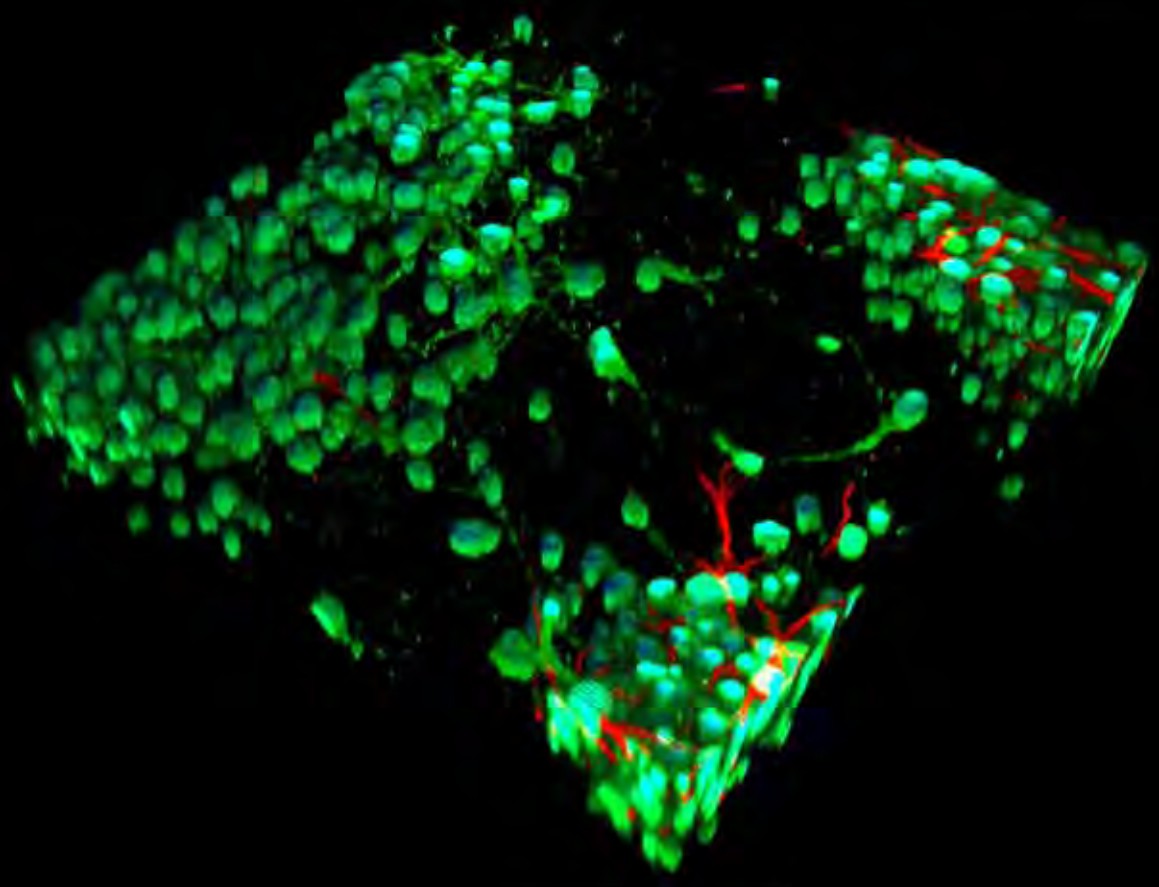
Re-Engineering Engineering Education

BIOMATERIALS FORUM

OFFICIAL NEWSLETTER OF THE SOCIETY FOR BIOMATERIALS

Fourth Quarter 2010 • Volume 32, Issue 4



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The official news magazine of the **SOCIETY FOR BIOMATERIALS** • Volume 32, Issue 4

Special Interest Group Reporters

Biomaterials Availability & Policy	Carl R. McMillin, carl@syntheticbodyparts.com
Biomaterials-Cell/Organ Therapies	Todd McDevitt, todd.mcdevitt@bme.gatech.edu
Biomaterials Education	Elizabeth A. Friis, lfriis@ku.edu
Cardiovascular Biomaterials	Peter G. Edelman, peter.edelman@bsci.com
Dental/Craniofacial Biomaterials	Hyun Joon Kong, hjkong06@illinois.edu
Drug Delivery	Thomas Dziubla, dziubla@engr.uky.edu
Implant Pathology	Janson Emmanual, jemmanual@wlgore.com
Nanomaterials	Thomas Webster, Thomas_Webster@brown.edu
Ophthalmic Biomaterials	Ping-fai "Sidney" Sit, sidney@latech.edu
Orthopaedic Biomaterials	Lakshmi S. Nair, nair@uchc.edu
Protein & Cells at Interfaces	Carl Simon, Jr., carl.simon@nist.gov
Surface Characterization & Modifications	Jeffrey L. Schwartz, jlschwar1999@yahoo.com
Tissue Engineering	Jan P. Stegemann, jpsteg@umich.edu

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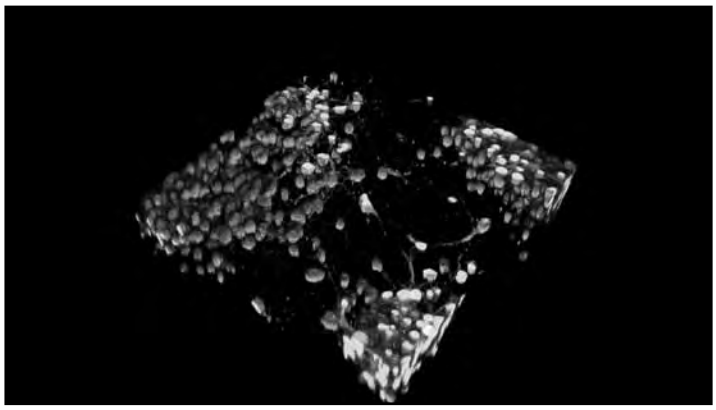
Departments



On the cover: *Embryonic mouse neural stem/progenitor cells in a three-dimensional hydrogel differentiating into neurons (green) and astrocytes (red). Photo courtesy of Andreia Ribeiro and Jennie Leach of the University of Maryland, Baltimore County and made possible with support from the National Institute of Neurological Disorders and Stroke and the Maryland Stem Cell Research Fund.*

From the Editor

By Karen J.L. Burg

It is now official; the word "innovation" is overused. Maybe not officially, but when the President of the United States uses the word nine times in his address to his country, starting with "The first step in winning the future is encouraging … innovation", I know we are close to abusing such a powerful word. I am sure that many of your institutional and government leaders are saying the same thing–"innovation" is all we need to solve our problems. A recent Newsweek article focused on apparent trends in global creativity; of particular note is a perceived "Creativity Crisis" in the United States. The article defined creativity as "production of something original and useful" and the result of "blender pulses" of convergent and divergent thinking. Furthermore, the opinion was cast that creativity can be learned, even by those not naturally inclined to that mode of thought. The article made me think about innovation in the biomaterials world and the necessary element of creativity in the biomaterials research, development, and translation process.

It would seem that for most, our time is divided into two categories, free time and work time. Work time is defined by the institution or environment in which we work. Certainly, I understand first-hand the creativity-dampening dangers at academic institutions, where researchers and educators are driven, in financially difficult times, to worry more and more about the minutia, where tasks are pushed to the lowest level in the interest of pursuing cost-cutting, institution-wide initiatives. Amusing but real examples include researchers being responsible for emptying office garbage bins, sorting out recyclables in the interest of "go green" slogans, or completing seemingly endless bureaucratic forms. The problems begin when the individuals with creative potential and mission feel overburdened with mundane, seemingly unrelated-to-the-job tasks. Budget crises do afford the opportunity to be creative, nimble, and to think in new directions, but unfortunately this aspect is rarely well managed/directed and therefore, rarely outweighs the addition of minutia. Thus maybe the workplace is not where we can be most creative.

The second category, free time, seems to be culture-driven, that is, driven by one's microenvironment. Like cells that react to and interact with their immediate surrounding environment, we as potentially creative people react and interact according to our respective surrounding environments, oftentimes being very sensitive to the "norms" of our surroundings and the perspectives and expectations of others in our surrounding environments. Our free time is determined by our resources, by our habits and our hobbies. For example, immersion in movies and video games likely provides minimal opportunity for the creative process, whereas immersion in arts and crafts likely does, as the latter are generally problem-based, ill-defined, and allow many paths to the end product. It seems that many of us have, by our own choices, squeezed creativity from our free time. If we don't have time to be creative at work and we choose not to be in our free time, when will we practice creativity so that we can innovate? Obviously, we all need to carve out creative time in our day.

Perhaps most concerning is how we are passing these values of a "full day of activity" on to our students, especially those learning about biomaterials. Certainly, I think we all recognize the benefits to problem-based learning in honing the creative process, but I think that many question the time investment and wonder if time spent on pursuing one problem eliminates the opportunity to learn the many other facts and figures necessary to becoming a knowledgeable biomaterialist. In other words, are we misleading our students by presenting only "fun" problem-based learning opportunities, where they work in teams and really do not have the opportunity to independently reflect and dissect? An additional concern is that problem-based learning initiatives simply take more time to prepare and to manage. In the absence of budget constraints, instructors have the luxury of low course loads and protected course planning time. We are not in such times. It is far easier to direct students to a book and require rote memorization and the affiliated traditional regurgitation. In times of budget crisis, it is hard to see, let alone justify, a long term payoff to society (i.e. a payoff attributable to increased creativity). However, the reality is that there is indeed a long term payoff to increased creativity, to educating individuals who can calmly work in the midst of obstacles and complex issues and who can skillfully navigate, with or without team members, through adversity and challenges. I claim it will take convergence and divergence of thought to address the current challenges of biomaterials education and to combat the Creativity Crisis.

Best wishes from Clemson,

Karen J.L. Burg
Hunter Endowed Chair & Professor of Bioengineering
Interim Vice Provost for Research & Innovation
Clemson University

From the President

By Jeremy L. Gilbert

Greetings! As we have past the six-month mark in my stewardship of the Society For Biomaterials (SFB), it feels like we have accomplished much and have much yet to accomplish. We are coming off a tremendous annual meeting in Seattle where attendance was terrific, and the content of the meeting was, in my opinion, outstanding. A strong thanks goes to Phil Messersmith and his program committee for putting such an outstanding program together. It was a model to emulate, and I believe Nick Ziats is doing just that with his programmatic efforts to date. I am very much looking forward to our upcoming meeting at Disney World.

Our Past President, Lynne Jones, had begun what I believe are many important initiatives that will bear fruit for the Society, but only if we continue with these efforts. Her leadership of the Society in 2009-2010 was an inspiration for me, and I want to thank her for her efforts then and her continuing efforts now.

Her works include the development of the Biomaterials Days meetings, which were highly successful and generated much interest in several regions across the country in development of local meetings for Biomaterials, where students play a central role and leaders in the field can impact a focused group of academics, industrial members and students with their research efforts. My role is to assure these programs continue to develop and flourish and that Biomaterials Days become a natural part of the Society's efforts. We have a few meetings that will occur/have occurred this year and several proposals under review for 2011.

Lynne was also instrumental in initiating the idea of an Academic Chairs council, which will comprise faculty members of the Society who can have an impact on issues related to curricular development, student mentorship and the relationship of SFB with the academic development of Biomaterials as a discipline. We have formed a committee to work on development of ideas for Biomaterials curriculum and explore the various ways Biomaterials interacts with the range of engineering, basic science and clinical science training programs that rely on biomaterials.

The Society is preparing for an exciting year in 2012 as well, when the World Congress of Biomaterials will be held in Chengdu, China. We are interacting with the organizing committee for this meeting, and I encourage all of the members to consider sending proposals and participating in this meeting. I believe the venue will be excellent and the science even better.

The Society is preparing for an exciting year in 2012 as well, when the World Congress of Biomaterials will be held in Chengdu, China.

SFB is also planning to hold a smaller October meeting in 2012 in New Orleans, and planning for this meeting is already underway. It is my hope that we build on the excellent meeting held in Atlanta in 2008 to make this October meeting during a World Congress year a normal part of the Society's mission.

Our efforts continue in the area of publications with many new efforts underway. We are about to name/renew the editors of the *Forum* and the Web Editor, and I am excited at the energy and interest these editors will bring to their respective positions. We are in the late stages of planning for the first in what I hope will be a string of books focused around different themes in Biomaterials. We have named overall editors of this book series and they are working on the first proposal which will be coming soon.

We have completed negotiation of the renewal of the contract with J. Wiley and Sons on the Society's peer-reviewed journals, *JBMR-A* and *B*. These journals both continue to be strong royalty generators for our Society, and I believe the relationship between Wiley and SFB is strong going forward.

I could go on... There is much underway in the Society, and I am grateful for all the hard work and commitment of all who feel, as I do, that this Society is the central venue through which Biomaterials Science and Engineering are relayed to the world. I look forward to my remaining time as president and in seeing SFB continue along its path.

Jeremy Gilbert

Staff Update

By Dan Lemyre, Executive Director

Society For Biomaterials Council Meeting: October 15, 2010, Philadelphia, PA

From Left to Right: Bob Hastings, Membership Committee Chair; Art Coury, Awards Ceremonies and Nominations Committee Chair; Lynne Jones, First Past President; Karen Burg, President-Elect; Jeremy Gilbert, President; Heather Doty, Student Chapter President; Chris Siedlecki, Special Interest Groups Representative; Julie Hasenwinkel, Education & Professional Development Committee Chair; Joel Bumgardner, Bylaws Committee Chair; Warren Haggard, Member-at-Large; Thomas Webster, Web Editor; Nick Ziats, 2011 Program Chair. (Note that several other Council members participated via teleconference.)

At the October 15, 2010 Meeting, the Board of Directors approved the 2011 Budget to support the Society's mission through the following committee activities:

Awards, Ceremonies and Nominations Committee: *Art Coury (Chair); Jason Burdick, University of Pennsylvania; Monty Reichert, Duke University; John Fisher, University of Maryland; Todd McDevitt, Georgia Institute of Technology/Emory University; Bob Latour, Clemson University Representative.* The Awards, Ceremonies and Nominations Committee nominations for the 2011 slate of officers and the 2011 award recipients were all approved by Council. In 2011 the Society will give a total of 12 awards, including the Founders Award, the C. William Hall Award, three Clemson Awards, two Young Investigator Awards, the Technology Innovation and Development Award and four Outstanding Research Awards. The award recipients' names will be published in the next issue of the *Forum*. In addition to the Society For Biomaterials Awards, Michael Sefton of the University of Toronto, SFB Past President, has been selected to receive the 2011 Acta Biomaterialia Gold Medal and he has elected to receive this prestigious award at the SFB 2011 Annual Meeting!

Bylaws Committee: *Joel Bumgardner, University of Memphis (Chair); Sachin Mamidwar, Orthogen Corporation; Lisa Friis, University of Kansas; Alan Litsky, Ohio State University; Lan Cao, Harvard University.* The Bylaws Committee has as its main charge for the 2010-2011 year the establishment of an Audit Committee. As an ongoing charge, the committee will continue to review and propose changes in bylaws to correct incongruities and/or to simplify bylaws as appropriate. These changes will likely include some adjustment to the annual meeting requirements and an expanded definition of the student and post graduate membership categories.

Devices and Materials Committee: *Gabriele G. Niederauer, ENTrigue Surgical, Inc. (Chair); Warren Haggard, University of Memphis; Kristine Kieswetter, Kinetic Concepts, Inc.; Paul Spencer, Surmodics Pharmaceuticals, Inc.; Chris Loose, Semprus BioSciences; Ann Salamone, Rochal Industries; Bruce Anneaux, Zeus, Inc.; Jeremy Gilbert, Syracuse University; Shrojal Desai, Hospira.* Specific goals for the committee in the next months are (1) to send out a survey to industry members to poll their unmet needs and (2) to investigate the possibility of developing a variety of educational webinars.

Education and Professional Development Committee: *Julie Hasenwinkel, Syracuse University (Chair); Sarit Bhaduri, University of Toledo; Lisa Friis, University of Kansas; Erin Lavik, Case Western Reserve University; Tom Slater, Medtronic Kyphon; Tim Topoleski, University of Maryland Baltimore County; Heather Doty, University of Memphis (National Student Chapter President).* The committee evaluated applications for the 2010 Biomaterials Day program and will award six $5000 grants in 2011 to: University of Michigan, Duke University, Purdue University, Texas A&M University, Clemson University, and a joint program between Syracuse University and the University of Rochester. The committee is also working on the C. William Hall Scholarship program, the 2011 Student Travel Achievement Recognition (STAR) Program, evaluating endorsement requests from other organizations, and developing a mentoring program for SFB members.

Finance Committee: *Laura J. Suggs, University of Texas at Austin (Chair); John Fisher, University of Maryland; Alan Litsky, Ohio State University; Tony Mikos, Rice University; Johnna Temenoff, Georgia Institute of Technology.* With passage of the 2011 Budget, the Finance Committee will continue to monitor the Society's long term reserve investments and will work to recruit and maintain the Society's sponsors.

