Winter 2014
Vol. 6, No. 1

Minnesota Academy of Science Annual Report & Newsletter

MINNESOTA ACADEMY OF SCIENCE

In this Issue

2013 Programs Report

By Celia Waldock, Executive Director

2013 was a busy year of programming for the Academy.

Science Bowl

158 students on 32 teams competed at our 19th Annual High School Science Bowl and 118 students on 24 teams competed at our 6th Annual Middle School Science Bowl. The first place team for each program won an all-expense paid trip to Washington, D.C. to compete at National Science Bowl. The winning teams included:

High School

1st Place:	St. Paul Central Team 1
2nd Place:	Stillwater Area High School Team 1
3rd Place:	Wayzata High School Team 1
Civility Award:	Mahtomedi High School Team 2

Middle School

1st Place:	Mahtomedi Middle School Team 1
2nd Place:	Minnetonka Middle School West Team 2
3rd Place:	Central Middle School Team 1
Civility Award:	Valley Middle School

Minnesota State Science & Engineering Fair and Junior Science & Humanities Symposium

493 students presented research projects competing for 410 awards at our 76th Annual Minnesota State Science & Engineering Fair (MSSEF) and 79 high school students presented their papers at our 45th Annual Junior Science & Humanities Symposium.

Our student surveys indicated that:

- 70% of students have not previously participated in the MSSEF program showing that we reach a significant number of new students each year and of those students indicating they had participated previously, 74% started a new research project;

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2013 Programs Report (Continued)

- 71% of the students participating in MSSEF indicated that their participation has increased their interest in STEM and STEM related careers;
- 84% of students indicated working on their projects outside of school anywhere from 50 hours to over 500 hours.
- The majority of teachers responding felt that MSSEF helped students find their passion for science, increased their communication skills, research skills, critical thinking skills and interpersonal skills. They also overwhelmingly indicated that participation in MSSEF increased their students' interest in pursuing STEM related majors in college and STEM careers.

Annual Meeting & Winchell Undergraduate Research Symposium

138 students from 18 colleges and universities exhibited research projects and/or oral presentations at our 80th Annual Meeting/25th Winchell Undergraduate Research Symposium held at Augsburg College in April.

Science Salon

We launched our new Science Salon in partnership with the American Association for the Advancement of Science in August with a presentation on Wheat Stem Rust by Dr. Philip Pardey of the University of Minnesota and moved on to a tour of the Digital Fabrication Laboratory at Century College in November. Science Salon brought together close to 100 STEM professionals for networking and cutting-edge research topic discussions.

High School STEM Communicator Awards

In addition, we launched our new High School STEM Communicator Awards program to identify and encourage high school students who show exceptional potential in performing scientific and mathematical research, in communicating their research through writing, and in understanding the societal context of their research and results.

Volunteers

691 Volunteers contributed 7,083 hours last year to make these programs happen. Thank you volunteers!

All in all, it was a great year of programming. We hope you will join us once again in 2014.

Membership Information

Minnesota will need to fill 188,000 jobs in the fields of science, technology, engineering, and math (STEM) by 2018. The Minnesota Academy of Science works to foster interest in STEM fields by providing opportunities for students and adults to experience the excitement of scientific discovery.

Since 1873, our supporting members have made it possible for MAS to promote scientific exploration, education, and networking through programs for scientists of all ages. Our programs mobilize educators, science professionals, and businesses to provide opportunities for students and adults to showcase their scientific research and gain recognition for their remarkable contributions.

Become a member of the Minnesota Academy of Science and help us recognize, promote, and influence excellence in science at all levels. Join or renew at www.mnmas.org/memberships.

Board of Directors

The Minnesota Academy of Science Board of Directors is made up of representatives from K-12 education, colleges and universities, and industry professionals. They include science teachers and professors, professional scientists, and other adults who support science and science education. Board members are elected by the Board of Directors to serve a three-year term. Officers are elected by the voting membership.

