2024
2025

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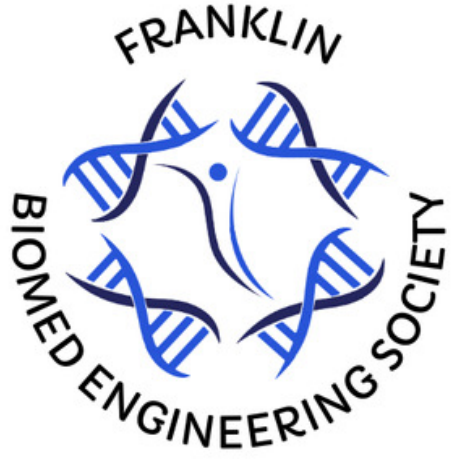
FRANKLIN HIGH SCHOOL

BIOMEDICAL ENGINEERING SOCIETY

CHAPTER DEVELOPMENT REPORT



RENEWAL DOCUMENT

Faculty Advisor

[redacted]

Biology and Physiology/Anatomy Teacher at Franklin High School

Officer Information

Co-President: [redacted]
- [redacted]

Co-President: [redacted]
- [redacted]

Vice President: [redacted]
- [redacted]

Treasurers: [redacted]
- [redacted]

Secretary: [redacted]
- [redacted]

Historian/Public Relations: [redacted]
- [redacted]

Research & Coordinators: [redacted]
- [redacted]

Free Membership Information

[redacted]

New Membership | Graduation Date: 2026

[redacted]

Club Information

Club Website: https://sites.google.com/d/1QMqRUcxxUA_qyffuc14Rq-3_xNp3B2qD/edit?ouid=111392639601518523014

Club Social Media & Contacts:

Instagram: @frhs.bmes
Gmail: franklinbmes@gmail.com
Remind code: 9b7aad
Google Classroom code: fk7d47c

FRANKLIN HIGH SCHOOL BIOMEDICAL ENGINEERING SOCIETY

STUDENT CHAPTER DEVELOPMENT REPORT

August 2024 - May 2025

Franklin High School Campus:
6400 Whitelock Parkway
Elk Grove, CA 95757
(916) 714-8150

Corresponding Authors:

[redacted]

Faculty Advisor:

[redacted]

Executive Summary and Aims

The Franklin High School (FrHS) Biomedical Engineering Society (BMES) chapter has fruitfully grown from the ground up over the past year and is committed to fostering a passionate and dedicated community of students interested in biomedical engineering. Our goal is to provide unique hands-on experiences, research opportunities, and professional development to expand students' knowledge of the field.

By integrating science, engineering, and healthcare, we aim to inspire future innovators and problem-solvers. Our chapter meets every other Tuesday in the faculty advisor's room at 3:30 P.M. for approximately an hour.

During the 2024-2025 academic year, the FrHS BMES chapter has significantly expanded its scope by incorporating interactive labs, research projects, and community-driven initiatives. We have conducted CRISPR labs, where members learned about gene editing techniques, Pacemaker labs to explore cardiac devices, and Prosthetic labs focusing on biomechanics and assistive technology. Additionally, our DNA extraction lab provided hands-on molecular biology experience, allowing students to engage with real-world applications of genetic engineering.

Beyond our laboratory work, we have actively contributed to the community through service initiatives such as a Medical Supplies Drive, which gathered essential equipment for underserved medical facilities. We also hosted food fairs to raise awareness and funds for biomedical research, and members collaborated with the Annual School Blood Drive, reinforcing the importance of public health and medical outreach. At a university level, we had the privilege of meeting with Professor Nadiv from UCSF in addition to forming online Zoom meetings with student groups from UCLA and UCSD, which all provided valuable insights into advancements in biomedical engineering and future research opportunities.

Our chapter is not only focused on research but also on academic and professional development. We have introduced members to reading and analyzing professional research papers, developing scientific models, and maintaining a sterile laboratory environment—essential skills for anyone pursuing a career in biomedical engineering. Additionally, through networking sessions with university BMES chapters, we have integrated professional and community development activities, ensuring that our members gain exposure to real-world applications of their studies.

COVER LETTER

Dear BMES National Student Chapter Award Committee Members,

We are writing to share the progress and achievements of our Biomedical Engineering Society (BMES) chapter. This year, our goal has been to establish our on-campus presence as a new association, welcome new student members, and encourage interest in biomedical engineering through various educational and engagement opportunities.

Throughout the year, our members explored important biomedical topics, including DNA viewing, cell engineering, prosthetics, biomedical devices in healthcare, and the importance of community service in this field, with guidance from professionals and presentations by club officers. Students had the opportunity to engage in case studies and interact with medical professionals to learn about current advancements in biomedical treatments. To organize as our chapter grew, our club formed highly organized officer boards to manage outreach, mentoring, and social activities.

We also undertook multiple research projects, where students were able to explore topics related to engineering and design. These projects gave our members practical experience while also promoting exploration in areas like nanotechnology and biomedical device design. Members were able to pursue individual projects with support from the club, gaining deeper insights into the field of biomedical engineering.

In addition to our academic endeavors, our chapter remained active in the local community through volunteering and outreach efforts. Members participated in various volunteer activities that provided support to local science and health organizations, helping to foster interest in biomedical engineering among younger students and the community at large.

Looking forward, our chapter plans to continue its ongoing projects, expand its visibility among students, and enhance its presence in the local community. We are committed to the growth of our chapter, furthering research, and inspiring peers to explore biomedical engineering.

Thank you for your time and consideration.

Sincerely,

[redacted]

Table of Contents

Franklin High School Biomedical Engineering Society

ADMINISTRATIVE REPORT

Our Biomedical Engineering Society (BMES) chapter is structured to maximize efficiency, communication, and long-term sustainability. Our leadership is composed of twelve members, including the Executive Board as well as the Project Board, all working together to organize events, manage resources, and further our mission of promoting professional development, technical innovation, and community engagement.

The Executive Board consists of seven members who oversee the major branches of our organization. Each board member is responsible for specific initiatives, while also collaborating cross-functionally to support club-wide goals. The Executive Board comprises two Co-Presidents, Vice President, Secretary, two Treasurers, Historian, and Public Relations officer. The Co-Presidents consistently collaborate to oversee all aspects of club management including outreach, donations, meetings, reports, and competitions. The Vice President, Secretary, and Treasurer consistently collaborate to manage outreach and funding. The Historian and Public Relations officers work jointly to promote events and engagement.

The project and general member officers are typically involved in specific tasks approved by members of the executive board. Project Managers and Research Coordinators help to facilitate event logistics, like informational presentations for lab-based meetings. The Outreach Coordinator and Member Liaison work together to publish engaging Google Classroom posts and create engagement strategies such as prize incentives for meeting attendance. Our technology officer monitors our website and social media engagement to responsibly answer all queries.

To ensure seamless communication and coordination, our full board holds monthly meetings where we discuss upcoming events, ongoing projects, and new initiatives. The Executive Board also meets independently bi-weekly to address administrative matters and brainstorm meeting ideas. All council meetings are documented, with action items tracked to maintain accountability and continuity.

COLLABORATION & ORGANIZATION

Our officers utilize several tools to streamline operations, including a centralized master spreadsheet that tracks all events, deadlines, and logistics, as well as a shared digital calendar to prevent scheduling conflicts. Our shared Google Drive folder contains a strategic nested folder setup, housing subfolders and documents that contain all relevant materials, including planning documents, promotional assets, and historical data. Within this structure, a shared spreadsheet tracks our treasury history, including all money accumulations and spending, as well as nested folders for outreach opportunities, separated meeting and lab information, club information, university contact information, and award applications. This drive has been systematically organized and maintained to ensure ease of access and knowledge sharing across leadership generations.

Preserving institutional knowledge is a key priority in our club. We have established comprehensive transition documents for each leadership role, updated annually to reflect changes in processes, contacts, and resources. These guides are complemented by our introduction of structured transition meetings between outgoing and incoming board members that will take effect at the end of each year, ensuring continuity and equipping new leaders with the tools and knowledge needed for success.

