SFB OFFICER NOMINEES, SFB AWARENESS UPDATES FROM THE DCB AND DD SIGS

BIOMATERIALS FORUM

OFFICIAL NEWSLETTER OF THE SOCIETY FOR BIOMATERIALS

FIRST QUARTER 2018 • VOLUME 40, ISSUE 1

ALSO INSIDE

HISTORICAL FLASHBACK BY SR. MICHAEL SEFTON

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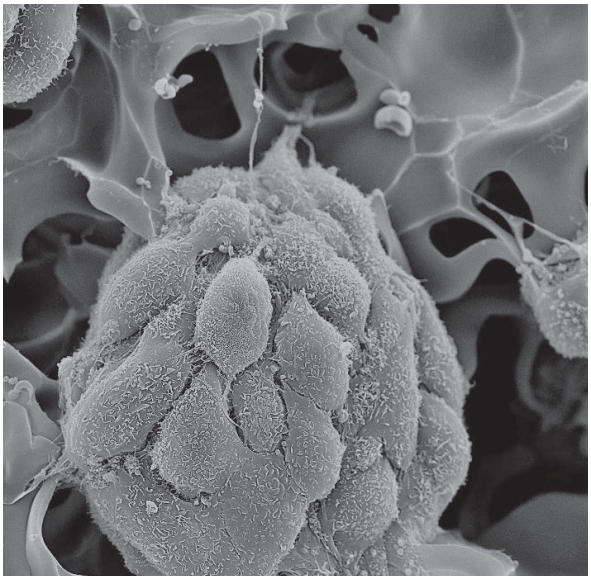
BIOMATERIALS FORUM

The official news magazine of the **SOCIETY FOR BIOMATERIALS** • Volume 40, Issue 1

SPECIAL INTEREST GROUP REPORTERS



ON THE COVER

The cover image, provided by Xiaoqi Tang of Prof. Martin W. King's lab in the Department of Textiles Engineering at North Carolina State University, shows 3D growth of 3T3 cell aggregates on porous chitosan scaffolds.

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From the Editor

Guigen Zhang

In the March–April 2017 issue of *Harvard Business Review*, Steven Prokesch wrote an article about Bob Langer called "The Edison of Medicine." It is an informative and enlightening piece to read. For example, you will get an inside scoop of "how to innovate like Langer" and even a to-do list on how to effectively run your research labs and teams, as I list below:

1) Focus on high-impact problems
2) Build a bridge over the valley of death
   a. Focus mostly on platform technologies — those with multiple applications
   b. Obtain a broad patent
   c. Publish a seminal article in a prestigious journal
   d. Prove the concept in animal studies, and don't push the discovery out of the lab too quickly
   e. Reward the researchers
   f. Involve the researchers in commercial development
   g. Make licenses contingent on using the technology
3) Forge a collaborative, multidisciplinary team
4) Embrace turnover
5) Lead without micromanaging

Of course, these are just the skeletal headings. You will get detailed explanations for each of these headings in the article.

A bonus treat for me was a the callout box that describes the detoured career path Langer took and his unconventional thought process behind it. Below I highlight an excerpt, in hopes to enlighten you:

By the time Bob Langer completed his PhD in chemical engineering at MIT in the early 1970s, the United States was in the midst of the OPEC embargo and oil crisis. This made him a hot commodity in the eyes of oil and chemical companies, and he received 20 job offers in the field in no time.

An interview at Exxon prompted a life-transition moment. Someone said to him, "If you could just increase the yield of this one chemical by point-one percent, that would be wonderful — that's worth billions of dollars." "Do I really want to spend my life doing this?" Langer questioned.

He did not take any of these jobs. Instead, he applied to colleges for jobs developing chemistry curricula. He got no replies. "Probably because as a chemical engineer, I wasn't in the right box. … I wanted to help people." He thought some explanations could help his chance but still received no offers.

A colleague suggested that he contact Judah Folkman, a surgeon at Boston Children's Hospital who had a reputation for hiring unusual people. Folkman had a controversial idea: that cancerous tumors emit chemical signals that stimulate angiogenesis, or the formation of new blood vessels. If the signals could be blocked, Folkman theorized, tumors' growth could be halted. He hired Langer to isolate the first angiogenesis inhibitors. This involved identifying candidates from cartilage, which has no blood supply (Langer got cow bones from a slaughterhouse) and inventing polymer systems that could deliver large molecules over time. Angiogenesis inhibitors ultimately became instrumental in treating many cancers, and polymers have become an important way to deliver drugs and vaccines and to help grow new body tissues.

Langer joined MIT in 1977 as an assistant professor in the Department of Nutrition and Food Science, because no Chemical Engineering department at a university would hire him. But to him, this gave him tremendous freedom, and he continued working on drug delivery, angiogenesis inhibitors and tissue engineering, obtaining funding from companies when his ideas proved too radical for government grants. Many senior faculty members of the department didn't believe in his ideas and suggested that he look for a new job. However, by the mid-1980s his discoveries, publications and start-ups began winning recognition.

And the rest is history.

In closing, let me briefly tell you what we have prepared for you in this issue. Aside from hearing from the president and reading staff and student news, you will get caught up with updates from the Dental/Craniofacial Biomaterials SIG and Drug Delivery SIG. Since this is the time for SFB to recognize its higher-achieving members, you will read about this year's numerous awardees. On the SFB organization front, it is our annual election "season," so we present you the officer nominees and their visions for leading the Society. In our regular columns, you will read industry news, government news and education news. In the historical flashback column, Sir Michael Sefton shares some of his fond memories from his association with SFB.

Best wishes,

From the President

David Kohn

I hope you are doing well in the new year.

The first quarter of 2018 is the last quarter of my presidency. Thank you for allowing me to serve as your president. A year goes by fast, and I'd like to recap some of what SFB has achieved over the past year. When I say SFB, I do not mean the leadership or our management group; I mean all of you. More than 150 members populate our committees, task forces and other volunteer activities, and you are the engine that powers SFB.

The Society is fulfilling its mission (to promote advancements in all aspects of biomaterials science and technologies, education and professional standards to enhance human health and quality of life) by creating action items to fulfill the strategic plan created by the Board and Council in 2015. The full plan can be found at biomaterials.org/about/society-biomaterials-strategic-plan. In my last letter to you, I will update the achievements we have made in the context of five strategic domains: visibility, membership, meetings, education and professional development, and globalization.

Within the domain of visibility, we have expanded SFB's social media presence. A task force led by Tom Dziubla developed a set of best practices and developed an SOP for the Society's use of social media to allow us to responsibly promote the activities of the Society and individual members. We have also created promotional videos and a Faces of SFB campaign to better articulate the value of membership.

The Membership Committee, chaired by **Christopher Gehrmann**, has taken initiatives to better articulate the value of membership. The visibility campaign from last year transitioned to a conversion campaign. Non-member attendees at Biomaterials Days, the Annual Meeting and webinars, as well as website visitors, were specifically targeted. Combined with the spike in membership following a World Congress year, we had a 225-person increase in membership in 2017.

Being a student-friendly society that emphasizes career development is the best way to retain members after they graduate. At the intersection of the strategic domains of membership and education and professional development lies our new mentoring program. A joint effort led by the Education & Professional Development Committee (led by Jan Stegemann) and Industrial Affairs Committee (led by Peter Edelman), with input from the Young Scientist Task Force (led by Cole DeForest) and Student Chapters (led by Daniel Hachim), enabled us to launch a mentoring program. The goal of this program is to provide members with guidance on career options and practical advice from experienced biomaterials scientists and engineers.

This is a one-on-one program in which mentees will be assigned a specific mentor who has experience in the area(s) a mentee would like guidance on. Potential topics include general career advice, as well as advice on searching for a job, being a professor or working in industry. A detailed list of topics and full description of the program are available at biomaterials.org/students/mentor-program.

Please encourage your trainees to sign up, and please consider becoming a mentor yourself. To participate as a mentee, please sign up here**. To participate as a mentor,** sign up here. The Education & Professional Development Committee will create matches, and, once matched, the mentee is responsible for reaching out to his or her assigned mentor to schedule meetings. We hope that mentors and mentees can meet in person at the Annual Meeting in Atlanta.

The Liaison Committee, chaired by Tim Topoleski, has implemented globalization aspects of the strategic plan. SFB is a member of AIMBE's Council of Societies, which provides a collective voice for action on policy issues. AIMBE representatives Martine LaBerge and Joel Bumgardner are helping define legislative priorities of importance to SFB members. In terms of trans-society activities, Liisa Kuhn has helped organize a joint ESB/SFB summer school in Bordeaux, France, this June, and SFB has been discussing a joint endeavor in 2020 with the Japanese Society For Biomaterials.

The Annual Meeting is fast approaching, and we are close to convening in Atlanta. Thank you to our program chairs Johnna Temenoff and Bob Hastings, who continue to partner with academic and industrial leaders to craft a program that reaches out to all sectors of SFB membership. I encourage you to attend and take advantage of the many opportunities the SFB Annual Meeting provides. The theme of this year's meeting — nexus — is reflected in how SFB connects members with one another and with opportunities. Johnna, Bob and the rest of the Program Committee developed a program that is scientifically robust, strives to engage industrial members and provides a variety of career development activities. This was accomplished by continuing the Biomaterials Technology in Industry (BTI) track and creating a Career Catalysis track. The BTI track has sessions dedicated to translational biomaterials research, testing methods for evaluating translational biomaterials and examples of technology development that have progressed through the translational pipeline from concept to clinical trial, among others. The Career Catalysis track also permeates the program with a combination of panels, workshops, luncheons and podium sessions, plus a return of the cage match. The program will also

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Historical Flashback

Editor's Notes: *In case you have not heard the news, Michael Sefton (pictured left), University Professor and Michael E. Charles Professor at the University of Toronto, has recently been appointed to the Order of Canada, the Canadian equivalent of UK's knighthood. One of Canada's highest civilian honors, appointment to the Order of Canada recognizes outstanding achievement, dedication to the community and service to the nation. Sir Michael Sefton was appointed specifically for his seminal contributions to the field of biomedical engineering and for his mentorship of the next generation of engineers. Sir Michael Sefton served SFB as its 2005 – 2006 president and has been recognized by numerous awards, including the 1993 Clemson Award for Basic Research and the 2008 Founders Award. Upon my request for him to share some memories from his time with SFB, he wrote me the following "What I Remember" column, which I would like to share with you.*

I don't remember the keynotes, the award lectures or the actual sessions, but I do recall the Bashes at the racetrack in Minneapolis and at the ironworks in Birmingham. I especially remember the boat in Orlando — although maybe I shouldn't remember the latter. I think there is even a photo beside the pool that made its way into the Baxter corporate newsletter.

Like the Gordon conferences of old, SFB Annual Meetings were where I got to know *who is who* in the world of biomaterials. SFB wasn't my original go-to place. When I began my career in the '70s, the American Society for Artificial Organs and even AIChE had more of what I was interested in. The best meetings were actually the December grantee workshops held by NHLBI as outgrowths of the artificial heart program. SFB seemed to me a place for hard materials, not soft ones, as we then divided the world. Protein adsorption and surface chemistry bridged the divide. Eventually, SFB adapted and increased its interest in blood-compatible materials and aspects of biocompatibility that went beyond the interface with bone.

I was also interested in insulin delivery and, eventually, islet microencapsulation. That brought me to the Controlled Release Society, then a small group meeting held regularly in Fort Lauderdale, and to the Tissue Engineering Society, an even smaller group also meeting in Florida (Orlando). There must be something about organizing scientific meetings in December. SFB missed the controlled release story (that field was more about the drug than the material in those days), but it did incubate and develop a significant tissue engineering component. I think the Tissue Engineering SIG is one of the largest SIGs, much to the chagrin of those studying classic biomaterials in orthopaedics or as dental materials. There is (or ought to be) much discussion in tissue engineering groups about what comes next — regenerative medicine has become the preferred term, and it encompasses so much more than the biomaterial or the scaffold. On the other hand, the biomaterial — or more crucially, to my mind, what we mean by biocompatibility — is getting lost as we move from developmental biology to the clinic.

The other feature of SFB was the involvement of industry. I don't see that in other scientific societies. Annual Meetings always seemed to be half industry folks, and so friendships grew naturally with those not in academia. Occasionally this led to a bit of consulting, but more important was the infusion of real-world values and know-how that tempered the enthusiasm for research that was not well grounded in the practical. I think the affinity for academic spin-offs may be a direct product of these SFB-mediated interactions.

Sure, SFB is about the science of biomaterials. But it's really about the people.

From the President (continued from page 3)

include a special session on the *Biomaterials Science* textbook, a thought leader symposium and a large number of rapid-fire sessions in which poster presenters can also give a short oral presentation. Please visit the Annual Meeting website (2018.biomaterials.org) to find out more about this year's Annual Meeting and to register. I also encourage you to stay in the conference hotel, the Hilton Atlanta. To secure the needed meeting space (session rooms, poster hall and exhibit spaces), SFB commits to filling a certain number of guest rooms. If we fail to fill our room block, we are penalized with attrition payments that will impact the cost of meeting registration in future years. It has been a pleasure to serve as president this year. I look forward to working with Andrés García as he takes over as president in Atlanta.

I look forward to seeing you in Atlanta!

2018 Award Recipients

Please join us in congratulating the following professionals, who have been recognized with SFB awards for their outstanding achievements in and contributions to the biomaterials field. Each award recipient will be honored during the Opening Ceremony at the Society For Biomaterials Annual Meeting in Atlanta, Georgia, on Apr. 11, 2018.

FOUNDERS AWARD

The Founders Award is awarded for long-term, landmark contributions to the discipline of biomaterials.

Andreas F. von Recum, Ph

Ohio State University, Retired

Dr. von Recum started his career in a rural veterinary practice in 1968. His true calling gradually directed him into academic veterinary medicine, and from there he became a pioneer in biomedical engineering. He taught for decades at the interface of human medicine and veterinary medicine and engineering, as well as the interface of medical progress and interdisciplinary input. In his early career, collaboration was discouraged at most universities until his retiring years, when collaboration became a requirement for successful research funding in biomedical engineering. Prof. von Recum is one of the founding members of the Society For Biomaterials, which has become the preeminent biomaterials organization in the world. He has served SFB in multiple leadership roles, including president. He has served as the chair of two biomedical engineering departments, first in 1984 at Clemson University and second in 2005 at Ohio State, where he founded its Biomedical Engineering Department.

Thomas Horbett, PhD

University of Washington, Retired

Dr. Horbett has contributed to the foundation and future for the field of biomaterials. He has brought to the biomaterials field state-of-the-art methods to purify, handle and measure proteins and incisive scientific methodology. His unparalleled critical abilities and prodigious analytical abilities in the early era of protein layer research advanced the field. Dr. Horbett defined the fields of protein adsorption, cell–surface interactions and blood–biomaterial interactions. His contributions include the Justifiable methodology for I125 labelling, protein elution techniques (and the significance of elutability), relationships between adsorbed proteins and cell behavior at surfaces, the importance of fibrinogen in blood compatibility and, importantly, the low-level criterion for platelet activation by adsorbed fibrinogen. He also pioneered studies on "smart" polymers for insulin delivery, surfaces with high protein retentiveness and non-fouling surfaces. Dr. Horbett received numerous NIH grants, as well as other agency grants, over the years, including "Cell and Protein Reactions with Foreign Materials," a grant that received more than 25 years of continuous NIH funding. The methodologies he pioneered and the understanding of proteins at interfaces he fostered will power the biomaterials field.

