ANNUAL REPORT

SUBMITTED BY

MASSACHUSETTS ACADEMY OF MATH AND SCIENCE

JULY 2023

ANNE LUDES

DIRECTOR

CELEBRATING MORE THAN 30 YEARS OF EXCELLENCE

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July 5, 2023

It is my pleasure to present the 2023 Annual Report of the Massachusetts Academy of Math and Science. Our faculty and students have continued to cultivate innovation in teaching and learning through Math Modeling, Physics, STEM Research, Scientific and Technical Writing, Computer Science, Humanities, and Languages. Students have engaged in both individual and team-based science and engineering projects as well as rigorous project- and inquiry-based applications of learning in all subjects.

Mass Academy nurtures highly motivated, independent learners in grade 11 who participate successfully as full-time university students in grade 12. As we embark upon our 32nd year as the Commonwealth's only secondary school of excellence and its only public-private school partnership (with Worcester Polytechnic Institute), we are proud to be recognized by Niche.com for the sixth consecutive year as the top public high school in Massachusetts. We are also honored to be named by Niche.com yet again as having the best public high school teachers in Massachusetts. Additionally, Mass Academy is the *only public* high school in the top 14 schools listed by Niche.com for STEM education in Massachusetts.

Mass Academy students continue their commitment to addressing real-world challenges. Through the Apps for Good project, students effect meaningful change by developing web-based applications to solve critical problems in the local and global community. Our assistive technology project, done in collaboration with organizations including Seven Hills Foundation, Elder Services of Worcester Area, and Easter Seals, is a model of engineering combined with community partnership. Our commitment to project-based learning and real-world applications has continued to be a driving force of our program.

This year we are proud to announce our "Junior Academy," a two-week summer program for underrepresented middle school students. Participants will engage in hands-on learning experiences, visit university labs, and meet STEM professionals. As we commit to our efforts to strengthen and diversify the STEM pipeline in Massachusetts, we are confident the Junior Academy will make a powerful impact to engage students in STEM, helping them realize that STEM fields are not only accessible to them, but they are fun, rewarding, and open doors for their future!

The enclosed annual report highlights in detail how we are achieving these goals. Please contact me with any questions or to arrange a visit to observe our program in practice.

As we reflect on the last 31 years, I want to express my sincere gratitude for your continued commitment to this program. It is because of your support that we are able to expand our reach and explore new opportunities for high-quality programming for the students of the Commonwealth.

Sincerely,

Anne Ludes

Anne Ludes
Director

PROFILE

The Mass Academy of Math and Science is a public school of excellence for one hundred academically accelerated 11th and 12th grade students in Massachusetts. We emphasize math and science within a comprehensive, collaborative, and interactive program. The rigor of junior year classes exceeds high school honors and AP and includes more than 1100 hours of instruction. Seniors complete a year of college, enrolling in classes full-time at Worcester Polytechnic Institute, a nationally ranked science and engineering school, thus making Mass Academy the only public school in Massachusetts whose students attend a private university full-time as high school seniors.

HISTORY

The State Legislature of Massachusetts founded Mass Academy in 1992 as a public school to serve academically advanced youth in grades eleven and twelve in math, science, and technology. To ensure a balanced curriculum, we developed an equally rigorous preparation in the humanities and world languages. The result is a junior-year program that is rich in project- and inquiry-based learning, technology, and collaboration, and a senior year program that is the same as the freshmen year at Worcester Polytechnic Institute. Overall, our small size—about one hundred students—and high expectations create a community that is serious yet flexible and demanding while remaining supportive.

CELEBRATING MORE THAN 30 YEARS OF EXCELLENCE

This year has marked the 31st anniversary of the founding of the Massachusetts Academy of Math and Science at WPI. We are honored to have the support of the students, families, community, and legislators of the Commonwealth of Massachusetts as we continue to promote high quality and innovative STEM education. We are equally grateful for the support and partnership with Worcester Polytechnic Institute, without whom Mass Academy may not exist. It is through this type of collaboration—which we promote throughout our programming—that we pave the way for students from all over Massachusetts to advance their learning further than they may have ever believed was possible.

ADMISSIONS

Each year the faculty selects approximately fifty students for the incoming junior class. New students are not admitted to the senior class. The applicant pool represents more than fifty schools, public and private, and fifty towns in Massachusetts. The acceptance rate is less than 35%. Candidates are typically high honors students in their home schools. Every year, students choose to leave their sending schools—where they are already excelling in their academics and beyond—to join Mass Academy and become a part of our school which boasts of a full year of coursework at WPI, a challenging yet collaborative academic program, and endless possibilities for project and research opportunities.

STATE, NATIONAL, AND INTERNATIONAL AWARDS, AND ATTENTION TO MISSION

- The senior Class of 2023 (of 50 students) produced **10** National Merit semi-finalists and **23** National Merit commended students, representing 66% of the graduating class.
- Mass Academy seniors attend classes full time at Worcester Polytechnic Institute. The average GPA at WPI for the Class of 2023 is **3.92**.
- Our students contributed over **6,000** hours of community service this year to schools, organizations, and individuals in need.
- **Three** seniors and **one** junior were selected to participate in the 2022 Massachusetts Junior Academy of Science (MJAS) Conference held in October at MIT. One senior was selected to represent Massachusetts at the national meeting of the American Junior Academy of Science (associated with AAAS) in Washington, DC in March 2023.
- **Two** Mass Academy seniors were named Scholars in the Regeneron Science Talent Search, selected from more than 1,900 applications. **One** senior was named a Finalist in the Regeneron Science Talent Search where they participated in a week-long competition and rigorous judging process.
- In the 2023 Massachusetts State Science and Engineering Fair, Mass Academy students earned **one first place, one second place,** and **three third place** awards, as well as **one special award.**
- Mass Academy had **two** representatives at the 2023 Regeneron International Science and Engineering Fair.
- **Sixteen** Mass Academy students were invited to present their STEM independent research at the New England Regional Junior Science and Humanities Symposium (JSHS) at the University of New Hampshire on March 2, 2023. **Three** of our students gave oral presentations during the Symposium and were awarded an all-expense paid trip to the National Junior Science and Humanities Symposium in Virginia Beach in April.
- This year, **fourteen** Mass Academy students competed in the F=ma Exam. This physics contest is made up of 25 challenging questions about mechanics. **Two** Mass Academy students qualified to advance to the second round by scoring at least 18 points on this exam. The second round, the USA Physics Olympiad exam, took place in April. **One** student, Mass Academy junior Alex Chen, earned Honorable Mention for his achievement on this exam. He was one of nine students from Massachusetts to score in the top 262 on the USA Physics Olympiad exam.
- **Two** Mass Academy students earned recognition from the National Center for Women and Information Technology (NCWIT) with Aspirations in Computing Awards. Award recipients were selected from more than 3,300 applicants from across the United States.

TEACHING AND LEARNING AT THE MASSACHUSETTS ACADEMY OF MATH AND SCIENCE

The mission of the Massachusetts Academy of Mathematics and Science is to address the changing needs of the technologically advanced community of the 21st century by pioneering a new vision of mathematics and science education embedded within the liberal arts. By creating a public laboratory school focused on nurturing the potential of students with exceptional aptitude in mathematics and science, we have formed a community of learners committed to the following:

- Lifelong learning by providing the tools, skills, and strategies for students to engage actively in their own education
- Evolving curricula which are project-based, interactive, and enhanced with technology
- Excellence and innovation in teaching practice, providing a model for schools in the Commonwealth of Massachusetts

The Commonwealth is truly fortunate to have this school of excellence that very clearly meets the needs of academically accelerated youth in Massachusetts. The Massachusetts Academy of Math and Science is the only school in the state whose students attend a university full-time as high school seniors.

The unique partnership between Mass Academy and Worcester Polytechnic Institute (WPI) makes available a wide variety of services and resources for Mass Academy students as they become actively engaged in their own education. The school's director is a strong champion of project-based learning and enthusiastically highlights the positive impact of Mass Academy's model on students interested in STEM fields. This mission is our way of life at Mass Academy. From the moment one walks through the door, it is evident that teaching and learning are inclusive, meaningful, authentic, innovative, and rigorous. Phrases such as "actively engaged in their own education," "interactive," "collaborative" and "inquiry-based" may be the goal at many schools but they are well-ingrained practices at Mass Academy.

Junior year at Mass Academy emphasizes inquiry-based and interdisciplinary learning that fosters both teamwork and independence. As seniors, these high school students utilize the skills and knowledge gained during their junior year to succeed at the college level at WPI. During both years, the students are challenged and supported by our caring, professional faculty.

The partnership between Mass Academy and Worcester Polytechnic Institute fosters a strong belief in students' abilities, promotes an appreciation for working collaboratively, and builds students' independence and self-advocacy skills to succeed academically at both the high school and university level. WPI is to be commended for its commitment to the success of Mass Academy. In addition, Mass Academy is proud of its work toward fulfilling the commitment to provide "excellence and innovation in teaching practice," and "providing a model for schools in the Commonwealth of Massachusetts." Continued funding by the legislature of the Commonwealth of Massachusetts makes this vision a reality. Anyone who has spent even a single day at Mass Academy understands the value of this investment.

NATIONAL MERIT AWARDS

High school juniors entered the 2023 National Merit Scholarship Program by taking the 2021 Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT®), which served as an initial screen of program entrants. The nationwide pool of Semifinalists, representing less than one percent of U.S. high school seniors, includes the highest-scoring entrants in each state. The number of Semifinalists in a state is proportional to the state's percentage of the national total of graduating seniors.

