The Reaction Times

VOLUME IV DECEMBER 2019 Fall Edition

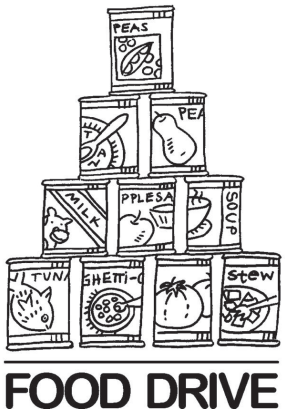
Penny War Food Drive

This holiday season, the Graduate Chemist Association has revived the Penny War Food Drive. Donations will benefit the Food Bank of Western Massachusetts, an organization that serves as a central provider of food to food pantries, shelters, and meal sites across Hampshire, Hamden, Franklin, and Berkshire counties. They are committed to fighting food insecurity to individuals, families, and seniors in Western Mass. For more information, please see: https://www.foodbankwma.org/who-we-are/what-we-do/

The department has been divided up into six teams, with the goal to earn as many points possible for each team via money and canned food donations. Pennies and food donations give each team points, but coins and bills can be used to remove points from other teams. The contest kicked off on Monday, November 18 and will run through Friday, December 14.

If you would like to make a donation, stations are located in LGRT 352 (chemistry mailroom), ISB 341 (undergrad chemistry office), PSB 130B, and LSL N360. You'll also find a complete list of the rules and a breakdown of the different department teams at these stations. If you have any questions, feel free to contact Michael Mingroni at mmingroni@umass.edu

Teams:
Team 1: Chemistry Staff/Teaching Faculty
Team 2: Rotello Lab
Team 3: Thai Lab
Team 4: Vachet, Kaltashov, Maroney, Farkas, Jianhan Chen Lab
Team 5: DV, Auerbach, Barnes, Kittilstved, Metz, Andrew, Walsh, DuChene Labs
Team 6: Streiter, Hardy, Min Chen, Thompson, Martin, You, Knapp, Skouta Labs



Your goal is to earn as many points as possible for your team through the donation of money or canned food! Pennies and cans of food will give your team points, however, all other coins and bills can be used to subtract points from other teams!

Postitive points for your team: Can of food = +100 points or Penny = +1 point
Sabotage other teams: Nickel = -5 points, Dimes = -10 points, Quarters = -25 points
Bills = -100 points (x the denomination of the bill)

Food donation can be any non-perishable items. For safety, no glass containers, torn/severely dented items, home-made items, or baby food can be accepted by the food bank. At the moment, the food bank has the highest need for the following items: hot/cold cereal, dried pasta, rice/rice mixes, granola bars, bread/muffin mix, crackers, tomato sauce/paste, soups, canned fruits, canned/boxed juices, applesauce, canned beef stews, baked beans, canned chili, canned tuna, canned chicken, canned sardines, dry or canned beans, peanut butter, and evaporated milk.

Food can go in provided boxes, money can go in the collection jars. Remember, you can subtract points from other teams putting coins other than pennies into their jars!

Let's Eat Cake!!

Chemistry Majors, please join faculty and staff to celebrate the end of the semester

for cake, coffee, tea, and other goodies

on Thursday, December 12th, from 2–4pm in the CRC

Innovation Challenge: Seed Pitch

Senior chemistry major Bryanna Lexus Freitas' team tied for first at the Innovation Challenge: Seed Pitch on November 20th, receiving $5,000 in free equity funding from the Berthiaume Center for Entrepreneurship.

Bryanna, along with sophomore Hadley Beauregard (biochemistry and molecular biology, German and Scandinavian studies) and junior Hailey Charest (biochemistry and molecular biology, microbiology) won the funding for their company Bac-Be-Gone, which is currently focusing on a cleaning product to eliminate MRSA. MRSA is an antibiotic resistant bacteria that kills thousands of people in hospitals across the US. Bryanna says that the company has been "looking at bacteriocins as an alternative method of treatment since we are entering the post antibiotic world."

Bryanna Lexus Freitas, Hadley Beauregard, and Hailey Charest

Bac-Be-Gone originated in Dr. Margaret Riley's lab, where Bryanna works. While there's often been a reliance on antibiotics in the medical field, Bryanna says, "Bacteriocins are amazing alternatives since they can be less toxic than antibiotics; they are narrow range killers which can avoid collateral damage to our microbiomes (a big issue), they have high stability, and they have a significant potency." Bryanna hopes that usage of bacteriocins gains momentum and that more people will learn—and perhaps use—them in the future.

