Physics dept Pre-Engineering Medical physics

Dr. Abdalla Darwish , Ph.D.

Professor of Physics

Presidential Professor

SPIE Fellow

Ruth Simmons Distinguished University Professor,

Dillard University

February 22,2022

NASEM Dillard University Virtual Town Hall

where many physics department are closing , our department is expanding!!

students' success in physics (our secret recipe of success)

1. Provide students with Financial support
2. Comprehensive academic advising
3. Hands-on training to involve them on real research activities which leads to peer review journal publication
5. Development of a professional culture through professional societies (OSA, SPS, NSBE, NSBP, ∑Π∑ physics honor society , Women of color in physics and optics chapters
6. Mentoring and Monitoring their success with feedback during monthly meetings
7. Academic support: Faculty and peer Tutoring– PASS (Peer Assisted Students session) program, and make them to take part of their academic success
8. Graduate preparation and placement, and workforce assistant and Guidance to Graduate School (GRE)
9. Placement in Summer internship REU programs

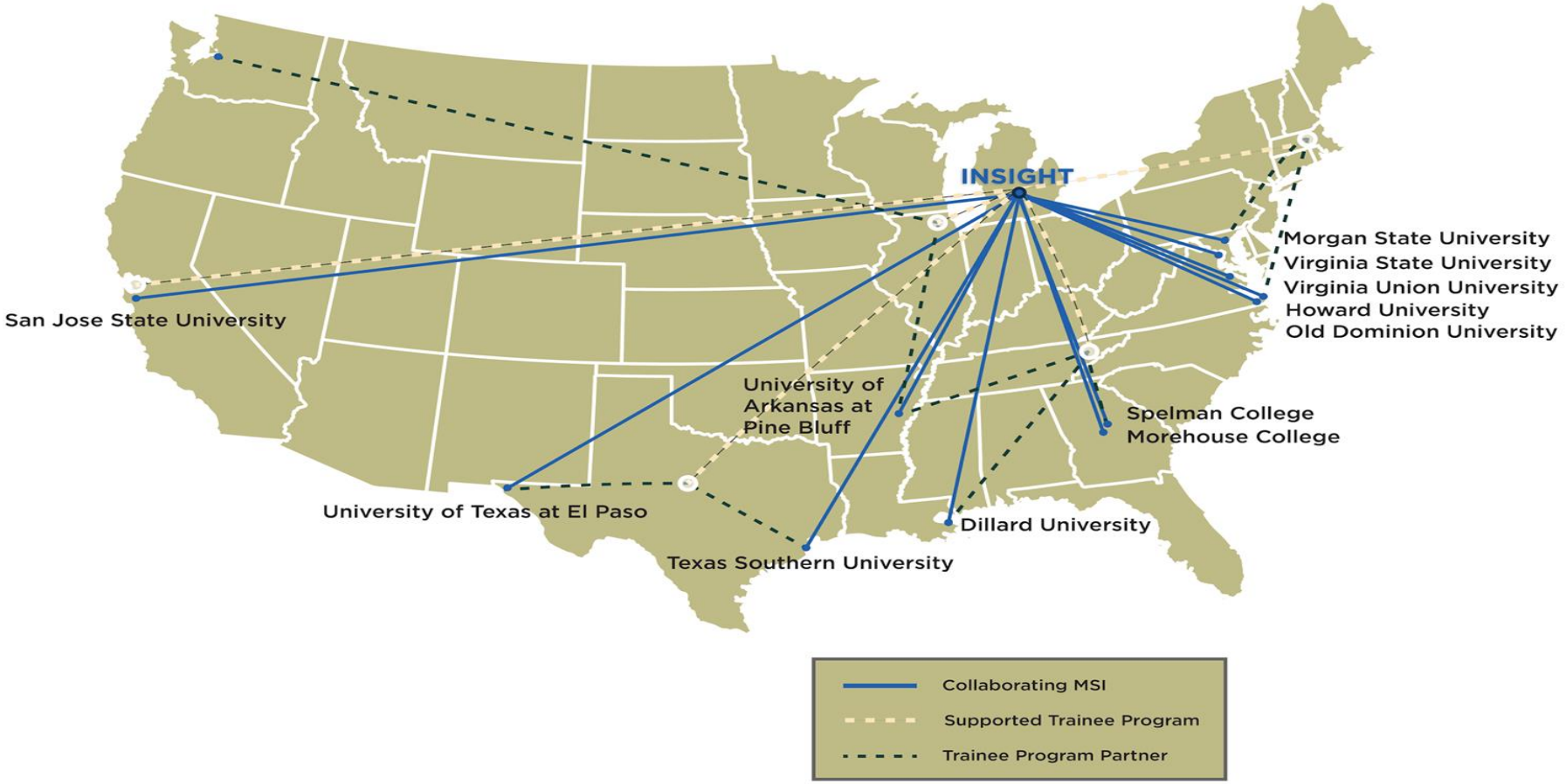
Dr. A. Darwish funding research, infrastructure (PI, CO-PI)

1. NSF LS-LAMP Alliance 1999-2026 Lead SUBR NSF/BOR
2. NSF GAEMP (Geoscience Alliance to enhance Minority Participation program 2004-2008
3. NSF GAELA (Graduate Alliance Education in LA) 2006-2011
4. NSF TESSE Transform Earth Science system Education program 2007-2013
5. NASA-EPSCoR Pulsed Laser Deposition of hard materials 2004 2007 (with Tulane Univ)
6. NASA– CAN NORC Research Center 2014-2018 (New Orleans 5 Universities)
7. NSF AGEP comparative study STEM Graduate USA-England DU&PSU 2012-2014
8. HBCU- PASS program to enhance retention and graduation 2014-2017 Helsinki
9. AFOSR and AFRL research grants 2008-20025
10. Army and ARL PLD for nanocomposite thin films for optical sensors and light emitting applications and instrumentation 2012-2019
11. Army and AFRL articulation agreement for fabricating new materials

Current Programs and centers in the Physics, Pre-Engineering and Medical Physics department