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Celia Waldock, Executive Director
Minnesota Academy of Science

Message from the President

By Mike Williams, President of the Board of Directors

I am a proud member of the Minnesota Academy of Science. I know that my membership dues are used to support programs that have an impact on scientists at all levels (e.g., middle school, high school, college, and post-graduate) throughout the state. In addition to my membership dues, I make extra financial donations to the Academy. I view these contributions as my responsibility to "pay it forward" for all of the help and encouragement that I received early in my science career.

I clearly remember a science fair project that I put together in grade school. Not only did I learn a lot about the process of smelting copper, I began to learn the process (and importance and excitement) of communicating my knowledge to others. In return, I received valuable feedback and support from teachers and adult attendees. That early support got me excited about science and set me on a path that ultimately led me to a Ph.D. program at the University of Minnesota.

In addition to pledging financial support to the Minnesota Academy of Science, I invest my time as a volunteer in support of the programs administered by the Academy. Whenever possible, I like to volunteer as a scorekeeper, scientific judge, or moderator at the Science Bowl competitions. I also enjoy volunteering as a judge at the Minnesota State Science & Engineering Fair and at the Winchell Undergraduate Research Symposium. I have had the pleasure of serving as a volunteer at the National Science Bowl competition in Washington, D.C. While there, I saw some amazing young scientists who, no doubt, will make enormous contributions in their future scientific careers. My employer generously matches my volunteer hours with a $250 donation to the Academy. If you donate time or money to the Academy, please check with your employer to see whether they have a similar Gift Match program.

I hope that, someday, a future scientist or engineer will look back on the positive feedback I gave her at one of the Minnesota Academy of Science events and conclude that my comments put her on the path to a career in engineering or science. That's what "paying it forward" is all about.

Science Salon at Fab Lab

By Stephanie Yancey, Board Member

Century College Fab Lab staff demonstrate lab equipment for Science Salon attendees *Photo by Dave Newell*

Our second Science Salon event was held November 7, 2013 to tour the Digital Fabrication Laboratory (Fab Lab) at Century College in White Bear Lake, MN. Approximately 50 guests were treated to a complimentary light meal catered by Dandelion Kitchens, with time allowed for socializing and networking. A short survey was also distributed to obtain input from our guests about future events. Those who turned in a survey were eligible to win a gift card from Ingredients Café.

After the meal, we gathered in the auditorium and Board President Mike Williams introduced volunteer Matt Hedlund from AAAS. Matt described how AAAS is partnering locally with the Academy in an effort to expand STEM-related programs for members of both organizations. The Director of the Fab Lab, Dr. Scott Simenson, then gave a brief presentation on how the Fab Lab model was created under the guidance of Dr. Neil Gershenfeld with the Center for Bits and Atoms at MIT. One of the best aspects of the Fab Lab experience is the world-wide network of Fab Labs that are connected through video conferencing. This allows someone using any of the labs to ask questions or share ideas with other students and faculty anywhere, “24/7”. More labs are added every year.

We toured the digital lab (with our safety glasses on, of course) and saw how state-of-the-art 3D printers, laser engravers, mini mills, micro spot welders and open-source software can be used to build prototypes of just about anything from the very small to the very large. The tour also ventured into a larger space that was more like a typical “shop class” with hand tools, band saws, presses and mills. In the middle of the room is a 4’x8’ ShopBot CNC router that uses CAD drawings generated by the students and staff to automate cutting large items from wood, plastics and metals. New equipment is being added as space and funding permits.

For students looking forward to a career in high-tech design or engineering as well as those inventors who just have an idea they want to become reality, there is something for everyone at the Century College Fab Lab.

What is a Fab Lab?

By Eliza Grames, Communications Specialist

A Digital Fabrication Laboratory (Fab Lab) is an advanced workshop where innovative thinkers can build just about anything. Fab Labs are equipped with 3D printers, laser cutting equipment, design software, and other machines used in design and manufacturing.

