



Chapter Development Report

Clemson University Biomedical Engineering Society

June 2015-June 2016

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Executive Summary

The student chapter of BMES at Clemson, broken into two groups, one for graduate students and one for undergraduate students, worked in the 2015-2016 school year to support its members in all endeavors outside of their “main” focus. For graduate students, that main focus is research, and for undergraduate students, the main focus is coursework. The areas of focus for the Clemson BMES student chapter are 1. Professional development, 2. Social Engagement and 3. Service Engagement. Student professional development was supported through a strong representation at the BMES annual meeting as well as through programs with members of various biomedical industries in the Upstate of South Carolina. Students became engaged socially, both amongst peers and with the students, faculty and staff, through football tailgates, board game nights, intramural sports and cooking contests in the Bioengineering building. Students became engaged through service by participating in outreach programs for elementary students and senior citizens. The student chapter of BMES also worked in 2015-2016 to promote the ideals of the national chapter of BMES through inter-chapter programming. Clemson and Georgia Institute of Technology partnered again this year to organize a local “Biomaterials Day.” Biomaterials Day served as a forum for students and faculty from research institutions in the Southeast to discuss breaking topics in the biomaterial branch of biomedical engineering. As we close the book on the 2015-2016 school year, Clemson BMES students are focusing on future improvements centered in increased student engagement.



June 1, 2016

Biomedical Engineering Society (BMES)
8201 Corporate Drive, Suite 1125
Landover, MD 20785-2224

To the Student Award Committee Members,

At Clemson University, the BMES student chapter works to give students opportunities to grow in areas outside of the classroom and research lab. The Clemson Bioengineering Society (CBS) supports student needs in professional development, social engagement and service. Through professional development, CBS strives to strengthen the biomedical workforce by preparing students for a career in the biomedical field. This goal was met through interview workshops, industry lunch and learns, and the 6th annual Biomaterials Day, a collaborative event with Georgia Tech. Through social events like tailgates, game nights, cooking competitions and intramural sports, CBS strives to connect students with their peers to build lasting personal relationships that may one day develop into professional ones. CBS gave students the opportunity to promote the biomedical field to all walks of life through service events with elementary school, middle school and high school students and senior citizens to expose biomedical innovation happening at Clemson.

Moving forward, the CBS and will evaluate the mentoring program. The mentoring program has traditionally been between graduate students and undergraduate students, but this structure may no longer reach the needs of bioengineering students. Instead, a more professional-facing mentorship program that leverages the Clemson Alumni network to connect students with members of industry. This program could set students on the proper path to their career goals before graduation, which should be the role of any collegiate department.

The professional development and social branches of the CBS has already began planning an event for the fall semester of 2016 to help strengthen the bond between biomedical alumni in industry and bioengineering students. The CONNECT Day, a Bioengineering-focused career fair, is scheduled to take in September and will host several representatives from biomedical industries in the southeast. During homecoming weekend in October, Clemson bioengineering students and alumni will be breaking bread together over a pig roast. Through these two fall events, the CBS will help students strengthen their network, a deliverable value that falls under the responsibility of a BMES student chapter.

The CBS would like to extend an enthusiastic thank you to the national BMES organization for its tireless efforts to promote student growth within the biomedical field.

Sincerely,

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I. Administration Report

In the Clemson University Bioengineering Department, student research interests and skill sets vary across many science and engineering disciplines. In addition to the Biomedical Engineering Society, Clemson Bioengineering students also belong to IEEE, ORS, TERMIS, and SFB. To cater to the entirety of student professional society interests, the Clemson Bioengineering Society (CBS) was created. CBS also acknowledges the difference in needs between undergraduate and graduate students. As a result, the Undergraduate Clemson Bioengineering Society (UCBS) was created to cater to the specific needs of undergraduate bioengineering students at Clemson.

