The Reaction Times

VOLUME V MAY 2020 Spring Edition

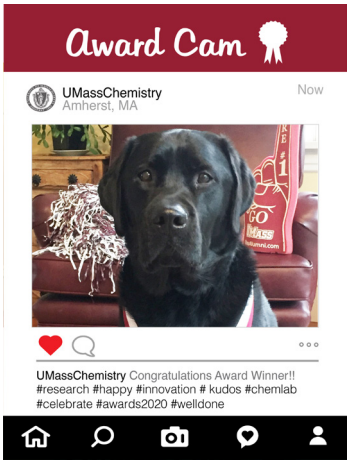
Congratulations, 2020 Senior Chemistry Majors!

Alexander Amato
Lauren Bishop
Kevin Richard Bonanno
Isabelle Bongiorno
Tala Chunga
Austin Croke
Madison Cuppels
Alex Dantone
Kathleen Dreher
Bryanna Lexus Freitas
Taylor Garrey
Luke He
Uyen Huynh
Isabella Jaen Maisonet
Natalie Jensen
Callie Jillson
Thomas Kumlin
Lynh Le
Jonathan Lee
Dimee Livingston-Padilla
Pui Chi Lo
Ruby Nelson
Jakub Polanowski
Cameron Sanders
Damon Schneider
Samantha Tufts
David Turnbull
Jenna Westley
Gillian Willcox
Yuying Zhang

Fall 2020
Liridon Dauti
Anna Kramer
Sixing Mo

2020 Undergraduate Award Winners

The department hosted a virtual Undergraduate Awards Ceremony on May 7th via Zoom.



Students and their families were joined by faculty, staff, donors, and Dean Serio at the annual awards celebration. While the applause and experience were virtual, the appreciation and gratitude towards our students and donors is sincere.

We are so proud of our students for their amazing ability to excel in these unusual and difficult times.

Academic Awards

American Chemical Society (ACS) Hach Scholarships
Olivia Pietrobuono and George Ryan

ACS Undergraduate Award in Analytical Chemistry
Garrett Miskell

CRC Press Chemistry Achievement Award
Bao Le, Sabrina Liang, and Sean Tran

Edward Shapiro Fund
Nicholas Dix, Alexander Hamel, Sean Macken, Erin Monaghan, and Mason Tomko

George R. Richason, Jr. Scholarship
Cameron Kaminsky

Jay A. Pirog Scholarship
Cameron Sanders

John A. Chandler Memorial Scholarship
Nicholas Heller

Michael Bruno Scholarship
Sean Macken

Robert Maxwell Williams Memorial Scholarship
Maya Hegde, Sidney Johnson, Jimmy Tran

Royal Society of Chemistry Certificate of Excellence
Bryanna Lexus Freitas

Thomas R. "Casey" Stengle Scholarship
Mason Tomko

Research Awards

ACS Undergraduate Award in Inorganic Chemistry
Mitchell Buckley

ACS Undergraduate Award in Organic Chemistry
Cameron Sanders

ACS Undergraduate Award in Physical Chemistry
Callie Jillson

Chemistry Undergraduate Research Fund
Ryan Thai

J.F.B. Fund for Undergraduate Research
Tiernan Kennedy

Mr. Tompkins Award
Emily Saltzman and Isabella Jaen Maisonet

Oliver Zajicek Memorial Scholarship Award
Yuying Zhang

Professor Jack Ragle Endowed Fund in Chemistry
Nicholas Heller

Roger G. Bates Chemistry Fund
Ethan Goulart

Tarselli Family Research Award
Ethan Goulart and Ryan Pham

Mahoney Undergraduate Summer Research Award
Ryan Pham

Departmental Awards

ACS-Connecticut Valley Section Student Award
Isabella Jaen Maisonet

American Chemical Society Membership Awards
Thomas Kumlin and Samuel Knight

American Institute of Chemists Award
Luke He

Departmental Recognition Award
Luke He and Samantha Tufts

Distinguished Undergraduate Instructor Award in Honor of Earl J. McWhorter and George R. Richason, Jr.
Rachid Skouta

Distinguished Graduate Teaching Assistant Award in Honor of George R. Richason, Jr.
Muhammed Abdullah

Distinguished Undergraduate Teaching Assistant Award in Honor of George R. Richason, Jr.
Samantha Tufts

Positron Award
Ryan Thai

Richard W. Fessenden Award
Ruby Nelson

Senior Class Award
Luke He

Congratulations to the 2020 Doctoral and Masters Graduates!

