

BIOMATERIALS

FORUM



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BIOMATERIALS FORUM



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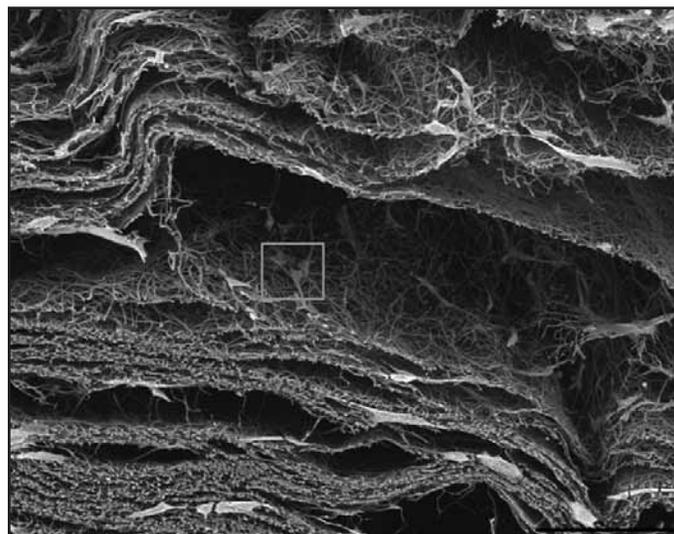
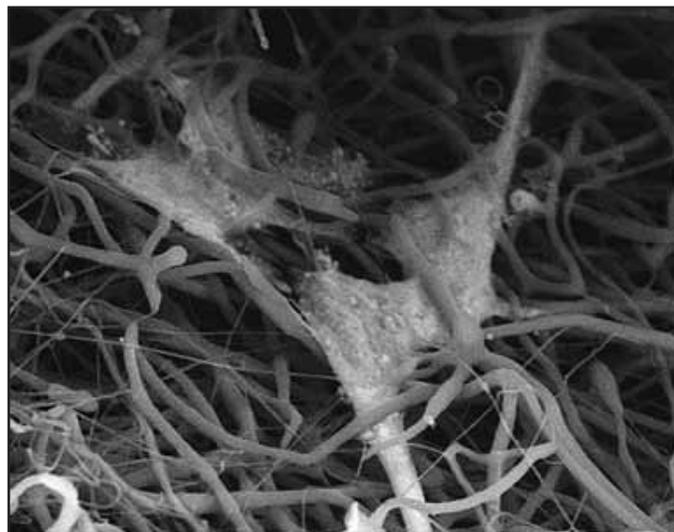
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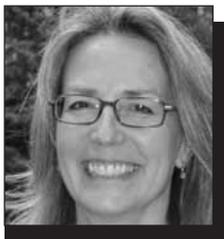
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On the cover: SEM visualization of human primary osteoblast colonisation onto a polycaprolactone nanofibrous 3D scaffold after three days. Scale bar: 150 μ m.

References: S. Eap, A. Ferrand, C. Mendoza-Palomarès, A. Hébraud, J-F. Stoltz, D. Mainard, G. Schlatter, N. Jessel. *Electrospun nanofibrous 3D scaffold for bone tissue engineering*. Biomed Mater Eng, 2012;22(1-3),137-4. Mendoza-Palomares, C.; Ferrand, A.; Facca, S.; Fioretti, F.; Ladam, G.; Kuchler-Bopp, S.; Regnier, T.; Mainard, D.; Benkirane-Jessel, N., *Smart Hybrid Materials Equipped by Nanoreservoirs of Therapeutics*. ACS Nano, 2012; 6 (1), 483-490.

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Greetings fellow biomaterials scientists,

Welcome to the *Biomaterials Forum* – the Society For Biomaterials news magazine that provides a platform for discussion of scientific, business and legislative matters related to biomaterials. In the *Forum*, you will find short reviews highlighting the latest biomaterials developments, announcements of key business deals between corporations involved in biomaterials, tips for improving biomaterials education, an opinion column, highlights of member achievements, book reviews and career stories.

Here are the highlights of this issue –

- It's election time—please read the officer nominee biosketches and cast your vote today for the next President-Elect, Secretary/Treasurer and Member at Large of the Society For Biomaterials. Information about the nominees can be found starting on page 6.
- Community outreach efforts of the student chapters of the Society For Biomaterials are increasing exposure to biomaterials in the local community and schools. Kudos to the student chapters at Case Western Reserve University, Columbia University, UCLA, Vanderbilt, the University of Texas at San Antonio, the University of South Dakota and Texas A&M for their outreach activities. Congratulations to those student chapters that have received the \$5,000 grants from the Society For Biomaterials to host Biomaterials Days in 2013. Read who won on page 21.
- Medical technology acquisitions and merger summaries for 2012 are found in the industrial news section on page 20. Despite the challenges and uncertainties that medical technology companies faced last year, the average transaction value was reduced only about 10 percent. It's still a good time to be commercializing biomaterials technology.
- Announcements of prestigious professional awards and relocations of our SFB members can be found on page 15.
- Learn more about the inaugural Biomaterials Education Challenge—a competition that encourages student teams to develop an educational model for middle school science classes—abstracts are due this month. Read more on page 12.

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biosketches and cast your vote
today for the next President-
Elect, Secretary/Treasurer and
Member at Large of the
Society For Biomaterials.

- The government agency, National Institute of Standards and Technology (NIST) is conducting research on single-wall carbon nanotubes (SWCNTs) and their studies show that SWCNTs may help protect DNA molecules from damage by oxidation. Read more on page 17.
- The classic biomaterials textbook, *Biomaterials Science: An Introduction to Materials in Medicine*, has been updated—see the book review on page 19.

I hope you enjoy this issue of the *Biomaterials Forum*. Like the ancient Roman forum, where orators engaged in powerful discourses about the key issues of the day, I hope you'll use this magazine as one of several venues to share your important views with the wider biomaterials community. If you've got something to say about biomaterials, any aspect of it, I invite you to submit a contribution for publication in the next issue of the *Forum*. Please send it to me at Lkuhn@uchc.edu.

Best wishes,

A handwritten signature in cursive script that reads "Lisa Kuhn".

University of Connecticut Health Center
Biomaterials Forum Editor



I am a big fan of *Discover Magazine*. I often refer to it as the *People Magazine* for nerds of science, and I take great pride when our members are highlighted in it—like Phil Messersmith’s (a 2013 Clemson Awardee) work on bioadhesives based on the glue mussels use to adhere to surfaces (*Discover*, Jan 2008). In reviewing the scientific and technical program for the upcoming 2013 SFB Annual Meeting, I recalled a quote in the “Crazy or Brilliant?” article by science journalist/writer, Jon Gertner—“There’s this incredible focus on the ‘a-ha moment,’ but I came to appreciate the arduous process of trying to make reliable products.” (*Discover*, Dec 2012). The crazy “a-ha” discovery moments essential to advancing the biomaterials discipline will be celebrated at the April 2013 annual meeting with presentations by our Society award winners, including Phil Messersmith and the other Clemson Awardees, Elliot Chaikof and Peter Ma; the Young Investigator awardee, Kurt Kasper; Technology, Innovation and Development Awardee, Cato Laurencin; Founders Awardee, Bob Langer and Acta Biomaterialia Awardee, Jim Anderson. I am sure there will be new “a-ha” moments presented among the many technical sessions such as Engineering Instructive Cues Biomaterials, Nanostructured Biomaterials and Porous Scaffolds, Biomaterials in the Fourth Dimension – Controlling Temporal Properties, and The Role of Antioxidants in Biomaterials, to name a few.

The process to make reliable biomaterials products and technologies is indeed an arduous process, and it is a key aspect of our Society and discipline. To help learn to navigate the arduous path from discovery to reliable product, there are numerous technical sessions and special programs. Translational Research in Nano-biomaterials, Animal Models for Biomaterial and Medical Device Testing, Developing the Next Generation of Cardiovascular Devices - From Concept to Implantation (An Industry Perspective), Advanced Biomaterials in Clinical trials, and Ethics in Biomaterials Product Development. Of special note is Standards in Biomaterials Development, a special workshop involving representatives from both the Chinese and US agencies. Given this exciting and diverse program, it will be interesting to see the crazy “a-ha” discovery ideas presented at this meeting turn out to be brilliant by becoming reliable products for advancing and improving health care and well-being—maybe Mr. Gertner will be watching!

I want to thank all who have read and provided feedback on the Society’s mission, vision and long-range goals and plans published on the web site.

I want to thank all who have read and provided feedback on the Society’s mission, vision and long-range goals and plans published on the web site. This is an important effort for the continued evolution and relevance of our Society in developing and advancing health care devices and technologies. Many efforts in the long-range plan such as the book-series, student design competition and promotional activities of the Society are underway and will come to fruition this year. We look forward to sharing the results of your feedback at the Society’s business meeting to be held during the 2013 Annual Meeting in Boston. I hope, as your schedules and other factors permit, that you are able to attend both the Annual as well as the Business Meetings.

Finally, I would like to give a big thanks to all the members who have volunteered their valuable time to be officers or committee chairs or members for the Society—your participation is the life and soul of the Society. I also need to send a shout-out to Dan Lemyre and his team at Association Headquarters for their dedication and enthusiasm in promoting and advancing the Society. Your efforts make the Society run successfully! I have learned much this past year from so many – thank you! It has been my honor and privilege to serve the Society as President over the past year – Cheers!

Joel D. Bumgardner, PhD
University of Memphis
President, Society For Biomaterials

Hello from Society For Biomaterials headquarters! As we gear up for 2013 and the annual meeting to be held in Boston, Massachusetts, the Society's board of directors, governing council, committees, task forces, and SIGs have been actively engaged in the following activities:

Awards, Ceremonies and Nominations - Chair Lynne Jones

The Awards, Ceremonies and Nominations Committee evaluated all nominations for officers and awards and presented their recommendations to council. Officer candidates are listed on page 6. The committee selected this strong slate of nominees on behalf of the membership to continue the tradition of leadership excellence in SFB.