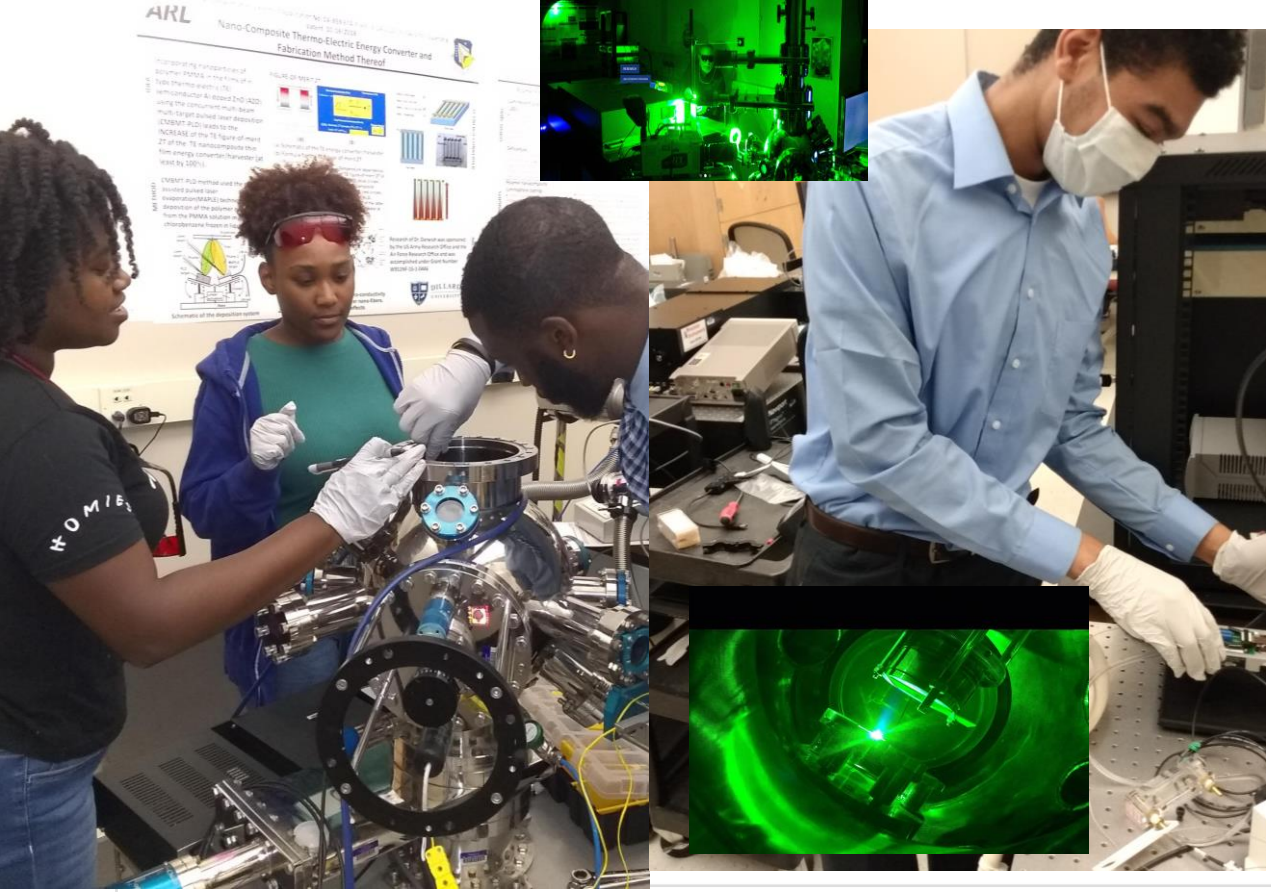
1. IBM- HBCU Quantum consortium for Qubit
2. DOE: INSIGHIT center (Darwish COPI, MSU lead institution)
Institute for Nuclear Science to Inspire the Next Generation of a Highly Trained Workforce
3. DOE: HIPPO center (Lead T A&M) & DU participant
Horizon-broadening Isotope Production Pipeline Opportunities (HIPPO)
4. DU WISHES program : Women in STEM high schools Experience Summer program
5. DoD AFOSR/Army (PI) : Polymer nanocomposite luminescent spectrum convertors for photovoltaic energy harvesting
6. LS-LAMP Program Louis Stock–LA Alliance for Minority participation
7. DU WISHES program : Women in STEM high schools Experience Summer program

INSIGHT: Institute for Nuclear Science to Inspire the next Generation of a Highly Trained workforce



New Orleans After Hurricane Katrina

April 13, 2005, LS-LAMP program STEM conference, DU
Just before Hurricane Katrina



Louis Stokes Louisiana Alliance for Minority Participation (LS-LAMP)

Thanks to our STEM STEM faculty who made this program a success!!

- **The Louis Stokes Louisiana Alliance for Minority Participation (LS-LAMP) is one of 34 National Science Foundation Alliance Programs nationwide. This comprehensive, statewide coordinated program is aimed at substantially increasing the number and quality of minority students receiving baccalaureate degrees STEM and, subsequently, increasing the number of minority students entering graduate schools to earn doctoral degrees in STEM fields. The basic, statewide strategy is the replication and enhancement of exemplary mentoring and outreach programs. Thanks to all our STEM faculty.**

NSF (TESSE) TRANSFORMING EARTH SYSTEM SCIENCE EDUCATION

The TESSE project addresses the need for highly qualified teachers in the geosciences especially after Hurricane Katrina by developing a comprehensive plan to transform geoscience education at the middle and high school levels. The summer institute bolster existing preparation programs for teachers to include mentoring and networking with in-service teachers and bona-fide research experiences in Earth system science with teachers during subsequent academic years.

NASEM Report 2020 : Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors (2020) “Darwish panelist in March 2019”. Page 29

“Dillard University, an HBCU, located in New Orleans, Louisiana, boasts the second highest female African American physics undergraduates in the nation.

They also send a large number of physics undergrads to graduate school. The university’s physics and pre-engineering program is primarily credited with this

achievement. Through this program, students receive hands-on experience by working closely with professors on real-world projects, using major research equipment, and publish in journals. In addition, Dillard University Women in STEM High School Experience in Summer is a summer program for high school females of color who are interested in physics and optics, the goal of which is to increase the number of African American women in STEM fields (Dillard University, 2019)”.

In 2019, I was invited by NASEM to present in a panel why Black females?

The Talent And Diversity Of HBCU Faculty

https://www.forbes.com/sites/marybethgasman/2021/07/19/the-talent-and-diversity-of-hbcu-faculty/?sh=39d5be1b4d90

"At Dillard University, a small HBCU in New Orleans, professor Abdalla Darwish leads a physics program that is second in the nation in terms of the production of African American physics majors, and is an exemplar in terms of its production of Black women physics majors. Darwish noted in a recent interview, "I believe in women, especially minority women… Just give them the chance and they will be the best."

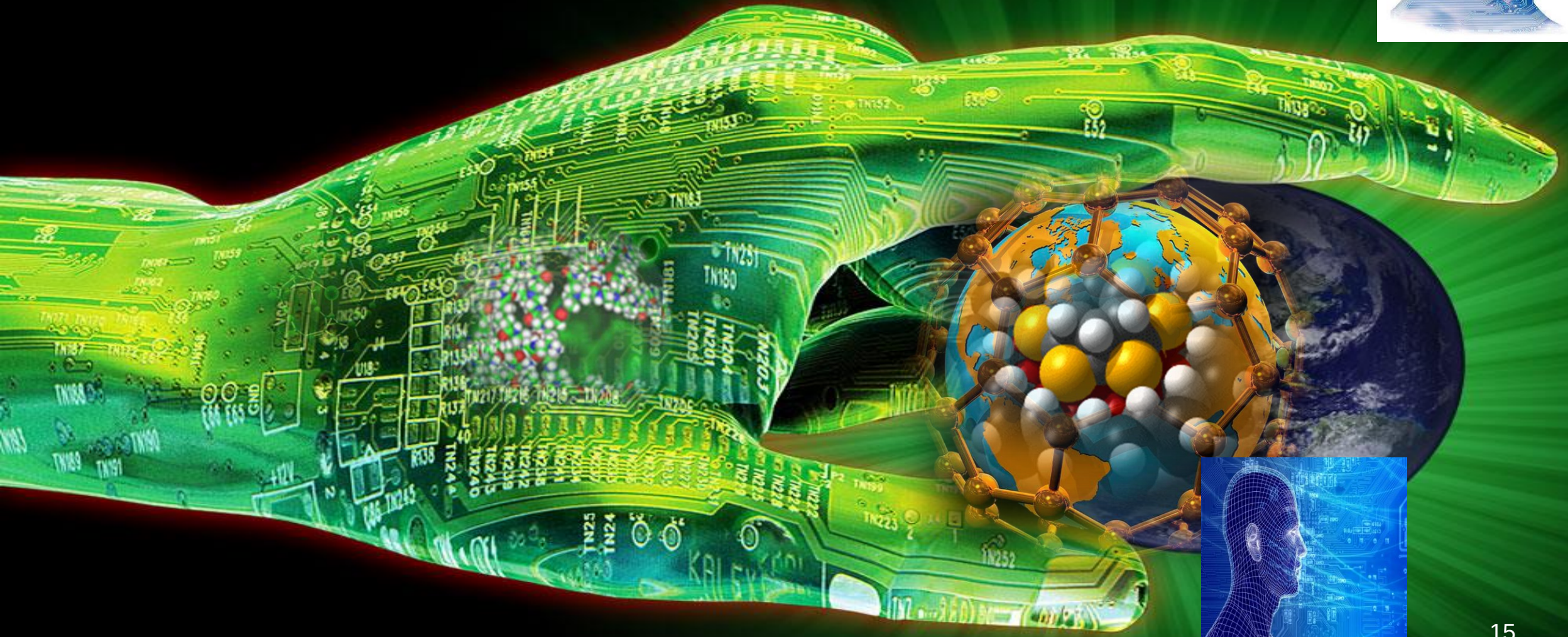
In the last 39 years, US physics doctorates went to 66 black women, four from Dillard University

