

Michigan Space Grant Consortium
University of Michigan
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LOB: NASA Internships, Fellowships, and Scholarships; Stem Engagement;
Institutional Engagement; Educator Professional Development

2016 – 2017 Funding Interval

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Michigan Space Grant Consortium is a Designated Program Consortium funded at a level of \$760,000 for fiscal year 2016.

PROGRAM GOALS

API ED-15-1: *Provide significant, direct student awards in higher education to (1) students across all institutional categories and levels; 2) racially or ethnically underrepresented students; 3) women; and 4) persons with disabilities at percentages that meet or exceed the national percentages for these populations, as determined by the most recent, publicly available data from the U.S. Department of Education's National Center for Education Statistics for a minimum of two of the four categories.*

The MSGC Fellowship and Internship Program

Goal: Increase the number of proposals that the MSGC Fellowship Program receives.

Goal: Improve the longitudinal tracking of the MSGC Fellowship award recipients.

Goal: Competitively award graduate and undergraduate fellowships using the National Center for Education Statistics (NCES) Digest as a guide for setting diversity targets. The MSGC target is currently 19.4%. U.S. citizenship is required.

API-15-2: *Engage with at least 80,000 educators in NASA-supported professional development, research, and internships that use NASA-unique STEM content.*

The MSGC Higher Education and K-12 Educator Incentive Programs

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Higher Education and K-12 Educator Incentive Programs with augmentation funds available to programs that target underrepresented minorities and women.

Goal: Award quality programs that target underrepresented minorities and women.

API-ED-4: *Maintain the NASA Museum Alliance and/or other STEM education strategic partnerships in no fewer than 30 states, U.S. Territories and/or the District of Columbia.*

The MSGC Informal Education Program

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Informal Education Program with augmentation funds available to programs that target underrepresented minorities, women, and persons with disabilities.

Goal: Award quality programs that target underrepresented minorities and women.

Goal: Award quality programs that encourage Science, Technology, Engineering, and Mathematics education in informal settings; e.g., museums science centers, boy and girl scouts, etc.

API-ED-5: *Engage with at least 600,000 elementary and secondary students in NASA STEM engagement activities.*

The MSGC Precollege Education Program

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Precollege Education and K-12 Educator Incentive Programs with augmentation funds available to programs that target underrepresented minorities and women.

Goal: Award quality programs that target underrepresented minorities and women.

PROGRAM/PROJECT BENEFIT TO PROGRAM AREAS

API ED-15-1: *Provide significant, direct student awards in higher education to (1) students across all institutional categories and levels; 2) racially or ethnically underrepresented students; 3) women; and 4) persons with disabilities at percentages that meet or exceed the national percentages for these populations. MSGC Fellowship and Internship Programs. Highlights are provided below:*

My Space Grant internship provided me the means to get through college comfortably so I could focus on my studies and research. Competing for an internship and being selected encouraged me to realize that if NASA believes in me that I can do this!" says Sydney Hamilton (University of Michigan). "I continued my education at the University of Southern California. I have received a few recognitions and will continue to contribute to the aerospace industry." I am currently a structural design engineer for the Boeing Company at the Southern California Design Center." This year, I was happy and proud to be featured by the National Society of Black Engineers and The Boeing Company at their Hidden Figures Power Panel. I was humbled to be recognized along side such phenomenal women!"

API-15-2: *Engage with at least 80,000 educators in NASA-supported professional development, research, and internships that use NASA-unique STEM content. Elementary/Secondary Education: MSGC Higher Education and K-12 Educator Incentive Programs. Highlights are provided below:*