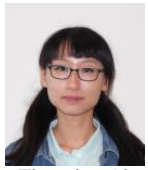

Bo Zhao


Sarah Marques


Akash Gupta

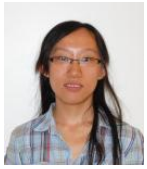

Yasaman G.

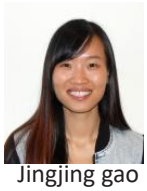

Meizhe Wang


Tianying Liu


Riddha Das


Ziwen Jiang


Hanwei Zhao


Jingjing gao


Christie Ellis


Xin Li


Wardah Ejaz


Joseph Hardie


Patanachai


Kirandeep Deol


Vikash Kumar


Yidan Cong


Ran Duan


Miaowei Xu

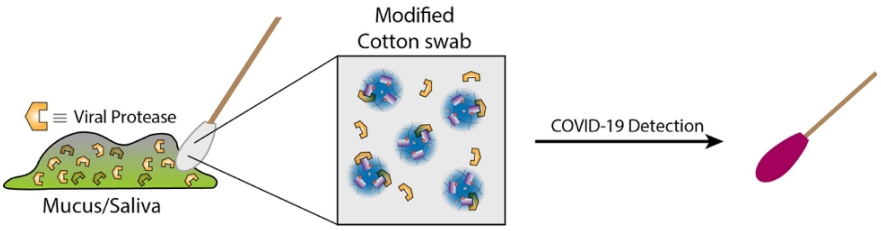

Maryam Shahryari

University of Massachusetts Amherst BE REVOLUTIONARY™

Congratulations to the 2020 Doctoral and Masters Chemistry Graduates: the next generation of talented and creative scientists. You are all true pioneers. When presented with unusual and unforeseen circumstances, you took challenges in stride, adapted, and rose to the occasion. You embody what has become the signature line of our university: Be Revolutionary. We wish you the very best as you pursue your dreams. And when you have a chance, come back to your Alma Mater, the University of Massachusetts Amherst. - DV, Graduate Program Director

Prof. Scott Auerbach, pictured in the yellow box, was joined by a host of notable UMass alumni, celebrities, Governor Charlie Baker, and Chancellor Subbaswamy, during the UMass Amherst Virtual Celebration video. https://www.umass.edu/commencement/

UMass Amherst Chemists Mobilize Quickly to Find Simple, 'Smart Swab' Detector for COVID By-products



Sankaran "Thai" Thayumanavan, Jeanne Hardy, and Trisha L. Andrew received a one-year, RAPID grant from the NSF, designed to quickly fund promising approaches to an emergency. As NSF explains, RAPID supports proposals "having a severe urgency with regard to availability of, or access to data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events."

The three have teamed up to investigate whether they can develop a simple, color-changing test swab for COVID-19 in the next year that would alert users if their body carries a viral product left after infection. Each brings complementary expertise to the team as they seek "a cheap test that will tell if you should get checked by medical professionals because you are probably infected," said Thayumanavan. Andrew adds, "Like a pregnancy test, but for viral infection."

They stress that this is a research effort. "We are being very careful to point out that we are working on a general solution for detecting viral infections, which can be easily customized to specific viruses and then rapidly mobilized in times of dire need," says Hardy. Andrew adds, "We are building up the basic science and chemistry needed for anyone to rapidly mass-produce tests that can be used at home. This concept certainly applies to the current COVID-19 pandemic but can also be relevant to future outbreaks."

Learning of the grant from NSF, Congressman Jim McGovern said, "This important grant is a testament to the amazing research work being done at UMass Amherst. We're lucky to have some of the best scientists in the world working to address the COVID-19 pandemic right here in Massachusetts, and this promising proposal is a great example of why we need to strongly support and fund the work of the National Science Foundation."

