2024 Crystallography Lecture with Dr. Bernbeck (Ga Tech) Crystallization Workshop with STARS at GT Report

Introduction and Contextualization

Below follows the introduction and contextualization of the event, as reported by Susanna.

The Structural Nucleic Acid Anticancer Research Society (SNAA Research Society or also STARS) crystallography research club was founded by Susanna Huang in the 2019 fall semester. It was initiated as a club for students who are interested in research and crystallography.

The group was incorporated in 2021, and the mission is to bring high-impact crystallography research experiences to K-12th and undergraduate students. STARS aims to show students the scientific and beautiful sides of inorganic compound and protein crystal-growing.

These last couple of years, STARS has hosted over six distinct crystal-growing competitions, crystallography workshops, or crystallography summer camps. Across all our events we have had over 340 student participants in our programs.

More recently, the STARS collegiate branch, which was started by Susanna Huang at Georgia Institute of Technology, was able to invite Dr. Liu (Emory) to deliver a crystallography lecture and crystallization workshop for the STARS branch members on January 20th, 2024. That day, STARS members learned how to grow lysozyme protein crystals for the very first time! And the protein crystals were absolutely stunning. The beautiful crystals had grown very large with clear faceted structures. This was the very first time STARS members have ever grown protein crystals, and the experience was absolutely amazing. Around six or seven of the club members became very dedicated to the club, only ever missing around two or three meetings of all the 14 meetings during the spring 2024 semester.

Seeing that the January 20th, 2024 crystallography workshop went so well, the STARS collegiate branch members set out to repeat it, but this time, the hands-on portion would be led by STARS members.

The STARS collegiate branch vision is: (1) Create a wet-lab crystallography research-based community for students as well as (2) foster student-faculty research collaborations on faculty research crystallography projects.

The STARS collegiate branch mission is: Provide club members with the opportunity to grow macromolecular crystals (including proteins, nucleic acids and their complexes), learn about crystallography, volunteer at STARS crystal-growing competitions and summer camps, and attend and present at the American Crystallographic Association conference.

In pursuit of this mission, Susanna Huang reached out to the postdoctoral student Dr. Maximillian Bernbeck, a small molecule crystallographer from the La Pierre Group, to invite him to give the guest lecture seminar talk. He gladly agreed. Soon, the preparations for the crystallization reagents were made, such as the creation of the buffer solutions, the salt solutions, etc., with the help of Ms. Alison Onstine, the biology lab manager. Most importantly, Hampton Research, Inc., one of the industry leaders in crystallization supplies and reagents, kindly donated STARS, Inc. over $800 worth of crystallization reagents, plates, and materials for the semesters' events, so some of these materials was able to be used at the STARS collegiate branch crystallography workshop event.

2024 Crystallography Lecture with Dr. Bernbeck (Ga Tech: La Pierre Group) and Crystallization Workshop with STARS collegiate branch

Below discusses what the event was about, what experiments were set up for the event, and what professors or laboratory scientists were present, as reported by Addie:

The goal of the STARS crystallography lecture and crystallization workshop was to provide enjoyable and insightful wet lab experiences to STARS members. In addition, the event introduced the GT STARS branch to non-members interested in crystallography. Dr. Bernbeck, a post-doctoral researcher at the La Pierre Lab, was the guest lecturer for the event. He prepared a crystallography lecture on small molecule crystallography. Following the presentation, Susanna and the STARS volunteers led a workshop that taught the basics of protein crystallography through lysozyme crystallization. The event was hosted in the Gilbert Hillhouse Boggs Building room 1-67 from 10:30am to 3:45pm on Saturday, April 13th, 2024.

Below as follows was the event schedule:

10:00am – 10:30am – Check-in on the main floor of the Boggs building
10:30am – 11:30pm – Lecture by Dr. Bernbeck on small molecule crystallography (Boggs 1-67)
11:30pm – 1:00pm – "Hot potato" + Lunch (in the check-in commons area outside of the lab)

- During "Hot potato," students have the chance to move between different tables and talk with Dr. Bernbeck, post-doctoral researcher at the La Pierre lab, and Dr. Wilkinson, professor and Associate Chair for Academic Programs (Chemistry and Biochemistry).

1:00pm – 3:30pm – Crystallography workshop – Guided lysozyme protein crystallization experiment (Boggs 1-67)
3:30pm – 3:45pm – Wrap up and Closing remarks
3:45pm – 4:15pm - Last touches of cleanups and inventory on the things that STARS finished using, wash glasses with soap, ensure everything is accounted for, etc.

Lecture and Workshop: Planning for the event

As reported by Susanna:

In preparation for the crystallography event, a variety of materials and equipment were needed and were prepared:

- **Micropipettes** (Boggs Biology Prep Lab)
- **Micropipette tips** (Boggs Biology Prep Lab)
- **Staircase centrifuge tube racks** (Boggs Biology Prep Lab)
- **Cryschem M sitting-drop crystallization plates** (Donation from Hampton Research)
- **Sodium acetate pH buffer (0.625 M)** (pHs: 4.2, 4.4, 4.6, 4.8, 5.0, 5.2, 5.4, 5.6) (sterile-filtered; prepared by Susanna Huang and Adelaide Kindler)
- **NaCl salt solution (3M)** (sterile-filtered, prepared by STARS at GT)
- **$NaNO_3$ salt solution (3M)** (sterile-filtered; prepared by STARS at GT)
- **DI water** (Boggs Biology Prep Lab)
- **15-minute crystallization reagent** (Donation from Hampton Research)
- **Lysozyme protein solution (25 mg/ml)** (solubilization buffer: 0.02 M sodium acetate pH 4.6 buffer) (sterile-filtered; prepared by Susanna Huang; lysozyme supplied by STARS at GT)
- **Sealing tape** (Donation from Hampton Research)
- **Thin Sharpies** (Boggs Biology Prep Lab)
- **Microscopes** (Boggs Biology Prep Lab)

STARS greatly thanks Hampton Research for their in-kind donations as well as thanks Ms. Alison Onstine and the Open Biology Lab for the biology lab resources and space.