Please join in congratulating the following 2013 award winners:

- **Founder's Award** – Robert S. Langer, ScD, Massachusetts Institute of Technology
- **Technology Innovation and Development Award** – Cato T. Laurencin, MD, PhD, University of Connecticut
- **Society For Biomaterials Award for Service** – C. Mauli Agrawal, PhD, PE, University of Texas at San Antonio
- **Young Investigator Award** – F. Kurtis Kasper, PhD, Rice University
- **Clemson Award for Applied Research** – Elliot Lorne Chaikof, MD, PhD, Beth Israel Deaconess Medical Center
- **Clemson Award for Basic Research** – Phillip B. Messersmith, PhD, Northwestern University
- **Clemson Award for Contributions to the Literature** – Peter X. Ma, PhD, University of Michigan
- **Student Award for Outstanding Research (PhD candidate)** – Stephany Tzeng, BS, Johns Hopkins University
- **Student Award for Outstanding Research (PhD candidate)** – Rameshwar Rao, MSE, University of Michigan

Full details about the awards and recipients will be provided in the next issue of the *Forum*. More detailed information is also available on the SFB website.

The committee thanks those who took the time to nominate their colleagues for awards and officer candidacy, and sincerely appreciates the officer candidates' willingness to serve the Society For Biomaterials.

Bylaws – Chair Jiro Nagatomi

The Bylaws Committee has worked together with the Long Range Planning Committee and the Membership Committee to propose changes to the Bylaws that would remove barriers to membership, making it easier to join the Society. Specific

verbiage changes will be mailed to all current voting members one month prior to the 2013 annual meeting.

Devices & Materials – Chair Andy Doraiswamy

The committee is exploring ways to further engage industry members, provide them with more content at the annual meeting, and to re-invigorate the award nominations being solicited for the Society's industry awards.

Education & Professional Development – Chair William Murphy

A student luncheon and a women's issues luncheon are being planned for the 2013 annual meeting. In addition, the Committee has been active in evaluating the C. William Hall Scholarship applications and is pleased to announce that the 2013 C. William Hall Scholarship will be awarded to Benjamin Fuller, University of Minnesota. The Committee has also evaluated the Student Travel Achievement Recognitions (STARs) put forth by the Special Interest Groups for presentation at the annual meeting. Last but not least, the committee is pleased to announce that the first-ever Biomaterials Education Challenge student curriculum design competition will take place at the 2013 annual meeting. For further information on any of these programs, please visit the SFB website!

Finance – Chair David Kohn

The Finance Committee has prepared and the Board has approved the 2013 operating budget, and the Finance Committee continues to monitor the Society's long term reserve holdings. Having achieved the stated objectives for the long term reserve, the Committee is encouraging the Board to invest in benefits that will increase the value of membership. Chief among these benefits is the development of a new website, the addition of a mobile application for the annual meeting, and recording of annual meeting sessions for web posting, giving additional value to those unable to attend the meeting.

Liaison – Chair Dave Puleo

The Liaison Committee continues its efforts to coordinate and collaborate with other societies. The committee's seven "mini-committees" will be instrumental in spearheading outreach to the following organizations: AADR, ACS, BMES, ISSCR, MRS, ORS, TERMIS. If you are interested in furthering collaborations with another society, please contact headquarters.

Long Range Planning – Chair Antonios Mikos

The committee has redeveloped the Society's strategic plan and has solicited input from the membership and from each of the Society's committees and SIGs. The new strategic plan includes a revised mission statement and a new vision statement, as well as an outline of action steps to achieve the new goals set forth. Each of these components will be discussed

with the governing council and approved by the board of directors prior to implementation. A summary of the strategic plan will be presented at the Annual Business Meeting on Friday April 12, 2013 at the John B. Hynes Veterans Memorial Convention Center in Boston Massachusetts.

Meetings – Chair Joel Bumgardner

The Meeting Committee has recommended to the board, and the board has approved, the locations of the 2014 and 2015 annual meetings in Denver, CO and Charlotte, NC respectively. In addition, the committee has been involved in the planning of the 2013 Bash, and the selection of the Biomaterials Pub theme. This promises to be a great networking event, complete with billiards, darts, lounges and great food and drink!

Membership – Chair Horst von Recum

The Membership Committee has worked with the Bylaws Committee to identify methods to streamline the application process and encourage engagement and conversion to active membership. The committee is also reaching out to several universities which have significant numbers of student members, but do not yet have active student chapters.

Program – Chair L.D. Tim Topoleski

The 2013 annual meeting program is complete. With submission of over 950 abstracts, the inclusion of an additional concurrent session on Wednesday, and the expanded capabilities of the Hynes Convention Center offering as many as seven sessions concurrently, there will be more podium presentations at the 2013 Annual Meeting than ever before! In addition, the 2013 program will include an outstanding collection of plenary lectures which will include not only the Society's 2013 award recipients listed above, but also a keynote address by Dr. Elazer Edelman of MIT, and the Acta Biomaterialia Gold Medal session honoring the 2013 Gold Medal recipient, and *JBMR-A* Editor-in-Chief, James Anderson, MD, PhD, Case Western Reserve University.

Publications – Chair Alan Litsky

The Publications Committee has worked to identify media opportunities in the Boston area to increase coverage of the annual meeting, and to establish a new bi-weekly e-newsletter the *Biomaterials Bulletin*. In addition, the Publications Committee will be working with the website redesign task force on a complete overhaul of the Society's website in the months ahead.

National Student Chapters – President Scott Cooper

2013-2014 student officer elections are underway. Open positions include President-elect, Secretary/Treasurer-elect, and Bylaws Chair. Students interested in running for office may send their school affiliation, experience, and vision statement for the Student Chapters to info@biomaterials.org by midnight of Thursday, March 21, 2013. In addition,

all SFB student chapters and related student groups are invited to participate in the inaugural Biomaterials Education Challenge! This competition will encourage student teams to develop innovative and practical approaches to biomaterials education. Teams are challenged to develop an educational module for middle school (6th-8th grade) science classes. For additional information, please visit the SFB website, or contact headquarters.

Special Interest Groups – Representative Jeff Schwartz

The SIGs are currently in the process of electing their new officers for the 2013-2015 term and will transition to their new leadership at the annual meeting. At the same time, an election for a new SIG representative to the board, also a two-year term, is taking place. The SIGs have been very active in creating sessions for the annual meeting and have planned their individual SIG member meetings concurrent with the annual meeting. SIG members continue to receive a monthly e-newsletter, *The SIGnal*, which keeps them up to date on SIG activities, SFB events, information and deadlines. Finally, student STAR award and honorable mention nominees were selected for consideration by the Education & Professional Development Committee. These awards will be conferred at the annual meeting.

If you have any questions, require any information or have suggestions for improved services, please feel free to contact the Society's headquarters office:

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2013 Officer Nominees

The task of selecting the slate of officer nominees for 2013 has been completed. Following are the nominees for President-elect, Secretary/Treasurer-elect and Member-at-Large. The Society encourages all members to cast a vote for the candidate of their choice. Ballots may be cast electronically via e-mail to headquarters, via the Members Only section of the Society's website (www.biomaterials.org) or via mail.

Following are descriptions of the responsibilities of each position, along with a brief synopsis of each nominee's biographical background and his vision for the Society's future.

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.

Nominees for President-Elect



L.D. Timmie (Tim) Topoleski, PhD
Professor
Mechanical Engineering Department
University of Maryland, Baltimore County

Biographical Sketch: L.D. Timmie (Tim) Topoleski is a Professor in the Mechanical Engineering Department at UMBC (the University of Maryland, Baltimore County). He joined the faculty of UMBC in the Fall of 1990 after completing his Ph.D. in Bioengineering at the University of Pennsylvania. He holds undergraduate and graduate degrees from Cornell University. His research interests are in the mechanics of materials for both manufactured implant materials and biological tissue. He received a Coventry Award for Basic Science from the Knee Society, has been awarded both the Outstanding Teaching and Outstanding Research awards from UMBC's College of Engineering and Information Technology, has been named a UMBC Humanities Teaching Fellow and is listed as one of UMBC's "Professors not to Miss" by their Office of Undergraduate Education. Tim has been an active member of the Society for Biomaterials since he was a graduate student and has served the Society as the Society's Member-at-Large in 2007-2008, Chair of the Bylaws Committee and Parliamentarian (2002-2007), Chair of the Orthopaedic Biomaterials Special Interest Group (1999-2000), Orthopaedic Biomaterials Organizer and Session Chair for the 6th World Biomaterials Congress (2000) and as a perennial Session Chair at the Annual Meetings of the Society for

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Biomaterials. He is currently serving as the 2012-2013 Program Chair for the 2013 meeting in Boston. He completed a two year term as the President of the UMBC Faculty Senate (2009-2011) and was recently chosen as the UMBC Presidential Teaching Professor (2008-2011). He is a reviewer for numerous scientific journals as well as for the National Science Foundation, the National Institutes of Health and the Arthritis Foundation and a consulting scientist to the US Food and Drug Administration.

Vision Statement: The Society For Biomaterials is a world-wide leader in promoting education and research in biomaterials science. The members of the Society want to maintain that leadership and increase the activities and visibility of the Society as biomaterials research and applications continue to evolve. I have enjoyed working with the Society members, the Board of Directors; and Council as the Chair of the Bylaws Committee, Member-at-Large and, recently, as the current Program Chair. I would like to continue to represent the expectations of the Society membership to the Board and Council. I am especially interested in continuing the growth of the educational mission of the Society For Biomaterials in both formal scientific training and also in professional development. I appreciate the nomination for the position of President, and I know the responsibilities of the office include representing the entire Society. If I have the privilege to be elected as the next President, I will work to maintain transparency in the Society's financial matters, help to standardize procedures and be a direct representative of the membership's voice to the Board and Council. I will use my experience and understanding of the Society's operations to work with the Society's membership to increase the benefits of membership by the continued responsible use of our resources and to seek out potential new and innovative sources of support and revenue. One of my main goals will be to continue to foster relationships between academia, industry and government/regulatory agencies to increase the visibility of the Society and promote our role in improving healthcare.



Nicholas P. Ziats, PhD

Associate Professor
Pathology, Biomedical Engineering,
and Anatomy
Case Western Reserve University

Biographical Sketch: Nicholas P.

Ziats, Ph.D. is an Associate Professor of Pathology, Biomedical Engineering and

Anatomy at Case Western University. His research is focused on biocompatibility, blood vessel diseases, cardiovascular devices and imaging/therapeutic treatments for vascular disorders. In addition, he has been involved in the area of drug delivery for treatment of cancer. Finally, he has a strong commitment to teaching and is involved in teaching biomaterials and biocompatibility courses to Biomedical Engineering students as well as in courses for industry personnel. He has published extensively and serves on the editorial boards of the *Journal of Biomedical Materials-A*, *Biomaterials*, *Recent Patents in Biomedical Engineering*, *Journal of Biomedical Science & Engineering* and *International Journal of Experimental Pathology*.