Robin L. McCarley, program director in NSF's chemical measurement and imaging program, adds, "NSF supports this line of research because the funding allows for developing strategies to address highly complex biological challenges with broad impacts on society, as a result of designing chemical analysis systems that take advantage of the fundamental properties of biology at the molecular level."

The UMass Amherst team will collaborate in phases, beginning with the Hardy lab's expertise in proteases as a basic foundation, she says. Proteases are proteins made by many organisms including viruses to help them copy themselves and multiply, she notes. Often called "molecular scissors," they identify precise locations on other proteins and cut them into pieces there, she adds.

"Different viruses make different proteases, so we can target which virus has been present. We can test for the specific protease made by SARS-CoV-2, the virus responsible for COVID-19," Hardy says. She is quick to add that her lab does not use an active virus, but only the protease "scissor," which is "not at all dangerous." Basic unknowns, she notes, include how long viral proteases linger in the body after exposure, and how much protease is produced by an infected individual.

Once a protease is identified, the project turns to Thayumanavan's lab, where he and colleagues have for many years focused on chemical signals and sensors. They are designing "reporter molecules" with chemical properties that change during the protease break-down process. In this case, the colorless reporter molecule will turn magenta after a virus-related protease cut.

"Imagine a Lego manufacturer making blocks," he says. "Imagine they come out as one long piece instead of individual blocks. The viral protease is the scissor that cuts that long piece into smaller blocks, which then self-assemble into spheres that are new copies of the virus. Because the viral protease cuts at a very specific place, we can design reporters that mimic that cut site and generate color changes when the protease cuts it," he adds.

Next, Hardy and Thayumanavan then look to Andrew to transform their chemistry into an inexpensive test platform. She says, "I figure out how to integrate sophisticated electronics and chemical sensors into textiles. For this project, we thought cotton swabs would be perfect because everyone understands how to use them and we can make many of them very quickly. Once we have a reporter molecule from Thai that will react to the presence of Jeanne's viral protease, I can use it to modify commercial swabs."

Thayumanavan adds, "If we work out the science well, there won't be a lab required. These 'smart swabs' should be like a pregnancy test where you get the answer in five minutes." If all goes as hoped, a next phase will require clinical testing, an expensive but necessary step, he says.

Because of the urgency of the situation, Thayumanavan says, the team is seeking permission to conduct necessary experiments in their labs on campus. He says they will work on a reduced scale with minimal staff, less than 20 percent of normal levels.

Each of the researchers belongs to one of the three core centers at the campus's Institute of Applied Life Sciences – Thayumanavan at the Center for Bioactive Delivery, Hardy at the Models to Medicine Center and Andrew at the Center for Personalized Health Monitoring, reflecting how the entire institute is addressing this research problem.

Response to COVID-19 from UMass Chemistry Alumni

Mike Tarselli '03: Scientific Director at SLAS (Society for Laboratory Automation and Screening)

Life sciences nonprofit, SLAS, has tried to help in a few ways: creating an open-access collection of antiviral and diagnostic publications, starting an online community to route resources, and by publishing some infographics explaining protocols like "CoV assays" and "high-throughput diagnostics." We also have plans to involve our research community in two special journal issues and in pandemic readiness research talks at our 2021 flagship event.

Katrina Nguyen '18: Research Technician at Dana-Farber Cancer Institute

Katrina Nguyen (Right)

I work for the Marasco Lab at the Dana Farber Cancer Institute. The lab has had previous discoveries in SARS and MERS outbreaks back in 2004 and 2012 respectively using a naive library of 27 billion human antibodies against all sorts of bodily invaders. Our goal is to utilize this same library to conduct phage display methods to find antibodies that bind our target antigen. The principles of phage display are quite simple: transfect E. coli cells with the bacteriophages containing plasmids from our library. These plasmids contain encoded protein sequences for the antibodies of interest. The colonies that subsequently grow are able to express these proteins on the surface of the bacteriophage. Each individual clone obtained is then sequenced and unique antibody sequences are compiled. My job is to take all the phage clones and screen for relevant antibodies from binding to the "Spike" protein on SARS2. This includes downstream characterization of the antibodies by binding assays and neutralization assays. These finalized antibodies will hopefully go out and contribute to the current need for both antibody therapy and detection processes for SARS-Cov2. Here is a statement released by DFCI on COVID19 research by our lab: https://blog.dana-farber.org/insight/2020/04/institute-researchers-at-forefront-of-development-of-antibody-therapy-for-covid-19/. Because the lab previously used this for the SARS antibody discovery campaign, many of the techniques used are very similar.