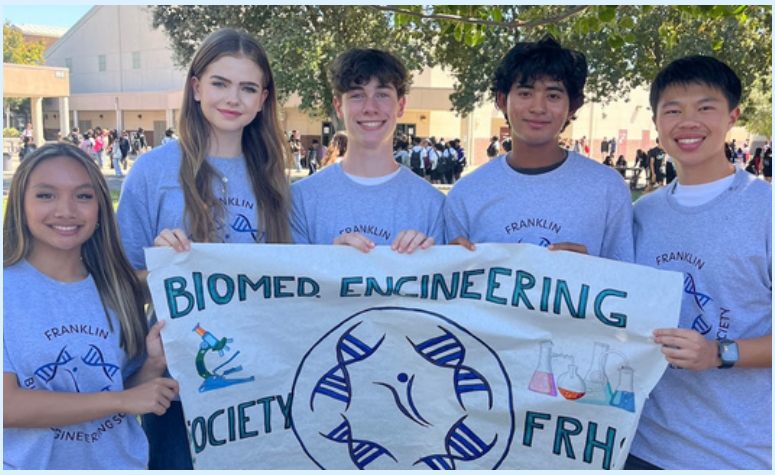
Through this structured yet flexible administrative foundation, our BMES chapter is able to consistently deliver impactful programming, support our members' professional growth, and uphold our commitment to excellence within the broader biomedical engineering community.

Non-Officer Members

85 students (as per enrollment in Google Classroom)

Around 18-21 active members (members attending nearly all meetings, with the exception of 1-2 absences)

OFFICERS ROLES AND DUTIES



Co-Presidents: [redacted]
Manages all club operations and maintains communication with school administration and Faculty Advisor. Presides over all meetings and outlines the direction of the club in terms of meeting topics and trajectories, competition goals, scheduling, and planning.

Vice President: [redacted]
Principal outreach coordinator accountable for facilitating digital communication and email extensions. Responsible for maintaining club logistics, including membership, officer communication, and overseeing member engagement produced by Public Relations Officer.

Treasurers: [redacted]
Manages money involved in fundraising and grant accumulation as well as coordinating collection of funds for annual dues.

Secretary: [redacted]
Tracks efficiency of meetings and records minutes of operation. Verifies meeting attendance and communicates club announcements and deadlines to other officers.

Historian/Public Relations: [redacted]
Manages social media accounts and is in charge of advertising club events to the school campus and students outside of the club. Digitally documents the contents of each meeting and synthesizes all past club information, storing information and analytics in documents that can be reviewed later.

TREASURY REPORT

The Biomedical Engineering Society at Franklin High School maintains a well-organized budget to ensure we can continue offering valuable programming and resources to our members. Our Treasurers, in collaboration with the Vice President, are responsible for acquiring additional funding to completely fund our club, as we do not collect membership dues under the notion that many high school students are financially equipped to pay and would be put off by. We consistently review and optimize our budget to ensure we are making the most of our resources and to identify new funding sources to support our activities. The treasurer tracks all expenses and monetary gains in an organized spreadsheet that tracks our budget through labeled tabs and a consistently updated total account balance. After each meeting, the treasurer collaborates with both presidents as well as the vice president to discuss the costs associated.

Food Fair Fundraising

Our chapter has successfully hosted two food fair fundraising events this year, first featuring spam musubi sales and subsequently offering McDonald's chicken nuggets.

Fall Food Fair

During our first food fair, we bought around 150 individual spam musubi, which were sold at $1.50, or three tickets, for a half and $3, or 6 tickets, for a whole. As we purchased these items in bulk and received a subsequent discount, each musubi was bought for around $2, making a $1 profit on each musubi sale.

Spring Food Fair

During our second food fair, we bought 25 orders of forty-piece chicken McNuggets. These were divided and sold in bundles of 5 nuggets. In total, we sold around 1000 nuggets, or 200 bundles, priced at $2.50, or 5 tickets. Each forty-piece order cost $12.75, making each bundle $1.60. Our club profited roughly one dollar from each bundle sale.

Both events exceeded sales expectations, with each event generating a profit. This success can be attributed to our proactive advertising efforts, which began at least one week prior to the event, and our commitment to professional and efficient execution when working with vendors. Throughout the fundraising events, we maintained high standards of food safety and hygiene by ensuring that all food handling was conducted with gloves and utensils, following appropriate healthcare protocols. Our streamlined ticket collection system on the day of the event allowed for efficient service and a smooth experience for both our members and customers. Our club's treasurer and presidents work together to plan the events by brainstorming food items and prices, considering the desires of the student body and setting prices in order to break profit while maintaining affordability.

BMES FINANCIAL REPORT 2024-2025

Category	Activity Name	Cost ($)	Profit ($)
Fundraiser	Fall Food Fair	[redacted]	
Lab	CRISPR Lab		
Lab	Prosthetic Arm Lab		
Lab	Pacemaker Lab		
Lab	DNA Lab		
Fundraiser	Spring Food Fair		
Donation	Parkinson's Cards		
Donation	Donation Drive		
Net Financial Information			
Net Change ($)	[redacted]		
Current Account Total ($)			

Future Finances

Looking ahead, we will continue to explore new opportunities to diversify our revenue streams, further optimize our budget, and build sustainable funding sources that will allow us to enhance our programming and provide more value to our members. Now that our club has established a steady account balance within our school's treasury department and within our own, we will be looking to expand our sources of funding and apply to a greater selection of grants.

CHAPTER ACTIVITIES

This year, our chapter focused on building a strong foundation in bioengineering while providing members with diverse opportunities to explore the biomedical field. Through hands-on labs, research initiatives, and community engagement, we aimed to cultivate both technical skills and a deeper understanding of biomedical science. Members participated in CRISPR lab, a DNA extraction lab, and a pacemaker lab in order to gain firsthand experience with genetic engineering, molecular biology, and medical device technology. Our prosthetic competition challenged students to apply biomechanics and design principles to create functional prosthetics. In recognition of DNA Day, we organized activities that celebrated advancements in genetics and biotechnology which gave us national recognition from the NIH. Beyond the lab, we prioritized outreach and impact. Members collaborated with a Parkinson's support group, organizing a school-wide medical supply drive and blood drive, as well as connecting with industry professionals like Dr. Adhiv from UCSF. We also hosted workshops on how to read research papers and prepare for biomedical competitions or competitive summer programs.

In-Class Meetings	Date	Activity
Introduction	10/22/2024	Students learned about our club, BMES as a whole, and our upcoming plans for the year.
CRISPR Lab	11/12/2024	Students learned about how CRISPR operates as well as its applications. We performed a chemical lab simulating gene editing.
Prosthetic Competition	12/17/2024	Students learned about and created DIY prosthetics before undergoing competition-style testing.
Pacemaker Lab	02/18/2025	Students simulated the actions of a pacemaker with a DIY heart and electrical circuit setup.
DNA Extraction	03/24/2025	Students learned about the properties of DNA and extracted DNA samples from kiwis.
Parkinsons Outreach	04/08/2025	Students learned about Parkinsons disease and created heartfelt cards for a local support group.

CHAPTER MEETINGS & LABS

1st Meeting: Introduction **10/22/24 | Cost: $0 | All members**

Our first meeting set the stage for the year, introducing members to bioengineering and exciting opportunities within the field. We outlined our goals, upcoming labs, competitions, and outreach initiatives. Our officers also discussed BMES as a whole, sharing the organization's goals, operations, and opportunities for student chapters and individual professionals in related fields.