Dr. Ziats has been a member of the Society For Biomaterials (SFB) since 1989. He is currently the Member-At-Large and has been an active member with regard to committees for the past 11 years. He has been involved with the Special Interest Groups for many years and served as the Chair and Program Chair of the Proteins and Cells SIG (2007-2009) and Co-Chair and Program Chair of the Education SIG (2010-2013). He has served on SFB Council as the Membership Committee Chair (2007-2009) and Program Chair (2010-2011). He has also served on other committees of the Society, including the Membership Committee (2006-2009), Program Committee (2009-2011, 2012), Long-Range Planning Committee (2011-2012), Education and Professional Development Committee (2010-2012) and the Awards, Ceremonies and Nominations Committee (2005, 2011). Dr. Ziats has also been instrumental in the organization of three Biomaterials Days: University of Kentucky (2009, 2012; Program Co-Chair), Case Western Reserve University (2010, 2013; Program Chair), and Purdue University (2011; Program Co-Chair).

Vision Statement: The Society For Biomaterials is the organization that I call home or my “go-to organization,” as it distinguishes itself from other societies, due to the breadth and scope of its members, committees and meetings. This Society has led the way in serving our constituents and the public with many venues for dissemination of knowledge about medical devices, their use and safety, as well as knowledge concerning the interaction of materials and living tissues, particularly with regard to recent advances in tissue engineering, nanotechnology and drug delivery in medical applications. The collaborations between academia, industry and government are most important to our success as a Society as well as the training of the future of our Society, our students, postdoctoral fellows and young investigators. My vision for the Society is to maintain its recognition as the lead organization in the world of biomedical materials science, engineering and technology from our past efforts, as well as the present and the future. My goal as President is to continue the outstanding efforts of my predecessors and put forth some similar, yet

different initiatives, to move our Society forward. We need to work together to make our Society the leader in the world of biomaterials by supporting its mission (“...dedicated to promoting advancements in biomedical discoveries, education and professional standards to enhance human quality of life”) and continue to find ways of making our organization strong.

I believe it is important to maintain a strong relationship with industry and identify areas underrepresented in our meetings. I believe we can accomplish this in a number of ways such as specifically surveying our members and interested parties from industry to identify and target areas of biomaterials research and education so the Society can better serve the needs of industry. As many investigators from academia are moving into “translational research,” this may become more important to have cooperative interaction with industry, and it may also help the Society promote educational or “real-world” problems/concerns with devices. I also believe we can encourage more participation from industry if they are more represented in the Society and would envision the selection of a Program Chair for the annual meeting from industry. This has not happened in the past 10 years or so. Those in academia are crucial to the success of the Society, and their continued interaction with industry and government will enhance the overall success of the Society. I also believe our SIGs could play an important role in identifying areas of concern and offering some solutions.

I remember this statement by a prominent member of our Society at a business meeting a few years back—“It is necessary to stress that the life and blood of our Society is our students.” This has resonated with me over the years, and I believe we need to engage our students even more and keep them within our organization, especially after they graduate and move forward with their lives. As Membership Chair for three years, including one year where our membership significantly declined due to the World Congress (as happened again this past year), we tried creative ways to improve it. One of the ways was to increase our Student Chapters, which we did from a few to many and they are more active within the Society. I believe we need to get more of our academic institutions to have Student chapters and create ways to incentivize them, such as the newly created Biomaterials Education Competition being put forward by the Education Committee. Biomaterials Days have been quite successful as reported in our *Forum*. Having had experience in chairing or co-chairing this event over the past four years, I believe we can have more of these around the country and/or provide some additional support. These Biomaterials Days provide an excellent means for students to present their data, provide more direct involvement in the Society and perhaps allow our students to consider the importance of maintaining their relationship with our organization after they graduate. We can also enhance our education mission by continuing to develop our website, which I believe we have moved quite well on in the past few years, but perhaps we can consider additional ways to provide information to our members. This is important for all of our constituents and we must be up-to-date in this area.

At one of our annual meetings a few years ago, the idea of recognizing more individuals in our Society was discussed at Council. New awards became available to recognize those serving our Society (Service Award) as well as those individuals

from industry or government (C. William Hall Award) who has made a significant contribution to our Society. I believe it is time to consider creating additional task forces to explore the possibility of recognizing the contributions of women in our Society, as well as exploring means and methods for recruitment/enhancement of participation in research for the development of biomaterials, with special emphasis on education of minorities at the K12, graduate and undergraduate levels. The Society should have a concentrated effort to enhance our visibility to all of these groups and would welcome insight and perspectives from the entire membership on these specific ideas.

I believe we need to take a closer look at our annual, off-year and World Congress meetings and consider what is working or not with regard to cost effectiveness, content and perhaps working with other organizations to co-sponsor or have overlapping days of meetings. This could lead to more visibility for our Society and bring forth new members, although the alternative, taking members away, may be not be prudent, so we need to be cautious in moving in this direction, but I believe this is still worthy of consideration and discussion.

It is an honor to be nominated for the position of President of the Society, and I am grateful to the Awards Committee for considering me for this prestigious position in our Society. If elected, I would serve as the active leader of Council and the Society. Having served on Council in recent years, I have seen how the role of the President is critical to moving our Society forward and would look forward to following the role models of the individuals who have held this office; they are some of the most prestigious members of our Society. I believe we can be more creative in reaching out to our members and make changes necessary to improve the Society, but obviously requiring the necessary input and productive discussions from our members, Council, SIGS and Committees.

In conclusion, I would be honored to serve as your next President of the Society For Biomaterials and no matter what the outcome; I will continue to support our Society, or, in other words, "my society or my home organization."

The Secretary-Treasurer-Elect shall become familiar with the duties of the Secretary-Treasurer, shall cooperate and assist in carrying out the duties and shall prepare for eventual succession to that office.

Secretary / Treasurer-elect

The Secretary-Treasurer-Elect shall become familiar with the duties of the Secretary-Treasurer, shall cooperate and assist in carrying out the duties and shall prepare for eventual succession to that office. In the temporary absence of the Secretary-Treasurer, the Secretary-Treasurer-Elect will perform the duties and exercise the duties of the office. The term of office shall be for a period of two years without succession. The Secretary-Treasurer-Elect shall be the chairperson of the Finance Committee.

Nominees for Secretary / Treasurer-elect



Lisa Friis, PhD

Associate Professor
Mechanical Engineering
University of Kansas

Biographical Sketch: Lisa Friis, PhD, is an associate professor of Mechanical Engineering at the University of Kansas. She earned her BS (1985) and MS (1987)

in biomedical and mechanical engineering from the University of Iowa. Lisa then worked at the Orthopaedic Research Institute in Wichita, Kan., working directly with medical doctors on biomaterials research and testing. While working full-time, she completed a PhD in mechanical engineering (1994). In 2001, Lisa joined the Mechanical Engineering faculty at the University of Kansas (KU) where she helped develop and now co-directs the Biomedical Product Design and Development track in the Bioengineering graduate program. In 2004, Lisa was appointed as a Kauffman Entrepreneurial Faculty Scholar and was selected for the charter class for the PIPELINE innovation and entrepreneurship program in 2007. From 2008-2011, Lisa developed and directed the entrepreneurial fellowship program for the Institute for Advancing Medical Innovation. Lisa's research interest is orthopaedic biomaterials, with a current focus in spinal products. Three commercial products have been translated out of her KU lab to two small companies. She has served as a reviewer on several private funding agencies and is also a regular reviewer on NSF and NIH panels. She serves on the Editorial Board for *JBMR-A*.

Lisa has been active in the Society since she was a graduate student. She has served the Society as chair of the Educational and Professional Development Committee, Bylaws Committee and as SIG Chair Representative; through these roles she served on the Society Board and Council. She has also served as a member on the Program, Bylaws and Education and Professional Development Committees. Lisa has been active in SIGs, serving as chair of the Biomaterials Education SIG and in various other officer positions in the Biomaterials Education and Orthopaedic SIGs. She has organized two workshops at the annual meetings.

Vision Statement: It is an honor to have been nominated for the position of SFB Secretary/Treasurer-elect. My long record of service to SFB demonstrates my commitment to help shape the future of the Society. SFB is my primary society because we recognize and support the need for innovation, research

translation and the partnerships between industry, academia and FDA. If given the opportunity, I will dedicate my energies to work proactively with the Board and Council to best serve the members.

As the world around us evolves, I believe we must be entrepreneurial and innovative in our thinking and actions in order to grow and better serve the needs of our members. We must recognize the changing needs of our members, yet learn from our past best practices. My past service to SFB and experience in entrepreneurial endeavors will allow me to provide useful input as a team member on the Board and Council. It is critical we ensure members see the value of their membership through network connections, education enhancement, SFB-affiliated publications and our annual meetings. In the Secretary/Treasurer-elect role, I will first learn from the current Secretary/Treasurer as I chair the Finance Committee, preparing to take on responsibilities of the full position. Later as Secretary/Treasurer, I will be responsible for bringing the financial concerns of the members to the Board and Council and will be transparent about the Society's fiscal matters.

Equally important as financial security are activities and programs to ensure the future of SFB. Just as I was mentored by SFB members who became our leaders, I believe we must support and guide our students and younger members and encourage them to actively participate in shaping our future. It is imperative our members directly experience the value of membership, meetings and publications, and that these resources are maintained and grown in a cost effective and responsible manner. SFB has a solid financial plan, but we must continue close oversight of our investment policy and long-term reserve accounts along with a consistent monitoring of expenses to ensure our future stability and growth.



Ali Khademhosseini, PhD

Associate Professor
Harvard-MIT's (HST), Division of
Health Sciences and Technology
Brigham and Women's Hospital (BWH)
Harvard Medical School (HMS)
Associate Faculty
Wyss Institute for Biologically Inspired
Engineering

Junior Principal Investigator
Japan's World Premier International – Advanced Institute for
Materials Research (WPI-AIMR) at Tohoku University.

Biographical Sketch: Ali Khademhosseini is an Associate Professor at Harvard-MIT's Division of Health Sciences and Technology (HST), Brigham and Women's Hospital (BWH) and Harvard Medical School (HMS) as well as an Associate Faculty at the Wyss Institute for Biologically Inspired Engineering. He is also a Junior Principal Investigator at Japan's World Premier International – Advanced Institute for Materials Research (WPI-AIMR) at Tohoku University. His research is based on developing micro- and nanoscale technologies to control cellular behavior, with particular emphasis in developing microscale biomaterials and engineering systems for tissue engineering. Currently, his laboratory is developing technologies to control the formation

of vascularized tissues with appropriate microarchitectures as well as regulating stem cell differentiation within microengineered systems. He has edited seven books and four journal special issues and is an author on more than 200 articles in peer reviewed journals, 70 book chapters/editorials, 160 abstracts and 15 patent/disclosure applications. As of Jan. 2013, he has been cited over 8400 times and has an H-index of 48. Also, he has been invited to give nearly 150 invited and keynote lectures.