For the materials that were prepared by STARS collegiate branch, the procedures for the materials preparations are detailed here:

Susanna Huang had been in contact with Dr. Maximillian Bernbeck since January 29th, 2024. Some context: The first protein crystallization workshop that STARS hosted was on January 20th, 2024, and from the workshop there were beautiful lysozyme protein crystals. Since the STARS group had obtained these well-looking lysozyme protein crystals, Susanna was interested in obtaining diffraction data on these crystals. She reached out to Dr. Wilkinson, the professor who was also at the January 20th, 2024 workshop lunch, and he put her in contact with the La Pierre Group and Dr. Maximillian Bernbeck. Then, Susanna and two other STARS members Maya and Siffah had the opportunity to speak with Dr. Bernbeck on February 2nd, 2024. That day, Susanna inquired after the possibility of using the La Pierre Group diffractometer for obtaining the electron density map for the lysozyme protein crystals. The diffractometer is usually used for small molecule crystallography, but since lysozyme is a relatively small protein, lysozyme protein crystals may be able to be diffracted on the diffractometer. They spoke about those possibilities, and Dr. Bernbeck also recommended some good resources for learning about crystallography.

Soon, the end of the semester was nearing, and STARS collegiate branch needed to organize and host its second semesterly workshop. The April 13th, 2024 date was confirmed as the workshop day, and the Boggs Open Biology Lab space (Boggs 1-67) was reserved for the May 13th, 2024 workshop. Since each event requires a guest lecture, a lunch/networking session, and hands-on crystallography workshop session, Dr. Bernbeck was invited to give a talk for the guest lecture, and he gladly agreed.

With the event day and event space and guest lecturer confirmed, Susanna Huang organized a meeting on Friday, April 5th, 2024, to talk about the crystallography lecture and crystallization workshop and introduce the event purpose and delineate the role of event organizers (this document prepared by Susanna Huang and shared by Susanna with the other three event organizers, who are also the other three STARS at GT officers, can be found at the first link in the Appendix). Susanna split up the tasks into four parts and let the four designated event organizers choose the part each would like to work on: (1) Check-in and Hospitality (Maya Leveille), (2) Laboratory 1 (Susanna Huang), (3) Laboratory 2 (Adelaide Kindler), (4) Media (Catherine Lue). Caty was able to create two versions of the event flyers on April 6th, and the event organizers began to print them and put them up around campus to advertise the event. Susanna also printed out 100 flyers and passed out 6-10 flyers to each of the other STARS at GT members at the club meeting on April 8th, 2024, so that they can also put up some flyers along their routes to and from classes. At the same club meeting, Susanna had the members sign up for the food/drinks that they would be bringing to the event. Over the next couple of days, Susanna additionally inquired professors if she could share the event information with her fellow classmates and chemistry/biochemistry majors, and with their approval, those messages were sent to large email lists of undergraduates, and Susanna made appearances at the beginning of three of her classes to further share the information with her classmates directly.

For each of the sections below, each event organizer spends some time discussing what went about preparing for their section and how they created certain documents or prepared certain lists or signups to help with the organization and preparation for the event, and how it all came to fruition on volunteer day:

Check-in and Hospitality – Event Organizer Maya:

As reported by Maya:

The Check-in and Hospitality duties were assigned to Maya. Club members were given the opportunity to bring materials to the event (refreshments, snacks, etc.), and all slots were filled. Lunch was ten dollars per person, consisting of pizza from Papa John's in addition to cans of different sodas, small water bottles, fruits, fruit snacks, and individual bags of chips.

Maya created the check-in materials two days before the event once admission to the event was officially closed. These materials included an excel spreadsheet with each person who

RSVPed (including professors and STARS club members), the portion of the workshop they signed up for, whether they were paying or bringing their own lunch, and their attendance on the day. The actual check-in process involved providing each person with a blank nametag for them to write their name and major (and for the special cases of Dr. Bernbeck and Dr. Wilkinson, a pre-written nametag), checking each person off the roster, accepting the lunch payment if applicable, and handing out flyers (which were designed by and printed out by Caty) that provided background information for the professors present at the event. Because some people who attended did not attend all the sections they signed up for, additional notes on attendance were added to the spreadsheet after the event. Maya worked check-in from 10am to 11:20am in case guests showed up late.

Laboratory 2 – Event Organizer Addie

As reported by Addie:

The Laboratory Set-up and assistance was the assignment given to Addie. Addie created a list of necessary materials by coordinating with Susanna. On Wednesday, April 10th, a meeting was arranged with Ms. Onstine to gather all materials from the supply room that were needed to prepare the acetate buffers necessary for the workshop. More details on these solutions and the preparation process can be found in the acetate buffer solution procedure document.

An email was drafted and sent the Friday before the event (April 12th, 2024) detailing the event location, schedule, and safety requirements. The email was sent to everyone who RSVPed and all attending faculty/professors. On the day of the event, April 13th, 2024, the STARS members volunteering at the event met at 9:00 AM, an hour before check-in, to drop off donated supplies and go over individual responsibilities during the event. During this time, Susanna and Addie collected the necessary pipettes and pipette tips from the supply room. The STARS volunteers met in the lab about 10 minutes before the end of lunch. These volunteers helped set up all materials for the pipette training and workshop. Just before the workshop, a short safety and pipette training presentation was given by Addie. After the workshop, all used pipette tips were sorted into the corresponding recycling containers and all other borrowed materials were cleaned, counted, and returned to their corresponding places in the supply room.

Laboratory 1 – Event Organizer Susanna

As reported by Susanna:

Laboratory 1 was Susanna's assignment. After the April 13th, 2024, event day was confirmed among the STARS at GT members, Susanna reached out to Dr. Bernbeck on February 27th, 2024, to inquire if he would be interested in giving the guest lecturer talk. There was some communication back and forth. Soon after the Boggs Open Biology Lab was reserved on April 3rd

for the April 13th event, Dr. Bernbeck was able to fully confirm his attendance and RSVP on April 4th, 2024. Soon after the STARS at GT officers were determined, Susanna hosted an officer meeting that also served as the event organizer meeting on Friday, April 5th, 2024. On that day, the event organizer roles were agreed upon for the four STARS at GT officers: Check-in and Hospitality (Maya Leveille), Laboratory 1 (Susanna Huang), Laboratory 2 (Adelaide Kindler), and Media (Catherine Lue).