2nd Meeting: Crisper Lab **11/12/24 | Cost: $0 | All members**

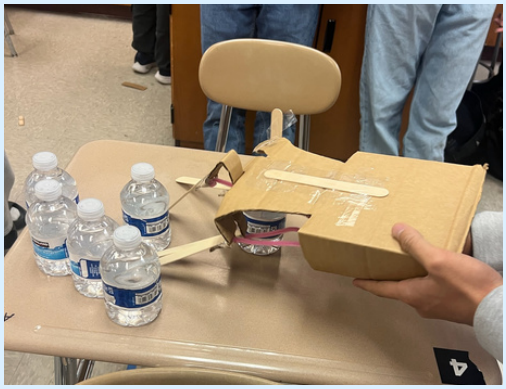
This lab consists of two simulations to demonstrate CRISPR-Cas9 gene editing, one using bioinformatics tools and the other using chemical reactions. In the first part, students use Benchling to digitally simulate the gene-editing process on the BRCA1 gene, a critical gene associated with breast cancer. They begin by importing the BRCA1 sequence, identifying Exon 11, and designing an optimized guide RNA (gRNA) to target a specific site for editing.

The second part introduces a chemical-based CRISPR simulation using color-changing reactions to model gene editing. Students use phenolphthalein, iodine, vinegar, and baking soda solutions to represent DNA mutations and corrections. The experiment demonstrates how an acidic solution (vinegar) mimics Cas9 cutting by neutralizing phenolphthalein's pink color, while iodine with starch represents a mutation. Adding a baking soda solution restores the original conditions, symbolizing successful gene correction.

3rd Meeting: Prosthetic Competition 12/17/24 | Cost: $42.62 | 12 members

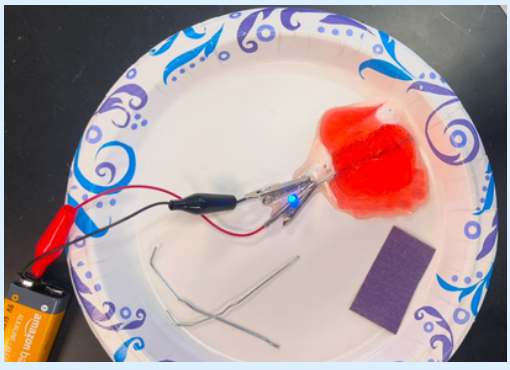
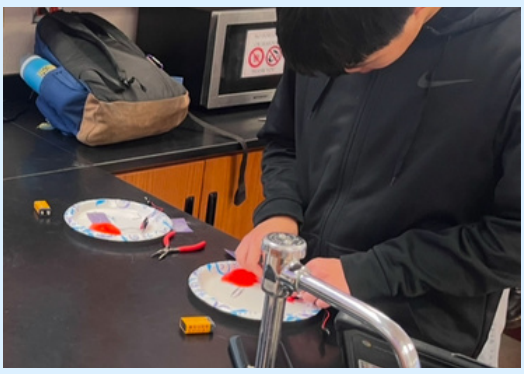
This meeting was an exciting fusion of engineering and biomedical science, where members utilized everyday materials to create prosthetic limbs. After an informational presentation about prosthetics, each team received a mix of cups, popsicle sticks, tape, string, pipe cleaners, and cardboard to create a working prototype. Popsicle sticks provided structure, pipe cleaners mimicked tendons, cardboard served as a sturdy base, and string was repurposed for pulley-like mechanisms. Once built, the prosthetics underwent a series of rigorous tests. The first challenge was picking up objects such as small water bottles. Then came the movement test, where prosthetics had to open a gently taped box, testing dexterity and control. Finally, teams launched small projectiles like paper balls. As the event wrapped up, the best prosthetic designs were crowned winners, with prizes awarded to teams that excelled in functionality, creativity, and biomechanics.





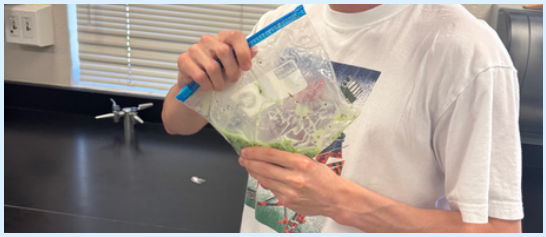
4th Meeting: Pacemaker Lab 2/18/25 | Cost: $94.98 | 12 members

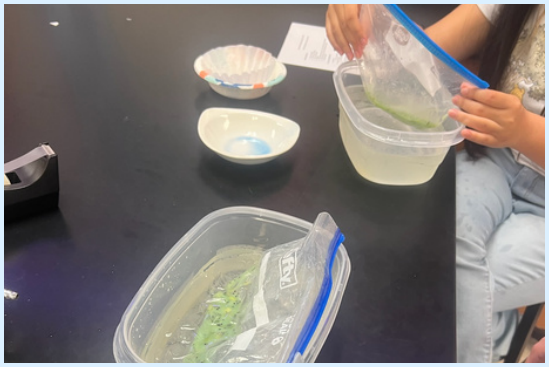
Members explored the function of pacemakers by constructing a working model using a gelatin heart and a simple electrical circuit. The gelatin hearts were constructed with Knox gelatin powder, food coloring, and salt to increase conductivity. To create the DIY electrical circuitry for this project, students cut, bent, and sanded paper clips to be embedded into the heart. This acted as a conductor to mimic the heart's natural electrical activity. Wires were carefully connected to a 9 volt battery-powered circuit via alligator clips, sending controlled electrical impulses to the gelatin, much like how a pacemaker sends signals to stimulate the heart's atria and ventricles to contract. Blue LED lights were also connected to the alligator clips to demonstrate the efficacy of students' design; if the light shone, the gelatin heart was experiencing the electrical current.

5th Meeting: DNA Extraction Lab 3/25/25 | Cost: $7.98 | 9 members

This hands-on experiment was organized to celebrate DNA Day 2025, giving students the opportunity to extract real DNA using everyday materials. We partnered with the National Human Genome Research Institute (NHGRI) to host this event. Although NHGRI was unable to display official events on their website this year, we collaborated with their team to create this meeting's activities. The experiment introduced students to the three key steps of DNA extraction with kiwis. To demonstrate cell lysis, the kiwi was mashed and mixed with an extraction solution that consisted of laundry detergent, salt, and water to break open cell membranes. Students cooled their kiwi in an ice bath to slow DNases, enzymes that break down DNA. Using a coffee filter, solid particles and seeds were separated, leaving behind a liquid full of genetic material. In the DNA precipitation stage, cold isopropyl alcohol was carefully added, causing the DNA to clump together and become visible as a stringy mass. Since DNA is insoluble in alcohol, this step allowed students to see the genetic material floating in their test tubes.





6th Meeting: Parkinson's Outreach 4/8/25 | Cost: $0 | All members

Recognizing the importance of patient advocacy, this meeting focused on community engagement and outreach. In collaboration with a local Parkinson's support center, our members created personalized handwritten cards for individuals living with Parkinson's disease, offering words of encouragement and support. Each member took the time to design and color their own card, incorporating personalized messages that reflected the insights they gained about Parkinson's disease through our learning section. Members were approached the task with sensitivity, understanding the importance of their messages in providing hope and connection to the recipients. This initiative served not only to foster a deeper understanding of the human side of biomedical science but also to highlight how research and technology ultimately serve to improve the lives of patients.