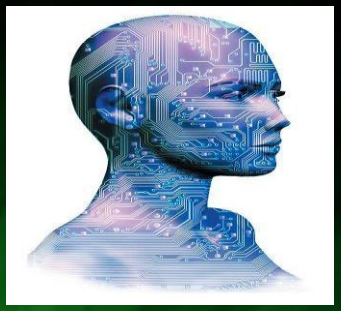
http://qz.com/432756/in-39-years-us-physics-doctorates-went-to-66-black-women-and-22000-white-men/

Return of Investments

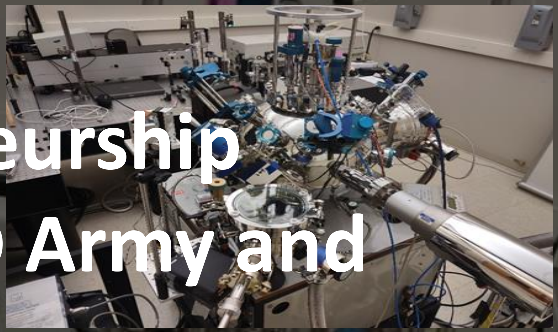
From previous and current programs

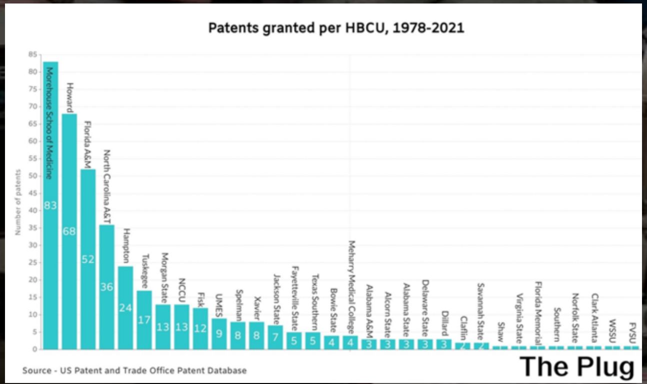
Our research : Nanocomposite Energy harvesting materials and Nano scale wearable flexible devices

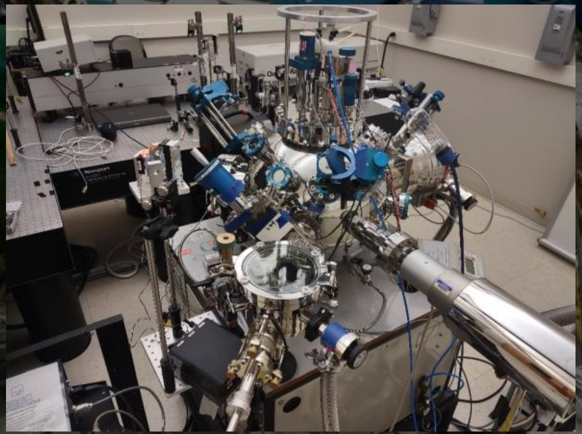


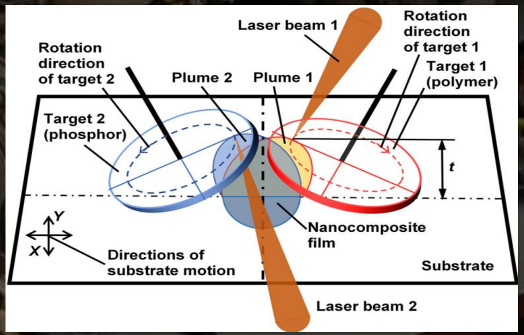


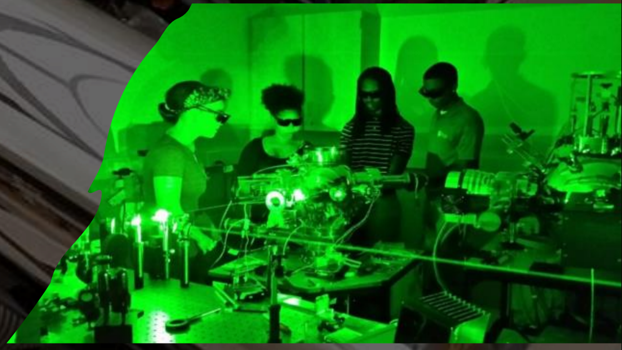
Reinvesting in Entrepreneurship and patents through DoD Army and AFOSR support