Ia. Officers

Officer Position	CBS Member Name and Email	UCBS Member Name and Email	Officer Responsibilities
President	Chris deBorde cdebord@g.clemson.edu	Joseph Wortkoetter jwortko@g.clemson.edu	<ul style="list-style-type: none"> Organize officer and general assembly meetings Mentor president elect
President Elect	Alex Bina abina@g.clemson.edu	Anna Lu Carter acarte6@g.clemson.edu	<ul style="list-style-type: none"> Learn logistics of organizing chapter
Vice President	Astha Khanna akhanna@g.clemson.edu	Eric Schatzer eschatz@g.clemson.edu	<ul style="list-style-type: none"> Maintain online database of student members
Secretary	Ali Welch aewelch@clemson.edu	Kaitlyn Hackathorn khackat@g.clemson.edu	<ul style="list-style-type: none"> Maintain and distribute meeting minutes
Treasurer	Laura McCallum lemccal@clemson.edu	Shannon Wood slwood@g.clemson.edu	<ul style="list-style-type: none"> Maintain budget
Professional Development/ Networking Chair	Breanne Przestrzelski bprzest@g.clemson.edu	Clayton Compton compto3@g.clemson.edu	<ul style="list-style-type: none"> Organize professional development activities
PULSE Chair	N/A	Cat Demos cdemos@g.clemson.edu	<ul style="list-style-type: none"> Plan PULSE events
Social Chair	Fernanda Guerrero fguerra@clemson.edu	Tri Vo huuv@clemson.edu	<ul style="list-style-type: none"> Organize social events to improve member participation
Outreach Chair	Margarita Portilla mportil@g.clemson.edu	Tim Harmon tbharmo@g.clemson.edu	<ul style="list-style-type: none"> Organize events to bring BME to Clemson community
Fundraising Chair	N/A	Sharon Olang olang@g.clemson.edu	<ul style="list-style-type: none"> Work with treasurer to build funds
Newsletter Chair	N/A	Mariah McMinn mmmcmmin@g.clemson.edu	<ul style="list-style-type: none"> Take pictures and write articles about events
Intramural Chair	Sarah Helms smhelms@g.clemson.edu	N/A	<ul style="list-style-type: none"> Organize fundraisers Organize intramural teams



Graduate School Government Senate Members	Danny Odenwelder dodenwe@clemson.edu Eric Wright ebwrig@g.clemson.edu	N/A	<ul style="list-style-type: none"> Maintain correspondence between student chapter and Clemson graduate school government
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Ib. Membership

	BMES Members	Students in BIOE Dept.	% BIOE students in BMES
Undergraduate	Est. 20	338	6%
Graduate	34	68	50 %

Ic. Executives and General Body Meetings

General Meeting and Events

Date	Attendance	Event Title	Event Type
9/5/15	17	Tailgate-Wofford	Social
9/12/15	13	Tailgate-App State	Social
9/16/15	5	PULSE-Dr. DesJardins	Prof. Dev.
9/21/15	5	PULSE-Dr. Naren Vyavahare	Prof. Dev.
10/3/15	21	Tailgate-Notre Dame	Social
10/6/15	5	PULSE-Dr. Kwartowitz	Prof. Dev.
10/20/15	5	PULSE-Dr. Benson	Prof.Dev.
10/26/15	32	General Body Meeting	General
11/4/15	10	Officer Meeting	Officer
11/7/15	16	Tailgate-Florida State	
11/9/15	25	General Body Meeting	General
11/12/15	5	Prof Dev Lunch-Dr. King	Prof. Dev.
11/19/15	5	Prof Dev Lunch-Maria Oden	Prof. Dev.
12/3/15	5	Lunch-Dr. Willey	Prof. Dev.
12/15/15	8	STEM Outreach-Innovation and Entrepreneurship Panel	Service
1/8/16	10	Officer Meeting	Officer
1/15/16	13	Game Night	Social
1/21/16	5	Lunch-Dr. Afonin	Prof. Dev.
2/14/16	11	Valentine's Cards for the Elderly	Service
2/23/16	5	PULSE-Dr. Dean	Prof. Dev.
2/25/16	12	Undergraduate Engineering Expo	Service
2/25/16	5	Lunch-Dr. El-Baz	Prof. Dev.
2/26/16	15	Chili Contest	Social



2/29/16	10	Graduate Interview Workshop	Prof. Dev.
3/3/16	5	Lunch-Dr. Kwon	Prof. Dev.
3/10/16	5	Lunch-Dr. Woodell-May	Prof. Dev.
3/24/16	40	Career Panel	Prof. Dev.
3/24/16	5	PULSE-Dr. LaBerge	Prof. Dev.
3/31/16	5	Lunch-Dr. Mezey	Prof. Dev.
4/11/16	20	General Body Meeting	General
4/16/16	2	EMAG!NE Design Challenge Tour	Service
4/18/16	19	Pie Contest	Social
4/21/16	5	PULSE-Dr. Harcum	Prof. Dev.
4/21/16	5	Lunch-Dr. Bolding	Prof. Dev.
4/28/16	17	Lunch and Learn- Rebecca DeLegge	Prof. Dev.

