

A Vibrant University Research Program is Critical for the Success of Fusion Energy and Plasma Science

David Maurer
Auburn University

Vice President, University Fusion Association

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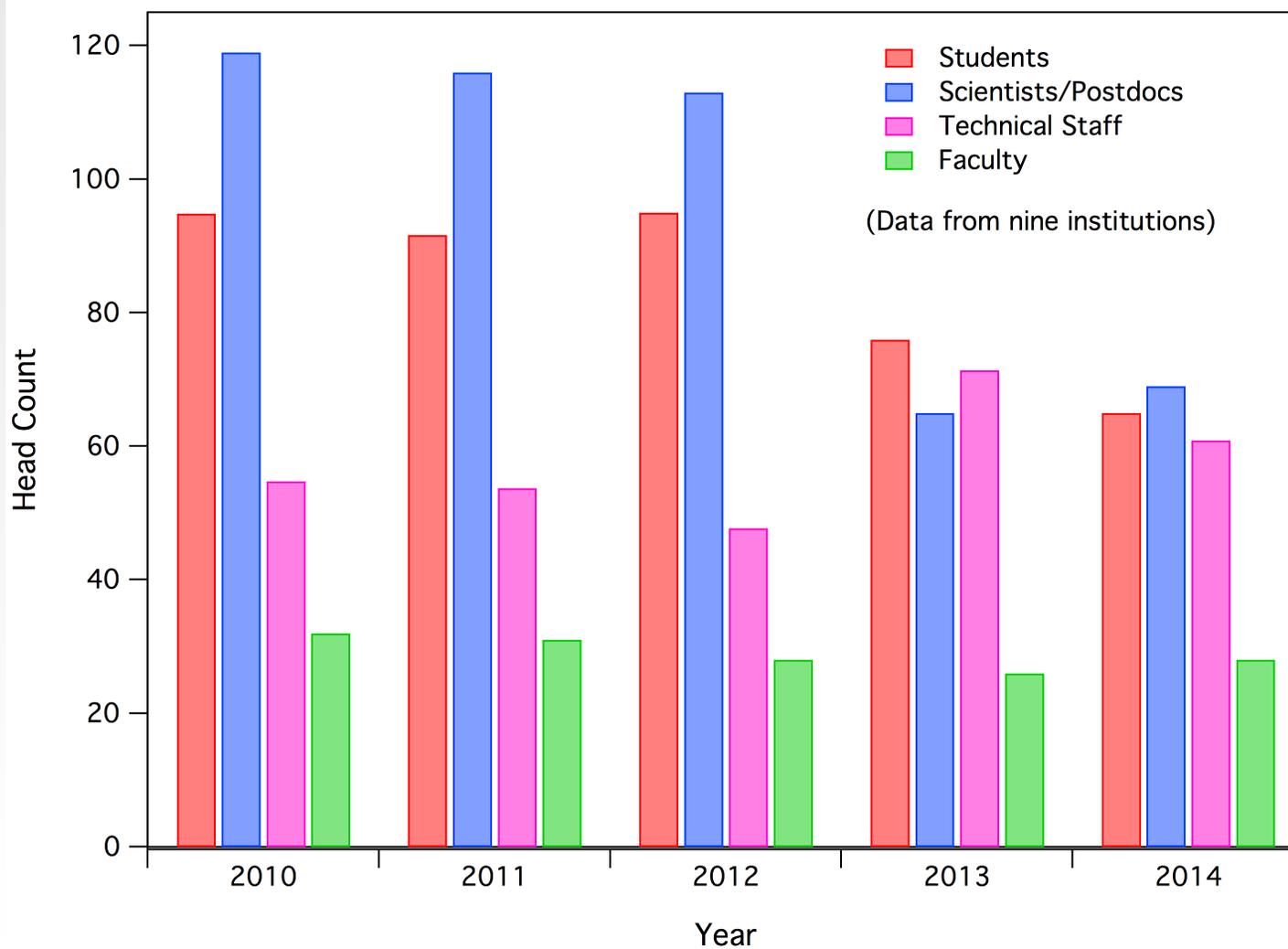
Progress, Breakthroughs, and Discoveries Occur at Universities

- University fusion research programs make numerous advancements to the fields of fusion energy and plasma science. In partnership with DOE/FES, universities small and mid-scale research programs are pathways to new ideas and scientific breakthroughs and, also, provide cost-effective support to more costly research at large national and international facilities.
- Many, many examples...
 - Lower hybrid current drive (MIT, *PRL*, 1982)
 - Discovery of bootstrap current (U. of Wisc, *PRL*, 1984)
 - Imaging turbulent structures (CalTech, *Nuc Fusion*, 1985)
 - Flow-shear reduces turbulent transport (UCLA, *PRL*, 1989)
 - Wall stabilization of the external kink (Columbia, *Phys Plasma*, 1996)
 - Reduced flow damping with helical symmetry (U. Wisc, *PRL*, 2005)
 - Detecting zonal flows with BES (U. Wisc, *PRL*, 2005)
 - Open field line confinement with supersonic rotation (U. Maryland, *PRL*, 2010)
 - Steady toroidal confinement without a toroidal field (C.U./MIT, *Nat Phys*, 2011)

After years of declining support, university fusion research programs are nearing a tipping point

- Without sustained funding to university fusion programs, the future of plasma science and fusion energy innovation in the U.S. is unclear.
- Once lost, university fusion energy science programs will be difficult if not impossible to resurrect or re-program.
- Negative examples of declining university support:
 - In 2010, several small and mid-sized experiments were notified that they would not be renewed, without input from FESAC or the community
 - Existing programs have continued with smaller budgets – sometimes on continual one-year renewals. Small programs have been terminated.
 - Alcator C-Mod is scheduled for termination.
 - In 2016, the proposed 15% decrease in FES domestic research results in a further decline in meaningful support for university fusion programs
 - DOE projects a 15% decrease in FES sponsored post-doctoral scholars and a 27% decrease in graduate students.

Trend of declining university participation does not bode well for the long term health and success of fusion and plasma physics research



Only with a vibrant university FES program can America continue to produce top plasma scientists, maintain its competitive advantage, and lead developments for viable fusion energy sources

- University fusion research programs should have meaningful and leading roles in the long-term advancement of fusion energy and plasma science.
- DOE should continue to leverage the significant University investments in faculty, research space, and educational programs dedicated to fusion.
- Universities' small and mid-scale research projects are essential, cost-effective pathways to new ideas and scientific breakthroughs.
- Universities need to continue to play a crucial, strong role as part of our national teams on major DOE facilities just as in HEP, NP, and BES
- DOE needs the leadership and abilities of the University community
- **We ask FESAC to express strong support for university fusion and plasma science research as it advises DOE on FES research priorities and strategies**