The machines are not the heart of the Fab Lab. “The real focus is on the innovation, the engineering, the creativity, and the problem solving,” explained Scott Simonsen, Director of the Century College Fab Lab. “There’s a social framework to the Fab Lab in addition to the technological framework, and that’s how you’re going to work in the modern world.”

The Fab Lab network is truly global. Students at Century College are connected to the network through a PolyCom system built into the classroom. “Most of the Fab Labs are online,” said Abu Adam, a Century College engineering student working in the Fab Lab. “If you are working on a project and you have a problem, you can tell them and find out who can help.”

Tech Shop *Photo by Dave Newell*

Abu Adam explains Fab Lab machinery *Photo by Dave Newell*

In developing countries, Fab Labs can be used to provide essential technology for communities. Fab Labs have been used to provide wireless internet to remote regions of Afghanistan, build self-sustaining solar homes, and construct thin-client computers. At one Fab Lab in India, engineers and community members built a tractor, water purification system, electricity generating system, and a computer all within the Fab Lab. Fab Labs without the capability to manufacture these products have access to the resources they need through the network. “If someone in Ghana, or Kenya, or Afghanistan doesn’t have a 3D printer in their lab, they can shoot their files here and then one of the labs will print the file and send it back to them,” said Abu.

The collaborative spirit of the Fab Labs is at the center of their success. “Fab Labs aren’t just for manufacturing,” said Scott. “They’re using them in brain and cognitive sciences, computer science, mathematics, physics, etc… People from all these disciplines are coming into the Fab Labs and collaborating on ideas and solutions.” As the Fab Lab network continues to expand globally, partnerships between researchers, scientists, engineers, and educators will strengthen the STEM community.

More information about the Fab Lab can be found at http://www.century.edu/currentstudents/fablab/.

Science Fair Presents Opportunities for Students

By Tim Renier, Duluth East High School

Tim Renier at a meeting of the Minnesota Environmental Health Association *Photo courtesy of Tim Renier*

I am writing to thank the Minnesota Academy of Science and its many sponsors for the fantastic annual Science Fair program. As a result of this program, I have had the opportunity to expand my education far beyond the normal confines of school. It has allowed me to discover my passion for research and has helped to direct me on a path of science as I continue on to college and to the real world. In addition to the many skills related to research and its communication, this program has helped me to learn to strive for excellence in all areas of my studies and has changed my life.

My Science Fair and JSHS experience is in the fifth year of its journey. When I began Science Fair in middle school, it was hard at first to come up with a topic. I had no idea what could be valuable, but I knew that I wanted to somehow improve the lives of others. I gleaned my topic from a critical and dangerous occurrence at the time—the 2009 H1N1 swine flu outbreak. As the media filled with stories of this epidemic, and I became motivated by fear, I decided to take action to try to stop this problem among my peers. I decided to focus on hand hygiene, a simple skill that is so important to the prevention of disease yet is so poorly practiced by our society. When I started this research, I had absolutely no idea just how much I would enjoy it. The following year, I conducted a continuation of my hand hygiene study involving an entire elementary and middle school. Whether I knew it or not, I was going to become a hand hygiene expert.

I spent the following year (2012) working on another project, linking the Health Belief Model to a hand hygiene intervention in an entire elementary and middle school. I got my first real experience working with real statistics, and was thus able to show a statistically significant school-wide reduction in illness absence rates. I was chosen as an alternate and student observer to the Intel International Science and Engineering Fair (ISEF) and was one of two students from the region of Minnesota, North Dakota, and South Dakota chosen to attend and compete at the National Junior Science and Humanities Symposium (JSHS) in Bethesda, Maryland. The JSHS program has been the perfect training ground to develop my presentation skills and confidence.