Liaison Committee: *Molly Shoichet, University of Toronto (Chair); Kristi S. Anseth, University of Colorado; Kevin Edward Healy, University of California, Berkeley; William Wagner, University of Pittsburgh; Ali Khademhosseini, Massachusetts Institute of Technology.* The Liaison Committee is in the process of developing new guidelines for collaborative interactions with other organizations to both enhance the SFB membership experience and to continue the Society's mission to promote advances in all phases of materials research. If you belong to another organization and have

suggestions for interactions, please don't hesitate to contact Dan Lemyre (dlemyre@biomaterials.org) with any ideas.

Meetings Committee: *Jeremy Gilbert, Syracuse University (Chair); Warren Haggard, University of Memphis; Chris Siedlecki, Penn State University; Phil Messersmith, Northwestern University; Ben Keselowsky, University of Florida*. The Meetings Committee has received Board approval for suggested venues for the 2012 Fall Symposium (New Orleans Marriott, October 3-6, 2012) and the 2013 Annual Meeting (Sheraton Boston/ Hynes Convention Center, April 9-13, 2013). In addition, the Committee has evaluated proposals for the 2011 Bash and has planned a spectacular event at the Epcot World Showplace!

Membership Committee: *Bob Hastings, DePuy Orthopaedics, Inc. (Chair); Horst Von Recum, Case Western Reserve University; Mariah Hahn, Texas A&M University; Julie Stenken, University of Arkansas; Stephanie Bryant, University of Colorado.* The Membership Committee has initiated a web-based banner ad campaign with the Materials Research Society, the Tissue Engineering and Regenerative Medicine International Society and the Biomedical Engineering Society, as well as a mailing campaign to authors of published papers in the field. In addition, outreach to attendees from the Biomaterials Day program continues. Finally, the Committee is working to make the dues renewal and meeting registration processes more convenient.

Program Committee: *Nicholas Ziats, Case Western Reserve University (Chair); Warren Haggard, University of Memphis; Christopher Siedlecki, Penn State University; Phillip Messersmith, Northwestern University; Guillermo Ameer, Northwestern University; Anthony Brennan, University of Florida; Monty Reichert, Duke University; Suping Lyu, Medtronic, Inc.; Peter Edelman, Boston Scientific; Andres Garcia, Georgia Institute of Technology; Anne Meyer, University at Buffalo; Liisa Kuhn, University of Connecticut Health Center*. We're pleased to report that 1,000 abstracts were submitted to the 2011 Annual Meeting being held April 13-16, 2011 at Disney's Contemporary Resort in Walt Disney World®. These abstracts will comprise the 42 General Sessions and Symposia at the meeting. In addition there will be four workshops, six panel discussions, three plenary sessions and several student chapter and SIG events. Dr. Anthony Atala, Director of the Wake Forest Institute for Regenerative Medicine, will deliver the keynote address entitled: "Regenerative Medicine: Approaches to Translation."

President's Advisory Committee: *Lynne Jones, Johns Hopkins University (Chair).* The President's Advisory Committee organized an SFB-supported symposium at the Orthopaedic Research Society Annual meeting held in January, 2011. The committee continues to support the student initiatives sponsored through the royalties of the *Biomaterials Science* textbook, including the C. William Hall Scholarship for undergraduate students, and is pursuing the potential to expand the scholarship program to other student categories.

Publications Committee: *Ashutosh Chilkoti, Duke University (Chair); David Grainger, University of Utah; Jack Ricci, New York University; Helen Lu, Columbia University; Karen Burg, Ex-Officio, Clemson University; Tom Webster, Ex-Officio, Brown University; Jeremy Gilbert, Ex-Officio, Syracuse University; Jim Anderson, Ex-Officio, Case Western Reserve University.* The Publications Committee has finalized the new Wiley Blackwell contract for the *Journal of Biomedical Research* (Parts A&B). The new contract calls for modest subscription rate increases in 2011 and 2013. While the SFB Board feels that the Society should be able to absorb the increases in 2011 and 2012, there is a likelihood dues will increase by $20 for electronic and $40 print in 2013 to offset the subscription rate increase. In other news, Dr. Thomas Webster, Brown University has accepted a re-appointment to the Web Editor position. The new editor of the *Biomaterials Forum* will be introduced in the second quarter 2011 Issue!

Special Interest Groups: (*Chris Siedlecki, SIG Chair Representative*) SIGs have been active this year with submissions of articles to the *Forum* and website content (Biomaterials of the Month as well as SIG-specific web pages). The Proteins and Cells at Interfaces SIG will be sponsoring a session at the 2011 Materials Research Society Meeting, the Dental Craniofacial SIG will be representing the Society at the International Association for Dental Research meeting, and the Orthopaedic SIG will be holding a networking event at the 2011 Orthopaedic Research Society Meeting. In addition to the regularly scheduled SIG meetings in Orlando, the Drug Delivery SIG will be hosting a social event for its members. Additional announcements on all of these events and more will come directly from the SIG officers and from headquarters in the coming months.

In addition to participating in several of the committee activities listed above, Member-at-Large Warren Haggard and Past President Lynne Jones have developed a survey to better understand our membership usage and interest in the SBIR and STTR federal grant programs. The results of this survey were used to inform the discussion held with congressional leaders during the AIMBE Federal Symposium on February 23, 2011.

If you are interested in knowing more about a particular issue, policy or committee activity, or if you have any suggestions for improved membership services, please contact me directly at the SFB headquarters office:

Sincerely,

Dan Lemyre, CAE, IOM
Executive Director
Society For Biomaterials
15000 Commerce Parkway, Suite C
Mount Laurel, NJ 08054
Phone: 856-439-0826
Fax: 856-439-0525
E-mail: info@biomaterials.org
www.biomaterials.org

2011 Officer Nominees

The task of selecting the slate of Officer Nominees for 2011 has been completed. Following are the nominees for President-Elect, Secretary-Treasurer-Elect and Member-at-Large. The Society encourages all members to cast their vote for the candidate of their choice. Ballots may be cast electronically via email to headquarters, via the Members Only section of the Society's website (www.biomaterials.org) or via mail.

Following are brief descriptions of the responsibilities of each position, along with a description of the nominees' biographical background and their 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

Joel D. Bumgardner, PhD
Professor
Biomedical Engineering
University of Memphis

Biographical Sketch: Joel Bumgardner, PhD is a graduate of Florida State University (BS with Honors, Biology) and The University of Alabama at Birmingham (BS, Materials Engineering, MS, PhD, Biomedical Engineering). He completed a JW Fulbright Fellowship at the University of Umeå, Umeå, Sweden, working in the area of dental amalgams and implants, before joining the faculty at Mississippi State University in 1994. While at Mississippi (MS) State, he helped launch the Bagley College of Engineering graduate biomedical engineering, Materials Engineering Certificate and study abroad programs and served as interim chair for the Biological Engineering Department. In 2004, Joel moved to the University of Memphis where he led efforts for the accreditation process for the new undergraduate biomedical engineering degree program. He has subsequently become co-director of both undergraduate and graduate academic programs in the Department of Biomedical Engineering.

Joel has had over 200 presentations and invited talks on corrosion and degradation of implant and dental alloys, including the roles of cells on corrosion processes, cellular responses to implant alloy corrosion products, and chitosan materials for coatings, drug delivery and bone tissue engineering applications. He is inventor/co-inventor of record on two patents and three patent applications; one patent has been licensed to a start-up company. He has authored over 78 peer reviewed journal articles and book chapters on dental and orthopaedic alloys, biocompatibility testing and chitosan materials. Many of the students he has supervised in research have received National (NSF) graduate research, MD/PhD fellowships and or JW Fulbright Fellowships. Joel is an Associate Editor for the *Journal of Biomedical Materials Research Part B (JBMR-B)*, served as co-editor of the special issue of the *Journal on Dental & Craniofacial Materials* as well as reviewer and editorial board member for many biomaterials related journals. He has been recognized as Outstanding Professor at the MS State University Bagley College of Engineering and recently as an American Institute for Medical and Biological Engineering Fellow. He is also regular reviewer on NSF and National Institutes of Health (NIH) panels.

Joel has been active in the Society since he was a graduate student as a founding member and the first President of the National Student Chapter in 1990. He has served the Society as chair of the Educational & Professional Development Committee (2003-2005, member 2000-2007, 2009-2010), where he grew student chapters to a peak of 16, the Bylaws Committee (2007-2009, 2010-2011, member 1996-1997 & 2009-2010), where he has been instrumental in correcting and modifying the Bylaws, and the Dental Craniofacial SIG (2002-2006; member 1996-present) where he initiated efforts for the SIG to publish a special issue of *JBMR-B* as well as organizing SIG symposia and workshops. He was elected as Member-at-Large in 2002, and as the Program Chair, organized and ran the very successful 2005 Annual Meeting during the Society's transition to a new management firm. In addition, he has served on Awards and Nomination, Long Range Planning and several special task force committees throughout the years.

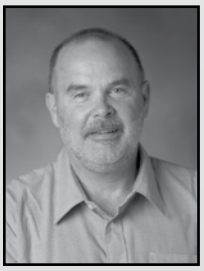
Vision Statement: The Society has a strong tradition and leadership role in the biomaterials discipline, especially in its ability to create programs and venues where researchers, clinicians, industrial, entrepreneurial and regulatory agency groups come together to discuss and share information. My vision is to continue the Society's world-wide leadership role to advance and promote biomaterials research, development, education, and policy. Towards this end, I will work to move the Society's strategic plan forward to ensure it is relevant to our members and to the broader biomaterials community and that we stay current with, as well as seek out new partnerships with federal agencies, other professional organizations and industry groups. To do this I will enlist leaders and innovators from all levels and aspects of the Society (e.g. senior and junior academics, industrial researchers, clinicians, and educators) for input, review guidance and implementation. This is important to ensuring that the Society continues to grow its leadership and relevance in the discipline and for the Society's membership.

The Society's Annual Meeting is a vital and essential vehicle for our members to reinforce ongoing relationships, to forge new collaborations and alliances, learn about new technologies,

and to promote educational and professional development. While efforts are on-going to include and develop programs for commercial and clinical groups, there are other opportunities to make the annual meetings more accessible and relevant to members through web-casting and digital archiving of keynote and other special presentations and workshops. These activities have the potential to lead to additional revenue for the Society as well as provide invaluable research and educational information that is not typically available through traditional journal or text resources. These opportunities will expand participation and access to important meeting events and provide additional value to our members. These activities are important to promoting the Society, its members and its mission, disseminating current information and for collecting and cataloguing important information on biomaterials and biomaterial leaders for historical purposes.

The Society has developed a strong history for educational and professional development of its members through the establishment of student chapters, support of student chapter activities, establishment of the biomaterials days programs, opportunities to offer continuing education credits and numerous professional development workshops on careers paths, entrepreneurship, and interviewing skills to name a few. I will work to further enhance these activities through improved networking opportunities for employment and research positions at the annual meeting and Society's website, and expand our educational outreach activities through design competitions for middle to high school students and our student clubs. To develop and implement these programs, I will work with our Materials and Devices Committee and industrial members as well as the Educational and Professional Development Committee, the Biomaterials Education SIG, and National Student Chapter Officers.

I am deeply honored and inspired to be nominated as President-Elect and look forward to the opportunity to continue my dedicated service to SFB and its members.



William M. ("Monty") Reichert, PhD
Professor of Biomedical Engineering and Chemistry
Director of the Center for Biomolecular and Tissue Engineering
Associate Dean for Diversity and PhD Education
Pratt School of Engineering
Duke University

Biographical Sketch: Monty Reichert, PhD was born in San Francisco, grew up in Ann Arbor, and currently lives in Hillsborough, North Carolina with his wife, Karen, his son Stephen, three dogs, and two cats. He also has an adult daughter, Elizabeth, and an adult stepdaughter, Miranda, who live in Pasadena and Hillsborough, respectively.

Monty graduated in 1975 with a BA in biology and chemistry from Gustavus Adolphus College. After working for a while he returned to school and received a Masters and PhD in Macromolecular Science and Engineering from the University of Michigan in 1980 and 1982, respectively. After receiving his PhD he was an NIH National Research Service Award Postdoctoral Fellow, a Whitaker Fellow, and an NIH New Investigator Fellow at the University of Utah in the Department of Bioengineering. He joined the Department of Biomedical Engineering at Duke University in 1989, and is currently Professor of Biomedical Engineering and Chemistry, Director of the Center for Biomolecular and Tissue Engineering, Director of the Duke Grand Challenge Scholars Program, Associate Dean for Diversity and PhD Education, and Program Director for an NIH pre-doctoral training grant that supports graduate fellowships in biotechnology.

Monty is a fellow of the American Institute of Medical and Biological Engineering, the Biomedical Engineering Society, and the American Council on Education. He is an Assistant Editor for the *Journal of Biomedical Materials Research*, and sits on editorial boards for Biomaterials and Langmuir. He has been a permanent and ad hoc member of several NIH study sections. His research in protein-mediated cell adhesion, biosensors and wound healing has been funded continuously by multiple NIH grants since receiving the first grant in 1984. Monty received the Clemson Award for Basic Research in Biomaterials in 2010 from the Society for Biomaterials and has received institutional and national awards for his work in graduate student recruitment, retention, and mentoring.

Vision Statement: It is an honor to be considered for President-Elect of the Society For Biomaterials. I attended my first SFB meeting in 1978 as a graduate student working for Sumner Barenberg at the University of Michigan on the thromboresistance of polyphosphazenes. I have considered SFB to be my main professional and intellectual home ever since. In the 70s and 80s the Society was a powerful group of scientists and engineers who were defining the fundamentals of the interaction of materials with blood and tissues. The basic and fundamental work of Buddy Ratner, Joe Andrade and Jim Anderson were essential in shaping my research agenda, but more largely they were part of a small army of researchers that shaped our current understanding of polymer surfaces, protein adsorption, cell adhesion, and the foreign body reaction. What is now de rigueur was back then the frontier. SFB now stands on the cusp of another expansion of our understanding of how materials act *in vivo*, but much less in terms of how tissues respond to materials, rather how materials may be used to dictate the response of tissues and cells. Drs. Ratner and Anderson were part of a panel on the Grand Challenges for Biomaterials that I organized for the 2010 SFB meeting in Seattle [Reichert WM, Ratner BD, Anderson J, Coury A, Hoffman AS, Laurencin CT, Tirrell D. JBMR A. 2010 Nov 29. PMID: 21117157]. The clear message of the panel: *regenerative medicine is coming (some say it is already here) and the biomaterials community had better stake its claim in this movement or we may become irrelevant*. To be honest, I think we have given much of what should be ours away to

other professional societies -- mostly because we have not been particularly forward looking. SFB should become, once again, the place where the science, technology and design rules for the future of the field are developed. We need to provide the forums where the senior and junior intellectual leaders in biomaterials research and education are both featured and challenged; we need to make SFB the place where people come to learn where the field is going, not where it is or where it has been.

Secretary-Treasurer-Elect

The Secretary-Treasurer-Elect shall become familiar with the duties of the Secretary-Treasurer, cooperate and assist in carrying out the duties and 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

Andy Doraiswamy, PhD

Senior Research and Development Manager
Advanced Vision Science Inc.

Biographical Sketch: Andy Doraiswamy, PhD has been an active member with the Society For Biomaterials (SFB) since he was a graduate student. He earned his PhD in Biomedical Engineering from the School of Medicine at the University of North Carolina-Chapel Hill. He holds an MS degree in Materials Science and Engineering as well as a BS degree in Chemical Engineering. Andy's research expertise is primarily in the field of applied biomaterials and implantable medical devices. He has co-authored over 50 peer-reviewed publications and presented at over 50 international conferences world-wide on the subject of applied biomaterials, medical devices, rapid prototyping, plasma processing, surface modification, regenerative medicine, direct-writing and nano-manufacturing.

Andy joined Advanced Vision Science Inc. (AVS) located in Santa Barbara, California in 2007 to lead the company's global surgical research and development division. AVS is a fully-owned subsidiary and the surgical arm of Santen Pharmaceutical Co. Ltd., a global leader in ophthalmic products. Since 2007, he has spearheaded a multi-faceted research and development team toward bringing several novel biomaterials and medical devices efficiently to market in order to improve healthcare of patients globally. At AVS, he has established a platform for advanced biomaterials and device engineering research for applications in class III implantable ocular devices. He is the inventor of several next-generation implantable ocular devices. Apart from his product development responsibilities, he is very active with the scientific research community. In 2009, Andy was elected program chair with the SFB ophthalmic biomaterials Special Interest Group and has served the position with great fervor and dedication. He continues to volunteer as a reviewer for multiple scientific journals in the field of applied biomaterials and medical devices. He is also an active member of the American Association for the Advancement of Science (AAAS), American Society of Cataract and Refractive Surgeons (ASCRS), The Association for Research in Vision and Ophthalmology, American Society of Ophthalmic Administrators (ASOA) and Material Research Society (MRS). He enjoys collaborating actively toward the advancement of healthcare with researchers from universities, national/private laboratories and clinical facilities/hospitals worldwide.