Id. Meeting Agenda Example

4 Nov 15 CBS Officer Meeting Agenda

1. Intramural Water polo congratulations
2. BMES-Chapter Development Report (see below)
3. Event/Program Planning
 - a) Service:
 - i. undergrad mentoring (set up meeting with UCBS big wigs)
 - ii. BIOMED related (“outreach”)-high schools, senior homes, etc
 - iii. Non-BIOMED (“service”)-Habitat for Humanity, Oconee Humane Soc.
 - b) Prof Dev:
 - i. Networking
 - ii. Interview skills
 - iii. Writing
 - iv. Accounting/financial skills
 - v. Communication
 - vi. Internship
 - c) Fundraising:-what do we have and what do we need?
 - i. Apparel sale-bring clothes/pics to general meeting
 - ii. Contests-food eating, fastest pipette in the west, etc
 - iii. Raffles (during seminar!)
 - iv. Restaurant fundraisers (partner w/ UCBS)
 - d) Social
 - i. Food-plan for Thanksgiving (2 weeks!), monthly potlucks after that
 - ii. Travel-hiking (partner w/ GSG)
 - iii. Games-weekly? Video vs board?
4. Conference Chair?
5. Next meetings
 - a) General: 9 Nov (after seminar)-need to advertise
 - i. Goal: each chair pitches their endeavors, builds committees
 - b) Officer: 18 Nov (Wed @ noon, CBS lounge)



II. Treasury Report

Financial Summary

For the 2015-2016 school year, the CBS treasurer along with the cabinet and committees reviewed allocation of funds each month and approved funding together. Each year, main fundraisers include personalized lab coat sales, Clemson Bioengineering t-shirt sales, and monitoring the Rhodes restroom on football Saturdays. The 2015-2016 school year required funding for:

1. Initial Lab Coat Sales Cost (lab coat cost, personalized embroidery, etc.)
2. Professional Development (invited speakers, conference registration, etc.)
3. Social Activities (tailgates, potlucks, game nights, etc.)

During the 2015-2016 school year, funds were allocated as follows:

4. Initial Lab Coat Sale Cost (\$1,549.30)
5. Professional Development: (\$478.13)
6. Social Activities: (\$644.48)

Through vigorous fundraising, our chapter was able to continue providing funding for professional development and social events for our members:

7. Fundraising: (\$2,498.56)

Fundraising is done in many forms through CBS. Apparel sales, including Clemson Bioengineering-specific apparel, are a big wintertime fundraiser for CBS members as well as their families. Perhaps our biggest fundraiser comes from the athletic department, where we open and supervise our building during home football games to allow fans to use the restroom. This is a great fundraiser for us as we can let fans see the inside of our building, all while we enjoy tailgates that are discussed in our social activities section. Finally, department-wide lab coat sales are a great way for CBS to get money. It is a way for all labs in the department to get proper (and professional-looking) protective equipment, all while aiding the organization.

Balance Sheet

The CBS account is carefully maintained, balanced and budgeted by the Chapter Treasurer. The balance sheet for the account is as follows:

CBS Account 2015-2016 School Year	
Beginning Balance	\$5,393.18
Withdrawals	\$4,099.00
Deposits	\$4,814.44
CURRENT BALANCE	\$6,101.62

III. Chapter Activities

IIIA. Industry and Professional Development Activities

Abstract: It is the goal of the professional development committee to provide opportunities for students to gain experience in preparation for life after graduation. For CBS, this goal was achieved in the 2015-2016 calendar year by inviting professionals from outside Clemson to improve cross-pollination of professional experiences. Professionals from academia, industry and medicine met with students in formal and informal environments to share their wisdom.

I. Graduate Interview Workshop

Four industry professionals from local companies and two professors from the BioE department were invited to participate in the interview workshop. Each student was paired with either a professional and went through a mock interview. Students were provided with a video recording of their interviews and feedback sessions for follow-up self-analysis. The graduate students gained knowledge and experience for real interviews.

Graduate Interview Workshop	3:30-5:00 PM, 2/29/16 Rhodes Annex Room 111	10 graduate student attendees
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II. “Lunch and Learn”

Rebecca DeLegge, CEO of DeLegge Medical was invited to speak with students about her career path. Discussion topics included were how she handled interviews, what advice she had for students looking for jobs, and how and why she started her own company. Students found the “Lunch and Learn” to be informative and were pleased with it overall. In the future, industry professionals will continue to be invited with different backgrounds to participate in this type of event.



Undergraduate and graduate students listen to career advice from CEO Rebecca DeLegge.