Over the course of his career, Prof. Horbett mentored and graduated exceptional graduate students and postdoctoral researchers. His students have become professors, researchers and industry leaders. One of Prof. Horbett's PhD students became vice president of a major medical device company, and another started a pharmaceutical company in Seattle that now employs more than 60 people.

In addition to Dr. Horbett's journal publications in the field of protein–surface interactions, he has made important contributions to the field of biomaterials as a co-editor of three landmark books dedicated to this area of research. These publications have brought significant attention and recognition to the Society For Biomaterials.

CLEMSON AWARD FOR APPLIED RESEARCH

The Clemson Award for Applied Research recognizes significant use or application of basic knowledge in science to accomplish a significant goal in the biomaterials area.

Mark Grinstaff, PhD

Boston University

Dr. Grinstaff is the Distinguished Professor of Translational Research, Biomedical Engineering, Chemistry, Materials Science and Engineering and Medicine at Boston University. Dr. Grinstaff's creativity in designing, actualizing and applying polymers for biomedical applications has resulted in some of the most complex biomaterials systems. He combines scientific and engineering principles to achieve critical paths to producible, testable and valuable biomaterials and drug systems.

Prof. Grinstaff's achievements are supported by his many peer-reviewed publications, presentations and patents. His accomplishments are manifested in the products of the companies that he has founded and out-licensed to other medical marketing companies.

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Dr. Grinstaff's engineering invention to protein-coat hydrophobic nanoparticles ultrasonically opened a new field of drug delivery, allowing for intravenous delivery and resulting in the paclitaxel-based chemotherapeutic, Abraxene, a drug formulation that has benefited hundreds of thousands of breast, lung and pancreatic patients. He has developed many additional techniques and inventions that have helped patients, including his FDA-approved surgical sealants and several new technologies for future use. Dr. Grinstaff is well recognized as a creative materials scientist developing translational biomaterials to improve healthcare.

CLEMSON AWARD FOR BASIC RESEARCH

The Clemson Award for Basic Research honors contributions to the basic knowledge and understanding of the interaction of materials with tissue.

Jason Burdick, PhD
University of Pennsylvania

Prof. Burdick is recognized around the world for his contributions in research and literature and has made significant scientific contributions to the field of biomaterials. His work spans advances in the synthesis of new materials — particularly in engineered hydrogels — through their application in clinically relevant animal models. Prof. Burdick's pioneering work has developed a number of materials that can be used to control cell behavior such as differentiation. His PHAN publication about the development of novel hyaluronan-based biomaterials for maintaining the undifferentiated state of human embryonic stem cells, the first demonstration of the use of a biomaterial for maintaining human embryonic stem cells, has pioneered new ways of thinking about controlling cell behavior by employing materials-based techniques.

He has more than 200 publications in the field of biomaterial research in journals including *Natural Materials*, *Nature Communications*, *Science Translational Medicine* and *Advanced Materials* and has given more than 150 invited presentations. Dr. Burdick is actively involved in the research community and has chaired numerous conferences, annual meetings and research sessions. His recent and timely research with his laboratory has made significant advances in the design of self-assembled hydrogels that exhibit shear-thinning and self-healing properties.

Dr. Burdick had made an overall impact across multiple fields. His ability to control materials with precision, to alter properties such as mechanics and degradation, and to introduce heterogeneity across a length of scales (combined with his interests in translational research) allow him to create further impact from his research.

CLEMSON AWARD FOR CONTRIBUTIONS TO THE LITERATURE

The Clemson Award for Contributions to the Literature awards significant contributions to the literature on the science or technology of biomaterials.

J. Paul Santerre, PhD
University of Toronto

Dr. Santerre is a professor at the University of Toronto best known for his invention of surface-modifying additives to enhance the biocompatibility of biomaterials. This breakthrough platform technology directly led to the formation of a novel Canadian company, Interface Biologics, Inc., and the raising of more than $35 million in private investment funding, which is a testament to the importance and relevance of his innovative technology.

His discoveries include many cost-effective materials and devices that offer patients better care through materials that self-arrange on the surface of the biomaterial, providing a surface that is less prone to generating blood clots, reducing the need for blood thinning medication and further reducing the overall cost and side effects to the patient.

Dr. Santerre has published more than 170 peer-reviewed publications and is a listed inventor on more than 60 patents in medical polymers, biodegradation, protein and blood interactions with surfaces, surface modification, regenerative medicine and drug delivery. His research and publications have led to a more in-depth understanding of the processes of biodegradation and has pointed toward methods of inhibiting hydrolytic and oxidative degradation of polymeric implant materials. His research in the area of biodegradation has also permitted the design of degradable polymer chains that can be specifically degraded by enzyme systems to provide therapeutic bioactivity in regenerative medicine approaches with vascular graft and cardiac tissue applications.

Dr. Santerre has demonstrated the initiative, energy and spirit it takes to seek out new ideas and to take a leading role in fostering and promoting them. He has provided a supportive presence and has the unique ability to create innovative products that have provided ideal care for many patients.

C. WILLIAM HALL AWARD

The C. William Hall Award honors members who have made a significant contribution to the Society and have an outstanding record in establishing, developing, maintaining and promoting the objectives and goals of the Society.

Michael Wolf, MS
Medtronic

Mr. Wolf is senior principal scientist and Technical Fellow at Medtronic. In the past three decades, he has worked in various areas of biomaterials and has made significant contributions to new products, as well as standards and methods for evaluation of biocompatibility of new, unique and innovative materials for biomedical applications. Most recently, his effort as chair of the International Organization for Standardization (ISO) 10993-4, "Biological Evaluation of Medical Devices — Part 4: Selection of Tests for Interactions with Blood," standard, published in spring 2017, was essentially revised, rewritten and updated by Mr. Wolf alone. This 69-page standard with 230 references is focused on the selection of tests for interactions with blood and will be of significant assistance to academic and industrial investigators.

As an industrial scientist, Mr. Wolf's publication record, not similar to academia, includes 26 peer-reviewed articles and four book chapters, and he has eight patents addressing various aspects of new blood-compatible biomaterials and technologies for improvement of those compatibilities. He is a core technology investigator and is involved in special projects in tissue-device/material interactions. While industrial activities are proprietary and confidential, Mr. Wolf's activities have included a wide variety of efforts focused on bringing additional information and knowledge to the general biomaterial and medical device community. His publications have provided this community with insights, perspectives and knowledge on how to adequately and appropriately evaluate blood/material interactions.

SFB AWARD FOR SERVICE

The SFB Award for Service is presented to an individual, corporation or government entity that has provided significant service to the Society by establishing, developing, maintaining and promoting its objectives and goals.

Howard Winet, PhD
Retired

Dr. Winet is a member with a passion for scientific ethics. Prof. Winet was a dedicated teacher whose mentorship encouraged students and peers while fostering and demanding scientific integrity. His commitment and guidance to students helped prepare them for advancement of their posters and question responses as podium lecturers. Dr. Winet has served SFB by moderating or chairing multiple symposia and workshops. He has served as program chair and vice chair for the Biomaterial–Tissue Interaction SIG over multiple years from 2001 to 2009. His expertise and commitment to the SIG has ensured success in organizing worthwhile programming for Annual Meetings for many years.

TECHNOLOGY INNOVATION AND DEVELOPMENT AWARD

The Technology Innovation and Development Award recognizes an individual (or team) who provided key scientific and technical innovation and leadership in a novel product in which biomaterials played an important and enabling role.

Harold Alexander, PhD
Orthogen, LLC

Dr. Harold Alexander received his doctorate in applied mechanics from New York University's School of Engineering and Science. He was then an Assistant Professor of Mechanical Engineering at the Stevens Institute of Technology, helping to establish the school's first biomedical engineering program. He performed research in cardiovascular and orthopaedic biomechanics with original research on the mechanical characterization of human skin, in collaboration with colleagues at Johnson & Johnson Research (J&J).

Dr. Alexander's was later at the Department of Surgery and Director of Orthopaedic Research at the New Jersey Medical School (NJMS) of the University of Medicine and Dentistry of New Jersey (UMDNJ). During his years at NJMS, Dr. Alexander co-founded two medical device companies. He also helped establish the joint UMDNJ-Rutgers University program in biomedical engineering. He was appointed by the Society for Biomaterials to edit a new journal, Applied Biomaterials, and became Editor Emeritus in 2009. Dr. Alexander became a professor in the Department of Orthopaedic Surgery of the New York University School of Medicine (NYUSM). being named director of the hospital's Department of Bioengineering. While at NYUSM, he helped establish the Biomedical Engineering Center at the City College of New York with funding from a Whitaker Foundation Special Opportunities Grant.

His research at HJD involved absorbable composite implants for fracture fixation and surface microgeometry control of tissue attachment to implants pursued with colleague, John L. Ricci, leading to the establishment of yet a third medical device company, the Orthogen Corporation, a research and Development company based in Springfield, NJ. Dr. Alexander is a Fellow of the American Institute of Medical and Biological Engineering (AIMBE), a Fellow of the New York Academy of

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Medicine and a Fellow, Biomaterials Science and Engineering (FBSE), and a member of the Society for Biomaterials. Dr. Alexander has extensively published and lectured worldwide in biomedical engineering. He holds 15 US patents and has been responsible for more than $20 M in grant funding. He resides in Short Hills, NJ.

John "Jack" Ricci, PhD
New York University College of Dentistry

Drs. Alexander and Ricci, pioneers in bone substitute materials, particularly for dental applications, have provided a professional approach to research, development and applications of devices using innovative conditions for biomaterials. Their innovations related to laser treatment of dental implant surfaces from origin to application represent a major advance specific to the functional stability of dental implants. Their additional work has benefited ligament replacements and calcium phosphate modification of various implant surfaces. Drs. Alexander and Ricci are tireless innovators and teachers advancing biomaterials, teaching what they have learned, inspiring students and supporting the field with their personal knowledge, attributes and abilities.

YOUNG INVESTIGATOR AWARD

The Young Investigator Award recognizes an individual who has demonstrated outstanding achievements in the field of biomaterials research. Candidates for the SFB Young Investigator Award must be within 10 years of receipt of their terminal degree (PhD or equivalent) and, if they work in an academic institution, must not be tenured at the time of nomination.

Susan Thomas, PhD
Georgia Institute of Technology

Prof. Thomas has made significant intellectual contributions and is a promising researcher in the biomaterials community. Her research program focuses on biomaterials and regenerative medicine with a focus on the interface of biotransport phenomena with biomaterials engineering in cancer therapy applications. As an independent investigator, Dr. Thomas has established a well-funded, multidisciplinary research program in immunoengineering and has secured significant funding, as PI or co-PI, in excess of $4.3 million going directly to her lab. She is an excellent teacher and advisor, recently awarded Georgia Tech's Center for Teaching and Learning Junior Faculty Teaching Excellence Award. Her research will have broad impact both in basic immunology and bioengineering and biomaterials science.

THE STUDENT AWARDS FOR OUTSTANDING RESEARCH ARE BEING AWARDED TO TWO PhD CANDIDATE INDIVIDUALS WHO HAVE DEMONSTRATED OUTSTANDING ACHIEVEMENT IN BIOMATERIALS RESEARCH.

STUDENT AWARD FOR OUTSTANDING RESEARCH — PhD CANDIDATE

Alysha Kishan
Texas A&M University

Ms. Kishan's research focuses on the translational relevance to human and veterinary medicine. Intestinal resection and anastomosis is a common procedure in humans for prevalent diseases like colorectal cancer and inflammatory bowel disease. In veterinary medicine, the procedure is also common in horses and dogs for a variety of conditions, including intestinal cancers and strangulating obstructions. There are two major sequelae to anastomoses that can be severe: leakage of the anastomotic site and adhesion formation. Ms. Kishan's work to develop an anastomotic wrap bioengineered to address these problems simultaneously would be highly novel and of considerable benefit to patients worldwide. Ms. Kishan provides rigorous characterization and identification of key relationships that advance the fundamental understanding of these processes. She is first author of five manuscripts in leading scientific journals.

STUDENT AWARD FOR OUTSTANDING RESEARCH — PhD CANDIDATE

Leo Wang
University of Pennsylvania

Mr. Wang's research is generally in the area of biomaterial-based RNA therapeutics for cardiac applications. He has worked on several hydrogel platforms toward this goal, building shear-thinning systems that permit injection into tissue and then

designing methods to make these materials either responsive to the local environment or interact better with the RNA and transfect cells. He has already published a review on this topic in *Advanced Healthcare Materials* and an initial report on the design of injectable PEI gels in *Biomacromolecules*. In that work, Mr. Wang designed hydrogels that assembled through the use of PEI modified with guest–host bonds that were injectable and eroded into complexes with siRNA that could transfect cells. He showed proof-of-concept studies on this in both in vitro and in vivo studies of GFP knockdown. This was his first scientific study from the lab and highlights his ability to delve deep into many aspects of material design and assessment.

In addition, Mr. Wang has been re-designing a hydrogel from the lab that degrades in response to proteases to deliver siRNA to knockdown MMPs, making this a responsive material system to the local tissue environment. He has been exploiting the dynamic covalent bonds found in this system for inject ability into tissues. Due to the inject ability of the hydrogel, he also identified that the hydrogel may also be useful as a bioink for 3D printing.

STUDENT AWARD FOR OUTSTANDING RESEARCH — UNDERGRADUATE

Justin Zhong
The University of Texas at Austin

Mr. Zhong's first research project, investigating protein adsorption to molecularly imprinted polymers (MIP), was under the supervision of a graduate student. This work was critical for the lab's development of major hypotheses regarding the role of protein templates in molecular imprinting, the biophysical and biochemical forces that govern molecular recognition, and the application of MIP systems in biosensing, drug delivery, and tissue engineering. He developed a new material for drug delivery applications in the form of nanoparticles of defined porous structure.

More recently, Mr. Zhong proposed a new extension of the lab's efforts in developing protein MIPs, which will detect proteins expressed on the surface of tumors and delivery chemotherapeutic drugs. His level of independence and creativity and ability to merge the lab's multiple research efforts are extremely rare.

His contributions have merited co-authorship on eight unique conference presentations at the Texas Biomaterials Day in Houston, Texas; the POLARIS meeting in Guimarães, Portugal; the Biomedical Engineering Society meeting in Tampa, Florida; the World Biomaterials Congress in Montreal, Canada; and the American Institute of Chemical Engineers (AIChE) Annual Meeting in San Francisco, California. He also made significant contributions to a recent publication in the *Journal of Biomedical Materials Research A*, where he is the manuscript's second author.

Above and beyond his contributions to the lab's ongoing collaborative work, Mr. Zhong's independent contributions have resulted in presentations at four University of Texas at Austin undergraduate research symposia, the Gulf Coast Undergraduate Research Symposium at Rice University, the AIChE Regional Meeting at the University of Houston and the AIChE Annual Meeting in San Francisco.

THE SOCIETY FOR BIOMATERIALS IS PLEASED TO ANNOUNCE ITS 2018 STUDENT AWARDS.