Dr. Khademhosseini's interdisciplinary research has been recognized by more than 30 major national and international awards. He has received early career awards from three major engineering discipline societies: electrical (IEEE Engineering in Medicine and Biology Society award and IEEE Nanotechnology award), chemical (Colburn award from the American Institute of Chemical Engineers) and mechanical engineering (Y.C. Fung award from the American Society of Mechanical Engineers). He is also the recipient of the Presidential Early Career Award for Scientists and Engineers, the highest honor given by the US government for early career investigators. In 2007, he was named a TR35 recipient by the Technology Review Magazine as one of the world's top young innovators. He is also a fellow of the American Institute of Medical and Biological Engineering (AIMBE). In 2010 he received the Society For Biomaterials (SFB) Young Investigator Award.

He has been an active member of SFB since his graduate school days and has served at various capacities in the Society. In particular, he routinely presents, reviews abstracts and chairs sessions at the annual meeting and has served as a member of the conference advisory board. He has also been a member of the Membership and Liaison Committees and was the vice-chair of the Tissue Engineering SIG.

Dr. Khademhosseini is an Associate Editor for the *International Journal of Nanomedicine*, *Biomedical Microdevices*, *IEEE Transactions on Biomedical Engineering and Organogenesis*. He is also the Associate Editor for research highlights for *Lab on a Chip*. He also serves as a member of the editorial boards of numerous journals including the *Small*, *Tissue Engineering (Parts A, B and C)*, *Journal of Tissue Engineering and Regenerative Medicine*, *Biomacromolecules*, *Reviews on Biomedical Engineering*, *Biomicrofluidics*, *Biomedical Materials*, *Journal of Biomaterials Science-Polymer Edition* and *Biofabrication*. He received his Ph.D. in bioengineering from MIT (2005), and MASc (2001) and BASc (1999) degrees from University of Toronto, both in chemical engineering.

Vision Statement: It is my great pleasure to be nominated for the secretary/treasurer position of the Society For Biomaterials. As the major society that aims to push forward the science and application of biomaterials in medicine, I believe the Society is well positioned to benefit its membership and enable future developments in this area. My goal, if I become elected, will be to help assure the financial security of the Society while ensuring maximum benefit to its membership.

I believe the benefit to the membership will directly correlate with the impact and future health of the Society. As such, I believe we should ensure we take lessons from the history of

the Society as well as the growth of other competing societies to ensure we provide the best benefit to our members to remain competitive in attracting the best researchers and young scientists to the Society. Some opportunities involve generating additional sources of income, which can be channeled back into the membership benefits. Some examples of such opportunities involve initiating industrial workshops that can generate funds while enhancing the educational programs of the Society. In addition, the Society could generate more funds for its membership through its publications. I believe it is very important the Society publications will be the premier places to publish in the field. This will not only raise the prestige of the Society and the field as a whole but will also likely yield to higher revenues. These and other activities, which aim to generate funds (without burdening the members) while ensuring enhanced benefits for the members, are particularly important during these difficult financial times.

Another one of my aims is to maintain and further foster a strong culture of accountability and organization in the Society to ensure efficient operations. The Society already has significant resources, which need to be used wisely. Also, I aim to continue to ensure the transparency of the Society's finances and long-term plans. I believe my strong involvement with other societies will help me in bringing best practices to the operation and finances of the Society. Also, I aim to use my interactions with other related societies to ensure expansion of the membership and cross-pollination and continued revitalization of the activities of the Society.

I aim to dedicate my full energy and passion to ensure the continued success of the Society. My strong involvement with the Society has made me highly committed to its success, and I believe that as the secretary/treasurer, I will have the opportunity to contribute to keeping the Society vibrant and active. This has always been the place for the best and the brightest biomaterials scientists, and I will do all that is needed to ensure it remains the premier place for this community. I thank you for your time and humbly ask for your support.

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.

Nominees for Member-at-Large



Dr. Krishnendu (Krish) Roy, PhD

Fellow, American Institute for Medical and Biological Engineering

Fellow, Biomedical Engineering Society

Professor, Department of Biomedical Engineering

Fellow of the Cockrell Chair in Engineering Excellence

The Cockrell School of Engineering

The University of Texas at Austin

Biographical Sketch: Dr. Krishnendu (Krish) Roy received his undergraduate degree from the Indian Institute of Technology followed by his MS from Boston University and his PhD in Biomedical Engineering from Johns Hopkins University. Following his PhD, he joined Zycos Inc., a start-up biotechnology company where he served as a Senior Scientist in the Drug Delivery Research group. Dr. Roy left his industrial position to join The University of Texas at Austin in 2002, where he is currently Professor of Biomedical Engineering and Fellow of the Cockrell Chair in engineering Excellence. Dr. Roy's research interests are in the areas of stem cell engineering with particular focus on material-directed cells signaling and immune cell generation and controlled drug and vaccine delivery technologies using responsive polymers with applications in cancer and immunotherapies. He was recently elected Fellow of the Biomedical Engineering Society (BMES) and Fellow of the American Institute for Medical and Biological Engineering (AIMBE). Dr. Roy has received numerous awards and honors, including the Young Investigator Awards from both the Society for Biomaterials (SFB) and the Controlled Release Society (CRS), the Young Scientist Award from HSEMB, NSF CAREER award, Global Indus Technovator Award from MIT, the CRS Cygnus Award etc. He has also received the translational research award from the Coulter foundation and the bioengineering grant from the Whitaker Foundation. He serves as a member of the Editorial Boards for the *Journal of Controlled Release* and the *European Journal of Pharmaceutics and Biopharmaceutics*.

Vision Statement: My association with SFB started as a graduate student and since then this has been my scientific home. Over the years, it has been an honor to serve the Society as a SIG Chair and as member of the Membership Committee and the Awards Committee. I have also been deeply moved to have received the Young Investigator Award from the Society. It will certainly be a privilege and an even bigger honor to serve you all as Member-at-Large, a position that truly represents the grass-roots of the Society.

SFB has evolved considerably over the past decade and made significant progress in bringing together researchers, students and industrial members. But there is still a lot of work to be done. My tenure as Member-at-Large will focus not only on being an effective interface between the membership body and the board of directors but also on proactively bringing new ideas to the table, seeking member feedback and actively pursuing those ideas with the board for efficient implementation.

It is my belief that the fundamentals of a professional organization like SFB must be rooted in exciting science. It is the pursuit of unresolved scientific questions and its promise to improve human health that brings us together. First and foremost, we must maintain that scientific identity of our Society, both to the younger generation of scientists and also to those who have long been involved with the Society. It is, after all, a balance between new ideas and experience that makes a society great! It would be my mission to ensure the annual meeting as well as the satellite meetings and workshops are all portraying the latest and most cutting-edge science in biomaterials, those that challenge paradigms and break new ground. To do this, the ideas and movements must come from the ground up. SFB is already pioneering this through SIG-

driven sessions and themes, but we need to go beyond that. It is critical we populate the SIGs and thus the foundations of the Society with new and young members who will work closely with more experienced folks. We have to bring in more people from industry and government to participate in the SIGs and to provide fresh ideas. We must do this proactively, and I believe my experience in the Membership Committee will help. If elected, this will be my first mission, to work with you all in strengthening the roots of this Society.

But beyond science and research the Society must play three other major roles: mentoring young scientists; supporting efficient translation of research findings to industry and clinic; and establishing standards, policies and guidelines in biomaterials and educate governmental and policy-making bodies. The past few years have seen a commendable surge in SFB activities related to young scientists. This must be maintained and further expanded, specifically in mentoring them for academic and research careers as well as careers in industry, government, FDA and policy institutes. SFB has long been a champion of industry participation. But it needs to go beyond the current norm and actually bring together ideas and sponsors through forums where the best ideas from research labs can meet industrial sponsors, venture capitalists, big pharma and investors. Finally, one of the areas we have lagged considerably has been in setting guidelines and standards as well as in influencing governmental policies. As a fellow of the American Institute for Medical and Biological Engineering (AIMBE) I have seen first-hand the efforts to pursue federal and local policy-makers and to direct global attention to issues important to our field. SFB must become the globally recognized body that provides advice, sets policies and influences societal thinking in all matters related to biomaterials. To achieve this we may need to work together with other societies like AIMBE or BMES. We have large number of our members who are active in other societies and are thought leaders in these areas. We must "recruit" them, seek their help and proactively shape the future of biomaterial research and policy.



Jan P. Stegemann, PhD

*Associate Professor
Biomedical Engineering
University of Michigan, Ann Arbor*

Biographical Sketch: Jan has been part of the biomaterials community for over 20 years. He received his MS in Chemical Engineering from the University of Toronto

in 1992 in the area of polymer encapsulation of mammalian cells for the treatment of endocrine diseases. He subsequently worked in the biomedical research division of W.R. Grace & Co. (1997-2002), where his research focused on cell-based bioartificial organs. He then returned to graduate school and obtained his PhD in Biomedical Engineering from the Georgia Institute of Technology (2002), where his doctoral work focused on biochemical and mechanical modulation of cell phenotype in 3D protein biomaterials. After a postdoctoral position in Bioengineering at Georgia Tech, he joined the faculty in the Department of Biomedical Engineering at Rensselaer Polytechnic Institute. In 2008, he moved his laboratory to its current location in the Department of Biomedical Engineering at the University of Michigan, where his research focuses on

biomaterials and cell-based therapies. As an educator, Jan has developed and teaches courses in cell-biomaterial interactions, as well on the commercialization of biomedical technologies.

Jan has been an active member of the SFB for over a decade. He has served on the Meetings Committee (2012-13), the Awards & Nominations Committee (2011-12), as Vice-Chair (2007-08) and subsequently as Chair (2009-2011) of the Tissue Engineering SIG, and has been active in organizing a variety of SFB activities. In 2011, Jan co-chaired the Upper Midwest Biomaterials Day, and he has organized and chaired many scientific sessions at the SFB Annual Meeting, which he attends each year. He regularly performs reviews for a variety of biomaterials-oriented journals, including the *Journal of Biomedical Materials Research* and *Applied Biomaterials*. Since 2010, Jan has served as Education Editor for the *Biomaterials Forum*, and in that capacity is responsible for a quarterly column that highlights interesting aspects of biomaterials education.