Michigan Technological University's five-day teacher professional development institute titled, *Engaging Your Students in Authentic Science Research*, was conducted for 13 teachers at Michigan Technological University, from June 27 to July 1, 2016. Teachers gained the skills to guide their students in the design of original research, rather than simply conducting cookbook experiments. Teachers participated in field and classroom research led by Michigan Tech research scientists, graduate students, and teacher experts, including the Department of Physics cloud chamber and atmosphere-related lab activities, monitoring the feeding habits of stream macroinvertebrates, salamander inventory, invasive plants and insects, and a biodiversity investigation. Following the institute, teachers created five-day teaching units describing how they will integrate a research experience into their curriculum. Teacher's units are posted on the Western U.P. Center for Science, Math & Environmental Education website (wupcenter.mtu.edu). Grant funding supported planning and coordination of the institute, and travel stipends for six teachers from under-served schools in Detroit, which allowed them to participate in this institute. "An article about the teacher institute and engaging high school students in original research investigations was published in the Michigan Science Teachers' Spring 2016 newsletter titled, *Getting Students Outdoors*, says Joan Chadde, Director for the Center for Science and Environmental Outreach at Michigan Tech University. "Follow-up contact with participating teachers is ongoing."

API-ED-4: *Maintain the NASA Museum Alliance and/or other STEM education strategic partnerships in no fewer than 30 states, U.S. Territories and/or the District of Columbia.* Informal Education: MSGC Informal Education Program. Highlights are provided below:

During the seven-week workshop, the Young Planetarians, students in grades 6 – 8 learned about Space Science and how to operate the new Longway Full Dome planetarium in a hands-on environment. "The students spent half of their time inside the theater learning to find constellations in the sky and then presented that information to an audience of peers," says Todd Slisher, Executive Director of the Sloan Longway (Sloan Museum and Longway Planetarium. "The other half of their time was spent learning about astronomy concepts, like solar system formation and the history of astronomical discoveries."

API-ED-5: *Engage with at least 600,000 elementary and secondary students in NASA STEM engagement activities.* MSGC Pre-College Education Program. Highlights are provided below:

The K-12 Outreach Program is designed to supplement classroom activities with lessons we have developed on aerospace and space science along with hands-on activities. "We find that students bond with the UM undergraduate and graduate student instructors who are just a bit older," says UM Research Scientist, Dr. Timothy Smith. "This combination has been successful for many years, giving us the tools to spark the interest of students that have not connected to science and math in the past, and to foster those who have." Events range from activities held within an afternoon class to multi-day, all-day events working with the same group of students or different groups of students. A sampling of the activities provided are: model rocket building and launching, balsa wood glider design, air surface controls, tower building, down-on-the-moon, and lectures, such as, *Why is the Sky Blue?* and undergraduate and graduate students describing their path to the university STEM field that they are currently studying to earn a bachelors or

graduate degree. Note: Augmentation funding was used to bring underrepresented and underserved students to the Michigan campus.

PROGRAM ACCOMPLISHMENTS

The Fellowship and Internship Program (refer to API ED-15-1)

Goal: Increase the number of proposals that the MSGC Fellowship Program receives.

Metrics: Compare the number of proposals received from year-to-year.

Approach: Provide brochures to all MSGC campus representatives to supplement the other ways (newsletter, website, postings, and e-mails) in which we announce the MSGC Fellowship and Internship opportunities.

Accomplishment: The MSGC flagship Fellowship Program received 58 proposals in 2016 as compared to 67 in 2015. We received 34 proposals to the MSGC Undergraduate Fellowship Program and 24 proposals to the MSGC Graduate Fellowship Program.

Goal: Improve the longitudinal tracking of the MSGC Fellowship and Internship award recipients.

Metrics: Track the next steps that students take after they are awarded fellowship funding from the MSGC.

Approach: With the contact information provided by Bonnie Bryant, Mark Fischer of Education Programs Support Services provides us with results from the surveys that he routinely sends to our Fellowship and Internship award recipients. Mentors of Fellowship and Internship award recipients are also contacted.

Accomplishment: The number of students that received funding from the 2016 MSGC Fellowship Program was 38 and from the MSGC Internship Program was 13 as compared to 31 Fellowships and 13 Internships in 2015. More details will be provided in our longitudinal tables which will be provided within the next few months per NASA Headquarters' direction.

Goal: Competitively award graduate and undergraduate fellowships and internships with demographics as specified by NASA of 19.4% underrepresented minority (NCES). U. S. citizenship required.