Science Fair Presents Opportunities for Students (Continued)

Research was in my blood. I spent my summer living and breathing the science of my research as I prepared for my 2013 study. I was driven by the high of realizing that what I was doing could genuinely impact the quality of others' lives. I used Motivational Interviewing (a technique previously unstudied with hand hygiene) to significantly improve the hand hygiene of high school students. The thousands of hours that I spent working on my project were well worth it as my dream that began in 7th grade was realized. I heard my name called as finalist to the 2013 Intel ISEF in Phoenix, Arizona—the "Olympics of science". At ISEF, I received a second place grand award, which translates into $1500 and an asteroid named after me—a pretty cool prize. However, what I really achieved was much more valuable than this; I developed priceless skills and most importantly, a passion to do research, to discover, and to make a difference. I also had the incredible opportunity to present my research in a general session at the Minnesota Environmental Health Association's annual spring conference.

Science Fair not only provides students with a chance to explore what real research is like, but it also provides a great introduction into the scientific community. I have developed important relationships with many professionals in scientific fields, and have developed friendships with fellow students interested in science.

Once again, as I'm racking up my thousands of hours as I am currently completing my 5th year of independent research on hand hygiene, I look forward to presenting my research at the Science Fair once again. Thank you again for this incredible opportunity.

Winners of the 2013 Minnesota Environmental Health Association Awards *Photo by Ken Mann*

Reflections on Science Fair

By Katie Steffl, College of St. Scholastica

My involvement in Science Fair began my freshman year of high school at St. Mary's in Sleepy Eye. A favorite teacher of mine, Mrs. Patti Braulick, approached me with an exciting opportunity to expand my horizons as well as my understanding of my own personal interests. I couldn't turn the offer down.

Katie (middle) and two close friends at ISEF *Photo courtesy of Katie Steffl*

The bulk of my Science Fair career consisted of studying the effects of music. My freshman year project basically got my feet wet in the process of what Science Fair consisted of. I had a great beginning project in the Biochemistry category, and did well thanks to my many contacts, but I knew I had to study something that was of interest to me. After that, I used my music background to discovery what I truly wanted to investigate.

For the last three years of my high school career, I focused on how music affects our bodies. The most memorable year in Science Fair for myself was my junior year. My project focused on how music affected the Medulla Oblongata of geriatric residents in my local nursing home. I would play my harp for the residents for a period of time and kept track of their vital signs before and after I played. From this experiment, I found that music was enough to improve their vitals. This project took me from my local Science Fair, all the way to ISEF in San Jose, California. It was one of the greatest experiences of my life thus far.

Four years in Science Fair taught me many lessons that I have used in countless situations since my high school career ended. As a participant in this organization, I learned the importance of hard work, integrity, and perseverance. Although my career in Science Fair may have been disappointing at times when I learned I didn't have a sufficient control group for my experiment, or my results were not how I wanted them to turn out, these experiences made me develop into the professional student and honest person I am today.

I am currently a junior at the College of St. Scholastica in Duluth, where I am studying Occupational Therapy. My hope is to someday use the information that I discovered in my Science Fair studies to improve the lives of the people I work with in my Health Science career. It is also my wish to see many more young people in Science Fair. Words cannot describe what my experience in Science Fair has done for my high school and college career and what it will continue to do. For those who are on the fence, I hope that you get your feet wet like I did and experiment for just one year in Science Fair. From personal experience, I think that you will see the many benefits of this organization.

Why I Volunteer for MAS Programs

By Craig Turner, Dakota Electric Association

For me, volunteering at the Science Fair and JSHS events is very exciting. I feel the enthusiasm each of the students has for their project and how they are lifted up by the other students competing with them. In contrast, for most sporting contests, the competition between the participants is focused to achieve a single winning team or individual. In sports, the contestants seldom interact or help each other improve. With Science Fair, each year I watch students interact with each other, give each other ideas to improve and strive to make everyone around them a winner. They share ideas, laptops and their friendship.

Craig (right) and his son Carl, a Science Fair alumnus, take a break from volunteering at JSHS

Photo by Ken Mann

I have also witnessed my own children be transformed by their involvement with JSHS (Junior Science & Humanities Symposium) and Science Fair. When my son was in middle school, he had a bad experience with science. Somehow he decided, or more likely was encouraged by the teacher, to complete a science project. He made it to the regional competition and won a small prize. Winning that simple award propelled him to compete in fairs all through high school and graduate with an engineering degree from the University of Minnesota. Science Fair was the spark.