Faculty at Home

We asked faculty about their quarantine situation and favorite pastime.

Scott Auerbach

Scott is at home in Amherst with his wife Sarah, his 21 yr old son Nick (who definitely wants to be back at college in Burlington), and his 18 yr old daughter Annie who's hoping to start Brandeis in the fall if the world starts up again. In Wash. DC is Scott's 24 yr old daughter Maddie who's living the work-at-home dream. Scott made a home office in his basement next to his drum kit (just learning this, getting better slowly), and his three cats. He's done more hiking lately, so here's a picture of him speaking softly but carrying a big stick (that's a Teddy Roosevelt line). Wishing all in UMass Chemistry sustained good health. Stay safe, sane, and sound!!

Jianhan Chen and Zueying (Sharon) Qin

The Chen household (Jianhan and Sharon, parents, and Allen and Alice, children) have been quarantined together at home since mid March. While the parents try our best to work from home, the kids are also working hard to keep up with their learning and with their friends.

Fortunately, we live in the beautiful Amherst area where there is plenty of space around the house and neighborhood. The kids' favorite pastime beside their (home) school work is having virtual playdates with their friends. As a family, we enjoy cooking, playing sports, and having a walk/light hike together.

Jeanne Hardy

My current quarantine situation is that I am at home while my sons and husband are in Wyoming. When UMass moved to remote instruction our house was in the middle of being reroofed, remodeled, and being repainted inside and out. Our house was 100% a construction zone. So I stayed here to work on a number of grants and manage the carpenters. It has been thrilling to have so much time to devote to science. I have learned A LOT about COVID. My husband and sons are staying in Wyoming with my brother who has the highest house on Casper Mountain. When they arrived Casper had gotten 40" of snow so they could sled and snowmobile right out of the back door. Now it is nicer and they are spending a lot of time hiking and mountain biking. They will return home soon after a month away and will certainly be shocked at the reality of quarantine in tighter confines! Luckily they enjoy baking and cooking.

My favorite quarantine pastime has been reorganizing each room as its renovations are completed, giving away things we don't need at the "Free Sale" in our front yard, only eating TV dinners and spending a lot of time with collaborators working on new projects! I have also enjoyed trail running most evenings. It is a gorgeous time of year!

Peter Lillya

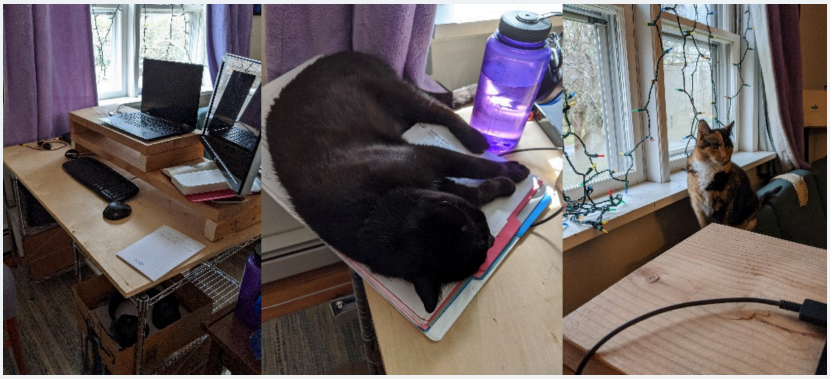
A former organic and materials chemist, I retired in 2002. After retirement, I continued a project to create OWL for organic chemistry students with my colleague Prof. Stephen Hixson, now also retired. When UMass is in session, I enjoy coming to seminars to see if I understand any new chemistry these days.

The stay-at-home life is relatively easy on us retirees. I live south of Hampshire College and go walking on the Mt Holyoke Range most days for exercise. Hikers politely step off the trail to let one another pass, and mountain bikers are waved on through. My time is spent working on the flower beds, listening to NEPR (public radio), watching PBS, and reading. Fortunately, I had stocked up on books just before the shelter-in-place instructions came out. Currently I'm reading a book of short stories by the Bosnian writer Ivo Andric.

