

Michigan Space Grant Consortium
University of Michigan
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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. 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 \$575,000 for fiscal year 2012.

PROGRAM GOALS

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate)* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs.

The MSGC Fellowship 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 with demographics as specified by NASA of 18.8% underrepresented minority (Department of Education). U. S. citizenship required.

The MSGC Research Seed Grant Program

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

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

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)* Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs.

The MSGC Precollege Education, Higher Education, K-12 Educator Incentive and Augmentation Programs

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.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission. (Engage and Inspire)* Informal Education: MSGC Informal Education and Augmentation Programs.

The MSGC Informal Education Program

Goal: Increase the number of applications coming from outside of the Consortium for the MSGC Public Outreach 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.)

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate)* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs. Highlights are provided below:

“I believe my first experience at the NASA Ames Academy for Space Exploration, funded by the MSGC, was the single greatest factor contributing to my pursuit of a career in spacecraft dynamics and control,” says **Joseph Starek**, graduate of the University of Michigan. “The experience directly led me to two additional internships at NASA Ames as well as provided me the motivation and desire to continue my education. I was accepted into the Stanford Aeronautics and Astronautics Doctoral Program. I would not be in this program if I had not been funded to intern at NASA Ames by the MSGC. I believe it is an invaluable program to engineering students across the country.”

“I did not have intentions to major in aerospace engineering, solely on the fear I would not have a job upon graduation. I was strongly encouraged to apply to the MSGC internship program and I was excepted into the program,” says **Sydney Hamilton**. “From there I was able to realize the opportunities that are available to aerospace engineers. After working at NASA, I was no longer in fear of being so specialized. If it were not for the internship, my mind would not have been opened to see all of the different roles for aerospace engineers. I appreciate it everyday. Although this program is challenging, I cannot imagine myself doing anything else.”

Professor Jacquelin Koch, an atmospheric scientist and **Ms. Carrie Dummer**, an education mentor and instructor, both from Hope College, were awarded an MSGC Research Seed Grant for their proposal, *Assessing the Effectiveness of an At-Home Laboratory Component for a Non-Major Online Science Course at Hope College*. This project found cost-effective ways to perform inquiry-based experiments with a positive impact on student learning, which addresses NASA's Strategic Goal 6.1: Improve retention of students in STEM disciplines by providing opportunities and activities along the full length of the education pipeline. This grant was used to assess learning gains for an online course with take-home laboratory kits by focusing on student achievement of well-defined course objectives. “The lessons learned from this research will further develop effective at-home experiments that can serve as a model for other course offerings in STEM disciplines,” says Professor Koch. “In addition, schools faced with budget constraints can use this model to maintain or even expand their course offerings, which enables greater exposure to STEM disciplines for non-majors when on-campus offerings are limited.” “The preliminary assessment data from this research will be used to submit a proposal to the Spencer Foundation,” added Ms. Dummer. “If awarded, this grant will support continued assessment of further course offerings to educate and improve the dissemination of effective teaching methods for both online and on campus STEM courses.”

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)*

Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs. Highlights are provided below:

We rarely receive a Research Seed Grant proposal that includes a component engaging precollege students. For that reason, we are please to highlight **Professor Brian Bodenbender's** award winning proposal, *Application of GigaPan Technology to Monitor Changes in Dynamic Coastal Sand Dune Systems along Lake Michigan*. “I worked with three undergraduate students to set up a field site in an open sand blowout and verify the effectiveness of a procedure for photographically measuring changes to the sand surface,” Professor Bodenbender of Hope College explained. “Following the successful demonstration of this method, I worked with a Grand Haven high school teacher to identify nearby sites where high school and middle school science club students could set up a similar field study once the ground thawed. In the initial stages of the project, high school students used *Google Earth* to explore possible field areas.” After students chose a field site, they drove erosion pins into the sand at various points throughout areas of open sand at the site. These pins have markings to indicate the depth of the pin in the sand. The students take photographs of each pin to record the starting sand height and will return to the field site periodically to re-photograph the pins. Students measure the amount of sand movement by comparing the most recent photos to the initial ones. The measurements

can be made directly from photographs displayed on a computer screen, allowing multiple students to repeat the measurements and check each other's work for errors. "While our current work involves high school students, we expect that the field and laboratory procedures will also be mastered by middle school students," added Professor Bodenbender. "We will be developing curriculum materials on Earth science themes related to this research, such as sand transport, measurement error, ecological succession, lakeshore processes, and weather patterns aimed at both the middle school and high school levels."