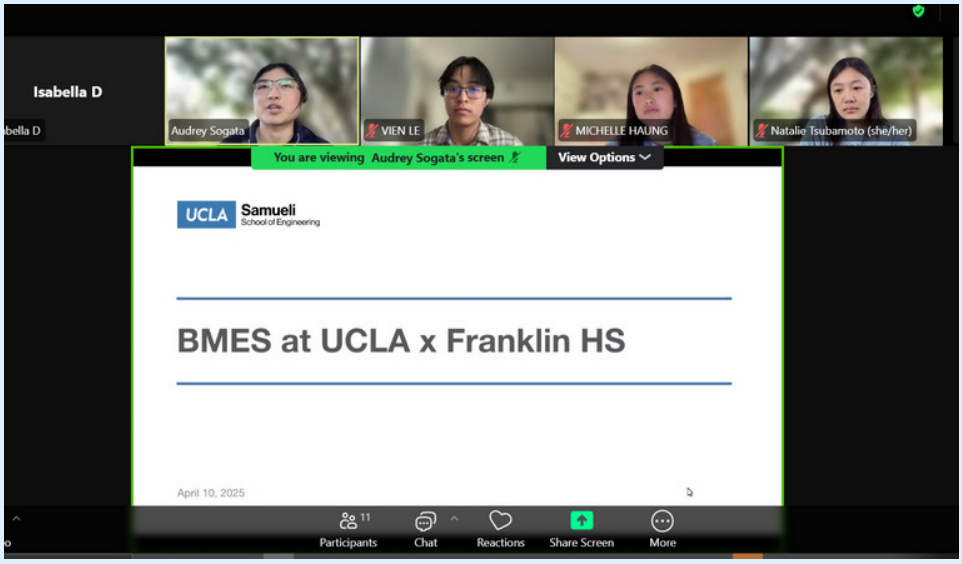
INTERCHAPTER ACTIVITIES

Cost: $0
All active members

Fostering meaningful connections with other Biomedical Engineering Society chapters has been an exciting and enriching part of our club's recent growth. This year, we have had the opportunity to engage in virtual interchapter meetings with two prominent university BMES chapters—UCLA and UC San Diego—allowing our members to broaden their understanding of biomedical engineering, explore collegiate opportunities, and strengthen our chapter's sense of community within the national BMES network.

UCLA Interchapter Meeting

Our meeting with the UCLA BMES chapter was a dynamic and insightful session. The event began with an overview of UCLA's club structure and the unique opportunities offered by their Bioengineering program. Their executive board shared detailed insights into how they organize their committees, plan major events, and maintain active engagement with their members and the broader biomedical community. This was followed by a Q&A panel featuring both undergraduate and graduate members of their chapter, which allowed our members to ask questions about research, internships, academic life, and transitioning from high school to college-level bioengineering programs. The panel created a comfortable and welcoming environment where students could learn directly from their peers and feel inspired by the possibilities of continuing in the field.



UCSD Interchapter Meeting

Our interchapter exchange with the UC San Diego BMES chapter provided an entirely different, yet equally valuable, experience. During this session, UCSD members showcased several of their club's ongoing projects. Their team walked us through the technical processes behind these projects, emphasizing interdisciplinary collaboration and real-world impact. In addition to the project presentations, they also conducted mini learning sessions to explain core bioengineering concepts that were integral to their work. This not only helped our members better understand the depth of the projects but also gave them practical knowledge that they could apply to their own interests and future initiatives within our chapter.

Both interchapter meetings emphasized the importance of collaboration and knowledge exchange in growing as future biomedical engineers. These events provided our members with a window into the collegiate BMES experience and sparked new ideas for our own chapter—from how we approach technical projects to how we can foster leadership and community. We plan to continue strengthening these interchapter relationships through future events, collaborative initiatives, and shared learning experiences. By building these bridges, we aim to create a supportive and inspiring network of young biomedical engineers who are committed to innovation, education, and making a meaningful difference in the field.

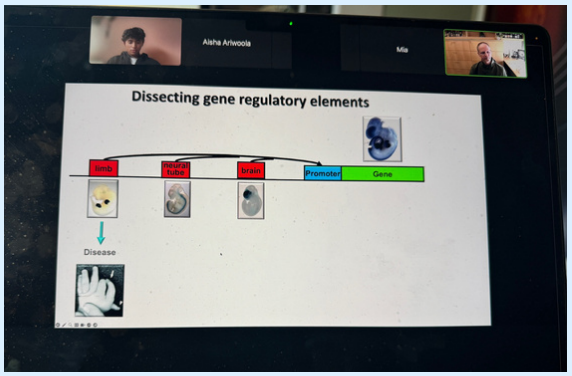
PROFESSIONAL & INDUSTRY DEVELOPMENT

Cost: $0 | All active members

Collaboration with Dr. Nadav Ahituv and his Research

In one of our most insightful collaborations, our club had the opportunity to interact with Dr. Nadav Ahituv, a distinguished professor in the Department of Bioengineering and Therapeutic Sciences at UCSF and the Director of the UCSF Institute for Human Genetics. Dr. Ahituv's research focuses on understanding how variations in gene regulatory elements contribute to human diversity and disease. Through his work, he is pioneering new ways to study genetic variations and their impact on human traits, diseases such as obesity, autism, and cancer, and responses to drug therapies.

During the event, Dr. Ahituv shared his groundbreaking work on massively parallel reporter assays (MPRAs), a technology that allows for high-throughput functional characterization of gene regulatory elements. This innovative approach has the potential to revolutionize disease diagnostics and therapeutic development, offering students valuable insights into the future of genetic research. His lab's focus on combining genomic technologies with human patient samples highlighted the importance of understanding genetic regulation in medicine and biotechnology.



Research Posters and Papers

In addition to competition-focused activities, our club provides valuable learning opportunities aimed at developing essential research skills through workshops on research paper and poster creation. In each of our regular meetings, we discuss one aspect of reading or writing a research paper, and we have an entire section of our website demonstrating such information.

Research Posters and Papers Continued

Each mini-workshop begins with an introduction to a different topic, like an in-depth look at how to read a research paper. We emphasize the importance of focusing on key sections to gain a deeper understanding of the study's purpose and findings. Students were taught how to efficiently navigate through the abstract, introduction, methods, results, discussion, and conclusion. The abstract provides a quick summary, while the methods and results sections help evaluate the study's direction, results, interpretation, and validity. In the discussion, students learned how to place the findings into a broader context, and the conclusion offered insight into the study's significance. With this approach, members gained the skills to read a paper thoroughly and critically, and we encouraged them to identify areas that were most relevant to their own research interests.

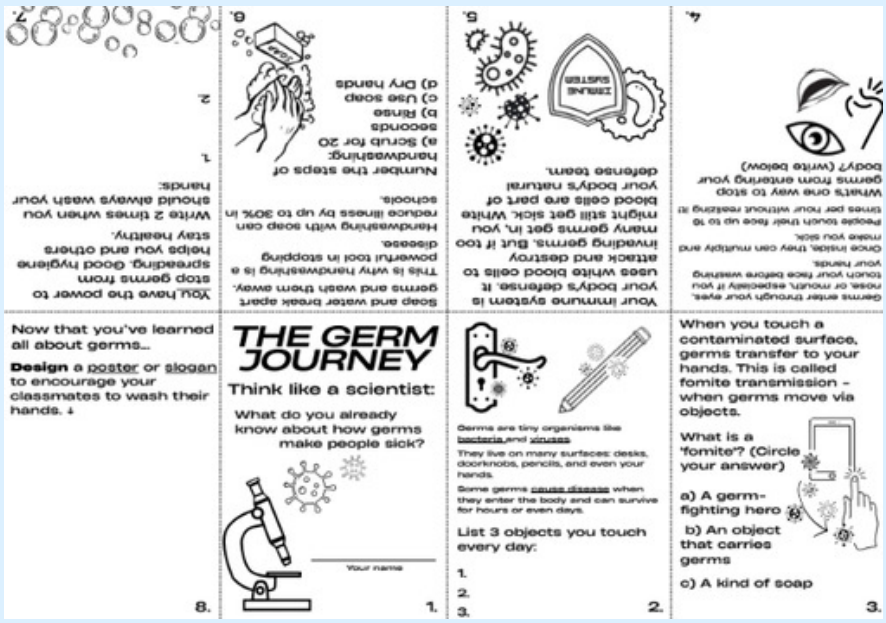
We also guided students on how to identify and utilize credible sources for their research. Journals like Nature, Science, The Lancet, and IEEE Transactions on Biomedical Engineering were highlighted as prime examples of peer-reviewed and reputable publications. This skill is essential for any researcher, as it guarantees that the information used is both reliable and relevant.