Craig Martin
Sadly, Professor Lynmarie Thompson and I had to cut our sabbatical in the Netherlands short and return home, but we continue to work with our groups remotely, just as we did from abroad. So in that sense, our activities have not changed much. Interesting (perhaps) anecdote: our town (Shutesbury) did not have broadband internet until this past Fall. We are very fortunate that our municipal fiber optic installation was completed this past December, just months before this quarantine. All in all, our problems are very minor, compared with people in other parts of the country and world.

Our town is sparsely populated, so it is easy to get out and still maintain physical distance from our neighbors. We've been walking and, recently, biking. Each weekend has had at least one day of wonderful weather, and we have enjoyed spending those days with our kids hiking segments of the Robert Frost trail.

Ruthanne Paradise
I am currently working from home. My husband has taken a leave of absence from working the registers at Chick-fil-A because he is immuno-compromised. Our housemate Thomas is working from home like me. We have two cats Ali (a tortoiseshell) and Ozzy (all black). They sometimes keep me company while I am working. The pictures attached are of my desk (I built the shelves) and my two cats.



To help with my routine I go for a walk in Amethyst Brook park before and after work every day. That helps me put boundaries between work and home.

Richard Vachet
I am working at home with my wife (Laura), my two teenage sons Charlie and William, and our 2-year old dog Gracie. We have really pushed our home wifi to the edge of its bandwidth as all of us have had regular Zoom meetings each day for work or school. Our dog Gracie has enjoyed having us around, but she can't understand why we won't play with her every minute of the day.

As a family, we've had fun hiking, shooting hoops, playing board games, and watching episodes of Rizzoli and Isles. I also taught my kids how to play Texas Hold'em, and William, our 13-year old, has become quite good at bluffing. I'm also having fun with Zoom virtual backgrounds, since my basement 'office' isn't the prettiest. The picture shows one my favorite backgrounds.

Gabriela Weaver
I am in my home in Amherst along with my family, two kids, dog and two cats. My husband and I are working from home and our kids are doing their school work (2nd grade and 4th grade) with a lot of Zoom, Google Classroom, Beast Academy (online math) and Rosetta Stone (language) – plus a LOT of nagging by their parents. My favorite activity is to get outside and go for a walk or hike.

Student Awards

NSF Graduate Research Fellowship Program

Jaen Maisonet Chhe

Two Chemistry students have been recognized by the NSF Graduate Research Fellowship Program, a highly competitive national program recognizing outstanding students. It is amazing that two of our students have been selected in the same year!

Isabella Jaen Maisonet received an NSF GRFP fellowship! Isabella is an undergraduate currently working with Mike Knapp's group, and will will start graduate school this Fall in the Chemical Biology PhD program at Harvard.

Kaitlyn Chhe received an honorable mention in the NSF GRFP competition! Kaitlyn is a graduate student working with Michelle Farkas's group.

PPG Fellowship

Congratulations to Haneen Mansoor from the Kittilstved research group, and Emily Smith from the Venkataraman research group, for being selected as the 2019 recipients of the PPG fellowship sponsored by the PPG foundation. This fellowship is competitively awarded to outstanding Chemistry graduate students who do research in materials chemistry.

Haneen Mansoor research summary: Multifunctional inorganic materials such as the "layered" Ruddelsden-Popper (RP) phases are attractive prospects for the implementation of next-generation renewable-energy resources and spin-based technologies. These materials have generated significant interest in the scientific community because their properties can be tailored for the specific applications. By replacing some of the host ions with targeted chemical dopants and utilizing dopant-specific spectroscopies, we aim to address the chemistry of intrinsic and extrinsic defects in such materials. With the support of the PPG Fellowship, I am working on understanding the structural and electronic interactions of transition-metal dopant ions and the corresponding defects in the RP phase of Sr2TiO4 bulk powders. Systematic control over the rich and complex defect chemistry is crucial for the development and application of these materials.

