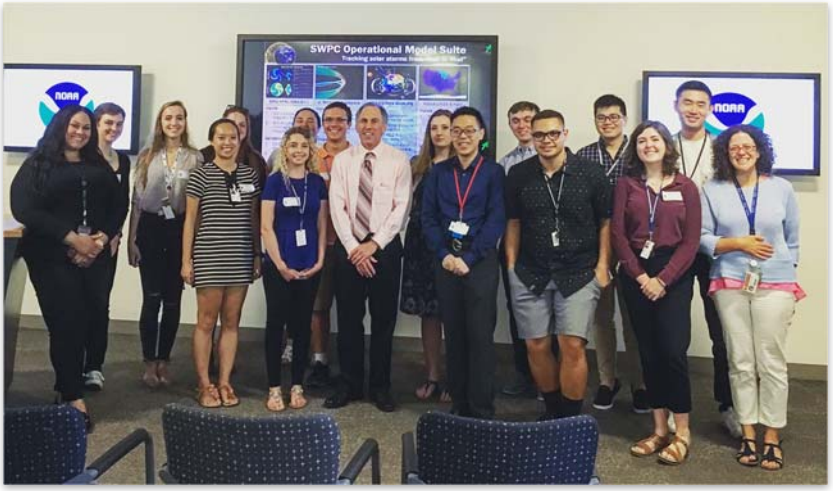
SESI NEWSLETTER

THE SCIENTIFIC AND ENGINEERING STUDENT INTERNSHIP AT NASA/GSFC



What is SESI?

Training our newest generation of Heliophiles

SESI is a cooperative program between the Institute for Astrophysics and Computational Sciences (IACS) at The Catholic University of America (CUA) and the Heliophysics Science Division at the NASA Goddard Space Flight Center (GSFC) in Greenbelt, MD.

The program provides talented students with exciting research opportunities and the chance to work with their mentors (the scientists, engineers, and researchers of GSFC) in the areas of solar and heliospheric physics, data analysis and computational modeling, building space hardware, and many other engaging scientific fields.

Students attend weekly lectures from senior scientists, tour Goddard's facilities, and participate in optional weekend activities in the DC area such as picnics, park/trail hiking, and museum tours.

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Thank you to all of our mentors, co-mentors, lecturers, and sponsors for making the 2017 SESI program a success!

Pictured above: Our 2017 SESI interns, their GSFC peers, Silvina, and Teresa with Dr. Bill Lapenta and Ashley Burrell of NOAA's CWCP. Other pictures courtesy of nasa.gov.

IMPORTANT DATES FOR THE 2018 PROGRAM

- **Program start/end dates**: *06/04 – 08/10 (10 weeks).*
- **Orientation**: *06/04 (9:00 am – 1:30 pm).*
- **Division/Labs. Lectures**: *06/20 Dr. Holly R. Gilbert; 06/27 671 Lecture; 07/2 67X Lecture, 07/11 672 Lecture; 07/18 67X Lecture.*
- **Parker Solar Probe launch window**: *07/31 to 08/19.*
- **Student Presentation Dates**: *7/25, 08/01, 08/08.*
- **Enrichment Activities**: *06/23 Field trip, 07/13 Picnic.*

(These dates are subject to change.)

A WORD WITH A MENTOR:
DR. GEORGIA DE NOLFO

The SESI team asked Georgia about herself, her work, and her mentorship experiences.

WHEN/WHY DID YOU DECIDE TO BECOME A SCIENTIST? DID YOU HAVE ANY TEACHERS/MENTORS THAT HELPED YOU FIND YOUR VOCATION?

My parents tell me that my interest in science goes as far back as elementary school but I think the most influential moment was during my junior year of high school. I was fortunate enough to be the only junior in the physics class that year, and since the seniors graduated a month early, I spent an entire month working on advanced topics in physics with my physics teacher. The one-to-one mentoring enabled me to ask questions I might not have asked in a large class and I soon discovered that I adored physics!

WHEN DID YOU JOIN NASA? HAVE YOU ALWAYS WORKED IN HELIOPHYSICS?

I joined NASA after my first postdoctoral fellowship at Caltech in 2001 as a National Research Council fellow. During those early years, I focused on several astrophysics projects related to detecting galactic cosmic rays with high-altitude balloon-borne payloads and also with the Advanced Composition Explorer (ACE) mission. I spent 10 years in astrophysics before heading over as a civil servant to the Heliophysics Division.

WHAT CAN WE DO TO INCREASE THE RECRUITMENT OF WOMEN IN SCIENCE?