C. WILLIAM HALL SCHOLARSHIP

Jenna Mosier
Mississippi State University

CATO T. LAURENCIN TRAVEL FELLOWSHIP

Timothy Mason
University of Connecticut Health & Institute for Regenerative Engineering

Mary Omotso
North Carolina Agricultural & Technical State University

Officer Nominees

PRESIDENT-ELECT

The President-Elect shall become familiar with the duties of the President and shall, at all times, cooperate and assist with the duties of that office. In the absence of the President, the President-Elect shall preside at the meetings of the Society, the Council and the Board of Directors, and perform the duties and exercise the powers of President. The term of office is for a period of one year without succession. The President-Elect is the chairperson of the Long Range Planning Committee.

Alan S. Litsky, MD, ScD
Ohio State University

Biographical Sketch

Dr. Litsky, MD, ScD, is associate professor of biomedical engineering and orthopaedics at Ohio State University. He leads the Orthopaedic BioMaterials Laboratory and serves as director of orthopaedic research. He earned his medical degree from Columbia University's College of Physicians and Surgeons and his ScD in materials science and engineering from MIT. His research focus is hard-tissue biomaterials with an emphasis on new materials for orthopaedic, dental and veterinary applications. Prof. Litsky's teaching includes courses on hard-tissue biomaterials, tissue mechanics and research ethics.

Dr. Litsky has served on NIH's Orthopaedic Study Section, the Arthritis Foundation's Technology and Biomechanics Study Section and the American Academy of Orthopaedic Surgeons' Basic Science Evaluation Subcommittee. He is a member of the editorial boards of *Journal of Biomedical Materials Part B — Applied Biomaterials, Veterinary and Comparative Orthopaedics and Traumatology, Journal of Dental Biomechanics* and *Annals of Improbable Research*. He is a regular reviewer for these journals and for several granting agencies. Dr. Litsky is a Fellow of the American Institute for Medical and Biological Engineering and serves as the Ohio State University faculty representative to the Federal Demonstration Partnership. He is an active participant in the Orthopaedic Research Society and the Society For Biomaterials.

Dr. Litsky has been a member of the Society For Biomaterials since 1985. His involvement in the Society has included abstract reviews for Annual Meetings and service on the Program Committee, Finance Committee and Awards, Ceremonies and Nominations Committee. Dr. Litsky has also been an active participant in workshops and plenary sessions at several Society meetings. He has served in leadership roles in both the Orthopaedic Biomaterials SIG and the Biomaterials Education SIG. He has served on the Council for many years as chair of the Education & Professional Development Committee, the Membership Committee and the Publications Committee, and he served an elected term as member-at-large. Dr. Litsky was elected to a four-year term as secretary/treasurer, serving as secretary/treasurer-elect and chair of the Finance Committee for two years and then as secretary/treasurer. During his tenure as secretary/treasurer, he focused on simplifying and clarifying the Society's financial planning, budgeting and accounting processes and implementing the long-term investment strategies developed to ensure the Society's fiscal future.

Vision Statement

If given the honor and opportunity to serve the Society For Biomaterials as president, I would like to focus on three important areas. The first is continuing recent efforts to **improve the value of SFB membership**. Many members interface with our Society primarily through the Annual Meeting, and I hope to continue and to expand current efforts emphasizing both the breadth and depth of the biomaterials field in our programs. Our meetings should include current research in basic and applied materials science and implant biology; they should also have a strong education component, both for our members and to fulfill our position as a resource for knowledge and policy advice in our discipline. Increasing the value of our journals by enhancing their scientific standing and working to establish year-round SFB activities will also make our Society more useful to our members and better serve the biomaterials community. Expanding and diversifying our membership to re-establish the interactions between members from the academic, industrial and government communities will make our meetings more valuable to us all.

A second emphasis will be to **ensure the future of our Society** by including students and young members in all Society activities. Increasing the number and activities of Student Chapters, expanding new member participation in program development and meeting planning, and ensuring the representation of young member perspectives in Council-level decisions will strengthen our Society and enhance its significance. Through this type of expanded involvement and mentoring, we can improve SFB and develop our next generation of leadership. Equally important is our financial security. We have in place a solid fiscal plan, but continued close oversight of our investment policy and long-term reserve accounts, along with careful monitoring of all of our expenses, will ensure that we not only survive the tight budgets of World Congress years but secure our ability to expand programmatic initiatives and member services.

One new initiative that I would prioritize as president is to **increase our role as advocates**, for our discipline and for science in a broader sense. We need to expand our efforts as a Society to be recognized as the source of the best scientific and engineering knowledge in the realm of biomaterials and

as individual members to defend and promote data-based information and policy. A two-pronged approach is needed. We need to advocate at a government level for sound policies and consistent research funding. This level of advocacy can be facilitated through our affiliation with AIMBE but also needs the grassroots involvement of our membership through letter writing, legislative visits and perhaps even as candidates. Longer-term advocacy needs to happen through education. As more and more policy decisions require a solid foundation in science and a respect for scientific data, we, as both a Society and as individuals, should increase our public outreach through the wide array of media outlets and through expanded focus on K-12 education in science and technology.

I am honored to have been nominated to run for president. If elected to this position, I look forward to continuing to work for the Society For Biomaterials and its members.

Horst A. vonRecum, PhD
Case Western Reserve University

Biographical Sketch

Since 2004, Dr. vonRecum has been a faculty member in the Department of Biomedical Engineering at Case Western Reserve University, where he was elected to the AIMBE College of Fellows in 2013 and promoted to full professor in 2014. At Case Western, he has been the graduate program director and helps lead biomaterials efforts, such as the Case Center for Biomaterials and the Biomaterials NSF REU program. He has trained more than 30 MS, PhD and postdoctoral trainees, who are now located in positions throughout academia, medicine, industry and the government sector.

In addition to his faculty position, Dr. vonRecum is co-founder of Affinity Therapeutics, a startup in which he spent a year of sabbatical. His translational efforts and brief stint in industry gave him perspective in academic–industry relationships, one of the main areas of emphasis he plans to pursue if elected president.

Dr. vonRecum has been active in the Society since he attended his first Annual Meeting as a graduate student in 1993 (and was probably attending meetings even before then).

In the Society, he has played many roles, including member-at-large and chair of the Membership Committee, a role he served in under three different presidents (2011 – 2014). In these roles, he was also on both the Executive Council and the Leadership Board. He served in positions on the Awards, Ceremonies and Nominations Committee; the Program Committee; and the Bylaws Committee and served in a number of roles in SIGs. Dr. vonRecum played a highly visible role as program chair of the Cardiovascular Biomaterials SIG and as program chair of the Drug Delivery SIG, putting together a large number of SIG-specific sessions for the meetings over which he presided.

Outside of formal leadership roles, Dr. vonRecum has been an active and highly visible contributing member of the Society, encouraging strong attendance from his lab (one year, students from his lab won both the MS and PhD student awards) and participation from his colleagues.

In 2015, Dr. vonRecum was vice chair of the Gordon Research Conference in Biomaterials, working with Ed Botchwey and Joel Collier to bring that meeting to an international venue (Spain) for the first time in its more than 30-year existence. In 2017, Joel and Dr. vonRecum as co-chairs brought the meeting back to the United States, with record participation and attendance. In addition to working with SFB and the Gordon Research Conference, he has held leadership roles in other related societies (e.g., BMES, CRS, TERMIS), which further demonstrates his high commitment to the biomaterials field.

Vision Statement

A recent publication on the changing role of societies entitled *The End of Membership as We Know It* demonstrates the changing role that societies play in our field and others. Two features of that publication are that a successful society today has to have an appropriate niche and a well-defined culture. We are extremely fortunate (and grateful to our predecessors) that the Society For Biomaterials has strong track records in both of these areas. We know our niche well (biomaterials) and represent one of the strongest, most active communities in the larger field, making SFB my favored home (and hopefully yours as well).

However, these goals are a moving target, and I feel it is the role of the president to have a finger on the pulse of the Society's members to identify the pivots that the Society needs to make and new directions in which to head to ensure that we stay on top. As Membership Committee chair, I have enacted changes that ensure that student, postdoctoral and industry members continue to be a growing, vibrant part of our Society. Similarly, another change brought forward by Society members and implemented by our Membership Committee will change the way dues and registration have been paid, hopefully making this easier for everyone. These changes would not have been possible without your voice.

Previous presidents, including David Kohn and Liisa Kuhn, have been exceptional in maintaining good communication with the Society's members and representing their voice in Board and Council meetings. I have big shoes to fill, and, if elected, I promise to similarly present your thoughts fairly and actively to the Society's leadership.

[CONTINUED ON PAGE 12]

To do this, I will seek out your input both in Annual Meetings and outside of Annual Meetings (the other 362 days of the year). I pledge to ensure that the voice of SFB is heard outside of the Society as well, and in the larger biomaterials community. My ultimate goal is that this outreach will bring back enthusiastic new members who contribute and grow our Society so that we continue to define the niche and community that makes SFB so wonderful.

MEMBER-AT-LARGE

The Member-at-Large shall serve as an unencumbered representative of the membership at meetings of both the Board of Directors and Council. The Member-at-Large shall serve for a period of one year.

Jason Burdick, PhD
University of Pennsylvania

Biographical Sketch

Dr. Burdick is a professor in the Department of Bioengineering at the University of Pennsylvania. He received his undergraduate and graduate degrees in chemical engineering at the University of Wyoming and the University of Colorado, respectively. His PhD under Dr. Kristi Anseth was focused on the development of photocrosslinkable and biodegradable polymers for application to the repair of bone defects. He completed a postdoctoral fellowship with Dr. Bob Langer at MIT, engineering injectable hydrogels for the delivery of growth factors to tissue defects. Dr. Burdick joined the faculty at the University of Pennsylvania in 2005 and is the director of the Polymeric Biomaterials Laboratory.

Dr. Burdick's research involves the development of hydrogels and elastomers for various biological applications, and his lab is specifically interested in understanding and controlling polymers on a molecular level to control overall macroscopic properties. The applications of his research range from controlling stem cell differentiation through material cues to fabricating scaffolding for regenerative medicine and tissue repair. These approaches have been applied to numerous clinical applications, such as in the repair of musculoskeletal tissues (e.g., articular cartilage, meniscus) and as acellular materials for treating cardiac tissue. In recent years, his lab has developed methods to fabricate shear-thinning and self-healing hydrogels that are useful as injectable materials, as well as for application to 3D printing. His work has been licensed in the development of clinical products, and several startup companies (e.g., Prohibix) have been initiated to advance the technology.

Dr. Burdick currently has more than 210 peer-reviewed publications, and he has given nearly 200 invited talks on his research. His work is currently funded through numerous agencies, such as NIH and NSF, and private foundations. He has been awarded a K22 Scholar Development and Career Transition Award through NIH, an Early Career Award through the Coulter Foundation, an NSF CAREER Award, a Packard Fellowship in Science and Engineering and an American Heart Association Established Investigator Award. He was also elected a Fellow of the American Institute for Medical and Biological Engineering. He has been on the editorial boards of *Tissue Engineering*, *Biomacromolecules, Biomedical Materials, ACS Applied Materials & Interfaces, Biofabrication,* and *Journal of Biomedical Materials Research Part A* and is an associate editor for *ACS Biomaterials Science & Engineering*. Dr. Burdick has chaired the Materials Research Society Fall Meeting and a Gordon Research Conference and is an upcoming program chair for the Biomedical Engineering Society Annual Meeting.

Vision Statement

It is an honor to be nominated for the position of member-at-large for the Society For Biomaterials. When I started my faculty position, I was given the advice to select one society to engage in as a faculty member — for me, this was SFB. I had already attended the SFB Annual Meeting as a graduate student and postdoctoral researcher, and it was clearly the society for me. I do not believe that I have missed an Annual Meeting since then.

To engage with SFB, I have served on the Awards, Ceremonies and Nominations Committee multiple times, organized numerous symposia, chaired numerous sessions, participated in SIGs and reviewed countless abstracts. I have also had the opportunity to participate in student–faculty mentoring events, act as a keynote speaker at Biomaterials Day events and chair a debate at an Annual Meeting. I am always excited to bring a group of trainees to the Annual Meeting to present work from our group and to connect with the community. Through these activities, I have observed the Society from many angles, which I believe will help if elected to this role.

It is the role of the member-at-large to act as the representative and voice for Society membership, particularly on the SFB Board of Directors and Council. The Society should make sure that there is great value to being a member and that there is the continuous development of professional activities and opportunities for the membership, at all levels. SFB already does a great job in many areas, but we should continue to evolve based on Society feedback and needs of the community. I will of course reach out to previous members-at-large and Society membership for input, but I envision working in areas such as (1) engaging trainees, (2) bridging members and (3) expanding our community.

To **engage trainees**, we can initiate further undergraduate opportunities in Society communication and at the Annual Meeting, bridge Student Chapters across institutions to enhance student numbers and opportunities, and include institutions whose neighbors are more remote for participation in Biomaterials Days, including through electronic participation.

To **bridge members**, we should identify missed opportunities, such as events to engage industry with academia, including smaller startups. The SFB Annual Meeting is a great opportunity for trainees to interact with industry toward internships and future positions and to learn more about aspects of translation. To **expand our community**, it is important for us to engage across societies where biomaterials research is relevant and to be inclusive to a diverse membership. This will allow us to maintain excellence in our scientific programs and activities and to connect with other organizations. There is also opportunity to further engage those outside of science, such as through policy initiatives and education.

If elected, I look forward to working for the membership over the upcoming term.

Rebecca Carrier, PhD
Northeastern University

Biographical Sketch

Dr. Carrier is professor and associate chair for research in the Department of Chemical Engineering at Northeastern University. Dr. Carrier has been an active member of the Society For Biomaterials, serving on the Membership Committee (2014 – 2015), as SFB Annual Meeting program chair (2017) and on the Program Committee (2017 – 2018).

Dr. Carrier earned a bachelor's degree in chemical engineering from Rensselaer Polytechnic Institute in 1995 and a doctoral degree in chemical engineering from MIT in 2000. At MIT, she worked in the lab of Dr. Robert Langer, helping to pioneer the field of cardiac muscle tissue engineering. After completing her graduate studies, Dr. Carrier worked at Pfizer as a senior research scientist in oral controlled release drug delivery for three years. At Pfizer, Dr. Carrier formulated and developed manufacturing processes of oral controlled release systems for clinical and commercial applications. Due to her strong desire to devote more time to research and education, she sought an academic position and joined the Northeastern University Chemical Engineering Department.

Dr. Carrier's previous research experiences in tissue engineering and drug delivery, and intriguing challenges made apparent through her industrial experience, are the driving forces behind her current research interests. The goal of Dr. Carrier's research program is to relate material properties to biological response in drug delivery and regenerative medicine to enable technologies that benefit human health. Current focus areas include (1) oral drug delivery, specifically mechanistic studies and modeling to predict the impact of lipids and food on oral compound absorption; (2) intestinal mucus barrier properties and their modulation to enable efficient drug delivery and control pathogen invasion; and (3) biomimetic materials for intestinal cell culture and intestinal and retinal tissue engineering. To advance these research efforts, Dr. Carrier has fostered collaboration and worked closely with multiple industrial partners, including Pfizer, Merck, Boehringer Ingelheim, and Simulations Plus, Inc., a leader in development of pharmaceutical modeling software.