As an avid mountaineer, Andy is currently on a "seven summits" quest. He is the co-founder of SummitforCure! (www.summitforcure.org), which has the goal of raising funds toward curing illness around the world during the course of his climb. For 2010-2011, his goal is to raise funds to support "The Himalayan Cataract" project towards their efforts to cure blindness in sub-Saharan Africa.

Vision Statement: Like most of us here at the Society For Biomaterials, my primary objective and focus is to contribute towards the advancement of healthcare for patients everywhere through scientific research and new product development. Advancement of biomaterials technology is arguably the primary facet in achieving this goal and our professional society provides a unique and valuable platform towards this advancement. Over the past few years, I have thoroughly enjoyed my role with SFB as program chair, moderator, and member of the Meetings Committee organizing symposium sessions for the annual meetings. I have also enjoyed working with other SFB members in garnering interest from researchers worldwide to participate and share their ideas and advancements at the SFB annual meetings. These interactions have led to several strong networks and valuable collaborations.

As Secretary/Treasurer-Elect with the Society For Biomaterials, I hope to bring my experience in applied biomaterials research, product development, project management and budget/cost management to help the Society move forward and achieve new heights. I also look forward to contributing to the Society's goal in further bridging the gap between front-end university research, product development, and end-user application to provide a more complete biomaterials technology cycle. Having worked in all three areas, I appreciate their relevance, importance and interdependence. My academic research was focused primarily in applied biomaterials and medical devices. The discoveries and advancements have been published in peer-reviewed journals and presented at various platforms worldwide. My recent and current role in Research and Development (R&D) has allowed me to lead development of implantable devices from concept to market. I enjoy my current role in developing a multi-faceted research and development team, managing new product development, post-market

feedback, initiating and managing collaborative projects with universities and clinical facilities worldwide toward the common goal of improving patient care. This role has seen me through leading a strong team of scientists and engineers successfully towards developing a platform for next-generation biomaterials research and device development for several Class III devices in various markets including the United States, Europe and Japan. My current role in management has also allowed me to hone my project and program management skills that include budget/cost controls.

In summary, if elected I sincerely look forward to serving the Secretary/Treasurer role for the Society For Biomaterials with the greatest professionalism, enthusiasm and dedication.

David H. Kohn, PhD
Professor
Departments of Biologic and Materials Sciences; and Biomedical Engineering
University of Michigan

Biographical Sketch: David Kohn, PhD is a Professor at the University of Michigan with appointments in the Departments of Biologic and Materials Sciences and Biomedical Engineering. He received his BS in biomedical engineering from Tulane University (1983) and his MS (1985) and PhD (1989) in bioengineering from the University of Pennsylvania. He joined the faculty at Michigan in 1989 and has progressed through the academic ranks. He served as the Graduate Chair in Biomedical Engineering from 2002 – 2008 and is Co-Director of an NIH Training Program in tissue engineering. In 2000-2001, David was a visiting professor in the Craniofacial and Skeletal Diseases Branch of the NIH intramural laboratories.

David's research has progressed from investigations of synthetic biomaterials at the macroscopic and microstructural levels to the synthesis and characterization of biomaterials at smaller levels of dimensional scale. In parallel, he has also established a vigorous research program in tissue mechanics. Early work provided insight into mechanisms of failure in load-bearing biomaterials, developed strategies for processing implants with increased function, developed non-destructive techniques to monitor function of biomaterials and tissues, and translated technologies into the private sector and use with commercially available implants. His research has evolved as the field of biomaterials has undergone a paradigm change in the past decade. Currently, his research program focuses on more biologically-based biomaterials and biomechanics research that is well integrated with cell and molecular biology approaches. David's research foci are now related to biomineralization, which is investigated by establishing structure-function relations in naturally forming mineralized structures and utilizing this information to develop biomimetic strategies to engineer mineralized tissue. His work has provided insight into mechanisms of bone fragility and mechanically mediated tissue adaptation, by coupling mechanical and chemical analyses. His lab has also developed organic/inorganic hybrid materials that can better control biological function and enable stem cells to regenerate bone *in vivo*. David has been continually funded throughout his career, including support from NIH, NSF, Department of Defense, the Whitaker Foundation and industry. He has published over 100 peer-reviewed papers and book chapters, holds five patents, and has over 80 invited presentations, including talks at SFB meetings and Gordon Conferences.

David has taught biomaterials and tissue engineering courses, as well as more clinically related biomaterials courses, to clinical students and residents. He is also extensively involved in student affairs. He has/is training 36 graduate students, four post-docs, 40 undergraduates, 14 clinical fellows, and five visiting scholars.

He is a long standing member of many professional organizations including the Society For Biomaterials and has performed an extensive amount of service to the community, including organization of symposia and workshops at SFB, ASME, IADR, BMES and AAAS; service on NIH, NSF, DoD, Arthritis Foundation and NSERC study sections; and reviewing manuscripts for over 20 biomedical journals. He is the recipient of the Whitaker Foundation Biomedical Research Award, NSF Research Initiation Award, NIH IPA award (visiting professor at NIH), and is a Fellow of the AIMBE.

David has been an active member of the Society for 25 years, dating back to when he was a graduate student. He has been an abstract reviewer and session chair almost annually since then and has organized many symposia over the years. He has served on the Program Committee on multiple occasions (1997-2002, 2007) and is the former chair of the oral/craniofacial biomaterials SIG (1996-1999). He served on the Awards, Ceremonies and Nominations Committee in 2003-2004, a task force for planning the 2004 domestic meeting, and the Education and Professional Development E&PD Committee in 2005-2006 and 2009-2010, when he was chair. He was Member-at-Large in 2006-2007 and served on the Long Range Planning Committee. As Member-at-Large, he brought concerns of members to the Board and Council and was able to create a forum for having members' concerns better addressed. As E&PD Chair, his committee helped expand the quantity and quality of Biomaterials Days held on campuses around the country, implemented student chapter awards and helped launch a mentorship program.

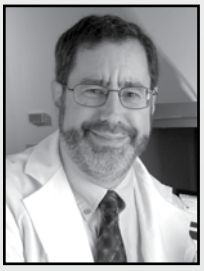
Vision Statement: I am honored to have been nominated for the position of Secretary/Treasurer-elect to have the opportunity to help guide the Society during these times of financial concern and to help structure the Society as a member of Board and Council. My long standing participation in the Society reflects my commitment to help shape the future of the Society. If elected, I will work to manage the Society's resources, to ensure that we are able to grow our membership and attendance at the annual meeting, understanding the constraints of economic uncertainty and competition from other societies. It is vital that we work to ensure that our members see the value of

membership, meetings and publications, and that this value is provided in a cost effective manner. I will be responsible for bringing the fiscal concerns of the members to the Board and Council and will be transparent about the Society's fiscal matters. Additionally, as a member of Board and Council, I will continue to work to make us the premier professional society for people involved in biomaterials research, development, education, service and translation. I will also work to ensure that we are home to biomaterialists in academia, industry and government, whether they be established in the field, established in other fields but new to biomaterials, just starting their career, or still in training. I will work to help increase the Society's visibility and membership, as well as increase our educational and mentoring missions and enhance the value of one's membership. I look forward to continuing to serve the Society.

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



Alan S. Litsky, MD, ScD
Associate Professor
Biomedical Engineering & Orthopaedics
Ohio State University

Biographical Sketch: Alan S. Litsky, MD ScD, is an associate professor of Biomedical Engineering and Orthopaedics at Ohio State University (OSU) where he also serves as Director of Orthopaedic Research. He earned his medical degree from Columbia University's College of Physicians and Surgeons and his ScD in Materials Science and Engineering from MIT. Prof. Litsky directs the Orthopaedic BioMaterials Laboratory at OSU which focuses on the study of natural and synthetic materials for orthopaedic, dental, and veterinary hard-tissue applications. His research has included new materials for orthopaedic and dental applications including development and evaluation of a reduced-modulus acrylic bone cement and a hydroxyapatite-metal alloy composite for net-shaped manufacture of musculoskeletal implants. He also works closely with the OSU Orthopaedic Residents on their research, which encompasses an array of both clinical and basic science projects. Prof. Litsky teaches courses on Hard-Tissue Biomaterials, Tissue Mechanics and Research Ethics.

Alan has served on the Orthopaedic study section at NIH, the American Academy of Orthopaedic Surgeons' Basic Science Evaluation subcommittee and the Arthritis Foundation's Technology and Biomechanics study section. He is an associate editor of the *Journal of Dental Biomechanics* and currently sits on the editorial boards of the *Journal of Biomedical Materials Part B – Applied Biomaterials, Veterinary Comparative Orthopedics and Traumatology* and the *Annals of Improbable Research*. He is a regular reviewer for these journals and for *Clinical Orthopaedics and Related Research*. He is an active participant in the Orthopaedic Research Society and the Society For Biomaterials.

Alan has been a member of the Society For Biomaterials since 1985. His involvement in the Society includes review of abstracts for the annual meetings, service on the Program Committee, the Liaison Committee and the Awards, Ceremonies and Nominating Committee. He has served in leadership roles as a member of the Orthopaedic Special Interest Group (vice chair 1999-2000, chair 2000-2001) and the Biomaterials Education SIG. He has served on Council as chair of the Education and Professional Development Committee (2001-2003), the Membership Committee (2004-2005) and as Secretary/Treasurer (Secretary/Treasurer-elect 2005-2007, Secretary/Treasurer 2007-2009). Alan has also been an active participant in workshops and plenary sessions at Society meetings.

Vision statement: If given the honor and opportunity to serve the Society For Biomaterials as Member-at-Large, I would like to focus on two important areas.The first is improving the value of SFB membership which I would like to accomplish through a number of Society activities. Many members interface with our Society primarily through the annual meeting and I hope to continue to expand current efforts emphasizing both the breadth and depth of the biomaterials field in our programs. Our meetings should include current research in basic and applied materials science and implant biology; they should also have a strong education component both for our members and to fulfill our position as a resource for knowledge and policy advice in our discipline. Increasing the value of our journals by enhancing their scientific standing (e.g., through the addition of review articles) and by working with our publisher to hold subscription costs in check (electronic subscriptions, etc.) will also add to the value of an SFB membership. Working to establish year-round SFB activities will help our Society better serve our members and increase our visibility within the biomaterials community. Expanding and diversifying our membership to re-establish the interactions between members from the academic, industrial and government communities will make our meetings more valuable to us all.

A second emphasis will be insuring the future of the Society. One approach to this will be the inclusion of student and young members in all Society activities –increasing the number and activities of student chapters, more new member participation in program development and meeting planning and stronger representation of a young member perspective in Council-level decisions. Through this type of mentoring we can build the SFB and develop our next generation of leadership. Equally important is our financial security. We have in place a solid fiscal plan but continued close oversight of our investment policy and long-term reserve accounts along with a careful monitoring of all of our expenses will ensure that we not only survive the tight budgets of World Congress years but secure our ability to expand programmatic initiative and member services.

Continued on page 26

Christopher Siedlecki, Special Interest Group News Contributing Editor
Peter Edelman, Cardiovascular Biomaterials Special Interest Group Reporter

Cell-Substrata Interactions: Role of Biomaterial Architecture in Regulation of Endothelial Cell Phenotype and Tissue Engineering

Laura Indolfi and Elazer R. Edelman
Harvard-MIT Division of Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, Massachusetts, United States of America

Cell-substrata material interactions

Tissue engineering (TE) is the discipline that supports the controlled *ex vivo* growth of cells and tissues on or within three-dimensional support structures to provide units that replace, repair or regulate biological functions or structures *in vivo*. The use of biomaterials in this field has progressed from simple, passive platforms for cellular support to novel, dynamic substrata capable of influencing cell differentiation and function[1]. This article highlights our recent investigation examining how biomaterials substrata affect the physical state and phenotype of three-dimensional vascular endothelial cells (EC).

Three dimensional synthetic constructs mimic natural architectures and cell-substrata relationships, allow cells to grow to precisely controlled density, with precisely regulated secretion and provide a robust system for *in vivo* implantation. Conventional 2D systems frequently distort normal cell behavior as they do not recapitulate faithfully physiologic cell interactions with the surrounding milieu. Interesting, 3D environments influence cells through both the surface material properties and the architectural and topographical cues that are far more complex than those present in 2D systems. Recent studies demonstrated that substratum curvature can direct neurite outgrowth[2]. Similarly, fibroblasts cultured on 3D collagen matrices have distinctly different patterns of morphology and migration compared with 2D counterparts[3].

In their native physiologic state *in vivo*, cells may be completely embedded in surrounding matrix, like chondrocytes, or attached to basement membranes with intricate surface properties, like epithelial and endothelial cells. Neither case is a planar, static interaction between cell and underlying surface. The vascular endothelial substratum has a defined contour that is subject to dynamic changes in dimensions and surface properties in response to local hemodynamic forces. Thus, the natural milieu of epithelial cells is not only supportive but unique architecture of the substratum transmits local mechanical cues and more than subtly directs cell biology.

Intriguingly, EC in 3D collagen matrices have a wide spectrum of physiologic activities and attain a phenotype that resembles neither the confluent nor the subconfluent phenotypes classically used to differentiate quiescent and proliferative EC when cultured in 2D collagen-coated systems.

The thesis driving our work is that, when embedded within matrices with specific contours and architecture, EC undergo morphological remodeling, affecting their bioregulatory function. We therefore aim to understand if the natural EC function-matrix structure relationships can be recapitulated in synthetic systems and in return impact their *in vivo* outcome.

While cellular density is the dominant force in 2D cell culture, surface contour is more important in 3D reservoirs. Our investigation of the biology of vascular endothelial cells in tissue engineering scaffolds illustrates this dimension-dependent effect. ECs cultured within 3D porous matrices, whose surface texture, porosity and materials properties mimic natural EC microenvironments, produce a marked difference in cell phenotype, biosecretion and regulatory effect *in vitro* and *in vivo*. Mechanical stimuli are transduced to the cell via receptors, extracellular matrix and the cytoskeleton; when seeded on 2D gelatin-coated tissue culture plates (gTCP) EC are stretched and pulled (Fig. 1a), while within 3D supports they conform to far more energy favorable states (Fig 1b). The nature of the contoured substratum is sensed by the cell; it is

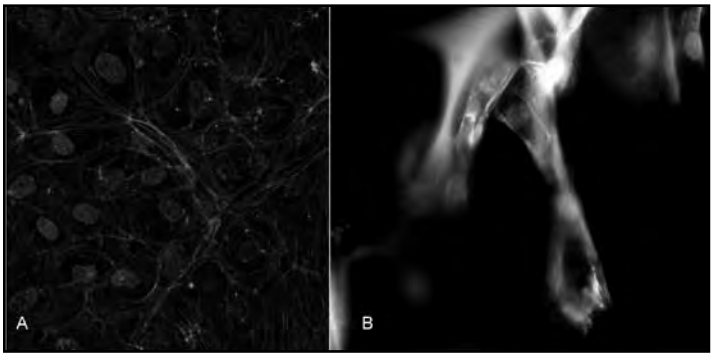


Figure 1: *Immunofluorescent images showing cell-substratum interactions. A) EC on 2D collagen-coated plates. B) EC within 3D collagen matrix. Cells are stained for actin (red), and nuclei (blue). Collagen matrix is shown in green.*

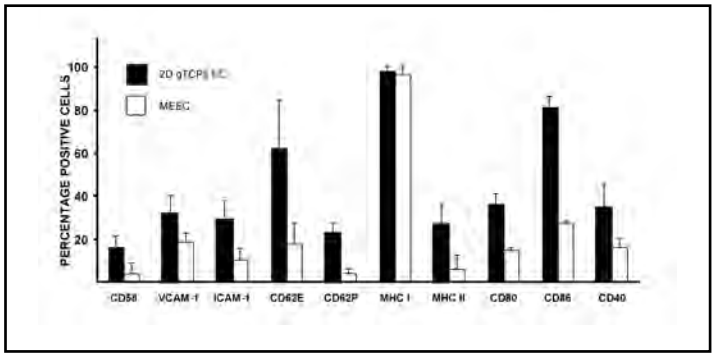


Figure 2: *EC embedded within 3D porous collagen matrices exhibit reduced expression levels of adhesion, MHCII and costimulatory molecules when compared to EC on tissue culture plates coated with the same collagen material.*[4]

apparent that cell cytoskeleton bends accordingly with the strut curvatures.

Intriguingly, EC in 3D collagen matrices have a wide spectrum of physiologic activities and attain a phenotype that resembles neither the confluent nor the subconfluent phenotypes classically used to differentiate quiescent and proliferative EC when cultured in 2D collagen-coated systems.