Vision Statement: The role of the Member-at-Large is to represent the broader membership of the Society. I am honored to be nominated for this position, and if elected I will work hard to ensure that all members have the chance to contribute their ideas, as well as voice their concerns. Clearly the strength of our Society lies in its membership, and therefore it is critical that our members are confident and supportive of the direction of the Society. My main priorities will be to:

- 1) Solicit the views of the SFB membership and then faithfully present these views to the executive leadership of the Society. These views need to be heard to allow the Society to move in directions that benefit both the field of biomaterials and our membership.
- 2) Promote participation of the membership in planning and implementing Society events both as part of the annual meeting and beyond. Such participation will organically lead to a stronger society, in which members feel the right and responsibility to contribute in a variety of ways.
- 3) Assist in growing the Society's membership through outreach and demonstration of the value of membership. Happy members who feel they are both creating and receiving value through the Society will create a strong and stable organization.

The effectiveness of the Member-at-Large is partly determined by the willingness of the SFB membership to bring forth their ideas. I encourage all SFB members to use their voice and to participate in directing the future of the Society. If elected as Member-at-Large, I promise to fairly and actively present the ideas and opinions of our members to the SFB leadership. I would consider it an honor to serve the membership in this way.

Special Interest Group News

Hello SFB and Fellow SIG Members,

As this will be my last opportunity to submit to *The Forum* as Special Interest Group (SIG) Representative, I would like to take this time to thank all of the SIG members for making these two years exceptional. I have met many wonderful people, and I will now have connections to biomaterial researchers I didn't have before. Thank you to the SIG officers from all 13 SIGs. SIG members may not realize the amount of effort put forth by these officers.

At the beginning of my term, I initiated two non-elected roles for SIG officers: the Web Representative and the Student Representative. This improved involvement from more SIG members and filled some very necessary roles. I hope the SIGs continue these roles in the future. Each SIG will need representation on the web, and I continue to believe students should take a more active role in the Society. By the way, SIG membership is free for students, and it provides students the chance to interact with academic, industry and government Society members.

We had quite an active two years. Two SIGs changed their names and initiated a rebranding initiative. The SIG committee, composed of SIG Chairs, created two proposals approved by the Council and Board. The first involved improving the SIG officer election process, and the second enhanced the Student Travel Achievement Recognition (STAR) award process. Articles were printed in *The Forum* by SIG members highlighting new and exciting topics and overviews of cutting-edge research. SIG members were heavily involved in the whole process of creating and implementing the SFB Annual Meetings—submitting session proposals, developing sessions, reviewing abstracts, organizing sessions, moderating sessions and attending the meetings. This is an overwhelming amount of effort, and it shows how active the SIGs are within the Society. During the meetings, some SIGs have organized social events, offered poster and presentation awards and given incentive prizes for attending SIG meetings.

I would also like to acknowledge the amount of coordination with the SIGs could not have been possible without Leslie Clark and Dan Lemyre from Association Headquarters. Thank you for all of your help and patience!

For those who have not had a chance to get involved with a SIG, make sure you select a category of interest when renewing your SFB dues. It costs only \$10 to join a SIG. There is a short form you can complete if you are a current member of SFB. Better yet, during our Annual Meeting in Boston in April, come to a SIG meeting in the morning or afternoon (check schedule for specific meeting times and locations) and get a free breakfast or lunch. You will find much more, I promise.

Your SIG Representative,

Jeff Schwartz

*Calling all SFB Student Chapters
and Related Student Groups*

Compete in the Biomaterials Education Challenge!

All SFB student chapters and related student groups are invited to participate in the inaugural Biomaterials Education Challenge! This competition will encourage student teams to develop innovative and practical approaches to biomaterials education. Teams are challenged to develop an educational module for middle school (6-8 grade) science classes. Each educational module will demonstrate fundamental biomaterials concepts, with scientific principles 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. See SFB website (www.biomaterials.org) for additional details and rules.

The Implant Pathology SIG Needs a Name Change

Special Interest
Group Opinion

By H. Winet

When the Implant Pathology SIG was constituted in 1993, there was a need for histologists who specialized in pathological tissue reaction to implants to have a venue to discuss ways to interpret the reactions from slides, electron micrographs, X-rays and other data from forensic detection procedures. There was also a time, 35 or so years ago, when bioengineers were usually the engineers who maintained hospital electronic instruments. Tissue reaction to implants is so much more than pathology, just as bioengineering is so much more than instrument engineering.

When an implant fails, it may do so because of acute tissue reactions, such as simple toxicity, or a long chronic series of episodes linked to cascades of adaptive immune responses, each with its own set of contingencies, such as particle disease for a number of long-dwelling implants. But how do we decide an implant has failed? Is pain the only indicator? And if the pain can be relieved by draining off a one-time collection of particles and a short course of medication, is the implant successful? My point is that one cannot be accurate about the onset of pathology unless there is a baseline that is well-enough defined that one can point to onset of a deviation.

In other words, a scientific detection of pathology cannot take place unless normal physiology has been scientifically detected. How can the developer of any device determine accurately what went wrong when it failed if there is no standard for what went right when it succeeded? Even forensic scientists have to know normal physiology to determine if a crime has taken place. Our SIG cannot simply be about “crimes against tissues.”

We are scientists. We must know successful implant physiology to establish standards for a device’s success. Accordingly, our SIG’s name should reflect the quest to establish standards for implant success. The name that has been agreed upon by a few members of our SIG who felt the matter important enough to vote on it, is “Implant Compatibility.” We eschewed “implant biocompatibility” because we were too aware of Jonathan Black’s sweeping definition that would include most of the publications in our journals.

We’d like to be a forum for discussing some of the new tricks being explored for making implants more compatible, such

When an implant fails, it may do so because of acute tissue reactions, such as simple toxicity, or a long chronic series of episodes linked to cascades of adaptive immune responses, each with its own set of contingencies, such as particle disease for a number of long-dwelling implants.

as coatings that block antibody attachment. I went through all the titles and a number of the abstracts submitted for the 2013 meeting and found a number that would be of interest to our members buried in other SIG sessions with only the subject organ in common. As long as the SFB members consider us a forensic SIG, they will send us pathology (if this, because they may not think outside their SIG’s organ) abstracts only. It is time we gained a scientific identity. I wrote this article to stimulate feedback and suggestions for other names, given the points presented. Thank you.

H. Winet (Past Chair and present Program Chair IP-SIG)

Please send comments to the editor at lkuhn@uchu.edu or present them at the Implant Pathology SIG Meeting in Boston at the Annual Meeting.

Student News

by Beth Pollot

Community outreach is an important facet of the student chapters of the Society For Biomaterials. As the objective of the student section is "... to promote student research, education and professional development in biomaterials," there are many ways the student chapters have developed to support biomaterial community outreach. At their own schools, student chapters have held regular meetings and seminars to present current research and discuss advancements in the field of biomaterials. The student chapter at Case Western Reserve University organized monthly meetings where students from various labs around campus provided a brief research presentation and then facilitated a discussion concerning the work with its group of more than 100 student members. Columbia University's student chapter hosted laboratory visits and demonstrations to underrepresented students interested in engineering. Some of the topics explored in these demonstrations included perfusion bioreactors for bone engineering, as well as the mapping of native cartilage tissue for the fabrication of novel biomaterials solutions. The chapter at the University of California, Los Angeles, which was founded recently in the summer of 2012, has already established a series of seminars, where students conducting biomaterials-related research talk about the applications of biomaterials used in their diverse fields.

Student chapters are also going into the local community and schools to increase enthusiasm and awareness regarding the applications of biomaterials. The Vanderbilt University student chapter teamed up with the School for Science and Math at Vanderbilt to increase high school students' exposure to biomaterials in the classroom through research presentations as well as hands-on activities. The chapter at the University of Texas at San Antonio held week-long summer camps for kindergarteners through eighth graders from the greater San Antonio region. Each day featured various learning activities about biomedical engineering and biomaterials. Activities and demonstrations ranged from looking at cheek cells to exploring



Columbia Engineering Experience Lab Visit and Demonstration

biomedical implants to learning anatomy and physiology, which culminated in students building a full body with each physiological system being represented with materials which simulated their function. Texas A&M University's student chapter worked with a local middle school's Science Club so students there can experiment with biomaterials. The Texas A&M chapter also performed demonstrations for high school students to educate them about biomaterials. For instance, one demonstration they developed was the introduction of polymers to students, which relates how these materials are used in tissue engineering, cytocompatibility and drug delivery. The student chapter at the University of South Dakota participated in the Sanford "It's All About Science Festival," which is a regional event put on by local educational and industry leaders to get children excited about science. The student chapter's exhibit was called "Science for All Senses" and had several hands-on activities such as strawberry DNA extraction, a color blind test, determining "super tasters" and guessing a bug from scanning electron microscopy images. Attendees were also able to experience and learn about hydrogels and the current research going on at the University of South Dakota.

Another way the student chapters increase awareness of biomaterials in their community is through sponsoring Biomaterials Days. Biomaterials Days are events hosted to present current research

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UTSA Summer Camp



*University of South Dakota
"It's All About Science Festival"*

Student Spotlight



Beth Pollot is currently the President-elect of the Society For Biomaterials National Student Chapter and a Ph.D. candidate at the University of Texas at San Antonio.

She received her BS in Biomedical Engineering from Western New England College in Springfield, Mass., in 2009. Her research focus is skeletal muscle regeneration with an emphasis in bioreactor conditioning of biomaterials and vascularization. Beth is a current recipient of the U.S. Army Institute for Surgical Research Graduate Fellowship.

Nicholas P. Ziats, Society Business and Membership News Contributing Editor



Hello to all Society members. This year should be quite promising for our organization. We look forward to the upcoming meeting and the program that Tim Topoleski, Ph.D., Program Chair, and the Program Committee has put forth. This meeting will be quite exciting and have excellent science, but it should be fun as well because of the various Society-sponsored social activities that always play a key role in creating networking opportunities.

In my role as Member-At-Large, I had sent out an e-mail (from the Society Headquarters) asking for any input regarding notable events and news. I am pleased to say I received a number of responses from you, and I will report them in this issue, as well as upcoming ones. If I may, I will remind you quarterly, so I can continue to report on the outstanding achievements from our members. I look forward to this challenge of working with you, the members, to discuss and enhance the needs of our Society. You can contact me by e-mail (Nicholas.Ziats@case.edu), or by telephone at (216) 368-5176.