Dr. Carrier received the NSF CAREER Award in 2008 for mechanistic studies and modeling of lipid-based drug delivery systems in the GI tract, as well as the Northeastern University Outstanding Teacher and Faculty Fellow awards in 2011 and 2014 for excellence in teaching and research leadership, respectively. She also won the Soren Buus Outstanding Research Award in 2017. Dr. Carrier was selected to attend the National Academy of Engineering Frontiers of Engineering Symposium (2016) and Frontiers of Engineering Education Symposium (2013) and served as a standing member of the NIH Gene and Drug Delivery Study Section (2013 – 2017). Her educational efforts are focused on integrating experiential learning into the engineering curriculum.

Vision Statement

I am extremely honored to be considered for the Society For Biomaterials member-at-large position. It would be a great privilege to represent and promote the interests of the SFB membership, a group of individuals that is dedicated to pushing the boundaries of discovery and development to benefit human health and well-being. I believe I can effectively represent the multidisciplinary membership of SFB, as well as the interests of the varied academic, industrial and government scientists. My work spans a broad range of biomaterials development and applications efforts in regenerative medicine and drug delivery, and my professional experience has been enriched with both industrial and academic experiences.

If I am fortunate enough to be elected member-at-large, I will do my best to faithfully represent the best interests of Society membership. In particular, I will work to:

Ensure representation of all SFB membership. SFB serves as an important nexus for the gathering of biomaterials scientists from across industry, academia and government labs. I will work to engage and represent the interests of all members — and, indeed, to foster collaboration among them. I had the experience of working in industry for a few years before I transitioned to an academic position, and I have had the great pleasure of continuing to collaborate with industrial scientists and engineers throughout my academic career. I believe these experiences will help me to better represent the varied backgrounds of our membership and to promote initiatives to support networking between all members. As a program chair for the 2017 SFB Annual Meeting, I worked with co-chair SuPing Liu to integrate new initiatives into the

[CONTINUED ON PAGE 15]

Staff Update

By Pam Gleason, Assistant Executive Director

Hello from the Society For Biomaterials headquarters! As we gear up for 2018, the Board of Directors, governing Council, committees, task forces and SIGs are working on the initiatives established at the November Board and Council meeting.

AUDIT COMMITTEE

Awards, Ceremonies & Nominations Committee

Chair Nicholas P. Ziats, PhD

The 2018 award recipients have been selected and notified. The full article can be found starting on page X in this issue. In addition, the slate of officer candidates is on page X. The 2018 – 2019 election website opened in January; please remember to vote! The committee is also reviewing nominations for the 2018 Cato T. Laurencin Travel Fellowship and the 2018 C. William Hall Scholarship.

Bylaws Committee

Chair Benjamin G. Keselowsky, PhD

The committee will continue to monitor the Society's operations and strategic direction to determine if amendments may be necessary. It is currently working to expand and define the role of the President's Advisory Committee.

Education & Professional Development Committee

Chair Jan P. Stegemann, PhD

Eight Biomaterials Days grants were approved for 2018. The SFB Council redesigned program funding for participants to be more invested. First-time groups will get matching funds up to a set amount for each dollar that is raised; groups that have already been funded will receive matching funds of $1 for each $2 raised. Dates for these events will be published as they become available. The committee is also organizing a Career Catalysis track at the Annual Meeting and has recently launched a mentorship program.

Finance Committee

Chair Elizabeth Cosgriff-Hernandez, PhD

The committee developed a 2018 budget that will return the Society to financially sustainable operations, with a positive net income. This includes a well-attended Annual Meeting and stay at the host hotel to avoid high attrition as in the previous year. It is important for Society members to focus on meeting the guaranteed room block and required minimums for all services. Reserves remain healthy, and the Board of Directors is anticipating healthy revenue from the Annual Meeting.

Industrial Affairs Committee

Chair Petre G. Edelman, PhD

The committee is working to develop and evaluate opportunities for industry members in Atlanta, including contributions to the Career Catalysis track. More effort will be made to involve academics in industry standards, and the committee remains focused on its efforts to select pertinent topics for industry, increase industry participation and interactions with appropriate standards group, and collect input from industry members about how to deal with standards development.

Liaison Committee

Chair Tim Topoleski, PhD

The committee is supporting a first-time symposium at the MatSciTech October 2018 meeting currently organized by TMS, AIST, ACerS and ASM. The symposium's success rate will determine our collaboration with future MatSciTech meetings. SFB is supporting a Summer School program at the University of Bordeaux in conjunction with the European Society For Biomaterials. In addition, SFB members can receive a registration discount to attend the McGowan Regenerative Medicine Summer School.

Membership Committee

Chair Christopher J. Gehrmann, PhD

The committee is working to develop strategies to increase membership, especially in industry and clinical sectors. These include a social media campaign highlighting some of the Faces of SFB to encourage non-member Annual Meeting attendees, webinar participants and website visitors to join. Board members approved modest increases in dues and registration for 2018.

President's Advisory Committee

Chair Liisa T. Kuhn, PhD

The committee is finalizing an SFB Code of Ethics and will publish it shortly. The committee is also working to put together a panel on ethics for the 2018 Annual Meeting.

Program Committee

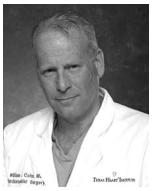
Co-Chairs Johnna Temenoff, PhD, and Robert Hastings, MS PE

The theme for the 2018 Annual Meeting is "Exploring the Nexus of Research and Application." In keeping with that theme, the committee has developed a program that focuses on biomaterial research across diverse scientific disciplines, from biology and material science to chemistry, physics, medicine and engineering.

The Annual Meeting program will include the latest innovations in materials science and molecular and cell biology and engineering, as well as new opportunities and mechanisms for translation of these findings to new or improved treatments or

diagnostics. The meeting format will include symposia, general sessions, workshops, panel discussions and tutorials covering all aspects of basic, applied and translational biomaterials science.

KEYNOTE SPEAKER



William E. Cohn
MD, FACS, FACCP, FAHA
Professor, Baylor College of Medicine

Dr. Cohn is a professor of surgery at Baylor College of Medicine and an adjunct professor of bioengineering at both Rice University and the University of Houston.

His major research interests include the development of new technology for decreasing the invasiveness of cardiac and vascular surgery and development of the continuous-flow, totally implantable artificial heart. In 2011, Dr. Cohn and Dr. O. H. Frazier successfully implanted the first pulseless, total heart replacement device in a human patient.

Dr. Cohn has a passion for medical device development and has more than 90 U.S. patents granted or pending and another 60 international patents for his medical innovations. His numerous awards include an honorary doctorate in science from Oberlin College, the Distinguished Scientist Award given by the MacDonald Fund, and the Edison Award for excellence in human-centered design and innovation for inventing the SentreHEART Lariat Suture Delivery Device.

Publications Committee

Chair Sachin S. Mamidwar, MBBS, MS

The committee continues its work with bi-weekly e-newsletter *Biomaterials Bulletin* and the *Journal of Biomedical Materials Research* while also working to expand services available on the SFB website.

NATIONAL STUDENT CHAPTERS

President Daniel Hachim, PhD

National student section officers are working with the Education & Professional Development Committee to develop content for the Career Catalysis track and to coordinate student activity within SIGs.

SIG Representative

Sarah Stabenfeldt, PhD

SIG budgets were approved for 2018, and SIGs are working to determine STAR recipients for 2018. In addition, an all-SIG breakfast is planned during the Annual Meeting.

If you have any questions,

need any information or have suggestions for improved services, please feel free to contact the Society's Headquarters office:

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Officer Nominees (continued from page 13)

Annual Meeting program, including the Biomaterials Technology in Industry sessions, to better represent the interests and advancements of industrial scientists. Being sensitive to the fact that industrial scientists are often unable to disclose all details about their scientific work, requirements and expectations for this information were relaxed for these sessions.

Ensure that the Society provides benefits of maximum significance to the membership. Benefits that Society membership offers that I think are particularly important include opportunities to communicate research findings and build connections with other members. Of course, high-quality scientific meetings are central to these benefits. Poster sessions at conferences can be leveraged, as the Planning Committee has planned for the 2018 meeting, to provide "rapid-fire sessions" in which a greater number of members can present their work. I will explore other innovative approaches, such as effectively using the website to highlight members on a regular basis.

Strengthen Society membership. The field of biomaterials has continued to evolve, and it is important to work to strengthen membership and the Society as a whole as this continuous evolution takes place. One way to accomplish this is to consciously ensure representation of biomaterials topics traditionally supported by the Society in programmatic activities (e.g., conference sessions) while actively working to integrate new areas (e.g., by polling membership for thoughts on what those areas should be).

Student Chapter Update

By Daniel Hachim, Student News Editor

STUDENT LUNCHEON/PANEL "EXPLORING OPTIONS AFTER YOUR DEGREE" AT SFB ANNUAL MEETING 2018

We are pleased to invite all bachelor, master and doctoral students to our event at our next Annual Meeting in Atlanta! We will host a special lunch panel discussion with great leaders from industry, academia, regulatory agencies and alternative careers, including:

- Dr. Johnna Temenoff, Georgia Tech and Emory University, representing academia
- Dr. Brian Thomas, Stryker Sustainability Solutions, representing industry
- Dr. Christine Horejs, associate editor of *Nature Reviews Materials*, representing alternative careers
- Dr. Megan Jamiolkowski, Biomedical Engineering Staff Fellow at FDA

Join this conversation to discuss career options, steps to take to achieve your ideal career, how to find opportunities that best prepare you for a given career, and the job application process and preparation.

CALL FOR STUDENT OFFICER NOMINATIONS

Nominations for SFB's 2018 – 2019 student officers are now open! We'd like to encourage everyone to be part of this great experience — no prior experience required. As members of the SFB Student Council, we represent student concerns and participate in the creation of events and opportunities for the education and professional development of SFB's student members. In addition, we work with many leaders in the field of biomaterials, gaining great experience and leadership skills.

We'll be looking forward to receiving your nominations, which are due by Mar. 22, 2018. Please do not hesitate to contact us with any questions or concerns!

BIOMATERIALS CHALLENGES FACED BY CURRENT ANTIMICROBIALS (*RAHIM JINDANI*)

Bacteria surround all of us and are a constant threat to humans, especially in crowded spaces such as hospitals, airports and shopping areas. Bacteria can be largely classified as gram positive and gram negative. The peptidoglycan cell layer for gram-negative bacteria is thin compared to gram-positive bacteria, but because they have an extra plasma layer, gram-negative bacteria are harder to treat. *E. coli* and gram-negative bacteria are hard to treat, since these bacteria can develop resistance to antibiotics over time. A number of medical textile products used in hospitals and in outerwear products today use fabrics that are coated with different formulations of silver-, copper- or zinc-based antimicrobials.

Metallic coatings have a number of downsides. Coatings can often cause yellowing in white fabrics or oxidize with time, making them ineffective against pathogens and bacteria. Metallic ions present in antimicrobial coatings can often limit the number of shades that can be achieved in fabrics used. Silver- and other metallic-based coatings or formulations as part of fibers and other bioplastics are currently being re-evaluated for their use as medical textile and outerwear products. As consumers learn about the harms and dangers from nanoparticles in products, they try to avoid products with heavy metallic ions. It is important to have robust formulations that are sustainable, even after several washings, and do not contain metallic ions. Formulations with biomaterials could potentially address these challenges.

A recent study undertaken at the University of Illinois–Urbana Champaign found that for antimicrobials to be effective against gram-negative bacteria, it is important that they have amine ends present.[1] Amine ends are rigid by nature and have lower globularity. The outer membrane for gram-negative cells has porins, which can be easily penetrated by amine groups, but penetration only occurs if the penetrating compound is rigid. Since metallic nanoparticles are rigid, it is easier for them to penetrate this outer membrane. Antimicrobials with amine ends can ensure disruption of the cell membrane for gram-negative bacteria. Some biomaterials that can overcome these challenges are highlighted as follows.

Chitosan is found in abundance in nature, in fish, crustaceans, mushrooms and insects. It has been reported in literature that the number of amine ends present in chitosan can be greatly increased depending on the amount of deacetylation achieved for chitosan. Chitosan usually works at a higher pH, but it has been reported that antimicrobial activity for chitosan reduces at a neutral or lower pH. One recent study found that chitosan and an alginate blend were effective against gram-negative bacteria, even at a lower and neutral pH.[2]

Another important issue with the use of biomaterials such as chitosan is particle size. Since manufacturers embed antimicrobials within the fiber core or as a bicomponent part, biomaterials being used or investigated must have a small surface area to be used during spinning.

It will be important that these challenges are addressed when strategies are employed to provide biomaterials that have antimicrobial capability against gram-positive and gram-negative bacteria.

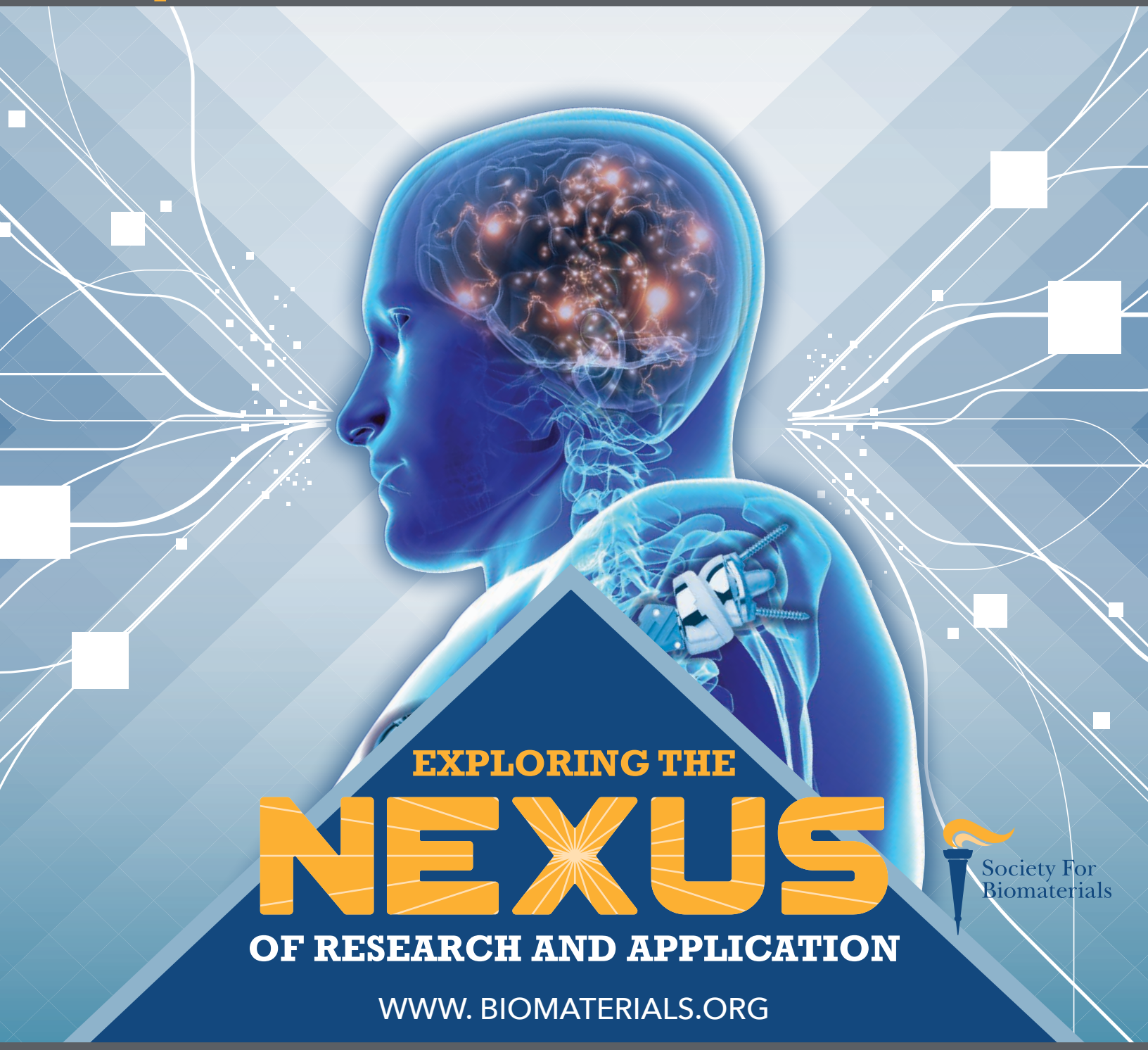
REFERENCES

1. Richter MF, Drown BS, Riley AP, Garcia A, Shirai T, Svec RL, Hergenrother PJ. Predictive compound accumulation rules yield a broad-spectrum antibiotic. Nature. 2017 May;545(7654):299.
2. Tang H, Zhang P, Kieft TL, Ryan SJ, Baker SM, Wiesmann WP, Rogelj S. Antibacterial action of a novel functionalized chitosan-arginine against Gram-negative bacteria. Acta Biomaterialia. 2010 Jul 1;6(7):2562-71.

