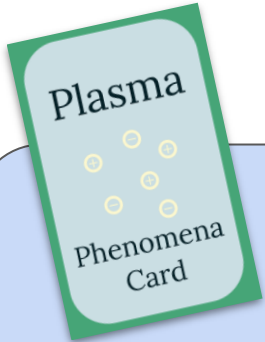
➤ Plasma Certification Program (FTPP collab) → ***partners are welcome***



Kostadinova, et al.
PoP 30, no. 6 (2023).

4. Maintain a website to **show the wonder, utility and diversity** of plasmas.

CPS collaboration with APS PhysicsQuest



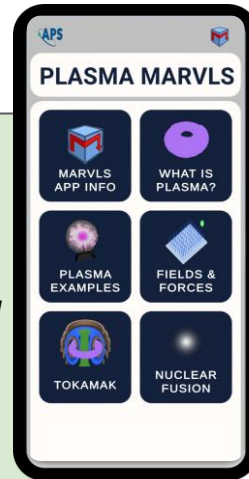
Plasma Science

Plasma Phenomenon

*Where does plasma exist in our universe?
What are the characteristics of plasma?*

MARVLS: Plasma App

Exploring and connecting natural phenomena and human-made instruments utilizing plasma.



A Star is Born

Where do stars come from? What are stars made of? How do stars form?

Three-Legged Challenge for Thermonuclear Fusion

Discovering crucial criterion to achieve thermonuclear fusion.



- **Plasma kits** created by plasma scientists and K-12 teachers
- Connection to science standards and a focus on DEI learning strategies in partnership with the **STEP UP Program**.
- Developed for wide distribution in the **Fall of 2024**.
- Demonstration during **Teachers Day** and **Plasma Student Expo**.

Sponsors/partners are welcome!

CPS collaboration with PPPL and APS DPP



■ Workforce Development Through Research-Based, Plasma-Focused Science Education and Public Engagement

- two half-days, 17 speakers, diversity of topics (K-12, DEI, physics education research, public engagement, science communication)



PoP publication: Kostadinova, Evdokiya G., Shannon Greco, et al. *PoP* 30, no. 6 (2023).

Read it, cite it, give us feedback!

Bridging the gap between plasma education and workforce



■ Recommendations on workforce

Challenge: Most plasma training programs for high-school and undergraduate students, such as summer schools, do not grant professional certifications.

Recommendation: Programs focused on **training the plasma workforce** should be established both at the state and the national level. Those should be implemented as certified professional development programs, specializations in Bachelor's degrees, or one-year Master's degrees.

Responsibility: Plasma colleagues at academic institutions should work with national labs and industries to **develop curriculum and training materials**. University leadership can work towards **providing certification** of these programs. A **public-private** partnership between government funding agencies and industries can be used to **sponsor** these programs. Nonprofit plasma organizations and emerging community networks can help advertise and recruit participants for the programs.



PoP publication: Kostadinova, Evdokiya G., Shannon Greco, et al. *PoP* 30, no. 6 (2023).

***Read it, cite it,
give us feedback!***

CPS collaboration with NSF EPSCoR FTTP



- We propose the establishment of “**Gateway to Plasma**” - a plasma-focused professional development program in the state of Alabama
- This program will be initiated by the NSF EPSCoR project **Future Technologies and enabling Plasma Processes (FTPP)**, which is a collaboration between nine universities (including four HBCUs) and one industry in Alabama
- Hybrid format
 - **Self-paced** online lecture classes
 - **Hands-on** practice in local labs
 - Access to **super-computing** facilities
 - Engage local **businesses**



Source: iStock by Getty Images

Future Technologies and enabling Plasma Processes (FTPP)



- 1) Advancing foundational plasma science with foci on four natural and laboratory plasma systems
- 2) Creating future technologies in advanced materials, bio-medical products, sterilization of food, seeds, and equipment, and developing space weather fore/nowcasting tools, and
- 3) Expanding a highly trained, inclusive PSE workforce.

University of Alabama at Huntsville (UAH, lead)

Tuskegee University

University of Alabama at Birmingham (UAB)