The ten seniors from the Massachusetts Academy of Math and Science at WPI, **Rajat Baldawa** (South Grafton), **Simon V. Beyzerov** (Medway), **Rohan Das** (Shrewsbury), **Henry Liu** (Grafton), **Arul R. Mazumder** (Boxborough), **Krishna Purimetla** (Marlborough), **Gracie H. Sheng** (Northborough), **Aaron Z. Tian** (Westborough), **Maya Zheng** (Westborough), and **David G. Zhukovsky** (Newton), along with the other semifinalists, had the opportunity to continue in the competition for some 7,500 National Merit Scholarships worth more than $28 million that will be offered in the spring.

Twenty-three students from the Mass Academy of Math and Science at Worcester Polytechnic Institute (WPI) were recognized as "National Merit Commended Students" in the 2023 National Merit Scholarship Program. A letter of commendation from the school and National Merit Scholarship Corporation (NMSC), which conducts the program, was presented to these scholastically talented students.

The students are **Abhinav S. Bapanapalli** (Andover), **Sreeja Bolla** (Hopkinton), **Justin W. Che** (Sudbury), **Amith S. Chintalapati** (Shrewsbury), **Alexis M.Chong** (Uxbridge), **Stephen J. Cooley** (Wilbraham), **Shreya Devarajan** (Chelmsford), **Svabhu Govindaraj** (North Grafton), **Daniel G. Kaminski** (Holden), **Karisma N. Lavana** (Shrewsbury), **Kiara N. Lavana** (Shrewsbury), **Poorvi Mohanakrishnan** (Marlborough), **Vinayak S. Rao** (Shrewsbury), **Mateo S. Rollins** (Boylston), **Aaheli Saha** (Marlborough), **Eeman R. Saud** (Shrewsbury), **Anush Shah** (Shrewsbury), **Diksha S. Sriram** (Shrewsbury), **Diego E. Suchenski Loustaunau** (Worcester), **Melinda A. Telford** (Shrewsbury), **Anh D. Tran** (Worcester), **Robin K. Warner** (Stow), and **Cameron T. Whiting** (Hopedale).

NATIONAL CENTER FOR WOMEN AND INFORMATION TECHNOLOGY AWARDS

The National Center for Women & Information Technology (NCWIT) Award for Aspirations in Computing (AiC) honors 9th-12th grade women, genderqueer, or non-binary students for their computing-related achievements and interests, and encourages them to pursue their passions. Since 2007, more than 20,000 students have received an Award for AiC. This year, 40 winners and 360 honorable mentions were selected from more than 3,300 amazing, talented young applicants.

Please join us in congratulating our Mass Academy 2023 NCWIT AiC Award recipients:

Erika Lam

Rianna Santra

Erika Lam received a 2023 Affiliate Winner Award.

Rianna Santra received a 2023 National Honorable Mention Award and an Affiliate Winner Award.

Award recipients were selected from more than 3,300 applicants from all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, Guam, all U.S. overseas military bases, and Canada for their outstanding aptitude and aspirations in technology and computing as demonstrated by their computing experience, computing-related activities, leadership experience, tenacity in the face of barriers to access, and plans for post-secondary education.

Each recipient received recognition and prizes: induction into the AiC Community of more than 22,000 women, genderqueer, or non-binary technologists; access to resources, scholarships, and internship opportunities; and more.

NCWIT is the farthest-reaching network of change leaders focused on advancing innovation by correcting underrepresentation in computing. NCWIT convenes, equips, and unites nearly 1,500 change leader organizations nationwide to increase the influential and meaningful participation of girls and women — at the intersections of race/ethnicity, class, age, gender identity, sexual orientation, disability status, and other historically marginalized identities — in the field of computing, particularly in terms of innovation and development.

We are very proud of our young innovators and encourage all to pursue their passions in computing and technology!

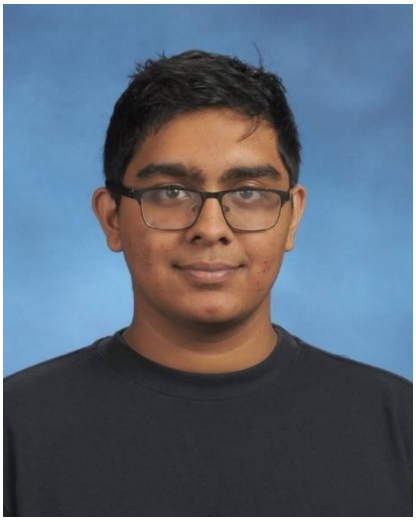
MASS ACADEMY SENIOR EARNS TOP SPOT AT MJAS CONFERENCE

Three seniors and one junior were selected to participate in the 2022 Massachusetts Junior Academy of Science (MJAS) Conference held on Oct. 22 at MIT. We are so proud of our students for being recognized with this honor. Students gave a 10-minute presentation and were judged on the quality of their presentation, scientific merit, experimental design, clarity of presentation, data quality and interpretation, visuals, creativity, and ability to answer questions. Top ranked presenters were selected to represent Massachusetts at the national meeting of the American Junior Academy of Science (associated with AAAS) in Washington, DC in March 2023.

Maya Zheng, member of the Class of 2023, earned the highest rank in the category of Biology, Biomedical Sciences, and Chemistry. Maya traveled to Washington, DC in March to present her research at the national level. Congratulations to Maya!

TWO MASS ACADEMY SENIORS NAMED SCHOLARS IN REGENERON SCIENCE TALENT SEARCH

Only 300 students worldwide were honored by this prestigious program.



Arul Rhik Mazumder

Diego Suchenski Loustaunau

Arul Rhik Mazumder and Diego Emilio Suchenski Loustaunau, seniors at Massachusetts Academy of Math and Science at Worcester Polytechnic Institute (WPI), have been recognized by Society for Science as scholars in the Regeneron Science Talent Search 2023. Only 300 students were selected for this honor from the 1,949 applications representing 627 high schools across 48 states, Washington, D.C., Puerto Rico and four other countries. The scholars were chosen based on their outstanding research, leadership skills, community involvement, commitment to academics, creativity in asking scientific questions, and exceptional promise as STEM leaders demonstrated through the submission of their original, independent research projects, essays and recommendations.

Rhik is from Boxborough, and his research is titled "An Adaptive Hybrid Quantum Algorithm for the Metric Traveling Salesman Problem." Diego is a resident of Worcester, and his research is titled "*In silico* Design of Novel 2'FANA Oligonucleotides To Inhibit APOBEC3G."

"We are incredibly proud of Rhik and Diego's accomplishments in their respective areas of research, as well as their involvement in their school and local communities," says Anne Ludes, Mass Academy Director. "We are so fortunate to have our amazing faculty and staff at Mass Academy who continually support students in their pursuit of academic excellence. Thank you to Dr. Kevin Crowthers, our STEM teacher, for providing authentic research opportunities for all our students."

The Regeneron Science Talent Search recognizes and empowers our nation's most promising young scientists who are generating innovative solutions to solve significant global challenges through rigorous research and discoveries. It provides students with a national stage to present new ideas and challenge conventional ways of thinking. Now in its one hundred and first year, Society for Science has played a significant role in educating the public about scientific discoveries as well as in identifying future leaders in science, technology, engineering and math. Regeneron has sponsored the Science Talent Search since 2017 as part of its deep commitment to STEM education and to supporting young scientists.

In addition to this year's honorees, over the past decade Mass Academy has had students selected as scholars in 2013, 2015, 2016 and 2019.

MASS ACADEMY SENIOR NAMED FINALIST IN REGENERON SCIENCE TALENT SEARCH

Only 40 students worldwide were honored with this recognition.

Diego Emilio Suchenski Loustaunau, a senior at Massachusetts Academy of Math and Science at Worcester Polytechnic Institute (WPI), has been recognized by Society for Science as a finalist in the Regeneron Science Talent Search 2023. Only 40 students were selected for this honor.

According to the Society for Science, "the finalists were chosen based on their projects' scientific rigor and their potential to become world-changing scientific leaders. Finalists were selected by a national jury of professional scientists from a pool of 300 scholars, who were announced earlier this month. The scholars were chosen from a pool of over 1,900 highly-qualified entrants, all of whom completed an original research project and extensive application process."

"Finalists will participate in a week-long competition in March 2023, during which they will undergo a rigorous judging process that goes beyond their own research to encompass other scientific disciplines and compete for more than $1.8 million in awards. They will also have an opportunity to interact with leading scientists and share their research during a virtual "Public Day" event on March 12. The top 10 Regeneron Science Talent Search 2023 winners will be announced during an awards ceremony on March 14, streamed live from Washington, D.C.," according to the press release.

"Congratulations to an exceptional group of Regeneron Science Talent Search 2023 finalists," said George D. Yancopoulos, M.D., Ph.D., Co-founder, President and Chief Scientific Officer of Regeneron, and a 1976 Science Talent Search finalist and top winner. "Inspiring and equipping the brightest minds to take on the world's most pressing issues is one of the most important ways we can ensure the scientific advancements necessary to better our society. We know the future is bright for these young scientists and are excited to see the positive impact they will make."

Diego is a resident of Worcester, and his research is titled "*In silico* Design of Novel 2'FANA Oligonucleotides To Inhibit APOBEC3G."