SOCIETY FOR BIOMATERIALS

2018 ANNUAL MEETING & EXPOSITION

April 11-14, 2018 • Hilton Atlanta • Atlanta, GA



EXPLORING THE NEXUS OF RESEARCH AND APPLICATION

Society For Biomaterials

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REGISTRATION BROCHURE

ABOUT THE SOCIETY

The Society For Biomaterials is a professional society that promotes advances in biomedical materials research and development by encouragement of cooperative educational programs, clinical applications, and professional standards in the biomaterials field. Biomaterials scientists and engineers study cells, their components, complex tissues and organs, and their interactions with natural and synthetic materials and implanted prosthetic devices, as well as develop and characterize the materials used to measure, restore, and improve physiologic function, and enhance survival and quality of life.

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Committee Chair

Robert Hastings, MS, PE
Depuy Synthes
Joint Reconstruction
Committee Chair

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PROGRAM OVERVIEW

Exploring the Nexus of Research and Application

Since its founding, Atlanta has been a hub of commerce and transportation, known for bringing together diverse people and ideas. Similarly, the Society has a long history of being the hub for multidisciplinary materials research and applied solutions for healthcare. Atlanta thus provides the perfect backdrop for the 2018 Society for Biomaterials annual meeting, which will act as a "nexus" to further opportunities for collaboration across diverse scientific disciplines, from biology and material science, to chemistry, physics, medicine and engineering.

2018 KEYNOTE SPEAKER

William E. Cohn, MD, FACS, FACCP, FAHA

VP, Medical Devices and Director, Center for Device Innovation at TMC

William E. Cohn, MD, is a Vice President of Medical Devices at Johnson&Johnson and the Director for the Johnson&Johnson Center for Device Innovation at the Texas Medical Center. He is also a professor of surgery at Baylor College of Medicine and an adjunct professor of Bioengineering at both Rice University and the University of Houston.

Prior to joining J&J, Dr. Cohn was the director of the Cullen Cardiovascular Research Lab at the famed Texas Heart Institute and the Director of Minimally Invasive Cardiothoracic Surgery at THI. A native of Houston, Dr. Cohn received his medical school education, general surgical training, and cardiothoracic surgical training at Baylor College of Medicine where he served as the last chief resident of the legendary heart surgeon Michael E. DeBakey. After graduation, Dr. Cohn spent eleven years on the faculty of Harvard Medical School and as an Attending Cardiothoracic Surgeon at Boston's Beth Israel Deaconess Medical Center.

His major research interests include the development of new technology for decreasing the invasiveness of cardiac and vascular surgery and development of the continuous-flow totally implantable artificial heart. In 2011, Dr. Cohn and Dr. O. H. Frazier successfully implanted the first pulseless total heart replacement device in a human patient.

Dr. Cohn has a passion for medical device development and has more than 90 US patents granted or pending and another 60 international patents for his medical innovations. His numerous awards include an honorary doctorate in science from Oberlin College, the Distinguished Scientist Award, given by the MacDonald Fund, and the Edison Award for excellence in human-centered design and innovation for inventing the SentreHEART® Lariat® Suture Delivery Device. In 2000, Dr. Cohn was named the distinguished Inventor of the Year by the U.S. Intellectual Property Owners Association and in 2014, he was named Outstanding Inventor of the Year by the Houston IPO. In addition, in 2014 he received an award for the most Innovative Medical Device Startup of the year at the Innovations in Cardiovascular Interventions Conference in Tel Aviv for inventing the TVA Everlin q system for percutaneous creation of AV fistulas and for founding TVA Medical. In 2015, he was awarded a Lifetime Achievement Award for healthcare innovation by the Houston Technology Center. He is the Chief Medical Officer of BiVACOR Inc. and currently serves on the board of directors of CSI Inc., BiVACOR, and TVA Medical. Previously, he served on the boards of ArterX, PluroMed, Onyx Medical, and SentreHeart.

SOCIETY FOR BIOMATERIALS

2018 ANNUAL MEETING & EXPOSITION

April 11-14, 2018 • Hilton Atlanta • Atlanta, GA

EXPLORING THE NEXUS OF RESEARCH AND APPLICATION

HIGHLIGHTS OF THE 2018 MEETING WILL INCLUDE:

Panels

Panel Discussions are presented in a format that fosters an open debate on a topic. The invited speakers include renowned experts in the area of focus and the chair allows time for open discussion with the audience.

- Contemporary Biomaterials' Ethics: Fundamentals, Recent Issues, and Controversial Case Studies
- Cage Match 2018! Academia vs. Industry: Where can you have the Greatest Impact?
- Spinning Academic Research into Startup Companies
- Challenges to and Opportunities for Implementing Regenerative Biomaterials in Patient Care

Workshops

Workshops will provide an in-depth educational experience on topics relating to biomaterials with a significant amount of time dedicated to discussion and questions and answers.

Each workshop requires separate registration, the fees for which are detailed on the registration form. Workshops take place on Wednesday, April 11.

Recent Advances in 3D Printing of Biomaterials

Advances in Histopathology Techniques in the Assessment of Implant Tissue Interface

Georgia Tech Lab Tour

Thought Leaders

Linda Griffith, PhD
Massachusetts Institute of Technology

Philip Messersmith, PhD
University of California, Berkeley

David Mooney, PhD
Harvard University

Leonard Pinchuk, PhD, DSc,
Innovia, LLC

Education Competition

Student Education Design Competition

The Biomaterials Education Challenge will encourage SFB student chapters and other student clubs or groups to develop innovative and practical approaches to biomaterials education. Student teams will be challenged to develop an educational module for middle school (6th-8th grade) science classes. Each educational module will demonstrate fundamental biomaterials concepts, with scientific principles that are understandable to a middle school audience and designed for a 45 minute class period. The education modules should have hands-on components, should be easily incorporated to typical middle school science courses, and should have materials easily obtained with clear educational and learning objectives. Winners will be identified based on their potential for educational impact, and judges will emphasize innovation, practicality, and likelihood of widespread adoption and dissemination of the educational projects. The goals of this competition are to improve widespread understanding of biomaterials-related science and careers in the middle school population; to encourage SFB student chapters to participate in K-8 outreach efforts; and to reward the communication skills and creativity of the next generation of biomaterials researchers and educators.

PRELIMINARY PROGRAM

All Sessions will take place at the Hilton Atlanta • (Tentative and Subject to Change)

WEDNESDAY, APRIL 11, 2018

7:30 am – 7:00 pm **Registration Open**

9:30 am – 11:30 am **Workshop:** Recent Advances in 3D Printing of Biomaterials

9:30 am – 11:30 am **Workshop:** Advances in Histopathology Techniques in the Assessment of Implant Tissue Interface

11:00 am – 1:00 pm **Tour:** Georgia Tech, Biotech Quad

1:00 pm – 3:00 pm **Concurrent Session I**

- Panel: Contemporary Biomaterials' Ethics: Fundamentals, Recent Issues, and Controversial Case Studies
- Panel: Biomaterial Bases Regenerative Medical Product Commercialization Hurdles
- Fabrication and 3D Printing of Tissue Engineering Scaffolds
- Biomaterials for Cardiovascular Regeneration
- Drug Delivery
- Dental/Craniofacial Biomaterials SIG
- Engineered Microenvironments in to Model Disease
- Cancer Nanotechnology

3:15 pm – 4:45 pm **Concurrent Session II**

- Rapid Fire 1

  Fabrication and 3D Printing of Tissue Engineering Scaffolds

- Rapid Fire 2

  Biomaterials for Regenerative Engineering Applications: Vascular

  Biomaterials for Regenerative Engineering Applications: Muscle, Nerve, and Skin

  Biomaterials for Regenerative Engineering Applications: Bone, Cartilage, and Ligaments

- Rapid Fire 3

  Biomaterials and Scaffolds for Interfacial Tissue Engineering

- Rapid Fire 4

  Drug Delivery: Nanoparticles

  Drug Delivery: Cancer

  Drug Delivery: Tissue Engineering

- Rapid Fire 5

  Supramolecular Nanomaterials for Drug Delivery, Imaging, and Immunoengineering

- Rapid Fire 6

  Engineered Biomaterials for Neural Applications: Controlled Release

  Engineered Biomaterials for Neural Applications

  Engineered Biomaterials for Neural Applications: Peripheral Nerves

- Rapid Fire 7

  Orthopaedic Biomaterials: Implant Degradation / Corrosion

  Orthopaedic Biomaterials: Tissue Engineering / Scaffolds

  Orthopaedic Biomaterials: Device Mechanics and Wear

- Rapid Fire 8

  Engineered Microenvironments in to Model Disease: Musculoskeletal Disease

  Engineered Microenvironments in to Model Disease: Cancer

5:00 pm – 6:30 pm **Opening Ceremony**

Keynote Address:
William E. Cohn, MD, FACS, FACCP, FAHA
VP, Medical Device and Director, Center for Device Innovation at TMC

6:30 pm – 8:30 pm Opening Reception
(In the Exhibit Hall)

THURSDAY, APRIL 12, 2018

7:00 am – 5:30 pm Registration Open

7:00 am – 7:45 am **Special Interest Group Meetings**

8:00 am – 10:00 am **Plenary Session I – Clemson Awards**

- Clemson Award for Basic Research: Mark Grinstaff, PhD, Boston University
- Clemson Award for Applied Research: Jason Burdick, PhD, University of Pennsylvania
- Clemson Award for Contributions to the Literature: J. Paul Santerre, PhD, University of Toronto

10:00 am to 10:30 am **Break**

10:30 am to 12:30 pm **Concurrent Session III**

- Thought Leader: Leonard Pinchuk
- Panel: Career Catalysis: Strategies for Biomaterials Education and Professional Development
- Biomaterial Technologies for Precision Medicine
- The Convergence of Advanced Materials with Developmental Biology
- Nano Drug Delivery
- Racing for the Surface: Recent Development in Antimicrobial and Osteoinductive Biomaterials
- Biomaterial-Tissue Interaction SIG
- Immune Engineering SIG

12:30 pm to 1:45 pm **Lunch on own**
Women Luncheon - Promotion and Networking: Tools for Success

1:45 pm to 3:45 pm **Concurrent Session IV**

- Thought Leader: David Mooney
- *BTI* From Conception to Clinical Trial: Examples of Technology Development
- Intelligent Hydrogels for Biomedical Applications (Joint Symposium with Korean Society for Biomaterials)
- The Preclinical and Clinical Experience with Regenerative Biomaterials
- Implantable Bioelectronics
- Panel: Dental/Craniofacial Arena: Opportunities, Regulations and Minefields in the Pathway from Benchtop to Commercialization
- Biomaterial Technologies for Hemostasis and Wound Care
- Next-Generation Biomaterials for Islet Delivery and Immune Acceptance for Diabetes

3:45 pm to 4:15 pm **Break in Exhibit Hall**

4:15 pm to 6:15 pm **Concurrent Session V**

- Panel: Cage Match 2018! Academia vs. Industry: Where can you have the Greatest Impact?

- *BTI* Testing Methods for Evaluating Translational Biomaterials
- Translation of Nanoparticle Contrast Agents for Clinical X-Ray Imaging Modalities
- Biomaterials and Scaffolds for Interfacial Tissue Engineering
- Supramolecular Nanomaterials for Drug Delivery, Imaging, and Immunoengineering 1
- Orthopaedic Biomaterials SIG
- Engineering Cells and Their Microenvironments SIG
- Therapeutic Strategies for the Treatment of Infectious Diseases

6:30 pm to 8:00 pm **Poster & Exhibit Reception**

FRIDAY, APRIL 13, 2018

7:00 am – 5:00 pm Registration Open

7:00 am – 7:45 am **Special Interest Group Meetings**

8:00 am – 10:00 am **Plenary Session II – SFB Awards**

- Founders Award: Thomas Horbett, PhD, University of Washington, Retired
- Technology Innovation and Development Award: Harold Alexander, PhD (Orthogen, LLC - retired) and John Ricci, PhD, New York University
- Young Investigator Award: Susan Thomas, PhD, Georgia Institute of Technology

10:00 am – 10:30 am **Break**

10:30 am – 12:30 pm **Concurrent Session VI**

- Thought Leader: Philip B. Messersmith
- 3D Bioprinting for Medical Applications
- Biomaterials and Scaffolds for Engineering Vascular Grafts and Blood Vessels
- Local Drug, Protein, and Gene Delivery from Implant Surfaces and Coatings
- Engineered Biomaterials for Neural Applications
- Advances in Bioactive Calcium Phosphate Ceramics and Bioglasses
- Harnessing Matrix Biology to Control Cell Fate: A Guest Symposium Sponsored by the American Society for Matrix Biology
- Glycomaterials

12:00 pm – 1:45 pm **Lunch on own**
Student Lunch: Exploring Options after Your Degree Students
Editors Lunch: Biomaterials Science Textbook - Planning the Fourth Edition

1:45 pm to 3:45 pm **Concurrent Session VII**

- Thought Leader: Linda Griffith
- Panel Discussion: Spinning Academic Research into Startup Companies
- Panel Discussion: Challenges to and Opportunities for Implementing Regenerative Biomaterials in Patient Care
- Enzyme-Assisted Biomaterials Fabrication and Modification for Biological Applications
- Cardiovascular Biomaterials SIG
- Supramolecular Nanomaterials for Drug Delivery, Imaging, and Immunoengineering 2
- Protein and Cells at Interfaces SIG
- Biomaterial-Mediated Control of Immunity for Regenerative Medicine

3:45 pm – 5:15 pm	**Poster Session II in Exhibit Hall**
5:15 pm – 6:15 pm	**SFB Annual Business Meeting** **SFB National Student Chapter Meeting**
7:00 pm – 10:00 pm	**SFB BASH at the Georgia Aquarium**

SATURDAY, APRIL 14, 2018

7:00 am – 12:00 pm	Registration Open
7:00 am – 7:45 am	**ALL SIG Meeting**
8:00 am – 10:00 am	**Plenary Session III – Acta Biomaterialia Gold Medal** • Gold Medal: Jeff Hubbell, PhD, University of Chicago • Silver Medal: Ali Khademhosseini, PhD, UCLA
10:00 am – 10:15 am	**Break**
10:30 am – 12:30 pm	**Concurrent Session VIII** • Surface Characterization and Modification SIG • Nanomaterials SIG • Supramolecular Design of Network Biomaterials • Tissue Engineering SIG • Materials for Cardiovascular Devices, and Blood Compatibility • Ophthalmic Biomaterials SIG • Orthopaedic Biomaterials • Engineered Microenvironments in to Model Cancer

HOTEL INFORMATION/RESERVATIONS

For your convenience, sleeping rooms have been reserved at the Hilton Atlanta. The hotel can be contacted directly for individual reservations and they are on a first-come, first-serve basis. Please be sure to reference the Society For Biomaterials or SFB 2018 Annual Meeting & Exposition when making reservations.