It is important to notice that cells in 2 and 3D are sensing the same surface chemistry, collagen substrata, therefore divergence in cell biology can be attributed to differences in topographical properties. ECs within collagen-based matrices secrete higher level of antiproliferative, antithrombotic, and anti-inflammatory factors with significantly reduced expression of adhesion (CD58, ICAM-1, VCAM-1, P-and E-selectin) and costimulatory (CD80, CD86, CD40) molecules (Fig. 2)[4]. Matrix-embedded ECs (MEEC) are characterized by a highly immunoregulatory phenotype that cannot be attained by free floating cells or cells on flat planar surfaces.
The regulatory, anti-proliferative and anti-inflammatory effects of cell embedded within 3D matrices persist when implanted *in vivo* – positively affecting the healing process of damaged tissues. Every aspect of vascular repair is modulated by MEEC implanted externally (perivascular) adjacent to an area of vascular injury, imposed for example by superficial injury of balloon denudation or complex insult of flow and compliance mismatch seen with arteriovenous (a-v) anastomoses. Two months after a-v anastomosis, perivascular EC implants virtually eliminated the classic and significant intimal hyperplasia seen in control group (Fig. 3)[5]. Moreover, evidence of inflammation was not detected in any of the venous sections of MEEC-treated group (Fig. 3, small boxes). The effect persisted long after the matrices had been cleared; these matrix formulations degrade over 4-6 weeks and are not detectable thereafter, yet they induce long-term healing – allowing for true repair rather than temporary pharmacologic poisoning of cell responses.

Taken together, these functional, immune and morphological related findings suggest that EC phenotype can be modulated in response to mechanical stimuli induced by the surrounding physical environment, eliciting attenuation of the immune response and inducing vascular healing through cell-substratum interaction. The confluence of cell and molecular biology with materials science has spawned the field of tissue engineering and in doing so has increased our understanding of how the biochemical, biomechanical and biological aspects can control cells physiology. Our work and that of others suggest that the physical properties of the substratum are as important as the biochemical microenvironment. A greater understanding of these processes will add to fundamental understanding of cell and immune biology and may be useful in creating powerful tools for regenerative medicine.

Acknowledgement:

This work was supported in part by grants from the NIH (GM 49039).

References

1 Orsi S et al. Biomater;31(3):570-576.
2 Smeal RM, Tresco PA. Exp Neurol 2008;213(2):281-292.
3 Zaman MH et al. Proc Natl Acad Sci U S A 2006;103(29):10889-10894.
4 Methe H, Edelman ER. Transplant Proc 2006;38(10):3293-3299.
5 Nugent HM et al. J Vasc Res 2002;39(6):524-533.

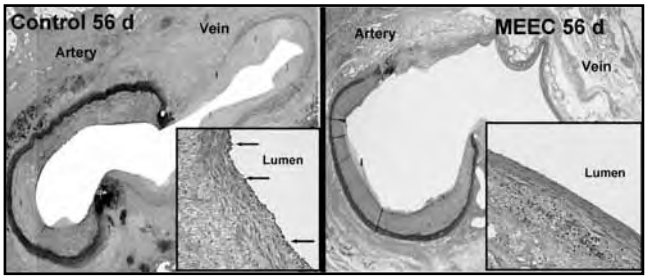


Figure 2: *3 Cross-sections of the anastomotic sites, 2 months after surgery. When compared to control anastomoses* ***(A)*** *perivascular endothelial cell implants* ***(B)*** *reduced intimal hyperplasia. Reproduced with permission of S. Karger AG, Basel from Ref. 5*

Indo-US Joint Center for Biomaterials for Healthcare

Bikramjit Basu[1] and Thomas Webster[2]
[1] Department of Materials Science and Engineering, Indian Institute of Technology Kanpur, India
[2] School of Engineering and Department of Orthopedics, Brown University, Providence, RI USA

In the last few decades, materials for biomedical applications have received greater attention in the scientific community, primarily due to the fact that suitably designed biomaterials have the capability to replace, reconstruct and regenerate human/animal body tissues for long term use, without many toxic or inflammation effects. Biomaterials, as well as their applications as artificial organs, are therefore recognized as part of an emerging area for material scientists, biotechnologists, chemists, engineers and medical professionals. Traditionally, biomaterials have been created by largely trial and error processes. For example, titanium was initially considered for orthopedic applications since it is light weight and strong (clearly important for artificial joint applications). This approach has sufficed to date to help restore organ function and at least partially return a quality of life to persons suffering from various diseases. However, all of the implants currently used today to treat body ailments (from orthopedics to vasculature) have limited lifetimes and often do not last as long as the lifetime of the patient. Clearly, approaches other than 'trial and error engineering' are needed to design even better implants for the coming generations.

For these reasons, Indo-US Public-Private Networked R&D Center on Biomaterials for Healthcare was established in November 2008, with Dr. Bikramjit Basu as Director and Dr. Thomas Webster as co-Director. With the participation of two academic institutes from India (IIT Kanpur and IIT Bombay) and three from USA (Brown University, University of Texas, San Antonio and University of Washington, Seattle) as well as two national research labs from India (National Metallurgical Laboratory, Non-Ferrous Technology Development Centre) and one private company from USA (Shaping Concepts, LLC), this center is the largest of all the Indo-US research centers that are currently funded by Indo-US Science and Technology Forum. Innovative Center projects include mimicking the natural chemical and nanostructure of natural tissues to create improved biomaterials to developing sensors which can determine in real time *in situ* events surrounding implants to ensure their success.

In particular, the Indo-U.S. Center for Biomaterials for Healthcare aims to combine innovative material science concepts (including nanotechnology) with biological science approaches to develop implants that can last the lifetime of the patient and return that patient to the lifestyle to which they were accustomed before they suffered from a medical ailment. The focused activities for the Center are in the following areas: (i) metals, ceramics and polymer-based hard tissue replacement (orthopedic implant) materials, with particular emphasis on nano-biomaterials; (ii) polymer based scaffold materials for tissue engineering applications; and (iii) strategy formulation based on novel manufacturing routes to produce complex shaped implant materials.

With more than twenty exchange visits of senior researchers and young doctoral students between India and the USA, this center has worked toward achieving the overall objective to combine the cutting edge technologies of fabrication and testing of materials science with the knowledge of biological sciences in order to formulate strategies to develop shaped implant materials for the purpose of the enhancement of public health.

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Some of the notable achievements include, a) understanding genotoxicity and gene profiling of osteoblast cells treated with HA-based nanobioceramic composites; b) development

of polymer-based scaffold materials for cartilage tissue engineering application; c) injection molding of polymer-ceramic hybrid biocomposites; and d) investigating a CAD/CAM-based manufacturing route as well as 3D printing route to fabricate complex shaped implant materials.

The Center Directors are assisted by principal investigators from the University of Washington (Dr. Rajendra K. Bordia), the University of Texas at San Antonio (Dr. Mauli Agrawal), Shaping Concepts, LLC (Dr. Animesh Bose), IIT Kanpur (Drs. Dhirendra Katti and Ashok Kumar), IIT Mumbai (Dr. Rinti Banerjee), NFTDC (Dr. Krishnamurty Balasubramanian) and NML (Dr. Arvind Sinha). The nodal coordinator of the center is Prof. S. P. Mehrotra, IIT Kanpur.

All the research activities of the center are described on the website (http://www.iitk.ac.in/indo_us_biomaterials/) and the forum is funded by Indo-US Science and Technology Forum (www.indousstf.org/).

Bikramjit Basu with Center faculty members and researchers from the Department of Biomedical Engineering at the University of Texas, San Antonio.

Members in the News

Chapter News
Contributed from Press Release

Congratulations to:

Dr. Michael V. Sefton, University Professor and Michael E. Charles Professor of Chemical Engineering at the University of Toronto, who has been awarded the 2011 Acta Biomaterialia Gold Medal. The award recognizes excellence and leadership in biomaterials research and practical applications. Professor Michael V. Sefton is being recognized for his leadership in biomaterials, biomedical engineering and regenerative medicine. His many accomplishments include the establishment of the Toronto Tissue Engineering Initiative and the Canadian Regenerative Medicine Network, to harness the scientific power generated by facilitating collaboration among scientists, engineers and physicians. He is a member of the Board of Directors for the Health Technology Exchange and Rimon Therapeutics Ltd., serves as a member of the Advisory Board for the Georgia Tech Emory Center for the Engineering of Living Tissues, the National University of Ireland at Galway Network for Functional Biomaterials, and the RESBIO program at Rutgers University. Dr. Sefton is a past President of the Society For Biomaterials and will receive the Acta Biomaterialia Gold Medal Award at a plenary session of the Society For Biomaterials annual meeting in April 2011.

Editor's note: Would you like to share some good news about an honor you or a colleague have received? We would love to hear from you; please email news items to kburg@clemson.edu.

Society For Biomaterials

2011 ANNUAL MEETING & EXPOSITION

APRIL 13-16, 2011 ORLANDO, FLORIDA

Registration Brochure

Animating Materials

Society For Biomaterials

2011 ANNUAL MEETING & EXPOSITION

APRIL 13-16, 2011 ORLANDO, FLORIDA

ABOUT THE SOCIETY

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

PROGRAM OVERVIEW

ANIMATING MATERIALS

The theme for the 2011 Annual Meeting of the Society For Biomaterials is "Animating Materials", a decidedly Disney-esque flair to reflect the 2011 meeting site and to highlight the Society's emphasis on "Giving Life to a World of Materials." The Annual Meeting focuses on fostering development of new implant materials and devices for improvement of the human condition. The meeting program will include the latest innovations in materials science, molecular and cell biology and engineering, new opportunities and mechanisms for translation of these findings to new or improved medical treatments, and engagement of attendees from industry and academia to accelerate the translation of research to clinical applications. The meeting format will include Symposia, General Sessions, Workshops, Panel Discussions, and Tutorials, covering all aspects of basic, applied, and translational biomaterials science.

PRELIMINARY PROGRAM

(Tentative and subject to change)

Anthony Atala, MD to Deliver Keynote Address

The Society For Biomaterials is pleased to announce Anthony Atala, MD, as the keynote speaker for its 2011 Annual Meeting and Exposition.

Anthony Atala, MD, is the Director of the Wake Forest Institute for Regenerative Medicine, and the W.H. Boyce Professor and Chair of the Department of Urology at Wake Forest University. Dr. Atala is a practicing surgeon and a researcher in the area of regenerative medicine. His current work focuses on growing new human cells, tissues and organs.

Dr. Atala works with several journals and serves in various roles, including Editor-in-Chief of *Current Stem Cell Research and Therapy*, and *Therapeutic Advances in Urology*; as Associate Editor of *Tissue Engineering and Regenerative Medicine*, *The Journal of Rejuvenation Research*, *Nanotechnology in Engineering and Medicine*, *Gene Therapy and Regulation*, and *Current Reviews in Urology*; as Executive Board Member or Section Editor of the journal *Tissue Engineering* and *International Journal of Artificial Organs*, and as Editorial Board member of *Expert Opinion on Biological Therapy*, *Biomedical Materials*, *International Journal of Stem Cells*, *Stem Cell Review Letters*, *Tissue Science and Engineering*, *Journal of Surgical Radiology*, the *Journal of the American College of Surgeons*, the *Journal of Urology*, *BioMed Central-Urology*, *Urology*, and *Current Opinion in Urology*.

Dr. Atala is a recipient of many awards, including the US

SFB 2011 Program Committee Chair

Nicholas P. Ziats, PhD • Case Western Reserve University • E-Mail: npz@case.edu

SFB Headquarters/Staff
15000 Commerce Parkway
Suite C
Mt. Laurel, NJ 08054
Phone: (856) 439-0826
Fax: (856) 439-0525
E-mail: info@biomaterials.org

Executive Director
Dan Lemyre, CAE
dlemyre@biomaterials.org

Assistant Executive Director
Leslie Clark
lclark@biomaterials.org

Meeting Manager
Anthony Celenza, CMP
acelenza@biomaterials.org

Meeting Coordinators
Astrid Schrier
aschrier@biomaterials.org

Annemarie Stanislawczyk
astanislawczyk@biomaterials.org

Exhibit Manager
Chris Brown, CEM, CMP
cbrown@biomaterials.org

Membership Director
Rebecca Riedesel
rriedesel@biomaterials.org

Congress funded Christopher Columbus Foundation Award, bestowed on a living American who is currently working on a discovery that will significantly affect society, and the Gold Cystoscope and Samuel Gross Awards for advances in his field. Dr. Atala was named by *Scientific American* as a Medical Treatments Leader of the Year for his contributions to the fields of cell, tissue and organ regeneration. Dr. Atala's work was listed as *Time Magazine's* top 10 medical breakthroughs of the year, and as *Discover Magazine's* Number 1 Top Science Story of the Year in the field of medicine in 2007. A *Time Magazine* poll ranked Dr. Atala as the 56th most influential person of the year in 2007. In 2009 Dr. Atala was featured in *U.S. News & World Report* as one of 14 Pioneers of Medical Progress in the 21st Century, and his work in 2010 was listed by *Smithsonian Magazine* as one of 40 things to know about the next 40 years.

Dr. Atala has led or served several national professional and government committees, including the National Institutes of Health working group on Cells and Developmental Biology, and the National Institutes of Health Bioengineering Consortium. He is currently a NIH "Quantum Grant" awardee. Dr. Atala heads a team of over 270 physicians and researchers. Ten applications of technologies developed in Dr. Atala's laboratory have been used clinically. He is the editor of nine books, including Minimally Invasive Urology, Methods of Tissue Engineering, Principles of Regenerative Medicine, and Foundations of Regenerative Medicine, and has published more than 300 journal articles and has applied for or received over 200 national and international patents.

HIGHLIGHTS OF THE 2011 MEETING WILL INCLUDE:

Symposia

A Symposium is designed to focus attention on a specific topic within the disciplines that make up the Society's membership. The symposium highlights a well-defined topic that is not addressed by the regular sessions of the Annual Meeting. The format includes a single lead speaker followed by related abstracts. The lead speaker either presents the current concepts of the topic or presents cutting-edge research within the area.

- Biomaterials and Technologies for Cell Manufacturing
- Ceramics in Drug Delivery
- Chemoselective Chemistry for Biomaterials
- Engineering Instructive Cues into Biomaterials
- Industrial Solutions to Material Problems, Biomaterials and Processing Technologies for Industrial Applications
- Macrophage-centered Host Response to Biomaterials and Wound Healing
- Propelling Materials into the Clinic
- Responsive Biomaterials: Exploiting Biological Signals
- Strategies to Promote Vascularization of Tissue Engineered Constructs
- Valves and Stents

General Sessions:

A General Session is on a topic that is familiar to the general membership. Abstracts reflect the most current research in that field.

- Advances in Ophthalmic Biomaterials
- Alternative Platforms for Pharmacologic Administration
- Biologically Derived Materials
- Biologically Inspired Biomaterials Approaches for Cancer Research
- Biomaterial Stem Cell Interactions
- Biomaterials and Scaffolding for Neural Regeneration
- Biomaterials-based Therapies Exploiting Immunological Processes
- Biomimetic Materials for Tissue Engineering
- Cancer Drug Delivery
- Cellular Responses to Biophysical Cues
- Ceramics in Orthopaedic and Dental Applications
- Dental Materials
- Drug Delivery from Implant Surfaces
- Dynamically Responsive Biomaterials
- Engineering Therapeutic Delivery from Biomaterial Scaffolds
- Imaging Biomaterials
- Molecular Mechanisms Mediating Protein-Surface and Cell-Surface Interactions
- Novel Approaches to Cellular Therapies
- Optimization and Characterization of Nanoparticle Biocompatibility
- Orthopaedic Alternative Bearing Surfaces: Laboratory Findings and Clinical Actualities
- Pluripotent Stem Cells in Engineered Microenvironments
- Polymeric Biomaterials - Synthesis, Characterization, Processing and Fabrication for Biomedical Applications
- Scaffold Assisted Bone Defect Repair / Regeneration
- Scaffolds for Cardiovascular and Musculoskeletal Organ Regeneration
- Self-Assembly in Cell and Tissue Engineering
- Spatially Patterned Biomaterials for Tissue Engineering
- Surface Fouling, Biofilms, and Their Impacts on Medical Devices
- Surface Modification for Sensors and Diagnostics
- The Art of Falling Apart: Exploiting Biomaterial Degradation
- Tissue Engineering Scaffolds
- Translational Research in Nano-biomaterials
- Tribocorrosion of Metallic Biomaterials

Rapid Fire Sessions

Rapid Fire Sessions consist of a one hour long session with two half hour blocks, each comprised of five 5-minute presentations, and a five minute Q&A.

- Mechanical Characterization of Biomaterials
- Polymeric Biomaterials - Synthesis, Characterization, Processing and Fabrication for Biomedical Applications
- Responsive Biomaterials and Therapeutic Scaffolds
- Thin-film Surface Modification of Biomaterials - Applications in Medical Devices

WORKSHOPS

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

Each workshop requires separate registration. The fees are detailed on the registration form.

- *Combination Medical Device Approval: FDA's Perspective*
- *Commercialization of Academic Biomaterials Research*
- *Data Acquisition and Data Interpretation for Conventional to Contemporary Surface Analytical Techniques*
- *Writing an NIH Grant Application*

Combination Medical Device Approval: FDA's Perspective

Combination medical device approval process has remained a mystery to many in the industry and in the applied research, especially to those not working directly with the regulatory agencies. In this session representatives from the FDA and industry will shed light on the device approval process and share their perspectives. The attendees will learn how best to prepare for device approval and common mistakes to avoid.