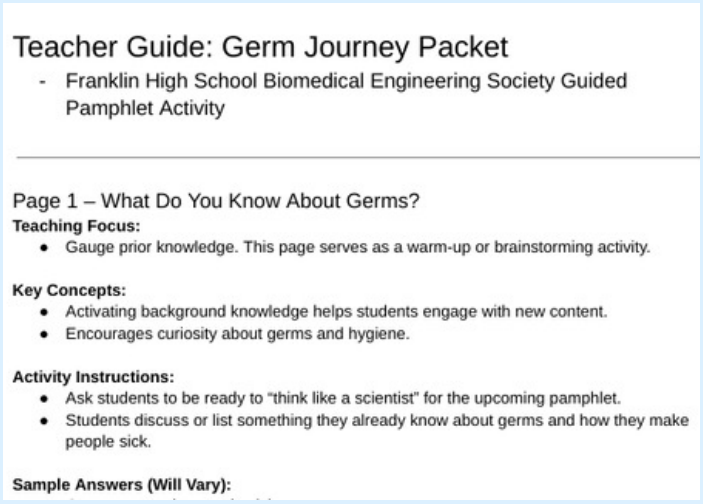
Beyond reading research papers, our workshops provided students with the tools necessary to write their own research papers and abstracts. We emphasized that writing a strong research paper involves gathering credible data, synthesizing findings, and presenting them in a clear, structured format. Students learned how to write an abstract that concisely summarizes the objectives, methodology, key results, and significance of their research. We worked with students to develop their skills in creating research posters, a crucial aspect of academic communication. Students learned how to present data clearly and concisely, breaking down complex information into digestible content for a diverse audience. By the end of each mini-lesson, participants were equipped with the knowledge and confidence to communicate their research effectively, whether through writing a paper or presenting at a conference.

We have also crafted a step-by-step guide to help students understand how to read and interpret scientific research papers and construct their own appealing and well-organized research posters

Elementary School Outreach- Pamphlet Designed to Teach the Process of Germ Transmission

The Franklin High School BMES Chapter is committed not only to educating our members but also to serving the broader community through meaningful, hands-on outreach. As a student-led organization passionate about health, science, and community service, we continually seek impactful ways to give back to local schools while fostering a love for learning in younger students. In line with this mission, we launched an elementary school outreach initiative to promote germ safety and hand hygiene—a topic particularly relevant due to the seasonal rise in cold and flu cases, an especially high transmission rate this year, and the anticipation of increased outdoor activity as children head into summer. We reached out to 11 elementary schools within our district to offer a simple yet enriching activity for students in grades one through six. Our team designed a foldable, interactive pamphlet that teaches the importance of handwashing and germ awareness through coloring activities, word games, and fill-in-the-blank sections. To ensure the activity would be easy for teachers to implement, our project coordinators also prepared a comprehensive teacher guide with instructions and key takeaways. This outreach is just one example of how our chapter uses education to build community connections. Through continued outreach with our elementary connections, we aim not only to teach important health habits but also to inspire curiosity in science and medicine at a young age, while demonstrating the power of student-driven service.





Teacher Guide: Germ Journey Packet

- Franklin High School Biomedical Engineering Society Guided Pamphlet Activity

Page 1 – What Do You Know About Germs?

Teaching Focus:

- Gauge prior knowledge. This page serves as a warm-up or brainstorming activity.

Key Concepts:

- Activating background knowledge helps students engage with new content.
- Encourages curiosity about germs and hygiene.

Activity Instructions:

- Ask students to be ready to "think like a scientist" for the upcoming pamphlet.
- Students discuss or list something they already know about germs and how they make people sick.

Sample Answers (Will Vary):

Library Learning Sessions

As part of our ongoing commitment to community outreach and science education, our BMES chapter is excited to introduce a new initiative this summer: a series of educational science lessons hosted at our local Franklin Public Library for elementary-aged children. These lessons are designed to be engaging, hands-on, and age-appropriate, aiming to spark early curiosity in STEM fields and make scientific learning both fun and accessible. Our club members will lead interactive sessions covering foundational topics such as basic circuitry, where students will explore how simple circuits work using batteries, lights, and conductive materials, and introductory anatomy, where they'll learn about major organs and body systems through models and creative activities.

Additionally, we will offer lessons on the discovery of germs, how they spread, and the importance of hygiene, using visual demonstrations to help kids understand these vital concepts in an age-appropriate way. Through these outreach efforts, we hope to not only educate and inspire young students but also foster a stronger connection between our club and the surrounding community. This initiative reflects our belief that scientific curiosity should be nurtured early, and that as future biomedical engineers, we have a responsibility to give back and help cultivate the next generation of thinkers and innovators.

SOCIETAL IMPACT & OUTREACH

Cost: $0 | All active members

Our club has continuously sought ways to bridge the gap between biomedical engineering and community service, which is at the core of our values. When considering the direction of our club at its original formation, our officers wanted to ensure that our efforts would extend beyond academic enrichment and would make a meaningful societal impact. Three of our most significant outreach initiatives were our school-wide donation drive, the Parkinson's cards project, and our elementary school outreach program, which reflect our commitment to patient advocacy, health education, and fostering a compassionate approach to science and engineering.

Donation Drive: Addressing Healthcare Disparities

One of our most impactful initiatives was the donation drive, which aimed to support underserved communities with essential medical and hygiene supplies. Recognizing the disparities in access to basic healthcare necessities, we organized a school-wide effort to collect items such as bandages, antiseptics, hygiene products, and over-the-counter medical supplies. Our project and general officer members researched local shelters, community clinics, and outreach programs to determine where our donations would have the most impact. Through this work, we encountered Chicks in Crisis and Hospitals for Humanity and were able to partner with organizations that serve individuals facing financial or medical hardships.

To maximize our community impact, we implemented a multi-faceted approach to raise awareness about our drive and goals and encourage donations. We created digital promotional materials such as Instagram posts and promotional stories, physical posters, school news promotions, and Google Classroom announcements to educate our peers about the importance of accessible healthcare resources. We also set up a designated, labeled drop-off location in our advisor's classroom to ensure ease of participation. Our club collaborated with the National Honor Society (NHS) chapter at our school, whose officers promoted our event and offered that each item donated would be worth ½ service hour, incentivizing all NHS members to donate.

Beyond the tangible donations and hours earned, this initiative played a key role in raising awareness within our school community about healthcare disparities. Many students who participated in the drive gained a deeper understanding of the everyday challenges faced by those with limited access to healthcare. The drive not only reinforced the importance of community-driven solutions in addressing public health issues but also empowered our members to take an active role in improving health equity. The act of giving and engaging in conversations about medical accessibility strengthened our collective sense of social responsibility, demonstrating that biomedical science is not just about technological advancements but also about ensuring those advancements reach the people who need them most.

Chicks in Crisis

Hospitals for Humanity

Elementary School Outreach: Education & STEM Engagement

In addition to our patient-centered advocacy, our club also recognizes the importance of health education and early exposure to STEM concepts. With this in mind, and understanding that younger students benefit from interactive and engaging learning experiences, we launched an elementary school outreach initiative aimed at promoting germ safety and hand hygiene and designed a foldable, activity-based pamphlet that teaches the importance of handwashing and germ awareness. This educational tool incorporated coloring activities, word games, and fill-in-the-blank sections, making the learning process fun and accessible for all students.
Our outreach efforts extended beyond simply distributing materials; we proactively contacted 11 elementary schools within our district, offering to provide not only the pamphlets but also a comprehensive teacher guide to ensure the activity could be easily implemented in classrooms. We wanted to make participation as seamless as possible, so we offered to print and deliver all materials based on each school's student count. Additionally, we encouraged feedback and customization requests, allowing schools to tailor the activity to their specific needs.

This initiative was more than just an exercise in health education, it was an opportunity to inspire curiosity in science and medicine at a young age. By discussing the science behind germs and proper hygiene, we helped students understand the role of microbiology in everyday life. Furthermore, by positioning this lesson within a biomedical engineering club's outreach, we subtly introduced the idea that science is not just something studied in textbooks but is a field that actively improves lives.
Our elementary outreach program demonstrated the power of student-led service in fostering a healthier and more informed community. By providing a simple yet impactful resource, we were able to equip young students with knowledge that could benefit their personal health while also sparking an early interest in STEM. As we continue our outreach efforts, we hope to build lasting relationships with local schools and hopefully community centers as well, continuing to reinforce the idea that science is a tool for positive change that begins with education and engagement.