"This recognition is a testament to Diego's commitment to research and his community," says Anne Ludes, Mass Academy Director. "We are proud of Diego for this accomplishment and for all that he does to make a positive impact on this world."

MASS ACADEMY STUDENT EARNS HONORABLE MENTION ON THE 2023 USA PHYSICS OLYMPIAD EXAM

Every year the American Association of Physics Teachers (AAPT) holds two rounds of physics competitions with the goals of challenging high school students across the country and selecting twenty students for the United States Physics Team. These twenty students participate in a ten-day physics training camp, after which five are selected for the traveling team to represent the United States at the International Physics Olympiad.

This year 5173 students across the country, including 11 juniors and 3 seniors from Mass Academy, took the first qualifying exam in February. This first round, known as the "F=ma Exam," is made up of 25 challenging questions about mechanics. The top 417 students, including junior Alex Chen and senior Henry Liu, qualified to advance to the second round by scoring at least 18 points on this exam.

The second round, the USA Physics Olympiad exam, took place in April and included two sets of open response problems covering topics including mechanics, electricity and magnetism, thermodynamics, waves, fluid dynamics, and modern physics. Alex Chen earned Honorable Mention for his achievement on this exam. He was one of nine students from MA to score in the top 262 on the USA Physics Olympiad exam.

MATHEMATICS AT MASS ACADEMY

It has been a busy year for the Math Team! Below are some highlights from each of the competitions.

The Math Team captains were seniors **Rhik Mazumder**, **Anush Shah**, and **Gracie Sheng**. They organized practices during A, B, and C terms for the team of 30 – 40 students. The practices focused on developing math competition, teamwork, and collaboration skills.

The Team
Each student named below competed in one or more of the competitions listed.

The Seniors
Rajat Baldawa, Rachel Bunsick, Justin Che, Amith Chintalapati, Svabhu Govindaraj, Henry Liu, Rhik Mazumder, Vinayak Rao, Anush Shah, Gracie Sheng, Diego Suchenski Loustaunau

The Juniors
Mihika Chalasani, Alex Chen, Omar El Nesr, Tarun Eswar, Arnav Gupta, Vaishnavi Harish, Alexander Kaneko, Anya Kelley, Nathan Lam, Anyee Li, Jaylin Li, Shuling Lin, Isabella Palit, Luke Pepin, Nihitha Reddy, Rianna Santra, Joshua Schnee, Jennifer Shaughnessy, Sumanth Sura, Travis Tran, Venkatraman Varatharajan, Suhruth Vuppala, Chengwei Wang, Anne Wu, Joseph Yu

Thank you to everyone for participating and giving their best effort!

NEW ENGLAND MATH LEAGUE

All juniors competed in this contest. The contest has six rounds of six one-point questions.

The top 5 scorers for Mass Academy were **Alexander Kaneko** (perfect score), **Rianna Santra**, **Chengwei Wang**, **Sumanth Sura**, and **Peter Liang**.

MASSACHUSETTS ASSOCIATION OF MATH LEAGUES (MAML)

Approximately 680 Massachusetts students competed in the 15-question MAML Olympiad Level 1 contest on October 20, 2022 (21 Mass Academy students).
The top 10 scorers for Mass Academy were **Alexander Kaneko**, **Rianna Santra**, **Sumanth Sura**, **Henry Liu**, **Alex Chen**, **Chengwei Wang**, **Isabella Palit**, **Joshua Schnee**, **Venkatraman Varatharajan**, and **Suhruth Vuppala**.

Based on their high scores, these 10 students competed in Level 2 of the contest on February 28, 2023.

HIGH SCHOOL MATHEMATICAL CONTEST IN MODELING (HIMCM)

Mass Academy had 14 teams (13 junior teams and 1 senior team) compete in the HiMCM November 9 – 11. The teams worked diligently to prepare their papers on one of the two choices for modeling problems: "The Need for Bees (and not just for honey)" or "CO_2 and Global Warming." It was a memorable experience for our students and we are so proud of their dedication to completing this challenge. We had 4 teams qualify for the 5-day International Math Modeling Challenge by scoring a designation of Outstanding, Finalist, or Meritorious on their HiMCM paper.
Team 12519: **Ashwina Bangari**, **David Barsoum**, **Nicole Plotnik**, **Charles Tang**
Team 12520: **Omar El Nesr**, **Rianna Santra**, **Joshua Schnee**, **Venkatraman Varatharajan**
Team 12525: **Marlon Jost**, **Nathan Lam**, **Donovan Sappet**, **Anne Wu**
Team 12855: **Simon Beyzerov**, **Diego Suchenski Loustaunau**, **Aaron Tian**, **David Zhukovsky**

INTERNATIONAL MATHEMATICAL MODELING CHALLENGE (IMMC)

Mass Academy had 1 team compete in the IMMC during March break. Our team was one of the two teams selected to move on to represent the USA in the IMMC! Judging at the international level will be completed in late June.
Team 12519: **Ashwina Bangari**, **David Barsoum**, **Nicole Plotnik**, **Charles Tang**

WORCESTER COUNTY MATH LEAGUE (WOCOMAL)

Mass Academy had 36 students compete in WOCOMAL this season. The four meets took place at Shrewsbury High School. Each student competed in 3 individual rounds and the team round. The results are recorded on the WOCOMAL site.
Mass Academy placed 1st overall! We had 6 of the 10 top scorers in WOCOMAL: **Rhik Mazumder**, **Alexander Kaneko**, **Rianna Santra**, **Venkatraman Varatharajan**, **Sumanth Sura**, and **Alex Chen**.

MASSACHUSETTS ASSOCIATION OF MATH LEAGUES STATE MEET

Based on our team's performance in WOCOMAL, Mass Academy received an invitation to participate in the MAML State Meet. This took place on March 30th. We had one team of 5 students compete at this meet: **Alex Chen**, **Alexander Kaneko**, **Jennifer Shaughnessy**, **Sumanth Sura**, and **Venkatraman Varatharajan**. Each student competed in 3 individual rounds and the team round. We placed 1st in the Small Schools Division!

NEW ENGLAND ASSOCIATION OF MATH LEAGUES REGIONAL MEET

Based on our team's performance at the MAML State Meet, Mass Academy received an invitation to participate in the NEAML Regional Meet. We had one team of 5 students compete at this Meet: **Alex Chen**, **Alexander Kaneko**, **Jennifer Shaughnessy**, **Sumanth Sura**, and **Venkatraman Varatharajan**. Each student competed in 3 individual rounds and the team round. We placed 2nd in the Small Schools Division.

AMERICAN MATH CONTEST (AMC12)

All Mass Academy juniors, as well as 3 seniors (Justin Che, Anush Shah, Gracie Sheng), participated in the AMC 12B contest in November. We had 7 students qualify to participate in the American Invitational Math Exam, the AIME. This 15-question, 3-hour AIME took place on February 7th.
AIME Qualifiers: **Alexander Kaneko**, **Peter Liang**, **Rianna Santra**, **Joshua Schnee**, **Gracie Sheng**, **Sumanth Sura**, and **Venkatraman Varatharajan**

HARVARD/MIT MATH TOURNAMENT (HMMT)

Mass Academy had two teams compete in HMMT at MIT on February 18th. Students competed in two team rounds, one was a proof-based round and the other a guts round. Each student also competed in 3 individual rounds.
HMMT Participants: **Alex Chen**, **Omar El Nesr**, **Arnav Gupta**, **Alexander Kaneko**, **Rhik Mazumder**, **Jennifer Shaughnessy**, **Sumanth Sura**, **Travis Tran**, **Venkatraman Varatharajan**, **Suhruth Vuppala**, **Chengwei Wang**, **Joseph Yu**

MATHWORKS MODELING CHALLENGE

Mass Academy had two teams compete in the 14-hour MathWorks Modeling Challenge during the March break. Each team consisted of 5 students who worked together to develop a solution to the problem "Ride Like the Wind Without Getting Winded: The Growth of E-Bike Use." There were 650 papers submitted, 168 of which were selected for round 2 of judging, including both the papers written by our teams!

Team 16621: **Omar El Nesr**, **Rianna Santra**, **Joshua Schnee**, **Sumanth Sura**, **Venkatraman Varatharajan**
Team 16623: **Ashwina Bangari**, **David Barsoum**, **Nicole Plotnik**, **Charles Tang**, **Shreya Venkayala**

PURPLE COMET

All Mass Academy juniors participated in the Purple Comet Math Competition on April 25th. The contest is a 30-question, 90-minute team competition for high school students in teams of up to six. One of our teams, the self-named "Unicorns," received Honorable Mention.
Unicorns Team: **Tarun Eswar**, **Arnav Gupta**, **Alexander Kaneko**, **Peter Liang**, **Charles Tang**, **Travis Tran**

MASS ACADEMY OF MATH AND SCIENCE CYBERPATRIOT TEAMS

CyberPatriot is the National Youth Cyber Education Program created by the Air Force Association to inspire K-12 students toward careers in cybersecurity or other STEM disciplines. At the center of CyberPatriot is the National Youth Cyber Defense Competition. The competition puts teams of high school students in the position of newly hired IT professionals tasked with managing the network of a small company. In each six-hour round of competition, teams are given a set of virtual images that represent operating systems and are tasked with finding cybersecurity vulnerabilities within the images and hardening the system while maintaining critical services. Students need to utilize their knowledge of networking, switches, routers, firewalls, TCP/IP protocols and architecture, and administration of various operating systems. They must determine whether there are unauthorized users getting into the network, whether their passwords are strong enough, or whether the firewall has holes in it. For every problem students identify and fix, points are awarded; however, points are deducted if there is a disruption to required services.