Oakland University, in partnership with Oakland Schools, recruited 51 teachers from 16 school districts into two STEM all-day workshops focused on educating teachers on how best to deliver STEM education in a student-centered, active learning environment. Participants were taken through a series of exercises on how to come up with low-cost ideas for economic sustainability of the experiences. "Teachers were asked to teach on a variety of topics that included Industrial Engineering or how to get kids to manufacture assemblies including paper airplanes and Lego cars," reports **Professor Chris Kobus**, an MSGC Higher Education Program award recipient. "They were also asked to find production bottlenecks and make adjustments as well as more traditional endeavors like teaching energy sciences by replicating the early Thomas Edison experiments. For example, experiments included using 0.9mm pencil lead as a filament for a light source powered by D-size batteries, using historical anecdotes to teach Earth Sciences. These lessons were performed with a backdrop of common-core standards that are coming down the pike and demonstrate to teachers how they can best meet these standards by keeping the students active. In the follow-up assessment of the workshops, 100% of teachers reported that they found the exercises helpful."

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission. (Engage and Inspire)* Informal Education: MSGC Informal Education and Augmentation Programs. Highlights are provided below:

Over 1,000 members of the community flooded Michigan Technological University's (MTU) new Great Lakes Research Center during the October 2012 Water Festival. MTU scientists, graduate and undergraduate students, specialists from the National Park Service, U.S. Forest Service, Fish and Wildlife Service as well as other non-profit and environmental organizations volunteered to present a wide variety of topics related to Lake Superior and water resources. Over 30 different sessions, ranging from hands-on experiences to discovering what aquatic insects tell about stream health to computer simulations illustrating changes in Lake Superior water temperatures, engaged the audience throughout the day. "The field trip was great and awesome," wrote one student. "My son was particularly enthused by controlling the water robots," added his father. "We learned about the currents in Lake Superior," said a grandmother of four. "It was fascinating!" "Thanks to the augmentation grant from the MSGC, the Water Festival was offered free of charge to participating schools; the only expenses incurred by school districts was transportation," says **Mrs. Lloyd Wescoat**, Education Program Coordinator and Service Learning Specialist in the Center for Science and Environmental Education at MTU. "This allowed for broad participation across local districts, the majority of which qualify for Title 1 funds with 30% or more of enrolled students eligible for free lunches or lunches at a reduced cost."

PROGRAM ACCOMPLISHMENTS

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate).* Higher Education: MSGC Fellowship, Internship, and Seed Grant Programs.

The MSGC Fellowship Program

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 60 proposals in 2012 as compared to 53 in 2011. We received 34 proposals to the MSGC Undergraduate Fellowship Program and 26 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: Mark Fischer, Executive Director of the National Space Grant Foundation, provides us with results from the surveys that he routinely sends to our Fellowship and Internship award recipients with the contact information provided by Bonnie Bryant, MSGC Program Coordinator. Bonnie also contacts the mentors of Fellowship and Internship award recipients for input.

Accomplishment: The number of students that received funding from the 2012 MSGC Fellowship Program was 40 and from the MSGC Internship Program was 22 as compared to 37 Fellowships and 26 Internships in 2011. Twenty-five students are pursuing advanced degrees in STEM disciplines, 3 are seeking STEM employment, 22 accepted STEM positions in industry, 1 accepted a position in industry, 8 accepted STEM positions in academia, and 8 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.

Goal: Competitively award graduate and undergraduate fellowships and internships with demographics as specified by NASA of 18.8% underrepresented minority (National Center of Education Statistics Digest). U. S. citizenship required.

