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BIOMATERIALS FORUM

First Quarter 2005 • Volume 27, Issue 1

Preparing Peptide-Polymer Hybrids

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2005 Officer Nominees

Biomaterials Forum, the official news magazine of the Society For Biomaterials, is published quarterly to serve the biomaterials community. Society members receive *Biomaterials Forum* as a benefit of membership. Non-members may subscribe to the magazine at the annual rate of $48. For subscription information, or membership inquiries, contact the Membership Department at the Society office (e-mail: info@biomaterials.org) or visit the Society's Web site, www.biomaterials.org.

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BIOMATERIALS FORUM

The official news magazine of the **SOCIETY FOR BIOMATERIALS** • Volume 27, Issue 1

Special interest Group Reporters

BIOMATERIALS FORUM
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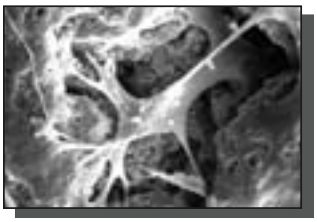
Features



Scanning electron micrograph showing osteoblasts migrating into the macropores of a calcium phosphate cement scaffold where cells are colonized on the pore bottom and established cell-cell junctions. From: Hockin H. K. X. et al., Strong, Macroporous and In-Situ Hardening Hydroxyapatite Scaffold For Bone Tissue Engineering.

Departments

The Torch

Special Interest Group News

Book Review

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Biomaterials Community

From the Editor

Challenges to Look Forward To

With the support of the Whitaker Foundation and advocacy of the AIMBE (American Institute for Medical and Biological Engineering) among many others, biomedical engineering/bioengineering is now recognized as a stand-alone discipline, a profession, a landmark in health care technology and patient care. Despite the focus of any bioengineering application, materials are needed to fabricate devices, to interface with the natural tissues and organs, or to acquire vital signals among others. Without any doubt, biomaterials science and engineering is an anchor of this discipline. Members of the Society consider it a discipline of its own, a particular branch of scientific knowledge, a profession, an occupation requiring special education.

For the past four decades, biomaterials innovations from the macroscale to the nanoscale pioneered by members of the Society have clearly benefited humankind. Research papers, manuscripts, and conference proceedings describing biomaterials advances are annually published by the thousands. Biomaterials is now a research focus at many other professional societies as pointed out by President Myers in this issue of *Biomaterials Forum*. New professional societies such as the Controlled Release Society and the Tissue Engineering Society have taken roots at the Society For Biomaterials. Biomaterials bridges funding agencies; one of the first joint funding programs between the National Institute for Biomedical Imaging and Bioengineering and the National Science Foundation included biomaterials (NIH-NSF Bioengineering and Bioinformatics Summer Institutes at Penn State University and Clemson University). According to the Whitaker Foundation, 67 percent of the 122 institutions offering academic programs in biomedical engineering/bioengineering offer one or many biomaterials courses in their curricula. Dissemination of biomaterials as an intrinsic research and education field has clearly been successful over the years. Many accomplishments to be proud of as a Society! What else remains to be done, one could ask? Build more successes, another would reply!

Since it is customary to make New Year's resolutions at the beginning of a New Year, here are some resolutions for 2005 that will help the Society build more success stories:

- Pay membership dues on time and yearly
- Enroll in a Special Interest Group
- Participate actively in a Special Interest Group
- Nominate a deserving colleague or student for a Society's award or Society membership

Continued on page 3

Letter from the President

Happy New Year!

Happy New Year, everyone! Inspiration for the title of this article came during hours at the airport (hours that are longer than in almost any other place, I think) following a meeting at the National Materials Advisory Board (NMAB) of The National Academies. The daylong session was the last in a series of four meetings of materials-focused technical societies to determine the potential for a "Materials Roundtable." As we learned over the 18-month planning process, "roundtable" has a specific meaning to the folks at The National Academies. It is a group convened for the purpose of asking questions and finding the means to educate themselves (and other interested parties) on topics of importance to the group. NMAB already has a Roundtable on Biomedical Engineering Materials and Applications (BEMA), which has several Society members on its roster. While a roundtable's discussions remain unpublished, the proceedings of special workshops initiated by the group can become available to a wider audience. A good example is the 2004 publication of "Science-based Assessment: Accelerating Product Development of Combination Medical Devices," the proceedings of the April 2003 BEMA workshop of the same name. You can see the workshop abstracts at www.nap.edu (search on "medical devices").

The Society For Biomaterials (SFB) has been in recent contact with the American Society for Artificial Internal Organs (ASAIO), the Materials Research Society (MRS), and the Institute of Electrical and Electronics Engineers (IEEE) to discuss areas of mutual interest, and plans for a day of collaborative sessions with the tissue engineering societies are in the works for our 2006 annual meeting in Pittsburgh. The proposed NMAB Materials Roundtable, however, will operate on a different and influential plane for sharing information about public policy and awareness approaches, outreach to K-14 teachers and students, and other national issues. Speaking about teachers and students, a 2002 National Academies publication focuses on the urgent need for technological literacy in the U.S.:

> "The argument for technological literacy is fundamentally about providing citizens with the tools to participate fully and confidently in the world around them. This aim is not unique to technological literacy; many other literacy campaigns—in reading, mathematics, science, and history, to name just a few—have similar goals. The unique aspect of this campaign is that it will prepare people—from policy makers to ordinary citizens—to make thoughtful decisions on issues that affect, or are affected by, technology. …" (from "Technically Speaking: Why All Americans Need to Know More About Technology," National Academy Press, 2002, page 12)

The Society certainly can fulfill its public mission as a nonprofit organization by promoting biomaterials literacy to a larger audience. Our recent interactions with other societies are good steps in this direction.

Frankly, as a result of the NMAB planning process and our off-line meetings with societies such as ASM International and The Minerals, Metals & Materials Society (TMS), I have a new perspective on what the SFB is about. My new perch reveals that we are unique in the combination of our size, the proportions of our members in industry and academia (about 50:50), the large numbers of graduate students in our student cadre, and the range of basic and applied research presented at our meetings. It is that range—basic as well as applied, science as well as engineering, laboratory as well as clinical, clinical specialties as well as crosscutting technologies—that is the foundation for strong biomaterials literacy among our members and their communities. Each year, I encourage you to attend a few SFB meeting sessions on topics different from your own current research. This is one of the best ways for you to become more informed in the entire field of biomaterials. (Besides, serendipity is a powerful element of innovation!)

Finally, I ask you to re-read the above excerpt about technological literacy. Only this time, replace "citizen" with "SFB member" to reach another, but equally useful, form of biomaterials literacy—that of participating in the organization, planning, and governance of our Society. It begins with your membership, advances with your votes at officer elections and at the business meeting, and shines with your participation on any of a number of committees. Please let me know if I can do anything to help you make the most of your Society membership. I am looking forward to hearing from you in the coming weeks, and seeing you in Memphis. Once again, best wishes to you for the New Year!

From the Editor

(Continued from page 2)

- Host a Biomaterials Day
- Attend the business meeting of the Society in Memphis and bring colleagues
- Volunteer as a committee member for the Society

All members of the Society and friends are challenged to lead the above resolutions to success, individually and as a team, and make 2005 the greatest Biomaterials Participation Year.