This season, Mass Academy had 33 students compete in CyberPatriot XV. In all, over 5,000 teams registered to compete. All teams excelled in the competition rounds, demonstrating teamwork, critical thinking skills, and technical knowledge key to a successful career in cybersecurity. We were very impressed with the determination and persistence that all students showed uncovering and fixing vulnerabilities. All teams did a great job working together and putting in their best efforts.

Please join us in congratulating the following teams who received MA State Awards and Tier Awards in their respective tiers:

3rd Place State Award – Platinum Tier – Team Blue #15-1593 consisting of **Rajat Baldawa**, **Simon Beyzerov**, **Daniel Kaminski**, **Ryan Mechery**, **Sashank Tadimeti**, **Aaron Tian**

3rd Place Tier Award – Gold Tier – Team Yellow #15-1587 consisting of **Tarun Eswar**, **Vaishnavi Harish**, **Shuling Lin**, **Thomas Park**, **Donovan Sappet**

AMERICAN COMPUTER SCIENCE LEAGUE 2022-2023

The American Computer Science League (ACSL) is a non-profit organization devoted to Computer Science education. ACSL organizes team computer programming and computer science contests for K-12 schools, organizations and local groups, led by an adult advisor. This school year was their 45th year of continuous operation. Last year, over 700 teams in the United States, Canada, Europe, and Asia participated. ACSL has five divisions: Senior, Intermediate, Junior, Classroom, and Elementary, providing an appropriate challenge for students of varying ages and abilities.

The ACSL regular season is divided into four contests that are held over the academic school year. Each contest focuses on fundamental concepts in computer science, ranging from Number Systems to Boolean Algebra to Digital Electronics to Graph Theory. In the upper divisions, each contest also includes a problem to solve through programming using Python, C++, or Java.

This year, Mass Academy participated in both the Classroom and Senior divisions. Three teams of approximately 11 students each participated in the Classroom division, and two teams of approximately 11 students each participated in the Senior division. ACSL calculates the total score of each contest as the sum of the 3 highest individual student scores on a team.

For the Classroom division, Mass Academy's three teams placed **sixth, ninth,** and **tenth** out of 30 total teams. For the sixth-place team, junior **Chengwei Wang** was the top scorer. For the ninth-place team, junior **Arnav Gupta** was the top scoring student, and for the tenth-place team, junior **Anyee Li** was the top scorer.

For the Senior division, Mass Academy's two teams placed **eighth** and **tenth** out of 107 total teams. For the eighth-place team, junior **Alexander Kaneko** was the top scorer, receiving a perfect score. For the tenth-place team, junior **Joshua Schnee** was the top scoring student.

ACSL also offers an invitational only, ACSL Finals contest. To be invited, students must have a cumulative score of at least 24 (out of 40) for all four regular season contests. Individual students meeting the required score can choose to participate in ACSL Finals. This year, the ACSL Finals contest was held online on Saturday, May 27, 2023.

Mass Academy had 16 students participate in the ACSL Finals across both the Classroom and Senior divisions.

Venkatraman Varatharajan received a Silver Medal award and **Anne Wu** received a Bronze Medal award in the ACSL Finals Classroom division.

Congratulations to all students who participated in ACSL 2022-2023 this year!

MASS ACADEMY STEM FAIR

Each year, Mass Academy holds an annual STEM Fair. This is a day to celebrate the hard work, perseverance and commitment of our remarkable students as they showcase their independent research projects. This year, we were able to return to an in-person fair, allowing students and professionals to engage in their high-level discussions face-to-face.

The annual STEM Fair is a very important event for our students and the entire Mass Academy community. This is not just an exhibition of a school project; it is at the core of our academic program. In fact, the Mass Academy mission highlights our goal of providing students with rigorous, relevant STEM learning experiences and authentic research. This event is our opportunity to celebrate our students' achievements and appreciate the curiosity, hard work, and perseverance of the members of the Class of 2024.

Special recognition goes to our students. They committed themselves to their research since last summer, cultivating their ideas and questions into their end results. Our students overcame many challenges along the way and strengthened their skills, knowledge, and confidence. They can—and should--be proud of their accomplishments. Words cannot express how proud we are of them.

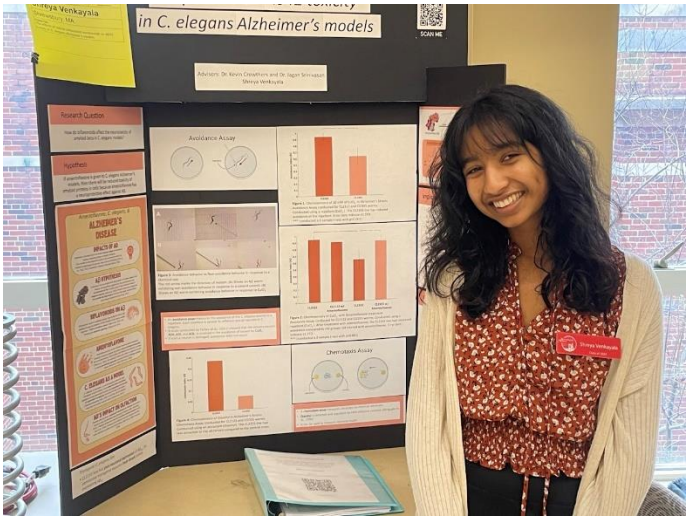
We are incredibly grateful to our STEM teacher, Dr. Kevin Crowthers, and visiting scholar, Nicholas Medeiros, as well as our faculty, seniors, alumni, and members of the WPI faculty and greater community who served as advisors and mentors and provided feedback. Their guidance and support lifted students when they needed it, challenged them to go further than they believed possible, and gave them confidence to pursue their passions. There is no limit to what our students can do, and the role these individuals played in these projects helped students to see that.

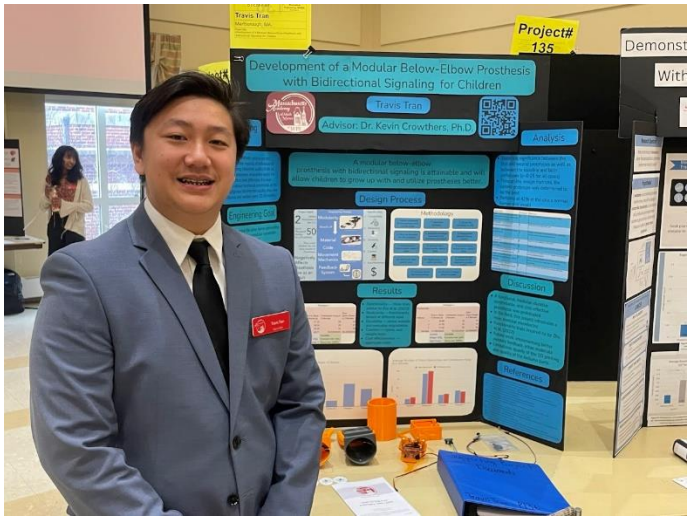
We also wish to thank the families of our students. Their encouragement and patience showed a belief in the students' abilities, enabling them to grow as researchers and problem solvers. The families were there to celebrate student successes on good days and offer words of reassurance when needed.

Lastly, thank you to our judges for being so generous with their time and for providing our students with valuable feedback. This project means so much to our students, and we are grateful to our judges for affirming these efforts of our young scientists, engineers, and mathematicians.