Parkinson's Cards Initiative: Advocating for Patients

Similarly, our Parkinson's cards initiative served as a testament to the human and personal side of biomedical engineering and patient advocacy. In collaboration with a local Parkinson's support center, we designed an outreach effort to bring encouragement and connection to individuals living with Parkinson's disease. Our members took the time to create and personalize handwritten cards, decorating them with care and crafting messages that helped convey warmth, encouragement, and support.

Unlike a standard letter-writing initiative, this project was intentionally interactive and educational. Before creating the cards, members learned about Parkinson's disease through an educational presentation, gaining a better understanding of the condition and its impact on daily life. This knowledge informed their messages, making them more personal and empathetic. Some members included words of encouragement based on what they learned, while others referenced their admiration for the resilience of individuals navigating neurodegenerative conditions.

In addition to writing heartfelt messages, members also used creativity in designing their cards. Many included colorful illustrations and intentional, uplifting quotes to make each card feel unique and personal.

To us, this project also reinforced the importance of patient-centered approaches in biomedical science. While research and technology play a crucial role in treating diseases, initiatives like these emphasize the significance of emotional and psychological support for patients. The experience was a reminder that all of our members, as future scientists, engineers, and medical professionals, must always be guided by empathy and a dedication to improving lives beyond just the clinical or technical aspects.

NATIONAL BMES MEETING

Unfortunately, due to age limitations and transportation issues, members of our club were not able to attend the National BMES meeting this year. However, a variety of our club members plan to continue their endeavors in scientific research and presentation by submitting their research to the BMES high school research poster competition in the following years for a chance to compete at the National BMES Meeting and potentially network with research professionals.

BMES
BIOMEDICAL ENGINEERING SOCIETY

SOCIAL ACTIVITES

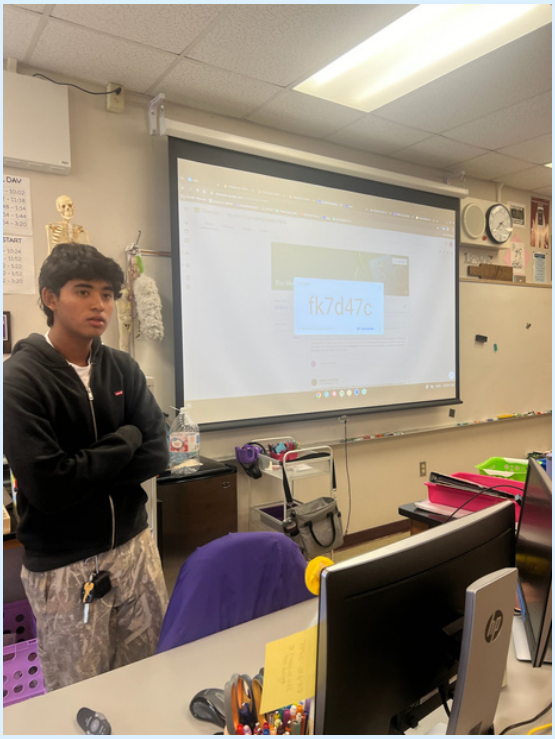
Cost: $0 | All active members

Club Rush

Our BMES chapter participated in our school's annual Club Rush, an event where clubs showcase their mission and activities to new students. We set up a booth where officers talked to students about our activities and purposes a club. Our booth was adorned with sign up sheets and QR codes that led students to our Remind sign up as well as a document with more information about our club. As a result, we successfully recruited over 70 members to our Google Classroom, at least 15 of which have have been continuously active members.

Introductory Meeting

Members were introduced to bioengineering and the fascinating prospects in the subject at our introductory meeting, which set the tone for the year. We gave an overview of our objectives, forthcoming laboratories, contests, and outreach activities. In addition, our officers shared information about BMES's objectives, activities, and opportunities for student chapters and individual professionals in relevant industries.



BMES Boba Run

Over 10 members participated in a boba run at our local boba shop, Hyper Tea, aiming to celebrate our wins and boosting club spirit. In the aim of creating stronger bonds in our leadership team and member base, all attendees participated in fun games such as Guess Who and Uno.

BMES Halloween Retreat

Members were welcome to celebrate Halloween together by carving pumpkins and going trick or treating together. Also participating in a horror movie marathon; members bonded through sharing snacks. All participating members also brought one fun fact about pumpkins or Halloween to the meetup, helping to still introduce some aspects of science while having fun.

FUTURE DIRECTIONS

The Franklin High School BMES Chapter has established itself as a club dedicated to both education and service, consistently finding innovative ways to engage students while making meaningful contributions to the broader community. However, we believe our greatest impact lies ahead. Our mission is not only to sustain our current efforts but to expand, deepen, and institutionalize them so that this club continues to thrive for years to come. With this goal in mind, we have outlined a series of ambitious initiatives that will propel us forward. These initiatives act as a mission statement for our next years of operation and span four key areas: hands-on biomedical education, mentorship and professional development, community outreach, and interdisciplinary collaboration. By strengthening our presence both within our school and in the larger scientific community, we aim to leave a lasting legacy that future members can build upon.

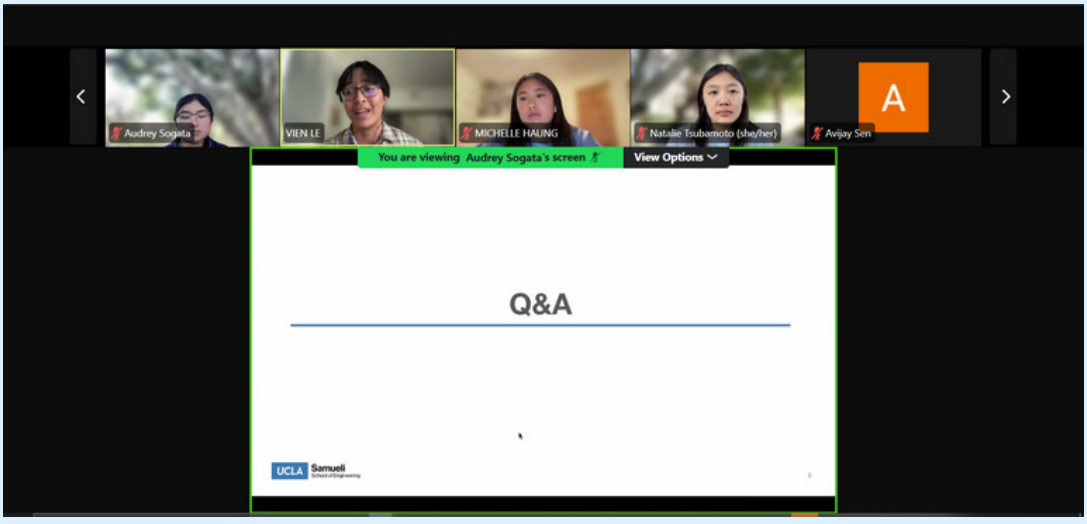
Real-World Biomedical Engineering Experience

One of our club's defining features is our commitment to hands-on learning. We have already conducted innovative, student-created labs, but we recognize that to truly prepare our members for careers in biomedical engineering and related fields, we need to expose them to the tools and techniques used by professionals. In the coming year, we aim to introduce more labs that involve actual biomedical machines and diagnostic equipment, including medical imaging technology, biosensors, and microfluidic devices. Our goal is to provide students with a tangible understanding of how biomedical devices work and how they can be applied in real-world medical settings. To achieve this, we are working on establishing partnerships with local universities and medical facilities to secure access to specialized equipment as well as applying for grants that could fund our investments. Additionally, we plan to introduce more case study-driven labs, where students can analyze theoretical patient case files and use biomedical techniques to propose solutions. This will strengthen problem-solving skills and prepare members for interdisciplinary thinking required in the medical field.