The editorial staff of *Biomaterials Forum* wishes you a prosperous and stimulating 2005. We look forward to informing you about the latest news within the biomaterials community and the Society For Biomaterials.

Staff Updates from Headquarters

The Torch
By Dan Lemyre,
Assistant Executive Director

Hello from the Society For Biomaterials' new headquarter offices! As of January 14th, 2005, the Society For Biomaterials new address is 15000 Commerce Parkway, Suite C, Mount Laurel, NJ 08054. E-mail and phone contact information remains the same. The move was only across the parking lot, but we still had to pack, and our address did change, albeit by one digit. Following is a summary of what's gone on in the last quarter, and what's to come…

SFB's 30th Annual Meeting
April 27-30, 2005
As we gear up for the Society's first Annual Meeting since the management transition, we realize there are still areas in which we need to improve the service we provide the Society's members—namely, abstract submissions. We will be reverting to a more traditional method of uploaded Word documents and/or PDF files for the 2006 meeting in Pittsburgh, Pa. Despite the difficulty with some of the abstract submissions, great strides have been made on the program, and the 2005 Annual Meeting in Memphis is set for great success! A summary of the program is available on the SFB Web site, www.biomaterials.org, and a more detailed version will be posted shortly.

We recently concluded the program planning meeting in Memphis, and if you haven't been, the program committee would like to recommend the ribs at the Rendezvous! We're also going to be in town for what promises to be an exciting time in Memphis; "Memphis in May" launches the weekend of our arrival, and Beale Street and the downtown area will be showcasing the food and music that is uniquely Memphis! For more information on this event, visit www.memphisinmay.org. Registration and hotel accommodation information are available on the SFB Web site. See you in Memphis!

2005 Elections
In this issue, you will see the new slate of officer candidates being presented for the 2005 election. Staff worked with the Awards, Ceremonies and Nominations Committee to gather nominations, and compile and tabulate reviews. Ballots will be mailed shortly, and the online election Web site will be up and running by February 1. As always, all voting is anonymous and results will be tabulated by an objective third party.

Membership Renewal Online
You can now renew your SFB membership on the SFB Web site. Remember, to access the "members only" section of the Web site, your username is the e-mail address on file with the Society and your password is your SFB membership number. We will also be launching an online membership application in the near future.

The Journal of Biomedical Materials Research
Our negotiations with John Wiley & Sons continue to go well. Stay tuned for more news on this item in the next issue of *Biomaterials Forum*.

WWW.BIOMATERIALS.ORG
In addition to the new online membership renewal, and forthcoming membership application Web sites, Rick Gemeinhart and Elaine Duncan, the Society's Web site co-editors, are working to reinvigorate the site with new content and functionality. Please feel free to send any suggestions for improved services to info@biomaterials.org.

2005 SFB PROGRAM COMMITTEE IS PLEASED TO ANNOUNCE

Cato T. Laurencin, M.D., Ph.D., Lillian T. Pratt Distinguished Professor & Chair, Department of Orthopaedic Surgery, Professor of Biomedical Engineering, Professor of Chemical Engineering, The University of Virginia

& Member of the National Academy of Science-Institute of Medicine

AS THE Keynote Speaker FOR THE

30th Annual Meeting & Exposition of the Society For Biomaterials

TENTATIVE TITLE: Musculoskeletal Tissue Engineering Past, Present, and Future

Membership Dues and Society Finances

The Torch
By Lynne Jones, Secretary-Treasurer-Elect

Dues notices went out during the last week of November. If you have not done so, we encourage you to renew your membership as soon as possible. Every year at this time, the dues notice raises several questions in my mind. They all begin with: why?

Why do we need to collect dues? There are several sources of income for the Society For Biomaterials, including membership dues, annual meeting registration, registration for other educational activities (including workshops), corporate donations/sponsors, and grants (such as the soon-to-end Whittaker Foundation grant).

Why isn't the meeting registration fee enough? The annual meeting registration fees offset the cost of the annual meeting (usually). And if this is where the Society activities ended, then it might be enough. However, the Society is an active entity throughout the year. Other activities include those associated with publishing three Society-associated publications: the *Journal of Biomedical Materials Research, Applied Biomaterials*, and *Biomaterials Forum*. In addition, there are costs associated with networking efforts within the Society through Special Interest Group activities, committees, and Council and Board meetings.

Why does it cost so much for the Society dues? As many of you well know, $205 of the dues goes towards the subscriptions for the two major journals mentioned previously. As a result of the current agreement with the publisher, only student members can opt for membership without a subscription. We are currently negotiating with the publisher for our next contract period, which begins in 2006; we will keep you informed of any changes in the status of our agreement.

What do you get for the remaining $45? Actually, you get quite a bit. You receive reduced fees for the annual meeting and other Society educational events. You get discounts on Society publications, such as the recently released "Biomaterials Science: An Introduction to Materials in Medicine, 2nd edition." You can receive other publications at a discount listed on the bookstore pages of the Society Web site. You receive a copy of *Biomaterials Forum*, the official news magazine of the Society. Not only can you find out what is happening in the field of biomaterials (including at the government level), but you can also use the news magazine to provide announcements of promotions and awards that you receive. You get access to the "Members Only" section of the Society Web site. This gives you the opportunity to use the member directory to access

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A Time of Change

The Torch
By C. Mauli Agrawal, Secretary/Treasurer

The past 18 months have been a time of change for the Society For Biomaterials. After 14 years of working with one management company, the leadership of the Society decided that it was time to move on. It was time for new ideas, new initiatives, and revitalization. Thus, we hired Association Headquarters to manage the affairs of the Society. Every change comes with an accompanying set of challenges, and this has been true for us as well.

The first challenge was a successful transition from one managing office to another—from Minneapolis to Mt. Laurel, New Jersey. This proved to be no easy task because in addition to active financial accounts, contracts, and other business documents, 14 years of records and history had to be transferred. For the most part, this transition was smooth apart from a few hiccups. Credit goes to member volunteers who gave long hours of their time to oversee different aspects of the transition.

The next challenge was to manage the financial health of the Society. Changing management companies and signing the required contracts resulted in additional expenditure. The transition came in a World Congress year when we did not have to plan and hold an annual meeting. This was a blessing because it would have been difficult for a new management group. However, the flip side of the coin was that we did not have access to the surplus funds that our annual meetings generate; funds that help us avoid red ink on our financial statements. Although we continue to stay financially viable as a society and continue to maintain reserves, we will close the books for the year 2004 showing a loss. Once again, due to a resurgence of volunteerism in the Society, we have been able to cut costs and minimize losses.

In an effort to provide our membership with the opportunity to attend a Society's scientific meeting in the United States this year, the leadership of the Society decided to organize a small meeting. Focusing on regenerative medicine, this meeting was held in Philadelphia in October and saw a sizable

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Anybody Have a Vision?

The Torch

By Michael Sefton,
Long-Range Planning Committee

This brief article is directed to those who are interested in the future state of the Society, like me and the other members of the Long-Range Planning Committee.