Commercialization of Academic Biomaterials Research

Commercialization of university technologies has become a critical issue, with biomaterials-related research being one of the most important areas in which new technologies are spun out from academic labs. This workshop will feature invited talks by faculty who are actively involved in translational research, either through entrepreneurial ventures or licensing technologies to existing companies. Speakers will share their experiences in commercializing their research, discussing the original research they were conducting, how they decided to pursue commercialization, and their experiences in the process. Topics will also include protection of intellectual property, university relations, collaborations, fundraising, balancing commercial and academic research, new venture formation and corporate partnerships. Attendees will have a unique opportunity to hear first-hand how high-impact biomaterials research moves from benchtop to bedside.

Data Acquisition and Data Interpretation for Conventional to Contemporary Surface Analytical Techniques

From the most conventional surface analytical technique like contact angle measurements to the state-of-the art time-of-flight secondary ion mass spectrometry, surface characterization has evolved over the years. However, the importance of good practices for data acquisition and data analysis as well as data interpretation is unchanged. This workshop will cover parameters to use for data acquisition and data analysis to get the most from your instrument. Interpretation of the data will also be discussed including significance of the data and potential error as well as best practices and common mistakes to avoid when using surface analytical techniques. Surface plasmon resonance (SPR), electron spectroscopy for chemical analysis (ESCA) or XPS, and time-of-flight secondary ion mass spectrometry (TOF-SIMS) will be covered.

Writing an NIH Grant Application

This is an intensive workshop on grant writing to assist new investigators with writing a NIH, or other peer-reviewed, grant application. The workshop will include didactic lectures regarding the NIH structure: the various institutes and the Center for Scientific Review, the system of peer review, the types of grants (R01, R03, R21, K awards, SBIR, STTR, and others), and the different components of the newly revised grant applications. This will be followed by a mock study section to demonstrate how the review session operates. There will be a panel discussion regarding successful strategies and developing hypotheses, realistic research plans and budgets. Attendees are encouraged to bring questions for discussion by the panelists.

PANEL DISCUSSIONS

Panel discussions foster open debate on a topic. The invited guests include renowned experts in the area of focus and the chair allows time for open discussion with the audience.

- *Biomaterial Challenges of Battlefield Injuries*
- *Bridging Industrial-Academic Biomaterial Research Gaps*
- *Cagematch 2011: Natural Versus Synthetic Biomaterials in Tissue Engineering*
- *Creating a Biomaterials Curriculum*
- *International Biomaterials Symposium*
- *Orthopaedic Alternative Bearing Surfaces: Laboratory Findings and Clinical Actualities*

Biomaterial Challenges of Battlefield Injuries

With the global efforts of our military, there is an increasing need for advanced treatment options for severely injured servicemen and women. The Department of Defense has created a new, federally-funded institution, the Armed Forces Institute of Regenerative Medicine (AFIRM). The AFIRM includes two multi-institutional consortia, one led by Wake Forest University, Winston-Salem, N.C. and the University of Pittsburgh; and one led by Rutgers University, New Brunswick, N.J. and the Cleveland Clinic. The U.S. Army Institute of Surgical Research in San Antonio, Texas, is also a collaborative partner. The AFIRM team is committed to developing clinical therapies over the next five years focusing on the following five areas: 1) burn repair, 2) wound healing without scarring, 3) craniofacial reconstruction, 4) limb reconstruction, regeneration or transplantation, and 5) compartment syndrome, a condition related to inflammation after surgery or injury that can lead to increased pressure, impaired blood flow, nerve damage and muscle death. Most of the projects have a significant biomaterials component. In fact, several SFB members are intricately involved in these projects. The aim of this panel discussion is to provide an overview of the AFIRM effort and a summary of the approaches that are being utilized.

Bridging Industrial-Academic Biomaterial Research Gaps

Each year, industry produces hundreds of millions of biomaterial-based formulations and devices to improve patient quality of life. While these companies have been extremely successful in delivering healthcare products, the scientific community may not fully understand the criteria used for material selection and processing. Likewise, there may be a lack of knowledge about critical manufacturing issues and how development of these products makes good business sense. These knowledge gaps limit the contribution that can be made with respect to biomaterial translation from academia. To compound matters, an increasingly intense competition for funding forces many scientists, especially young professors, to only look at leading edge and hypothesis driven research topics. In order to bridge the knowledge gap, four leading scientists from both industry and academia will provide a forum to share typical design criteria (with relevant examples) when developing biomaterials that would be attractive to the industry. This discussion will also shed light upon the types of IP industrial sources are most likely to license in their respective fields and why. The ultimate goal of the panel is to bring industry and academia closer together in terms of which projects they choose to pursue. Everyone is welcome.

Cagematch 2011: Natural Versus Synthetic Biomaterials in Tissue Engineering

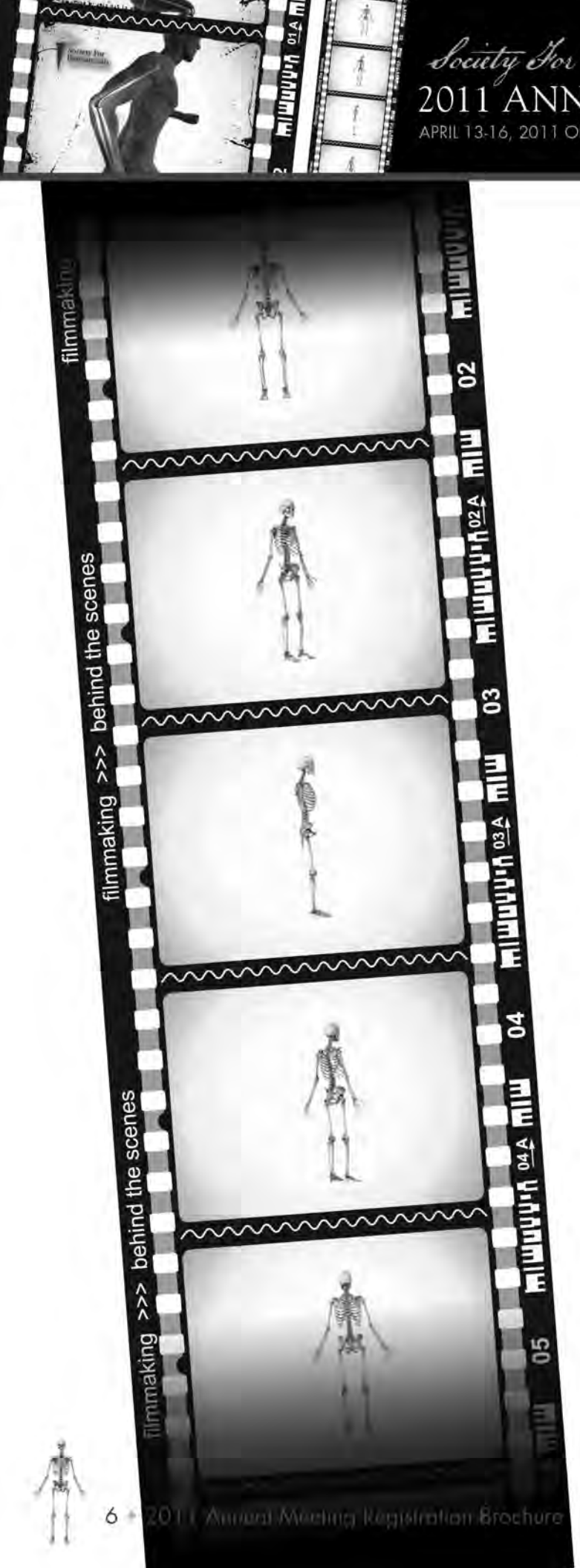
This session will pit two teams of biomaterials scientists against each other to fight for their point of view. Team Natural will advocate for the use of naturally-derived biomaterials such as collagen, fibrin, chitosan, alginate, agarose, and others. Team Synthetic will promote the use of man-made polymers such as PLA, PGA, PEG, PU, HEMA, and others. The outcome of the session will be to crown a winner based on the strength of their case. Vigorous discussion and audience participation will be encouraged.

Creating a Biomaterials Curriculum

SFB has been remiss in "owning" biomaterials education; i.e. there is currently no consensus in the biomaterials community about what constitutes a high quality biomaterials curriculum, much less the essential content of a single class in biomaterials. The purpose of this panel is to start a serious dialog about "Creating a Biomaterials Curriculum." The panel and the ensuing discussion will be used to explore several topics that include: 1) necessary curricular content, 2) building a curriculum from scratch, 3) building a curriculum from pre-existing courses in other departments, 4) building a minor v. a major area of study, and 5) ABET accreditation. The primary outcomes of this panel will be to: (1) prepare a document that will serve as a road map for developing biomaterials curricula, and (2) establish SFB as the primary organizational authority and clearing house for issues in biomaterials education.

International Biomaterials Symposium

Biomaterials research is inherently international. This panel discussion will highlight current state-of-the-art research being conducted in each of the world biomaterials congress societies. This panel discussion will include our international colleagues who will emphasize the current state of the art research and where resources are being used in their respective countries for unique areas of biomaterials research.



Orthopaedic Alternative Bearing Surfaces: Laboratory Findings and Clinical Actualities

The panel discussion's objective is to define the relationships between laboratory findings and clinical actualities in alternative bearing surfaces for total hip arthroplasty. The format of the presentation is uniquely constructed to allow laboratory and clinical outcomes to be objectively compared for each of three bearing options. The construct of two podiums where points of view are made, followed by questions and answers from the moderators and/or audience has proven to be an optimal learning technique, minimizing learning gaps for the benefit of both the audience and presenters.

TUTORIALS

The purpose of a tutorial is to teach attendees about a specific technology or focus area. It includes up to two presenters and time for questions and answers. The invited speakers are selected for their experience in the field, as well as their ability to teach fundamental topics that are of increasing importance to a wide range of biomaterials scientists and engineers. Attendance at the tutorial is included with the general meeting registration. In 2011, the tutorial topics will be:

- *Immunohistology Techniques for Animal Tissues with and without Implants*
- *Wet Tutorial for Scaffold Fabrication*

Immunohistology Techniques for Animal Tissues with and without Implants

The use of antibodies (monoclonal and polyclonal) for the detection of specific pathologies is common in pathology, clearly delineating the specific proteins involved. The technique of immunohistochemistry could greatly enhance detecting changes in biocompatibility of various implants with almost similar chemistries. With the advent of combinatorial chemistries in implant manufacture, it will be useful to dissect and identify tissue response changes as a result of these implant prototypes.

Wet Tutorial for Scaffold Fabrication

Use of scaffolds to serve as 3D templates for tissue regeneration is a central theme in the fields of tissue engineering and regenerative medicine. Many novel schemes for fabricating 3D tissue scaffolds have been developed. However, implementing these approaches by reading journal articles can be difficult and time-consuming. Seeing a live demonstration of a scaffold fabrication technique can make it much easier to replicate back in your own lab. In this tutorial, experts will perform live "wet" demonstrations of scaffold fabrication techniques. Any level of scientist from beginner to advanced is welcome. The only requirement is a desire to learn scaffold fabrication techniques.

TENTATIVE PROGRAM SCHEDULE • *(subject to change)*

WEDNESDAY, APRIL 13, 2011

8:00am – 8:00pm	**Registration Open**
9:00am – 12:00pm	**Workshop 1: Data Acquisition and Data Interpretation for Conventional to Contemporary Surface Analytical Techniques**
9:00am – 12:00pm	**Workshop 2: Writing an NIH Grant Application**
12:30pm – 2:30pm	**Workshop 3: Combination Medical Device Approval: FDA's Perspective**
12:30pm – 3:30pm	**Workshop 4: Commercialization of Academic Biomaterials Research**
4:00pm – 6:00pm	**Concurrent Session I** • Dental Materials • Engineering Instructive Cues into Biomaterials (Symposium) • Industrial Solutions to Material Problems, Biomaterials and Processing Technologies for Industrial Applications (Symposium) • Optimization and Characterization of Nanoparticle Biocompatibility • Surface Fouling, Biofilms, and Their Impacts on Medical Devices • Orthopaedic Alternative Bearing Surfaces: Laboratory Findings and Clinical Actualities
6:00pm – 6:30pm	**Break**
6:30pm – 8:00pm	**Opening Ceremony**
7:15pm – 8:00pm	**Keynote Address: Regenerative Medicine: Approaches to Translation** **Anthony Atala, MD** **Wake Forest University**
8:00pm – 9:30pm	**Opening Reception**

THURSDAY, APRIL 14, 2011

7:00am – 6:00pm	**Registration Open**
7:00am – 8:00am	**Special Interest Group Meetings**
8:00am – 9:30am	**Plenary Session I** **C. William Hall Award** Shalaby Shalaby, PhD (posthumous) **Founders Award** Antonio Mikos, PhD Rice University **Technology Innovation and Development Award** James William Burns, PhD Genzyme Corporation
9:30am – 1:00pm	**Exhibit Hall Open**
9:30am – 10:00am	**Break**
10:00am – 12:00pm	**Concurrent Session II** • Biologically Inspired Biomaterials Approaches for Cancer Research • Dynamically Responsive Biomaterials • Macrophage-centered Host Response to Biomaterials and Wound Healing (Symposium) • Propelling Materials Into the Clinic (Symposium) • Scaffold Assisted Bone Defect Repair / Regeneration
10:00am – 12:00pm	**Tutorial:** Wet Tutorial for Scaffold Fabrication Part I
12:00pm – 1:00pm	**Lunch (on own)**
12:00pm – 1:00pm	**Student Career Fair**
12:00pm – 1:00pm	**Special Interest Group Meetings**

THURSDAY, APRIL 14, 2011 *(continued)*

1:00pm – 3:00pm	**Concurrent Session III** • Advances in Ophthalmic Biomaterials • Biologically Derived Materials • Biomaterials-based Therapies Exploiting Immunological Processes • Drug Delivery from Implant Surfaces
1:00pm – 2:00pm	**Concurrent Rapid Fire Sessions 1&2** • Polymeric Biomaterials - Synthesis, Characterization, Processing and Fabrication for Biomedical Applications • Thin-film Surface Modification of Biomaterials - Applications in Medical Devices
2:00pm – 3:00pm	**Concurrent Rapid Fire Sessions 3&4** • Mechanical Characterization of Biomaterials • Responsive Biomaterials and Therapeutic Scaffolds
3:00pm – 6:30pm	**Exhibit Hall Open**
3:00pm – 3:30pm	**Break**
3:30pm – 5:00pm	**Concurrent Session IV** • Biomaterials and Technologies for Cell Manufacturing (Symposium) • Ceramics in Drug Delivery (Symposium) • Chemoselective Chemistry for Biomaterials (Symposium) • Imaging Biomaterials • Translational Research in Nano-biomaterials
3:30pm – 5:00pm	**Panel Discussion:** Creating a Biomaterials Curriculum
5:00pm – 6:30pm	**Poster Session 1 and Exhibition Reception**

FRIDAY, APRIL 15, 2011

7:00am – 6:00 pm	**Registration Open**
7:00am – 8:00am	**Special Interest Group Meetings**
8:00am – 10:00am	**Plenary Session II** **Young Investigator Award** Alireza Khademhosseini, PhD Harvard Medical School **Young Investigator Award** Jeff Karp, PhD Massachusetts Institute of Technology **Acta Biomaterialia Gold Medal** Michael V. Sefton, ScD University of Toronto
10:00am – 6:30pm	**Exhibit Hall Open**
10:00am – 10:30am	**Break**
10:30am – 11:30am	**Annual Business Meeting**
10:30am – 11:30am	**National Student Chapter Meeting**
11:30am – 11:45am	**Break**
11:45am – 1:15pm	**Concurrent Session V** • Pluripotent Stem Cells in Engineered Microenvironments • Responsive Biomaterials: Exploiting Biological Signals (Symposium) • Self-Assembly in Cell & Tissue Engineering • Valves and Stents (Symposium)
11:45am – 1:15pm	**Tutorial:** Immunohistology Techniques for Animal Tissues with and without Implants
11:45am – 1:15pm	**Panel Discussion:** Cagematch 2011: Natural Versus Synthetic Biomaterials in Tissue Engineering
1:15pm – 3:00pm	**Lunch (on own)**
1:15pm – 2:15pm	**Special Interest Group Meetings**
1:15pm – 3:00pm	**Student Luncheon/Panel Discussion: Exploring Alternative Careers in Biomaterials**

FRIDAY, APRIL 15, 2011 *(continued)*

3:00pm – 5:00pm	**Concurrent Session VI** • Biomimetic Materials for Tissue Engineering • Cellular Responses to Biophysical Cues • Engineering Therapeutic Delivery from Biomaterial Scaffolds • Molecular Mechanisms Mediating Protein-Surface and Cell-Surface Interactions • Scaffolds for Cardiovascular and Musculosketetal Organ Regeneration
3:00pm – 5:00pm	**Tutorial:** Wet Tutorial for Scaffold Fabrication Part II
5:00pm – 6:30pm	**Poster Session 2**
7:00pm – 12:00am	**BIOMATERIALS BASH** Join your colleagues at the 2011 BASH Reception being held at Epcot Center.