Connections with Hospitals and Universities

Many of our members are eager to pursue careers in biomedical fields, yet lack guidance on navigating research opportunities, college applications, and career pathways. To address this, we are actively working to establish a mentorship program that connects our members with professionals in the field. We have already begun reaching out to local hospitals and universities to explore collaboration opportunities. Ideally, such a program would pair students with mentors, such as graduate students, university professors, medical professionals, or biomedical engineers, who can provide career insights, research opportunities, and professional development advice. We understand that such an intricate goal could take months or years to develop, but our long-term vision is to formalize this mentorship program into a structured system where students can shadow professionals, assist with ongoing research projects, and gain first-hand exposure to biomedical engineering applications.

To further integrate our club into the broader biomedical engineering community, we have initiated continued outreach to BMES chapters at universities across California, creating bonds with chapters and alumni at schools like UCLA. Our goal is to create a mutually beneficial partnership where we can exchange knowledge and collaborate on projects. University students can serve as guest lecturers for our meetings, sharing research experience and advice while we can assist with their outreach programs by connecting them with younger students who are interested in STEM. By forging these connections, we aim to create a pipeline where high school students interested in biomedical engineering can transition into college-level programs with a built-in support network.



Organizing a School-Wide STEAM Conference

Science, technology, engineering, art, and math education is most impactful when it is interdisciplinary, which is why we are currently collaborating with other on-campus clubs such as Mathletes and STEM For Girls to host a STEAM conference or fair. This event is set to be held at the end of April on our school campus and will bring together students from diverse academic backgrounds to showcase their projects, present research, and participate in hands-on workshops and fun events.

By including the arts in our event, we hope to highlight the creative and human-centered aspects of science and engineering. For example, biomedical visualization, medical illustration, and prosthetic design all involve an artistic component that is crucial to innovation yet often dismissed or underrepresented. Our goal is to create an event where students can see the intersection of these fields and gain a deeper appreciation for how different disciplines contribute to advancements in medicine and technology.

Strengthening and Expanding Our Charitable Efforts

Finally, we are committed to sustaining and expanding our donation drives and card-writing initiatives. These projects have had a tangible impact on patients and underserved communities, and we want to ensure that they continue to grow.

To increase our reach, we plan to involve a larger segment of our county community, seeking support from local businesses, hospitals, and other organizations. By securing additional funding and donations, we can scale up our efforts, providing more supplies to those in need and reaching more patients with our cards of encouragement.

We also want to explore new ways to support patients beyond donations and letters. One idea is to develop educational resources or interactive activities that can be distributed to hospitals and rehabilitation centers. This would allow us to combine our passion for science with our commitment to making a difference in people's lives.

CURRENT GOAL ACHIEVEMENTS

Competitions

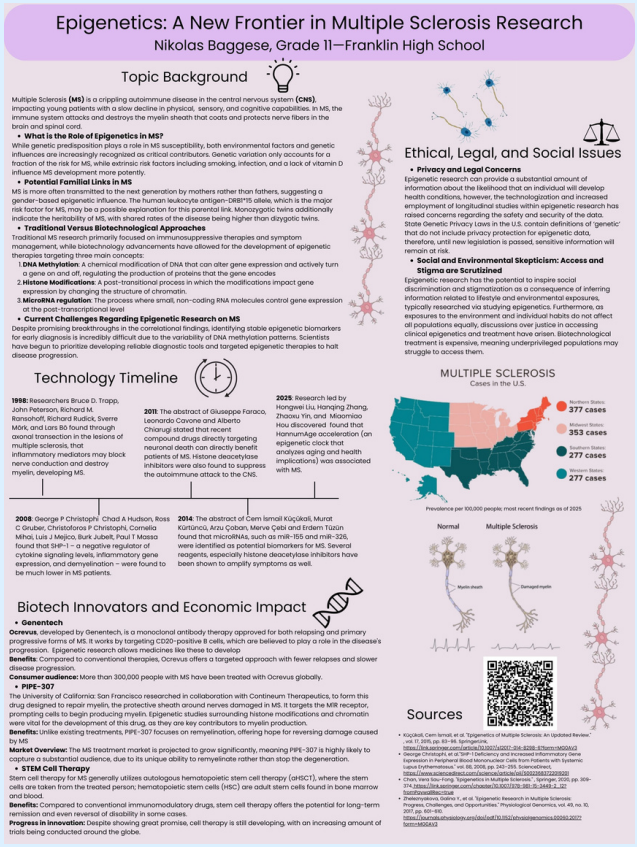
As a club, we focused on providing our members with various opportunities to grow and develop in the fields of biomedical engineering and biotechnology. We began by recommending prestigious competitions such as MIT Think, the Teen Biotech Challenge, and other academic contests, aiming to expose our members to challenging experiences that would further enhance their skills and knowledge. Additionally, we encouraged members to apply to different summer programs and internships, which could offer hands-on research opportunities, industry experience, and invaluable networking.

BioHESC

One of the most notable accomplishments this year was the participation of four of our members in UC Berkeley's BioHESC competition. Our team, consisting of Aisha Ariwoola, Isabella D'Augostine, Irina Salvador, and Avijay Sen, decided to explore the potential of Vagus Nerve Stimulation (VNS) as a cutting-edge bioelectronic therapy for treating chronic conditions. VNS, which uses electrical impulses to stimulate the vagus nerve, has shown promise in treating conditions like epilepsy and depression. Our team designed a dual chamber vagus nerve stimulation system. The first chamber is attached to the cranial nerve X at the lumbar level, stimulating the vagus nerve to promote the revitalization of the gut-brain axis. The second chamber was created with the implementation of nanotech biosensors that detected the presence of biocomponents like short chain fatty acids, hydrogen sulfide, and c-reactive protein cytokines. This information would be sent through a machine learning model to update the stimulation parameters in real-time, providing personalized, compassionate healthcare. We also aimed to develop a more efficient and accessible VNS device that could potentially help a broader range of patients, including those with neurodegenerative diseases such as Alzheimer's. With the guidance of a UC Berkeley graduate student, our team worked diligently to design and prototype this device, ensuring it could deliver precise, adjustable electrical stimulation while being minimally invasive and cost-effective. This experience not only challenged our technical skills but also emphasized the importance of interdisciplinary collaboration and innovative thinking in solving real-world healthcare problems.

Teen Biotech Challenge

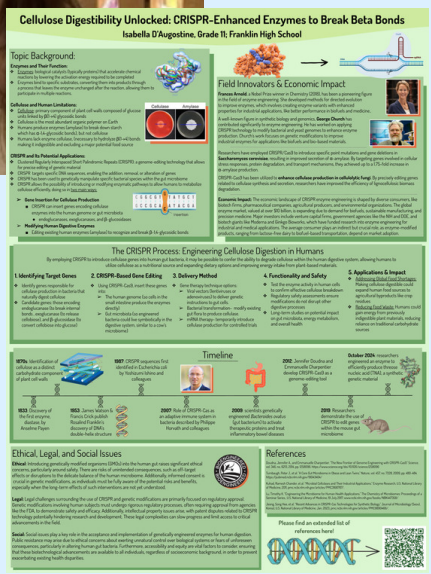
Multiple students from our club submitted poster applications to UC Davis' Teen Biotech Challenge which requires that participants study a concept in a specific area of biotechnology. From there, all students craft a poster submission that includes background on the subject, field innovators and applications, a timeline of the subject's history, and ethical, social, and legal issues. Our club had four students submit posters, all in different categories. Avijay Sen focused on microbes as biomarkers for early cancer detection and the implication of using Machine Learning for prediction and detection. Isabella D'Augostine researched the potential of CRISPR-Cas9 in editing sucrase, an enzyme in the digestive system that processes sucrose, or starch, to be able to break down the β-1,4-glycosidic bonds in cellulose. Humans currently do not possess an enzyme to break down cellulose, limiting the kinds of plants that we are able to eat. Collin Liang explored the novelties of ozempic and its ability to block the GLP-1 receptor in the pancreas. Nikolas Baggese submitted our club's final poster, detailing the increasingly clear connection between multiple sclerosis (MS) and epigenetics.



