

Andrew Oakleigh Nelson

(303) 834-5364 — a.o.nelson@columbia.edu — oaknelson.com — he/him/his

PROFESSIONAL OBJECTIVE

To advance magnetic confinement fusion energy towards commercial realization. To pursue excellence in university-level teaching and mentorship to prepare the next generation of diverse physicists and engineers.

EDUCATION

- Ph.D. – Plasma Physics – Princeton University** 2016 – 2021
Thesis: Comprehensive Dynamic Analysis of the H-mode Pedestal in DIII-D
- M.A. – Plasma Physics – Princeton University** 2016 – 2018
Focus in experimental magnetic confinement fusion
- B.Sc. – Engineering Physics – University of Colorado Boulder** 2012 – 2016
Minors: Applied Mathematics, Leadership Studies

RESEARCH EXPERIENCE

- Associate Research Scientist – Columbia University** 2022 – present
Principle investigator for data-driven optimization of fusion energy systems with Next Step Fusion; Project lead for initial implementation of negative triangularly plasmas on MAST-U (United Kingdom); Project leadership for design, optimization and development of advanced negative triangularity scenarios on DIII-D (San Diego, CA); Working group leader for the EU/US negativity triangularity collaboration; Development of data driven methods for analysis and modeling of fusion energy systems; Modeling and assessment of vertical stability control for SPARC and ARC (Devens, MA); Data preparation and support for AI/ML-based high-fidelity simulations for the optimization of the tokamak edge; Development of automated kinetic equilibria reconstructions for tokamaks; Analysis and oversight of international non-ELM database; Economic assessment of fusion pilot plant designs
Strong collaborations with private (General Atomics, Commonwealth Fusion Systems, Next Step Fusion) and public (Princeton Plasma Physics Laboratory, Princeton University, United Kingdom Atomic Energy Authority, Massachusetts Institute of Technology) fusion programs.
- Postdoctoral Research Fellow – Columbia University** 2021 – 2022
Project lead for US Joint Research Taskforce on multi-machine 0-D non-ELM database; Assessment of vertical and edge stability for negative triangularly experiments and reactor designs; Design modeling of vertical stability and startup for SPARC
- Graduate Researcher – Princeton University and PPPL** 2016 – 2021
Experimental and modeling studies of the plasma edge and core on DIII-D; Development of various new automated routines for edge modeling, internal profile fitting, kinetic equilibrium reconstruction and neutral beam penetration on DIII-D; Study of fast vertical motion and microturbulence on DIII-D and KSTAR (Korea); Design and implementation of advanced electron cyclotron emission diagnostic techniques on DIII-D; Experimental support for machine learning database studies
- Undergraduate Researcher – University of Colorado Boulder** 2012 – 2016
Honors thesis regarding the design and construction of cryogenic test stand for dusty and space plasmas (IMPACT - Boulder, CO); Experimental and modeling work on fast ignition in laser-based inertial confinement fusion (Technische Universität Darmstadt, Germany); Experimental and modeling work in terahertz metrology (NIST - Boulder, CO)

PUBLICATIONS

See attached for an assorted list of publications, or visit [Google Scholar](#) or [ORCID](#).

TEACHING AND MENTORING EXPERIENCE

- Research and Academic Mentor – Columbia University** 2021 – present
Direct research advisor for eleven undergraduate students and two graduate students; Founder of a weekly graduate-level seminar course on plasma physics; Guest lecturer for introductory plasma physics topics; Instructor for reactor design course held jointly with Columbia, Princeton and MIT; Interdisciplinary curriculum development; Pedagogical simulation development
- Research and Academic Mentor – Princeton University** 2019 – 2022
Direct research advisor for three undergraduate students; Direct academic mentor for “PreDoc” Graduate Preparation Program; Guest lecturer for plasma physics seminar and introductory fusion courses; Teaching assistant for one undergraduate lecture course and one graduate lab course; Teaching fellow with the Princeton Writing Center and McGraw Center for Teaching and Learning
- Private Tutor – Undergraduate Physics and Mathematics** 2014 – 2021
1 – 3 hr/week private instruction in undergraduate physics and mathematics

LEADERSHIP AND OUTREACH

- Co-chair – General Atomics Personnel Development Committee** 2023 – present
Oversight for efforts to improve community and pedagogy at the DIII-D tokamak in San Diego
- Co-chair – USFusionEnergy.org and US Fusion Outreach Team** 2023 – present
Leadership for USFusionEnergy.org and the inaugural Fusion Energy Week
- Principle Investigator – ORFEAS Student Fusion Design Contest** 2022
Led a group of eight graduate students in a research contest, winning the maximum prize of \$20k
- Ally – APS Division of Plasma Physics (DPP)** 2022 – present
Trained and active resource for diversity, equity and inclusion within US physics communities
- Chair – APS-DPP Student Day** 2021 – 2024
Responsible for a student-oriented mini-conference at each national APS-DPP convention
- Chair – APS-DPP CONNECT Committee** 2020 – present
National organization to address the concerns of students and early career plasma scientists
- Board of Directions – Fusion EP Seminar Series** 2021 – 2022
US contact for the international student-led plasma physics seminar series
- Founder + Chair – Plasma Graduate Student Committee, Princeton University** 2019 – 2021
Established a committee to amplify student voices and support development of the graduate program
- Organized graduate curriculum reform, Princeton University** 2019 – 2021
Led a student effort to dramatically reform a graduate-level plasma diagnostics course
- President – Princeton Plasma Student Leadership** 2018 – 2019
Bridge between graduate students and faculty and program management

SELECTED AWARDS

- 2018 — US Burning Plasma Association International ITER School Scholar
- 2016 — CU Boulder Outstanding Graduate of the College of Engineering and Applied Science
- 2016 — CU Boulder Engineering Physics Distinguished Graduate
- 2016 — CU Boulder Engineering Physics Distinguished Graduate for Research
- 2016 — Hertz Foundation Scholarship Finalist
- 2015 — Astronaut Scholarship Foundation Scholar