

The AGEP Engineering Alliance: A Model to Advance Historically URM Postdoctoral Scholars and Early-Career Faculty in Engineering

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Comas Lamar Haynes is a Principal Research Engineer / faculty member of the Georgia Tech Research Institute and Joint Faculty Appointee at the Oak Ridge National Laboratory. His research includes modeling steady state and transient behavior of advanced energy systems, inclusive of their thermal management, and the characterization and optimization of novel cycles. He has advised graduate and undergraduate research assistants and has received multi-agency funding for energy systems analysis and development. Sponsor examples include the National Science Foundation, Department of Energy and NASA. Dr. Haynes also develops fuel cells and alternative energy systems curricula for public and college courses and experimental laboratories. Additionally, he is the co-developer of the outreach initiative, Educators Leading Energy Conservation and Training Researchers of Diverse Ethnicities (ELECTRoDE). He received his Bachelor of Science degree from Florida A&M University and his graduate degrees (culminating in a Ph.D.) from Georgia Tech; and all of the degrees are in the discipline of Mechanical Engineering.

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I am the John and Ann Doerr Professor of Mechanical Engineering at Rice University, where I am also the Faculty Director of the Rice Center for Engineering Leadership (RCEL) and the founding director of the Particle Flow and Tribology Lab. Outside of Rice's School of Engineering, I am also its Vice Provost of Academic Affairs.

Prof. Illya V. Hicks, Rice University

Illya V. Hicks was born and raised in Waco, TX. He received a BS in mathematics (1995) from Southwest Texas State University (currently Texas State University at San Marcos). He also received an MA and PhD in Computational and Applied Mathematics (2000) from Rice University. Illya served as faculty member in the Industrial and Systems Engineering Department at Texas A&M University (2000-2006) and is currently a professor in the Computational and Applied Mathematics Department at Rice University. He has also served as the faculty advisor to the president of Rice University (2016-2019). In terms of research, his interests are in combinatorial optimization, graph theory, and integer programming with applications in big data, imaging, social networks, and logistics. Illya is the recipient of the 2005 Optimization Prize for Young Researchers from the Optimization Society of INFORMS and the 2010 Forum Moving Spirit Award from INFORMS for his work with the Minority Issues Forum of INFORMS. Illya was also recently named an INFORMS Fellow.

Dr. Clayton J. Clark II, Florida A&M University

Dr. Clayton J. Clark II is a Professor in Civil and Environmental Engineering at Florida Agricultural & Mechanical University (FAMU) in the FAMU-FSU College of Engineering, and a licensed Professional Engineer. His research specialties include water quality, water resources, remediation of contaminated soil and water, environmental sustainability, hydrology, hazardous waste management, and STEM education. Dr. Clark has been blessed to have the opportunity to edit three books, produce nearly forty peer-reviewed publications, in addition to over fifty presentation to national and international audiences. He has also served as a reviewer for numerous technical journals and a panel reviewer for the National Science Foundation, the U.S. Department of Education, and the Environmental Protection Agency numerous times. Dr. Clark's research interests include combining chemical and environmental engineering techniques for hazardous waste handling and disposal; research and treatment of various environmental contaminants; overall environmental and water resources sustainability; and STEM Education. He has previously served as Director for the Title III Minority Graduate Fellowship Program and the STEM-Public Policy Program at FAMU. He presently serves as the Director for the Program of Excellence in STEM (PE-STEM) and the Civil Engineering Graduate Assistance in Areas of National Need (GAANN) Program at FAMU. He has also served as faculty advisor for Engineers without Borders and the National Society for Black Engineers for the FAMU-FSU College of Engineering, and received his M.A. in Biblical Studies in 2019. He and his wife Kimberline of 21 years are the parents of 3 sons and 2 daughters.