Student Name - Town	Project Title
Rianna Santra - Tyngsboro	*Leveraging Differential Gene Expression Analysis and Agent-Based Modeling to Detect Biomarkers of Brain Cancer Subtypes*
Charles Tang - Southborough	*A Semi-trailer Truck Right-Hook Turn Blind Spot Alert System for Detecting Vulnerable Road Users with Transfer Learning*
Nevin Thinagar - Shrewsbury	*Cost Effective On-Orbit Millimetric Orbital Debris Detection and Characterization*
Sumanth Sura - Westborough	*Using Machine Learning Techniques to Improve Computer-Based Assessment of Musical Performances*
Jennifer Shaughnessy - Carlisle	*Reminder Device to Notify People who Need and Forget to Use a CPAP*
Omar El Nesr - Southborough	*Gene Expression Meta-Analysis Identifies Novel Cell Type Specific Pathways in Multiple Sclerosis*
Suhruth Vuppala - Marlborough	*An Early Diagnostic Method to Detect ALS Using Machine Learning*
Donovan Sappet - Sterling	*Evaluating WIMP Dark Matter Candidacy with Distant Astrophysical Phenomena*
Shreya Venkayala - Shrewsbury	*The effects of natural biflavonoid compounds on Aβ42 toxicity in C. elegans Alzheimer's models*
Joshua Schnee - Auburn	*Improvement of Compressed Air Energy Storage Using Mechanical Springs*
Venkatraman Varatharajan -Northborough	*Evaluating the Feasibility of a Gray Box AI From a Game Theory Perspective*
Anshika Shekhar - Westborough	*The effectiveness of a standardized mixture of antioxidants as a preventative treatment for PTSD and its symptoms in C. elegans*
Krisha Patel - Shrewsbury	*The Effects of Varying Ground Surfaces on the Degree of Footstrike Hemolysis*
Thomas Park - Franklin	*Upkeep on the MBTA: A maintenance-affected public transit simulation*
Mihika Chalasani - Boylston	*A Deep Learning Model to Detect Emotions for Evidence in the Justice System*
Lily Pattison - Sutton	*Engineering a Plant-Based Device to Filter Pollutants from Urban Runoff Water*
Peter Liang - Hopkinton	*Using a Sunrise Alarm to Simulate Dawn and its Effect on Sleep Inertia*
Luke Pepin - Harvard	*In-Pipe Hydrokinetic Turbine for Home Use*
Chengwei Wang - Westborough	*Developing an Algorithm to Enhance Audio Quality of Music Recordings*
Vanessa Fobid - Shrewsbury	*Observing the Role of DSL proteins in hair cell regeneration using C. elegans*
Arnav Gupta - Shrewsbury	*Designing and Building a Piezoelectric Power Harvester Framework to Generate Energy for a Pacemaker*
Riley Harn - Canton	*Utilizing Digital Twin Modeling Technology to Determine the Optimal Recycled Material to be Used as Building Insulation*
Nihitha Reddy - Boylston	*Enhancing Psychiatric Disorder Classification Based on MRI Scans with Biomarker Analysis*
David Barsoum - Framingham	*A Deep Learning Feedback System for Practicing Competitive Diving*
Anyee Li - Shrewsbury	*A Deep Learning Flush Volume Device for Water Efficiency in the Toilet*
Shivani Parmar - Hadley	*Optimization of a Compost-Based Heat Pump for Sustainable Heat Exchange*
Ashwina Bangari - Framingham	*Heat-Impacted Allergen Identification Utilizing Spectroscopic Methods*
Anya Kelley - Rutland	*The Impact of Natural Substances on the Regenerative Capabilities of Planaria*
Marlon Jost - Groton	*Simulating Electrodynamic Tethers using the General Mission Analysis Tool*
Nicole Plotnik - Shrewsbury	*Computationally Modeling the Filtering of Heavy Metals out of Water using Hydrochar.*
Giang Pham - Auburn	*Impact of Biosynthesized Silver nanoparticles and Phage Hybrids Against E. coli*
McKenna Childs - Ware/Holden	*Hydrothermal Liquefaction Utilizing Styrene Monomers Coupled with Hydrogen Peroxide*
Nathan Lam - Worcester	*Using wave diffraction to create a model for noise cancellation to a large area*
Joseph Yu - Shrewsbury	*Using Immune Footprints in a Novel Deep Learning Model to Detect Human Diseases*

Kweku Akese - Auburn	*Modifying Ribonucleotide Reductase and Hydroxyurea to Increase Binding Affinity*
Travis Tran - Marlborough	*Development of a Modular Below-Elbow Prosthesis with Bidirectional Signaling for Children*
Naga Vikram - Shrewsbury	*Demonstrating Melatonin's Anticancer Effects With A Planarian Model For Cancer*
Emily Wang - Westborough	*Analyzing the Function of NucS in M. smegmatis*
Jaylin Li - Northborough	*The Effects of Nitric Oxide in the Cerebrovascular System during Exercise*
Vaishnavi Harish - Ashland	*Analysis of the Taxis of E. coli and C. reinhardtii Hybrids*
Anne Wu - Shrewsbury	*Detecting Fake News Using a Machine Learning Model Based on Lexical Characteristics of Text*
Anne Tie - Shrewsbury	*PD-L1 Expression is Upregulated in Tumor Infiltrating Myeloid Cells of Young Tumor-Bearing Hosts*
Shuling Lin - Shrewsbury	*The Behavioral Effects of Microplastic Consumption in Drosophila melanogaster*
Tarun Eswar - Worcester	*Modeling T1 Resting State MRI Variants Using Convolutional Neural Networks in Diagnosis of OCD*
Kyle Klamka - Westford	*Feeding Practices Change the Gait of Caenorhabditis elegans*
Alex Chen - Sherborn	*Assessing the Efficacy of Virtual Reality Exposure Therapy for Public Speaking Anxiety*
Isabella Palit - Northborough	*Determining the Effects of IGF-1 on Collagen Production and Morphology in Smooth Muscle Cells to Improve Understanding of Uterine Leiomyoma Pathology*
Amy Chen - Westborough	*Using A Mathematical Model to Personalize Keyboard Layouts For Users Who Are Missing Digits*
Alexander Kaneko - Shrewsbury	*Dynamic Space-Phase-Time Hypernetwork For Synchronizing Electric Vehicles With Traffic Signals*





WORCESTER REGIONAL SCIENCE AND ENGINEERING FAIR

Eleven Mass Academy juniors advanced from the STEM Fair to compete in the 68th Worcester Regional Science and Engineering Fair (Region II) on March 10th. Congratulations to the following students who competed in the Massachusetts Science and Engineering Fair (MSEF) on May 5th. First place winners qualify to enter the ISEF Regeneron International Science and Engineering Fair.

1st Place Award Winners and ISEF Representatives

- **Nevin Thinagar**, *Affordable On-Orbit Millimetric Orbital Debris Detection and Characterization*
- **Anshika Shekhar*,** *The effectiveness of a standardized mixture of antioxidants as a preventative treatment for PTSD and its symptoms in C. elegans*

**Recipient of Regeneron Biomedical Science Award*

2nd Place Award Winner

- **Rianna Santra**, *Leveraging Differential Gene Expression Analysis and Agent-Based Modeling to Detect Biomarkers of Brain Cancer Subtypes*

3rd Place Winner

- **Joseph Yu**, *Using Immune Footprints in a Novel Deep Learning Model to Detect Human Diseases*

Honorable Mention Awards

- **Amy Chen**, *Using A Mathematical Model to Personalize Keyboard Layouts For Users Missing Digits*
- **Krisha Patel**, *The effects of varying ground surfaces on foot strike hemolysis*
- **Alex Chen**, *Assessing the Efficacy of Virtual Reality Exposure Therapy for Public Speaking Anxiety*
- **Nihitha Reddy**, *Differentiating Neurological Disorders Based on MRI Scans of Previous Patients*
- **Anne Tie**, PD-L1 Expression is Upregulated in Tumor Infiltrating Myeloid Cells of Young Tumor Bearing Hosts

Donovan Sappet and **Omar El Nesr** were also be eligible to compete in MSEF as direct entries.

Congratulations to all students who have worked hard throughout this process. Thank you to the seniors and parents who have provided support throughout the year. Your feedback and encouragement made a difference.

MASSACHUSETTS SCIENCE AND ENGINEERING FAIR

Eleven Mass Academy juniors competed in the Massachusetts Science and Engineering Fair (MSEF) held on May 5th at MIT. Congratulations to the following students who received placement in MSEF this year and to all our students who worked so hard on their research throughout the year.

FIRST PLACE

- **Krisha Patel**, *The effects of varying ground surfaces on foot strike hemolysis*

SECOND PLACE

- **Rianna Santra**, *Leveraging Differential Gene Expression Analysis and Agent-Based Modeling to Detect Biomarkers of Brain Cancer Subtypes*

THIRD PLACE

- **Anshika Shekhar*,** *The effectiveness of a standardized mixture of antioxidants as a preventative treatment for PTSD and its symptoms in C. elegans*
- **Nevin Thinagar**, *Affordable On-Orbit Millimetric Orbital Debris Detection and Characterization*
- **Joseph Yu***, *Using Immune Footprints in a Novel Deep Learning Model to Detect Human Diseases*

***Special Award: Regeneron Biomedical Science**

Each year thousands of students in Massachusetts experience the professional practices of working scientists and engineers through the development of independent research projects. MSEF supports the students and their teachers with a portfolio of tools (webinars, handbooks, volunteers, etc.) that facilitate and enhance their research. Through the process, students hone their critical thinking skills, learn through both successes and failure, and help solve local and global challenges. The Fair is the showcase, celebrating both the journey and the project completion.

Advancing science and engineering literacy since 1949, the Massachusetts Science & Engineering Fair (MSEF) was founded by the American Academy of Arts & Sciences, MIT professors, and a group of pioneering K-12 science educators.

2023 APPS FOR GOOD FAIR

WHAT IS APPS FOR GOOD

"Our goal is to transform the way technology is taught in schools; to empower students from all backgrounds to seize the opportunities of our digital age and create solutions to the problems they care about, using technology."

~ *Rodrigo Baggio, CDI Apps for Good, Founding Chairman & Founder CDI Global*

WHAT WE DO

Students work together as teams to find real issues they care about and learn to build a mobile, web, or social app to solve them. Like professional entrepreneurs, students go through all key aspects of new product development, from idea generation, technical feasibility, and programming to product design, deciding on business models, and marketing. Students become real-life entrepreneurs.