After Caty had prepared two different flyers for the workshop event on April 6th and 7th, Susanna had the event organizers communicate which buildings on campus they planned on posting the flyers. Susanna posted flyers around Boggs, CoC, the entrance to Caldwell and Folk (the Science Living Learning Communities), as well as West Village Dining Hall and Eighth Street Apartments West. Caty stated that she would be putting flyers in the CULC, Student Center, Howey Physics Building, Klaus, and in the library. Maya stated that she would be putting flyers in the Bio Quad, and Addie stated that she would be putting flyers in the Bio Quad and Skiles. At the club meeting on April 8th, 2024, Susanna passed out around six to twelve flyers to each of the STARS at GT members, and instructed them to post the flyers up around campus just along their regular routes to and from classes on campus. In total, an estimated 200 flyers were put up around campus in preparation for this event. In addition to putting up flyers, word of mouth advertising was also encouraged, as well as speaking to professor's classes directly about the event for marketing.

On April 3rd, Susanna inquired Dr. Wilkinson if she could come by his Chemical Crystallography class and speak to his students briefly about the crystallography event that the STARS collegiate branch will be hosting. Dr. Wilkinson kindly agreed, and so Susanna spent around five to six minutes after the course lecture on Friday, April 5th, 2024, to speak with the students in the course and record the emails of the students who may be interested in the event.

On April 5th, Susanna had inquired Dr. Evans, a Senior Academic Professional and Director of First-Year Chemistry, if he would be able to help disseminate the workshop information to the Chemistry and Biochemistry undergraduate majors at Georgia Tech (through the major email list), and he also gladly agreed. Susanna prepared the message that was to be sent out to the undergraduate major list, and Dr. Evans helped her send out the information to the email list on April 9th, 2024. A quick check of the RSVP link revealed that a couple of students had immediately begun signing up soon after the information was sent out.

Susanna had additionally inquired Dr. Stockton, Dr. McDaniel, and Dr. Williams (each on April 7th) for the chance to speak to their classes (Analytical Chemistry, Physical Chemistry, and Biochemistry, respectively) about the crystallography workshop event that would be taking place the Saturday of that week. All three agreed, so Susanna prepared the message that was to be shared with the students in the three classes, and she spoke at the front of the classroom to the Analytical Chemistry class (around 40 students) and Physical Chemistry class (around 30 students) for around five minutes at the beginning of their respective lecture sessions on Wednesday, April 10th (at

9:30am and 11:00am, respectively). Also, she spoke at the front of the lecture hall to the Biochemistry class (around 200 students) for around five minutes at the beginning of the lecture session (at 9:30am) and even received a round of applause at the end.

On April 8th, 2024, during the collegiate branch club meeting, Susanna led the STARS members Siffah, Maya, Sunny, and Diego to prepare three 50 mL solutions of NaCl (3 M) and to prepare two 50 mL solutions of $NaNO_3$ (3 M) using the salts and balances from the biology preparatory lab and the DI water and 50 mL centrifuge tubes from the Boggs 1-59 and 1-67 labs.

On April 4th, 2024, Susanna inquired Ms. Alison Onstine if some prepratory lab materials can be used for preparing the below materials for the workshop:

- 0.625 M sodium acetate pH buffer set (4.2, 4.4, 4.6, 4.8. 5.0, 5.2, 5.4, and 5.6) (each buffer 13 mL x 3)

- 0.02 M solution of sodium acetate pH buffer 4.6 (50 mL x 2)

- 3 M NaCl (50 mL x 3)

- 3 M NaNO3 (50 mL x 2)

Ms. Alison Onstine agreed and kindly found a link for a sodium acetate pH buffer calculator (in the Appendix), which helped provide the masses of the salts needed to create the buffer solutions at their desired pH values. Susanna, Addie, and Ms. Alison Onstine met at 1pm on April 10th, 2024, and Ms. Alison Onstine provided the much-needed materials for the preparation of the solutions, such as micropipettes, micropipette tips, sterilizing filters, centrifuge tubes, glacial acetic acid, sodium acetate, pH paper, etc. Addie and Susanna worked on preparing the sodium acetate pH buffer solutions, and Susanna sterile-filtered the buffer solutions, the NaCl and the $NaNO_3$ solutions, as well as prepare, spin-down, and re-aliquot the lysozyme (25 mg/mL) protein solutions into 1 mL Eppendorf tubes. The document linked in the Appendix provides more detailed information on the preparation of the buffer solutions, sterilization of the salt solutions, and the preparation of the lysozyme (25 mg/mL) protein solutions.

Susanna additionally invited Dr. Bernbeck and Dr. Wilkinson to participate at the event lunch and networking session, and both gladly agreed. Subsequently, Susanna prepared the protein crystallography workshop handout and the workshop handout Excel spreadsheet to streamline the workshop experience for the students (the two documents can also be found in the Appendix), and Susanna sent these two documents out to the students who had RSVPed on the morning of April 13th, 2024, and printed several copies of the handout for the students at the event.

There, she had an event organizer and volunteer meeting in the morning with the finalized schedule (Appendix), gave the introduction about STARS, the warm welcome for Dr. Bernbeck, and the short introduction before the beginning of the networking session, and led the protein crystallography hands-on workshop session.

After the conclusion of the event, on April 14th, she sent out an email to the event attendees, thanking the guest lecturer Dr. Bernbeck, Dr. Wilkinson, Dr. Liu, Ms. Alison Onstine, and Bob Cudney from Hampton Research for their help, assistance, and support for making the event possible. She also thanked the STARS volunteers and event organizers for making the event possible as well. She also sent out the event survey feedback form in the same email so that STARS may know the areas it performed well and the areas that it may improve in.