	Lunch and Learn	12:00-1:30 PM 4/28/16 Rhodes Annex Room 109	11 CBS members 6 UCBS members
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III. PULSE Lunches

Similar to the Lunch and Learn above, PULSE lunches give undergraduate students in UCBS an opportunity to eat lunch with a professor. Limited to five students, these lunches give participants the chance to connect with Clemson faculty in an intimate setting to gain wisdom in topics not usually covered in class. These topics focus on professional development, graduate school, medical school, and career planning.



Dr. John DesJardins	9/16/15	5 UCBS members
Dr. Naren Vyavahare	9/21/15	5 UCBS members
Dr. David Kwartowitz	10/6/15	5 UCBS members
Dr. Lisa Benson	10/20/15	5 UCBS members
Dr. Delphine Dean	2/23/16	5 UCBS members
Dr. Martine LaBerge	3/24/16	5 UCBS members
Dr. Sarah Harcum	4/21/16	5 UCBS members

IV. UCBS Career Panel

Representatives from a variety of biomedical industries in the Upstate of South Carolina visited with undergraduate Bioengineering students. Panel member included industry representatives from Kiyatec, ATI and Selah Genomics, as well as medical students, graduate students and industry-focused faculty.

	Career Panel	2/24/16 201 Rhodes Annex	40 UCBS members
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V. Visiting Professional Lunches

The Clemson Bioengineering department hosts several speakers each semester through the C. Dayton Riddle Seminar Series and the Page Morton Hunter Distinguished Seminar Series. Up to 5 graduate students had the opportunity to take the speaker out to lunch and learn about their experiences in medicine, the medical device industry, academia, and clinical trial research.

	William King, PhD, Biomet Biologics	12:00 11/12/15, Greenville, SC	5 CBS members
	Maria Oden, Rice University	12:00, 11/19/15, 301 Rhodes	5 CBS members
	Jeffrey Willey, PhD, Wake Forest	12:15, 12/3/15, 301 Rhodes	5 CBS members
	Kirill Afonin, PhD, UNC Charlotte	12:00, 1/21/16, 301 Rhodes	5 CBS members
	Ayman El-Baz, PhD, Univ. of Louisville	12:00, 2/25/16, 301 Rhodes	5 CBS members
	Glen Kwon, PhD, Univ. Wisc.-Mad.	12:00, 3/3/16, 301 Rhodes	5 CBS members
	Jennifer Woodell-May, PhD, Zimmer Biomet	12:00, 3/10/16, Greenville, SC	5 CBS members
	Eva Mezey, MD, PhD, NIDCR, NIH	12:00, 3/31/16, 301 Rhodes	5 CBS members
	Mark Bolding, PhD, UAB	11:30, 4/21/16, 301 Rhodes	5 CBS members



IIIB. Social Activities

Abstract: The goal of the CBS social committee is to offer opportunities for bioengineering students to connect by organizing different social activities throughout the semesters. Aside from encouraging all CBS members, non-members are also encouraged to participate, which helps to provide a friendly marketing of our organization to non-member students. These social events help create an environment that provides an opportunity for students to interact outside of a school setting, which helps in contributing to stress relief.

I. Fall 2015 Tailgates:

During the fall of 2015, the social committee was responsible for organizing the tailgate for all home football games. Tailgates also served as the most financially rewarding event, as CBS earned money by monitoring the bathroom use of Rhodes Engineering Research Center, the home of Bioengineering at Clemson. For the most popular games, CBS contributed financially so that the social chair could arrange and provide food for the students. The tailgates contributed positively by providing an opportunity for students to meet and connect with each other.



Rain can't wash away these Clemson smiles!

Tailgate-Wofford	9/5/15, noon Forbidden Forest	17
Tailgate-App State	9/12/15, 9:00 AM Forbidden Forest	13
Tailgate-Notre Dame	10/3/15, noon Forbidden Forest	21
Tailgate-Florida State	11/7/15, noon Forbidden Forest	16

II. Spring 2016 Game Nights:

During the spring semester of 2016 the social committee promoted game nights in the department, in which students were encouraged to bring board and card games, as well as snacks, to contribute to a relaxing time among friends and colleagues.

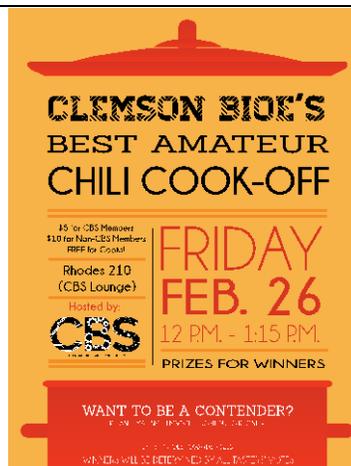


Several CBS members gather in a study room in Rhodes Engineering Research Center to play games.