SATURDAY, APRIL 16, 2011

7:00am – 4:00pm	**Registration Open**
7:00am – 8:00am	**All Special Interest Group Officers Meeting (open to all SIG members)**
8:00am – 9:30am	**Plenary Session III** **Clemson Award for Contributions to the Literature** Ashutosh Chilkoti, PhD Duke University **Clemson Award for Basic Research** Kevin Healy, PhD University of California, Berkeley **Clemson Award for Applied Research** William Wagner, PhD University of Pittsburgh
9:30am – 10:00am	**Break**
10:00am – 12:00pm	**Concurrent Session VII** • Biomaterials and Scaffolding for Neural Regeneration

SATURDAY, APRIL 16, 2011 *(continued)*

	• Tribocorrosion of Metallic Biomaterials • Strategies to Promote Vascularization of Tissue Engineered Constructs (Symposium) • Surface Modification for Sensors and Diagnostics • Tissue Engineering Scaffolds
10:00am – 12:00pm	**Panel Discussion:** International Biomaterials Symposium Part I
12:00pm – 1:00pm	**Lunch (on own)**
1:00pm – 2:30pm	**Concurrent Session VIII** • Cancer Drug Delivery • Ceramics in Orthopaedic and Dental Applications • Novel Approaches to Cellular Therapies • Spatially Patterned Biomaterials for Tissue Engineering
1:00pm – 2:30pm	**Panel Discussion:** Bridging Industrial-Academic Biomaterial Research Gaps
1:00pm – 2:30pm	**Panel Discussion:** Orthopaedic Alternative Bearing Surfaces: Laboratory Findings and Clinical Actualities
2:30pm – 3:00pm	**Break**
3:00pm – 5:00pm	**Concurrent Session IX** • Alternative Platforms for Pharmacologic Administration • Biomaterial Stem Cell Interactions • Polymeric Biomaterials - Synthesis, Characterization, Processing and Fabrication for Biomedical Applications • The Art of Falling Apart: Exploiting Biomaterial Degradation
3:00pm – 5:00pm	**Panel Discussion:** Biomaterial Challenges of Battlefield Injuries
3:00pm – 5:00pm	**Panel Discussion:** International Biomaterials Symposium Part II

Society For Biomaterials

2011 ANNUAL MEETING & EXPOSITION

APRIL 13-16, 2011 ORLANDO, FLORIDA

General Information

All sessions of the meeting, including exhibits, posters, and oral presentations will take place at Disney's Contemporary Resort.

Photographs and/or videos of any slide or poster presentation are strictly prohibited.

Registration

All attendees are expected to register for the meeting. Register early and get the pre-registration fees, which are much lower than on-site registration. The pre-registration deadline is April 1, 2011.

Registration fees include: Abstract CD-ROM, admittance to all scientific sessions, tutorials, panel discussions, exhibits, opening reception, poster and exhibition reception and the Bash, unless opted out (additional fees apply to Wednesday workshops).

BASH

Join your colleagues at the 2011 Biomaterials BASH Reception being held at Epcot Center on Friday, April 15, 2011. An international buffet, wine and beer, delicious desserts and coffees will act as a prelude to, *IllumiNations: Reflections of Earth*, a mesmerizing fireworks, laser and water show. After the show, all participants will enjoy full access to Epcot Center until midnight.

Transportation to and from Epcot Center will be provided. Buses will depart the Contemporary Resort at 7:00pm and will return after the end of the show for those who do not wish to remain in the park for the extended hours. The monorail will continue to provide return service to the hotel until 2:00 am.

Since this is a ticketed event, participants will only be able to access the Bash via the bus transportation provided by SFB. All student registrants are welcome to attend the Bash.

Member Rates

Member rates apply to members of the Society For Biomaterials, USA, other world biomaterials congress societies, and TERMIS. Members of TERMIS or world biomaterials congress societies must include a photocopy of a current dues receipt or membership card with registration to qualify for member discount. World biomaterials congress societies are Australasian Society for Biomaterials, Canadian Biomaterials Society, Chinese Taipei Society for Biomaterials and Controlled Release, European Society for Biomaterials, the Japanese Society for Biomaterials, the Korean Society for Biomaterial and the Society for Biometerials and Artificial Organs (India). Probationary Special Interest Group members do not qualify for member rate.

Full-time students and post-graduates receive discounted registration rates. To qualify for discounted registration rates, proof of full-time student or post-graduate status must accompany registration.

Cancellations/Refunds

To cancel your registration and receive a refund, a written request must be received by April 1, 2011. Cancellation requests received by this date will receive a refund, less a $75 processing fee. Requests will be processed after the meeting. All requests received after April 1, 2011, will forfeit 100 percent of monies paid.

Web Registration

Registration for members and non-members may be submitted via the SFB Web site, www.biomaterials.org.
NO REGISTRATIONS WILL BE ACCEPTED VIA TELEPHONE.

Final Program, Certificates of Attendance, and Visas

Certificates of attendance will be available for all registrants at the on-site registration desk. Badges will be required to be worn at all functions of the meeting. Participants are expected to make their own travel arrangements, and procure their own visas. The final program will be distributed at the meeting.

The official language of the meeting is English.

Dress Code

Business casual is the recommended dress for the meeting.

Transactions Book

All of the abstracts being presented at the meeting, (oral and poster) will be on CD-ROM, which is included in your meeting registration. A printed transactions book will be available for purchase upon registration.

Special Needs

The Society For Biomaterials wishes to take steps to ensure that no person with a disability is excluded, denied services, segregated, or otherwise treated differently than other individuals because of the absence of auxiliary aids and services. If you require any auxiliary aids or services identified in the Americans with Disabilities Act, please indicate so on your registration form.

Sponsors and Exhibits

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

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

For more information on exhibiting and sponsorship opportunities, please visit the Annual Meeting page of the society's Web site (www.biomaterials.org) and download the Exhibitor and Sponsorship Prospectus or contact:

Chris Brown, CEM, CMP, Exhibits Manager
(856) 439-0500 ext. 4401 • cbrown@biomaterials.org

Exhibit Hours

Thursday, April 14	9:30am – 1:00pm, 3:00pm – 6:30pm
Friday, April 15	10:00am – 6:30pm

Society For Biomaterials

2011 ANNUAL MEETING & EXPOSITION

APRIL 13-16, 2011 ORLANDO, FLORIDA

Animating Materials

Please print or type.

Registration Form

First Name _____ Surname/Last Name _____

Title _____ Degree _____

Specialty or Discipline _____

Affiliation _____ Department _____

Address _____

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

Telephone _____ Facsimile _____

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

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

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

Scientific Registration	Member On Or Before April 1	Post-Grad Member On Or Before April 1	Student Member On Or Before April 1	Retired Senior Member On Or Before April 1	Non-Member On Or Before April 1	Post-Grad Non-Member On Or Before April 1	Student Non-Member On Or Before April 1	Member After April 1	Post-Grad Member After April 1	Student Member After April 1	Retired Senior Member After April 1	Non-Member After April 1	Post-Grad Non-Member After April 1	Student Non-Member After April 1	Government Employee Rate
Meeting & Exhibit Registration	❒ $550*	❒ $380*	❒ $190	❒ $160*	❒ $775*	❒ $500*	❒ $240	❒ $650*	❒ $430*	❒ $225	❒ $195*	❒ $875*	❒ $550*	❒ $275	❒ $575
Workshop 1 • Data Acquisition and Data Interpretation	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $65
Workshop 2 • Writing an NIH Grant Application	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $65
Workshop 3 • Combination Medical Device Approval	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $65
Workshop 4 • Commercialization of Academic Biomaterials	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $50	❒ $30	❒ $20	❒ $50	❒ $65	❒ $45	❒ $25	❒ $65

***$25 will be deducted if a non-student wishes to NOT attend the Biomaterials Bash - to opt out of Bash check box here: ❒**

Scientific Registration Subtotal $ _____

❒ **Student Luncheon/Panel Discussion: Exploring Alternative Careers in Biomaterials** Lunch will be provided and you must check this box if you intend to participate as this is a ticketed event, limited to the first 200 SFB student members only. *(Friday, April 15, 1:15 -3:00 p.m.)*

Optional Transactions *(one CD-ROM included with each Meeting Registration)*

❒ Transactions Book . . . . . ❒ $100: Member ❒ ❒ $125: Non-Member

❒ Additional CD-ROM. . . . . ❒ $30

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

Extra tickets for Accompanying Guests (#) _____ X ❒ $75 each (name of guest _____)

*** Student and Post-Graduate status verification required.**

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

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

X _____

Signature of advisor or department chair

Advisor's Printed Name _____

Advisor's Telephone _____

Advisor's Email _____

Transaction and Social Registration Subtotal $ _____

Total Amount Due $ _____

Method Of Payment:

❒ Check Enclosed *(Checks must be in U.S. dollars, drawn on a U.S. Bank and made payable to the Society For Biomaterials)*

❒ MasterCard ❒ VISA ❒ American Express

Name (as it appears on card) _____

Card # _____

Expiration Date _____

Cardholder Signature _____

Three Options For Registration:

1. WWW.BIOMATERIALS.ORG
2. Fax this registration form to 856-439-0525
3. Mail this registration form to:
   SFB Registration
   15000 Commerce Parkway
   Suite C
   Mt. Laurel, NJ 08054

Hotel Information/Reservations

For your convenience, sleeping rooms have been reserved at **Disney's Contemporary Resort**. The hotel can be contacted directly for individual reservations and they are on a first-come, first served basis. Please be sure to reference the Society For Biomaterials or SFB Annual Meeting when making reservations.

Sleeping room rates have been reserved for attendees at a conference rate of $219.00 single/double occupancy.

The special room rate will be available until March 15, 2011 or until the group block is sold-out, whichever comes first, after this date the prevailing rates for the hotel will apply.

To reserve a room at the group rate, contact the hotel directly by calling 407-824-3869, please be sure to reference the Society For Biomaterials or on-line at www.biomaterials.org.

Disney's Contemporary Resort
4600 North World Drive
Lake Buena Vista, FL 32830
407-824-3869

Conference Rates:

$219 per room, per night for single or double occupancy.

Conference rates are available from April 12, 2011 to April 17, 2011, based on hotel availability.

Disney's Contemporary Resort is an ultra-modern Disney Deluxe Resort, boasting views of the nearby Space Mountain attraction and Cinderella Castle, the Resort overlooks 4.5 miles of shoreline along Bay Lake and Seven Seas Lagoon and is the closest hotel to Magic Kingdom theme park.

Take advantage of Disney's free Magical Express shuttle service and save up to $140 on airport transfers.

Society For Biomaterials
Giving life to a world of materials

2011 Officer Nominees

Continued from page 10

Jan P. Stegemann, PhD

Associate Professor of Biomedical Engineering
University of Michigan, Ann Arbor

Biographical Sketch: Jan Stegemann, PhD 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 matrices. 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 tissue engineering. 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 as Vice-Chair (2007-08) and subsequently as Chair (2009-2011) of the Tissue Engineering SIG, and was active in organizing SIG activities during that period. In addition, 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*. Most recently, Jan has begun to serve as Education Editor for the *Biomaterials Forum*, and is responsible for a quarterly column that highlights an interesting aspect of biomaterials education.

Vision Statement: The role of the Member-at-Large is to represent the broader membership of the Society. Perhaps the most tangible responsibility of this position is to serve as the Members' representative at the annual Board of Directors and Council meetings. However the Member-at-Large must also be available throughout the year to gather and solicit the views of the SFB membership and to then faithfully present these views to the executive leadership of the Society. Clearly the strength of our Society lies in its membership and therefore it is critical that our members have the chance to contribute their ideas as well as voice their concerns. These views need to be heard to allow the Society to move in directions that benefit both the field of biomaterials and our membership. 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 vigorously 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.

Writing Demonstrable Learning Objectives - Providing Clarity for Teachers and Learners

Kay C. Dee
Professor, Applied Biology and Biomedical Engineering
Founding Director, Center for the Practice and Scholarship of Education

"Could you possibly cover my biomaterials class this Thursday, while I'm at a meeting?" asked my colleague. "Sure," I said, "I can help you out. What will we be doing in class that day?" "Oh, just talk about dental implants for a while," she said as she walked away. "Hmm," I wondered to myself. "Am I just supposed to fill up class time? Or am I instead supposed to be teaching the students something?"

When we first start teaching our own courses, most of us begin by counting the number of class sessions we will have, making a list of the topics to be covered during various sessions, and including these plans on the course syllabus. The resulting syllabus tells our students what, generally, they'll be learning about. But after we've taught a subject for a while, many of us begin to realize that the real issue is not what the students will be *learning about*, but instead what the students will be *learning to do*. It really comes down to the demonstrable learning objectives.

A demonstrable learning objective is simply a statement of what someone will be able to do after successfully completing a learning activity. Learning objectives can be written for individual assignments, for individual lectures, for course units, or for an overall course. Compared to topical lists, lists of demonstrable learning objectives are more helpful to students, more informative for our colleagues, and more useful (and ultimately time-saving!) for ourselves.

For example – after reading this article, individuals will be able to:

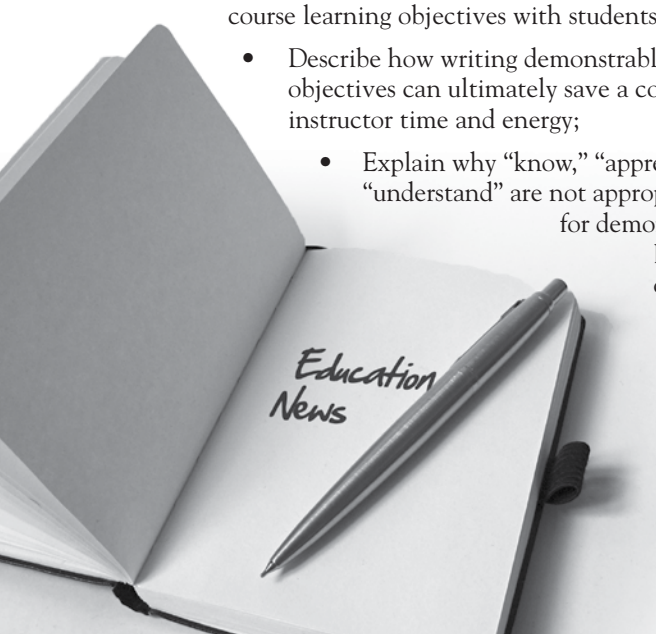
- Defend the decision to share (or not to share) course learning objectives with students;
- Describe how writing demonstrable learning objectives can ultimately save a course instructor time and energy;
- Explain why "know," "appreciate," and "understand" are not appropriate verbs for demonstrable learning objectives;
- Write demonstrable learning objectives for a lecture period they have recently taught.

The objectives above give you a better idea of what this column is about than would a simple topical statement ("This column is about learning objectives."), and the list above also makes clear exactly what I hope you could do in order to demonstrate your knowledge about learning objectives. These attributes make learning objectives helpful to students, which is why I share lists of objectives with my students (especially in lower-level classes; usually on a week-by-week basis). Providing a list of learning objectives to students doesn't "dumb down" a course, or "spoon-feed" students. Courses are "dumbed down" and students are "spoon-fed" when the intellectual rigor of course content and the standards of evaluation/grading are lowered. Learning objectives simply make expectations clear, and those expectations can be very high.

If one of your pedagogical goals is to have your students become experts at determining what you want them to learn, and how you will want them to demonstrate that learning, then you might not want to share learning objectives with students. You might instead have students practice writing their own demonstrable learning objectives, based on the course material you have presented to them! I do this often in homework assignments for my upper-level and graduate classes.

Lists of demonstrable learning objectives are helpful tools for facilitating communication with colleagues. Are you team-teaching a course? A list of mutually agreed-upon learning objectives will help coordinate activities and assessments across different course sections. Are you teaching a course that is a prerequisite for advanced courses? Your learning objectives will help your colleagues understand exactly what students were intended to learn in your course.

Writing demonstrable learning objectives for your courses requires an initial investment of time, but can save you time later. Need a quick active learning activity to use in class? Look at your list of learning objectives, pick one out, and



Education Quote of the Quarter:

" Knowing is not enough; we must apply."
— Johann Wolfgang von Goethe

have the students do it. Need to make a fair and appropriately challenging exam? Your list of learning objectives is an excellent basis for exam questions. Choose some critical objectives that all of the students should have mastered, some important and challenging objectives, and some difficult/advanced objectives that will help discriminate between an excellent and a good performance on the exam. The exam questions will almost write themselves – they will be opportunities for students to demonstrate how well they've mastered the objectives.

It is often easiest to start writing learning objectives for a class period you recently taught. Start the list with something like "After this class, students will be able to:" and go through your lecture notes for that period, adding objectives to the list. Each objective should start with a demonstrable verb – an activity that you, as a professor, could directly observe and evaluate. Note that "understand," "know," and "appreciate" are not directly demonstrable verbs, and so should not be used when writing learning objectives. You can't look into someone's mind or heart and 'see' that they know or appreciate something. Instead, think about what someone could do, specifically, to *demonstrate* that they know or appreciate something.