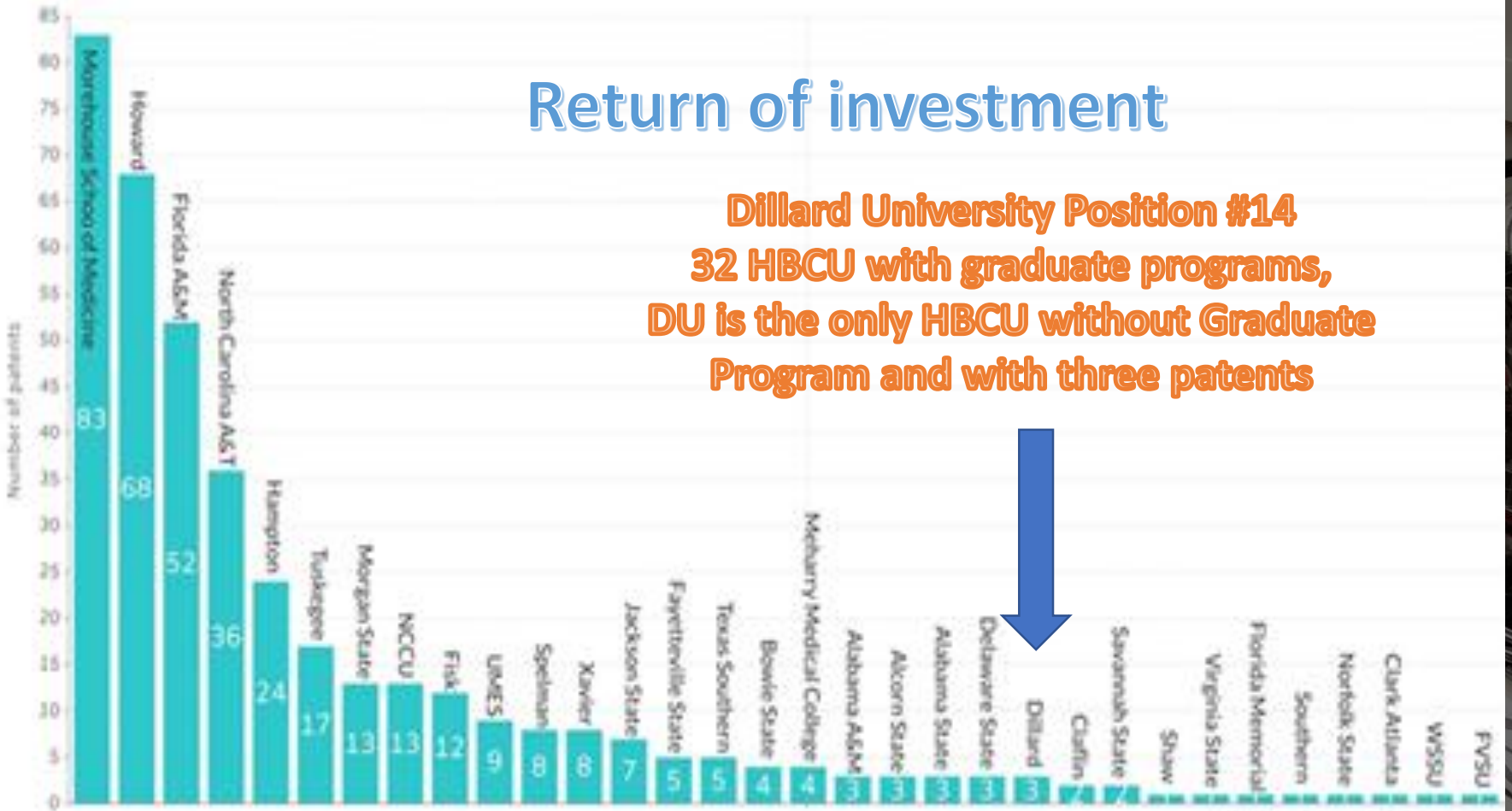








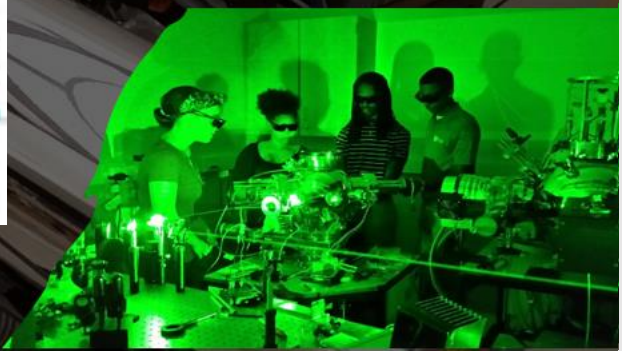
Patents granted per HBCU, 1978-2021

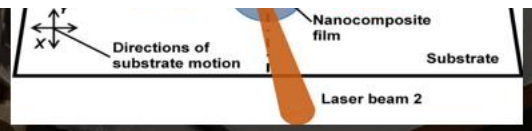


Source - US Patent and Trade Office Patent Database

Return of investment

Dillard University Position #14
32 HBCU with graduate programs,
DU is the only HBCU without Graduate Program and with three patents





The Plug

Dillard university Physics department Research infrastructure and Educational Labs

1. **Nanocomposite of hard and soft materials, for the fabrications of optical, chemical and Biological sensors**
2. **Polymer nanocomposite luminescent spectrum convertors for photovoltaic energy harvesting**
3. **Nano-Additive and 3D manufacturing**

Students participating in summer REU and research internship during the AY as well

Internship:

ARL, AFRL, Fermi Lab, NASA, REU in many universities, INSIGHT center, HIPPO center, and many others

Center of Nanocomposite materials and thin film fabrication for Flexible and wearable devices using DTPLD/ MAPLE Fabrication & Characterization Flowchart

Analytic Instrumentation


RHEED


High-speed video camera 1Ms/sec


Atomic Force Microscope


FTIR


XRD


XRF


SEM JSM-7100FA

RHEED
High-speed video camera 1Ms/sec
Atomic Force Microscope
FTIR
XRD and XRF
SEM JSM-7100FA
Cary 6000i
Integrating sphere GS-002X
Fluorescent spec optical response
Home-made measurement system

Making solid pellets from the RE fluoride powders to be used as MBPLD targets

MB-MAPLE and MBPLD preparation of the polymer- inorganic nano composite films and in situ analytics

Post-fabrication analytics: structural analysis of the upconversion and AZO-PMMA TE films

Post-fabrication analytics: structural analysis of the upconversion and AZO-PMMA TE films

Post-fabrication analytics: Emission spectroscopy, lifetime, and QE measurements of the upconversion films

Post-fabrication analytics: Optical response to gases (ammonia, oxygen, hydrogen, etc.)

Post-fabrication analytics: electro-, thermo-conductivity, Seebeck of AZO-PMMA TE films

Reporting, publications, training

Processing Instrumentation

Pellet press
2 and 3-laser Beams PLD Chambers
Nd:YAG laser PRO-250-50
Nd:YAG laser Lab-170
OPO with wavelength extender
Femtosecond laser
Probe station LTMP-4. MMR Technologies
4-point probe PRO4-4000


Pellet Press


2-Beam PLD Chamber / 3-beam PLD Chamber

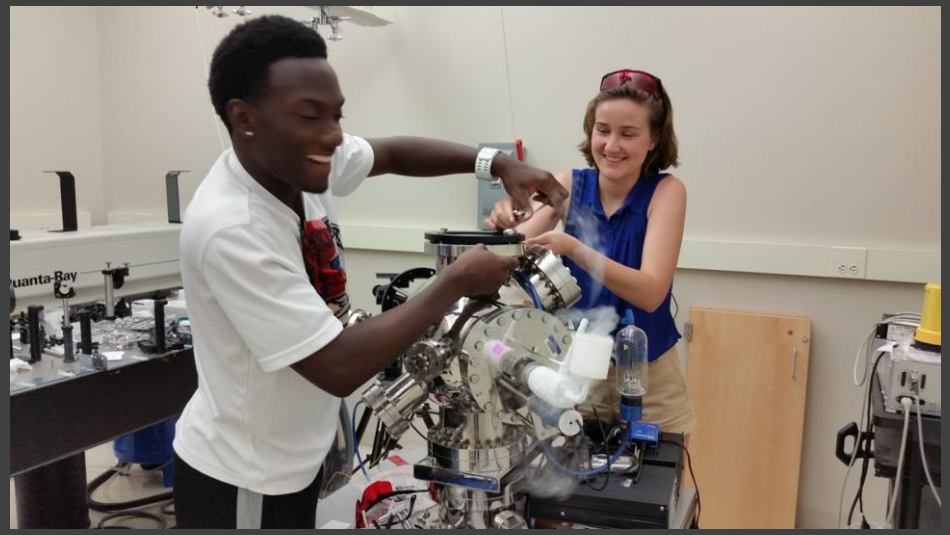

Nd:YAG laser PRO-250-50


Nd:YAG laser Lab-170


OPO with Wavelength Extender


Femtosecond


Probe station LTMP-4. MMR Technologies



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Share resources ..! Tulane PVA&M and others


DoD site visites, where our students tell the stories

~~DoD take the~~ pentagon to people meeting at DU 2014.