Metrics: Compare the number of proposals received each year by gender and ethnicity.

Approach: The Summer Research Opportunity Program (SROP), a long-standing minority student recruitment program for graduate school, focuses on exposing rising sophomores, juniors, and seniors to on-campus research activities. The Council of Graduate Schools, a *Big Ten Plus* consortium of graduate schools that routinely brings dozens of high-achieving underrepresented minority undergraduates to its campuses each summer supports the SROP Program. SROP runs through the graduate school at UM and at MSU. In 2016, MSGC dedicated funds to 10 SROP students in order for them to participate in internships at the University of Michigan. The MSGC also offers a fellowship program targeted to undergraduate, underrepresented minority students. In this program, strong mentorship is required. Mentors qualify for \$1,000 per student. A mentor may have up to two underrepresented minority students on his/her team. A \$500 incentive is offered to mentors of underrepresented students not eligible for this program, for example, underrepresented graduate students.

Accomplishment: Our target is to award a minimum of 19.4% underrepresented minority students in our fellowship program. The target is derived from the underrepresented minority

student enrollment percentage for the state of Michigan as per the NCES Digest. Our commensurate minimum for women is 40%. During funding interval 2016, 25% of the fellowship and internship award recipients were underrepresented minority students; the amount of underrepresented minority students that we awarded in 2015 was 25%. During funding interval 2016, 45% of the fellowship and internship award recipients were women. The amount of women awarded in 2015 was 50%.

The Higher Education and K-12 Educator Incentive Programs (refer to API ED-15-2)

Goal: Increase the number of applications coming from outside of the Consortium for the Higher Education and K-12 Educator Incentive Programs.

Metrics: Record the number of applications that the MSGC receives from outside of the Consortium.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs.

Accomplishment: During the 2016 funding interval, we received 10 proposals from outside of the MSGC as compared to the 10 proposals we received during the 2015 funding interval.

Goal: Encourage quality programs that target underrepresented minorities and women.

Metrics: Record the number of programs targeted to underrepresented minorities and women.

Approach: Announce that augmented support will be available to those programs that target underrepresented minorities and women. Within the announcement add that to be considered for augmented support, an additional page describing in detail why added funds are necessary to assure the success of program targeting underrepresented minorities and/or women.

Accomplishment: During the 2016 funding interval, we received 4 proposals that directly targeted underrepresented minorities and/or women, compared to the 3 proposals that we received during the 2015 funding interval.

The Research Seed Grant Program

Goal: Improve participation in the Research Seed Grant Program across the MSGC.

Metrics: Compare the distribution of awards across the institutions within the MSGC.

Approach: Keep a record of the proposals we received overall as well as the distribution across the Consortium.

Accomplishment: During funding interval 2016 – 2017, we received proposal to the MSGC Research Seed Grant Program from 7 out of 11 affiliate universities as compared to 8 out of 11 affiliate universities in 2015.

Goal: Increase the diversity (underrepresented minorities and women) in the MSGC Research Seed Grant Program.

Metrics: Record the number of applicants each year by gender, ethnicity, and persons with disabilities.

Approach: Target announcements to college and university groups using e-mail, group meetings, and invitations from the director and campus representatives.

Accomplishment: During the 2016 funding interval, we were pleased to receive 6 proposals from women as compared to 9 in 2015. Four proposals from women were funded. Two underrepresented proposers were awarded this year.

The Precollege Education Program (refer to API ED-15-5)

Goal: Increase the number of applications coming from outside of the Consortium for the Precollege Education Program.

Metrics: Record the number of applications that the MSGC receives from outside of the Consortium.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs.

Accomplishment: During the 2016 funding interval, we received 3 proposals from outside of the MSGC as compared to the 3 proposals we received during the 2015 funding interval.

Goal: Encourage programs that target underrepresented minorities and women.

Metrics: Record the number of programs targeted to underrepresented minorities and women.