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

Approach: A long-standing minority student recruitment program for graduate school, the Summer Research Opportunity Program (SROP) 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 2012, MSGC dedicated funds to 7 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 goal is to award a minimum of 18.8% underrepresented minority students in our fellowship program. The goal is derived from the underrepresented minority student enrollment percentage for the state of Michigan as per the National Center of Education Statistics Digest. Our commensurate minimum for women is 40%. During funding interval 2012, 34% of the fellowship and internship award recipients were underrepresented minority students; the amount of underrepresented minority students that we awarded in 2011 was 27%. During funding interval 2012 - 2013, 46% of the fellowship and internship award recipients were female students. The amount of female students awarded in 2011 was 50%. While we continue to see a dip in the number of eligible female students, we persist in finding new ways to recruit.

The MSGC 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 2012 – 2013, we received proposals to the MSGC Research Seed Grant Program from 8 out of 12 affiliate universities as compared to 7 out of 12 affiliate universities in 2011. We funded proposals from 8 universities in 2012 as compared to 7 universities in 2011.

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 2012 funding interval, we were pleased to receive six proposals from women, the same recording-breaking amount that we received in 2011. Four proposals from women were funded. We did receive one proposal from an underrepresented minority woman in 2012 that was not funded. Note: The woman (Vicki-Lynn Holmes) that was not funded received feedback from the MSGC Executive Board, re-proposed in 2013, and was awarded a Research Seed Grant.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. (Educate and Engage)*
Elementary/Secondary Education: MSGC Higher Education, K-12 Educator Incentive, Pre-College, and Augmentation Programs.

The MSGC Precollege Education, Higher Education, and K-12 Educator Incentive Programs

Goal: Increase the number of applications coming from outside of the Consortium for the Precollege Education, K-12 Educator Incentive, and Augmentation Programs (all K-12 Educator Incentive Program proposals come from outside of the MSGC).

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 2012 funding interval, we received 17 proposals from outside of the MSGC as compared to the 15 proposals we received during the 2011 funding interval. Eleven of these proposals were from the MSGC K-12 Educator Incentive Program.

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 (via the Augmentation Program) 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 2012 funding interval, we received 20 proposals that directly targeted underrepresented minorities and/or women. During the 2011 funding interval, we received 14 proposals that directly targeted underrepresented minorities.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission. (Engage and Inspire)* Informal Education: MSGC Informal Education and Augmentation Programs.

The MSGC Informal Education Program

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 2012 funding interval, we received 7 proposals from outside of the MSGC, the same number of proposals that we received during the 2011 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 2012 funding interval we received 12 proposals that directly targeted underrepresented minorities and/or women compared to the 6 proposals that we received for the 2011 funding interval.

Goal: Encourage programs that include Science, Technology, Engineering, and Mathematics in informal settings (e.g., museums, science centers, boys and girl club, etc.).

Metrics: Record the number of applications that come from libraries, museums, planetariums, and others that offer STEM education in informal settings.

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. We also encourage MSGC campus representatives to reach out to these establishments in their communities.

Accomplishment: During the 2012 funding interval, all of the programs awarded offered STEM education in informal settings with highly trained staff that provided supplemental materials; the same was true of the 2011 funding interval. Informal settings included libraries, symposiums,

and planetariums, for example, The Longway Planetarium, The Chelsea Library and Discovery Center, and Square One Education Network.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Total Awards = 62; Fellowships = 40. Higher Education/Internships = 22. Twenty of the total awards represent underrepresented minority Fellowship and Internship funding. During the FY12 program year, 25 students are pursuing advanced degrees in STEM disciplines, 1 accepted a position at NASA, 22 accepted STEM positions in industry; 1 accepted a position at NASA; 8 accepted STEM positions in academia; and 8 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing when they received their Space Grant award.
- **Minority-Serving Institutions:** The underrepresented minority enrollment 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 and Keweenaw Bay Ojibwa Community College, and Saginaw Chippewa Tribal College are the three tribal colleges located in Michigan but at this time, no science programs are offered on these campuses. Our focus remains to recruit minority students and junior faculty members from MSGC institutions and through the SROP Program.
 - **NASA Education Priorities** are noted throughout this progress report: **Starek** – page 2; **Hamilton** – page 3; **Koch** – page 3; **Bodenbender** – page 3; **Kobus** – page 4; and **Wescoast** – page 4.

