

# Minnesota Academy of Science Newsletter



## MINNESOTA ACADEMY OF SCIENCE

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## Message From the Director

by Celia Waldock

We couldn't do it without you! In this issue of the Minnesota Academy of Science newsletter, we salute the hundreds of volunteers that make our programs possible. Our biggest group of volunteers will arrive at the Minneapolis Marriott City Center location soon for the North Central Regional Junior Science & Humanities Symposium (March 25) and the Minnesota State Science & Engineering Fair (MSSEF) (March 25 to March 27):

- 350 judges with credentials in STEM fields who offer student projects and papers insights based on experienced perspectives grounded in their industry;
- 100 volunteers passionate about STEM education and creative problem-solving who offer skills ranging from organization, data entry, registration, photography, chaperoning, time-keeping and other general tasks.

In January and February, 150 volunteers with STEM backgrounds helped us offer lightning-round competition opportunities for middle and high school teams in the 2017 Science Bowls.

See inside some of our favorite photos of our volunteers and our students, with more to come in the next issue!



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# Message from the President

Dr. Stephanie D. Yancey



The Academy couldn't perform the majority of its work without an extraordinary army of volunteers.

Over the past 6 years, it has been my privilege to work with many of my work colleagues at Beckman Coulter judging for the Special Awards at the State Science & Engineering Fair (SSEF). In 2013 our judge coordinator, Dan Ehresmann, left to become a high school science teacher (kudos to Dan) so I took on the job of coordinating funding, finding judges, organizing abstract reviews and making sure we were all ready for the big day. We have associates with backgrounds in fields ranging from microbiology (my favorite) to immunology, organic chemistry, mechanical engineering, molecular biology, electrical engineering, biochemistry, systems engineering. It certainly takes a team effort to get our products to customers, and that teamwork is also evident in the Minnesota Academy of Science programs.

At SSEF, we follow the international rules, but we only look at a subset of posters that are in fields of interest that relate to what we do in Chaska: clinical diagnostics. One team of three judges looks at the posters for a subset of life sciences, and the other team of three focuses on engineering, physics and software. At the end of the day we put our teamwork skills to the test, since sometimes one judge sees a student's presentation differently than the others. We include teamwork as one of our judging criteria (for the increasing number of presentations given by teams) because we know how important it is as a skill for the scientists and engineers of the future.

Even though the day itself can be chaotic and long, we all leave with a renewed belief in the future of STEM in Minnesota, and the world. Many of the students we talk with come from other countries. And while some of the students we have given a Beckman Coulter award to have also won numerous awards from other institutions, as well as ISEF, it's not about the money. It's about encouraging young ladies and gentlemen in the pursuit of their dreams.

I must take this opportunity to thank all of the Grand Awards judges. Their day can be even more stressful, since they usually visit many more presenters than we do as Special Awards judges. The Fair also would not be a success without the hard work and dedication of our general volunteers and staff. I'd like to thank our new Science Fair director, Sara Gomez; fundraising & outreach coordinator, Lisa Day; volunteer coordinator, Jenny Worden. With our change in venue this year, they have done a phenomenal job getting everything ready.

I had hoped that I could participate in the Science Bowls this year, but alas it was not possible. I heard from colleagues that it was fun, educational (for them) and fast! Another volunteer opportunity I will miss this year is reading papers for the STEM Communicator Awards. I have done so in the past and have always found them to be well-written and illuminating. The same can be said for the Junior Science & Humanities Symposium (JSHS) papers and presentations. I haven't judged them in Minnesota, but I am familiar with them from many years judging in California. Our incredibly talented high school presenters amaze me. The college students at Winchell Undergraduate Research Symposium are also amazing.

I can't end without mentioning the other part of the Academy's mission: to be a resource for professional engineers, scientists, educators and college/grad students through our Science Salon. This is an event that has taken off with a new coordinator, Jennifer Schuetz. Recent speakers have ranged from Dr. Michael Osterholm on emerging infections, to Dr. Marla Spivak talking bees, to a tour and discussion of biofilms at Ecolab, to Dr. Anu Ramaswami's talk on reinventing cities. The goal is to give attendees a chance to network, learn something new and have a good time.