The special room rate will be available until March 11, 2018 or until the group block is sold-out. After this date the prevailing rates for the hotel will apply.

To reserve a room at the group rate, visit the SFB website or contact the hotel directly by calling (404) 629-2000, please be sure to reference the Society For Biomaterials.

HILTON ATLANTA
255 Courtland Street NE
Atlanta, GA 30303
1-404-659-2000

CONFERENCE RATES:

Sleeping room rates have been reserved for attendees at a conference rate of $179.00 single/double occupancy plus taxes.

Conference rates are available from April 10, 2018 to April 14, 2018

GENERAL INFORMATION

ABSTRACT PUBLICATION

If you would like a printed copy of all the abstracts, you may pre-purchase a Transactions Book through online registration. You will be given the Transactions Book upon check-in at the registration desk. **This offer is only available to those who register by March 21, 2018.**

BADGES

Please pick up your conference badge at the registration desk (Hilton Atlanta, Level 2 Meeting Space Lobby) upon your arrival to conference. You must wear your badge throughout the conference as it is to identify you as a SFB 2018 Annual Meeting & Exposition attendee. If you misplace your badge, please go to the registration desk for a replacement.

BIOMATERIALS BASH

Join your colleagues at the Georgia Aquarium for the 2018 Biomaterials Bash being held on Friday, April 13, 2018 from 7:00 pm – 10:00 pm. You do not have to pre-register for the bash. Each registrant can attend at no charge. There is an option to purchase a guest ticket.

CERTIFICATE OF ATTENDANCE

You may pick up a Certificate of Attendance on-site at the registration desk.

CURRENCY EXCHANGE

Hartsfield-Jackson Atlanta International Airport

Travelex Currency Exchange offers foreign currency exchange, travelers checks, drafts and wires, phone cards, travel insurance and foreign check collection.

Travelex has 12 currency exchange locations at Hartsfield-Jackson:

- Atrium – 404-766-8767
- Concourse T near Gate T7 – 404-767-3471
- Concourse A Centerpoint – 404-762-7696
- Concourse B near Gate B16 – 404-762-7996
- Concourse D Centerpoint – 404-767-4530
- Concourse E at Customs – 404-761-1406
- Concourse E near Gate E12 – 404-761-1941

- Concourse E Gate E26 – 404-761-6331
- Concourse E Centerpoint – 404-768-2465
- Concourse F near Gate F6 – 404-763-0900
- Concourse F Arrivals Area (Baggage Claim) – 404-719-1175
- Concourse F (Train/Customs Level) – No phone number

For additional information, including hours of operation, contact the Travelex atrium location at (404) 766-2700 or Concourse E location at (404) 761-6331. You can also visit www.travelex.com.

DRESS CODE

Business casual is the recommended dress for the meeting.

PASSPORTS AND VISAS

All persons travelling by air outside of the United States (U.S.) are required to present a passport or other valid travel documentation to enter or re-enter the U.S. You can find more information on U.S. Customs and Immigration at www.dhs.gov.

Before traveling to the U.S., a citizen of a foreign country must generally obtain a nonimmigrant visa for temporary stay. If a visa is required, please contact Society For Biomaterials' Meeting Coordinator, Allison Leyh at aleyh@biomaterials.org to receive documentation explaining your intended purpose of travel to the U.S. Visa applicants should apply well in advance of your travel departure date.

For more information on passports and visas, please visit http://travel.state.gov/

The official language of the meeting is English.

REGISTRATION

All attendees are encouraged to pre-register for the meeting. By registering early, attendees can benefit from a reduced rate much lower than that offered on-site. To take advantage of this economic offer, register by March 21, 2018 as part of our Early Bird Registration. Attendees can register via the SFB Conference website, 2018.biomaterials.org, or by using the paper form attached to this brochure.

All registration fees include: admittance to all scientific sessions, tutorials, panel discussions, exhibits, opening reception, poster and exhibition reception, breaks and the BASH. Additional fees apply to Wednesday workshops.

MEMBER RATES

Member rates apply to members of the Society For Biomaterials, USA, and other world biomaterials congress societies such as Australian Society for Biomaterials, European Society for Biomaterials, the Japanese Society for Biomaterials, and Korean Society for Biomaterials and TERMIS. Members of TERMIS or world biomaterials congress societies must upload a photocopy of a current dues receipt or membership card during the registration process to qualify for the member discount. Probationary Special Interest Group members do not qualify for member rate.

Full-time students and Post-graduates receive a discounted registration rate. To qualify for discounted registration rates, proof of full-time student or post-graduate status must be uploaded during the online registration process or sent via e-mail to Society For Biomaterials' Membership Department at info@biomaterials.org.

REFUNDS

To cancel your registration and receive a refund, a written request must be received by March 21, 2018. Cancellations can be made by contacting Society For Biomaterials' Meeting Coordinator, Allison Leyh at aleyh@biomaterials.org or at 856-642-4439. Cancellation requests received by this date will receive a refund less a $75 processing fee. Requests will be processed upon notification. All requests received after March 21, 2018, will forfeit 100 percent of monies paid.

SESSION LOCATIONS

All sessions of the meeting, including exhibits, posters and oral presentations will take place at the Hilton Atlanta.

SPECIAL NEEDS

The Society For Biomaterials wishes to take steps to ensure that no disabled person is excluded, denied services, segregated, or otherwise treated differently than other individuals because of the absence of auxiliary aids and services. If you require any auxiliary aids or services identified in the Americans with Disabilities Act, please contact Society For Biomaterials' Meeting Manager, Melanie Ryan at mryan@biomaterials.org or (856) 380-6895.

SPONSORSHIP AND EXHIBITS

Each year, the Society For Biomaterials Annual Meeting & Exposition serves as the central gathering point for the entire biomaterials field. This year's Annual Meeting in Atlanta promises to offer an exciting interaction between meeting registrants and exhibitors.

In order to provide exhibitors with steady exposure to meeting attendees, all coffee breaks and poster sessions will be held exclusively in the exhibit area. This format encourages frequent contact and dialogue between biomaterials scientists in industry, academia and the exhibiting companies.

For more information on exhibiting and sponsorship opportunities, please visit the Exhibitor page of the society's annual meeting website (2018.biomaterials.org) and download the Exhibitor and Sponsorship Prospectus or contact:

Dan Lemyre, Executive Director
(856) 642-4201 • dlemyre@biomaterials.org

EXHIBIT SCHEDULE

(Tentative and subject to change):

Wednesday, April 11, 2018
Move-In: 10:00 AM - 5:00 PM
Opening Reception in Exhibit Hall: 6:30 PM - 8:30 PM

Thursday, April 12, 2018
Exhibits Open: 10:00 AM - 1:45 PM; 3:45 PM - 8:00 PM
Exhibit Reception & Poster Session I: 6:30 PM - 8:00 PM

Friday, April 13, 2018
Exhibits Open: 10:00 AM - 1:45 PM; 3:45 PM - 5:15 PM
Poster Session II: 3:45 PM - 5:15 PM
Tear Down: 5:15 PM - 8:00 PM

TRANSPORTATION

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

Hartsfield-Jackson Atlanta International Airport (ATL) is located approximately 10 miles from the Hilton Atlanta.

AIRPORT TRANSPORTATION OPTIONS

There are several forms of transportation available for getting from the Hartsfield-Jackson Atlanta International Airport to downtown Atlanta, where the Hilton Atlanta is located.

Cab:
Readily available outside the Atlanta Airport terminals, the cabs are metered, with set fees for journeys to the central business district. Please note that due to state law, taxicabs are obliged to collect sales tax on all fares.

Downtown **Atlanta** is approximately 15 minutes from the airport, with fares averaging $30-$40

Train Services
The Metropolitan Atlanta Rapid Transit Authority (MARTA) is the most efficient method of reaching the metro-Atlanta area from Hartsfield Airport. MARTA trains take just 15 minutes to reach the city center, and they arrive and depart from the western end of the terminal complex every eight minutes.

Bus / Van Services
Atlanta Airport Shuttle operates a service to downtown Atlanta every 15 minutes. Northside Airport Express serves northern Atlanta. Details of these and other services can be obtained at the ground transportation areas in the North and South terminals.

VISITOR INFORMATION

LOCAL ATTRACTIONS

Attractions located in close proximity to Hilton Atlanta
- The Center for Civil & Human Rights
- The College Football Hall of Fame
- Centennial Olympic Park, Georgia Aquarium and World of Coca-Cola
- Fox Theatre
- Inside CNN Studio Tour at CNN Center
- NEW Mercedes-Benz Stadium - Home to the Atlanta Falcons
- MLK Jr. National Historic Site
- Philips Arena - Home to the Atlanta Hawks
- Ponce City Market

SOCIETY FOR BIOMATERIALS

2018 ANNUAL MEETING & EXPOSITION

April 11-14, 2018 • Hilton Atlanta • Atlanta, GA

REGISTRATION FORM *(Please print or type)*

First Name _____ Surname/Last Name _____

Title _____ Degree _____

Speciality or Discipline _____

Affiliation _____ Department _____

Address _____

City _____ State/Province _____ ZIP/Postal Code _____ Country _____

Telephone _____ Facsimile _____

(For international numbers, please include country and city codes.)

Email _____ Special Requests (ADA, Dietary, Etc.) _____

Member in which Society? ❑ Society For Biomaterials, USA ❑ Other WBC Society (list) _____ Member Number _____

3 OPTIONS TO REGISTER:
1. www.biomaterials.org
2. Fax form to 856-439-0525
3. Mail to 1120 Route 73 • Suite 200 Mt. Laurel, NJ 08054

	ON OR BEFORE MARCH 21, 2018								AFTER MARCH 21, 2018							
	Registration for Paid Members				Registration for Non-Members				Registration for Paid Members				Registration for Non-Members			
	Member	Post Grad	Student	Retired Senior	Non-Member	Non-Member Post Grad	Non-Member Student	Retired Senior	Member	Post Grad	Student	Retired Senior	Non-Member	Non-Member Post Grad	Non-Member Student	Retired Senior
Meeting & Exhibit Registration	❑ $595	❑$425	❑ $260	❑ $160	❑ $905	❑ $625	❑ $390	❑ $160	❑ $745	❑ $475	❑ $290	❑ $160	❑ $1,065	❑ $675	❑ $420	❑ $160
Wednesday April 11th Workshops																
Workshop 1: Recent Advances in 3D Printing of Biomaterials *(Wednesday, April 11th 9:00 am – 11:30 am)*	❑ $50				❑ $50				❑ $50				❑ $50			
Workshop 2: Advances in Histopathology Techniques in the Assessment of Implant Tissue Interface *(Wednesday, April 11th 9:00 am – 11:30 am)*	❑ $50				❑ $50				❑ $50				❑ $50			
Tour: Georgia Tech Tour *(Wednesday, April 11th 11:00 am – 1:00 pm)*	❑ $10				❑ $10				❑ $10				❑ $10			

❑ **Student-Young Scientist Lunch – Exploring Options After Your Degree Students** $10
(Friday, April 13, 12:30 pm - 1:45 pm)

❑ **Women's Networking Luncheon – Promotion and Networking: Tools for Success** $10
(Thursday, April 12, 12:30 pm -1:45 pm)

❑ **Biomaterials Science Textbook – Planning the fourth edition (Luncheon)**
(Friday, April 13, 12:30pm – 1:45pm)

Optional Transactions

❑ **Transactions Book** Quantity: ❑ $100; Member ❑ $125; Non-Member

Guest Registration *(includes Opening Reception, Exhibition Reception and Bash)*

Extra tickets for Accompanying Guests (#)_____ ❑ $75 each (name of guest):

_____

_____

Student and Post-Graduate status verification required.

❑ I attest the named individual is a full-time, degree-seeking student.

❑ I attest the named individual is a post-graduate, degreed individual in training at an academic institution, e.g., a resident or post-doc.

Signature of advisor or department chair _____

Advisor's printed name _____

Advistor's telephone _____ Advisor's email _____

New & Renewing Members ONLY:

Add Membership including Journal of Biomedical Materials (E-Journal)

Active	Post-Grad	Student (with Subscription)	Student (No Subscription)
❑ $205	❑ $110	❑ $75	❑ $40

Additional Publications (Optional)

Acta Biomaterials	❑ $160 PLUS VAT where applicable
Biomaterials	❑ $301 PLUS VAT where applicable
The Journal of Biomaterials Science *Polymers Edition*	❑ $344 (print) ❑ $172 (online)
NEW! Biomedical Materials	❑ $110

Special Interest Group ($10 for each, free for students)

- ❑ Biomaterials and Medical Products Commercialization
- ❑ Biomaterials Education
- ❑ Biomaterials Tissue Interaction (formerly Implant Pathology)
- ❑ Cardiovascular Biomaterials
- ❑ Engineering Cells and Their Microenvironments
- ❑ Dental/Craniofacial Materials
- ❑ Drug Delivery
- ❑ Immune Engineering *NEW*
- ❑ Nano Materials
- ❑ Ophthalmic Biomaterials
- ❑ Orthopaedic Biomaterials
- ❑ Protein & Cells at Interfaces
- ❑ Surface Characterization and Modification
- ❑ Tissue Engineering

Registration Subtotal:_____

Transaction & Social Registration Subtotal: _____

TOTAL DUE: _____

Method of Payment:

❑ Check enclosed *(Checks must be in U.S. dollars, drawn on a U.S. Bank and made payable to the Society For Biomaterials)* ❑ MasterCard ❑ VISA ❑ American Express

Name (as it appears on card) _____ Card # _____

Expiration date _____ Cardholder signature _____

Fax completed form to Allison Leyh: 856-439-0525
Do not e-mail form.