Bryanna says, "This semester my research lab teammates (Hadley Beauregard and Hailey Charest) decided to shift our lab research towards MRSA and see if we could kill MRSA using bacteriocins. This semester we have shown that our drug works effectively in comparison to the "gold standard" drug that's available out there for MRSA. We came up with a product that can be applied as a wipe/spray and is organic, nontoxic, versatile, and our drug has already been FDA approved so getting our product approved should hopefully be relatively smooth. Also, the active drug that we're using is already used as a food preservative and hasn't shown resistance in over 50 (now going on 60) years. It also has so many other applications just outside of our MRSA spray/wipe which I think makes it amazing."

Bryanna highlights the supportive environment in the Riley lab as a driving factor for the company's success, as well as the strong sense of teamwork amongst those pitching Bac-Be-Gone. She says that participating in the competition "was amazing since my team works so well together and we were all able to showcase our strengths and passion for applied science."

The venture received $5,000 in funding from the recent challenge, and Bryanna points out that the competition will continue into the spring. The team is also looking to compete at Smith College this Spring in a women's entrepreneurship competition. The group will continue with their research, testing their formula, and working on a patent.

Summer Snapshot - Undergraduate Experiences

Associates of Cape Cod Lab Technician

by Madison Cuppels '20

Over the summer I worked as a lab technician at an FDA regulated company called Associates of Cape Cod. My job included extracting blood from horseshoe crabs and using the blood to make an endotoxin reagent called LAL. The product that we made, LAL, is used to test parenteral pharmaceuticals and medical devices that go intravenously for any endotoxins. This experience gave me insight and a new perspective on what it is like to work on the industry side of science as opposed to research, which is what I had been accustomed to at UMass.

Research at the Dana-Farber Cancer Institute

by Isabella Jaen Maisonet '20

This past summer I was a part of the Harvard Medical School: Biological Chemistry and Molecular Pharmacology scholars program, where I researched in the Buhrlage Lab at the Dana-Farber Cancer Institute. The lab studies deubiquitinating enzymes (DUBs), which regulate the removal or shortening of ubiquitin chains from target proteins. The original goal of my project was to validate hits from a previous inhibitor library screen with various DUBs, but my results shifted my focus to two DUBs; USP28 and USP48. Using a ubiquitin-rhodamine fluorescence assay, I measured the activity of USP28 and USP48 against various inhibitor analogs to develop a strong structure-activity relationship for each enzyme. In the Buhrlage Lab, I also developed my skills in mammalian cell culture and harvested over 540 plates over the course of the ten-week program. Overall, I had a wonderful experience this past summer because everyone in my lab was so welcoming and eager to help me succeed.

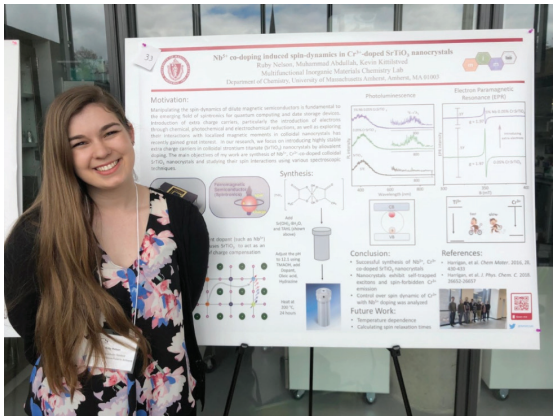
Research in Phase Separated Mxa Biomolecular Condensates in Antiviral Mechanisms

by Jenna Westley '20

I met Dr. Pravin Sehgal last summer at the New York Medical College where I was introduced to biomolecular condensates. At UMass, in the Thayumanavan lab, I study the chemistry behind micelles which are essentially the same thing as biomolecular condensates. Last summer, we focused on the phase separated Mxa biomolecular condensates in antiviral mechanisms. Biomolecular condensates are membrane-less condensates that experience intracellular phase transitions. We study GFP-Mxa in cancer cells such as Huh7. We've performed experiments studying the VSV antiviral effect, cGAS, and different markers for the Endoplasmic reticulum and cytoplasm. cGAS was used to confirm whether the structures were liquid condensates and coassemble with Mxa. We wanted to show MxA structures do not reside in the Endoplasmic Reticulum so we used a cytoplasmic marker to show that MxA condensates are in fact found in the cytoplasm. Recently, my work over the past two summers with Dr. Sehgal were published in the Journal of Virology.