One of the Research group and graduate schools' students Shaelynn Moore, Wydglif Dorlus ,Tyler Bastian, Patric Thomas, Jen Flex, Aziz Muhammad, Daniel Jessar, Aliyah Emery, Jusstice Grace,

Where are they now? Some of the physics graduates after getting their PhD or MS degrees

Dr. Jeff Josiah, Raytheon Company ,in Tucson, Arizona

Prof. Kelly Nash, Professor, UTSA

Prof. Kim Michelle Lewis Associate Dean Howard Univ.

Dr. Enrique Jackson, MSFC, Huntsville, Al

Dr. Trivia Frazier, Entrepreneur, Owner and CEO, >> Trivia Frazier Obatala sciences co, New Orleans, LA,

Ms. Ebonie Pierce (MS Engineering) , Naval Oceanographic, Miss.

Ms. Kamika Chandler, (MS, Engineering), Naval Oceanographic, Miss

Ms. Tayler (Ms, Nuclear Physics),

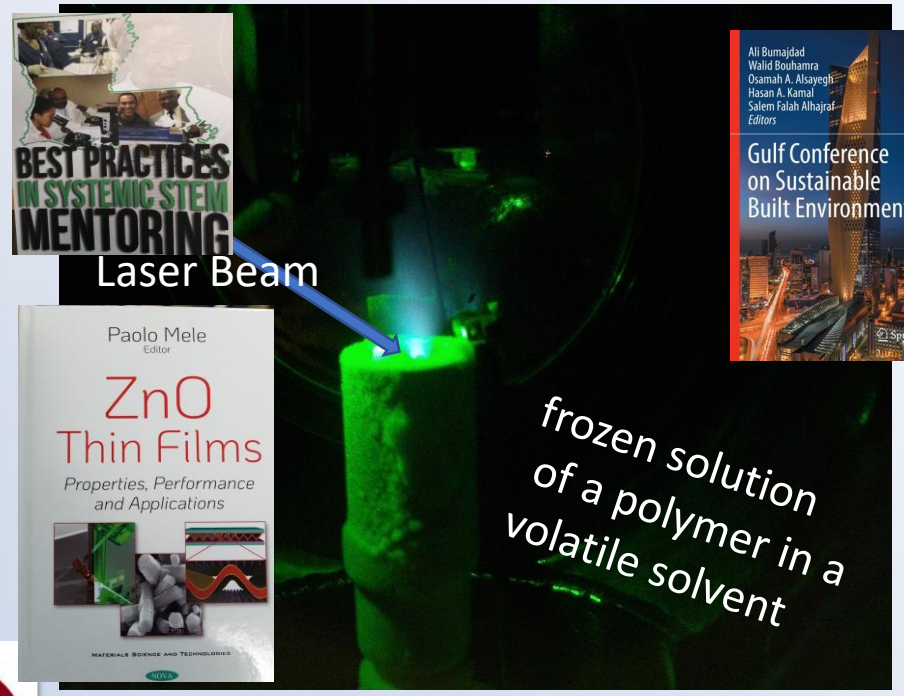
Kadegah Ransome, Jamaal Grainger (MS, Aerospace Engineering), Boeing, then Raytheon, la, Calif

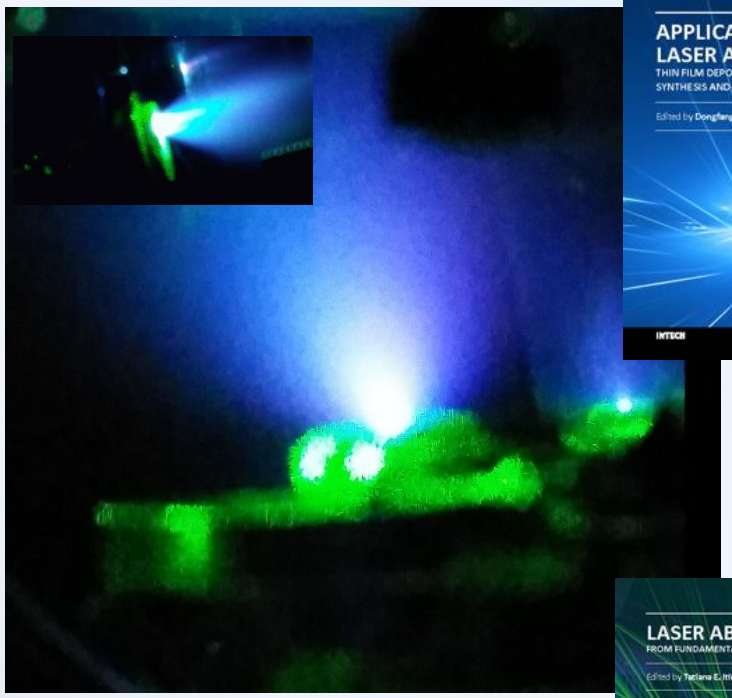
And many much more!!!, currently, we have one females in PhD program, and two will start…)

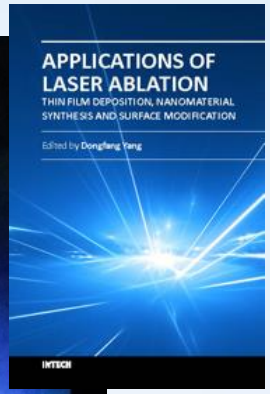
Matrix Assissted Pulsed Laser Evaporation D/ T concurrent PLD

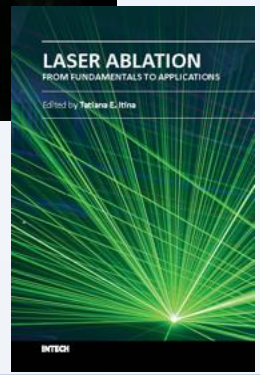
"Darwish's Textbbooks chapters

"Concurrent multi-target laser ablation for making nano-composite films"



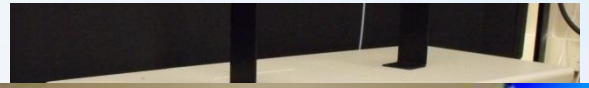






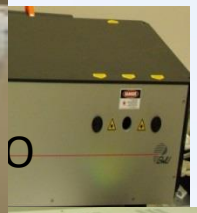
photon energy → solvent → converted to thermal energy → heated polymer , solvent vaporized and polymer molecules gained thermal energy and transferred to gas phase.