Auburn University

Alabama A&M University

Oakwood University

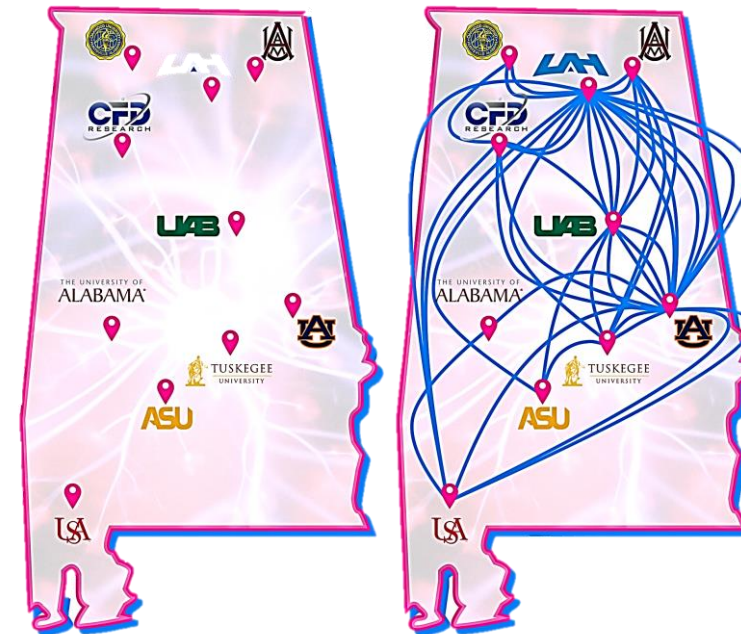
CFDRC

University of South Alabama

Alabama State University

University of Alabama

Historically Black Colleges and Universities (HBCUs)



University of Alabama, Huntsville Certification Program



- Program structure:

- **short-term** programs (30-45 hours to complete, stretched over 30-90 days)
- **Two-tiered** structure: Intro to Plasma (30 hours) + Plasma Applications (15 hours)
- Open to **students** and working **professionals** (students pay less)
- **Pass-Fail** structure (70% to pass)
- Platform is based on **Canvas** and videos are done with **Panopto**

- Benefits:

- offers **specialized knowledge** that could bolster your résumé or help you advance in your current career
- more **productive** in your current job by acquiring a new skill
- more **valuable** to your current employer by enhancing an existing skill
- more **competitive** on the job market by acquiring new skills

How to develop content in a fast and efficient way?



- **Graduate:** consolidate materials from graduate-level general plasma classes taught at the 9 universities
 - Example: Auburn **Survey of Plasma** (PHYS 5620) and **Plasma Physics** (PHYS 8600) classes
- **Undergraduate:** work with plasma summer undergrad programs
 - Example: **SULI Intro Course** [2020](#), [2021](#), [2022](#)
- **Topic-specific:** work with initiatives and specialized university classes
 - Example: [PlasmaPy](#), AU **Dusty Plasma** (PHYS 5600), K-12 teaching
- **Industry-specific:** fusion, plasma processing, nanotechnology
 - Example: Survey **Fusion Industry Association** on the skills most relevant to jobs in fusion startups

Partners/feedback are welcome!

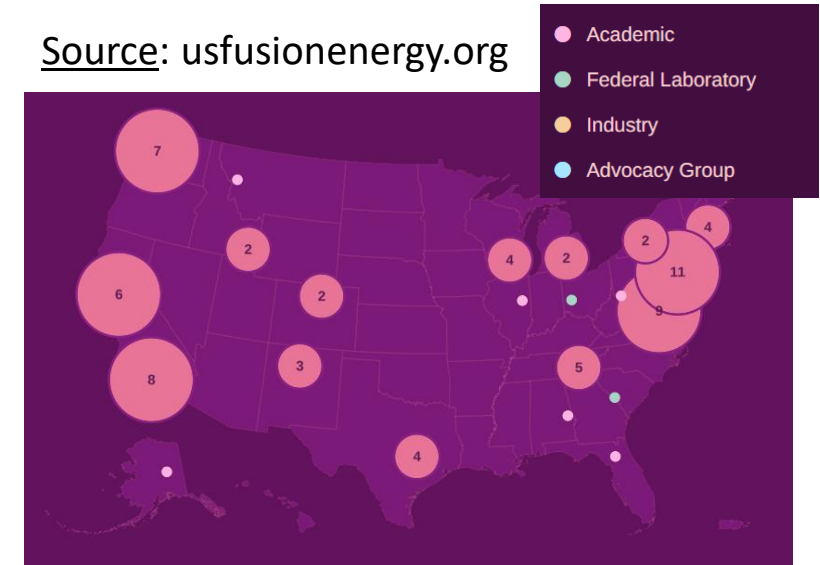
Can we start local but go national? International?



- Engaging colleagues:

- **Other networks:** MagNetUS, LaserNetUS, LTPNet, Znet, etc.
- **User/Collaborative facilities:** MPRL, WiPPL, BaPSF, DIII-D, ZEUS, etc.
- **Large collaborations:** EPSCoR grants, collaborative grants, centers
- **Organizations:** Coalition for Plasma Science, Fusion Power Associates, Fusion Industry Association, University Fusion Association, US Burning Plasma Organization, Small College Consortium, etc.

Source: usfusionenergy.org



Source: euro-fusion.org



Partners/feedback are welcome!