Hospital Volunteering

Our club is also committed to direct medical outreach. Our members Elza Tse and Ethan Cline regularly volunteer at local hospitals through a junction with FrHS BMES. Serving the community in such a way not only allows us to gain greater insight into the field of medicine and biomedical applications, but opens our eyes to the actual experiences that many patients face every day.

MEMBER SPOTLIGHTS

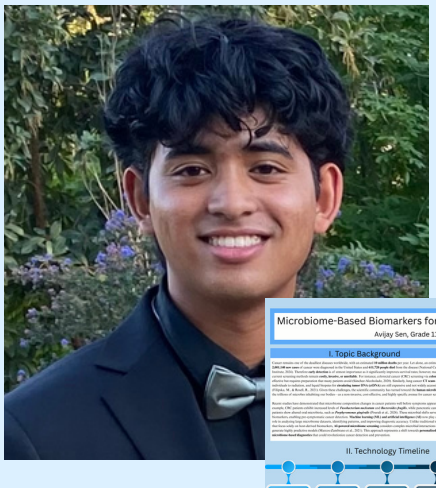


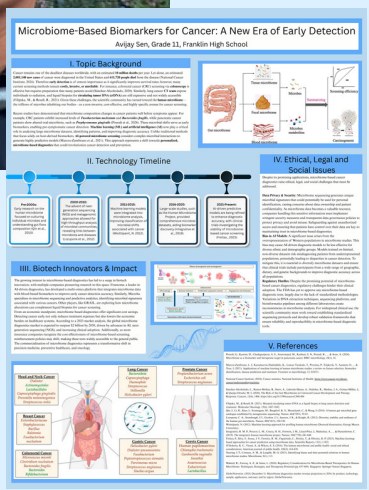
Isabella D'Augostine

Isabella D'Augostine participated in the 2025 Teen Biotech Challenge and emerged as the first place winner last year in the Molecular Tools: Nanobiotechnology, Synthetic Biology & Genetic Engineering category. She has also participated as a group member for the BioHESC competition and creation of the Vagus Nerve stimulation device. Last summer, she worked closely with a UC Berkeley graduate student, where she contributed to pioneering work in gut dysbiosis and its relation to traumatic injuries in communities of color.

Avijay Sen

Avijay Sen has participated in the 2025 Teen Biotech Challenge and in the BioHESC program, where he gained invaluable research experience. Additionally, he further honed his research skills with a Safebeat internship, contributing to their novel predictive ECG technology. Avijay has also been published in several conference-level papers on cardiology. In addition to his research achievements, he attended last year's Harvard Vision Global Health Leadership Conference and is returning this year.





Nick Thao

Beyond being a member of FrHS BMES, Nick Thao has the role of President of Destined Doctors, another student-led organization aimed at inspiring future physicians. Under his leadership, the group expanded its reach through educational events and community health initiatives. In collaboration with BMES members, Nick organized a successful high school wide blood drive. Additionally, he was able to shadow a plastic surgeon, gaining cynical exposure.

Aisha Ariwoola

Aisha Ariwoola participated in the BioHESC program, where she engaged in research and collaborated with professionals in the biomedical engineering field. Her dedication to engineering extends beyond the lab and even science itself. She was also selected for the prestigious Rail Innovation in Action program. There, Aisha worked alongside MIT engineers and sustainability leaders to explore forward-thinking solutions in transportation.

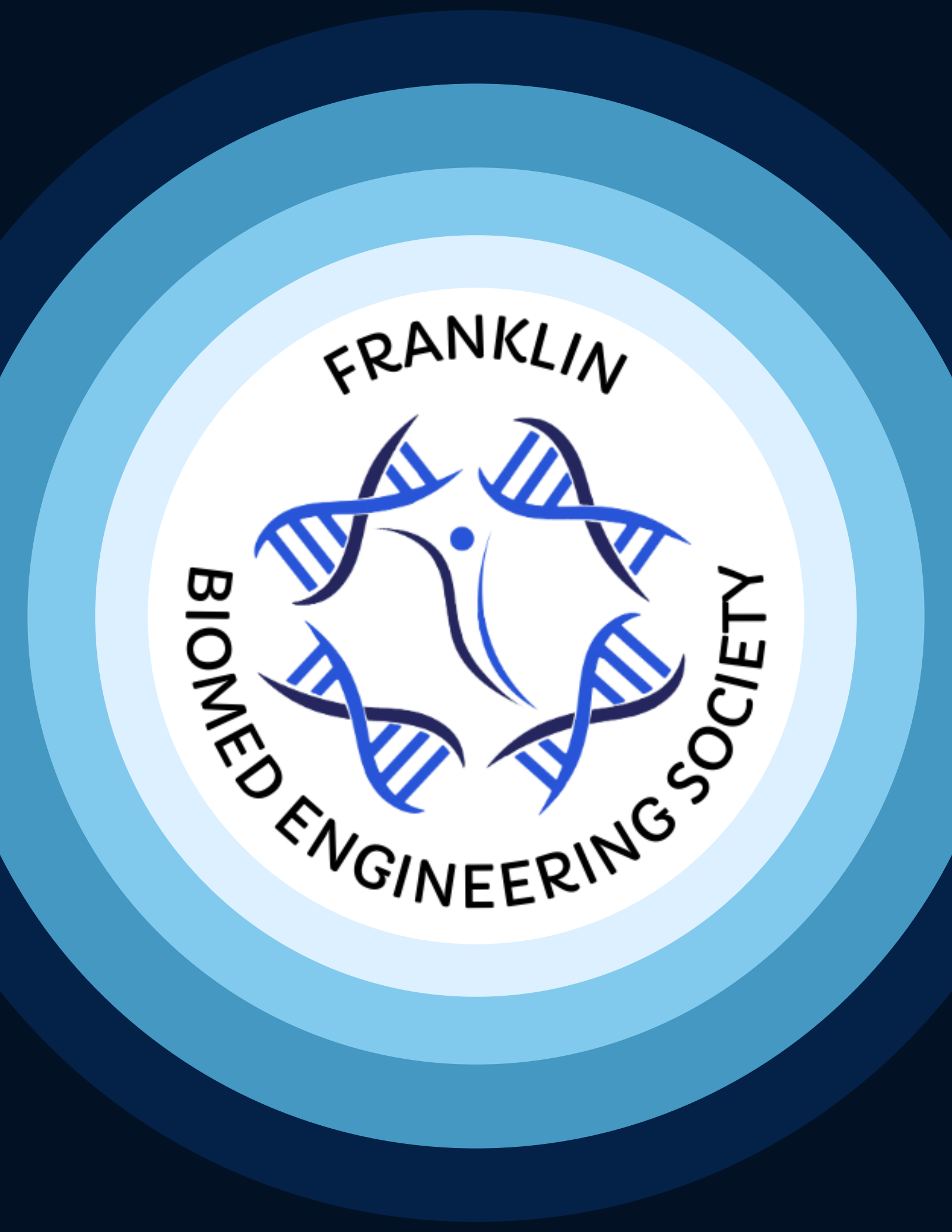
Irina Salvador

Irina Salvador participated in the BioHESC program, where she engaged in research and collaborated with professionals in the biomedical engineering field. Her scientific curiosity is matched by her leadership potential. Irina is set to attend the prestigious Auxiliary Girls State summer program, a selective government and leadership experience that empowers young women to explore civic engagement and public service.

CLOSING STATEMENT

As our Biomedical Engineering Society chapter continues to grow, we are proud of the foundation we've built and the vision we share for the future. From technical projects and fundraising events to interchapter connections and community outreach, each initiative reflects the dedication, curiosity, and collaborative spirit of our members. What sets our club apart is not only what we've accomplished, but how deeply invested our team is in the journey ahead.

Every student featured in this application gave their full permission to be included, as they're genuinely proud to be part of this chapter and excited to see how it develops. This enthusiasm drives us forward and keeps our mission strong: to make biomedical engineering accessible, meaningful, and impactful for both our members and the wider community. We're just getting started.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