Cary 5000 UV-V



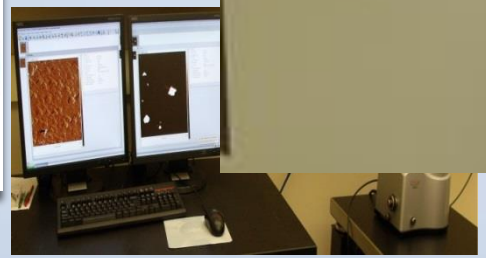
iger XRF

Memrecam

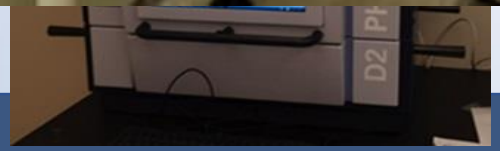


O

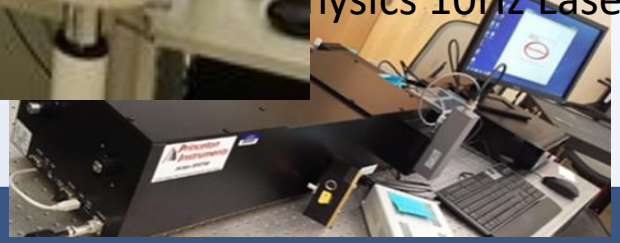
nysics 10Hz Laser



Veeco di Innova AFM

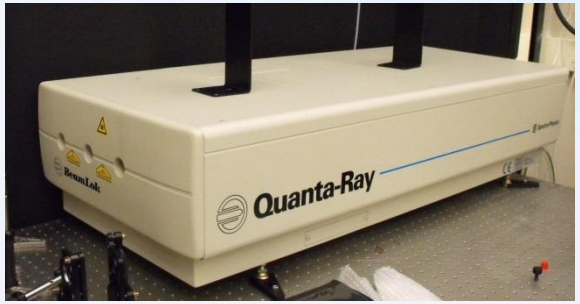


D2 Phaser XRD



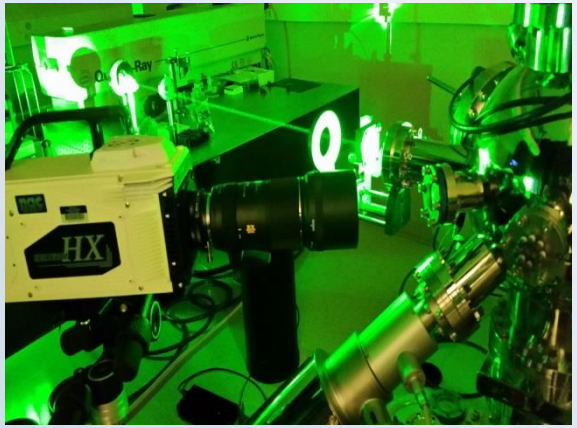
Acton 2750 Spectrograph

Cary 5000 UV-Vis-NIR Spectrophotometer

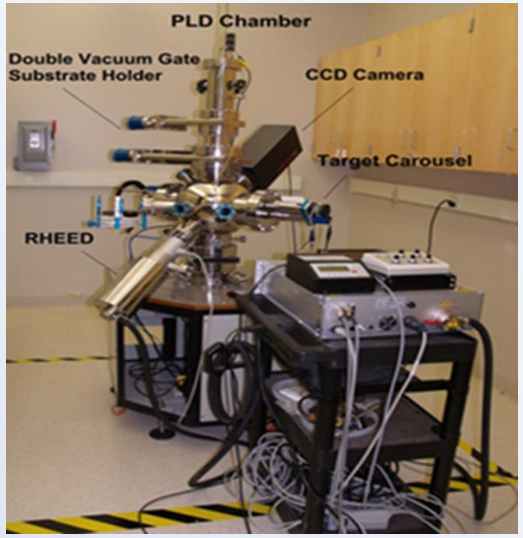


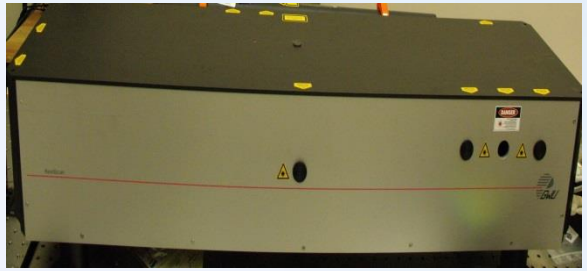
Spectra Physics 50Hz Laser

S8 Tiger XRF



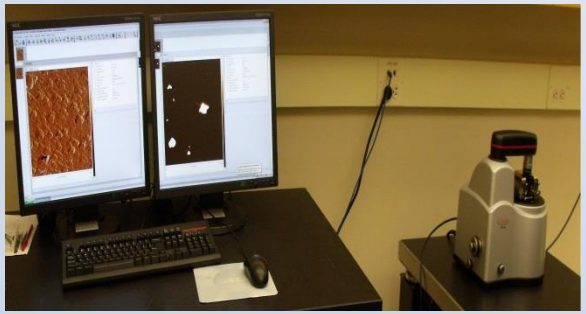
Memrecam HX High Speed Cam





GWU OPO

Spectra Physics 10Hz Laser

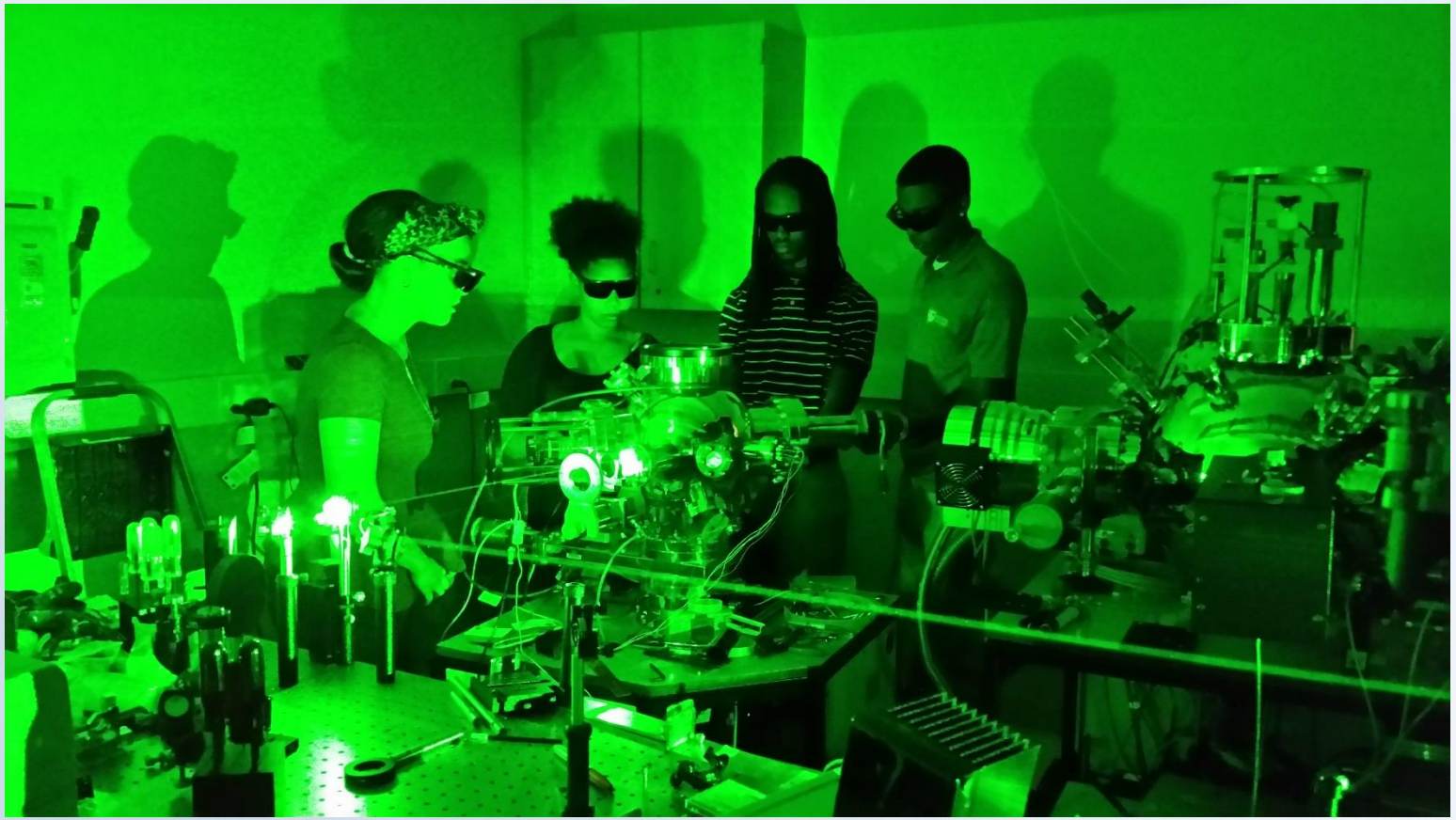


Veeco di Innova AFM

D2 Phaser XRD

Acton 2750 Spectrograph

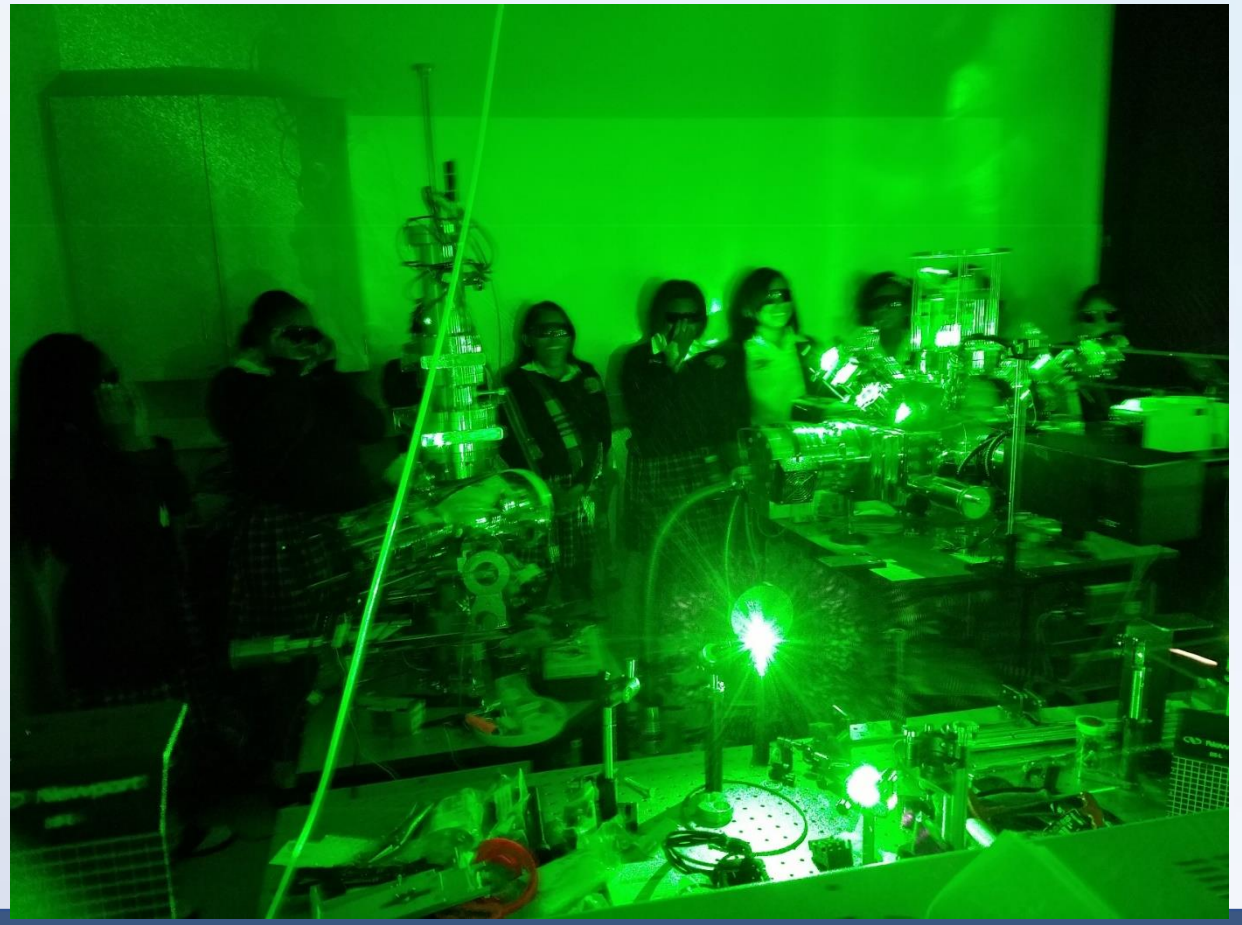
Students well trained and moving to graduate schools as their first choice



More outreach and Physics freshman programs

Dillard University Physics second top producer of Black Minority Females in Physics

Outreach programs: K-12 science on wheels visitation, Minority Female in STEM summer programs as part of DU WISHES program supported by the AFOSR



More outreach programs for minority Females in STEM Like DU WISHES and Science on wheels

Success story and Impact of the AFOSR EPA on the DU WISHES program

Dr. Abdalla Darwish, Dillard University

Impact on the high schools' minority female participants:

1.We are able to increase the awarence of our community especially minority women to the need of more well trained and qualified females on STEM fields.

2. The DU WISHES summer program expand to have a tutoring component for high school students as well as STEM students at Dillard University.

3. According to our survey, 75 % retention rate in STEM fields from the high school minority females participants on DU WISHES program.

4. The hands-on training and explorations, made the participants to request more involve on the summer REU at DU which is supported by the AROSR.

EPA Impact of the African American Female in STEM

1. The New EPA enabled physics program to increase the number of black female in STEM disciplins especially physics.