While I have seen an increasing presence of women in my field, it is still quite challenging to find female mentors, and this is such a critical part of inspiring young women to persevere in physics. *I also suspect that confidence building in STEM subjects starts at an early age and so it is vital that women in science continue to participate in outreach programs. The toughest part of being a woman in science (and likely any other field) is navigating between career and family obligations. I still don't have good advice for this except that it takes compromise.*

ABOUT HER WORK

The focus of my research has been to understand how particles, whether from supernovae or from solar flares, get energized. Typically, the energization is in the form of shocks but it is the details that make fully understanding these processes challenging. We not only have to build sensitive instrumentation to detect details in the energy spectrum and composition with very fine time cadence, but we need to connect these new observations to other contextual observations that suggest or link potential sources and/or processes. ***Understanding how these particles get energized, in some cases to fractions of the speed of light, provides us with the tools for understanding fundamental processes that are ubiquitous in the farthest reaches of our galaxy and universe beyond.*** *Furthermore, these energetic particles are a main contributor to space weather and the potential hazards that face mankind with increasing presence in space.*

Continued on page 3

ABOUT HER

Dr. Georgia de Nolfo received her B.S. and M.S. from the University of Chicago and her PhD in 1997 from Washington University, St. Louis.

She spent 4 years as a postdoctoral scholar at the California Institute of Technology and as a National Research Council Fellow at NASA/Goddard.

Since then Dr. de Nolfo has worked in experimental astrophysics at NASA/Goddard focusing on instrument development, mission support, and data analysis of energetic particles.

Dr. de Nolfo has served on numerous astrophysics teams (e.g., high-altitude balloon-borne missions, CALET) in addition to the Advanced Composition Explorer (ACE) team.

Currently Dr. de Nolfo is providing instrument hardware for several upcoming CubeSat missions including a terrestrial gamma-ray flash payload, TRYAD, and an astrophysical gamma-ray burst payload, BurstCube. Dr. de Nolfo is Deputy Project Scientist for the ACE and STEREO missions.

Picture and bio courtesy of nasa.gov.

CUA SPOTLIGHT:
THE APPLIED SPACE WEATHER RESEARCH MASTER'S PROGRAM

With human presence in space expanding and dependence on space-based technologies increasing, the demand for qualified professionals who are knowledgeable about conditions in the space environment continues to grow in government, industry, and academia. In response to that demand, the Department of Physics at the Catholic University of America (CUA) is pleased to offer a two-year, customized curriculum at the graduate level leading to a Master of Science Degree in Space Weather.

The Applied Space Weather Research (ASWR) Program includes courses that cover both the fundamental physics of the Sun-Earth system and the practical knowledge needed to better understand and anticipate the impacts of solar and geomagnetic storms on technology. The courses are taught by senior scientists with extensive experience in space weather research and applications. The new Space Weather Center in the CUA Department of Physics provides access to data and state-of-the-art computer models that will give students real-world experience in space weather monitoring, simulations, and forecasting. ***The program is now open for Fall 2018 enrollment. For more information, visit physics.cua.edu/ and physics.cua.edu/spaceweather.cfm.***

A NOTE FROM THE HELIOPHYSICS SCIENCE DIVISION

It's my pleasure to extend a warm welcome to our prospective student SESI interns. Many of us working today in the GSFC Heliophysics Science Division (HSD) were inspired to pursue a career in science because of the engagement, encouragement, and excitement we experienced during the kind of internship that SESI offers. All our mentors share Dr. de Nolfo's conviction that internships are mutually beneficial to you and to our organization. We always look forward to the annual arrival of a "gaggle" of interns eager to learn, offer new perspectives, and, of course, work hard!

Heliophysics is a relatively new field. Its domain is the heliosphere: the Sun and all of interplanetary space, down to the surface of planets and other solid bodies and out to the edge of the solar system. Its subdisciplines include studies of the Sun, the solar wind and its interactions with solar system bodies, magnetospheres of the Earth and other planets, the Earth's upper atmosphere (ionosphere, thermosphere, and mesosphere), and the interaction of the heliosphere with the interstellar medium. These subjects have been studied for many decades and have reached a high degree of sophistication. However, only in recent years have we come to realize that the heliosphere must be understood as an interconnected, highly dynamic system. A system-level approach is vital for understanding and predicting space weather effects of the heliosphere on Earth, astronauts, and robotic spacecraft.

Here at HSD, we pursue every aspect of the heliospheric system, including theory, computational modeling, data analysis, new technology and instruments, and the planning and execution of space missions. You will learn about and contribute to one or more of these activities while interacting with working scientists and finding new friends among your fellow interns.