NSF-supported CURE Summer Internship (Kittilstved lab)

by Ruby Nelson '20



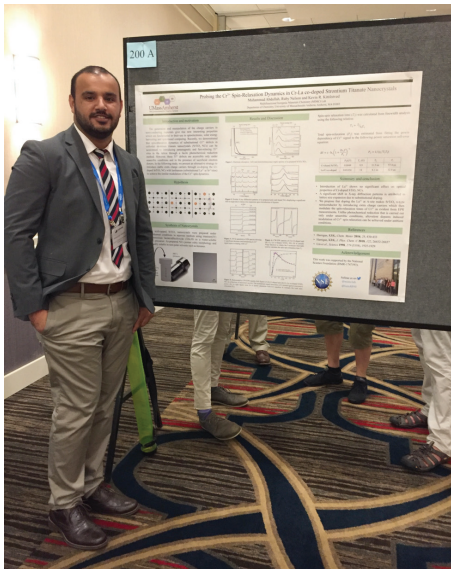
Modulating the spin relaxation times of transition metal ions doped in colloidal semiconductors nanocrystals constitutes a long-standing challenge for the development of quantum information processing applications. This past summer I got an opportunity to work in the Kittilstved lab as a Collaborative Undergraduate Research in Energy (CURE) internee supported by the NSF which gave me a chance to delve deeper in exploring the field of colloidal nanocrystals. My research primarily revolved around controlling the relaxation time of chromium ions doped in semiconducting SrTiO3 nanocrystals under ambient conditions. This program gave me experience as a full-time researcher and helped me determine that I would like to continue research in my future career. More importantly, it also allowed me to meet young researchers around the United States and develop networking that I would never have made otherwise.

Summer Graduate Experience

Internship at MedImmune

by Francesca Anson

As a BTP trainee, I was required to complete an internship and it genuinely changed my PhD experience! From February - June 2018, I interned at MedImmune, a member of the Astrazeneca group, in Gaithersburg, Maryland. I worked alongside a postdoc in the Antibody Develop and Protein Engineering (ADPE) group, regularly attended group meetings and weekly events! At the end of my internship I was able to attend MedImmune's SciFest where all research groups in various divisions presented posters and talks. The goal of my internship was to contribute to the development of a non-viral gene delivery platform (proprietary) in which I was able to execute experiments related to both organic synthesis and biochemistry.



Muhammad Abdullah Selected to Attend NSF-supported EPR Summer School and Wins Best Poster Prize at Rocky Mountain Conference on Magnetic Resonance

Muhammad Abdullah (AB), a graduate student in the Kittilstved lab, was one of forty graduate students selected to participate in an international summer school on electron paramagnetic resonance (EPR) spectroscopy. The school was co-sponsored by the NSF and the International EPR/ESR Society (IES) and took place at the University of Denver in July 2019, and focused on everything from the basic underlying theory of EPR to more advanced and modern techniques. AB also gained significant hands-on and practical experience in various EPR techniques with the help of numerous world-renowned experts from both academia and industry. Immediately following this school, AB also presented his work on modulating the spin relaxation time of transition metal ions doped in semiconducting nanocrystals for quantum information processing applications and won a best poster prize.

The Reaction Times aims to highlight student highlights and accomplishments as well as non-science news or fun stories from the department.

A huge thank you to those who contributed to this issue, and please keep sending comments, achievements, and ideas for our next issue to reaction-times@chem.umass.edu.

Editorial staff: Amanda Bennett and Brigette McKenna

Chemistry's 2nd Annual Cultural Potluck Luncheon















Julian Tyson Competes at the World Veteran Fencing Championships in Cairo, Egypt

by Professor Emeritus Julian Tyson

At the World Championships for veteran fencers (in three age categories: 50-59, 60-69, and 70+), up to four fencers per weapon (foil, epee, and sabre), per age group, per country can participate. For countries like the USA with large numbers of veteran-age fencers, a qualification system is needed. For US hopefuls, three qualifying competitions produce a ranking list, from which the top 4 are automatically selected for the World Championships. In the 70+ age category events leading up to Cairo, my best results in foil were 3rd and 2nd places, and in epee were two 1st places, placing me in the top 4 in both weapons. As one of these competitions was also the National Championship, I finished the season, not just number 1 on the national ranking list, but also the National Champion in epee. I have been National Champion at epee in each of the other age-groups. There is, unfortunately, a National Championship for fencers aged 80 and over, so I can still realize my ambition of being the National Champion in all the veteran age categories.