The Committee is worried about the future and we seek your advice. There is a new buzz about biomaterials, and the Society has received requests from a variety of professional societies about collaboration and shared programming. As one example, the Biomedical Engineering Society is promoting its discipline and the large student population that energizes the group, but they envy the industry participation that we enjoy. The Society For Biomaterials is no longer centered around the medical implant, so we have to ask ourselves: What are we, and what should we be doing to get where we want to be in 10 years?

To help set goals and plan ahead, we're asking for your thoughts on the following questions:

- 10 years from now, what will the role of the Society be in the new world of combination products, tissue engineering, nanomedicine, and medical devices?
- What do we mean by "biomaterials" in the term "Society For Biomaterials" (e.g., biomaterials as an enabling technology)?
- What do we mean by "Society" (e.g., professional or technical)?
- How do we define or brand ourselves?

Please e-mail me (sefton@chem-eng.utoronto.ca) or contact one of the other members of the committee with any suggestions or thoughts.

Fun, Food, and Music - The Memphis Way

The Torch

By Joel D. Bumgardner, Jack Parr,
Paul Kovacs, Shah Jahan

Contrary to popular myth, there was a Memphis before Elvis! In 1819, Andrew "Old Hickory" Jackson, John Overton, and James Winchester founded Memphis on a bluff overlooking the Mississippi River. The site was used as a fort by early Spanish and French explorers and was high enough to provide protection against flooding. The town grew into a major riverboat and trading center due to abundant agriculture in the region and its strategic location between New Orleans and the Ohio Valley. The city has survived the Civil War, yellow-fever epidemics, bankruptcy, and the assassination of Dr. Martin Luther King during the civil rights movement to become one of the leading cities in the South. The city now boasts a rich musical heritage as the "Home of the Blues," and "Birthplace of Rock 'n' Roll" and, with FedEx, has built on its early trading history to become the major cargo and distribution center in the United States. The city also supports national sports, entertainment and arts programs including the NBA Grizzlies, Memphis Redbirds Triple-A baseball, the National Civil Rights Museum, Stax Museum of American Soul Music, WONDERS-the Memphis International Cultural Series, Memphis Opera, Mudd Island, The Peabody Ducks, and the world-famous Beale Street.

Most dining, entertainment, and attractions in the downtown area are within easy walking distances or short trolley rides from the convention center and local hotels. The trolley, which runs approximately every 10 minutes, costs $0.60 per ride, or 1 or 3 day passes for $2.50 or $6 respectively (www.matatransit.com).

Dining Out

Some personal recommendations for dinning out include: Café Francisco (roasts its own coffee, features specialty sandwiches, and has high-speed Internet), Sleep Out Louies (fresh oysters, sandwiches, and prepare to leave your tie), Sekisui (sushi and Japanese cuisine), The Rendezvous (world famous ribs and barbecue - be sure to enter through alley), Café Samovar (Russian cuisine), Butcher Shop Steakhouse (steak - what else?), Erika's German & American Restaurant (German fare), Sawaddii Thai (traditional Thai menu and curries), Chez Philippe (in the Peabody, upscale French), McEwens (upscale American-continental), Grill 83 (steaks and seafood), Automatic Slim's Tonga Club (southwestern-Caribbean fusion), and Dyer's Burgers (Memphis original since 1912). Both the Overton Square and the Cooper-Young districts are within a 15-minute drive or cab ride, and feature a variety of restaurants such as Paulette's (French), Dancing Pig BBQ Shop (barbecue), Huey's (best burgers and sandwiches in town), The Beauty Shop (chairs are '50s hairdryer stations), Tsunami (seafood with Asian influence), and Young Avenue Deli (sandwiches, wraps, and salads).

Attractions

During breaks from the meeting, be sure to visit the top of the Madison and the Peabody Hotels for an impressive view of the city. The Peabody ducks march at 11 a.m. and 5 p.m. daily. Take the trolley to just south of Beale Street to visit the Gibson Guitar Factory and the Memphis Rock 'n' Soul Museum. A little further, a field is the South Main Street district that hosts

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Erratum - Fellows Biomaterials Science and Engineering

In the last issue of *Biomaterials Forum*, a tribute was made to the Fellows, Biomaterials Science and Engineering (FBSE) recently inducted at the 7th World Congress in recognition of their leadership in the field of biomaterials. The editorial team sincerely apologizes for having neglected to include many scientists, engineers, and clinicians who have been recognized by the other members of the International Union of Societies for Biomaterials Science and Engineering (IUSBSE) as pioneers and leaders, and inducted as Fellows in 1996 (known then as the International Liaison Office). In fact, when the Fellowship status was first introduced, each of the societies supporting the launch of this status nominated Fellows, not just the Society For Biomaterials. From the beginning, this initiative was an initiative on an international level. Even though the Society played an important role in it, the activities were channelled through the "International Liaison Office." The status of FBSE is clearly an outstanding recognition for individuals who have led, and continue to lead, the field of biomaterials science and engineering.

Toshihiro Akaike
Luigi Ambrosio
Yilin Cao
David Castner
Chun-Yiu Cheng
Chong-Su Cho
Adam Curtis
Stuart Goodman
Hans Griesser
Zhongwei Gu
Kazuhiko Ishihara
Hiroo Iwata
John Jansen
Kazunori Kataoka
Haruma Kawaguchi
Joachim Kohn
Hai Bang Lee
Shi-Bi Lu
Takehisa Matsuda
Bruce Milthorpe
Takashi Nakamura
Hajime Ohgushi
Russ Parsons
Heinrich Planck
Josep Planell
Julio San Roman
Paul Santerre
Etienne Schacht
Samuel Stupp
Yong Kiel Sung
Elizabeth Tanner
Tetsuya Tateishi
Pertti Tormala
Shenguo Wang
Kangde Yao
Antti Yli-Urpo
Lian Zhou
Hesun Zhu
Noriya Akamatsu
Charles Baquey
Mario Barbosa
Rena Bizios
Henry Brem
Karin Caldwell
John Davies
Wouter Dhert
Linda Griffith
Hitoshi Hamanaka
Jeffrey Hubbell
Yoshito Ikada
Jacqueline Jozefonvicz
Bent Kasemo
Young-Ha Kim
Un-Young Kim
James Koeneman
Tadashi Kokubo
Jindrich Kopecek
Cato Laurencin
Eugene Lautenschlager
Michael Lee
Heng-De Li
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Klaus Schindhelm
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Peter Thomsen
Paulo Tranquilli-Leali
Clemens van Blitterswijk
Jerome Werkmeister
Gregory Wilson
Yao-Ting Yu
Xingdong Zhang
Ren-Xi Zhuo
Harold Alexander
James Anderson
Joseph Andrade
Kazuhiko Atsumi
John Autian
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Norman Cranin
Klaas de Groot
Michael E. DeBakey
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Jan Feijen
Jorge Galante
Ulrich Gross
Robert Guidoin
Garth Hastings
Gunther Heimke
Jorge Heller
Larry Hench
Allan Hoffman
Thomas Horbett
Rolfe Howlett
Samuel Hulbert
Derek Jones
Marcel Jozefowicz
Lawrence Katz
Haruyuki Kawahara
Sung-Wan Kim
James Kirkpatrick
William Kolff
Robert Langer
Clive Lee
Robert Leininger
Jack Lemons
Robert Levy
Donald Lyman
Edward Merrill
Ishi Miura
Akio Nakajima
Marcel Nimni
Yukihiko Nosé
Seizo Okamura
Nicholas Peppas
William Pierce
Robert Pilliar
Arturo Pizzoferrato
Hanns Plenk
Solomon Pollack
Berton Rahn
Buddy Ratner
Yutaka Sakurada
Yasuhisa Sakurai
Thomas Salthouse
Tadashi Sasada
Philip Sawyer
Frederick Schoen
Michael Sefton
Dennis Smith
Teiji Tsuruta
Thomas Valega
Georges van der Perre
Michel Vert
Andreas von Recum
Leo Vroman
David Williams
Takao Yamamuro
Akio Yamanaka
Ioannis Yannas
Takeo Yokobori
Walter Zingg