Wrong, wrong, wrong: After reading this article, individuals will know how to write learning objectives… will appreciate how useful learning objectives are… will understand the main components of a demonstrable learning objective.
better: After reading this article, individuals will be able to explain why "know," "appreciate," and "understand" are not appropriate verbs for demonstrable learning objectives.
Good learning objectives include, when appropriate, some description of the conditions under which a student would be expected to demonstrate their mastery of the objective. Would students be allowed to use a calculator? A reference manual? Would they work independently, or in teams? Excellent learning objectives also include some indication of the level of achievement that must be demonstrated by the student, or the criteria that will be used to evaluate the student's performance [1]. Must students be able to complete a task within a specific time period? Must they explain a technical topic in terms that the general public would understand (if, say, published in a newspaper)? Must an explanation or essay be concise, or should it be detailed?

You might consider using Bloom's Taxonomy of Educational Objectives [2] as a guide for either writing or categorizing your learning objectives. Bloom designates general groups of thinking skills, in lower levels (knowledge, comprehension, application) and higher levels (analysis, synthesis, evaluation). If the demonstrable learning objectives for an advanced course contain many action verbs associated with Bloom's lower levels (such as: list, identify, define, outline, explain, describe), there may be an opportunity for course revision to include more advanced activities (model, derive, predict, design, create, assess, optimize, justify, critique).

Writing demonstrable learning objectives for my courses helps me think more clearly and critically about my teaching, my students' learning, and how we spend our time together in class and in lab. When I designed the new course I'm teaching this quarter, I first wrote a list of demonstrable learning objectives for the course overall, and then I selected topics and activities based on the objectives. A lot more could be said about links between writing demonstrable learning objectives, Bloom's taxonomy, and course design [3], but due to space limitations I'll just point out that online resources [*e.g.*, 4] and teaching workshops [*e.g.*, 5] can provide more information. And if you'd like to see example learning objectives for an undergraduate biomaterials course, you can download a complete set – freely provided for you to use and adapt to your own needs – at: www.rose-hulman.edu/~dee/biomat_objs.htm

References:

1. Arreola, R.A., "Writing Learning Objectives," University of Tennessee, Memphis, 1998.
2. Bloom, B.S. et al., *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: The Cognitive Domain*, New York: Longman, 1956.
3. Wiggins, G. and McTighe, J., *Understanding by Design*, (expanded second edition), Prentice Hall, 2005.
4. Felder, R.M. and Brent, R., "Objectively Speaking," *Chemical Engineering Education* 31(3):178-179, 1997. Available online (last accessed 10/05/10) at: www4.ncsu.edu/unity/lockers/users/f/felder/public/Columns/Objectives.html
5. The National Effective Teaching Institute, offered annually prior to the national meeting of the American Society for Engineering Education. Information available online (last accessed 10/05/10) at: www4.ncsu.edu/unity/lockers/users/f/felder/public/NETI.html

American Institute for Medical and Biological Engineering (AIMBE) News

Alan Litsky, AIMBE News Contributing Editor
From Press Release

AIMBE, the American Institute for Medical and Biological Engineering, was founded in 1991 "to establish a clear and comprehensive identity for the field of medical and biological engineering" and "seeks to serve and coordinate a broad constituency of medical and biological scientists and practitioners, scientific and engineering societies, academic departments and industries." The Society for Biomaterials is a member society of AIMBE; two SFB members serve on the AIMBE Council of Societies. More about the organization can be found at their web site: www.aimbe.org.
The AIMBE staff publishes a bi-weekly Federal Update, monitoring governmental activities and initiatives relevant to their constituencies. The following are highlights from the Updates.

NSF SEEKS COMMENTS ON STEM (SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS) PARTICIPATION

The National Science Foundation (NSF) seeks to implement a new program to catalyze next-generation capacity to produce a diverse STEM workforce with 21st century knowledge and skills - one that is able to contribute to the Administration's vision for new opportunities in the energy, environment, and technology sectors, and, more generally, to the scientific enterprise. This new program, which has the working title "Comprehensive Broadening Participation of Undergraduates in STEM" (CBP-US), will operate out of NSF's Directorate for Education and Human Resources (EHR). The goal of CBP-US is to enrich the quality and innovation potential of tomorrow's STEM workforce through comprehensive broadening participation of undergraduates in STEM.
The program will be introduced in FY 2011, but the transition period will take 3-5 years. In the coming months, EHR's Division of Human Resource Development (HRD) will sponsor many opportunities to confer with the multiple interested communities as the new program develops.

FOOD AND DRUG ADMINISTRATION (FDA) SUBMITS RECOMMENDATIONS TO LIMIT ANTIBIOTICS USED IN ANIMALS FOR FOOD CONSUMPTION

Giving animals antibiotics in order to increase food production is a threat to public health and should be stopped, the FDA said today. The federal agency says it has the power to ban the practice, but it is starting by issuing "draft guidance" in hopes the food industry will make voluntary changes. After a 60-day public comment period, the guidance will become FDA policy.

The guidance is based on two principles:

- Antibiotics should be given to food animals only to protect their health.
- All animal use of antibiotics should be overseen by veterinarians.

"We are seeing the emergence of multidrug-resistant pathogens," FDA Deputy Commissioner Joshua Sharfstein, MD, said. "FDA believes the overall weight of evidence supports the conclusion that using medically important antimicrobial drugs for production purposes is not appropriate." Sharfstein said it is a public health issue when antibiotics important for human health are given to animals on a massive scale. Such use encourages the growth of drug-resistant bacteria that can cause hard-to-treat human disease.

SUPREME COURT RULING SUPPORTS BIOTECH

The U.S. Supreme Court's ruling in *Bilski v. Kappos* (6/28/10) paves the way for continued drug discovery and exploration. The court rejected the notion that a product is eligible for a patent only if it is tied to a specific machine or transforms a particular article or substance to a different state or thing. In doing so, the court overturned a U.S. Court of Appeals for the Federal Circuit ruling that created a new test for patents based on this so-called "machine or transformation" test.

The ruling specifically states that the machine or transformation test is not the sole test for patent eligibility and recognized that the lower court's ruling could have created uncertainty in fields such as advanced diagnostic medicine techniques.

In writing for the majority, Justice Anthony Kennedy noted: "The machine-or-transformation test is not the sole test for patent eligibility. … The court's precedents establish that although that test may be a useful and important clue or investigative tool, it is not the sole test for deciding whether an invention is a patent-eligible 'process.'"

CAMPAIGN REACHES OUT TO WOMEN IN ENGINEERING AND SCIENCE TO RUN IN 2012

The 2012 Project is seeking women in engineering and science who are interested in serving in public office. The 2012 Project is a national, non-partisan campaign to mobilize an unprecedented number of women to run for Congress and state legislature in the post-redistricting election cycle, when new and open seats offer more opportunity for women. A major challenge the US faces is attracting public servants with the skills and expertise to write workable legislation governing emerging and rapidly changing industries. The 2012 Project focuses on recruiting women with expertise in critical fields

of the future, such as health care, and connecting them to political resources.

"We have a once-in-a-decade opportunity to make big gains for women in 2012. It will take a coordinated national effort to be successful, and we must not miss this moment," said Mary Hughes, founder and director of The 2012 Project and a longtime political consultant based in California. The 2012 Project is a campaign of the Center for American Women and Politics at Rutgers University. For more information, visit www.the2012project.us, write to info@the2012project.us, or call 866-997-8880.

IIE OPENS FELLOWS AND SCHOLARS PROGRAM

The Institute of International Education (IIE) is pleased to announce the opening of the *2011-2012 Whitaker International Fellows and Scholars Program* competition, with a January 24, 2011 deadline. The Whitaker International Program provides funding for biomedical engineers/bioengineers to conduct a field-relevant activity abroad. The Whitaker International Program is a competitive grant that sends emerging leaders in biomedical engineering (or bioengineering) overseas to increase international collaboration in the field. The Whitaker Program was funded by The Whitaker Foundation (now closed), and is administered by the Institute of International Education. The institute is looking for at least 150 qualified applications this year, so all students who are even thinking of this type of option are encouraged to apply.

Types of Grants

- Fellows - Graduate-level applicants, from graduating seniors through current PhD students. Fellows receive a stipend for one year, and are eligible for tuition reimbursement.
- Scholars - Post-doctoral applicants, who recently received their Ph.D. Scholar awards can be for as short as one academic semester or as long as two years of funding, depending on the need. Second year funding is contingent upon demonstration of progress made during the first year.

Go to http://whitaker.usapplications.org/ for more information about the program and to access the online application.

NIST SEEKS NEW MEMBERS FOR NINE ADVISORY COMMITTEES

The National Institute of Standards and Technology (NIST) is seeking nominations of qualified individuals for its nine existing Federal Advisory Committees. Nominations for all committees will be accepted on an ongoing basis and will be considered as and when vacancies arise. Check the July 27th Federal Register notice (Federal Register Vol. 75, No. 143, p. 43933) that details each committee, including the number of members serving on the committee, its objectives and duties, the nomination procedure and committee contacts.

US NATIONAL ACADEMY GRADUATE FELLOWSHIP PROGRAM ANNOUNCES 2011 SESSIONS AND CALL FOR APPLICATIONS

This Graduate Fellowship Program of the National Academies—consisting of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council—is designed to engage its Fellows in the analytical process that informs U.S. science and technology policy. Fellows develop basic skills essential to working or participating in science policy at the federal, state, or local levels. Graduate students and postdoctoral scholars and those who have completed graduate studies or postdoctoral research in any social/behavioral science, medical/health discipline, physical or biological science, any field of engineering, law/business/public administration or any relevant interdisciplinary field within the last five years are eligible to apply.

The program takes place in Washington, D.C. and is open to all U.S. and non-U.S. citizens who meet the criteria. The Fall session will take place August 29 through November 18, 2011. Go to http://sites.nationalacademies.org/PGA/policyfellows/index.htm for details on criteria, application instructions, and access to the online application and reference forms. Please note the requirement for submission of an online reference from a mentor/adviser. The application deadline for the Fall program is May 1, 2011. (Candidates may apply to both sessions concurrently.) A stipend grant award of $8,240 will be provided for the 12-week session to offset expenses. Questions should be directed to: policyfellows@nas.edu.

Changes in Cell Orientation due to Variations in Nanograting Height

Nancy J. Lin[1], Jirun Sun[2], Yifu Ding[3], Sheng Lin-Gibson[1]
[1]*Polymers Division, National Institute of Standards and Technology, Gaithersburg, MD 20899*
[2]*American Dental Association Foundation, Paffenbarger Research Center Gaithersburg, MD 20899*
[3]*Department of Mechanical Engineering, University of Colorado at Boulder, Boulder, CO 80309*

Surface topography is known to play a critical role in the biological response to materials, with surface features on the order of both microns and nanometers altering cell response, including morphology, adhesion, cytoskeletal orientation, and gene expression.[1-3] However, the mechanisms responsible for changes in cell response are not well understood. Our recent work utilized a novel nanograting with a height gradient to shed some light on the mechanisms behind cell orientation on line-and-space grating patterns.[4,5] Cell orientation on these nanogratings as a function of pattern height correlates with water droplet contact angle anisotropy and suggests a similar mechanism for early cell alignment and water droplet spreading.

Nanogratings with a pitch of 420 nm or 800 nm and a continuous gradient in pattern height were prepared from three different polymers: polystyrene (PS), polymethylmethacrylate (PMMA), and ethoxylated bisphenol-A dimethacrylate (DMA), using two different techniques. For the thermoplastic polymers, PS and PMMA, nanogratings were fabricated on silicon wafers via a two-step process that involved nanoimprint lithography followed by temperature-gradient annealing.[4] Typical nanoimprint lithography was used to generate gratings of equally spaced lines with a uniform height. The second step of temperature gradient annealing produced a gradient in pattern height. As the annealing temperature continuously increased above the polymer glass transition temperature (T_g), the patterns slumped until the ridges were completely gone (flat surface) resulting in a pattern height that varied continuously from 320 nm to 0 nm (Fig. 1). To generate gradients for thermoset polymers, such as photo-polymerized DMA, PS patterns were used as inverse molds to fabricate free-standing, transparent DMA nanogratings.[5] DMA monomer activated with a photo-initiator system was spread onto the PS gradient nanograting and photo-polymerized using visible light. The grating pattern transferred from PS to DMA with high fidelity, resulting in a second method to prepare substrates with a pattern height gradient. We note that the line-to-space ratios differ slightly for the PS/PMMA and the DMA nanogratings, and these shape differences contributed the different cell alignment responses.

These three types of nanogratings were used to evaluate the effects of pattern height, shape, and surface chemistry on cell orientation of MC3T3-E1 murine pre-osteoblast cells, a relevant cell line for bone regeneration. Kinetic studies of cell spreading on the high end of transparent DMA nanogratings revealed that cells begin to align parallel to the grating direction shortly after contact with the substrate. Figure 2A follows the same set of cells over a 3 h period that shows

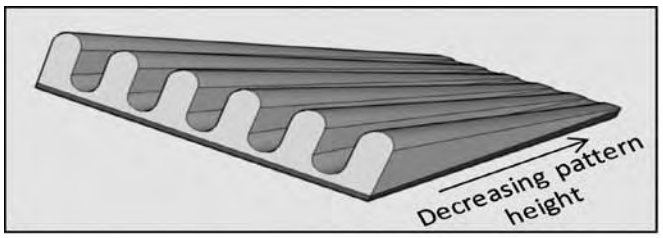


Figure 1. *Cartoon of a nanograting with a pattern height gradient.*

alignment with respect to the grating shortly after contact with the grating substrate (even at 20 min). Data collected over the next 3 h indicate that cells further elongate, but alignment remains unchanged. Analysis of five different cells showed that the cell orientation angle, the angle between the major axis of the cell and the grating line direction, changes minimally during initial cell spreading (Fig. 2B), whereas cell length increases via elongation in the direction of the grating lines (Fig. 2C). Thus, initial contact with the grating pattern prompts the onset of cell alignment.

Further studies of cell alignment as a function of pattern height (Fig. 3A) revealed two critical heights: 1) the onset of cell alignment, and 2) the height where cell alignment reached a plateau. For all patterns studied, cells began to sense and respond to the nanopattern via cell alignment at ≈ 30 nm.[5] As the pattern height increased, the average orientation angle of the cell population continued to increase, reaching a maximum of up to 70 % of the cells aligned within 10° of the nanograting direction at ≈ 250 nm, depending on the shape of the nanograting evaluated. Thus, the onset of alignment is determined by the pattern height, whereas the plateau in alignment depends upon the pattern shape. In terms of surface chemistry, DMA and PMMA are more hydrophilic compared to PS. Therefore, cells were relatively more spread on DMA and PMMA flat surfaces and more elongated on flat PS surfaces. Alignment data were similar on PS and PMMA substrates, which had a similar shape but different chemistry, suggesting that the height of the nanotopography has a much stronger effect than substrate surface chemistry.

Our results revealed that cell alignment occurs very quickly, on a time scale in which thermodynamics dominate prior to active cellular processes taking over. We noticed that water droplets on these same PS and PMMA nanogratings also elongated, with the long axis of the droplet parallel to the grating lines, similar to cell elongation and alignment. In fact, the contact angle of the droplet, as seen looking parallel to the grating lines, varies as a function of pattern height in a manner similar

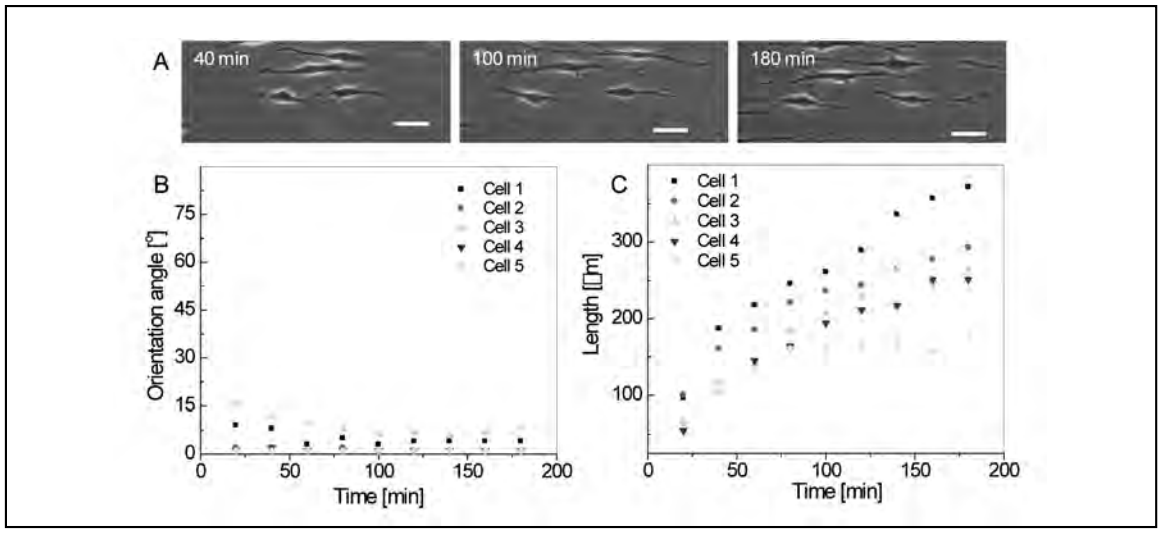


Figure 2. *Cell alignment as a function of time on DMA nanogratings with a pattern height of (320 ± 5) nm and a pitch of 800 nm. (A) Phase contrast images of cell attachment as a function of time. Scale bars = 50 μm. (B) Cell orientation angle for five individual cells during cell attachment. (C) Development of cell length for the same five cells as a function of time.*

to the variations in cell orientation (Fig. 3B). The spreading of the water droplet is governed by the work of adhesion, which depends upon the free energy of the system.[4] Since both the water droplet and the cell experience the same energetic barriers as they initially spread on a nanograting surface, the same thermodynamic calculations may also be applied to understand cell alignment. Our previous work indicates that while cells are highly complex entities with a complicated biological response, upon encountering a nanograting,[6] the initial contact and spreading (including orientation) of a cell can be described as that of a simple liquid.[4]

In summary, we have developed a versatile method to create polymer gratings (or other structures) with a gradient pattern height that decreases continuously from several hundred nm to a smooth surface (no pattern). Nanogratings with different chemistries and shapes and continuous variations in pattern height were used to determine the effect of the line-and-space patterns on cell orientation. Experimental results clearly demonstrate that the initial development of cell orientation is consistent with the notion that the work of adhesion associated with a water droplet spreading on a rough surface corresponds with the energetic barriers that cells experience during spreading. Thus, the thermodynamics governing the anisotropic spreading of water droplets on nanogratings can also apply to initial cell alignment. Using thermodynamics to predict cell alignment is a promising approach to design new materials and also to better understand the cell behavior.