Game Night	8:00-11:00 PM, 1/15/16 Rhodes Study Room	13 CBS members
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III. Cooking Competitions:

Students, faculty, and staff were encouraged to enter their best homemade chili and those that did not enter, were encouraged to attend, eat, and rank their top three favorite chili recipes. The goal of the chili cook off was to give the department an opportunity to have a relaxing lunch as well as socialize and get to know others in the department. Next year's competition should be planned earlier in the winter season, as well as on a day that is not a Friday during the Lenten season. CBS and UCBS collaborated to hold a pie making contest. Students, faculty, and staff were invited to participate in a pie contest organized by the CBS and UCBS. The goal was to create an event for the department to enjoy an afternoon of socializing as well as showing off their baking talents.



Promotional flyer for the CBS Chili Cookoff.

Chili Cook-Off	12-1:15 PM 2/26/16 CBS Lounge	12 CBS members, 3 UCBS members
Pie Contest	12:30-1:30 PM, 4/18/16 Rhodes 3 rd Floor Annex	14 CBS members, 5 UCBS members

IV. Intramural Sports

All year long, CBS members build camaraderie and teamwork skills through Clemson's intramural sports programs. This year, CBS members put together teams in soccer, ultimate Frisbee, basketball, and volleyball, but the most success came in innertube waterpolo. The CBS team made it all the way to the finals through pure heart and grit, and while the Intramural championship evaded us, the championship for "having the most fun" sits firmly on the mantle place in our hearts.



Innertube Waterpolo Intramural runner-ups, seconds after a heart-breaking defeat.

Intramural Sports	Weeknights, 6-9, Intramural Fields	20 CBS members (3-15/sport)
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III.C. Inter-Chapter Activities

Abstract: The goal of inter-chapter activity is to strengthen the professional network with BMES and within the larger biomedical community. For several years, hosted a “Biomaterials Day” to promote research in the field of biomaterials. This year’s event was the first that was hosted as a combined effort from students at Clemson and Georgia Tech. While rivals on the gridiron, Georgia Tech and Clemson have demonstrated enthusiastic collaboration to share ideas and promote the biomaterial field. Biomaterials Day is made possible through financial support from the Society for Biomaterials.

I. Southeast Biomaterials Symposium (“Biomaterials Day”)

The Clemson chapter annually hosts a “Biomaterials Day” where we offer a unique collaboration opportunity for those involved in the multidisciplinary field of biomaterials. The conference, which is organized and facilitated by students, focused on providing a forum for students, leading researchers, and industry representatives to meet and exchange ideas, in order to cultivate collaboration between academia and entrepreneurial professionals. The event, which was held in September 2015, was the first where Clemson jointly hosted the event with the Georgia Institute of Technology, and together we hosted about 150 participants with students and professors from 6 other visiting institutions. The theme for the symposium was “Partnerships in Research”. We aimed to broaden the networks of all attending by providing a large amount of student oral presentations, as well as presentations from faculty and industry leaders. Speakers were chosen through an abstract evaluation process, and those that did not receive oral presentations were given poster presentations. We had an industry and academic keynote for the event and included an industry panel discussion which the audience greatly seemed to enjoy. Overall the event ran smoothly and attendees left satisfied with their networks expanded.

The symposium incorporated two key note speakers, Dr. Thomas Webster from Northeastern, who discussed his research and progress in the field of biomaterials and Kara Elkin, a Professional Relations Analyst from DePuy Synthes to discuss the role industry plays in biomedical engineering. These two speakers represented academic research and industry application, respectively.

Research presentations were broken into two concurrent sessions: 1.) tissue engineering and regenerative medicine and 2.) biomechanics and orthopedics. Students moderated the presentations. Each session included six student oral presentations and two faculty oral presentations. In the Regenerative Tissue Engineering Session, we had talks ranging from the potential of human amniotic stem cells



Former SFB Director and key note speaker, Dr. Thomas Webster, speaks about nanotechnology in biomaterial research.



to mitigate osteoarthritis to the considerations needed in vascular tissue engineering against the rising tide of diabetes. Presenters highlighted the optimism held for tissue engineering while pointing out the need to make translatable technologies and bridge the funding gaps present for a tissue engineered device. The Biomechanics and Orthopedics session discussed topics including modular TKR and reprocessing and recycling of medical devices. The last presentation during this session was presented by a team of undergraduate students who have successfully developed a device to help pediatric patients with cerebral palsy walk and are currently trying to commercialize their device.