Supporting the Science Fair events through volunteering is one way I can help other youth experience that positive and encouraging spark that just may propel them further. My hope is that volunteering will help provide the framework to allow the youth to encourage each other and show each other what is possible. Through the interactions between the students, many develop lifelong friendships that will continue to nurture their growth. Helping make this possible and watching the excitement grow in the students is why I volunteer.

Judging at the Minnesota State Science & Engineering Fair

By Irene Abrahamson, Seagate Technology

I enjoy volunteering for the state science fair as I feel it's important to encourage our youth to experience what science has to offer and inspire them to explore new technologies for the future. It's great to see how proud and excited the students and parents are of the projects that are presented. I believe that by presenting individual projects to the judges, students gain valuable public speaking experience and it helps them learn to organize and explain their thoughts and conclusions concisely. Also, I find working side-by-side with other volunteers is a great way to network and meet new friends.

Save the Date: Science Salon

Dr. Jason Simser, BCA Forensic Scientist – Wednesday, March 5

Join us for Science Salon at the Open Book, 1011 Washington Avenue South, Minneapolis, MN 55415 on Wednesday, March 5. Dr. Jason Simser, Forensic Scientist in the Biology Section of the Minnesota Bureau of Criminal Apprehension Forensic Science Service will present on forensic DNA. Dr. Simser will talk about the biology section of the BCA, evidence exams and different forms of DNA testing and present an overview of the BCA, investigations, criminal histories and law enforcement support.

The Minnesota legislature created the BCA in 1927 to assist peace officers statewide in solving crimes and apprehending criminals. The division of statistics, a forerunner of the Minnesota Justice Information Services (MNJIS), was added in 1935, as were additional personnel and full police power for the bureau's agents.The BCA lab became operational in 1947, and the BCA became a part of the newly-created Department of Public Safety in 1969. The BCA established one of the first DNA laboratories in the nation in 1990, and shortly afterward became the first in the nation to identify a suspect based solely on DNA.

Beverages and networking time available before and after the presentation. No fee. More information can be found at http://mnmas.org/science-salon/.

3M Innovation Center – Thursday, May 15

Join us for Science Salon at the 3M Innovation Center, 2501 Hudson Rd, St Paul, MN 55144 on Thursday, May 15. Learn about 3M's culture of innovation and tour the Innovation Center. 3M has more than 65,000 products sold worldwide and innovates across a wide range of industries as diverse as Health Care, Automotive, Biotechnology, Nanotechnology, Aviation, Oil & Gas, Industrial, Construction, Communications. This unique opportunity is generally open only to customers and employees, and by invitation.

Hors d'oeuvres, drinks and networking follow the tour. $30 MAS fee. More information can be found at http://mnmas.org/science-salon.

Save the Date: Minnesota Technical Symposium

The 12th Annual Minnesota Technical Symposium (MinnTS) will be held March 27, 2014 at Medtronic Headquarters. MinnTS is a joint meeting of scientific and technical societies; the event combines networking with presentations on a wide range of topics. The featured speakers at the 2014 MinnTS will be Dr. Alexander Khoruts and Dr. Donald Dengel.

Dr. Alexander Khoruts is an Associate Professor of Medicine in the Division of Gastroenterology and the Center for Immunology at the University of Minnesota. His research focuses on gut microbiota in clinical disease states, particularly refractory C. difficile infection.

Dr. Donald Dengel is a Professor in the School of Kinesiology and Director of the Human Performance Core and Densitometry Services in the Clinical and Translational Science Institute at the University of Minnesota. Recently, Dr. Dengel received a grant from NFL Charities to examine the effects of multiple sports-related concussions on neurocognition and cerebral vascular function.

Members of the Minnesota Academy of Science receive a discounted registration price for MinnTS. Register online at www.mnmas.org/membership-info/minnesota-technical-symposium.