Here are some outstanding achievements by some of our members.

Robert E. Baier, Ph.D., Professor and Director of the Biomaterials Graduate Program, State University of New York at Buffalo has an article concerning SFB activities over the past 35 years, entitled, "Parts for People: Biomaterials Experts Seek Consensus." The website to access his article is: <http://www.bestthinking.com/article/permalink/2084?tab=article&title=parts-for-people-biomaterials-experts-seek-consensus>. Dr. Baier is past President of the Society and has extensively published in many areas of biosurface physics, particularly involving dental and medical implant technology.

Elaine Duncan, President of Paladin Medical, Inc. announces the 25th Anniversary of Paladin Medical, Inc. Elaine writes "...in many ways, we owe our start to **Dr. James Anderson**. During the Fall 1987 meeting of the Council of the SFB, I told Jim I was starting a regulatory consulting company. He told a company here in the Minneapolis area about me, and we had our first client. We have served numerous start-up biomaterial companies that have sprung from the membership of the SFB, and we owe a great deal to the support from our SFB friends." More information about the firm can be found at www.paladinmedical.com

Grayson W. (Bill) Marshall, D.D.S., a Distinguished Professor Emeritus and Chair of the Division of Biomaterials and Bioengineering at the University of California San Francisco, recently received an honorary doctorate from Malmö University in Sweden. Dr. Marshall holds fellowships in the AAAS, the Academy of Dental Materials, American College

of Dentists, and the International College of Dentists. In 2007, he received the IADR Wilmer Souder Distinguished Scientist Award, and in 2009 the ADM Founders Award. He served as President of the American Association for Dental Research in 2009-10. His research group studies structure-mechanical property relationships of calcified tissues such as bone, cementum, dentin and enamel by trying to seek insight into biomineralization processes associated with these tissues during development, alterations resulting from disease or repair and regeneration from clinical treatments.

Adam W. Feinberg, Ph.D., an Assistant Professor of Biomedical Engineering and Materials Science and Engineering at Carnegie Mellon University, recently received a NIH Director's New Innovative Award on developing new biomaterials and cardiac tissue engineering strategies to help repair the human heart following injury and disease. Dr. Feinberg's lab is focused on the engineering of protein scaffolds that can dynamically guide tissue repair and regeneration. In a recent statement, Dr. Feinberg indicates "to do this, we are studying multi-cellular tissue assembly in embryonic development and wound healing in order to develop biomimetic engineering design principles and will be ultimately applying this basic research to model how cells interact with the extracellular matrix in multiple tissue types including cornea and cardiac muscle." He also indicates his work could lead to future medical applications including improved drug discovery and screening platforms, novel tools for biological investigation and engineered tissue grafts for disease and trauma repair. Before joining Carnegie Mellon University in 2010, Dr. Feinberg did his postdoctoral training at Harvard University, where he developed new biomaterials and cardiac engineering strategy. His doctoral work at the University of Florida was under the guidance of **Dr. Anthony Brennan**.

On December 14-17, 2012, in Maui, Hawaii, a symposium was held celebrating the 80th birthday of one of the most influential figures in the fields of biomaterials and drug delivery, **Professor Allan S. Hoffman**. Dr. Hoffman has had phenomenal impact on biomaterials, diagnostics, medical devices and drug delivery as a pioneer, innovator and educator. More than 100 scientists paid tribute to Allan Hoffman's impact on the field in these three days of excellent scientific talks. Dr. Hoffman is also a past President of SFB.

David H. Kohn, Ph.D., Professor of Biologic and Materials Sciences and Biomedical Engineering at the University of Michigan recently had a tissue engineering and regeneration grant renewed by NIH. Dr. Kohn is a co-principal investigator and director of the training program whose federal funding is designed to jump start the research careers of PhD students and post-docs working in the fields of tissue engineering and regenerative medicine. When the \$6 million, five-year training grant expires in 2017, Dr. Kohn says it will mark the 40th anniversary of the longest-funded training grant awarded by the National Institute of Dental and Craniofacial Research.

The training grant was initially awarded to the School of Dentistry in 1976 and is one of the two longest-standing training grants awarded to University of Michigan. "By using these funds in a collaborative endeavor at the three units at the University of Michigan, we can bring together a large number of faculty and PhD or post-doctoral students who can work together more effectively," Kohn says. "This will represent a significant change since much of the work now being done is by individual investigators or small groups of investigators."

Buddy Ratner, Ph.D., Professor of Bioengineering and Michael L. and Myrna Darland Endowed Chair in Technology Commercialization at the University of Washington, received a number of awards and honors in 2012, including the George Winter Award from the European Society for Biomaterials, an Honorary Professor of Sichuan University and was named a Fellow of the Tissue Engineering and Regenerative Medicine International Society. Dr. Ratner is a past President of SFB.

Molly Shoichet, Ph.D., Professor of Chemical Engineering and Applied Chemistry, Chemistry and Biomaterials and Biomedical Engineering at the University of Toronto was awarded the Queen Elizabeth II Diamond Jubilee Medal in 2012. This new commemorative medal was created to mark the 2012 celebrations of the 60th anniversary of Her Majesty Queen Elizabeth II's accession to the throne as Queen of Canada and honors significant contributions and achievements by Canadians. Dr. Shoichet was also inducted as a Fellow of the Canadian Academy of Health Science in 2012. With this latest honor, Dr. Shoichet is now the only living person to be a fellow of three prestigious Canadian Academies: The Canadian Academy of Sciences of the Royal Society of Canada, the Canadian Academy of Engineering and the Canadian Academy of Health Sciences.

Professor R. Geoff Richards, Ph.D., Director of AO Research and Development, Switzerland and Editor in Chief of the *eCM Journal* was elected by the Tissue Engineering and Regenerative Medicine International Society (TERMIS) members to become the Member at Large for Europe along with the European representative of the world committee with a three year term from January 1, 2013. He will also be one of the local organizers of the 8th Meeting of the Combined Orthopaedic Research Societies, Venice, 13-16 October 2013 (<http://www.cors2013.org>).

Other members in the news:

AAAS Fellows Elected in 2012: The following members of our Society have been elected as Fellows of the American Association for the Advancement of Science (AAAS) for 2012, **Amit Bandyopadhyay, Ph.D.**, Professor of Mechanical and Materials Engineering at Washington State University Ministry, **Andres J. Garcia, Ph.D.**, Professor of Mechanical Engineering at Georgia Institute of Technology and **David H. Kohn, Ph.D.**, Professor of Biologic and Materials Sciences and Biomedical Engineering at the University of Michigan. We congratulate these Society members on receiving this prestigious award, which

recognize scientists for their significant contributions to science and to the public's understanding of science. These awards were presented at the AAAS Annual Meeting in Boston of 2013.

Edward Phelps, Ph.D., recently finished his Ph.D. in the lab of **Dr. Andrés García** at Georgia Institute of Technology and received the award for best bioengineering Ph.D. thesis in 2011. Dr. Phelps is now in Switzerland at the EPFL working as a post-doc in the laboratory of Dr. Melody Swartz and is supported by a post-doctoral scholarship from the Whitaker International Program. His current project focuses on the immunopathology of autoantigens in type 1 diabetes, with joint projects with Dr. Steinunn Baekkeskov and SFB member **Dr. Jeffrey Hubbell**. Dr. Phelps was featured on the cover of the *Biomaterials Forum* issued in 1st quarter, 2010.

Students in the News:

Mohammad K. Bhuyan, a Ph.D. candidate in the Department of Mechanical Engineering at The University of Texas at El Paso, reports on a number of areas being investigated in their biomedical and regenerative medicine laboratory, ranging from studies on photovoltaic device based targeted drugs for cancer chemotherapy to inkjet-mediated gene transfection in cells and organs.

Elsevier Announcement

Elsevier has announced the award of the 2013 Acta Biomaterialia Gold Medal will go to Dr. James M. Anderson. This award is given in recognition of "...undisputed world leaders who have demonstrated excellence and leadership in biomaterials, including basic science and translation to practice."

Dr. Anderson, past president of the Society For Biomaterials and SFB's Founders Award recipient in 1997, serves as Distinguished University Professor, Professor of Pathology, Macromolecular Science, and Biomedical Engineering at Case Western Reserve University in Cleveland, Ohio. His research has focused on identifying in vivo mechanisms which cause clinical success or failure in medical devices, particularly inflammatory, wound healing and foreign body reactions to those devices. He is also the author of 313 peer-reviewed publications and 80 published book chapters.

Dr. Anderson has chosen the Society For Biomaterials' Annual Meeting in Boston, Mass., April 10 – 13 as the venue for receiving the Acta Biomaterialia Gold Medal Award. His SFB colleagues join in congratulating him on this great honor.

NIST Study Suggests Carbon Nanotubes May Protect DNA from Oxidation

Government News
Joy Dunkers,
Government News Contributing Editor

By Joy Dunkers

Researchers at the National Institute of Standards and Technology (NIST) have provided evidence in the laboratory that single-wall carbon nanotubes (SWCNTs) may help protect DNA molecules from damage by oxidation. In nature, oxidation is a common chemical process where a reactive chemical removes electrons from DNA and may increase the chance for mutations in cells. More studies are needed to see if the *in vitro* protective effect of nanotubes reported in the laboratory also occurs *in vivo*, that is, within a living organism.

“Our findings don’t tell us whether carbon nanotubes are good or bad for people and the environment,” says Elijah Petersen, one of the authors of the study. “However, the results do help us better understand the mechanisms by which nanotubes might interact with biomolecules.”

Single-wall carbon nanotubes—tiny hollow rods that are one-atom-thick sheets of graphene rolled into cylinders 10,000 times smaller in diameter than a human hair—are prized for their extraordinary optical, mechanical, thermal and electronic properties (Figure 1). They are being used to produce lightweight and extremely strong materials, enhance the capabilities of devices such as sensors and provide a novel means of delivering drugs with great specificity. However, as carbon nanotubes become increasingly incorporated into consumer and medical products, the public concern about their potential environmental, health and safety (EHS) risks has grown. Scientifically determining the level of risk associated with the carbon nanotubes has been challenging, with different studies showing conflicting results on cellular toxicity. One of the components lacking in these studies is an understanding of what physically happens at the molecular level.