The first round of the epee event. Julian Tyson vs Heikki Paakkenen from Finland. Tyson wins 5 – 3. The electrical leads connecting each fencer to the spools can be seen, as can the cable connecting the metal strip to the recoding apparatus. The clock counts down from three minutes: after 8 seconds of fencing, the score, not surprisingly, is 0 – 0.

The numbers of fencers participating in the World Championships are growing. About 20 years ago at the World Championships, the 50-59 men's epee event, in which I placed 16th, had 28 competitors; in Cairo, the same event featured 73 competitors. Overall in Cairo, there were 699 competitors from 46 countries so the average team size was only 15 members, whereas a full team would be a whopping 72 fencers. Some fencers do qualify for more than one event, but the numbers are small: only 4 members (myself included) of the entire US Team fenced in more than one event.

Competitions start with a round of "pools" in which 6 or 7 fencers compete. Unlike other competitions, pool assignments during the World Championships were a bit random. For my foil event (39 competitors from 15 countries), my assignment of #28 put me in a pool with five other fencers, whose initial rankings were mostly higher, including a former member of the British team with whom I played squash when we were graduate students together at Imperial College. Everybody in the pool fences everybody else; the winner of each encounter is the fencer who scores 5 touches, or is leading if the 3 minutes of fencing time has elapsed. Fencers are under the control of a referee, who starts and stops the action and awards hits (and applies penalties) according to the rules. Much to my surprise, I win 4 fights.

After the first round, in which no one is eliminated, a new ranking order is created based on victory ratio and hit indicator (touches scored minus touches received). Fencers are then seeded, and the #1 seed would fence the #64 seed, the #2 seed fences the #63 seed and so on. Because there were fewer than 64 fencers, the top 25 seeds got byes to the

Basic concepts. Foil and epee are poking weapons: valid touches can only be scored with the point. For foil, the target is restricted to the torso and there are rules governing which fencer has "right of way." At epee, the entire body is target and the first fencer to score gets the touch; if the hits land within one twenty-fifth of a second, both fencers are awarded a hit. With a sabre, a hit can be scored by slashing as well as poking, and the target is restricted to body parts above the waist. There are rules about "right of way," similar to those of foil. Hits are detected electronically: for foil and sabre, fencers wear conductive clothing, and a foil and an epee have a spring-loaded switch in the point. Wires run up the blade to a socket inside the guard into which is plugged a body cord, the other end of which is connected to a wire that spools and unspools as the fencer moves backwards and forwards on the strip. Each fencer's spool is connected to a central recording apparatus. Hits on the guard or the strip, made of metal, are not recorded. The set-up for epee can be seen in the picture.

last 32 and were joined by the winners of the 7 bouts between fencers seeded 26 to 39. Losers are eliminated and final placings in the competition are based on seeding after the first round.

Based on my 4 victories in foil during the pool matches, I was seeded 9th. My opponent in the round of 32 was the #24 seed from Egypt. Matches at this stage of the competition are fought till one fencer has scored 10 touches, or is leading after two three-minute periods. I prevail 9 – 6. I'm now in the last 16. My next opponent is the #8 seed. Unfortunately, this turns out to be a fellow US team member, who is a former US Olympian, who is our #1 vet-70 foilist, and whom I have never beaten. After holding the score to 2 – all, I gradually fell behind losing 10 – 4. Thus, my placing is somewhere in the 9 – 16 bracket. If the matches all went in line with the seeding, I would be placed 9th, the highest seeding in this group of losers. But, there are several major upsets at this stage: the #1, #2, and #6 seeds all lose. So fencers seeded 1, 2 and 6 take places 9, 10, and 11, and I am pushed down to 12th place.