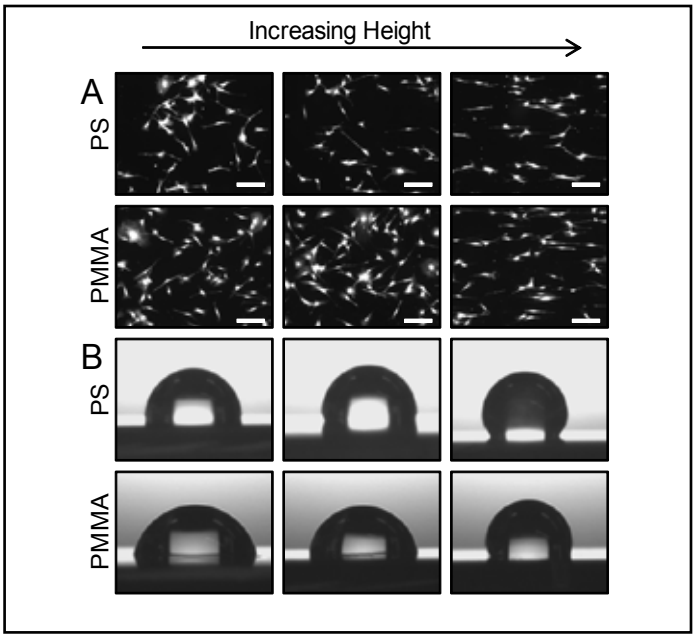


Figure 3. *Anisotropy due to increasing pattern height on 800 nm pitch nanogratings. (A) Cell alignment along the grating direction increases with increasing height. Scale bars = 50 μm. (B) Images of a water droplet as viewed looking down (parallel to) the grating lines reveal increases in contact angle as height increases.*

Acknowledgements
This work is partially funded by the National Institute of Dental and Craniofacial Research (NIDCR) through an Interagency Agreement (Y1-DE-7005-01) with NIST and by the NIST Office of Microelectronic Programs. We acknowledge the nanofabrication laboratory of the Center for Nanoscale Science and Technology (CNST) at NIST for providing facilities for the nanoimprint process, and acknowledge the use of the NIST Combinatorial Methods Center equipment.

References
1. Chen CS et al. Sci 1997;276(5317):1425-8.
2. Clark P et al. Dev 1990;108(4):635-44.
3. Stevens MM, George JH. Sci 2005;310(5751):1135-8.
4. Ding Y et al. Adv Mater 2010; DOI: 10.1002/adma.201001757.
5. Sun J et al. Biomacromol 2010; In press.
6. Gasiorowski JZ et al. Biomater 2010;31(34):8882-8.

Book Reviews

Biomaterials – A Nano Approach

Authors: S. Ramakrishna, M. Ramalingam, T.S.S. Kumar, W.O. Soboyejo
CRC Press, Taylor and Francis Group, copyright 2010, 350 pages.

This book is an excellent textbook for an introduction to biomaterials course. As you might recollect, I've reviewed several textbooks in this column that are suitable for an introduction to biomaterials course. Each textbook offers a unique slant on the field, which is not surprising given the diversity of our field. This particular book, as can be gleaned from the title, has a unique emphasis on "nano" aspects of biomaterials. The book chapters have traditional titles; such as, Basics of Human Biology, Degradation and Corrosion of Biomaterials, Failure and Tribology of Biomaterials, Metallic Biomaterials, Ceramic Biomaterials, and Polymeric Biomaterials, but what makes this book stand out as a valuable contribution to the biomaterials literature is that the authors consistently point out how the nano-aspects of both traditionally processed materials and newer nanobiomaterials impact biological performance. The final chapter, called Nanobiomaterials for Tissue Regeneration, brings all of the concepts together. I agree with the authors that the book "provides a solid framework for understanding the past, present and future trends in biomaterials with an emphasis on nano aspects of biomaterials". The authors have clearly put a lot of time and energy into the book as evidenced by detailed figures and tables that provide a wealth of information for both the new biomaterials student and the experienced biomaterials scientist. For example, Table 1.1 describes the evolution of biomaterials for human use. The table spans 2000 BC to 2006 AD. It is always fascinating to learn more about historical uses of natural materials such as elephant's tusks for artificial legs and teeth by the Egyptians in 2000 BC. Another outstanding feature of this book is the chapter-specific case studies, glossaries and exercises that make the new material accessible to the student and provide a means to reinforce their learning. Faculty members should give this book a close look since they may want to adopt this book for their course or at least use it as a resource for supplementary materials to augment their existing course textbook.

Orthopaedic Research: Why? What? How?

By Jonathan Black, Copyright 2009. (http://www.lulu.com) ($12 softcopy; $3 download). 132 pages.

This book, on some level, is the equivalent of "Tuesdays with Morrie" for junior biomaterials scientists. There are 15 chapters with titles such as: Asking Questions, Experimental Design, Some Ideas About Statistics, Research Notebook and Manuscripts. It is written in a grandfatherly style that does not detract from the valuable advice contained in this short book. This book is recommended as required reading for all new PhD or MS students in biomaterials because of the introductory style and inclusion of essential aspects of biomaterials research, such as writing laboratory protocols. These are the skills we need our students to have and often expect them to learn them without adequate training and modeling. This book provides the detailed instructions they need. These features, combined with the low cost of $3.00, makes it too good to pass up. To ensure full disclosure, note that Jonathan Black is Chair of the Scientific Advisory Committee for Stryker Orthopedics, Mahwah, NJ. This book was produced as a part of an educational publishing effort of the Homer Stryker Center, the educational component of Stryker Orthopedics.

From the Member-at-Large

Warren Haggard, Society Business & Membership News Contributing Editor

I am the current Society For Biomaterials (SFB) Member-at-Large. The Member-at-Large serves as an unencumbered representative of the Society's membership at the meetings of both the Board of Directors and Council. I am your voice and influence for these two groups and other Society committees. As I have learned these past few months, the Member-at-Large is also a member of several SFB committees, including the Program and Meetings Committee, so this position does give the membership much input on Society current activities and future plans.

For our Society to be impactful in today's scientific, technical and educational interactions within our membership and the outside world, we need active and engaged membership. I want to encourage you to seek ways to improve our Society and biomaterials use, development and research. I have a few suggestions for you to ponder regarding how to become more engaged; for example, consider: 1) joining a special interest group (SIG) but doing more than just join by taking a small leadership role; 2) volunteering to help a local SFB chapter with some portion of the program or activities; or 3) agreeing to assist when contacted regarding reviewing scientific abstracts for an upcoming meeting or chairing an annual meeting session. These suggestions are just a few of many ways to engage in your Society's future and progress and none of these suggestions are big "calendar eaters."

Again, I am your voice and influence in the Society's leadership and I have attempted to foster and promote the membership needs during the Society's committee meetings. To be very honest with the membership, we have very active, sensitive and cooperative Society leadership so promoting membership needs has been a collective effort and not my individual effort as the Member-at-Large. Even with collective efforts, we may still be missing an opportunity to enhance our Society so please contact me if you –the membership- have a potential issue, activity or enhancement that the Society leadership needs to discuss or address. You can contact me by telephone (901-678-4346) or by email (warren.haggard@memphis.edu). I look forward to continuing to serve as your representative on the Society leadership committees for the remainder of my term.

Biomaterials Education Tip – Technical Standard Access

In our continuing efforts to provide our classes and students real-world biomaterial applications, an international standards organization has made available a cost-effective approach for our course instruction. American Society for Testing and Materials (ASTM) International has developed a ten standard package that each student can access for just $10 for their class projects in a biomaterials or a senior design project class. To use this special standard package in a class, the course instructor registers the course online and selects up to 10 ASTM standards for use in the course. There is no cost for registering a course, and the registration takes about 5-10 minutes. The students in the class must join ASTM as student members, which is also free to them, so they may access all of the ten selected standards for just $10.

This cost-effective program from ASTM International allows students to access biomaterial, biocompatibility, mechanical testing standards and guides for their use in class projects and activities. I have used and continue to use technical standards in my Biomaterials and Senior Design classes. This program allows me to expand my students' access and understanding of real-world applications and tools. To learn more about this 10 ASTM standard program, please see www.astm.org/studentmember/Access_by_Course.html or www.astm.org/campus or call (610) 832-9552.

Editor's note: Dr. Haggard was named to a three-year term on the ASTM International Board of Directors in January 2009.

Look for information about these student events, to be held at the upcoming Society For Biomaterials (SFB) annual meeting:

- Student luncheon networking event with guest speaker
- Career fair
- Student business meeting

Announcing new 2010 student chapters:

- Wake Forest University / Wake Forest University Baptist Medical Center
- University of Texas at San Antonio/University of Texas Health Science Center at San Antonio

Quick guide for starting a student chapter at your school:

1. Find three students who are national members of SFB
2. Find a faculty member who is an SFB member at your school, who is willing to serve as the chapter advisor.
3. Write a constitution for your chapter - don't worry, this is easy with the constitution template we have online at http://www.biomaterials.org/student_section/form_chapter.cfm
4. Email Rebecca Riedesel at rriedesel@ahint.com with all of the information above. Then after a short review...presto...the student chapter will be official.

To renew a chapter, don't forget to send your new officer information to Rebecca so she can keep the records current!

Student Chapter Conference Call – we are planning a student chapter conference call for March 2011.

Community Calendar

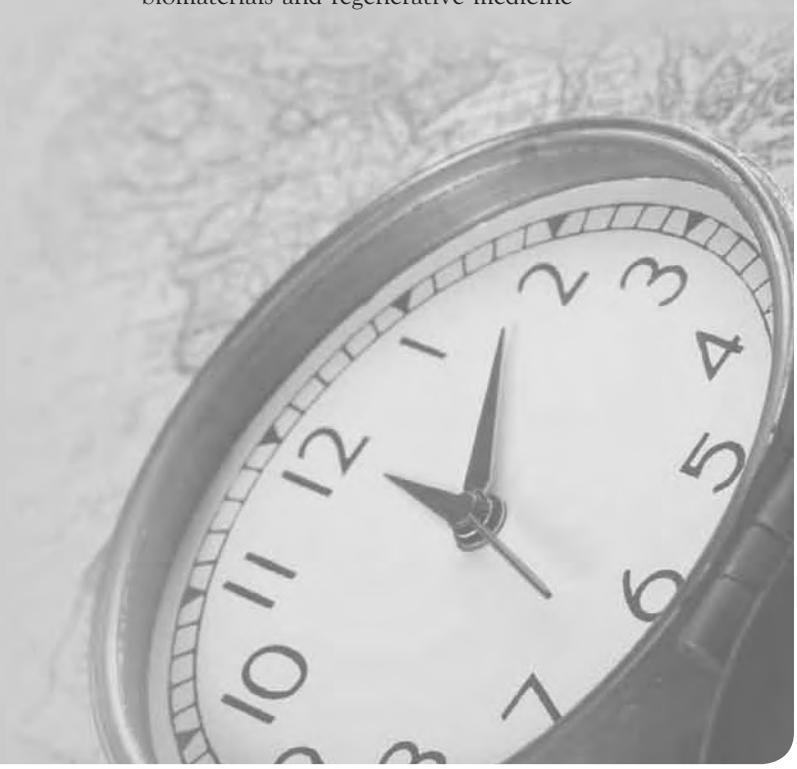
Society For Biomaterials 2011 Annual Meeting and Exposition
Orlando, FL
April 13–16, 2011
http://2011.biomaterials.org

Upper Midwest Biomaterials Day
Ann Arbor, Michigan
May 12–13, 2011
Website: www.bme.umich.edu/umbd/

Ceramics, Cells and Tissues 13th Seminar & Meeting
Faenza, Italy
May 17–20, 2011
http://cct.agenziapoloceramico.it

2011 Gordon Research Conference in Biomaterials and Tissue Engineering
Plymouth NH
July 31-August 5, 2011
www.grc.org

Summer School on Biomaterials and Regenerative Medicine
Trento, Italy
September 19–23, 2011
www.unitn.it/dimti/evento/15205/summer-school-biomaterials-and-regenerative-medicine



BioInk

Steve T. Lin, Industrial News Contributing Editor
From Press Release

Johnson & Johnson (New Brunswick, New Jersey) will pay $480 million for medical device maker Micrus Endovascular, adding a range of treatments for stroke and brain aneurysms. The announcement comes as drug and medical device maker Covidien announces the acquisition of the endovascular device maker ev3.

J&J's DePuy Orthopaedics Inc. unit (Warsaw, Indiana) said it is recalling hip implants because too many patients needed surgeries to replace the devices. The unit sold about 93,000 of the devices before phasing out production last year. The company said it's withdrawing the "very few" left on the market because new data indicates surgeons needed to replace them at a rate more than twice the industry average. The latest recall deepens concern about quality controls at the company. J&J's Vision Care Inc. unit withdrew about 100,000 boxes of contact lenses sold in Asia and Europe because a manufacturing problem prompted some customers to complain of pain, stinging or redness.

Synapse Biomedical Inc. (Oberlin, Ohio) has received Humanitarian Use Device approval from the Food and Drug Administration for its NeuRx Diaphragm Pacing System in certain amyotrophic lateral sclerosis (ALS) patients. Under the approval, the device that stimulates the diaphragm to contract — simulating a breathing motion — can be used for (ALS) patients who have stimulatable diaphragms and inadequate breathing. Humanitarian Use Device (HUD) designation establishes NeuRx DPS as a medical device intended to help treat a disease or condition that affects fewer than 4,000 U.S. patients per year.

Other News:

The **U.S. Food and Drug Administration** (FDA) Orthopaedic and Rehabilitation Devices Panel voted nine to four (one abstention) and ten to three (one abstention), that data including results from a large, prospective randomized clinical trial demonstrated the safety and effectiveness, respectively, of Medtronic's AMPLIFY™ rhBMP-2 Matrix for fusions of the lower spine in patients with degenerative disc disease. The benefits of this new bone graft option, which is specifically designed for single-level, posterolateral spinal fusion procedures, were also found to outweigh any risks associated with this product, by a vote of six to five against (three abstentions). AMPLIFY™ rhBMP-2 Matrix was found in the clinical trial to produce statistically higher rates of bone fusion at the designated 24-month endpoint compared to the control group, which used the patient's own bone harvested from the hip. AMPLIFY™ rhBMP-2 Matrix must be used in conjunction with a metallic posterior supplemental fixation device that is indicated for temporary stabilization of the spine.

The **Advanced Medical Technology Association**, **AdvaMed**, which represents the device industry, said its analysis of Class I recalls for 510(k)-cleared products shows that the process is "remarkably safe." Less than one percent of devices cleared since 1998 were involved in Class I recalls, according to the study. Class I recalls involve products that could cause serious injury or death. The study, conducted by Cambridge, Mass.-based Battelle Memorial Institute, included the roughly 47,000 medical devices cleared through the 510(k) process during that period. The study also found that only 0.08 percent of cleared devices were recalled for design reasons that might have been detected during pre-market review.

Society For Biomaterials

2011 ANNUAL MEETING & EXPOSITION

Animating Materials

APRIL 13-16, 2011
DISNEY'S CONTEMPORARY
RESORT IN ORLANDO, FLORIDA

KEYNOTE SPEAKER:

Anthony Atala, M.D., Director,
Wake Forest Institute for Regenerative Medicine

The meeting program will include the latest innovations in materials science, molecular and cell biology and engineering, new opportunities and mechanisms for translation of these findings to new or improved medical treatments, and engagement of attendees from industry and academia to accelerate the translation of research to clinical applications.

Society For Biomaterials
Giving life to a world of materials

http://2011.biomaterials.org