Finally, I must say that the past year since I became President of the Board has flown by. The Board has grown with the addition of Liz Karlen from Wallin Education Partners and Dr. Tanya Shipkowitz from Smith Medical. We are on a solid financial footing and may expand our list of programs while continuing to improve the current roster. As always, I look forward to serving you, our membership, as well as the Board, to the best of my ability. I couldn't do it without the support of our Executive Director, Celia Waldock, and her staff.

Again, many thanks to all of the hard-working volunteers. We wouldn't be here without you!

# Thanks to the Volunteers!



# SCIENCE BOWL

## High School Science Bowl (January 21, 2017)

The double-elimination competition among 37 teams resulted in the Edina #1 returning champions repeating as winners, advancing to the National Science Bowl in D.C., by beating out Wayzata #3 — a very tough team of freshmen and sophomores. Chanhassen #2 (below) was selected in a vote of students for the Civility Award, as the nicest team to compete with. Maple Grove fielded a team for the first time. Find pictures of all participating teams, the winning teams, and the final results here: <http://www.mnmas.org/science-bowl/2017-high-school-science-bowl-results>.



## Middle School Science Bowl (February 11, 2017)

Congratulations to Minnetonka West for repeating as 2017 Middle School Science Bowl champions in Minnesota. They'll be heading to D.C. this spring to represent our state at the National Science Bowl, having defeated Eden Prairie 1, with Wayzata West 1 finishing third. Parnassus (below) repeated as the "best sportsman" with the Civility Award. Find pictures of all participating teams, the winning teams, and the final results here: <http://www.mnmas.org/science-bowl/2017-middle-school-team-results>.



# Why Science?

## From Albany's all-girls High School Bowl Team 2

Sammy Schneider, 11th grade: "I am always on the farm or working with vehicles, and science is the background of both of those. I plan on becoming a large animal vet. Competition is a fun side activity for me, since most of my time is put into FFA, but it is something I enjoy."

Miranda Breth, 11th grade: "A contest like this helps to open my eyes so I can see different things. It also helps me to open up. I enjoy trying new things."

Anna Panek, 11th grade: "Math questions are my favorite. The Science Bowl competition really boosted my confidence. Even though we didn't win every round, getting questions right made me feel good. Being only one of two all-girls team was also great. I hope to see more next year when I go back!"



## From Parnassus

Paula Pickett, 10th grade: "I would like to become an aerospace engineer — I love learning about outer space, math, and I like puzzles and other brain games. A competition like this gives me an excuse to study what I want without getting in trouble because I have other homework to do."

Karthik Subramanian, 9th grade: "I intend on using computational science in my career. The Bowl prepares and urges me to study a specific branch of science, which is beneficial for my future."

Pranav Rupireddy, 10th grade: "I am interested in physics and engineering. Bowl is fun for me. It helps me see where I stand in science alongside other Minnesotans."

## First Time Participants: Maple Grove

Maple Grove sent a team to the High School Science Bowl for the first time. Here's how team captain Taylor Nelson summed up the experience. "I was surprised by how good some of the teams were. Some teams knew almost every answer to every question. They were very intimidating. Though, there were also teams that didn't answer many questions. Practicing is where the true fun and learning comes."

Anna Chabica, 9th grader, is considering a career in medicine: "Participating in Science Bowl has helped me learn about all the branches of science."

Alessandro Snyder, 11th grade: "The unexplained areas of psychology fascinate me, and that's why I've always enjoyed science, because it explains the unexplained."

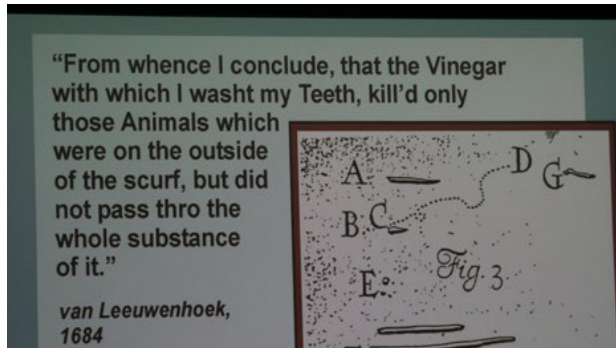


Photo of Maple Grove team, left to right: Carter Herman, Missy Deisting, Taylor Nelson (standing), Anna Chabica, and Alessandro Snyder.