In my epee event, there are 46 fencers from 21 countries. I am ranked 33rd and am drawn in a pool with another 5 fencers, ranked, 5, 10, 19, 23 and 38. I know one of my opponents, a British fencer who trained at the same club as I did in London in the early 70's, during my graduate student days. As it happens, he is my first fight and when the 3 minutes of fencing time has elapsed the score is 2-all. We get another minute of fencing time, during which the fencer who scores a touch will win. Should the score still be equal at the end of this extra minute, the fencer who was awarded "priority" will win. Priority is determined by random assignment via the electronic recording apparatus. I "lose" the priority, but win the fight. I win all my other fights and emerge as #2 seed going into the direct elimination stage.

My first fight in the elimination stage is against an Italian seeded #31. When time runs out the score is 5 – 5. So the referee assigns priority and again my opponent is the lucky one. But I win, and I am through to the last 16. Next is a Frenchman seeded #15. When time runs out, the score is 9-all. Once again, I lose the electronic coin toss and my opponent has priority. Eventually, I have to launch an attack, which my opponent successfully parries and scores with a riposte. So I am eliminated, but as the #2 seed, I should be placed 9th in the 9 – 16 group. But there were more upsets, including defeat of the #1 seed, who drops into 9th place, and I slip to 10th.

Julian Tyson and Holly Davis at the Bent Pyramid at Dashur, approx. 40 km south of Cairo. Not exactly a crowded spot. All the tourists are at Giza, where we were earlier in the day.

Clearly doing well in the first round is no predictor of later success, as in both my foil and epee events neither the first nor second seeds ended up in the medals. Of course, all tournaments end with a defeat for all but one competitor, so fencers are used to the disappointment of defeat; but some, like my one-hit defeat in the epee, partly due to the vagaries of the random assignment of priority, carry more sting than, say, a 10-4 loss to a clearly superior opponent in the foil.

Further Information. Results of the Veteran World Fencing Championships can be found here: https://www.fencing-timelive.com/tournaments/eventSchedule/03A6F49D9D3D438880EE81E7BD8FF0A7#today More information about my fencing background and motivation can be found in this article in the Daily Hampshire Gazette (https://www.gazettenet.com/Julian-Tyson-Lisa-Wolf-to-represent-USA-at- Veteran-Fencing-World-Championships-28788396), and in this article for the Commonwealth Honors College (https://www.umass.edu/honors/news/professor-julian-tyson-ranked-number-ten-over-age-70-fencer-world). Here's the video of my gold medal bout in the 70+ epee event at the 2019 National Championships https://www.facebook.com/USAFencing/videos/2643458995682746/ The local club, where I train, welcomes potential fencers of all ages (http://www.riversidefencingclub.com/).

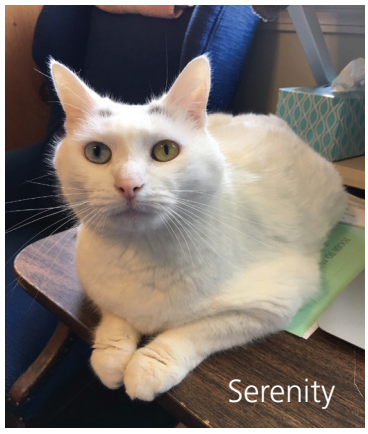
Pet Faces that Warm the Hearts of Staff Members.


Marley

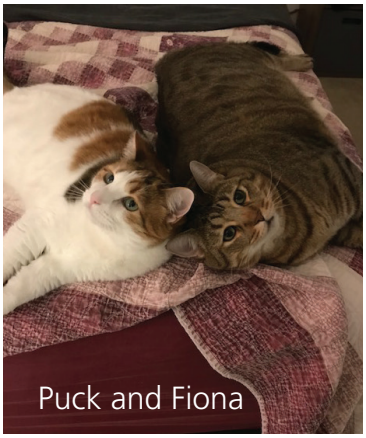

Ayza


the Girls


Gia

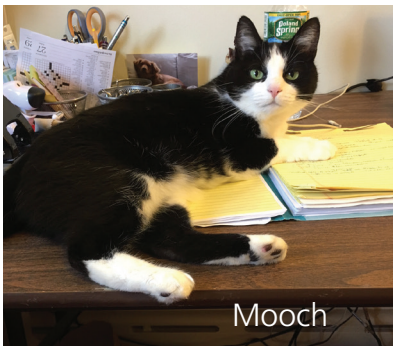

Serenity


Precious


Puck and Fiona


Finneas


Izzy


Mooch


Lily


Sansa


Minerva