Memphis, "America's Distribution Center," Welcomes the Society For Biomaterials

The Torch

By Mike Demster, vice president, Memphis BioWorks Development Council

As the world headquarters to FedEx, Memphis has become well-known as "America's Distribution Center" by becoming the largest international port of entry for air cargo. What is less well-known is the growing industry position of the Memphis region within the biosciences. Today, the broad-based collection of bio-industries in the region employs over 36,000 workers across 310 establishments.

Memphis has a rich history of physician innovators and device-makers, and is the second largest producer of orthopedic medical devices in the U.S. Global device makers, such as Smith & Nephew, Medtronic Sofamor Danek, Gyrus ENT, and Wright Medical, are all headquartered in Memphis. An energized academic and research community, led by the University of Memphis, the University of Tennessee Health Science Center, and St. Jude Children's Research Hospital, adds even greater depth to the local resources focused on research and development, training, commercialization, and the transfer of technologies.

In an effort to promote the continued development of the biosciences as a major economic driver, Battelle Memorial Institute was retained in 2003 to build the roadmap for Memphis' future direction. Part of that roadmap included branding the region's resources, "Memphis BioWorks - Where Biosciences Come to Life and to Market."

Led by the Memphis Biotech Foundation, the Memphis BioWorks initiative is focused on moving Memphis forward as a vibrant and diversified bioscience region. The major areas of focus will be a center for orthopedics and medical devices, a thriving academic community, strong clinical programs in area institutions, and a highly successful Central Medical District. Demolition work will begin in early '05 as the prelude to the construction of the UT/Baptist Research Park, and new UT College of Pharmacy building.

The Memphis BioWorks Development Council, organized under the Memphis Regional Chamber, serves as the body seeking to engage all the bioscience organizations and institutions in a collaborative effort toward economic development. With 55 member organizations and growing, the Council is learning to work together in realizing our city's economic potential in the biosciences, and raising the visibility of the outstanding work conducted here. Additional information on our local and regional bio-industries, activities and other events may be found on our Webpage at www.memphischamber.com/BioWorksNews/indexhome.html. We welcome you and the Society For Biomaterials conference to Memphis and look forward to having the opportunity to share with you more about our efforts during your visit. The Memphis BioWorks Development Council wishes a productive and enjoyable conference to all attendees of the Annual Meeting of the Society For Biomaterials.

2006 Annual Meeting: Your Say, Your Program, Your Meeting

The Torch

By W. John Kao

As the Society prepares for its upcoming conference, planning for the 2006 Annual Meeting is underway. The meeting will be held from Thursday, April 27, to Sunday April 30, 2006, in Pittsburg, Pa. To expand on the success of joint sessions with BMES in our 2004 Fall Symposium, the 2006 meeting will have potential overlaps with the Tissue Engineering Society and ASAIO to reflect and enhance the diversity and value of our membership. The Meeting Leadership team consists of SFB 2006 Meeting Committee Chair W. John Kao, SFB President Elect Michael Sefton, and an array of both young and established researchers from academia, industry, and government in the United States and abroad.

You have a say in the program development of this meeting. All are encouraged to submit topic ideas, potential keynote speakers, and advice directly to John at wjkao@pharmacy.wisc.edu. A standardized submission form for symposium and workshop proposals will be available on the SFB 2006 Annual Meeting Web site. Please go to www.biomaterials.org for that link. Students and young investigators are especially encouraged to submit proposals. The meeting announcement and the call for papers are tentatively scheduled to appear in July/August 2005. The deadline for abstracts is tentatively scheduled for early November 2005.

The meeting committee will work hard for you, and with you, to bring a conference that you can get excited about!

A Universal Synthetic Methodology to Prepare Peptide-Polymer Hybrids

By Ying Mei

The design of next generation of tissue engineering scaffolds requires biomaterials with well-defined architecture, appropriate mechanical properties, and proper biological ligands, which could specifically interact with cell receptors. Polymeric materials can provide tunable mechanical properties and good biocompatibilities, and oligopeptides can modulate the cell functions such as adhesion, spreading, and differentiation. Therefore, it is of great interest to create a flexible synthetic methodology to integrate cell-signaling peptides with synthetic polymers.

Recently, biomaterials with tailored structures received much attention because by manipulation of their nanostructure, the biomaterials could engage the cell receptors more efficiently through controlling spatial organization of multiple ligands. Rapid development of "controlled" polymerization techniques, such as atom transfer radical polymerization (ATRP), allows the design and preparation of biomaterials with well-defined architectures. Unlike the other "living" polymerization

Scheme 1. *The solid supported peptide and polymer.*

techniques, the ATRP syntheses of polymers with well-controlled molecular weight and molecular weight distribution do not stringently require water-removal and the chemistries of ATRP are tolerant to a wide range of functional groups. By combining the solid phase peptides synthesis and ATRP, we prepared the RGD-terminated poly(2-hydroxyethyl methacrylate) [poly(HEMA)]. Poly(HEMA) was chosen because it is one of most extensively studied biocompatible, hydrogel-forming polymers and it resists protein adsorption and cell attachment. By incorporating cell-signaling peptides such as RGD into poly(HEMA), the interactions between cells and biomaterials with the well-defined molecular structure can be controlled.

The successive steps in the synthesis of peptide-polymer hybrids were shown in Scheme 1. More specifically, we employed the solid phase peptide synthesis to add peptides to Wang resin, coupled the ATRP initiator to the peptides, and used ATRP to prepare poly(HEMA) from peptide-loaded solid supports.

Solid-state 13C NMR (Figure 1) was employed to follow the consecutive reaction steps. The results from solid-state 13C NMR was confirmed by MALDI-TOF MS, and 1H NMR analyses of the products cleaved from the resin.