Read more from our students at [MNMAS.org](http://MNMAS.org)

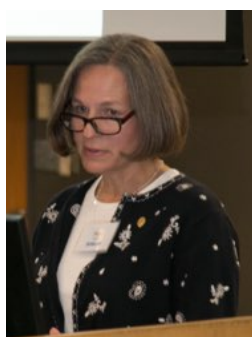
## THANKS TO OUR BOWL SPONSORS

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Hardenbergh Foundation



## Science Salon at EcoLab: How To Attack Biofilms

Our second Science Salon of the fall season was held on October 18 at EcoLab in Eagan. EcoLab employs 1,600 scientists at 11 global research centers and eight regional tech centers, and holds around 6,700 patents, each of which is focused on clean water, safe food, abundant energy, and healthy environments.



EcoLab's Dr. Ruth Petran, Dr. Scott Burnett and Tony Erickson shared with us the work their team is doing with biofilms in the food and beverage industry: how they form, why they are harmful, and how to remove and prevent biofilms from forming in the machinery that our food comes into contact with.



### The Problem

Every year 1 in 10 people get sick with food-related illnesses worldwide. When you accumulate the sick time, that is 33 million healthy life years lost every year. Our food systems are not becoming less safe, but the incidents are more visible and we are better able to detect the types of pathogens causing illnesses and the sources of contamination.



The top 3 contributors to food-related sicknesses are fish, chicken and dairy.

Food borne illnesses from fish and chicken generally come from improper preparation and cooking.

Sicknesses attributed to dairy can often be traced back to inadequately cleaned and sanitized processing equipment. When cleaning procedures are not adequate, an accumulation of biofilm can occur. EcoLab has been working to discover how these biofilms form, how they react to removal/sanitization treatments, and what treatments or combinations of treatments work the best to eliminate these biofilms.

### What is a biofilm?

A biofilm is a group of microorganisms that stick to a surface. Think of the coating on your teeth when you wake up — that's a biofilm. Part of the problem with biofilms is that when enough microorganisms congregate, they will express polymers, like a slime that creates an environment particularly suited to bacterial growth. If it gets big enough, pieces of the film can break off and move around, spreading the problem.



Another trouble with the slime these biofilms create is that it protects the majority of the biofilm from many methods of sanitation. The bacteria on the surface might be taken care of, but everything underneath remains unaffected. The propagation of these biofilms is a problem the entire food industry sees. It causes problems in the tubes of the machinery used to milk cows and in the nooks and crannies of processing plants.

It's even impacting the food retail and food services aspects of the industry, such as beverage dispensers and cooling towers.

## The Solution

What has Ecolab been doing to help their customers combat these biofilms?

Traditional clean-in-place systems (i.e., you don't take it apart and scrub it down, common in industrial scale food processing plants) that use detergents often leave some biofilm behind, and it is quick to rebound. So Ecolab has developed a process using something that works a little like scrubbing bubbles. The chemicals that are used cause a reaction that physically breaks apart the biofilm so the sanitizer can then penetrate through to the surface and kill any remaining bacteria. Ecolab also works with customers to better prevent these films from developing in the first place. They help evaluate the sanitary design of plants and identify places where bacteria can accumulate, making sure parts are being replaced on the correct schedule, and ensuring clean-in-place systems are operating effectively and efficiently.

At the October 2016 Science Salon, the Ecolab team showed us how they are better able to find ways to clean their customer's equipment, enabling the food industry to provide us with safe, high quality food.

— Ashley Smith, previous Science Salon coordinator



## Science Salon

### "Reinventing Cities," with Dr. Anu Ramaswami

Dr. Anu Ramaswami spoke to a large Science Salon audience on February 15, 2017, about her work exploring how to develop healthy, sustainable cities in the United States, India and China. About 70 people attended the Minnesota Academy of Science salon at the University of Minnesota Humphrey School of Public Affairs, where Ramaswami is the Charles M. Denny, Jr., Chair of Science, Technology, and Public Policy.

She shared results from her work with researchers across the world on redesigning cities to address not only urban infrastructure issues, but also reduce greenhouse gas emissions, improve social structure and create more open space. Her work was funded by a National Science Foundation grant titled "Partnerships for International Research and Education – Developing Low-Carbon Cities in the U.S., China and India."

### THE PROBLEM

- 200,000 premature deaths occur annually in the U.S. due to air pollution.
- 30-40% of the urban population in Asia and Africa live in informal settlements, and the world is becoming increasingly urban.
- Many U.S. cities are suffering from aging infrastructure.