The second half of the symposium was designed to take the lessons and themes learned from the research talks in the morning and begin an open discussion on how to make our field of biomedical engineering more translatable to doctors and the patients they serve. This session began with our plenary speaker Kara Elkin, discussing academia and industry and their collaboration through translational research. After her plenary talk, three different speakers talked about three major pillars in translating research into reality. Three industry leaders came to speak about entrepreneurship, technology transfer at the university level, and translational research through the eyes of a surgeon. Each of these speakers discussed their views of how to be successful and how to traverse the complicated industry of biomedical engineering.

Following the industry section we then had a poster session and challenge for every attendee at the symposium. During the poster session, we gave every person a Bingo card. Participants filled in their Bingo cards by meeting people from other institutions, industries, experiences, etc. This activity was meant to break the ice and encourage collaboration and network development.

Overall, the event was a success in promoting collaboration between students, faculty and industry leaders. We were able to host a diverse body of students from many visiting institutions, cover a wide area of research topics, and collaborate with industry minds on how to make progress in our fields of research towards translatable products. In addition, for the student leaders that organized the logistics of the event, Biomaterials Day served as an opportunity for strategic planning, an important skill in professional development. We hope to continue this tradition of excellence moving forward.



CBS members and Biomaterials Day organizers

Biomaterials Day	9:00-6:00, 11/26/15 Madren Conference Center, Clemson SC	9 faculty, 34 CBS members, 11 UCBS members
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III. Outreach Activities Report

Abstract: The goal of the outreach program in both CBS and UCBS is to inform the public, from the littlest learner to the eldest, about the wonderful advances made possible by bioengineering. As any BIOE student that has ever attended a career fair will tell you, there are still lots of companies wondering what a Bioengineering graduate can do. Through outreach programs with the local community, Clemson BIOE students are doing their part to promote the field of bioengineering to youths through professional support of elementary school inventions and enthusiasm. Clemson BIOE students also respect the wisdom of the senior citizens, and connects with the local nursing home as often as possible. By reaching out to both ends of the age spectrum, Clemson BIOE students work to educate the public on the power of medical innovation.

I. Innovation and Entrepreneurship Panel



CBS members listened to pitches from 4th grade inventors during the Invention Convention.

After finishing a unit introducing 4th grade students to the engineering design process, a group of BIOE graduate students with varying experiences in entrepreneurship listened to student invention pitches. The purpose of this event was to provide supportive advice and encouragement to budding inventors in the field of entrepreneurship. Graduate students paired up with several elementary school students to hear about the project that was the culmination of the student's design efforts. After one on one discussions, students were able to ask questions to

the panel of graduate student entrepreneurs. In the future, this event could bring elementary school students to Clemson University to see the result of the design process at the collegiate level.

Event	Date, time, location	CBS attendance (% of membership)
STEM Outreach - Innovation and Entrepreneurship Panel	8:00-12:00, 12/15/15 Roebuck Elementary School, Roebuck, SC 19376	8 CBS members

II. Sharing BIOE Love with the Elderly

In an effort to promote bioengineering (and terrible Valentine's day biomedical puns) to an often forgotten demographic, several CBS members dusted off the craft bin and made Valentine's Day cards for residents of a local nursing home. Cards were also personally delivered

by CBS members, who spent the day sharing their stories (and hearing some better ones) with those that most frequently benefit from the biomedical innovation we encourage at Clemson.

Valentine's Day Cards for the Elderly	2/14/16 Lila Doyle Nursing Home, Seneca, SC 29672	11 CBS members
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III. Clemson Engineering Expo

The goal of the Engineering Expo is to introduce elementary students to STEM related fields. Over 13 different STEM departments were represented at the Engineering Expo. Each year, members of both CBS and UCBS gather together to represent the cool technology and innovation developing in the Clemson bioengineering labs. The audience? 200 screaming second graders. They say you don't really know something unless you can teach it, but you can only truly know something when you can explain it to a second grader. Clemson Bioengineering students used PVC pipe, water and Play-Doh to demonstrate atherosclerosis. Second graders then learned how doctors treat atherosclerosis through proper stent placement.



Over 200 2nd grade students learn about atherosclerosis.

Engineering Expo	7:00-2:00, 2/25/16 Hendrix Ballroom	2 CBS and 10 UCBS members
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IV. Clemson EMAG!NE Design Challenge Tour

Similar to the goals of the Engineering Expo, the Clemson EMAG!NE network is a collection of students and faculty at Clemson that promote STEM fields in middle and high schools throughout South Carolina. This year, students from bioengineering contributed to design challenges for close to 100 middle and high school students through the EMAG!NE network. These activities included designing support platforms, water filtration units and rockets.