Save the Date: 2014 Annual Meeting & Winchell Undergraduate Research Symposium

The 2014 Annual Meeting & Winchell Undergraduate Research Symposium will be held April 26, 2014 at St. Mary's University of Minnesota in Winona, MN. Kevin Kenow, Wildlife Research Biologist at the Upper Midwest Environmental Sciences Center, will deliver the keynote address.

Undergraduate students pursuing scientific studies are invited to present their research as a poster or oral presentation and receive feedback from professional scientists in their discipline. Registration is open. To register, visit www.mnmas.org.

Professional scientists from industry and academia are needed to judge student presentations. To volunteer as a judge, visit www.mnmas.org/annual-meeting/judges.

Judges and Volunteers Needed for 2014 Minnesota State Science & Engineering Fair

Judges and general volunteers are needed for the Minnesota State Science & Engineering Fair and the North Central Regional Junior Science & Humanities Symposium (JSHS). This is a great way to get involved and impact the lives of emerging scientists! The Minnesota State Science & Engineering Fair will be held March 30-April 1, 2014 and JSHS will be held March 29-30, 2014 at the DoubleTree Hotel in Bloomington.

For additional details or to volunteer, visit www.mnmas.org or email the Judge and Volunteer Coordinator, Jana Nash, at jananash@mnmas.org.

Staff Changes

Jana Nash joined the staff of the Minnesota Academy of Science in January of 2014 as the Judge and Volunteer Coordinator for the Minnesota State Science & Engineering Fair and JSHS. She will manage the recruitment, communication, scheduling, training, and recognition programs for all judges and volunteers involved in this year's activities. Jana aims to increase the numbers of judges and volunteers participating in the competitions and increase the retention of both groups moving forward. Jana has a Fundraising Management Certification from the University of St. Thomas and a B.A. in Mass Communications. She has practical experience in volunteer recruitment and management and event planning and execution. Jana has been at volunteer at MSSEF in the past and has attended the fair when her children competed.

After working with the Academy for the past seven years, Megan Buchanan is moving on to other projects. During her time with MAS, Megan served as the Annual Meeting Coordinator, Data Management Director, and Judge and Volunteer Coordinator. The staff and Board of Directors of MAS thank Megan for her excellent work over the past seven years and wish her luck with her future projects.

2013 Financial Report

Minnesota Academy of Science
Statement of Financial Position
Fiscal Years Ended June 30, 2013 and June 30, 2012