Media – Event Organizer Caty

As reported by Caty:

The organization of the event planning for media involved both preliminary and post event planning, including development of advertising flyers, personal flyers and event questions for students, and Instagram posts, which these responsibilities were given to Caty. Volunteers were not required for the media portion of this event and only the media chair was involved except for the distribution of information about the event related to flyers. A week prior to the event, Caty developed an Instagram post and two flyers detailing information about the event and where to sign up. The Instagram post was made on April 6th, 2024, and the advertising flyers were given to other STARS collegiate members on April 8th and were distributed around the Georgia Institute of Technology campus before the event. Planning was also done on how to optimally take images from iPhone 14 pro and edit them on Adobe Lightroom before the event on April 13th. Research was done to develop informational flyers on Dr. Bernbeck and Dr. Wilkinson distributed at the event on April 13th. This concludes the preliminary actions taken before the event on April 13th. On the day of the event, informational flyers were distributed to participants and photos were taken by Caty throughout the event and Susanna during the hot potato portion of the event. Photos were taken during the lecture, luncheon, and laboratory portions. Photos can be seen in the appendix. After the event, photos were obtained and placed into a shared Google Drive folder. Best photos from the event were selected and edited in adobe. These photos can be seen in the appendix. These photos were used to create two Instagram posts, which were designed on Canva. Posts included information thanking participants, detailing club meeting information, photos of develop crystals, and a request to fill out the post-event survey. These posts were made on April 13th and April 20th.

Feedback from the event

Below are the cumulative feedback from the event surveys as reported by Caty.

A post-event survey was conducted, sent out April 14th, 2024 via email. Survey inquiries included name, email, attendance, event enjoyment, likelihood of participating in another event, how informative the event was, likelihood of joining STARS or recommending it to a friend, and whether they would officially like to join. There were 7 responses to the survey.

Responses to multiple choice yes/no questions are found in the appendix (Table 1). Average responses were positive towards material learned at the event and desire to join STARS as a social member. It was seen that more than 71% of participants engaged in all sections of the workshop and lecture. However, we found that five out of seven participants current or past research experience was moderately or not related to the topics presented during our event. Additionally, there were short answer questions participants filled out (seen in appendix, Table 2).

When asked if the participant enjoyed the event, all said yes, stating it was informative, leaving students wanting to learn more and that they appreciated the chance to speak with Dr. Bernbeck. The second question of what the participants was favorite experience/moment during the event garnered responses of talking to professors during lunch, learning about new areas in science related to their career, and performing the experiment. Participants recommended for future event that a greater amount of advertising should be done for the event and materials required and providing additional challenge material and new topics to learn about during lecture and laboratory sections. These responses will be considered for future events, where the club plans to increase advertising of its events and will look further into incorporating new ideas and concepts into future event workshops.

Conclusion

The concluding remarks on how thankful the event organizers were for the GT facility, to Ms. Onstine, to Dr. Bernbeck, and Hampton Research, Inc., as reported by Adelaide:

The event organizers are so thankful to Dr. Bernbeck, Dr. Lieberman, Dr. Wilkinson, Ms. Onstine, the GT facility, Hampton Research, Inc. and everyone else who made this event possible. The goal of STARS at GT has always been to share the experience of growing crystals with students interested in crystallography research. Thanks to everyone involved, this event was a valuable experience for Georgia Tech students of all skill levels. It allowed those new to crystallography to engage in a hands-on crystallization workshop and an enriching conversation with the participating professors. In addition, it allowed students with more experience in crystallography to practice a new protein crystallization technique, and to hear a new perspective on crystallography by speaking with the participating professors about their work with inorganic crystals. The event had a great turnout with seven STARS members attending the lecture, lunch and workshop, and seven non-STARS students attending the lecture and lunch, with three of those students additionally attending the workshop. This event puts the club in a great position to grow crystals in the future using the sitting drop crystallization technique practiced in the workshop. In addition to regrowing lysozyme crystals, the club student members will continue to be able to experiment with different proteins and buffer solutions, and eventually get and solve diffraction data. This event gave the GT students a great introduction to crystallography and provided them with the foundation they need to eventually grow crystals on their own.

Next Steps

As reported by Susanna:

The hands-on workshop experience went much, much smoother this time, and several attributed it to the handout and the Excel spreadsheet (which could do the automatic calculations for the volumes of each reagent necessary for each well). (In fact, the event even ended around 30 minutes earlier than expected due in part to the addition of these two resources) With the buffer solution materials and the protein samples only barely used, these materials can most definitely be used in the May workshop that STARS collegiate branch plans on hosting at Walton HS. The current day for the event is May 18th, 2024. Just as how STARS was so excited to grow protein crystals for the first time at the first workshop (on January 20th, 2024), it was equally exciting and exhilarating to prepare STARS crystal-growing buffer and protein solutions on our own for the first ever time and actually see the protein crystals come out so nicely (and in a gradient in accordance with the periodic change in pH and salt concentration). STARS collegiate branch hopes to bring the joy and excitement of protein crystal-growing to the high schoolers as well! STARS members cannot wait to share the outstanding experience with the local students!

In terms of the food-related and materials left over from this event: The remaining (1) water bottles, (2) plates, (3) paper towels were retained by Susanna. These three items in addition to the Coke cans, Sprite cans, and forks from the first event can be used in conjunction for the May 18th, 2024, workshop for the Walton high school students during the lunch and networking session.

Additionally, it is planned that the copper sulfate crystal-growing material can be passed out on May 18th, 2024 (at the workshop event) as well as on May 20th , 2024 (at the 2023 Dodgen Crystal-Growing Competition Awards Ceremony) to students who may be interested in participating in the STARS summer crystal-growing competition and crystal-growing summer camp.

As reported by:

Catherine Lue, Adelaide Kindler, Maya Leveille, and Susanna Huang

May 2024

Appendix

All event materials:

- **Workshop event STARS meeting topics for event organizers (1/12/2024):** https://gtvault-my.sharepoint.com/:b:/g/personal/shuang466_gatech_edu/Ed6FqZYI-ZNMg_FE5KuQvVYBWI3KEaJLKHzYeHaaMqZGNA?e=NBFUGO
- **Event timeline:** https://gtvault-my.sharepoint.com/:b:/g/personal/shuang466_gatech_edu/EdHJcw-W6fBFmy9gaLvqL6EBthF1x5e7MDSS2uZ9MBpX_w?e=M3254a
- Workshop flyer advertisement (1): Crystallization Workshop Flyer (1).pdf
- Workshop flyer advertisement (2): Crystallization Workshop Flyer (2).pdf
- Experiment preparation procedures: Procedure for preparing needed reagents in a lysozyme crystallization experiment.pdf
- **Crystallography experiment handout:** April 13th, 2024 - STARS Crystallography workshop handout.pdf
- Presentation given by Dr. Bernbeck: 20240413_STARS_Crystallography_Seminar.pptx
- **Recorded presentation of the Dr. Bernbeck guest lecture:** https://youtu.be/-lIy2k06h0E
- Flyer introducing the professors during the lunch (Dr. Bernbeck): Bernbeck.pdf
- Flyer introducing the professors during the lunch (Dr. Wilkinson): Wilkinson1.png, Wilkinson2.png
- Survey Feedback form: https://forms.office.com/r/eiXYRDmGhv
- Photos of the event (Caty): Media
- Photos of the event (Susanna): Photos
- **STARS at GT Instagram page:** https://www.instagram.com/stars.anticancer.gt/

Event survey summary:

Table 1. Multiselect Survey Questions

Question	Anonymous Response with iD's 1-7
Did you attend the 10:30am-11:30am crystallography lecture with Dr. Max Bernbeck (Georgia Tech: La Pierre Lab)	1. Yes 2. Yes 3.Yes 4. Yes 5. No 6. Yes 7. Yes
Did you attend the 11:30am-12:45pm lunch with Post-doc Dr. Max Bernbeck (Georgia Tech: La Pierre Group) and professor Dr. Wilkinson (Professor and Associate Chair for Academic Programs at GT)?	1. Yes 2. Yes 3.Yes 4. No 5. Yes 6. Yes 7. Yes
Did you attend the 1:00-3:30pm crystallography workshop with STARS at GT?	1. Yes 2. Yes 3.Yes 4. Yes 5. No 6. No 7. Yes
On a scale of 1 to 10, how much did you enjoy the event experience?	1. 9/10 (Promoters) 2. 10/10 (Promoters) 3. 7/10 (Passives) 4. 10/10 (Promoters) 5. 7/10 (Passives) 6. 10/10 (Promoters) 7. 10/10 (Promoters)
On a scale of 1 to 10, how likely would you attend another event like this one?	1. 9/10 (Promoters) 2. 10/10 (Promoters) 3. 9/10 (Promoters) 4. 10/10 (Promoters) 5. 7/10 (Passives) 6. 10/10 (Promoters) 7. 10/10 (Promoters)
On a scale of 1 to 10, how informative did you find this event to be?	1. 8/10 (Passives) 2. 9/10 (Promoters) 3. 7/10 (Passives) 4. 9/10 (Promoters) 5. 7/10 (Passives) 6. 10/10 (Promoters) 7. 10/10 (Promoters)

On a scale of 1 to 10, how applicable did you find the information from the event to be to your own areas of research?	1. 7/10 (Passives) 2. 7/10 (Passives) 3. 6/10 (Detractors) 4. 7/10 (Passives) 5. 0/10 (Detractors) 6. 10/10 (Promoters) 7. 8/10 (Passives)
On a scale of 1 to 10, how interested are you in learning more about the STARS at GT crystallography research club?	1. 10/10 (Promoters) 2. 10/10 (Promoters) 3. 8/10 (Passives) 4. 10/10 (Promoters) 5. 7/10 (Passives) 6. 8/10 (Passives) 7. 10/10 (Promoters)
On a scale of 1 to 10, how likely would you recommend a friend to attend an event like this in the future?	1. 9/10 (Promoters) 2. 10/10 (Promoters) 3. 8/10 (Passives) 4. 10/10 (Promoters) 5. 8/10 (Passives) 6. 8/10 (Passives) 7. 10/10 (Promoters

Table 2. Short Answer Feedback Questions

Question	Anonymous iDs	Corresponding Short Answer Response
Did you enjoy attending the event? Please describe why or why not.	1-7	1. I very much enjoyed the event. The lecture was rather informative, and left me wanting to learn more. The lunch and networking was interesting and useful, and the lab workshop was fun and taught me new skills. 2. I really enjoyed it. There was a very lighthearted but inquisitive atmosphere that made the entire process very fun. Everyone was encouraged to be involved in conversation, and everyone was very friendly. 3. Yes, I thought the event was great. Valuable information and the time alloted for each portion was appropriate. 4. I did enjoy attending the event because it felt very approachable, especially the workshop. The talk was also very enjoyable as Dr. Max went into the right amount of depth to keep us engaged but not so much as to lose the audience. 5. It is always nice to talk with students. 6. I quite enjoyed the opportunity to share my experience and enthusiasm for experimental crystallography. 7. Yes! The lecture was interesting and talking with Dr. Bernbeck was really great.

Would you be interested in joining as a social club member (if you are not a STARS at GT member)?	1-7	1. I would love to join as an official member starting next semester (Fall 2024)! 2. I am a STARS at GT member 3. I would be interested in joining as an official club member 4. I would be interested in joining as an official club member 5. I would not be interested at the moment, but perhaps in the future 6. I would not be interested at the moment, but perhaps in the future 7. I am a STARS at GT member
Please describe your favorite experience or moment of the event.	1-7	1. My favorite experience was the lecture because it informed me about an area of science that I hadn't heard of but is rather applicable to my career. 2. The experiment was the most fun because I got the opportunity to joke around a lot, but the lunch was very insightful. Dr. Max Bernbeck gave a lot of good information about grad school and advice for finding research, jobs, and networking. 3. The experiment was the most fun because I got the opportunity to joke around a lot, but the lunch was very insightful. Dr. Max Bernbeck gave a lot of good information about grad school and advice for finding research, jobs, and networking. 4. Pipetting the protein drops or seeing examples of protein crystals under the microscope!! 5. Talking with students. 6. The students were quite engaged, and they had wonderful questions after the presentation. 7. My favorite moments were talking with Dr. Bernbeck and looking at the crystals under the microscope.
What are some recommendations you may have for improving similar events in the future?	1-7	1. The lab might have been slightly more engaging if we had seen our results at the end, though I understand that this is impossible. Maybe you could send pictures of the results to participants via email for those who cannot attend the meeting Monday. 2. We should begin advertising earlier, maybe two weeks before the event. We could also do lectures about more specific applications of protein crystallography or research rather than a general overview (so people keep coming back). It would be interesting if professors came and presented their research, or maybe introduced a pertinent program for structural chemistry. Just an idea for people who want to attend the workshops but don't want to hear the same/similar things. If the budget allows, we could also try to synthesize different proteins, or follow up workshops where we try to pull the protein crystal out. If more people come, we could also reduce the price of lunch.