EMAG!NE Design Challenge Tour	9:30-4:30 4/16/16, Roper Mtn. Science Center, Greenville, SC	2 CBS members
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III. Mentoring Activities

Abstract: The goal of the mentoring program at Clemson is to allow senior members of the program to lead by example in areas not covered specifically in any individual bioengineering course. As students learn biomedical engineering topics like thermodynamics and CAD modelling, it is important for students to have the opportunity to apply that knowledge and skill set. The most successful applications of student knowledge are student-driven passion projects. Bioengineering students have the opportunity to follow their passions by working with mentors in research, design, and entrepreneurship. Research mentor roles are filled by graduate students and faculty. Design and entrepreneurship mentors are a melting pot of industry representatives, faculty members and graduate students. All mentors support students in their educational journey in a more customized manner than general curriculum.

I. Creative Inquiry Program

At Clemson University, undergraduate students from all majors have the opportunity to work on interdisciplinary teams to perform research through a program called Creative Inquiry. Each Creative Inquiry is mentored by either a faculty advisor or a graduate student. This program gives undergraduate students the opportunity to carry out their own research with intimate guidance from a research mentor, a unique opportunity not available in the large lab and lecture sizes in the common curriculum. Research mentors meet with student teams on a weekly basis to aid in the journey from idea conception to idea realization to experimentation and, finally, iteration. Research mentors also guide in the process of background research to ensure student work is filling a medical need. The Clemson Bioengineering department houses 19 different creative inquiry projects for 117 participating undergraduate students. Research topics include implant retrieval, developing medical technology for developing parts of the world, creating medical and instructional simulations, tissue engineering and regenerative medicine, sports medicine and human performance, and smart prosthetics.



Multidisciplinary team mentored by BIOE grad student performs data analysis for Clemson football team.

Creative Inquiry Research Mentorship	All Semester Creative Inquiry Labs	117 Undergraduate students, 19 Graduate students
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II. Research Lab Mentorship

In addition to creative inquiry, undergraduate students have the opportunity to work on research projects in a more 1:1 role with a graduate student while receiving course credit. In this mentorship model, graduate students are tasked with developing the daily tasks for undergraduate research assistants to support the research goals of the lab. This graduate student research mentorship model was also used with 24 high school students through a local chapter of Project

Lead the Way. The research mentorship from graduate students resulted in undergraduate students presenting posters at the annual BMES meeting and published undergraduate student research. Face to face interaction/student is estimated between **45 and 135 hours/semester**.

Research Lab Mentorship	All semester Clemson research labs	FALL 2015: 53 undergraduate students 35 graduate students SPRING 2016: 72 undergraduate students 48 graduate students
High School Mentorship	All semester Clemson research labs	24 high school students 6 grad students, 3 undergraduate student teams

III. Senior Design Mentorship

In addition to research mentorship, graduate students also provide medical device design mentorship for undergraduate students through the senior design program. Through the senior design program at Clemson, undergraduate student teams of 4-5 develop a device to solve a problem and a commercialization plan to maximize the value of the device. Throughout the design process, student progress is tracked through biweekly gate meetings. Gate meetings are attended by graduate student volunteers, graduate student teaching assistants, faculty volunteers, industry volunteers, clinical collaborators and the instructor of record. Each undergraduate design teams and attend 6 meetings/team. This means undergraduate students have the opportunity to meet face to face with graduate student, faculty, clinical and industry mentors for six hours each semester in gate meetings alone.



Senior Design teams present their year-long project to clinicians, industry leaders and faculty at the Bioengineering-GHS Design Expo

Senior Design Mentorship	All semester Senior Design Lab, Rhodes Conference Room	FALL 2015: 5 undergraduate teams (20 students) 5 graduate student mentors SPRING 2016: 18 undergraduate teams (81 students) 23 graduate student mentors 15 faculty mentors
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IV. National BMES Meeting