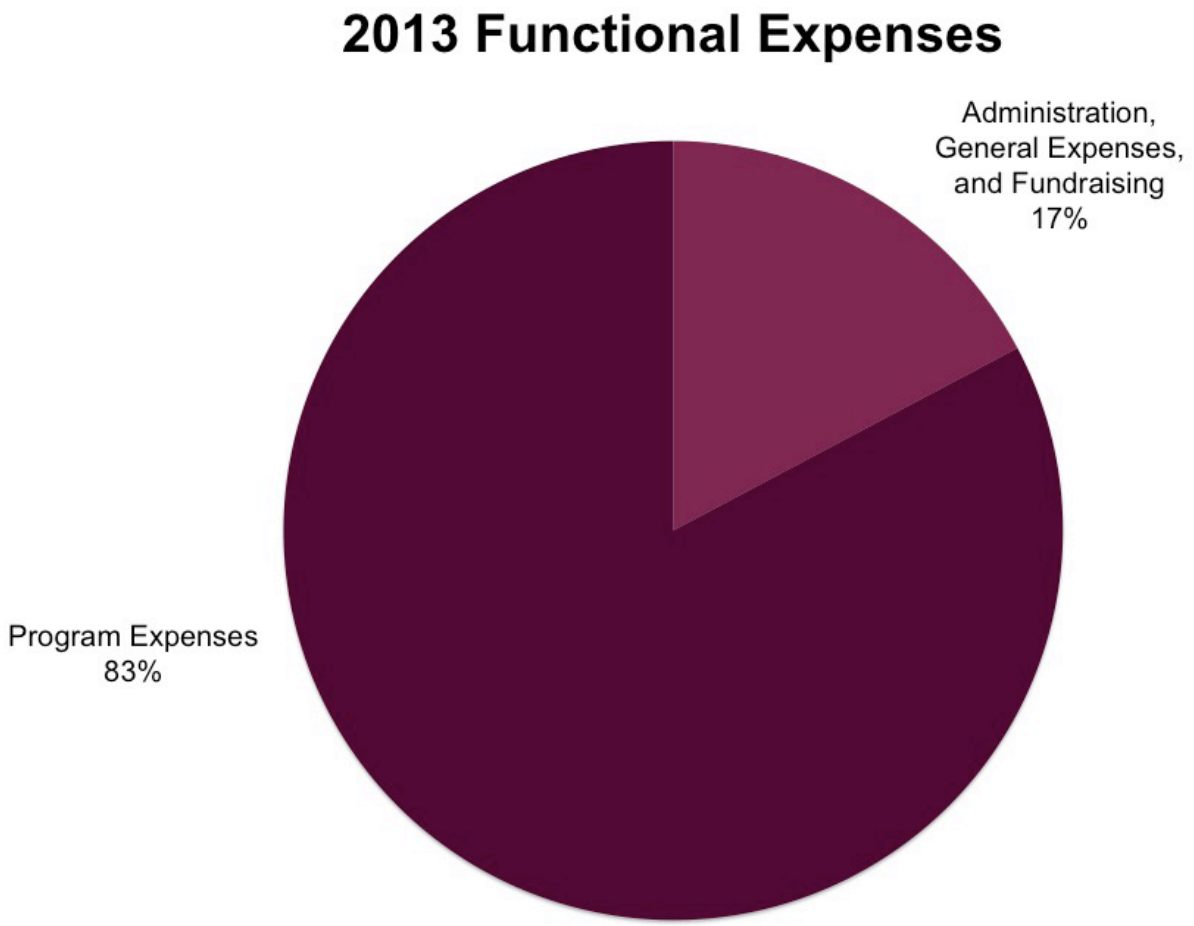
ASSETS	6/30/13	6/30/12
Checking/Savings	$ 259,981	$ 193,266
Grants Receivable	$ 25,168	$ 66,168
Other Assets	$ 8,080	$ 5,790
Total Assets	$ 293,229	$ 265,224
LIABILITIES AND NET ASSETS		
Accounts Payable	$ 54,094	$ 3,867
Other Liabilities	$ 7,380	$ 4,100
Total Liabilities	$ 61,474	$ 7,967
Unrestricted Net Assets	$ 215,132	$ 165,354
Temporarily Restricted Net Assets	$ 16,623	$ 91,903
Total Net Assets	$ 231,755	$ 257,257
Total Liabilities and Net Assets	$ 293,229	$ 265,224

Minnesota Academy of Science
Statement of Activities
Fiscal Years Ended June 30, 2013 and June 30, 2012

REVENUE		
Contributions*	$ 195,716	$ 291,850
Program Revenue	$ 119,985	$ 127,517
Investment Income	$ 361	$ 361
Miscellaneous Income	$ 63	$ 70
Total Revenue	$ 316,125	$ 419,798
EXPENSES		
Program Expenses	$ 283,043	$ 263,950
Administrative and Fundraising	$ 58,584	$ 64,974
Total Expense	$ 341,627	$ 328,924
Net Revenue over Expense*	$ (25,502)	$ 90,874

*Generally Accepted Accounting Principles require two-year grants to be taken into income the year they are committed creating an artificial inflation of revenue over expense the first cycle year (2012) and an artificial deflation of revenue over expense in the second cycle year (2013).

2013 Financial Report (Continued)



2013 Functional Expenses

Administration, general expenses, and fundraising	$ 58,584	17%
Program expenses	$ 281,171	83%
Total Functional Expenses	**$ 339,755**	

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