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Dr. Sylvia Mendez is a Professor and Chair of the Department of Leadership, Research, and Foundations at the University of Colorado Colorado Springs. She earned her PhD in Educational Leadership and Policy Studies from the University of Kansas, MS in Student Affairs in Higher Education from Colorado State University, and BA in Economics from Washington State University. Dr. Mendez's research centers on effective faculty mentoring practices, broadening participating in higher education, and the educational attainment and schooling experiences of Mexican descent youth in the mid-20th century.

Dr. Valerie Martin Conley, University of Colorado at Colorado Springs

Valerie Martin Conley is dean of the College of Education and professor of Leadership, Research, and Foundations at the University of Colorado Colorado Springs. She previously served as director of the Center for Higher Education, professor, and department chair at Ohio University. She was the PI for the NSF funded research project: Academic Career Success in Science and Engineering-Related Fields for Female Faculty at Public Two-Year Institutions. She is co-author of *The Faculty Factor: Reassessing the American Academy in a Turbulent Era*.

Molly Stuhlsatz, BSCS Science Learning

The AGEP Engineering Alliance: A Model to Advance Historically URM Postdoctoral Scholars and Early-Career Faculty in Engineering

Project Background

The AGEP Engineering Alliance brings together Georgia Institute of Technology, Florida Agricultural and Mechanical University, William Marsh Rice University, and the University of Colorado Colorado Springs to develop, implement, study, evaluate, and disseminate a model focused on the career development of historically underrepresented minority (URM) engineering postdoctoral scholars who eventually successfully transition into tenure-track faculty positions. Funding for this Alliance was procured from The National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) program (award numbers: 1821298, 1821019, 1821052, and 1821008). Presently, approximately 10% of postdoctoral scholars (Yadav et al., 2020) and 6% of engineering professors (Roy, 2019) identify as racial/ethnic minorities, and this disproportionality will continue until URMs are more effectively engaged and embraced in the discipline (NSF, 2018).

Personal and Professional Development Sessions

To address increasing the effective engagement and embracement of URM postdoctoral scholars, the AGEP Engineering Alliance project team employs an asset-based approach to meeting the career development needs of the project participants by offering both prescribed and customized personal and professional development sessions. This poster details survey evidence of the effectiveness attributed to the sessions presented between 2019-2020 from the point of view of the 11 postdoctoral scholars participating in the project. This study is guided by the following research questions:

1. How do the engineering postdoctoral scholars rate the relevance and benefit of the personal and professional development sessions?
2. What do the postdoctoral scholars identify as most valuable about the personal and professional development sessions?
3. In what areas of the personal and professional development sessions do the postdoctoral scholars feel more informed?
4. What recommendations do the postdoctoral scholars offer in terms of additional session topics and session improvement?

Postdoctoral Scholar Participants

Eleven engineering postdoctoral scholars are participating in the AGEP Engineering Alliance. Six participants are from Georgia Tech—a public doctoral university with very high research activity (R1) and considered a predominately White institution (PWI); one is from Florida A&M—a public doctoral university with high research activity (R2) and is a Historically Black College or University; and four are from Rice University—a private R1 and also a PWI. The sample is comprised of five females and six males, each self-identified as either African American or Latinx, and they represent a variety of engineering disciplines. Participant demographics are displayed in Table 1.

Table 1. *Postdoctoral Scholar Demographics*

Gender	Race/Ethnicity	Field of Engineering
Female	African American	Agricultural
Female	African American	Biochemical
Female	African American	Chemical & Biomolecular
Female	African American	Chemical & Biomolecular
Female	African American	Mechanical
Male	African American	Aerospace
Male	African American	Chemical
Male	African American	Statistical Science
Male	Latinx	Chemical & Biomolecular
Male	Latinx	Computational & Applied Mathematics
Male	Latinx	Materials Science & Nanotechnology

Session Topics

One of the key career development components of the project are the personal and professional development sessions offered to the postdoctoral scholar participants. Session topics were both pre-determined and individualized and tailored to the scholars' stated needs and interests. 2019-2020 topics included:

- Leveraging the Postdoctoral Experience for a Successful Career in Academia
- Insights Regarding Teaching at Different University Types
- Let's Talk about Teaching in Higher Education
- Career Check-In
- How to Write Stellar Research Articles
- Entrepreneurship
- 1:1 Mentorship: Grow your Network
- Parenting as a Professor
- COVID-19 Check-In

Survey Results

In order to determine the effectiveness of the personal and professional development sessions the project team developed a survey with both closed-ended and open-ended items. Results indicate participants found the sessions to be relevant to their academic career intentions, as nearly 100% of the sessions were rated as "relevant" or "very relevant" (see Table 2). The Career Check-In, How to Write Stellar Research Articles, and the Parenting as a Professor sessions were identified by all participants as "very relevant."

Table 2. *Session Relevance to Pursuing an Academic Career*

Session Title	Not Very Relevant	A Little Bit Relevant	Relevant	Very Relevant
Leveraging the Postdoctoral Experience for a Successful Career in Academia	20%	---	40%	40%

Insights Regarding Teaching at Different University Types	---	---	60%	20%
Let's Talk about Teaching in Higher Education	---	---	20%	40%
Career Check-In	---	---	---	100%
How to Write Stellar Research Articles	---	---	---	100%
Entrepreneurship	---	---	100%	---
1:1 Mentorship: Grow Your Network	---	---	50%	50%
Parenting as a Professor	---	---	---	100%
COVID-19 Check-In	---	---	100%	---

--- = 0%

Survey results also revealed participants found the sessions to provide information beneficial to their academic career planning process, as nearly 100% of the sessions were rated as “beneficial” or “very beneficial” (see Table 3). The How to Write Stellar Research Articles session was identified by all participants as “very beneficial.”

Table 3. *Session Information was Beneficial for Academic Career Planning*

Session Title	Not Very Beneficial	A Little Bit Beneficial	Beneficial	Very Beneficial
Leveraging the Postdoctoral Experience for a Successful Career in Academia	---	20%	60%	---
Insights Regarding Teaching at Different University Types	---	---	60%	20%
Let's Talk about Teaching in Higher Education	---	---	20%	40%
Career Check-In	---	---	25%	75%
How to Write Stellar Research Articles	---	---	---	100%
Entrepreneurship	---	---	100%	---
1:1 Mentorship: Grow Your Network	---	---	50%	50%
Parenting as a Professor	---	---	33%	66%
COVID-19 Check-In	---	---	100%	---

--- = 0%

Additionally, survey results indicated the postdoctoral scholars found conversations amongst themselves and with the AGEF project team members to be valuable as they were able to use the session time to connect, network, and quell individual anxieties as they embarked on tenure-track faculty job searches. Participants also reported feeling more informed on teaching responsibilities, academic entrepreneurship prospects, start-up packages, the importance of

networking, and pursuing employment at various institutional types because of the sessions. They also recommended additional sessions involving conversations with URM faculty in which they share their tenure-track hiring and faculty experiences; ways to create and optimize mentoring relationships; grant-funding advice; personal branding; effectively managing a lab; and additional guidance on hiring, such as developing well-crafted application packages, preparing for interviews, and negotiating start-up packages. Suggestions on improving the sessions included facilitating more structured rather than organic discussions and meeting more frequently to leverage the project opportunities offered.

Conclusion

Engineering postdoctoral scholars seeking to enter the professoriate are in need of both prescribed and customized career development support to be confident and competitive in the tenure-track faculty hiring process (Chakraverty, 2020; Griffin, 2019; Hokanson & Goldberg, 2018; Pyhältö, 2018; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav et al., 2020). If colleges and universities are truly interested in diversifying engineering and supporting the career advancement of URM postdoctoral scholars into the professoriate institutional support is warranted. In unison the postdoctoral participants indicated they had received little to no guidance around their career development needs beyond what the AGEP Engineering Alliance offered which suggests systematic investment in this area is essential. Without this investment the academy's stated commitment to broadening participation in engineering rings hollow.

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