CPS partnership with PPPL: PlasmaNET



- **Plasma Network for Engagement and Training Mission:**
Establish a network of people engaged in plasma-focused public engagement, education/training, DEI, and related topics
 - Provide **support for newly-hired colleagues** (e.g., outreach coordinators)
 - Share best practices and establish a **repository of materials**
 - Collect and share data in coordinated way → **publications**
 - Develop and share **impact assessment tools**
 - Promote **plasma communication**



PlasmaNET Slack

Promoting Plasma Communication



■ 2024 Workshop on Plasma communication

Unite the plasma research community behind a common message

- Session on engaging **diverse** audiences (**K-12**-focused)
- Session on science writing (**media**-focused)
- Workshop on crafting **consistent messages** (public engagement)
- Session on advocacy and engaging **policy makers**
- Developing materials for **industry sponsors**



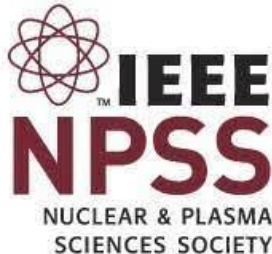
PlasmaNET Slack

Sponsors/Speakers are welcome!

Join the Coalition!

- Coalition for Plasma Science website: www.plasmacoalition.org
- Contact emails: egk0033@auburn.edu (Eva Kostadinova, chair) and dorlov@ucsd.edu (Dmitri Orlov, vice-chair)
- List of members includes universities, national labs, private companies, professional societies, international members.

Sponsored by APS and IEEE



PlasmaNET Slack



Website:
plasmacoalition.org



Join the Coalition!

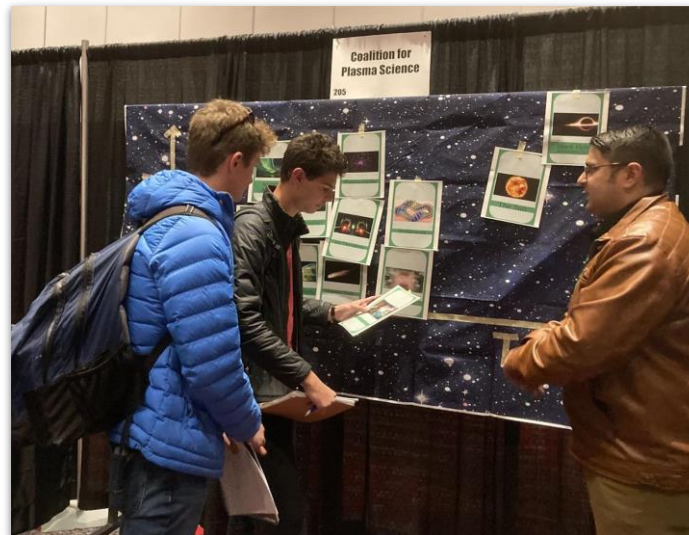
Backup slides



Testing the Kits at APS DPP 2023



- Demonstration during Teachers Day and Plasma Student Expo.
- Provides opportunity for teacher/student feedback.





Maajida Murdock



Elizabeth Oxford (ZEUS)



Laura Provenzani (FTPP-AL EPSCoR)



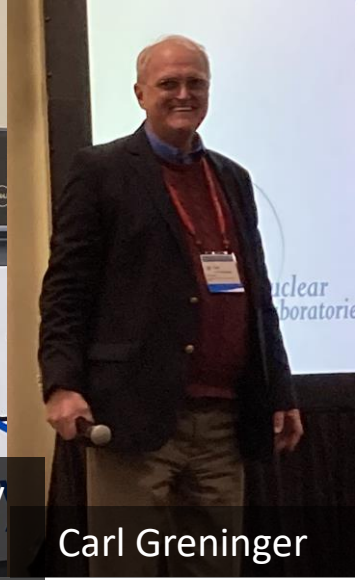
Chandra Curry (LaserNet)



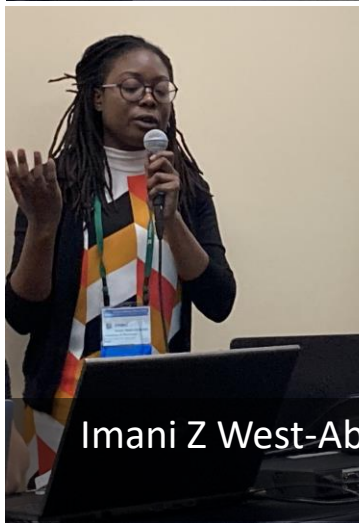
Claudia Fracchiolla (head of APS Public Engagement)



Shams El-Adawy (Kansas State)



Carl Greninger



Imani Z West-Abdallah, Hannah R Hasson (CRANE)



Katrina Brown, Cheryl A Harper (CPE)



Bryan Stanley, Michigan State



Franklin Dollar, UCI



Earl Scime, West Virginia