Approach: Announce that augmented support will be available to those programs that target underrepresented minorities and women. Within the announcement we added that to be considered for augmented support, an additional page describing in detail why additional funds are necessary to assure the success of program targeting underrepresented minorities and/or women.

Accomplishments: During the 2016 funding interval we received 7 proposals that directly targeted underrepresented minorities and/or women, compared to 6 proposals that we received for the 2015 funding interval.

The Informal Education Program (refer to API ED-15-4)

Goal: Increase the number of applications coming from outside of the Consortium.

Metrics: Record the number of applications that the MSGC receives from outside of the Consortium.

Approach: Some 8,000 brochures are sent to public and intermediate school districts, including high, middle, elementary, charter along with the Boy and Girls Scouts, museums and after-school clubs.

Accomplishment: During the 2016 funding interval, we received 3 proposals from outside of the MSGC, compared to the 3 proposals that we received during the 2015 funding interval.

Goal: Encourage programs that target underrepresented minorities and women.

Metrics: Record the number of programs targeted to underrepresented minorities and women.

Approach: Announce that augmented support will be available to those programs that target underrepresented minorities and women. Within the announcement we added that to be considered for augmented support, an additional page describing in detail why additional funds are necessary to assure the success of program targeting underrepresented minorities and/or women.

Accomplishments: During the 2016 funding interval we received 8 proposals that directly targeted underrepresented minorities and/or women, compared to 3 proposals that we received for the 2015 funding interval.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Diversity:** Benchmarks for diversity within the MSGC Fellowship and Internship Programs have consistently been met as reported within this and past ADP's. Over half of the Program proposals are targeted to underrepresented minorities or to women. Again this year, an unprecedented amount of women proposed to the MSGC Research Seed Grant Program.
- **Minority-Serving Institutions:** The underrepresented minority enrollment for students attending Wayne State University and Eastern Michigan University is 36% and 20%, respectively, as compared to 4% - 13% at other MSGC-affiliated universities and colleges. The only historically black college that we have in the state of Michigan is Lewis College, a non-accredited business college in Detroit. Bay Mills Community College, Keweenaw Bay Ojibwa Community College, and Saginaw Chippewa Tribal College are the three tribal colleges located in Michigan, but at this time, no engineering programs are offered on these campuses. The tribal colleges in Michigan primarily focus on liberal arts and local economic development (casinos). There are no hispanic-serving universities or colleges in the state of Michigan. Our focus remains to recruit minority students and junior faculty members from MSGC institutions and through the SROP Program.
- ***Office of Education Annual Performance Indicators:**
 - *Numbers will change as statistics come in and will be reflected on the OEPM for 2016.
 - API 2.4.1 ED-16-1: 13/23/0 (# of NIFS to underrepresented, female, and disabled.)
 - API 2.4.2 ED-16-2: 75 (# of educators.)
 - API 2.4.4 ED-16-4: 50 (# of informal education events.)
 - API 2.4.5 ED-16-5: 1500 (# of K-12 students.)

IMPROVEMENTS MADE IN THE PAST YEAR

On July 1, 2016, our favorite Space Grant director, Alec D. Gallimore, was appointed the Robert J. Vlastic Dean of Engineering at the University of Michigan. We are so proud of him. Dean Gallimore chaired the Great Midwestern Regional Space Grant Conference that was held on October 7 and 8, 2016. Highlights are described below.

The MSGC hosted the Great Midwestern Regional Space Grant Conference on Friday and Saturday, October 7 and 8, 2016. Dr. Dawn Tilbury was the keynote speaker on Friday. Her presentation was entitled, *Michigan Robotics*. "The University of Michigan is leading the way to develop driverless cars that will save tens of thousands of lives every year," said Dr. Tilbury. "Autonomous submarines will map the ocean floor and inspect ships' hulls for cracks and other dangers. Walking robots will assist humans with search-and-rescue tasks." Dr. Tilbury also talked about the future of prosthetic limbs that link with the human brain to restore function for stroke and accident victims as well as the new M.S. and Ph.D. programs launched at Michigan.