Ramaswami indicated the need for governments to collaborate with each other to tackle transboundary issues, such as greenhouse gas emissions. Roughly 70%

of greenhouse gas emissions are associated with cities, because of energy and electricity imports to cities; thus, reshaping and rethinking cities is critical.

## SOLUTIONS

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- Cities, acting as drivers of global change, can rethink urban form by co-locating infrastructure, employment and housing, which not only reduces greenhouse gas emissions but also results in positive social change.
- Minor changes in habits and product choice will not allow us to achieve significant reductions in greenhouse gas emissions. Instead, state programs such as mandating increased reliance on renewable energy, reducing energy demand through financial incentives and educating consumers, and shifting to natural gas make biggest impact on greenhouse gas emissions.
- Why stop there? She suggested we imagine driverless cities. One driverless car could replace 12 regular vehicles. There are six to eight parking spots per each car owned in the U.S.
- She suggested using waste heat from industries as energy inputs to heat and cool cities. So much could be conserved if urban centers were redesigned for energy efficiency — 70 to 80 percent of energy used in China is for industry.

## RESEARCH

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In India, Dr. Ramaswami led a study to harness anaerobic digestion and biogas technology from wastewater and food waste. She is continuing her research in a National Science Foundation grant titled "Sustainability Research Network - Integrated Urban Infrastructure Solutions for Environmentally Sustainable, Healthy, and Livable Cities".

Keep up with this study at [sustainablehealthycities.org](http://sustainablehealthycities.org). To read more about Dr. Ramaswami's work, visit [hfh.umn.edu/directory/anu-ramaswami](http://hfh.umn.edu/directory/anu-ramaswami).

— Jennifer Schuetz, Science Salon Coordinator



The Minnesota Academy of Science works to bring scientists from different disciplines together. Science Salon is a forum for professional scientists and engineers to stay current on groundbreaking research and emerging technologies, engage in cross-disciplinary networking, and participate in philanthropic activities.

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Contact: Jennifer Schuetz, program coordinator, [jenniferschuetz@mnmas.org](mailto:jenniferschuetz@mnmas.org)

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## Visit the website to read articles from past Science Salons

[Dr. Michael Osterholm, Infectious Diseases](#)

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[Dr. Fotis Sotiropoulos, St. Anthony Falls Lab](#)

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[Dr. Marla Spivak, Bee Lab](#)

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## Next Science Salon May 16

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Research on virtual reality from University of Minnesota College of Computer Science & Engineering with Drs. Vicki Interrante and Dan Keefe

STAY TUNED at [MNMAS.org](http://MNMAS.org) FOR DETAILS AND REGISTRATION



# COMING: Winchell Undergraduate Research Symposium

Macalester College, St. Paul, April 22

Registration is now open for statewide college students to deliver oral and poster presentations. The final date to register is April 1. Find details at [MNMAS.org](http://MNMAS.org).



This year's keynote speaker is Dr. Mary Montgomery (left), Associate Professor and Chair of the Biology Department at Macalester College, who will discuss her new research in gene editing using the Cas9 tool. She is a specialist in studying regulation of gene expression,

specifically the mechanisms underlying a form of gene silencing called RNA interference.

The Symposium prepares undergraduate students to enter STEM fields by providing a forum to showcase their scientific research, receive comments from professional scientists and peers, and network.

## NEW ENTRY: Journal of the Minnesota Academy of Science

Curtis L. VanderSchaaf, Gordon Holley, Andrew Arends, Joshua Adams, Donald Deckard

"Comparing Economic Returns of Red Pine Plantation Thinning Scenarios Using Forest Vegetation Simulator (FVS)."

**Partial abstract:** Red pine (*Pinus resinosa* Ait) plantations are an important cover type of Department of Natural Resources (DNR) lands because of relatively high yields and economic value. Out of the approximate 400,000 acres of Minnesota red pine plantations, one-fifth of the acreage is managed by the DNR. The DNR recently established a policy to rescind purposeful management to manage all red pine plantations to extended rotation ages, or rotation ages beyond those maximizing economic returns or biological yields.

*Journal of the Minnesota Academy of Science*, 2016; 4(2016): 1-11. (Find it at [MNMAS.org](http://MNMAS.org).)

## Networking: New Realities

The annual [Minnesota Technical Symposium](#), coordinated by Minnesota Academy of Science board vice president Bill Heidcamp, was held March 16, 2017, at Ecolab's Innovation Lab in Eagan.