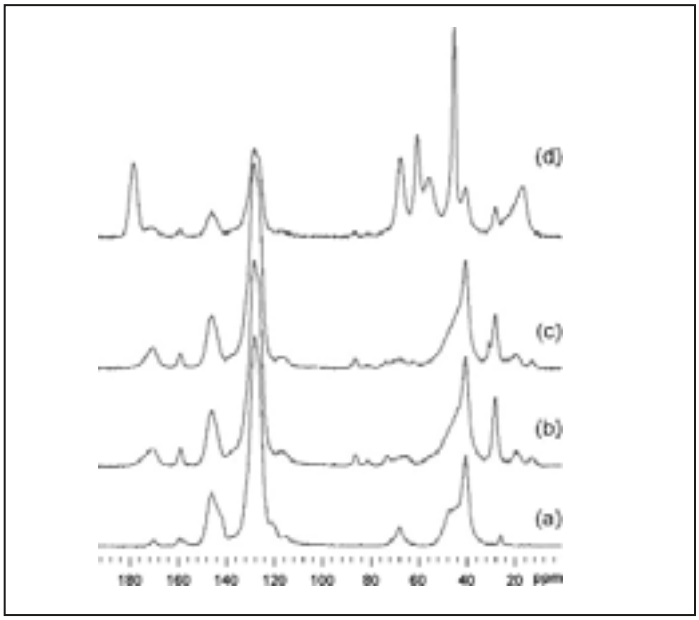

Figure 1. *The solid state 13C NMR spectra of Fmoc-glycine Wang resin (a), GR(Pbf)GD(Obut)S(But) Wang resin (b), GR(Pbf)GD(Obut)S(But)-initiator Wang resin (c), R(Pbf)GD(Obut)S(But)-poly(HEMA) Wang resin (d).*

The successful syntheses of peptide-polymer hybrids were confirmed by the various analytical techniques mentioned previously. It is important to point out that the polydispersity of the peptide-polymer hybrids prepared by ATRP from solid support (1.29) was found similar to the polydispersity (1.3~1.5)

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2005 Officer Nominees

The task of selecting the slate of Officer Nominees for 2005 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 will be distributed soon and are available on the Society's Web site.

Following are brief descriptions of the responsibilities of each position, along with a description of the nominees' biographical background and their Society experience. Each nominee has also developed a vision statement for the Society that they would work to achieve should they be elected.

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, and 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

C. Mauli Agrawal, PhD, PE

Mauli Agrawal is the Director of the Institute for Bioengineering and Translational Research and the Peter Flawn Professor of Biomedical Engineering at the University of Texas at San Antonio. He also serves as the Associate Dean for Graduate Studies and Research. In 1997 he co-founded Xilas Medical, which is a medical device company now selling FDA-approved products.

Mauli received his PhD in materials science from Duke University in 1989. Prior to that, he obtained his MS from Clemson University, and his BTech from the Indian Institute of Technology at Kanpur, India. Following his graduation from Duke, he served on the faculty at Duke until 1991, before he moved to San Antonio to establish a new biomaterials program that has now diversified and grown into a biomedical engineering graduate program that he chairs.

The primary focus of Mauli's research is in the area of polymeric biomaterials used for orthopaedic and cardiovascular tissue engineering applications. His laboratory has also studied wear debris from total joint prostheses for more than a decade and has developed a particle characterization methodology, which is now the basis for an ASTM standard. He has authored more than 220 scientific papers and articles, and has 15 patents issued or pending. Several of these patents have been licensed to the industry and have resulted in the formation of new start-up companies.

An active member of the Society For Biomaterials since 1991, Mauli has been an ardent volunteer and has served the Society in various capacities, including: Secretary/Treasurer and Secretary/Treasurer-Elect (2001-2005); Program Chair, Annual Meeting at St. Paul/Minneapolis (2001); Program Committee (1999-2003); Member-at-Large on Board of Directors (1999-2000); Assistant Program Chair, Annual Meeting at Providence (1999); Chair, Orthopaedic Biomaterials SIG (1988-1999); Chair, Membership Committee (1997-1999); Member, Council (1997-1999); Member, Long Range Planning Committee (1997-1998); Member, Committee for Education and Professional Development (1996-1997); Member, Sub-committee on Member Status Development (1993-1995).

He also served as a Contributing Editor for the *Biomaterials Forum*

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Elaine Duncan, MSME, RAC

Elaine Duncan is the founder and president of Paladin Medical Inc. The firm specializes in regulatory/clinical and developmental strategies for new medical technology development. Elaine has held key executive positions in start-up medical companies, including VP of new ventures, VP of research and development, and VP/director of regulatory affairs/quality assurance. Prior experience in corporate acquisitions and technology assessment provides Elaine with a unique understanding of the dynamic medical industry. Her experience has proven invaluable to clients wishing to optimize biomaterials selection, biocompatibility analysis, device qualification and "in-life" testing. Elaine has had broad development and clinical trial experience in diverse areas, including artificial hearts, vascular grafts, urology, disposable sterile products, and powered standing wheelchairs.

Elaine has served more than two decades as an active member of the Society For Biomaterials and currently serves on the Board of Directors as the representative of all Special Interest Groups of the Society. She received the C. William Hall Award from the Society for service in advancing the goals of the Society in 1999. Elaine is the former editor of *Biomaterials Forum* and contributes frequently to a variety of biomedical industry publications.

Elaine is a member of numerous other biomedical organizations, including ASAIO, AAMI and BSME and ASTM-F-4. Elaine has served as advisor to biomedical education programs at the University of Minnesota, Clemson University, and the University of Kentucky, her alma mater, where she currently serves on the Dean's Advisory Committee for the College of Engineering. Elaine was honored in April 2000 with induction into the University of Kentucky College of Engineering Hall of Distinction and received the Medical Alley Outstanding Contribution to the Health Care Industry Award in 1992.

Vision Statement:

The Society For Biomaterials must be vital, diverse, and dynamic to attract multidisciplinary professionals. The Society's mission is as important in 2005 as it was in 1975. It is easy to complain that the Society is not keeping up with "new biomaterials" or that it has

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Secretary/Treasurer-Elect

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

Nominees for Secretary/Treasurer-Elect

Alan S. Litsky, MD, ScD

Alan S. Litsky is an associate professor of Biomedical Engineering and Orthopaedics at Ohio State University, 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 M.I.T. Alan is Director of the Orthopaedic Biomaterials laboratory at Ohio State University. His research focus is hard-tissue biomaterials with an emphasis on 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. Continuing research projects include quantifying the micromotion between components of total hip arthroplasties, the use of shape-memory alloys for fracture fixation, and the fatigue behavior of external fixators and dental prostheses. Alan teaches three courses on biomaterials and a course on professional and ethical issues in biomedical research.

Alan has served on the Orthopaedic study section at NIH and on the American Academy of Orthopaedic Surgeons' Basic Science Evaluation subcommittee. He is currently chair of the Arthritis Foundation's Technology and Biomechanics study section and sits on the editorial boards of the *Journal of Biomedical Materials Part B - Applied Biomaterials*, *Technology and Health Care*, 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), and the Membership Committee (2004-2005). Alan has also been an active participant in workshops and plenary sessions at recent Society meetings.

Vision Statement:
If elected to the position of Secretary/Treasurer-Elect, I will work to continue the Society on a sound fiscal path and to develop a long-term budget strategy to bridge the Society across the World Congress years, when it does not host an annual meeting. I hope to also continue past efforts to increase student involvement in Society decision-making processes.