In a recent paper,* NIST researchers investigated the impact of ultrasonication on a solution of DNA fragments known as oligomers in the presence and absence of carbon nanotubes. Ultrasonication is a standard laboratory technique that uses high-frequency sound waves to mix solutions, break open cells or process slurries. The process can break water molecules into highly reactive agents such as hydroxyl radicals and hydrogen peroxide that are similar to the oxidative chemicals that commonly threaten mammalian cell DNA, although the experimental levels from sonication are much greater than those found naturally within cells. “In our experiment, we were looking to see if the nanotubes enhanced or deterred oxidative damage to DNA,” Petersen says.

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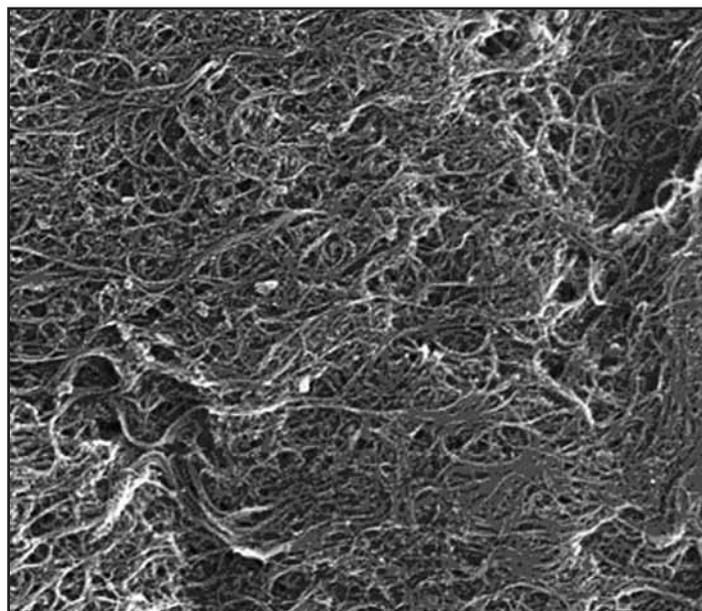


Figure 1. Scanning electron microscope image of a typical sample of the NIST single-wall carbon nanotube soot standard reference material. Recent NIST research suggests that, at least in the laboratory, carbon nanotubes may help protect DNA molecules from damage by oxidation. The image shows an area just over a micrometer wide. (Color added for clarity.)
Credit: Vladar, NIST

Contrary to the expectation that carbon nanotubes will damage biomolecules they contact, the researchers found that overall levels of accumulated DNA damage were significantly reduced in the solutions with nanotubes present. “This suggests that the nanotubes may provide a protective effect against oxidative damage to DNA,” Petersen says.

A possible explanation for the surprising result, Petersen says, is that the carbon nanotubes may act as scavengers, binding up the oxidative species in solution and preventing them from interacting with DNA. “We also saw a decrease in DNA damage when we did ultrasonication in the presence of dimethyl sulfoxide (DMSO), a chemical compound known to be a hydroxyl radical scavenger,” Petersen says.

Petersen says that a third experiment where ultrasonication was performed in the presence of DMSO and SWCNTs at the same time produced an additive effect, reducing the DNA damage levels more significantly than either treatment alone.

This research is part of NIST’s work to help characterize the potential EHS risks of nanomaterials, and develop methods for identifying and measuring them.

* E.J. Petersen, X. Tu, M. Dizdaroglu, M. Zheng and B.C. Nelson. Protective roles of single-wall carbon nanotubes in ultrasonication-induced DNA base damage. *Small* (2012), DOI: 10/1002/smll.201201217. Media Contact: Michael E. Newman, michael.newman@nist.gov, (301) 975-3025

New NIST Reference Material Could Aid Nanomaterial Toxicity Research

The National Institute of Standards and Technology (NIST) has issued a new nanoscale reference material for use in a wide range of environmental, health and safety studies of industrial nanomaterials. The new NIST reference material is a sample of commercial titanium dioxide powder commonly known as “P25” (Figure 1).

NIST Standard Reference Materials® (SRMs) are typically samples of industrially or clinically important materials that have been carefully analyzed by NIST. They are provided with certified values for certain key properties so that they can be used in experiments as a known reference point.

Nanoscale titanium-dioxide powder may well be the most widely manufactured and used nanomaterial in the world, and not coincidentally, it is also one of the most widely studied. In the form of larger particles, titanium dioxide is a common white pigment. As nanoscale particles, the material is widely used as a photocatalyst, a sterilizing agent and an ultraviolet blocker (in sunscreen lotions, for example).

“Titanium dioxide is not considered highly toxic and, in fact, we don’t certify its toxicity,” observes NIST chemist Vincent Hackley. “But it’s a representative industrial nanopowder that you could include in an environmental or toxicity study. It’s important in such research to include measurements that characterize the nanomaterial you’re studying—properties like morphology, surface area and elemental composition. We’re

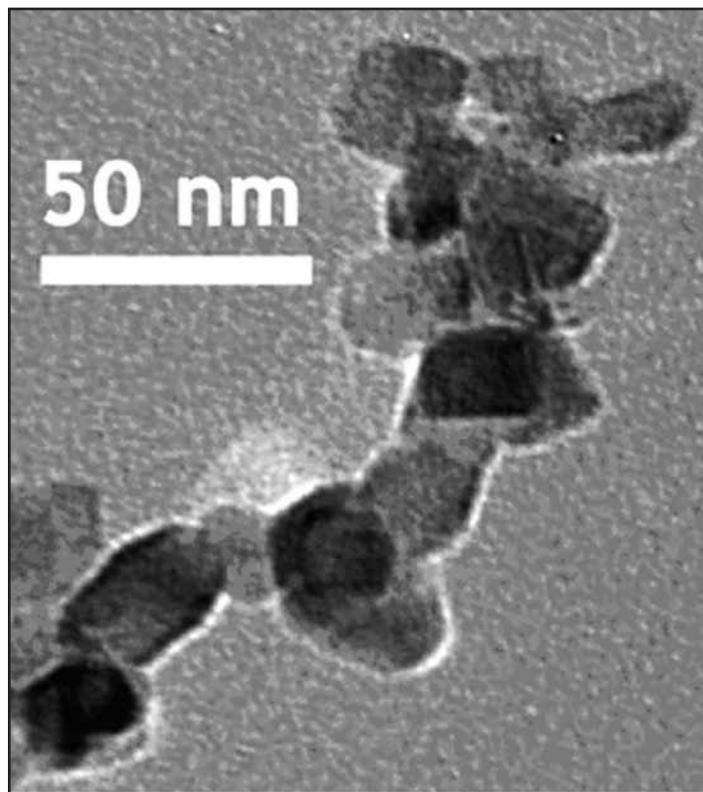


Figure 1. TEM image shows the nanoscale crystalline structure of titanium dioxide in NIST SRM 1898 (color added for clarity.) Credit: Impellitteri/EPA

providing a known benchmark.”

The new titanium-dioxide reference material is a mixed phase, nanocrystalline form of the chemical in a dry powder. To assist in its proper use, NIST also has developed protocols* for properly preparing samples for environmental or toxicological studies.

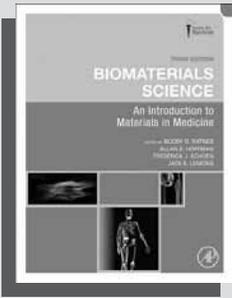
The new SRM also is particularly well suited for use in calibrating and testing analytical instruments that measure specific surface area of nanomaterials by the widely used Brunauer-Emmet-Teller (BET) gas sorption method.

Additional details and purchasing information on NIST Standard Reference Material 1898, “Titanium Dioxide Nanomaterial” are available at www.nist.gov/srm/index.cfm.

SRMs are among the most widely distributed and used products from NIST. The agency prepares, analyzes and distributes nearly 1,300 different materials that are used throughout the world to check the accuracy of instruments and test procedures used in manufacturing, clinical chemistry, environmental monitoring, electronics, criminal forensics and dozens of other fields.

* See “Protocols for Measurement and Dispersion of Nanoparticles” at www.nist.gov/mml/np-measurement-protocols.cfm.

Media Contact: Michael Baum, michael.baum@nist.gov, 301-975-2763.



Biomaterials Science: An Introduction to Materials in Medicine. 3rd edition.

Edited by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E. Lemons. New York: Elsevier/Academic Press, 1519 pages, 2013. ISBN: 978-0-12-374626-9.
ISBN: 978-1-4398-6651-1

“This book introduces a subject that has profound impact on human health and considerable economic importance. The issues addressed include the biology, medical applications, markets, regulation and ethical issues involved in biomaterials science. This spectrum of issues reflects the interdisciplinary nature of the field. The key features are that it provides a strong, cohesive compilation unlike any other currently on the market; covers the entire spectrum of biomaterials and their use in medicine; and has contributions of leaders in the biomaterials field.”

This synopsis is still valid for the third edition—no small feat considering how much the field of biomaterials science has grown since 1997. The outcome is obvious: the textbook has expanded from 851 pages to 1519 pages. The latest edition is organized into four major parts:

1. Materials Science and Engineering
2. Biology and Medicine
3. Practical Aspects of Biomaterials
4. Perspectives and Possibilities in Science

A comparison to the second edition (2004) reveals there are more sections, a reorganization of sections and increased emphasis on current biomaterials and their clinical applications. The section on tissue engineering has been expanded substantially and now includes topical discussion on cell sources, micromechanical design criteria, bioreactors, decellularized tissues and several subsections on specific applications. The remaining chapters/sections are updated and continue to provide the necessary background for understanding concepts and applications. The new sections and the significantly modified old sections show how the field has advanced over the past nine years since the last edition.

I must be honest—I have not read the entire textbook! However, I did read the chapters I have continued to use when lecturing to undergraduate and graduate students as well as residents. The authors for the chapters I teach from have remained essentially the same. This provides a continuity I find to be reassuring. These chapters have been written by world renowned experts in the field and while the chapters maintain the core principles and figures that were detailed in the previous editions, they have also been updated to include current concepts that have gained consensus in the field. I like the use of case studies to drive home key points. I also think that the use of color for both figures and within the text is a welcome addition – highlighting important points for the student.

In an effort to significantly enhance the teaching and learning experience, there is now an associated website that contains companion materials: 1) an image bank of all the figure files used in the book, and 2) exercise and end of chapter problems. In addition, the textbook is available as an e-book.

I believe that *Biomaterials Science: An Introduction to Materials in Medicine* continues to be an outstanding resource for courses in biomaterials science. One of the goals that the authors mention is that they wanted the textbook to be comprehensive—a one-stop shop, so to speak. While this goal has been achieved, it creates a rather heavy book to tote around. Another goal was for the book to be assessable to physicians, chemists, engineers—each gaining insights based on their own perspectives. I believe that this goal is achieved.