		3. N/A 4. Maybe adding some optional challenge or game to the procedure! 5.N/A 6. A future workshop focused on handling diffraction data and extracting a structure would be informative and would not require a laboratory setting. 7. There was one issue with someone not having a lab coat so making sure that is more emphasized in the pre-event email maybe.
Any other comments or questions?	1-4	1. I had an amazing time. Thanks for the experience! I look forward to possibly joining STARS club next semester. 2. n/a. i yapped a lot above. 3. Fun! 4. n/a

List of event attendees

Listing of the number of participants for the lecture, for the lunch, for the workshop, along with their affiliations and classification status. Total number of attendees: 16. Nine STARS at GT members; Seven GT non-member students; Two invited faculty. As reported by Maya.

Name	Affiliation	Lecture Attendance	Lunch Attendance	Workshop Attendance
Ludyanna Lebon	Non-STARS			
Penny Hicks	Non-STARS			
Sara Dixon	Non-STARS	X	X	X
Sara Hunihan	Non-STARS	X	X	X
Yogi Parmar	Non-STARS			
Vaughn Roverse	Non-STARS			
Sarah Schultz	Non-STARS	X		
Chi Nguyen	Non-STARS			
Jesseca McNair	Non-STARS		X	
Phillipa Thomas-Wilkinson	Non-STARS			
Calvin Zhang	Non-STARS	X	X	
Kyra Andrews	Non-STARS	X	X	
Max Thomsen	Non-STARS	X	X	X
Aaron Thompson	Non-STARS			
Camille Branch	Non-STARS			
Kayla Baldera	Non-STARS			
TD Winters	Non-STARS	X	X	
Maya Leveille	STARS GT	X	X	X
Sunny Xu	STARS GT	X	X	X
Siffah Bonsu	STARS GT	X	X	X
Susanna Huang	STARS GT	X	X	X
Diego Gonzalez	STARS GT	X	X	X
Addie Kindler	STARS GT	X	X	X
Caty Lue	STARS GT	X	X	X
Dr. Wilkinson	Invited Professor		X	
Dr. Bernbeck	Invited Guest Lecturer	X	X	
Totals		15	16	10

Photos

Maya at our check-in station waiting to greet participants.

Check-in station welcoming and signing-in participants to the event.

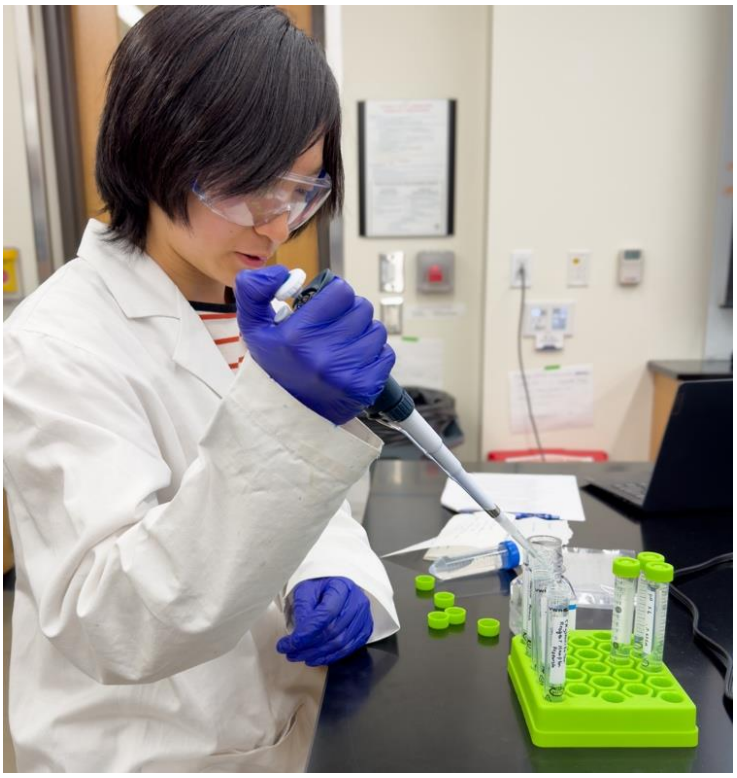
Dr. Bernbeck introducing himself and the start of his lecture.

Dr. Wilkinson discussing with students during hot-potato.

Students obtaining food during our lunch portion of the workshop.

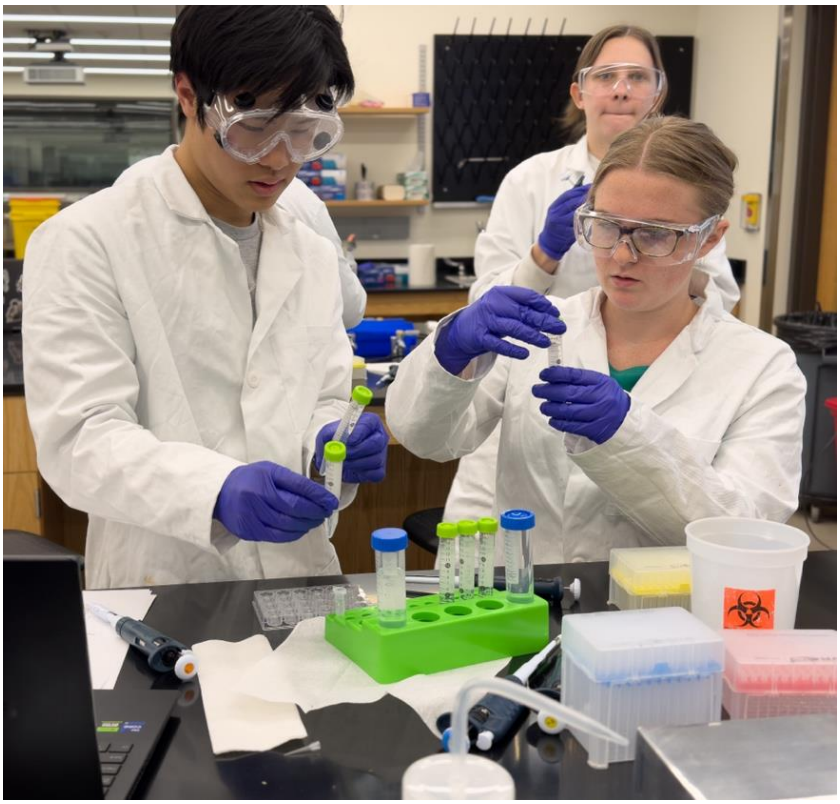
Students discussing with Dr. Bernbeck during the hot-potato section.