Anthony M. Lowman, PhD

Anthony M. (Tony) Lowman is currently the Associate Dean for Undergraduate Engineering and an Associate Professor of Chemical Engineering at Drexel University, where he has been on the faculty since 1997. He also has appointments in the Department of Materials Science and Engineering and the School of Biomedical Engineering at Drexel. Prior to joining Drexel, he was educated at the University of Virginia (BS) and Purdue University (PhD), where he received degrees in chemical engineering.

In addition to his main academic appointment, Tony has been active in international collaboration with major research centers around the world. He has served as a Visiting Professor at Hoshi University of Tokyo, Japan, and as a Visiting Researcher at the University of Parma, Italy. Additionally, in 2002 Tony co-founded Gelifex Inc., a company pursuing methods for using hydrogels for repair of the nucleus pulposus of the intervertebral disc. Tony served as chief technical officer of Gelifex until 2004 when Gelifex was acquired by Synthes.

Tony's research contributions have been in the area of polymers for biomedical applications. He is known for his work on the preparation, characterization and evaluation of the behavior of compatible, crosslinked polymers known as hydrogels, which have been used as biocompatible materials and in controlled-release devices, especially in controlled delivery of drugs, peptides and proteins, and the development of novel biomaterials. He has over 50 refereed publications and proceedings papers in this area and has fours patents pending. Additionally, he is co-editor of the book "Biomimetic Materials and Design" by Marcel Dekker, published in August 2002. Based on his innovative work, in September 2003 he was honored as one of the top 100 Scientific Innovators in the world under the age 35 as named by the *MIT-Technology Review Magazine*.

Tony has been active in professional societies, including AiChE, ACS, CRS and the Society For Biomaterials. He has taken numerous leadership roles in organizing and chairing conferences and symposia related to biomaterials and drug delivery systems. Additionally, he has twice served as the Drug Delivery Special Interest Group Chair for the Society For Biomaterials, as well as the Vice-Chair (two years) and Chair (two years) of Area 8b, Biomaterials, of AiChE. Within the Society For Biomaterials, aside from serving as Chair of the Drug Delivery Special Interest group, Tony has organized many sessions, served as an abstract reviewer, and moderated many sessions. Additionally, Tony served on the President's Long Range Strategic Planning Committee and was on the Programming Committee for the fall 2004 meeting on Biomaterials in Regenerative Medicine: Advances in Combination Products.

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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

Rena Bizios, PhD

Rena Bizios holds a BS (Cum Laude) degree in chemical engineering from the University of Massachusetts, a MS degree in chemical engineering from the California Institute of Technology, and a PhD degree in biomedical engineering from the Massachusetts Institute of Technology. She is Professor of Biomedical Engineering at Rensselaer Polytechnic Institute where she teaches (both undergraduate and graduate courses) and conducts research. Her research interests include cellular and tissue engineering, biomaterials and biocompatibility. She has authored/co-authored a textbook and over 95 scientific publications and book chapters. She has given numerous presentations at scientific conferences and invited seminars/lectures in academic institutions and industry. She also organized and/or co-chaired numerous symposia and sessions at national/international conferences. Rena's involvement in the Society For Biomaterials includes review of abstracts for, and participation at, the annual meetings; and membership in the Proteins and Cells at Interfaces Special Interest Group (Chairperson, 1995-1997) and in the Awards, Ceremonies & Nominations Committee (elected member, 1998-1999).

Rena is a member of many professional societies; she has been an active participant (including elected officer positions) in the Society For Biomaterials, the Biomedical Engineering Society, and the American Institute of Chemical Engineers. She is a member of the editorial board of the *Journal of Biomedical Materials Research* (JBMR) and of the *IEEE Transactions on NanoBioscience*. She was a member of many national review panels, and chaired NIH study sections and symposia, as well as a section in an NSF-European Community Workshop on Nanomaterials in Biomedical Applications. She has served on numerous departmental, School of Engineering, and institute committees at Rensselaer. She received the Outstanding Alumna in Engineering Award of the Society of Women Engineers, College of Engineering, University of Massachusetts, Amherst, MA (1985), the Rensselaer Alumni Association Teaching Award, Rensselaer Polytechnic Institute (1997), and the Clemson Award for Contributions to the Scientific Literature of Biomaterials from the Society For Biomaterials (1998). She was Jubileums Professor at Chalmers University of Technology, Göteborg, Sweden (fall, 2002). She is Fellow of the American Institute for Medical and Biological Engineering and International Fellow of Biomaterials Science and Engineering of the International Union of Societies for Biomaterials Sciences and Engineering.

Vision statement:
I consider it an honor and a privilege to have an opportunity to represent the membership of the Society, as well as to voice their interests and concerns, at the Council meetings. I am especially interested in, and will work towards, making the annual meetings the forum of choice for both members and nonmembers who are active in the field of biomaterials. Another issue which, in my opinion, needs to be addressed constructively is membership; in this respect, promoting student membership (in other ways, investing in the future of the Society) is one strategy that needs to be considered and implemented.

Thomas J. Webster, PhD

Thomas J. Webster is an assistant professor of the Weldon School of Biomedical Engineering and the School of Materials Engineering at Purdue University. He received a BS in chemical engineering (1995) from the University of Pittsburgh and a MS (1997) as well as a PhD (2000) in biomedical engineering from Rensselaer Polytechnic Institute. He joined the faculty at Purdue in 2000.

Thomas' research involves the design, synthesis, and evaluation of nanophase materials for various biomedical applications. Nanophase materials are those materials that possess constituent dimensions less than 100 nm in at least one direction. His research has led to the development of novel nanophase ceramics, metals, polymers, and composites for orthopedic, cartilage, vascular, bladder, and neural applications. In all of these organ systems and for all materials tested, his lab group has demonstrated that the underlying property that increases cellular responses is a surface that possesses nanoscale features. He is the editor of two books, and the author of more than nine book chapters, 87 publications, 63 conference proceedings, 15 patents, 160 contributed conference presentations, and 50 invited presentations on the use of nanotechnology for biomedical applications. Tom interacts heavily both with industrial and clinical personnel in his research.

His research on bionanotechnology has received attention in recent media publications such as *Men's Health, Economist, MSNBC News, Chemical and Engineering News, Advances in Nanomaterial Research, Nanoparticle News, American Ceramic Society Bulletin,* and the *Materials Research Society Bulletin*. In four years at Purdue, he has graduated nine MS (thesis-completing) and one PhD student. He has supervised over 30 undergraduate students. He currently has a lab of two post-doctoral students and 16 graduate students. He is on the editorial board of *Biomaterials, Journal of Bionanotechnology*, and *Expert Review of Medical Devices*. Tom has received several awards, including 2004 Outstanding Young Investigator Award for the Schools of Engineering at Purdue University, 2004 State of Indiana for Special Contributions for Teaching in a Biomaterials Distance Learning Course, 2004 John F. Johnston Society for Prosthodontics for Contributions to Research, 2002 Biomedical Engineering Society Rita Schaffer Young Investigator Award, and 2000 Lester and Karen Gerhardt Award for promise of a successful career. Tom has also served on several NIH and NSF Nanobiotechnology Initiative study sections.