2. More Black Females learned the impotantance of STEM fields and are interested to stay in STEM.
3. More funding was applied for to continue the education and research funding to increase the number of female participants and increase the capacity of minority in STEM.

1. University and students Impact :
2. The physics department became the DU University signature program
3. Number of the studens tripled in physics dept to 56
4. More Females from DU STEM disciplins are tutroing the high school female students which inteated a PASS leader program at both DU and HS.
5. DU recongnized as on the top five producing more than 55% of African American in Physics and the second top producer to black female in physics (AIP, AP, ..)

Imapct on the University and physics department infrastructures

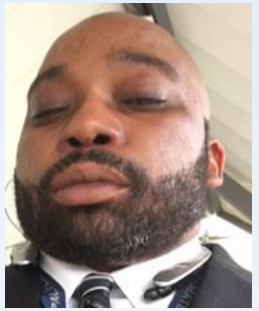
1. The physics department is equipped with state-of-the-art-major research infrastructure
2. The physics department in process of establishing a MS program degree in materialscience and optics.

Alesha Harris

Asha Pierce

Bridget Sisney

Byron Knowles



Enrique Jackson,, MSFC,

Hassan Moore STEM CHAIR, St. John Paul High School

Ivory Ellis

Jeff Josiah
Raytheon Company
in Tucson, Arizona

Joy Semien

Karen Jack

Kelly Nash
Professor, UTSA

Kim Michelle Lewis
Associate Dean Howard Univ

Kurt Watson

LaKeasha Hamburg

Latisha Franklin

LaTonia Smith

Lawrance Mullen

Lewins Walter

Leyte Winfield

Return of investment over 39 PhD and PhD Md and MS STEM students were trained by LAMP program

Publications Over 120 papers, four Book chapters and 9 Patents applications, three Patents awarded

Some of the published Papers See the complete list at WWW.Researchgate.net

1. Abdalla M. Darwish, Michael Tavita Sagapolutele, Sergey Sarkisov, Darayas Patel, David Hui, and Brent Koplitz, Double beam pulsed laser deposition of composite films of poly(methyl methacrylate) and rare earth fluoride upconversion phosphors, Composites Part B: Engineering, Volume 55, December 2013, Pages 139–146.