A participant practicing micro pipetting onto a weigh boat.



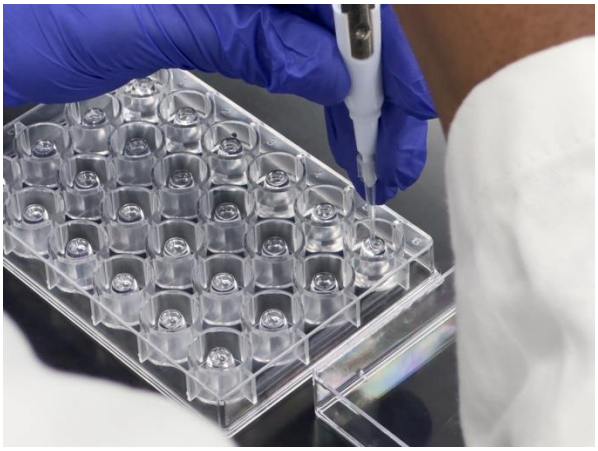
STARS collegiate branch president, Susanna, transferring some solution between test tubes.

Students working together during the experiment to create buffers.

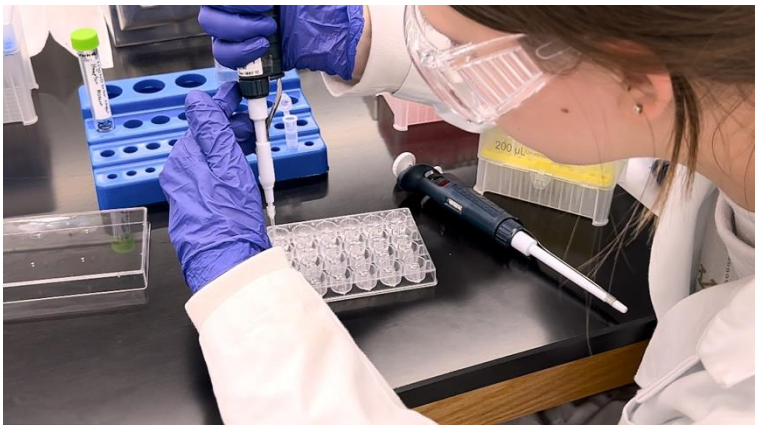


Students analyzing which solutions they will need to use for the next portion of the experiment.

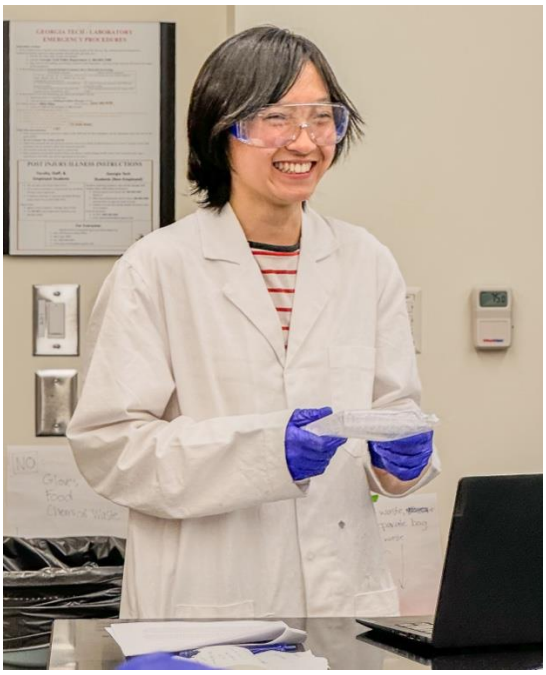
Students having fun in the laboratory while micro pipetting.



The fine detail our participants put into micro pipettes was amazing.



High level of focus a student was engaging in during the experiment while micro pipetting.



Our president discussing with other students about the experiment and having fun.