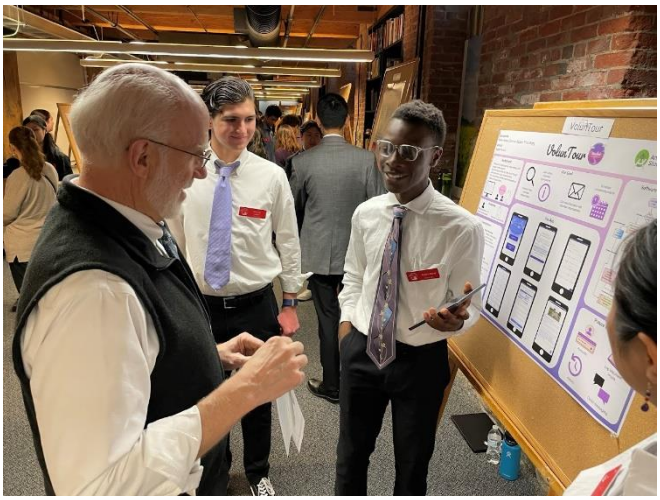
WHAT OUR STUDENTS LEARN

The curriculum teaches coding and the fundamentals of the digital world, while also developing skills in problem solving, creativity, communication, and teamwork. With a focus on solving real issues that matter to young people, our students learn the full software product development process in a hands-on way.

WHY APPS FOR GOOD EXISTS

We want to build a new global generation of problem solvers and creators: students who can create, launch, and market new products that change the world. We believe that technology can be a great equalizer and a massive force for good to transform lives and communities around the world.

Our annual Apps Fair took place on Wednesday, May 17th. Student teams displayed their posters and presented their projects during a public showcase.



Here is a list of the applications developed by the project teams this year:

Buzzwords

Alex Chen, Thomas Park, Shivani Parmar

Buzzwords aims to extract the main keywords in the media. It scans a variety of financial, scientific, or political news sources for the most frequent terminology. Then, it complies these words into a regularly updated interface where users can quickly and easily view definitions.

CarbSmart

Marlon Jost, Lily Pattison, Anne Wu

CarbSmart is a carb calculator designed for Type 1 diabetics to easily and accurately look up and calculate the grams of carbs in a restaurant meal. Users can search a database of grams of carbs in a variety of foods from an assortment of restaurants. The streamlined design simplifies current nutrition apps down to the essential features to create an app tailored to Type 1 diabetics.

Chews New Foods

McKenna Childs, Shuling Lin, Venkatraman Varatharajan

Chews New Foods is an app that allows a user to expand their palette. Many apps for "picky eaters" on the market are more suited for getting children to eat more, not adults. The goal of this app was to give individuals of all ages a space to grow without feeling ashamed or infantilized.

enLighten

Vaishnavi Harish, Luke Pepin, Rianna Santra

This app uses an algorithm to assist in scheduling tasks and in staying productive while studying. enLighten is geared towards a teenage student audience or anyone looking to organize their tasks in a way that keeps them focused and productive.

Hearitage

Riley Harn, Nathan Lam, Anshika Shekhar, Nevin Thinagar

History is ruled by the extraordinary, not the mundane. Hearitage aims to allow families to record, save, and share their family heritage all from one application. Ancestral knowledge once lost to time can be captured in audio recordings accessible for generations.

LaunchGuide

Amy Chen, Nihitha Reddy, Anne Tie

This app aims to emphasize accessibility by aiding visually impaired pedestrians as they navigate crosswalks. Using the camera and an on-device image classification model, the app continuously monitors the user's surroundings. Based on what is detected, the app will return a visual and audible signal indicating whether it is safe to cross.

Learn2Do

Alexander Kaneko, Anyee Li, Giang Pham

Our app helps teach adults with learning disabilities how to sequence daily tasks via a gamified format. The user reorders the steps of a specific task and receives feedback on the accuracy of the order they put the steps in. The goal is to have the user then be able to complete these tasks independently, or with minimal help, after learning from our app.

Pantry Access

Jennifer Shaughnessy, Sumanth Sura, Charles Tang

Pantry Access is a universal food pantry application for food pantries and clients. Our free, cross platform web app streamlines communication between clients and pantries and provides a single cloud-based location to manage inventory and desired donations.

Park King

Omar El Nesr, Joshua Schnee, Chengwei Wang

Park King is a mobile application that helps users find a parking location. By providing a list of nearby parking locations around WPI and a wide variety of accompanying information, the app is designed to help you find the right place to park.

SharePool

Tarun Eswar, Vanessa Fobid, Peter Liang

Students often face difficulties when planning carpools to and from school. SharePool streamlines this process by providing an all-in-one application for parents and students to coordinate carpools.

SNAP*

Arnav Gupta, Nicole Plotnik, Shreya Venkayala

Our app's goal is to help users improve their medication adherence, while simultaneously providing peace of mind for their caretakers. It allows users to create a medication schedule and send reminders via SMS messaging. It also allows users to connect to caretakers who are notified if medications are not taken in an allotted time.

StyleSync

Mihika Chalasani, Jaylin Li, Suhruth Vuppala

StyleSync is a virtual closet app that is capable of storing clothing information. Additionally, the app can suggest outfits using the clothing pieces stored within the app.

UNav

David Barsoum, Krisha Patel, Isabella Palit

Patients often find it difficult to navigate the UMass hospital campuses. UNav takes user input to determine which building and floor the user needs to go to for their appointment. Additionally, the app employs live navigation features to help them get to their destination.

UnifiedGroceryApp

Travis Tran, Joseph Yu

UnifiedGroceryApp provides an all-in-one "virtual fridge" to catalog all of the ingredients currently in one's home. Based on these ingredients and factoring in expiration dates, UnifiedGroceryApp is able to recommend relevant recipes. We hope to help our users utilize their ingredients more wisely and decrease food waste around the world.

VolunTour

Kweku Akese, Donovan Sappet, Emily Wang

VolunTour is an app for connecting volunteers with volunteer organizations. It provides a variety of features, such as organization search and recommendation features for volunteer users and a "create event" feature for organization users.

Water You Waiting For*

Ashwina Bangari, Kyle Klamka, Naga Vikram

Seventy-five percent of Americans are chronically dehydrated, and a large percentage of them are unaware of their water deficiency. Water You Waiting For is a mobile application which connects to a smart water bottle in order to record and improve the water consumption of the user.

* Combined STEM II/Assistive Technology and Apps for Good project

ENGINEERING HELPING PEOPLE

We believe client-driven, project-based learning provides meaning and impact for our Mass Academy students and the greater community. Our juniors complete a STEM II/Assistive Technologies engineering project each spring. Students spend one and a half terms working in teams to develop and build a working prototype of their product for their client. In May, each team presents their product during a public showcase. Many of our teams continue to improve their products during the summer and beyond so they can deliver the best possible working model to their clients.

The theme for the past several years has been Assistive Technologies. Students design and build assistive devices to help clients with disabilities in their communities achieve their goals. Mass Academy has developed highly successful partnerships with Seven Hills Foundation, Easter Seals, and Elder Services of Worcester Area. It is through these important partnerships that our students can provide this assistance to so many clients.

Examples of this year's projects include: **Improving Medication Adherence in Older Adults*:** A Smart Novel Automated Pillbox, **SEARCH**: Smart Electronic Assistance and Retrieval Companion for Home, **Trustfall**: A Device to Protect the Hips in the Event of a Fall, **Water You Waiting For*:** A Smart Water Bottle to Help Users Develop and Maintain Healthy Hydration Habits, and **Scopey:** An Affordable Robotic Feeding Device for Those with Limited Body Mobility Restrictions.

*Combined STEM II/Assistive Technology and Apps for Good project

FOREIGN LANGUAGE FILM FESTIVAL

Each May, the Mass Academy juniors present original films they scripted, acted in, directed, recorded, edited, and produced as part of their Spanish and French language classes. These films are showcased at the Annual Foreign Language Film Festival. During this months-long project, students communicate only in their target language—Spanish or French—for the entirety of their collaboration, from story development through final editing. This is another example of the way Mass Academy teachers and students embed technology throughout the curriculum and, in this case, use the expressive means of film production.

DAY OF DIVERSITY CELEBRATION

In January, Mass Academy held its annual Day of Diversity. As part of this celebratory event, students wrote and illustrated six-word stories explaining their views on race, ethnicity, and identity; enjoyed a potluck lunch; shared an aspect of their family's history; and delivered cultural performances and demonstrations. This Mass Academy tradition offers an inclusive means of celebrating individual backgrounds, building community, and experiencing diverse cultures. This event would not have been possible without the hard work and dedication of our Humanities teacher, Mrs. Kristen Small. Thank you to Mrs. Small and all juniors for their roles in this wonderful celebration.

FIRST ROBOTICS / TEAM 190

Mass Academy is home to TEAM 190, World Champions of *FIRST* Robotics in 2007. The mission of FIRST Robotics is to inspire young people to be science and technology leaders by engaging them in exciting mentor-based programs that build science, engineering, and technology skills; that inspire innovation; and that foster well-rounded life capabilities including self-confidence, communication, and leadership. The “Varsity Sport for the Mind," FIRST Robotics combines the excitement of sport with the rigors of science and technology. Under strict rules, limited resources, and strict time limits, our team builds and programs a robot to perform prescribed tasks against a field of competitors.

In April, FRC TEAM 190 traveled to Houston, Texas to compete in the 2023 FIRST Robotics International Championship.

MASS ACADEMY HONORS INSPIRATIONAL EDUCATORS

In December, juniors at the Massachusetts Academy of Math and Science at WPI expressed their appreciation to teachers who have made a difference in their lives through the annual Mass Academy Teacher Appreciation Day. Each student created a personal video message for their chosen educator and sent the message—along with a letter, small gift, and video message from Director Anne Ludes—to express their gratitude for the educator's contribution to the student's educational and personal journey. Teachers from schools across Massachusetts and beyond were honored for their contributions to their students' success.

The juniors, the honored teachers, and their representative schools are listed below.