Name of Attendant	BMES ID	Participation (title and author, student chapter booth, chapter workshops)
Alex Bina	2342281	Volunteer: Social Media Correspondent
Yu Tan	2341744	Poster: Silicon Nanowires-Induced Maturation of Cardiomyocytes Derived from Human Induced Pluripotent Stem Cells
Jia Jia	2347091	Poster: Biodegradable Alginate as a Bioink for Bioprinting Volunteer, attended Clemson reception
Tyler Harvey	25536	Volunteer: room monitor, attended Clemson reception
Lucy Lu	234223	Poster: Assessment of Pore Size and Histology for Different Types of Explanted Hernia Mesh
Jayesh Betala	40687	Poster: Smooth Muscle Cell Proliferation Inhibition Using Drug-Loaded Polymeric Micelles
Hobey Tam	24620	Oral: Improved Extracellular Matrix Stabilization Increases Tearing Resistance for Heart Valve Biomaterials
Aesha Desai	35564	Poster: Characterizing Axial and Longitudinal Mechanics of Individual Cardiomyocytes Volunteer: Registration desk, Clemson Chapter booth, attended Clemson Reception
Zhonghai Wang	0036162	Poster: Establishment of a Reentry Model on a Multielectrode Array
Siyu Ma		Poster: Establishment of a Reentry Model on a Multielectrode Array
Xiaoqi Yang	2340898	Poster: Live-Cell Imaging of Sarcomeric Remolding Under Uniaxial Mechanical Loads
Dmitry Gil	2342224	Poster: Degradation of Polypropylene Hernia Repair Meshes
Matt Rusin	0039805	Poster: Adipose Stem Cell Proliferation After Gamma Irradiation; The Effect of Very Low Dose X-Ray Radiation on the Proliferation of 3T3 Fibroblasts
Kayla Wilson	40454	Department booth
Andrew Cobb	2347630	Department booth
Sarah Grace Dennis	2349840	Oral: Bioprinting Viable 3D Cell-Laden Constructs with a Complex Geometry; Construction and Characterization of a Pre-Vascularized Bioartificial Pancreas
Nasim Nosoudi	41249	Poster: Targeted Delivery of Pentagalloyl Glucose Using Anti-Elastin Decorated Nanoparticles Prevents Abdominal Aortic Aneurysm Formation in Rats.
Bre Przestrzelski	37647	Poster: Rapid Manufacturing of Custom Foot Orthoses for Reduction of Peak Plantar Pressure
Saketh Karamched	2237104	Oral: Targeted Chelation Therapy with EDTA-Loaded Albumin Nanoparticles to Reverse Arterial Calcification in a Chronic Kidney Disease Rat Model
VeeAnder Mealing	2342280	Poster: Development of a Bone Bioreactor for Forensic Applications



IV. Future Directions

1. Introduce a New Professional Development Event in the Fall

The programming priority of CBS in the 2016-2017 will be in professional development. The professional development and industry relations committee will continue both of the aforementioned events on a semesterly/yearly basis with addition of one major Fall event. CONNECT Day will be a full day event with the goal to connect students, faculty, and industry through conversations that are not often had in the current silo-ed environment. This goal will be achieved by way of four sessions over the day: (1) A Bioengineering-specific career fair, (2) A productive design-thinking activity over lunch, (3) An exercise that bridges the gaps and starts meaningful conversations between the three groups, and (4) A final networking event. Through this event, the professional development team sees that its students as well as faculty and industry will form relationships that will be nurtured for future collaboration.

2. Grow the Organization

Increase CBS membership and student engagement (goal: $\frac{2}{3}$ of department = CBS member, 100% = member of professional society). Moving forward, CBS plans to grow membership participation and engagement in department events and programs. This goal will be accomplished in three steps: 1. Strengthen communication between three groups: CBS leadership and general members, CBS and UCBS members, and between CBS leadership members; 2. establish defined committees that report directly to each chair position; 3. improve record-keeping to evaluate successes and failures of each CBS event.

3. Improve Communication

Communication between CBS leadership and general members will be strengthened by a monthly newsletter and stronger social media presence. The newsletter will focus on longform summations of research interests of students from across all disciplines within Clemson BIOE. The newsletter will also summarize student participation in activities both within CBS and across campus to promote BIOE student participation in extracurricular activity. The CBS social media presence will be used to quickly promote individual activities as well as provide national BMES updates. Communication between UCBS and CBS will be strengthened by increased collaboration in programming and participation, both on a social and professional level. Communication between members of CBS leadership can be improved through the use of online communication tools that organizes electronic messages by topic without flooding email inboxes.

4. Improving Participation through Committees

On the first general meeting of the year, each member, both new and old, will have the opportunity to join a team led by one of the chair positions. These teams will work together to determine the goals of the group for the entire year. After the first month, teams will form subcommittees as needed to make sure that planned events and programs are organized and carried out in a manner to maximize benefit for the growth of Clemson Bioengineering Students.



5. Digitalizing Record Keeping

One problem that CBS experienced in the 2015-2016 school year was keeping track of student participation, membership and engagement within CBS. For the 2016-2017 school year, record-keeping will move from paper and pen to online shared files. This way, each member of the leadership team will be able to access minutes, attendance lists and organizational materials at any time after the completion of the event. This will also make post-event success evaluation easier.