IMPROVEMENTS MADE IN THE PAST YEAR

The MSGC hosted the annual fall conference on Saturday, October 6, 2012. Professor Nilton Renno and student, Harvey Elliott, talked about exploring Mars with the *Curiosity Rover*. Professor Renno is a professor of Atmospheric, Oceanic, and Space Sciences at the University of Michigan. Professor Renno was the leader of the Phoenix Mars Mission Atmospheric Science Theme Group. He led the team that found the *first* direct evidence for liquid water outside the Earth, liquid brines on Mars. Professor Renno is Co-Investigator of the Mars Science Laboratory. He has been developing instruments for measurements on Earth, the Moon, Mars, and beyond. Harvey Elliott is a Ph.D. student at Michigan. Harvey has conducted two field campaigns testing spacecraft instruments at Mars analog sites in the Southwestern United States and African Sahel. One of those campaigns featured a checkout of the Rover Environmental Monitoring System (REMS) – a suite of atmospheric science instruments above the Mars Science Laboratory Rover, *Curiosity*. Harvey is currently the principal investigator of a new project in the Student Space Systems Fabrication Laboratory (SF3L) called, *Microscopes on Mars*.

Dr. Aurles Wiggins regrettably relinquished her MSGC Executive Board membership due to increasing job responsibilities. We are very pleased to announce that Professor Michael Velbel, two-time Research Seed Grant award recipient, filled the Michigan State University vacancy. Michael Velbel is a geological scientist and his research includes terrestrial weathering of Antarctic and non-Antarctic meteorites; rock-, mineral-, and chemical-weathering on Mars and in Martian meteorites; recognition of pre-terrestrial aqueous alteration on other meteorite parent bodies from mineralogical investigations of meteorites; and preservation of sample integrity for past and future sample-return missions. Professor Velbel is also a Smithsonian Senior Fellow at the Division of Meteorites, Department of Mineral Sciences, National Museum of Natural History, Smithsonian Institution, working on aqueous alteration features in Mars meteorites.

We were sorry to lose long-time MSGC Executive Board member, Ms. Mary Ann Sheline Grand Valley State University. Mary Ann was with us from the beginning and is now enjoying travel and spending time with her grandchildren. Mary Ann nominated Professor Bopaiah Biddanda as her replacement. Once we met with him, we agreed that he was the perfect choice to fill the GVSU vacancy. Professor “Bopi” Biddanda is an Aquatic Microbial Ecologist interested in the Carbon Biogeochemistry of natural waters. He has a background in Marine Biology, Oceanography and Microbial Ecology, and likes to address questions of carbon flow driven by microorganisms in nature. Currently, he conducts research on the use of time-series sensors, the carbon cycle and the ecology of submerged sinkholes in the Laurentian Great Lakes, teaches graduate courses on Aquatic Microbial Ecology and Ecosystem Biogeochemistry, mentors undergraduate and graduate students, and serves on the board of two international science journals (Journal of Plankton Research and Aquatic Microbial Ecology).

Professor Gerald Thompkins, the MSGC representative from Wayne State University (WSU), relocated and is now the director of the STEM Education and Research Center at Kent State University. Jerry was recently honored as a distinguished alumnus at Indiana University for his contributions to STEM education. One of the first goals that Jerry accomplished at Kent State was to be awarded membership into the Ohio Space Grant Consortium. Professor Darin Ellis is now the MSGC representative at WSU. Professor Ellis is the Associate Dean of Academic & Student Affairs at WSU. He is responsible for academic operations, academic regulations, advising, curriculum review, and oversight, recruiting, enrollment management, retention, accreditation, public outreach, and student organizations. He has nearly 20 years of experience in human factors and ergonomics, specializing in human-computer interaction. Professor Ellis 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.

We continue to strive to improve the clarity of the funding announcements. In 2011, we re-wrote the Fellowship and Research Seed Grant announcements and in 2012, we re-wrote the precollege education, informal education, higher education, and augmentation announcement and tweaked the rubric. We continued to work with the National Space Grant Foundation’s, Eric Day and Mark Fischer for website and proposal and review system issues.