Emily Smith research summary: With the PPG fellowship, I will be furthering my research looking into the implications of ion transport in hybrid perovskite solar cells. One key area of focus for our group is the accumulation and dissipation of ions at device interfaces under illumination, and its implications for overall device performance. In my work, we have developed a technique that allows us to transiently map ionic charging and discharging of interfaces in devices under operational conditions. We can use this technique to quantify key parameters of interfacial charge accumulation and to explore the transient characteristics of devices which employ various architectures. Overall, these studies will give us critically needed insight into the transient interfacial effects of ions in hybrid perovskite solar cells, equipping us with the necessary knowledge to develop new materials and devices with improved performance and stability.

Thank you to everyone who sent in accomplishments and story ideas. Please email comments, achievements, and ideas for our next issue to reaction-times@chem.umass.edu.

Editorial staff: Amanda Bennett, Isabella Jean Maisonet, and Richard Vachet. Design and editing: Brigette McKenna

Lara Al-Hariri's Professional Leave

Very recently, Senior Lecturers on campus were given the opportunity to apply for 'Professional Improvement Leave' that would provide a semester release from teaching to devote time to develop new ideas and approaches to teaching. This professional leave is analogous to the sabbaticals that tenure-track faculty have benefited from for years. This past Fall semester (2019) Prof. Lara Al-Hariri was the very first Senior Lecturer in the Chemistry Department to apply for and receive professional leave.

Prof. Al-Hariri devoted her professional development leave to developing and implementing artificial intelligence (A.I.) in large enrollment courses so that she can effectively use her time to attend to other aspects of teaching, which technology can never replace. She developed a virtual teaching assistant built using the same concept as SIRI, Alexa and website chatbots. The virtual assistant autonomously answers routine and frequently asked questions about the course. The virtual teaching assistant learns from the responses of the teaching assistants and interacts with the student by greeting them and responding to them at the same level as a human. Also, Lara collaborated with Dr. Andrew Lan (UMass/CICS) to give the Virtual Teaching Assistant the capability to respond to questions in a discussion forum of the course as a way to engage students outside the classroom. The Virtual Teaching Assistant could also provide accommodation to students who don't feel comfortable asking questions in front of peers or directly to the instructor. The collaboration with Dr. Lan yielded a paper entitled "Exploring Automated Question Answering Methods for Teaching Assistance" that has been accepted as a full paper for publication and presentation at the 2020 Artificial Intelligence in Education Society meeting.

Hans Mentzen Lilly Fellowship

This past year I was awarded a position in the campus Lilly Fellowship program. This program brings a small group of junior faculty together to learn about new teaching pedagogies. A goal of the fellowship is to redesign a course that includes some of these new learning techniques. My section of Chem 112 this Spring started to implement some of these active learning techniques, and I plan on continuing this development in Chem 112 and Chem 111 as well. Many of these techniques have proven to be very effective in remote learning as well as traditional in-person learning!

In addition to the Lilly Fellowship, I have accepted an Adjunct position with the UMass Food Science department. This position ties directly into my fermentation research program. Discussions with Food Science have clearly shown many direct links between both their graduate research activities and undergraduate course offerings, and I am very excited to see where this collaboration will lead!

Congratulations on 70 years at UMass!

In February 1950, Prof. Richard (Dick) Stein joined the UMass Chemistry faculty as an Associate Professor. He carried out pioneering studies developing and using rheo-optical techniques to study orientation and phase transitions in amorphous, crystalline and liquid crystalline polymers. He also developed the university's first advanced physical chemistry courses in quantum mechanics, statistical mechanics and polymer science.

Dick became Commonwealth Professor, and in 1961 he founded both the Polymer Research Institute and the Research Computing Center. In 1980, the chemistry department awarded him the Charles A. Goessmann Chair in Chemistry (he's currently the Emeritus Goessmann Professor in Chemistry). Later in the 1980's he was involved in establishing and obtaining funding for the Silvio O. Conte Center for Polymer Research. Among his many honors, Dick is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences.

The impetus for *The Reaction Times* newsletter was a series of discussions members of the Equity & Diversity Committee had with undergraduates, graduate students, postdocs, faculty, and staff, who indicated that they would like to learn more about others in the UMass Chemistry community.