Dr. Ryan Eustice was the keynote speaker on Saturday. His presentation was entitled, *Autonomous Vehicles and the Road Ahead*. Dr. Eustice gave an overview of Michigan's work in collaboration with the Ford Motor Company in full-scale automated driving. In particular, he discussed some of Michigan's successes in high definition map building and localization. Dr. Eustice also talked about Michigan's unique Mcity Test Facility for connected and automated driving and about the challenges ahead in achieving reliable, wide-scale deployment. On Friday,

regional guests toured the Mcity Test Facility as well as Dean Gallimore's Plasmadynamics and Electric Propulsion Laboratory as well as other labs on the College of Engineering campus.

"I think it's really important that we focus young people on the importance of math and science and engineering and that we talk about the new jobs that are being created," noted Congresswoman Debbie Dingell. "I want to see more young people getting excited and engaged in STEM, and wanting to be at the forefront of where we're going to go as a state and a country leading innovation and technology for the world." Congresswoman Dingell was the keynote speaker for Robotics Day, hosted by the MSGC and the National Center for Manufacturing Science on April 15, 2016.

CURRENT AND PROJECTED CHALLENGES

None at this time.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The MSGC Executive Board consists of the following members:

Calvin College • Private four-year liberal arts college: Jason Smolinski is an Assistant Professor of Physics and Astronomy with research in the field of globular star clusters.

Ann Arbor Public Schools: Mr. Michael Madison is an elementary school principal. Mr. Madison was recently elected President of the Ann Arbor Administrators' Association for a two-year term. He is also Executive Board member of the Ann Arbor Hands-On Museum, and Vice-President of the Pioneer High School Boosters.

Eastern Michigan University • Public Ph.D.-granting university: James Sheerin is a Professor of Physics and Astronomy and is active in space physics research and in developing science courses for non-majors and pre-service teachers.

Grand Valley State University • Public Master's-granting university: Bopaiah Biddanda is an Aquatic Microbial Ecologist interested in the Carbon Biogeochemistry of natural waters. In his research, he addresses questions of carbon flow driven by microorganisms in nature.

Hope College • Private four-year liberal arts college: Peter Gonthier is an astronomer and Professor of Physics. Professor Gonthier recently won an NSF grant for his proposal, *Radio, X-Ray, and Gamma-Ray Emission from Neutron Stars*.

Michigan State University • Public Ph.D. granting university: Michael Velbel is a Professor of Geological Sciences where he investigates the geological, mineralogical, geochemical, and geomorphic factors that control mineral alterations at the Earth's surface.

Michigan Technological University • Public Ph.D. granting university: Lorelle Meadows is the dean for MTU's Pavlis Honors College.

Oakland University • Public Ph.D. granting university: Laila Guessous is an Associate Professor of Mechanical Engineering with research in the field of computational fluid dynamics and computational heat transfer.

Saginaw Valley State University • Public Master's-granting University: Garry Johns is Professor of Mathematics and also consults with high school mathematics teachers in the Buena Vista School District regarding best teaching practices and curriculum alignment. Buena Vista has a large African-American population.

University of Michigan (lead institution) • Public Ph.D. granting university: Alec Gallimore is the MSGC director, Arthur F. Thurnau Professor of Aerospace Engineering and was recently

named Dean of the College of Engineering for the University of Michigan's College of Engineering.

University of Michigan • Public Ph.D. granting university: Dr. Cinda Davis is the director of the Women in Science and Engineering Program.

Wayne State University • Public Ph.D. granting university: R. Darin Ellis is the Associate Dean of Academic and Student Affairs Wayne State University. He is currently on the faculty of the Industrial Engineering Department where he holds the rank of Associate Professor and teaches courses including statistics, human factors in product development, work design, and ergonomics.

Western Michigan University • Public Ph.D. granting university: Massood Atashbar is Professor of Electrical and Computer Engineering and the director of Advanced Smart Sensors and Structures and the Sensor Technology Laboratory.

Respectfully submitted on March 22, 2017,
Alec D. Gallimore, MSGC Director