Update from the Dental/Craniofacial Biomaterials SIG

EXPANDING HORIZONS IN ORTHODONTICS THROUGH CLEAR ALIGNER TECHNOLOGIES

By F. Kurtis Kasper

The dental specialty of orthodontics broadly seeks to achieve appropriate alignment of the teeth and jaws of a patient to promote proper function and desirable esthetics. To this end, orthodontic treatment typically involves the use of corrective appliances to apply forces directed to move teeth into their respective desired positions. Orthodontic forces can be delivered through fixed appliances, such as orthodontic brackets bonded to the tooth structure, in combination with orthodontic wires and elastics. While metallic orthodontic brackets are commonly used clinically, patient concerns for esthetics during treatment have motivated the development of "esthetic" brackets comprising ceramic and polymeric materials over the years that are less visible on the teeth than metallic brackets.[1] Regardless of the bracket material, fixed appliances present challenges to patients in maintaining oral hygiene, which can contribute to undesired sequelae, such as white spot lesions on the tooth structure and periodontal complications.[2]

Removable orthodontic appliances, such as clear orthodontic aligners (Figure 1), present an esthetic alternative to fixed appliances for certain orthodontic cases. Clear aligner therapy involves a series of minor tooth movements achieved through application of a corresponding series of individual clear polymeric aligners, which are changed in sequence over the duration of treatment. Interestingly, the concept of applying a series of positioners to accomplish major tooth movements through small, sequential movements was first proposed in 1945 by Dr. Harold Kesling, who concluded that "at present, this type of treatment does not seem to be practical … its practical application might be developed in the future."[3] Indeed, Kesling's prediction was realized with the release of the Invisalign system by Align Technology, Inc., in 1999, which leverages digital scanning, computer-aided design and additive manufacturing technology to produce a series of aligners from a single dental impression.[4,5] The Invisalign system and comparable clear aligner systems generally involve digital manipulation of a digital impression of the dentition of the patient to develop a series of small, sequential tooth movements from the initial condition to the desired final outcome. Physical models of the dental arches corresponding with each step then are fabricated via 3D printing. The series of physical models supports the fabrication of a corresponding series of clear aligners through a thermoforming process and subsequent trimming.

The clinical utility of a clear aligner depends in large part upon the selection of an appropriate material for aligner fabrication. A variety of thermoplastic polymers have been applied in clear aligner fabrication over the years, including various polyesters, polyurethanes, polypropylenes and polymer blends.[6] Desired clear aligner properties include formability, biocompatibility, environmental stability, low esthetic impact, minimal stress relaxation, dimensional stability and chemical stability.[2,6–8] Considerable ongoing research efforts seek to characterize the properties of clear orthodontic aligners, often in the context of a two-week envisioned wear duration for an aligner, to guide appropriate clinical application and refinements to aligner design [2,4,8,9]

As patient demand for esthetic orthodontic appliances rises, especially among the increasing number of adults seeking orthodontic treatment, the market for clear aligners has experienced exponential growth.[2] At the same time, continued advances in the digital tools and 3D printing technologies associated with the fabrication of clear aligners are driving an increased ease of use and a decreased cost. Accordingly, increasing numbers of orthodontists and orthodontic laboratories are engaging directly in the fabrication of clear aligners. However, sufficient access to the technologies also exists for untrained members of the public to engage in treatment in a do-it-yourself fashion, albeit at high risk. Media reports in recent years highlight an example in the case of Amos Dudley, who took advantage of resources available to him during his studies at the New Jersey Institute of Technology to create a series of clear aligners to achieve movement of his maxillary teeth.[10,11] Briefly, Mr. Dudley took an alginate impression of his own teeth, which he used to cast a ceramic dental model. He then used a laser scanner to create a digital representation of the model, and he applied software to manipulate the positions of his teeth digitally. He then created a series of dental models with a 3D printer, which he applied in fabricating a series of clear aligners via vacuum forming. Although he reported his self-directed clear aligner treatment as a success, he acknowledged his lack of orthodontic training and cautioned others not to attempt the self-directed treatment procedure.

Figure 1

A clear orthodontic aligner fabricated via thermoforming over a 3D-printed dental model. The aligner was trimmed prior to being fit back onto the dental model for the photograph.

While orthodontists present the requisite specialized clinical knowledge to effect tooth movement, informed decisions in applying clear aligners appropriately also requires knowledge of key properties of the aligners.[9] Accordingly, the success of clear aligner technologies will require ongoing collaboration between clinicians and biomaterials scientists to guide continued development and appropriate application.

REFERENCES

1. Russell JS. Aesthetic orthodontic brackets. *J Orthod*. 2005;32(2):146-163.
2. Lombardo L, Arreghini A, Maccarrone R, Bianchi A, Scalia S, Siciliani G. Optical properties of orthodontic aligners—spectrophotometry analysis of three types before and after aging. *Prog Orthod*. 2015;16:41.
3. Kesling HD. The philosophy of the tooth positioning appliance. *Am J Orthod Dentofacial Orthop*. 1945;31(6):297-304.
4. Hennessy J, Al-Awadhi EA. Clear aligners generations and orthodontic tooth movement. *J Orthod*. 2016;43(1):68-76.
5. Melkos AB. Advances in digital technology and orthodontics: a reference to the Invisalign method. *Med Sci Monit*. 2005;11(5):PI39-42.
6. Zhang N, Bai Y, Ding X, Zhang Y. Preparation and characterization of thermoplastic materials for invisible orthodontics. *Dent Mater J*. 2011;30(6):954-959.
7. Fang D, Zhang N, Chen H, Bai Y. Dynamic stress relaxation of orthodontic thermoplastic materials in a simulated oral environment. *Dent Mater J*. 2013;32(6):946-951.
8. Liu CL, Sun WT, Liao W, et al. Colour stabilities of three types of orthodontic clear aligners exposed to staining agents. *Int J Oral Sci*. 2016;8(4):246-253.
9. Dasy H, Dasy A, Asatrian G, Rózsa N, Lee HF, Kwak JH. Effects of variable attachment shapes and aligner material on aligner retention. *Angle Orthod*. 2015;85(6):934-940.
10. Behrents RG. Do-it-yourself impressions and clear retainers: a fairy tale. *Am J Orthod Dentofacial Orthop*. 2016;150(2):205-207.
11. Dudley A. Orthoprint, or how I open-sourced my face. *Squintin', lookin', doin' Blog*. March 10, 2016. http://amosdudley.com/weblog/Ortho. Accessed January 3, 2018.

Update from the Drug Delivery SIG

CARRIER-FREE RNAI DELIVERY AND PROTEIN-MIMICKING NANOPARTICLES FOR THERAPY

By Craig Duvall and Eun Ji Chung

Craig Duvall

Eun Ji Chung

Hitchhiking of gene-silencing RNA interference (RNAi) molecules on the abundant human serum protein albumin has been reported by Craig Duvall and his team[1]. While RNAi shows promise for controlling the behavior of cancer cells, this class of molecules does not effectively reach cancer cells when injected into the body. The team made a simple modification to a small-interfering RNA molecule, called siRNA-L2, allowing it to rapidly load into an albumin "pocket" typically reserved to ferry fatty acids around the body. By designing RNAi to dock to albumin after intravenous injection, it reduces the rapid clearance of molecules by the kidneys. Hence, by keeping the therapeutic in the blood stream longer, it has a higher probability of reaching the targeted tumor.

WHILE RNAi SHOWS PROMISE FOR CONTROLLING THE BEHAVIOR OF CANCER CELLS, THIS CLASS OF MOLECULES DOES NOT EFFECTIVELY REACH CANCER CELLS WHEN INJECTED INTO THE BODY.

As nanoparticles are another widely explored technology for tumor delivery of RNAi, the authors explored whether the smaller albumin-bound RNAi would better penetrate throughout the tumor versus the relatively larger nanoparticles. To prove this point, they compared the new conjugate technology to jetPEI nanoparticles, the mostly widely used or "gold standard" synthetic carrier used for the task. They found that the siRNA-L2 had significantly less dose-limiting toxicity and significantly higher tumor penetration, including in patient-derived xenografts, compared to the synthetic nanoparticles. The combined results suggest that this approach will yield higher delivery and dose of the anti-cancer RNAi drug to the tumor with less potential to harm the patient by off-target side effects.

In a recently published article, Poon et al[2] reported additional utility of monocyte-targeting micellar nanoparticles originally designed to bind plaques in atherosclerosis. The monocyte-targeting peptide in micelle form upregulated signaling pathways similar to the native protein compared to the free peptide. Given these biomimetic properties and the role of monocytes in cancer progression and metastasis, the authors also explored the micelle's ability to act as a blockade and an anti-cancer therapy. They describe in their article the cytotoxic characteristics specific to cancer cells of these nanoparticles in part by downregulating receptors involved in monocyte binding and show novel biofunctional and therapeutic design of peptide micelles.

REFERENCES

1. Sarett SM, Werfel TA, Lee L, et al. Lipophilic siRNA targets albumin in situ and promotes bioavailability, tumor penetration, and carrier-free gene silencing. *Proc Natl Acad Sci U S A*. 2017;114(32):E6490-E6497.
2. Poon C, Chowdhuri S, Kuo CH, et al. Protein mimetic and anticancer properties of monocyte-targeting peptide amphiphile micelles. *ACS Biomater Sci Eng*. 2017;3(12):3273-3282.

Education News

WHEN YOUR STUDENTS' REPORTS GIVE YOU A HEART ATTACK, TRY CPR (CALIBRATED PEER REVIEW)

By C. Lashan Simpson, Education News Editor
Contributed by Ann Saterbak and Tracy Volz

Engineering students who are prepared to communicate their work are not only in a better position to compete for jobs, but they are also more likely to advance in their careers, get selected for leadership positions and rise to positions of prominence in their chosen fields. To develop students' written, oral and visual communication competencies, many engineering faculty assign reports, oral presentations and technical posters that feature verbal and visual elements. As students mature in their studies, they should also develop the ability to critically evaluate the research and engineering work of their peers.

We have been using Calibrated Peer Review (CPR)[1] in the classroom for more than 10 years to develop students' communication and critiquing skills. CPR is a software tool that makes it easy to implement anonymous peer review. If you have ever tried to conduct a peer review exercise in class, then you know it can be a challenge to get students to thoroughly evaluate a peer's work based on a set of criteria and, more importantly, to apply high standards.

CPR's unique calibration feature addresses both of these problems, which is why it has been embraced by faculty from fields ranging from engineering to medical education. In CPR, the instructor establishes the evaluation criteria and students must demonstrate competency as reviewers before they are allowed to rate their peers' work.

A CPR assignment consists of five stages:

1. *Text Entry.* Students upload text (e.g., document, poster, video) for peer review.
2. *Calibration.* Students evaluate three sample calibration texts of variable quality, which have been selected and rated in advance by the instructor. The students use a set of evaluation statements provided by the instructor to rate the samples, and the students' evaluations must match the instructor's within a specified range before advancing to the next stage.
3. *Review.* Students anonymously evaluate three peers' texts using the same set of evaluation statements.
4. *Self-Assessment.* Students use the evaluation statements to rate their own text.
5. *Results.* Students view the feedback they received from their peers.

Ann Saterbak

Tracy Volz

We have used CPR in a junior-level tissue culture laboratory course in the Bioengineering Department at Rice University. After completing a series of experiments, students produce technical posters summarizing their experimental results. This assignment was created to develop students' skills in data presentation and analysis in a format that is commonly used to present results in biomedical research. For many students, creating a technical poster is a new experience, and they are challenged to communicate their key results through succinct text and well-designed figures and tables. By using CPR as a part of this assignment, we were also able to give students practice in their peer- and self-critiquing skills through its sequence of activities.

IF YOU HAVE EVER TRIED TO CONDUCT A PEER REVIEW EXERCISE IN CLASS, THEN YOU KNOW IT CAN BE A CHALLENGE TO GET STUDENTS TO THOROUGHLY EVALUATE A PEER'S WORK BASED ON A SET OF CRITERIA AND, MORE IMPORTANTLY, TO APPLY HIGH STANDARDS.

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CPR also provided us with a deeper, more nuanced understanding of the strengths and weaknesses of our students' posters, which later guided our efforts to provide better instruction. Because CPR collected all of our students' ratings and comments about their peers' posters as well as their own, we could use this data to study the degree to which their ratings of various features of the posters matched the primary instructor's ratings. Based on data collected over three years, we discovered that students were highly proficient in their ability to perform simple critiquing tasks, such as determining whether a poster identified the experimental variables or reported results using an appropriate number of significant figures in a legible font size. However, they were not as successful in their attempts to perform more complex critiquing tasks, such as assessing whether the experimental evidence presented in a poster

OUR RESEARCH SHOWS THAT ACTIVE LEARNING TECHNIQUES, GUIDED STUDENT PRACTICE AND CPR CAN BE USED TO IMPROVE ENGINEERING STUDENTS' VISUAL COMMUNICATION SKILLS.

supported conclusions drawn about cause and effect or whether the quantitative evidence presented in graphs and tables bore any relation to the corresponding key results presented in words. Generally speaking, students were quite capable of evaluating the "easy" features but not so good at evaluating technical arguments or data presentation. [2]

These findings indicated that we needed to better prepare students to summarize and interpret their experimental results and to create effective graphs and tables. We altered the lecture schedule associated with the lab course to make room for two new active learning modules that addressed these objectives.[3] In the first activity, students prepared a draft results slide ahead of class and then worked in small groups to revise the slides. In the second module, students wrote informative slide titles and key results based on instructor-provided data derived from prior tissue culture experiments.

After collecting data for three more years, we conducted an educational research study in which we were able to compare student performance before and after the pedagogical intervention. More specifically, we tracked students' ability to evaluate their peers and students' ability to evaluate themselves; instructor evaluations were also noted. There were statistically significant improvements following the addition of the learning modules for peer evaluations, self-evaluations and instructor evaluations associated with developing effective graphs and tables that present experimental data. Unfortunately, we did not observe significant improvements in students' ability to summarize and interpret experimental results, despite the added module. In summary, our research shows that active learning techniques, guided student practice and CPR can be used to improve engineering students' visual communication skills. Furthermore, CPR is a robust tool that fosters students' peer critiquing skills and has the added benefit of helping instructors identify gaps in students' knowledge and communication abilities. These gaps can be addressed through the introduction of short, targeted active learning modules to improve student performance over time. Moreover, CPR can be used for many types of assignments and learners in a wide variety of settings. We encourage you to explore its potential!

REFERENCES

1. Calibrated Peer Review. http://cpr.molsci.ucla.edu/Home.aspx. Accessed February 12, 2018.
2. Saterbak A, Moturu A, Volz T. Using a teaching intervention and Calibrated Peer Review™ diagnostics to improve visual communication skills. *Ann Biomed Eng*. 2018;46(3):513-524.
3. Volz T, Saterbak A. Students' strengths and weaknesses in evaluating technical arguments as revealed through implementing Calibrated Peer Review™ in a bioengineering laboratory. *Across the Disciplines*. 2009;6. https://wac.colostate.edu/atd/technologies/volz_saterbak.cfm. Accessed February 13, 2018.

Industry News

By Steve Lin, Industry News Editor

Medical technology group **Smith & Nephew** (S&N) will buy a U.S. sports injury business for up to $210 million. The British company, best known for its replacement hips and knees, will pay an initial $125 million to acquire unlisted Minnesota-based Rotation Medical, plus up to $85 million over the next five years if certain financial targets are hit. S&N said the deal would be neutral for earnings in 2018 and boost them in 2019. Rotation Medical has developed a novel tissue regeneration technology for shoulder rotator cuff repair that is already cleared for sale in the United States. A filing is being prepared for approval in Europe. Rotator cuff injuries typically occur in people who repeatedly perform overhead motions, either in sport or in their jobs.