The section on tissue engineering has been expanded substantially and now includes topical discussion on cell sources, micromechanical design criteria, bioreactors, decellularized tissues and several subsections on specific applications.

Updates In Industry



Medtronic, Inc. (Minneapolis, Minn.) and **China Kanghui Holdings** (Changzhou, China) announced they have entered into a merger agreement whereby Medtronic will acquire Kanghui for \$816 million in cash. As a leading provider of orthopedic devices in China, Kanghui brings a strong product portfolio and new product pipeline in trauma, spine and joint reconstruction. The combined portfolio expands Medtronic's

offerings in orthopedic surgery and complements the company's existing presence in spine, neurosurgery, neuromodulation, advanced energy and surgical navigation.

Despite the challenges and uncertainties medical tech companies faced this year—which include the slow, cumbersome, yet highly regarded U.S. regulatory system, lack of a permanent R&D tax credit and the 2.3 percent excise tax on the medical device industry—mergers and acquisitions remained strong in 2012. Major companies made transactions across most medical device and diagnostics segments, and cross-border transactions were also strong. **HT Capital Advisors** tracked more than 200 M&A transactions in the medical device and diagnostics space for the first 10 months of 2012, compared with more than 260 transactions tracked in all of 2011. The average transaction value, based on publicly available data on 75 transactions, was \$178 million, compared with \$195 million,

based on publicly available data on 116 transactions. Seven transactions were valued at \$1 billion or more, compared with eight in the previous year and four in 2010.

Smith & Nephew, a medical device manufacturer based in the United Kingdom, announced it has successfully completed the acquisition of **Healthpoint Biotherapeutics** for \$782 million. The acquisition of Healthpoint gives the U.K. company a strong position in the bioactives wound management market. Healthpoint Biotherapeutics, founded in 1992, has been focused on biopharmaceuticals in acute, chronic, and burn-related wound care over the last several years. The company growth is led by sales of Collagenase Santyl[®] ointment, and they have also laid the groundwork for strong future growth through development of a novel cell therapy, HP802-247, which completed a successful phase 2b in 2011 (recently published in *The Lancet*) and for which a North American phase 3 trial was initiated last September.

Edwards Lifesciences, a medical device manufacturer, announced it would double the number of employees at its production facility in Draper, Utah. According to the *Draper Journal*, a local newspaper, Edwards Lifesciences plans to increase the number of employees at the facility from 500 to 1000. The newly-created jobs comprise manufacturing, administration, financial and engineering roles. The decision to double the number of employees at its Utah plant is in direct response to a recent regulatory win for the company. In November of 2011,

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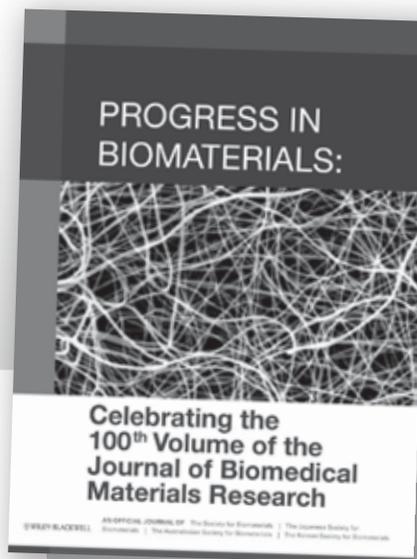
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WILEY

Updates in Industry

Continued from page 20

the US FDA granted approval for the company's transcatheter aortic valve implantation system.

A recent **AdvaMed** survey showed that only eight percent of the companies polled felt their existing systems could manage collecting and reporting for the new Medical Device tax. More than 50 percent said they expect complying with the tax will require major changes to their systems. Advamed estimated that the changes will cost between \$400 million to \$667 million to implement. "While Washington talks about a fiscal cliff, this tax could push us off an innovation cliff, costing jobs and hurting our industry's ability to find tomorrow's treatments and cures," says Stephen J. Ubl, CEO of AdvaMed.

Stratasys, Inc. (Eden Prairie, Minn.) and **Objet Ltd.** (Israel) announced the completion of their merger, forming a leader in 3D printing and direct digital manufacturing. The combined company will trade on the NASDAQ stock exchange as Stratasys Ltd. ("Stratasys") under the symbol SSYS beginning December 3, 2012. Based on the closing price of Stratasys, Inc. stock on November 30, 2012, the market capitalization of the new company will be approximately \$3.0 billion. The company will offer three leading technologies: FDM® for functional prototypes and production parts; inkjet-based PolyJet® for prototyping parts with high feature detail and fine surface finish; and Solidscape® Drop-on-Demand ("DoD") thermoplastic ink-jetting technology for complex wax patterns for investment casting of finished parts.

Student News

Continued from page 14

from academia and industry as well as seminars, networking events, panel discussions and exhibits in a regional setting. Over the past year, Biomaterials Days have been hosted at Rice University, the University of Kentucky, the University of Memphis, the University of Florida, Clemson University and Duke University. In 2013 there will be many Biomaterials Days occurring across the US. The following universities and schools received a \$5,000 grant from the Society For Biomaterials to host their own Biomaterials Day in 2013: the University of Florida, the University of Kentucky/Case Western Reserve University/Purdue University, University of South Dakota/South Dakota School of Mines and Technology and the University of Texas at Austin/Texas A&M University/Rice University. Vanderbilt University and the University of Memphis have also received a grant together and will be co-hosting a Biomaterials Day event featuring talks from leading industry and academic representatives, student research presentations, a networking luncheon, sessions focused on the FDA approval pathway and the technology transfer process as well as an outreach session open to the community at-large.

Through the efforts of all the student sections of the Society For Biomaterials, we are increasing interest in biomaterials and science through the development of new learning activities and presentations. With more students gaining an interest in biomaterials and the continued success of Biomaterials Days, the student chapters of the Society For Biomaterials have a very bright future ahead.

Advances in Tissue Engineering

Rice University

Center for Excellence in
Tissue Engineering,
BioScience Research Collaborative,
Institute of Biosciences and
Bioengineering,
Department of Bioengineering

Houston, Texas
August 14 – 17, 2013

Twenty-first annual short course with leading scientists from Rice University, the Texas Medical Center, industry, and other institutions on advances in the science and technology of tissue engineering. Be informed on the latest technology in the world of patient-specific therapeutics, from transplantation of cells and tissues to artificial organs.

For biomaterialists, biomedical engineers, physicians, technical managers, and others involved in research in the areas of:

- Stem cell biology
- Cell & tissue culture
- Applied immunology
- Drug delivery & targeting
- Organ & cell transplantation
- Vascular surgery
- Plastic surgery
- Reconstructive surgery
- Gene therapy
- Nanobiotechnology



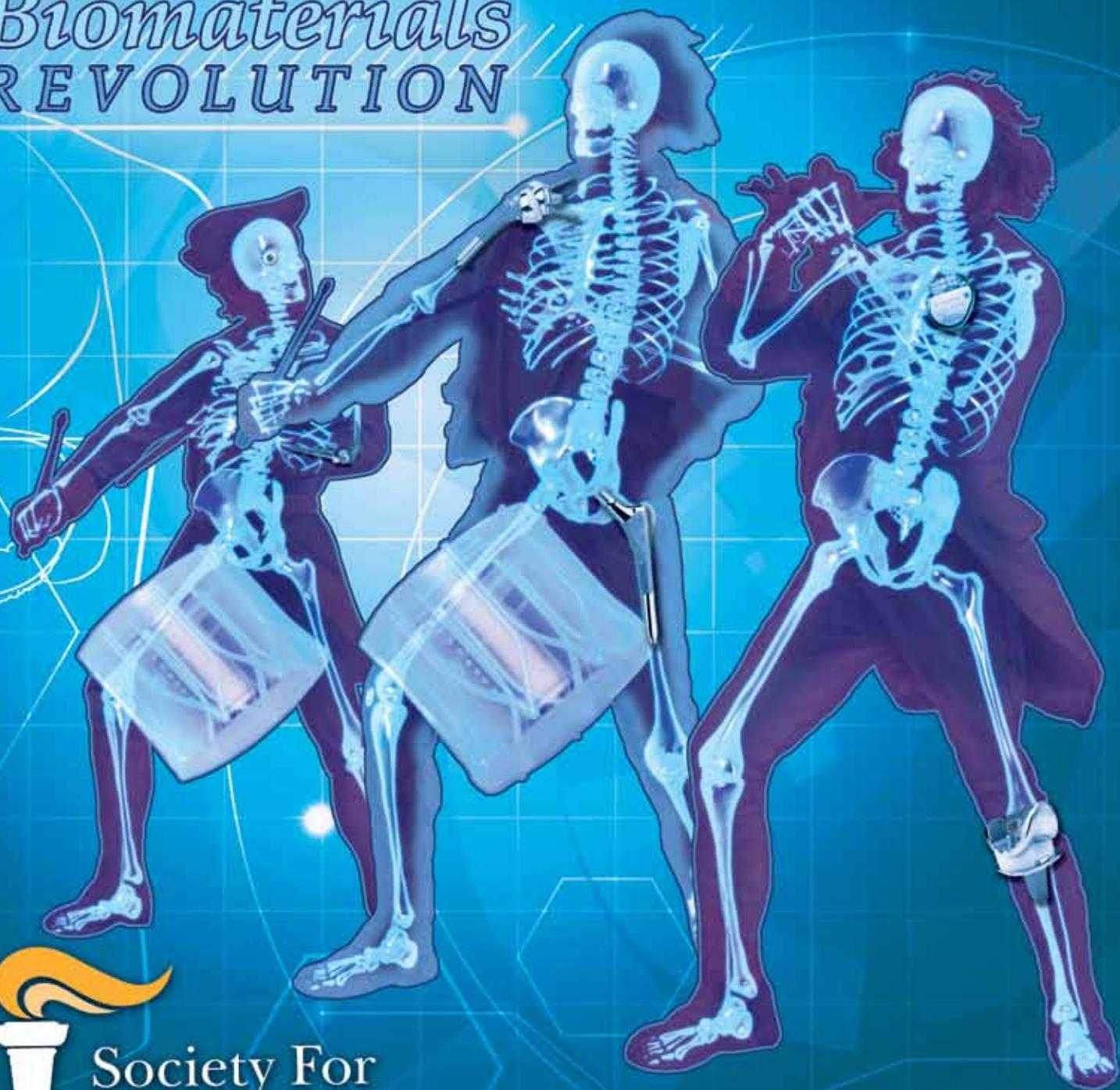
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