Corey Maloney	St. Stephens School	nominated by	Kweku Akese
Elisa Sadulsky	Walsh Middle School	nominated by	Ashwina Bangari
Alex Mitchell	Framingham High School	nominated by	David Barsoum
Jane Mutti	Tahanto Regional Middle High School	nominated by	Mihika Chalasani
Richard Waterman	Dover-Sherborn High School	nominated by	Alex Chen
Patricia Gallo	Annie E Fales Elementary School	nominated by	Amy Chen
Carl Wilson	Formerly Notre Dame Academy, retired	nominated by	McKenna Childs
Thierry Lincou	Squash Coach	nominated by	Omar El Nesr
Yuka K	Japan Language Institute	nominated by	Tarun Eswar
John Brocki	Shrewsbury High School	nominated by	Vanessa Fobid
Ryan Stoens	Shrewsbury High School	nominated by	Arnav Gupta
Michael Wurster	Ashland High School	nominated by	Vaishnavi Harish
Robert S. Gruberman, Ph.D.	Canton Public Schools District	nominated by	Riley Harn
Kerrie Pratt	Groton Dunstable Regional High School	nominated by	Marlon Jost
Jessica Linsey	Shrewsbury High School	nominated by	Alexander Kaneko
Sue Gillman	She retired.	nominated by	Anya Kelley
Timothy Curran	Stony Brook Middle School	nominated by	Kyle Klamka
Leann Ledoux	South High Community School	nominated by	Nathan Lam
Kristine Gustafson	Walter J. Paton Elementary School	nominated by	Anyee Li
Courtney Gilpin	Algonquin Regional High School	nominated by	Jaylin Li
Lidiana Morcka	Piano Instructor	nominated by	Peter Liang
Curtis Bellemer	Shrewsbury High School	nominated by	Shuling Lin
Seth Czarnecki	Algonquin Regional High School	nominated by	Isabella Palit
Mrs. Urkevic	Charter School	nominated by	Thomas Park
Susan Duncan	Hopkins Academy High School	nominated by	Shivani Parmar
John Brocki	Shrewsbury High School	nominated by	Krisha Patel
Cheryl Craig	Sutton Memorial High School	nominated by	Lily Pattison
Philip Tran	Bromfield School	nominated by	Luke Pepin
Nicole Pingitore	Auburn High School	nominated by	Giang Pham
Amy Prior	Shrewsbury High School	nominated by	Nicole Plotnik
Carol Staras	Tahanto Regional Middle/High School	nominated by	Nihitha Reddy
Julie Parsons	Central Catholic High School	nominated by	Rianna Santra
Christopher Aguiar	Worcester Academy	nominated by	Donovan Sappet
John Bastien	Auburn Middle School	nominated by	Joshua Schnee
Ingrid Sutter	Concord Carlisle High School	nominated by	Jennifer Shaughnessy
Jessica White	Mill Pond Elementary school	nominated by	Anshika Shekhar

Geoff Maletta	Mill Pond School	nominated by	Sumanth Sura
Thomas St. Pierre	P. Brent Trottier Middle School	nominated by	Charles Tang
Sarah Krippenstapel	eBridge Montessori School	nominated by	Nevin Thinagar
Melinda Moynihan	Shrewsbury High School	nominated by	Anne Tie
Anna Makovoz	AMSA	nominated by	Travis Tran
Juliette Darmon	North Andover Middle School	nominated by	Venkatraman Varatharajan
Janet Duggan	Sherwood Middle School	nominated by	Shreya Venkayala
Angela Poppalardo	Maj. Howard W. Veal School	nominated by	Naga Vikram
Anna Makovoz	Advanced Math and Science Academy	nominated by	Suhruth Vuppala
Geoff Maletta	Mill Pond School, Westborough MA	nominated by	Chengwei Wang
Christine Thomas	Westborough High School	nominated by	Emily Wang
Matthew Amdur	Oak Middle School	nominated by	Anne Wu
Catherine Phillips	Shrewsbury High School	nominated by	Joseph Yu

COMMUNITY SERVICE

Each Mass Academy student is required to contribute a minimum of 50 hours of community service per year. This service represents an opportunity for the students of Mass Academy to acknowledge the support of the citizens of the Commonwealth by giving back through service to others. Community service projects meet a range of needs and include teaching STEM lessons at local schools, offering free activities at STEM Saturdays, providing individual or small group tutoring to elementary and middle school students, working for Habitat for Humanity, refurbishing a veterans memorial, assisting with the Special Olympics, mentoring local refugees, working in hospitals, and assisting in food pantries and homeless shelters. This year, Mass Academy students exceeded **6,000** hours of service to the community.

MASS ACADEMY LAUNCHES "JUNIOR ACADEMY" SUMMER PROGRAM

STEM education in the broader sense–beyond our brick walls– is incredibly important to us. We can only teach 50 juniors and 50 seniors per year, but we can extend our reach through engagement with students and educators, both locally and throughout the Commonwealth.

We believe participation in STEM opportunities must begin at an early age if we are to ensure equitable access to advanced STEM programs like Mass Academy. To help strengthen and diversify the STEM pipeline, we are committed to supporting and directly providing rigorous, high-quality learning opportunities for students in elementary and middle school so that more students, particularly those from underserved populations, will feel prepared and confident to explore programs and careers in STEM fields.

During the school year, much of our work is done through educational outreach and community partnerships, including near-peer tutoring at local schools, visits to schools to deliver hands-on STEM lessons, mentoring and STEM enrichment at community-based organizations, and STEM Saturdays for school-aged children and their families at local parks and libraries.

We are also proud to announce that this summer we are launching a Junior Academy for underrepresented middle school students. The students will be able to participate–at no cost–in a two-week program that focuses on math intervention, literacy, and hands-on STEM programming. Participants will visit university labs and meet real scientists. And when the summer program is over, the participants will remain connected to Mass Academy through targeted programming to help them stay on track and academically successful all year long. We are confident the Junior Academy will make a powerful impact to engage students in STEM, helping them realize that science, technology, engineering, and mathematics are not only accessible to them, but they are fun and rewarding and open doors for their future!

Junior Academy Program Staff, 2023

PROFESSIONAL DEVELOPMENT ACTIVITIES JULY 2022-JUNE 2023

Mass Academy has provided well over **750** hours of professional development this year in many areas including STEM education, technology, Physics, Mathematics, and Civics. An important part of the mission of Mass Academy is to promote excellence in teaching through advancing and providing high quality professional development to K-12 educators. Below is a partial list of professional development provided by Mass Academy:

- Supporting student teachers in science and STEM fields through classroom observations
- Mentoring and supporting a new teacher through the visiting scholar program
- Presentation at Massachusetts Association of Science Teachers (MAST) annual conference: Modeling Instruction as an Approach to Encouraging Questioning, Discourse, Deep Thinking, and Equity
- Modeling coding, robotics, engineering, and STEM activities to students and teachers in local elementary and middle schools, providing access to lessons and resources
- Providing consultation to educational technology start-up program
- Director serving as Innovation Fellow for the Innovation Collaborative, providing consultation and support to the national organization on the implementation of professional development programming focused on transdisciplinary and culturally relevant curriculum and instruction
- Student-led presentations at Connections Conference: *Empowering Youth through STEM* and *Arts and Crafts Activism: Using Zines to Share Your Message*
- Director serving on the board of directors for Massachusetts Science and Engineering Fair, Inc.
- Ten-part STEM Speaker Series consisting of guest speakers from a range of STEM fields. Areas included Olfactory dysfunction in neurological disorders, Computer networking and security, Modeling large scale systems behavior, Swarm robotics, Clean energy technologies, and more.
- Presentations to education students at College of the Holy Cross on high quality teaching and learning
- Full-day workshop for teachers and their students on Action Civics Projects Curriculum Design, co-facilitated by Lindsay Lyons, Educational Justice Coach
- Physics Education Research Group
- Joint Mathematics Meetings Conference
- Presentation at the Computer Science Teachers Association (CSTA) Regional Conference at UMass Amherst: Bridging Biology and Computer Science to Engage High School Students in Solving Real World Problems
- Newly established teacher resource room for educators to use our collaboration space, access our resources including instructional materials and STEM kits, and receive support for curriculum development
- Advanced Placement workshops through Mass Insight Education and Research
- Training on eliminating bias in hiring practices
- Career coaching, including how to successfully navigate a job search, resume writing, and interview skills
- Texas Instruments: MCAS Roadshow, two-part series of full-day workshops to support MCAS math instruction through the use of technology
- Full-day project-based learning workshop organized by Worcester Education Collaborative