Mike Nowak, CIO of Ultimarc and [co-founder of the Minneapolis Virtual Reality \(VR\) Meet-up](#), gave an overview of the growth of VR technology. He said the big work in the industry is toward improving the full immersion experience of users without delayed reaction time. A weak spot is not memory or processing speed, but offering graphic cards with a high refresh rate. He is excited for VR applications in education (such as [edu.goggle.com/expeditions](http://edu.goggle.com/expeditions)), giving nursing home residents a travel option, applications in military, engineering and medical training. Pokemon Go and Snapchat glasses are only the cusp of what will come in a few years, he said. [St. Paul-based Voxel](#) and [Eden Prairie's VR Junkies](#) offer play time.



Mehdi Mekni, a St. Cloud State professor, specializes in the augmented reality market — the technology that enables, for example, sports fans to see information superimposed on the screen during a game. "Seeing with your eyes PLUS," he said. Such as navigating the human body in anatomy classes at St. Cloud, global white boards enabling colleagues to collaborate in real time, fitting rooms for online Gap shoppers to try clothing on at home, restaurant ratings popping as you walk, checking skills before hiring, using your eye to dial up information instead of your finger.



HTC Vive, Microsoft HoloLens and Oculus have been leading innovations so far. Apple has been silent in the market, but tends to come late with a higher quality option. Google Glass was a strong product, but too early — social acceptance is not yet here to enable users to film people and places without permission. Security and privacy issues, contrasted with gathering of scientific analytics (and consumer data) are challenging conversations to come. Do we want more services like Netflix to recommend to us, or not?

## STEM Communicator Awards

Through the generous funding of St. Jude Medical Foundation, the Minnesota Academy of Science invites participation in the 2017 Minnesota High School STEM Communicator Awards. The goal of these awards is 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. [Find details at MNMas.org](http://MNMas.org).

### Looking to Feature Students

Funders of our education programs like to hear from students about what the experience of participating means to you.

- What did you learn as you journeyed through STEM research, team-building, or presentation preparation enroute to Science Bowl, Science & Engineering Fair, JSHS, High School STEM Communicator Award, Winchell?
- What were highlights of the experience?

**You might be featured on the MAS website or in this newsletter.** Please send a few paragraphs (photo helps!) about how MAS programs have been an important experience: [mikkimorrisette@mnmas.org](mailto:mikkimorrisette@mnmas.org).

### STEM Professionals: Can We Feature Your Work?

We want to include more personal stories of our MN MAS community: program alumni, current students, volunteers and supporters. What are you working on in a STEM field? We're looking for all disciplines, including mathematics and computer science.

If you'd like to be part of this free promotional opportunity, please contact our Communications Specialist at [mikkimorrisette@mnmas.org](mailto:mikkimorrisette@mnmas.org).

Thanks to high school coach Cynthia Welsh, we've been able to feature profiles of two students: Logan Pallin, in the [Spring 2016 newsletter](#) and [on the website](#), and Bethany Rosemore in the [Winter 2017 issue](#) and [on the website](#).

Because we are a small organization, the MAS office is only staffed part-time. Below is the best way to contact our contractors and staff:

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### Newsletter Production Team

- Celia Waldock, Editor-in-Chief
- Mikki Morrissette, Communications Specialist
- Photo credits: Thanks to volunteer Dave Newell for some of the images used in this issue



# Thank You to Our Sponsors

Raise the visibility of your company and sponsor the Minnesota Academy of Science. Join us to recognize, promote and influence excellence in science.

Help support science by supporting the Minnesota Academy of Science. There are many opportunities to help our small nonprofit organization. Sponsorship options range from \$1,000 to \$100,000.

Sponsorship donations contribute to offsetting the costs for Minnesota State Science & Engineering Fair, Science Bowl, Winchell Undergraduate Research Symposium, and so much more — all of which are underfunded.

Co-sponsors also are needed for Science Salon by providing a meeting venue, tour, speaker, and refreshments for participants.

## Contacts:

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[celiawaldock@mnmas.org](mailto:celiawaldock@mnmas.org) with questions or to sponsor a program.

**Lisa Day, our Fundraising & Outreach Coordinator,**  
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## WELCOME TO OUR NEWEST SPONSORS!