Exactech, a leading developer and producer of orthopaedic implant devices and surgical instrumentation for extremities and large joints, announced that it has entered into a definitive merger agreement under which TPG Capital, the global private equity platform of alternative asset firm TPG, will acquire all of the outstanding shares of Exactech common stock. Exactech's Board of Directors approved the agreement, which provides for the payment of $49.25 per share in cash to all holders of Exactech common stock, other than certain management stockholders who have agreed to exchange a portion of their shares for new equity securities in the transaction. The transaction values Exactech at $737 million. The cash purchase price represents a premium of approximately 54 percent over Exactech's closing stock price on Oct. 20, 2017. Upon completion of the transaction, Exactech will be a privately held company headquartered in Gainesville, Florida.

GlaxoSmithKline (GSK) has entered into a collaboration with U.S.-based healthcare company NeuroMetrix to develop and expand the Quell wearable technology for pain relief. Under the deal, GSK's Consumer Healthcare unit will obtain exclusive ownership of the Quell technology in markets outside the United States, while NeuroMetrix will retain its rights in the country. NeuroMetrix is set to receive a payment of $5 million from GSK for Quell-related assets, as well as up to $21.5 million on reaching certain development and commercialization milestones. Designed to treat chronic pain, Quell is an over-the-counter therapeutic device that can be personalized and managed through the Quell app. The wearable technology also enables health tracking relevant to chronic pain patients, including pain, sleep, activity and gait. Data captured by the Quell technology can be synchronized with the Quell Health Cloud, which delivers customized feedback. Starting this year, GSK Consumer Healthcare and NeuroMetrix will co-fund development of the technology over three years through 2020, with scope for subsequent annual renewals.

Pfizer has partnered with molecular information firm Foundation Medicine to develop and commercialize companion diagnostics (CDx) for its oncology portfolio. The new diagnostics will be added as updates to FoundationOne CDx, which is a comprehensive genomic profiling assay comprising various companion diagnostics. FoundationOne is said to analyze all types of genomic alterations in 324 genes that are known to be associated with cancer growth, as well as genomic biomarkers that could predict the use of immunotherapies. It is approved by the U.S. Food and Drug Administration (FDA) for all solid tumours and as a broad companion diagnostic for certain types of non-small cell lung, melanoma, colorectal, ovarian and breast cancers to identify patients who can benefit from using one of 17 on-label targeted therapies. Under the collaboration, Pfizer will also have access to Foundation Medicine's data analytics platform, FoundationInsights, which is designed to enable discovery of new biomarkers and optimize clinical trial design.

Medtronic's Neurovascular business division has obtained clearance from the FDA for its Riptide Aspiration System to treat acute ischemic stroke. The Riptide Aspiration System includes the Arc Catheter, Riptide Aspiration Pump, Riptide Aspiration Tubing and Riptide Collection Canister with intermediate tubing. The system is intended to restore blood flow in blocked arteries of ischemic stroke patients by retrieving the clot through the Arc Catheter, which is inserted via an incision in the leg and up to the specific artery. Riptide is used for the revascularisation of patients affected by acute ischemic stroke secondary to intracranial large vessel occlusive disease within eight hours of onset of the symptoms. The system can be used to treat patients who are not eligible or fail therapy with intravenous tissue plasminogen activator.

The **Continuous Glucose Monitoring (CGM) market** will be worth $14.4 billion by 2024, according to a report published by Coherent Market Insights. The market for the technology used to treat patients with diabetes was valued at $2 billion as recently as 2015. Conventional glucose monitoring involves patients pricking fingers and forearms to draw blood, which can then be tested to determine its glucose content. However, these methods are painful for patients and only provide a small insight to a patient's blood glucose levels at a particular time of day. CGM treatments involve the placement of a glucose sensor beneath the skin to measure glucose levels in tissue fluid. The sensor is connected to a transmitter, which sends glucose readings in real time to a monitoring device, removing the need for constant finger pricking and providing a regular supply of information that gives a more accurate picture of the change in a patient's glucose levels over time.

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Industry News (continued from page 33)

Becton Dickinson (BD) has completed the acquisition of CR Bard for $24 billion under a definitive agreement signed between the companies in April last year. Expected to result in annualised revenue of around $16 billion, the combined entity aims to improve disease treatment for patients and process of care for healthcare providers. The deal is said to leverage BD's expertise in medication management and infection prevention while boosting its growth opportunities with the addition of Bard's product portfolio and pipeline. BD chairman and CEO Vincent Forlenza said, "Today is a historic day for BD as we welcome Bard and its 16,000 associates to BD." Following the transaction, Bard became a wholly owned subsidiary of BD, which will report the majority of acquired offerings under a new Interventional segment structure. The firm plans to report the remaining Bard offerings under the Medical division.

A **Chinese consortium** comprising medical technology and healthcare firms and financial investors has signed a definitive agreement to purchase the entire share capital of Italy-based medical equipment maker Esaote. The transaction involves all of Esaote's outstanding shares, including those held by Ares Life Sciences, NB Renaissance Partners, Value Italy, Equinox, Carlo Castellano and Carige. The deal is said to aid Esaote's growth by offering improved access to the growing medical equipment market in the country. In parallel, the consortium would leverage Esaote's R&D capabilities, product portfolio and international distribution network for the medical imaging industry. Following the completion of the acquisition, the company will function as an independent entity and will continue its R&D and manufacturing activities in Italy and the Netherlands.

Government News

By Carl Simon, Government News Editor
Contributed by Gray Chynoweth

The Advanced Regenerative Manufacturing Institute (ARMI) celebrated the official launch of the BioFabUSA program at the end of July 2017 and is actively engaged in creating a road map to guide the organization. BioFabUSA's road map will organize around five key thrust areas: (1) cell selection, culturing and scale-up; (2) biomaterial selection and scale-up; (3) tissue process automation and monitoring; (4) tissue maturing technologies; and (5) tissue testing, preservation and transport. Each of these five thrust areas addresses a critical component of scaling the academic field of regenerative medicine and tissue manufacturing toward a mature manufacturing industry.

The first step in the roadmapping process involves an assessment by BioFabUSA's members of the manufacturing needs associated with each of the five thrust areas. Members have now begun a gap analysis of those needs and are prioritizing which needs to address first. "Right now, we're really aiming to work on solving the manufacturing scaling up problem," said Dr. Richard McFarland, chief regulatory officer of ARMI. Along with these efforts, several "quick-start" proposals will be funded that will work to address gaps in manufacturing and technology by applying technologies from other disciplines. "These will often leverage knowledge of solutions to similar questions from different fields," Dr. McFarland noted.

The roadmapping process consisted of workshops to discuss each thrust area in more detail. A final road map is targeted for January 2018, at which time it will be made available to the public. For more information about ARMI and BioFabUSA, and to learn how to become a member, visit armiusa.org.

Out-of-Classroom Learning

LEARNING TO SOLVE BIOMEDICAL PROBLEMS AT THE HORSE RACING TRACK

By Sarah Thompson

Kentucky is known for horse racing, among many things. For a few weeks every year, the Keeneland Racecourse in Lexington, Kentucky, holds a weekly "Sunrise Trackside at Keeneland" event for people to learn about horse racing, enjoy a hot breakfast and watch horses warm up at sunrise before the races begin. For biomedical engineering (BME) students at the University of Kentucky (UK), going to the racetrack means not only watching horse racing but also putting what they know about biomedical engineering to bear to tackle biomedical problems for horses in a real-world setting.

And in the early morning of Saturday, Oct. 21, 2017, that's exactly what they did. A group of UK BME students (a team of eight undergraduate students and a team of four graduate students), faculty and special guest JP Giacomini, a world-renowned dressage horse trainer, gathered and enjoyed a hot breakfast in Keeneland's Equestrian Dining Room while watching a beautiful sunrise.

Over breakfast, the group listened to Mr. Giacomini share his lifelong experience with horse training, his belief of the importance of balance and relaxation to a horse, his observations of the biomedical challenges the horse racing community faces and his own attempts to address some of these challenges.

Prior to the event, students were challenged to use bioengineering means to create design ideas to address biomechanical problems encountered in racing horses. Following breakfast, students presented their ideas. The team of undergraduate students presented its approach first. After introducing the historical and economic importance of horse racing in Kentucky, the team discussed the problem of horse bone fractures. The team proposed using ultrasonic means to strengthen bones as well as to heal injured bones. Team members not only cited the bone remodeling theory of Wolff's Law to support their idea but also laid out detailed plans to test their hypothesis.

The most intriguing aspect of the undergraduates' idea was reflected in the dots they connected. As described by Lucy Niemeyer, "Limestone is the major cause of famous Kentucky staples, such as the caves and waterfalls, Kentucky bourbon and, most appropriately, horse racing. At first thought, you wouldn't put the subjects of geology and bioengineering together, but

Figure 1

The group engages in an intense discussion and debate at the Keeneland Racecourse.

[CONTINUED ON PAGE 36]

the history of limestone plays a key role in the bone structure of horses. Limestone is composed of calcium and bicarbonate ions. When it rains, the limestone breaks down and the calcium is released. This can happen because rain water is slightly acidic. The calcium then goes into the environment, including water and plants. Horses then eat and drink the high concentration of calcium and, therefore, have a stronger bone density."

reinventing the wheel or repeating a failed idea and (2) focusing on the end value of an idea to create something of value instead of just inventing something new.

BME faculty judges also offered their assessments of the presentations by echoing the two points raised by Mr. Giacomini and providing explanations for why they are important. They

Figure 2

Lucy Niemeyer conducts a demonstration by adding acid drops to a limestone slab.

Ms. Niemeyer even demonstrated the presence of phosphate in limestone by adding drops of acid to a limestone slab, causing a sizzling chemical reaction.

The team of graduate students proposed a data-collecting, clip-on horseshoe idea as a real-time horse performance feedback device to the rider. The team also provided its hypothesis and ways to test it.

As a judge for students' design ideas, Mr. Giacomini offered his insights and critiques for both teams. He highlighted two points: (1) finding out what has already been done or attempted to avoid

were particularly delighted to see undergraduate students connecting the dots in the learning process.
After the "competitive" presentation and discussion, the group moved trackside to watch the horses run and warm up. Mr. Giacomini continued explaining to the group his observations and insights as to which jockey–horse couple had a visibly relaxed and harmonic relationship and why such a harmonic relationship is important in winning a race.

After the event, Mr. Giacomini expressed his appreciation for being invited to observe and provide feedback from his real-world viewpoint to students' efforts and intellectual development.

Figure 3

UK students, faculty and special guest JP Giacomini pose in front of the racetrack.

Students expressed their enjoyment and appreciation for the unique experience. Particularly, students noted how helpful it was to discuss engineering problem-solving approaches with real-life experts in the field. "I really enjoyed the event we had at Keeneland, and I learned a lot from it, too. It would be great if we had similar (or completely different) events in the future to engage the BME community at UK," said one student.

Others added, "I very much enjoyed the meeting at Keeneland. I learned a lot from the project, as well as from our guest speaker. I think more of these meetings would be beneficial in the future," and, "I really enjoyed this experience. Most of the time, learning is done in a classroom on campus, so being able to leave campus to learn was really refreshing."

The student sentiments say it all. If you are interested in learning more about the unique learning experiences of UK BME students, please contact UK's BMES Student Chapter at ukybmes@gmail.com.

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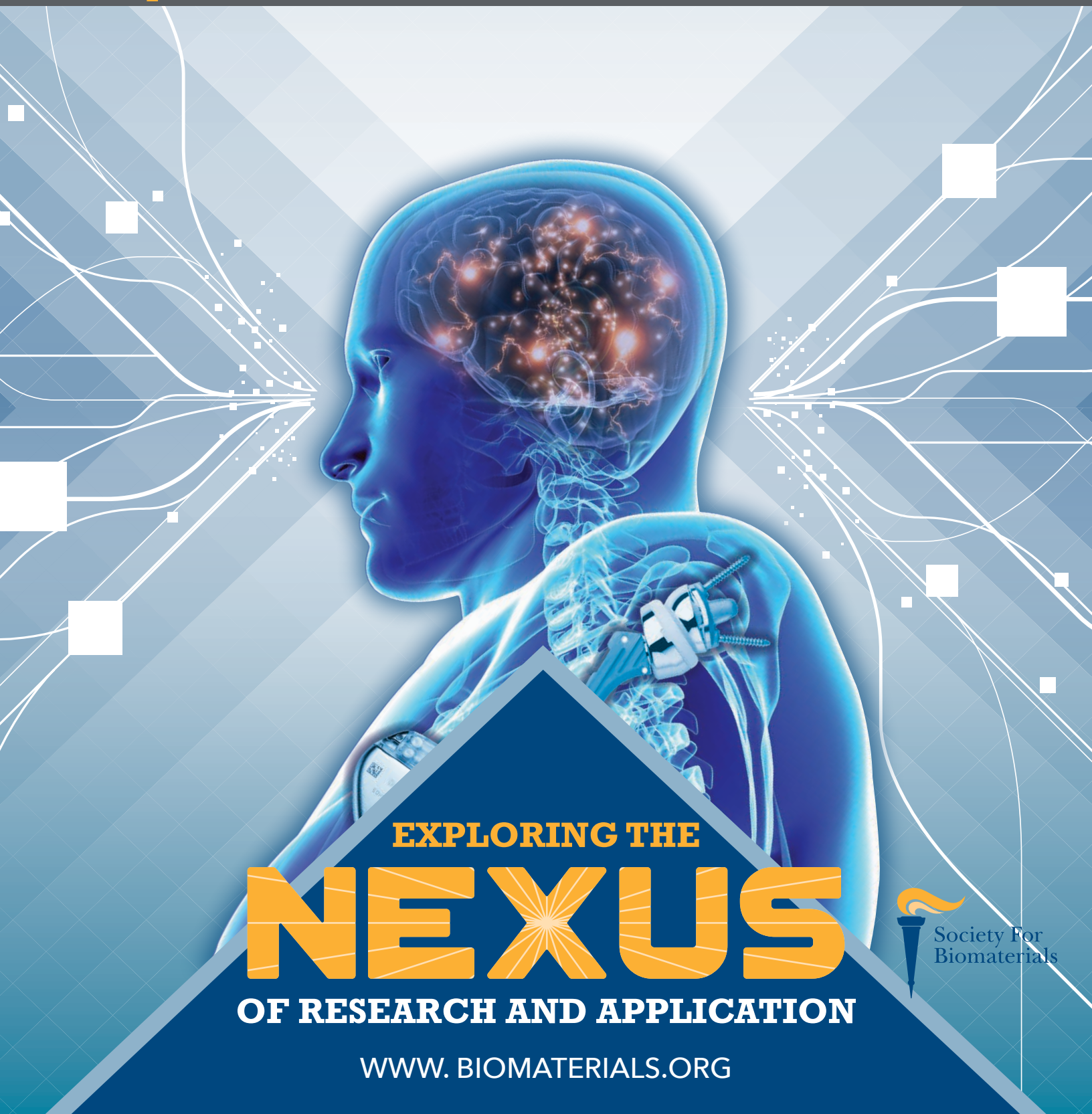

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