2. Abdalla M Darwish, Michael Tavita Sagapolutele, Simeon Wilson, Sergey Sarkisov, Darayas Patel, Brent Koplitz, and David Hui, Double pulse laser deposition of polymer nanocomposite films for optical sensors and light emitting applications, Proceedings of ICCE-21 (Twenty first annual internal conference on composite/nano Engineering, Edited by David Hui, July 21-27, 2013 Tenerife, Canary Islands, Spain, Paper 181.

3. Abdalla M. Darwish, Simeon Wilson, Sergey Sarkisov, Darayas Patel, "Double pulse laser deposition of polymer nanocomposite NaYF4:Tm3+, Yb3+ films for optical sensors and light emitting applications," in Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications VII, edited by Shinzhuo Yin, Ruyan Guo, Proc. of SPIE Vol. 8847(2014), 884702, 884702-1—88702-13.

4. Abdalla M. Darwish, Allan Burkett, Ashley Blackwell, Keylantra Taylor, Sergey Sarkisov, Darayas Patel, Brent Koplitz, and David Hui, Polymer-inorganic nano-composite thin film upconversion light emitters prepared by double-beam matrix assisted pulsed laser evaporation (DB-MAPLE) method, Composites Part B 68 (2015), 355–364.

5. Abdalla M Darwish, Simeon Wilson, Ashley Blackwell, Keylantra Taylor, Sergey Sarkisov, Darayas Patel, Brent Koplitz, and David Hui, New double-beam matrix assisted pulsed laser evaporation (DB-MAPLE) method for making polymer nano-composite coatings, Proceedings of ICCE-22, Twenty Second Annual International Conference on Composites or Nano-Engineering, Edited by David Hui, July 13-19, 2014, Malta, 2 pages.

Publications (continued)

Papers published

6. Abdalla M. Darwish, Allan Burkett, Ashley Blackwell, Keylantra Taylor, Vernell Walker, Sergey Sarkisov, Brent Koplitz, "Efficient upconversion polymer-inorganic nanocomposite emitters prepared by the double beam matrix assisted pulsed laser evaporation (DB-MAPLE," in Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications VIII, edited by Shinzhuo Yin, Ruyan Guo, Proc. of SPIE Vol. 9200 (2014) 92000C, 92000C-1—92000C-15.

7. Darayas Patel, Ashley Lewis, Donald Wright III, Danielle Lewis, Ruben Valentine, Maucus Velentine, Dennis Wessley, Sergey Sarkisov, and Abdalla M. Darwish "Optical properties and size distribution of the nano-colloids made of rare-earth ion-doped NaYF4" in Optical Components and Materials XII, edited by Shibin Jiang, Michel J. F. Digonnet, Proc. of SPIE Vol. 9359, 93591L (2015) 93591L-1 – 93591L-9.

8. Abdalla M. Darwish, Simeon Wilson, Ashley Blackwell, Keylantra Taylor, Sergey S. Sarkisov, Darayas N. Patel, and Brent Koplitz, Ammonia Sensor based on polymer-inorganic nano-composite thin film upconversion light emitter prepared by double-beam pulsed laser deposition, American J. of Materials Sciences 5(3A) (2015), 8-15.

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Conclusions

- The implementation of the success model produces a well hands-on trained black males and females and with great champions for cause and the purpose,then a success is a must.
- Building a strong research infrastructure facilitate the well trained, well educated black community who ignite the capacity of human capital for leadership, and homeland security.
- Our business in education is Working for a purpose everyday,. And Building legacy for generations to come.

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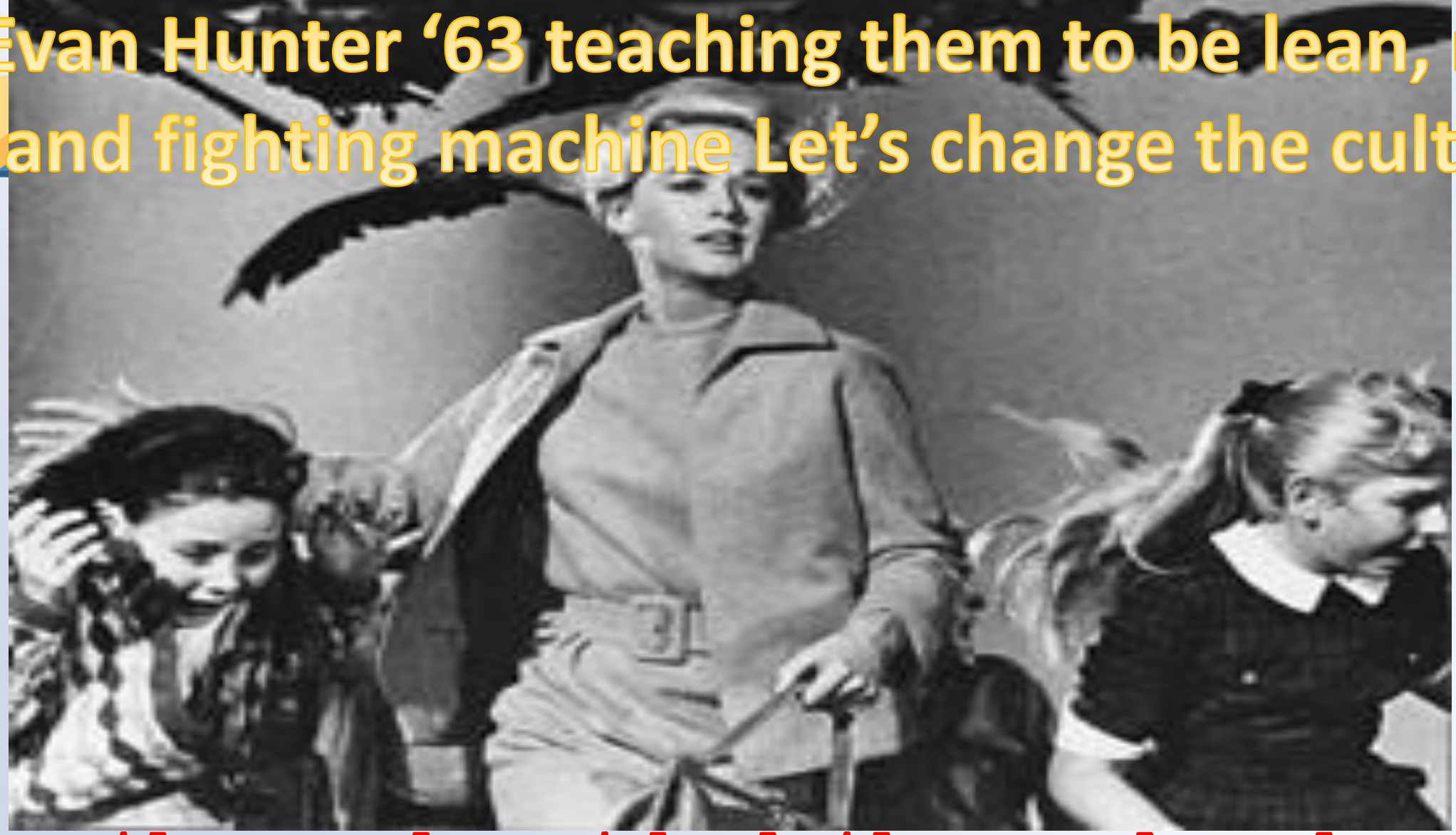
Evan Hunter ‘63 teaching them to be lean, mean and fighting machine Let’s change the culture !



It’s not how much you take, but how much you leave behind when you go! Building legacy! Where we go from here? Questions?

Questions ?