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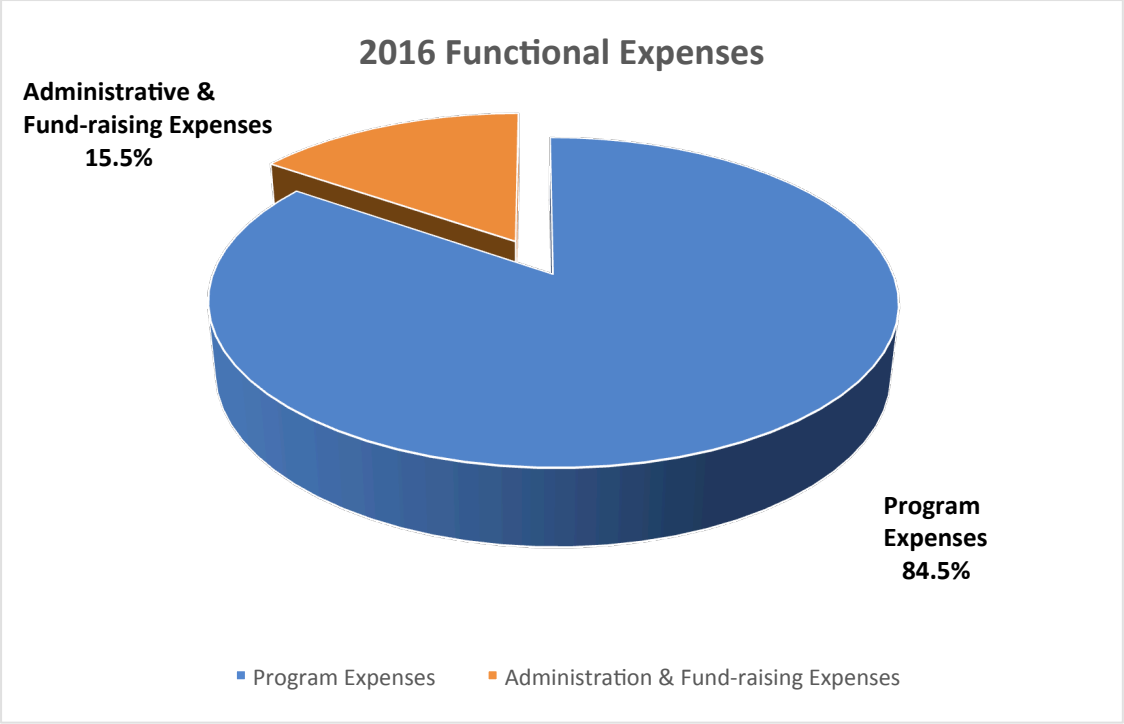
**Minnesota Academy of Science  
Statement of Financial Position  
Fiscal Years Ended 6/16/2016 and 6/30/15**

ASSETS	6/30/16	6/30/15
Current Assets		
Checking/Savings	178,667.63	233,233.83
Grants and Accounts Receivable	66,910.00	10,500.00
Other Assets	79,162.53	32,025.46
	324,740.16	275,759.29
<b>TOTAL ASSETS</b>		
 LIABILITIES AND NET ASSETS		
Accounts Payable	21,669.89	5,613.23
Other Liabilities	19,900.00	2,162.50
Total Liabilities	41,569.89	7,775.73
Unrestricted Net Assets	240,990.27	256,058.56
Temporarily Restricted Net Assets	42,180.00	11,925.00
Total Net Assets	283,170.27	267,983.56
	324,740.16	275,759.29
<b>TOTAL LIABILITIES AND NET ASSETS</b>		

**Minnesota Academy of Science  
Statement of Activities  
Fiscal Years Ending 6/30/16 and 6/30/15**

Revenue		
Contributions*	286,077.71	205,003.86
Program Revenue	115,031.63	118,164.00
Other Revenue	4,135.31	6,030.95
Investment Income	2,392.16	209.71
Miscellaneous Income	-	-
Total Revenue	407,636.81	329,408.52
Expenses		
Program Expenses	332,180.06	285,468.90
Administration & Fund-raising Expenses	60,270.04	58,441.35
Total Expenses	392,450.10	343,910.25
 NET REVENUE OVER EXPENSES*	15,186.71	(14,501.73)

\*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 in the first cycle year (2016) and an artificial deflation of expense in the second cycle year (2015).



### 2016 Functional Expenses

Program Expenses	332,180.06
Administration & Fund-raising Expenses	60,270.04
 Total Functional Expenses	 <u><u>392,450.10</u></u>