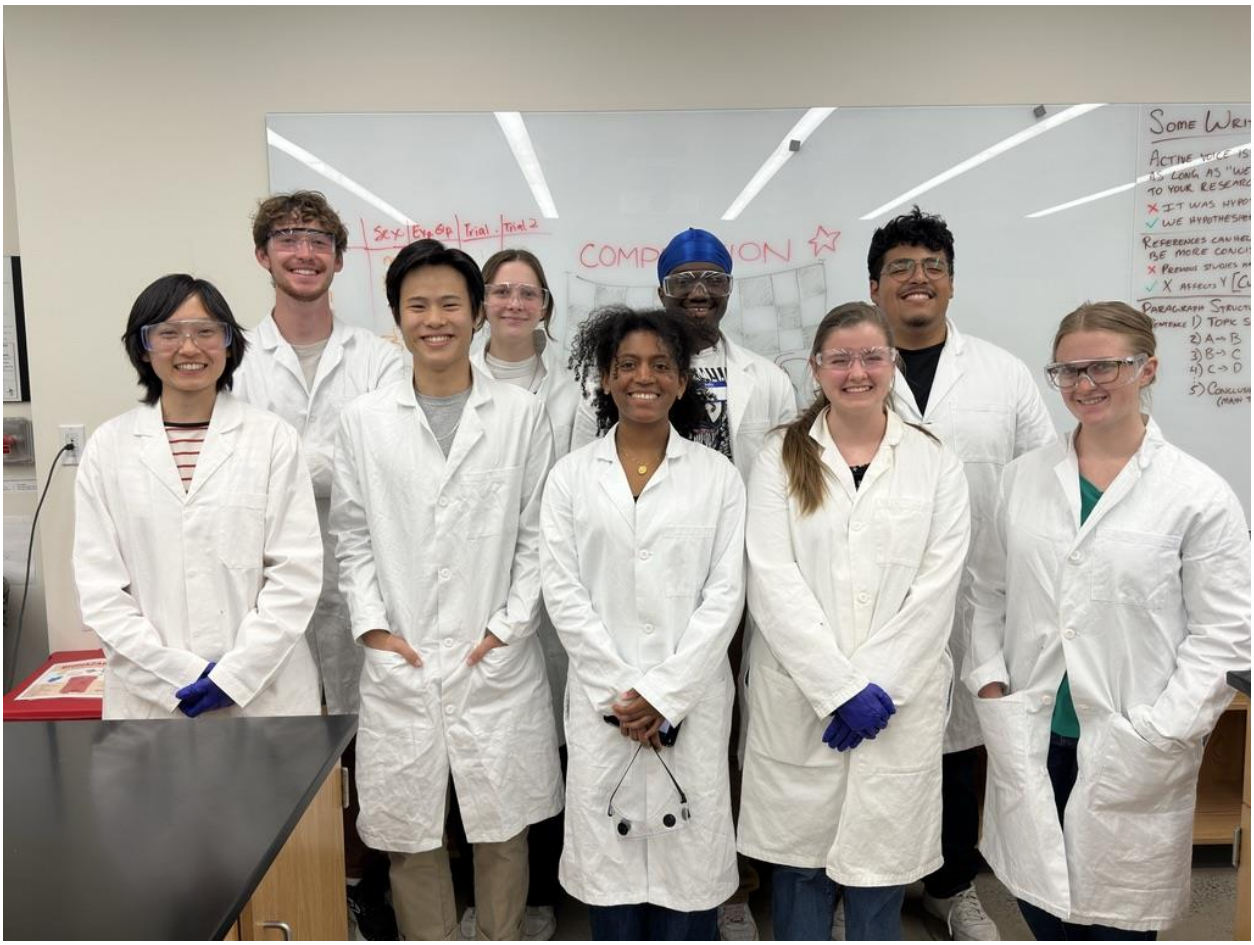
Some cool scientific poses.

Students talking with each other and having fun after finishing up the experiment.

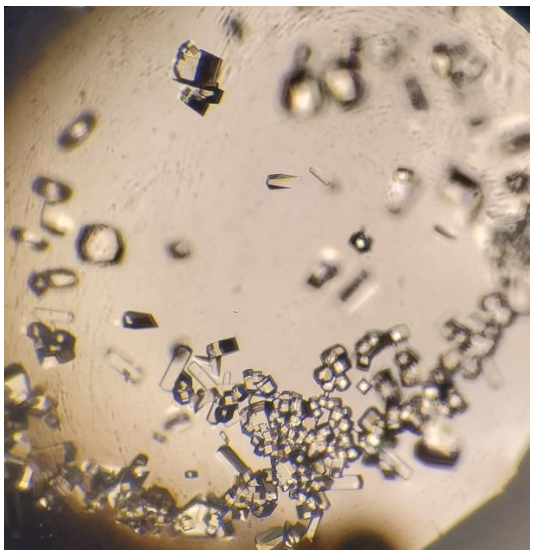
Students showing the amazing goods, micro pipettes and test tubes.

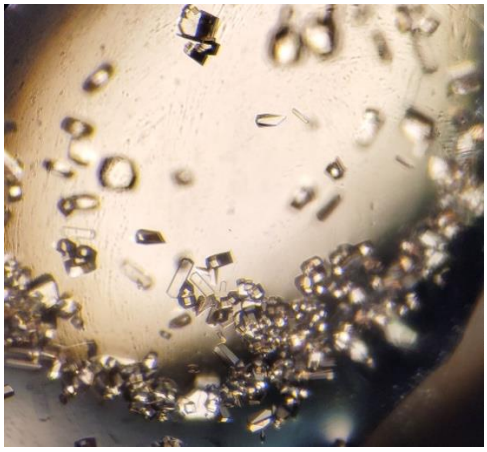
Participants receiving gifts of copper sulfate crystals.

Students analyzing crystals from a past experiment to see what their results would look like in a couple of days.



Group photo of participants who stayed and completed the experiment section of our workshop.





All three crystal photos are amazing examples of protein crystals taken by Susanna of the crystals produced during the workshop.

STARS nonprofit activities summary

- Competed in the US Crystal-Growing Competition (USCGC) annually [Fall 2019 – current]
    - 2019 USCGC – Susanna Huang won 2nd place in the clearest crystal category (Walton STARS branch; Acting president: Susanna Huang)
    - 2020 USCGC – Team members experimented with crystallizing glow-in-the-dark highlighter ink and quinine into crystals (Walton STARS branch; Acting president: Susanna Huang)
    - 2021 USCGC – Walton STARS branch (Acting president: Susanna Huang)
    - 2022 USCGC – Walton STARS branch (Acting president: Selina Huang)
    - 2023 USCGC – Walton STARS branch (Acting president: Selina Huang)
- Hosted and organized local crystal-growing competitions annually [Spr. 2021 – current]
    - 2021 Timber Ridge Crystal-Growing Competition
    - 2022 Cobb County Crystal-Growing Competition
    - 2023 Dodgen Crystal-Growing Competition
- Hosted and organized local crystal-growing summer camp [Sum. 2021 – current]
    - 2021 STARS Crystal-Growing Summer Camp
    - 2022 STARS Crystal-Growing Summer Camp
- Presented at Cobb County STEM teacher conference [Sum. 2021 – current]
    - 2021 STEMapalooza STEM teacher conference
    - 2022 STEMapalooza STEM teacher conference
- Presented at American Crystallographic Association annual conference [Sum. 2023 – current]
    - 2023 ACA conference (Baltimore, Maryland)
- Hosted and organized crystallography workshops [Spring 2024 – current]
    - 2024 Crystallography Lecture and Crystallization Workshop with Dr. Liu – STARS at GT branch (Acting president: Susanna Huang)
    - 2024 Crystallography Lecture with Dr. Max Bernbeck (Georgia Tech: La Pierre Group) and Crystallization Workshop with STARS at GT branch (Acting president: Susanna Huang)