Welcome!
Dr. Holly Gilbert
Director, Heliophysics Science Division

Picture courtesy of nasa.gov.

A Word with A Mentor: Continued from page 2

ABOUT MENTORSHIP AND EDUCATIONAL PROGRAMS

My laboratory incorporates two electrical engineers, several mechanical engineers, a postdoc and several students. Most of my students work during the summer with the undergraduate internship program. I typically have two undergraduates working during the summer in my lab. In addition, some students work through the academic year, either conducting high school senior research projects or as graduate students.

One mechanical engineer working in my laboratory has just completed his masters at MIT and will contribute to the analysis of instrument and CubeSat structures under a two-year fellowship from Spain. ***I really love mentoring students. Not only do I benefit from their hard work and the often fresh perspectives they bring to the work, but I find it rewarding to try to share some of my enthusiasm for science with next-generation scientists.*** *I had the good fortune to work in a laboratory as an undergraduate with John Simpson at the University of Chicago. I worked on a tiny instrument to detect dust that eventually flew through the tail of Halley's comet on the VEGA mission. It was that hands-on experience and invaluable mentoring that provided a foundation for a career in science.*

Picture courtesy of Georgia de Nolfo.

THE 2017 INTERN EXCHANGE WITH NCWCP

During the 2017 SESI Session, our students engaged in an intern exchange with their counterparts at NOAA's Center for Weather and Climate Prediction (NCWCP) in College Park, Maryland. The NCWCP is one of nine National Oceanic and Atmospheric Administration's National Centers for Environmental Prediction (NCEP) that make up a part of NOAA's National Weather Service.

The CWPC provides a wide variety of outlooks, predictions, and discussions for climate-related fields such as hazards, droughts, and hurricane seasons; these products have many applications and impacts to sectors from the socio-economic, to the scientific, to those related to health and human safety. Our interns were able to check out the NCWCP's many prediction tools, including some of NCWCP's real-time monitoring systems, and they also received a lecture/center overview from NCEP director Dr. William M. Lapenta.

In return, NCWCP's interns visited Goddard's Heliophysics Science Division. They were able to tour the Community Coordinated Modeling Center (CCMC) and Space Weather Laboratory with Dr. Yihua Zheng, the STEM Innovation lab for VR tours with Lani Sasser, and visited the Energetic Particle Laboratory with Dr. Georgia de Nolfo. They also sat in on part of the weekly SESI lecture series, in this case highlighting Code 674, the Space Weather Lab, with Dr. Sarah L. Jones and Dr. Robert F. Pfaff.

We would like to give a special thanks to Dr. Genene Fisher, Ashley Burrell, and all of our lecturers and tour-givers at Goddard for making this intern exchange such a wonderful experience for our students!

2017 STUDENT PRESENTATIONS

David Bialy (American University):
Main CME drivers behind Geomagnetic Storms in 2016
Mentors: Teresa Nieves-Chinchilla, Silvina Guidoni

Mathew Garcia and **Andrea Minot**
(College of the Desert and Dickinson College):
Oscillations in Emerging Active Regions on the Sun
Mentors: Karin Muglach, Raphael Attie

Heather Mei (Tufts University):
3D Solar Coronal Mass Ejection Kinematics & Topology
Mentor: Barbara J. Thompson

Alyssa Mills (UMD, College Park):
Correlating Class 1 Meteorite Showers to Dust Impacts Detected by the WIND Spacecraft
Mentors: Chris St. Cyr, Lynn Wilson

Keighley Rockcliffe (Rensselaer Polytechnic Institute):
Do ICMEs Perturb Interplanetary Dust? Evidence from Wind.
Mentors: Chris St. Cyr, Lynn Wilson

Steven Schlax (University of Illinois at Urbana-Champaign):
Wave Analysis Platform for Solar Wind Studies
Mentor: Lan Jian

2018 PROJECT SPOTLIGHTS

Here are just a few of the exciting opportunities that our mentors have posted for the upcoming intern session:

- *Research on solar-terrestrial effect in the climate of Nigeria.*
- *Space Weather Web App Development at the Community Coordinated Modeling Center (CCMC).*
- *Benchmarking CME propagation models: Define the CME measurements used as model inputs.*
- *Understanding CME model performance during STEREO quadrature.*
- *Heliophysics sonification user interface in HTML5 and Javascript.*

Pictured: The SESI Team

Center: Dr. Teresa Nieves-Chinchilla, CEPHEUS Director of Education

Right: Dr. Silvina Guidoni, CEPHEUS Deputy Director of Education

Left: Ms. Lizz Bowlen, CEPHEUS/SESI Program Manager