MSGC Director, Professor Alec Gallimore, was named Associate Dean for Research and Graduate Education (ADRGE) for the University of Michigan's College of Engineering on September 1, 2011 after having served six years as an Associate Dean in the Horace H. Rackham School of Graduate Studies at Michigan. As the ADRGE, Professor Gallimore's responsibilities include the College of Engineering's \$200M/year research enterprise, and the College's 3300 master's and Ph.D. students.

We are proud to announce that MSGC Board member and junior member of Central Michigan University's faculty, Professor Kristina Lemmer, was selected to participate in the Summer Faculty Research Fellowship Program at NASA Jet Propulsion Laboratory (JPL) over the summer of 2012. While at JPL, Professor Lemmer participated in Hall thruster acceleration channel erosion investigations using radiation emission spectroscopy. She worked with Dr. Richard Hofer, JPL senior engineer.

The Great Midwestern Space Grant Regional Conference was held at The Astor Hotel in Milwaukee, Wisconsin on October 11 and 12, 2012. Two MSGC Fellowship award recipients participated in the student poster competition. Competition was strong among almost 30 posters. Colin Gurganus, from Michigan Technological University, won first place in the graduate student poster competition and Caitlin Leslie, from Grand Valley State University, won first place in the undergraduate poster competition.

- “I really appreciated the opportunity to attend the Great Midwestern meeting,” says Caitlin Leslie. “It was great to present my research to a diverse audience and learn about current research in a variety of subjects.”
- “I am wholeheartedly grateful to the MSGC for allowing me to present my research and interact with such a prestigious collection of faculty, NASA representatives, and my peers,” says Colin Gurganus. “The wealth of disciplines represented by the diverse group of participants at the poster session gave me a better appreciation of the breadth of projects supported by NASA. Overall, I gained insight into the goals and expectations of the Space Grant Program while building connections that will benefit me as I enter my post-doctoral career.”

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The MSGC Board is comprised of 29% women and 14% underrepresented minorities, including the director, Professor Alec Gallimore.

Calvin College

Private four-year liberal arts college

As mentioned above, Professor Deborah Haarsma is the Chair of the Department of Physics and Astronomy. In her research, she pursues questions about galaxies and the universe as a whole.

Central Michigan University

Public PhD. granting university

Kristina Lemmer is a Professor in the Department of Mechanical Engineering. Her interests are plasma propulsion, applied plasma physics, space propulsion systems, plasma applications to environmental concerns, and medical plasma applications.

Dicken Elementary School

Ann Arbor Public School System

Mr. Michael Madison is the 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 Professor of Physics and Astronomy and is very 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

Bopi 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* and a Fermi Guest Investigator Award for his proposal, *Pulsar Population Synthesis and Contribution to Positron and Diffuse Gamma-Ray Backgrounds*.

Michigan State University

Public Ph.D. granting university

Michael Velbel is Professor of Geological Sciences at Michigan State University. He studies regolith geoscience, and the rates and mechanisms of mineral-water interactions during rock and mineral weathering. In his research, he investigates the geological, mineralogical, geochemical, and geomorphic factors which control mineral alterations at the Earth's surface and the migration of chemical elements through the landscape, emphasizing small-watershed geochemistry.

Michigan Technological University

Public Ph.D. granting university

Ms. Chris Anderson is the Special Assistant to the President and specializes in the recruitment of women and underrepresented minorities into engineering. Ms. Anderson was recently selected to serve as diversity technical advisor for the STARS (Sustainability, Tracking, and Assessment Rating System) and joined the Diversity Committee for the national Women in Engineering Pro-Active Network.

Oakland University

Public Ph.D. granting university

Bhushan Bhatt is Professor of Mechanical Engineering. His research is in Thermal-hydrodynamics of Two-Phase Flows and Electronic Component Cooling.

Saginaw Valley State University

Public Master's-granting University

Garry Johns is Professor of Mathematics at Saginaw Valley State University. Professor Johns 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, as mentioned above, the newly appointed Associate Dean for Research and Graduate Education (ADRGE) for the University of Michigan's College of Engineering.

University of Michigan (lead institution)

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.

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.