Specifically, for the Society For Biomaterials, Tom has served in two elected positions in two Special Interest Groups: Vice Chair of Proteins and Cells at Interfaces (from 2002 to date) and Vice Chair of Biomaterials Education (2003 to date). He was the editor of the *PCI Newsletter* (2000-2003). He has organized five symposia and one tutorial focused on the integration of nanomaterials in medicine at Society For Biomaterials meetings over the past four years.

Vision Statement:
Students. Students. Students. Through my involvement in the Society to date, that is what I have heard from an increasing number of our members. Our members have told me of the large

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Officer Nominees...

(Continued from page 10)

C. Mauli Agrawal, PhD, PE continued…

from 1993 to 2000 and currently serves on the Editorial Boards of both the *Journal of Biomedical Materials Research* and the *Journal of Biomedical Materials Research (Applied Biomaterials)*. During his term as Secretary/Treasurer, he oversaw the financial aspects of the transition between management companies handling Society business. Earlier, he was instrumental in the establishment of a Young Investigator Award (effective 1999) for the Society. As Member-at-Large, he was responsible for developing a policy for handling grievances registered by the membership, and for establishing the concept of a Biomaterials Day.

Vision Statement:
Although SFB is a vibrant and healthy society, there is much that remains to be done. If elected, I intend to be proactive in first working with the SIGS to develop policies so that they can operate with flexibility within clear guidelines. Also, I will work toward the increased involvement of clinicians via alliances with other professional groups such as the American Medical Association. Additionally, I will emphasize industry-academia interactions.

Elaine Duncan, MSME, RAC continued…

become outmoded. It takes a personal sacrifice to devote energy and creativity to keep an organization on focus and relevant to its constituency. I have never been more convinced that the Society For Biomaterials can, and should, play a pivotal role in the leadership of our field. The membership deserves to know that their time and commitment will be rewarded. But how does the Society serve its membership while sustaining its mission? With a vital, diverse and dynamic membership, answering this question takes a lot of work.

I have served on the Council of the Society For Biomaterials and nearly every Council Committee of the Society since 1979, including the Publications Committee, the Finance Committee, the Devices and Materials Committee, and as Council Representative of the Special Interest Groups, to name a few. Several years ago, I was recognized by the Society with the C. William Hall Award for Service to the Society For Biomaterials in recognition of my work as editor of *Biomaterials Forum*. I am qualified for the position of President-Elect, but that should not be the only consideration. What counts, or what should count, is that I am willing to tackle the question of how the Society can serve its members and its mission. Without that devotion-to-cause from the Society's leadership, the organization cannot remain vital.

The Society For Biomaterials has not done enough to educate professionals in the field or the public at large about the science of biomaterials. We need to be more visible in the public schools, in the university curriculum, and at the negotiating tables of Washington, D.C. We must be proactive in joining efforts with like-minded organizations to assure that research and educational funding is devoted to biomaterials. We must go back into the boardrooms of the medical device and pharmaceutical industries and promote the mission of the Society For Biomaterials as relevant to business. It is more relevant today than ever before, so redevelopment of the industrial membership in the Society For Biomaterials is a critical effort. The Society For Biomaterials must sustain the cohesive relationship between industry, government and academic interests. When the Society becomes unbalanced it loses diversity.

The Society For Biomaterials has the capacity to surge ahead, but will it? It will take efforts in new directions with an entrepreneurial spirit. But frankly, everyone is so busy in his or her daily life and their own professional careers, we are all simply overtaxed. How can the Society For Biomaterials ask its member's to take time and serve the organization? When the membership can be rewarded on a personal level, members will serve.

Individuals want to be part of an organization that is on the move. But where do we head to assure the membership will want to come along? What if the Society could help a member address the issues he or she may face each day on the job? What if the Society could be a resource where a professional could go for answers to questions, find new jobs opportunities, find talent to fill an open position, find a technical reference that is needed, find a company that provides a service that has to be done yesterday? What if the Special Interest Groups could foster training sessions to assist specialists learn a new technique, find a new type of equipment, and locate a colleague with a needed skill for a collaborative project? What if the Society For Biomaterials could be a dynamic force in this industry? What if the Society could foster and promote the development of new biomaterials?

I am dedicated, still, to the Society's mission. I have the experience and vision to see it through.

Anthony M. Lowman, PhD continued…

Vision Statement:
The most important challenge is to further improve the quality and scope of what the Society has to offer. With the number of professional societies that have overlap in technical areas, it is important the Society For Biomaterials offers unique, important benefits to its members. This can be achieved by working closely with professional organizations with similar missions. Additionally, a stronger connection between academia-industry-government organizations needs to be forged to provide guidance in feedback to the professionals in our field.

Thomas J. Webster, PhD continued…

student membership increases occurring in other societies. They tell me of the high student retention from year to year other societies are experiencing. They tell me of the increasing role students play in all organizational aspects of other societies. They tell me of the large number of awards (not all monetary) that other societies give to undergraduate and graduate students for their research and involvement. Overall, they ask a very important question that all of us (including whoever is elected to become Member-at-Large) need to think about: how important are students to our Society? We all say yes, but do our actions express it.

It is for this reason that I wish to become Member-at-Large. In addition to bringing all concerns the membership has about the Society (like this one) to the Council, I wish to increase student membership, student representation at all levels, and student retention even after graduation. I can think of no larger goal for our Society's future: our students.

Of course, the first step in this process is to determine why, unlike other societies, student membership, representation at all levels, and retention is not as high as it should be. This feedback can be easily obtained by proactively seeking student input to identify why they

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Strong, Macroporous and In-Situ Hardening Hydroxyapatite Scaffold for Bone Tissue Engineering

Feature

By Hockin H. K. Xu[1], Carl G. Simon, Jr.[2], Shozo Takagi[1], Laurence C. Chow[1], Frederick C. Eichmiller[1]

Bone fracture and damage result in more than 1.3 million surgical procedures every year in the United States alone, and this number is predicted to increase dramatically as the life expectancy of the population increases. Hydroxyapatite (HA) has found wide use as a bone replacement material due to its chemical and crystallographic similarity to the apatite in human bone. However, to fit into a bone cavity, sintered HA involves machining, which is difficult due to its brittleness. The surgeon needs to modify the surgical site in the tissue to fit the implant, or to carve the hard and brittle implant to the desired shape. This leads to increases in bone loss, trauma to the surrounding tissue, and longer surgical time. A self-hardening calcium phosphate cement (CPC) can adapt to complex cavity shapes without machining. CPC is comprised of a mixture of fine particles of tetracalcium phosphate [TTCP, or $Ca_4(PO_4)2O$] and dicalcium phosphate anhydrous [DCPA, or $CaHPO_4$]. The CPC powder can be mixed with water or body fluids to form a paste, which can be placed in the bone cavity, molded to the desired geometry, and hardened *in situ* to form resorbable HA. However, the low strength of CPC limits its use to only non-stress-bearing orthopaedic applications. In addition, macropores need to be built into CPC to enhance cell infiltration and tissue ingrowth.