Massachusetts Academy of Mathematics and Science

Teachers and Administrators 1992-2023

Teacher/Admin.	***Position***	***Hometown***	***Term***
Abrams, Joshua	Mathematics	Roslindale	6/94-6/99
Barnes, Andrew	STEM-Engineering-Visiting	Shrewsbury	8/18-6/19
Barney, Michael	Director/Co-Director	Lunenburg	8/11-12/21
Barys, James	Mathematics	Oakham	1/00-6/13
Bonneau, Jacklyn	Science	N. Grosvenordale (CT)	6/95-7/19
Borowski, Maria	Technical Writing-Visiting	Millbury	8/13-6/16
Brunner, Adam	Engineering-Visiting	Providence, RI	8/17-6/18
Burke, Dana	Computer Science-Visiting	Upton	8/10-6/11
Burns, Kristen	Mathematics	Auburn	7/22-present
Chase, Maureen	Physics	Hadley	7/22-present
Cochran, Erin	STEM-Engineering	Ludlow	8/19-12/19
Connell, Richard	Physics/Engineering-Visiting	Shrewsbury	8/14-6/16
Contonio, Brooke	Science-Visiting	Paxton	8/03-6/04
Collins, Peter	Math-Visiting	Auburn	8/07-6/08
Cote, George	Mathematics-Visiting	Millbury	8/93-6/94
Crowthers, Kevin	Technical Writing-STEM	N. Smithfield, RI	8/19-present
Curran, Shiobhan	Technical Writing-STEM	Worcester	8/16-6/19
Daukas, Stephen	Computer Science-Visiting	Shrewsbury	8/02-6/03
Degon, Nancy	Science-Visiting	Auburn	6/92-6/93
Dodge, Misty	Science-Visiting	Leicester	8/01-6/05
Durkin, John	Assistant Director	Worcester	8/93-6/98
Ellis, William	Science	Worcester	8/03-6/22
Ennis, Kathleen	Humanities	Newton Highlands	8/93-6/99
Ferrell, Theloise	Humanities	Ashburnham	7/99-6/05
Gagne, Kenneth	Technical Writing	Worcester	8/01-6/05
Hamos, James	Director	Shrewsbury	7/97-6/99
Harrison, Gray	Science-Visiting	Jefferson	8/00-6/01
Harvel, Kyle	Science-Visiting	Nashua, N.H.	8/12-6-13
Higgins, Patricia	Humanities-Visiting	Acton	8/00-6/01
Hillman, Kay	World Language-Visiting	Fitchburg	8/02-6/03
Horton, Jerry	Science-Visiting	Worcester	8/03-6/05
Johnson, Rachel	Mathematics/STEM	Framingham	8/16-6/17
Johnson, Robert	Mathematics-Visiting	Haverhill	8/93-6/94
Kallagher, David	Mathematics-Visiting	Westminster	5/92-6/93
Kelley, Zederick	Computer Science-Visiting	Needham	8/01-6/02
Kelly, Timothy	Guidance	Holden	6/95-4/03
Knittle, Robert	Mathematics-Visiting	Worcester	1/00-6/01
Lamarche, Pauline	Principal	Worcester	5/92-11/03
Lang, Karen	Computer Science	Worcester	8/03-6/14
LeBlanc, Phillip	Science-Visiting	Thompson (CT)	8/02-6/03
Lippold, Heidi	Chemistry-Visiting	Shrewsbury	8/01-6/03
Ludes, Anne	Director	Framingham	7/21-present
Ludt, David	Humanities	Shrewsbury	7/05-7/20
Luzader, William	Science	Brockton	9/93-6/98
Melehov, Victor	Science-Visiting	Jefferson	5/92-6/93
Medeiros, Nicholas	STEM-Visiting	Northbridge	10/22-3/23
Menard, Jean-francois	World Language	Westford	7/95-6/07
Padmanabhan, Anita	Math-Visiting	Ayer	6/09-6/10
Post, Lisa	College Counselor	Holden	08/04-present
Reardon, Audrey	Operations Manager	Worcester	7/05-7/21
Reizes, Sonia	World Language (PT)	Lexington	6/93-5/95
Regele, Thomas	Math	Worcester	8/11-6/22
Salvatelli, Robert	Director/Assoc Dir	Leominster	8/99-12/12
Schneider, Raymond	College Counselor	Leicester	8/04-12/11
Small, Kristen	Humanities	Sutton	8/17-present

Smith, Erin	STEM-visiting	Lunenburg	8/13-6/14
Stachelek, Amanda	Math-Visiting	Sunderland	8/05-6/07
Stafford, Kenneth	Robotics	Auburn	7/99-6/20
Steneson, Margaret	Science	Norton	8/93-5/95
Sumner, Judith	Science Technical Writing	Worcester	8/07-6/15
Sun, Ivy	World Languages (PT)	Sutton	8/95-6/96
Taricco, Angela	Computer Science	Shrewsbury	8/14-present
Theriault, Julie	Operations Manager	Worcester	8/21-present
Tokaya, Gregory	Math-Visiting	Southborough	8/10-6/11
Traver, Robert	Principal	Harvard	8/03-6/11
Turner, Warren	Physics-Visiting	Springfield	8/01-6/02
Vargas, Stanley	Science	Worcester	7/99-6/01
Vetter, Leah	Director	Lexington	10/92-1/97
Weaver, Shari	Science	Millbury	8/12-6/15
Wiberg, Derek	Science-Visiting	Arlington	8/01-6/02
Whitmore, Andrew	Physics-Visiting	Holden	8/05-6/07
Wood, Paul	Physics-Visiting	Holden	8/07-6/08
Julia Wildfong	World Language	Clinton	6/06-present
Wittels, Norman	Computer Science-Visiting	Brookline	8/00-06/01

COLLEGE MATRICULATION
CLASS OF 2023

Rajat Baldawa	University of Maryland
Abhinav Bapanapalli	University of Maryland
Isaiah Bateman	Brigham Young University
Simon Beyzerov	Carnegie-Mellon University
Smita Nandkumar Bhogle	University of Pittsburgh
Sreeja Bolla	University of Maryland
Rachel Susan Bunsick	McGill University
Zoe River Butzke	Worcester Polytechnic Institute
Charlotte Noelle Cain	Stony Brook University
Justin Che	Worcester Polytechnic Institute
Amith Sai Chintalapati	Brown University
Alexis Chong	Boston College
Stephen James Cooley	Northeastern University
Saaya Rani Daga	Brandeis University
Rohan Das	University of Illinois Urbana-Champaign
Shreya Devarajan	Case Western University
Isabella Doyle	Boston College
Svabhu Govindaraj	Georgia Institute of Technology
Daniel George Kaminski	Cornell University
Erika Lam	University of Massachusetts Amherst
Karisma Nikhil Lavana	Duke University
Kiara Nikhil Lavana	Duke University
Donny Minh Le	Northeastern University
Asya Litvak	Northeastern University
Henry Liu	University of Massachusetts Amherst
Arul Rhik Mazumder	Carnegie-Mellon University
Ryan Mechery	University of Massachusetts Amherst
Poorvi Mohanakrishnan	Northeastern University
John Liam Morrison	University of Massachusetts Amherst
Garyth Page Violette	Worcester Polytechnic Institute
Krishna Purimetla	Carnegie-Mellon University
Vinayak Satyaprakash Rao	University of Massachusetts Amherst
Mateo Stephan Rollins	Rensselaer Polytechnic Institute
Jonah Finn Villars Sagarin	Union College
Aaheli Saha	University of Maryland
Raheel Sarwar	University of Connecticut
Eeman Saud	University of Massachusetts Amherst
Anush Shah	Brown University
Gracie Sheng	Massachusetts Institute of Technology
Diksha Sriram	George Washington University
Diego Suchenski Loustaunau	Yale University
Srikrishna Sashank Tadimeti	Georgia Institute of Technology
Jessica Rose Taubert	University of Utah

Melinda Telford	Tufts University
Aaron Tian	University of Massachusetts Amherst
Anh Dang Nhat Tran	Princeton University
Robin Warner	Rollins College
Cameron Timothy Whiting	Northeastern University
Maya Zheng	University of Wisconsin Madison
David Zhukovsky	University of Michigan

SCHOOL FUNDING -7061-9624

Mass Academy is funded out of the Department of Elementary and Secondary Education budget and is the only public high school in Massachusetts not funded through Chapter 70. In 2013 and 2015, the Mass Academy budget was subjected to a Governor's 9C budget reduction halfway through the fiscal year. In FY13, the cut was restored through a STEM grant. In FY15, the 9C reduction of $21,000 was not restored, resulting in staffing cuts. The same happened in FY18 (a 1% cut of $14,000). In FY19, a $200,000 increase was requested, of which $100,000 was granted. In FY21, the Governor's budget was reduced by 1%, resulting in a $15,000 cut, bringing our budget to $1,485,000. FY22 was back to $1,500,000 and, thankfully, was not reduced during the year. Our hope is that the trajectory of the funding of Mass Academy keeps up with the funding of all the other public high schools in the Commonwealth. The foundation budget inflation rate is 4.50 percent.

Historically, Mass Academy's budget has not kept up with inflation. This makes it challenging to maintain high quality instructional staff when costs are increasing and yet funding remains level. It most certainly creates additional barriers when Mass Academy works diligently to maintain its mission of remaining at the forefront of teaching and learning in the fields of science, mathematics, engineering, and computer science.

None of the accomplishments contained in this report would be possible if it wasn't for the Massachusetts Legislature's commitment to this program. We cannot thank you enough. With the Mass Academy budget subject to legislative vote every year, we depend on our elected officials to make it all happen. During FY22, we were faced with major budget challenges that, if not resolved, would have ultimately resulted in staff cuts. In a program of this size, that is devastating. Legislative approval of a budget increase for FY23–bringing our total budget to $2M– made all the difference, both for sustaining our existing program and for expanding our outreach to students and educators so Mass Academy can provide substantive academic enrichment to diversify and strengthen the STEM pipeline. We are counting on the Massachusetts Legislature to keep us moving forward by sustaining this same funding for FY24 and beyond so we can continue to maintain our existing program and support as many students–and their teachers– as possible. The future of our program is in your hands.

Thank you for your support.