To increase the fracture resistance of CPC, biocompatible and absorbable suture fibers were incorporated to develop strong CPC for bone repair in stress-bearing locations. The polymer suture consisted of individual fibers braided into a bundle with a diameter of 322 μm. The suture was cut to 8 millimeters length and randomly mixed with the CPC paste at 30 percent volume fraction. The composite paste was placed in 3 millimeters x 4 millimeters x 25 millimeters molds to make flexural specimens. The paste in each mold was allowed to set at 100 percent relative humidity at 37 ∞C for 4 h. The hardened specimens were immersed in a simulated physiological solution (1.15 mmol/L Ca, 1.2 mmol/L P, 133 mmol/L NaCl, 50 mmol/L HEPES, buffered to a pH of 7.4) at 37 ∞C for 20 h prior to mechanical testing. Fracture toughness of cement specimens was measured by using a single-edge-notched beam method in flexure with a span of 20 millimeters on a computer-controlled Universal Testing Machine. One standard deviation (sd) was given in this paper for comparative purposes as the estimated standard uncertainty of the measurements. These values should not be compared with data obtained in other laboratories under different conditions. The fracture toughness results are listed in Table I.

Materials	CPC Control	CPC Composite	Sintered Porous HA	Cortical Bone
Fracture Toughness K_{IC} ($MPa \cdot m^{1/2}$)	0.23 ± 0.03	1.44 ± 0.30	0.1 to 0.25	2 to 12

Table 1. *Fracture Toughness (mean ± sd; n = 6) of CPC-Suture Fiber Composite, CPC Control without Fibers, and Literature Values* of Sintered Porous Hydroxyapatite and Cortical Bone*

** Suchanek W, Yoshimura M. Processing and properties of hydroxyapatite-based biomaterials for use as hard tissue replacement implants. J Mater Res 1998;13:94-117. Hing KA, Best SM, Bonfield W. Characterization of porous hydroxyapatite. J Mater Sci: Mater in Med 1999;10:135-145. Damien CJ, Parsons JR. Bone graft and bone graft substitutes: A review of current technology and applications. J Appl Biomater 1991;2:187-208. O'Kelly K, Tancred D, McCormack B, Carr A. A quantitative technique for comparing synthetic porous hydroxyapatite structure and cancellous bone. J Mater Sci: Mater in Med 1996;7:207-213.*

Although significant reinforcement was achieved using suture fibers, a concern was raised on reproducibility when different operators with varied experience were mixing the fibers with the paste and making the specimens. Therefore, three operators each made six specimens: Operator A with extensive experience in CPC and fiber mixing; Operator B with some experience in CPC and fiber mixing; and Operator C with no prior experience in CPC mixing. Operator C was given a 1-minute verbal instruction and watched Operator A making one specimen (which took about one minute). Operator C was then left alone to make specimens. The specimens were 3 millimeter x 4 millimeter x 25 millimeter bars without notches, and were used for flexural strength measurement. The

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2005 Buyers' Guide

The Society For Biomaterials presents its 2005 Buyers' Guide. This guide lists the leading companies in the biomaterials industry along with their areas of business. Use this guide throughout the year to find companies that are ready to provide you with the products and services you need to accomplish your professional endeavors.

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AST Products Inc.
Innovatech Labs LLC

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4th State Inc.
AST Products Inc.
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SurModics Inc.

Contract Research & Consulting
4th State Inc.
AST Products Inc.
Brookwood Pharmaceuticals Inc.
Hysitron Inc.
Ionbond LLC
Innovatech Labs LLC

Device Development & Manufacture
Midwest Plastic Components

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Brookwood Pharmaceuticals Inc.
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Medical Device Evaluation
EnduraTEC Systems Group - Bose Corporation

Packaging Products & Services
Midwest Plastic Components

Surface Modification & Treatment
4th State Inc.
AST Products Inc.
Ionbond LLC
Surface Solutions Labs Inc.
SurModics Inc.

Testing Equipment
EnduraTEC Systems Group - Bose Corporation
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Strong, Macroporous...

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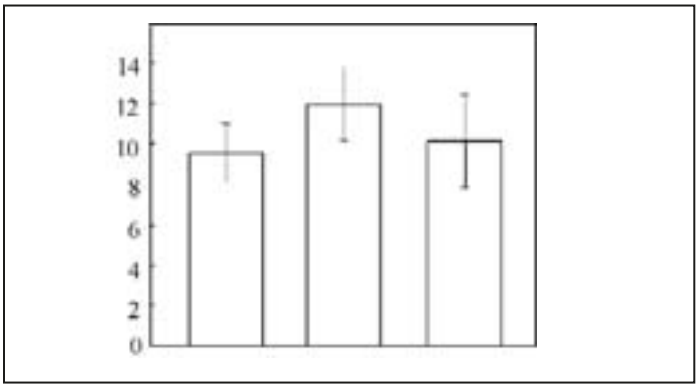

Figure 1. *Strength of CPC-suture fiber composite made by three different operators to examine operator sensitivity. The three operators produced cements with similar strengths, indicating that the composite fabrication method was reproducible. Horizontal line indicates values not significantly different (p>0.05).*

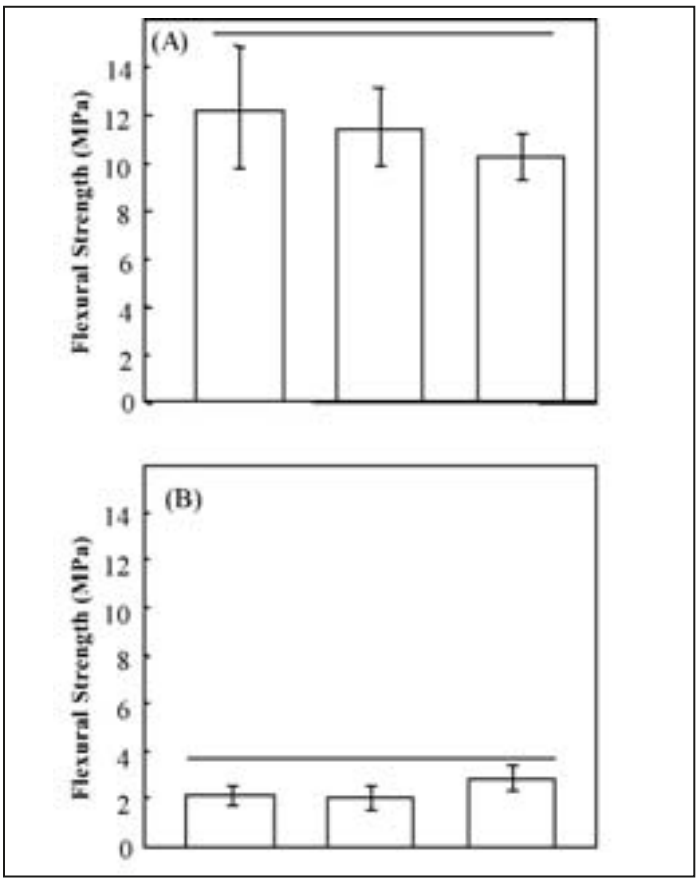

Figure 2. *Flexural strength of (A) CPC-mesh, and (B) CPC control without mesh, made by three different operators to examine the operator sensitivity. Mesh reinforcement may have potential for craniofacial and thin bone repairs. Horizontal line indicates values that are not significantly different from each other (p > 0.05).*

flexural strengths of these specimens after 1-day immersion are plotted in Fig. 1. Error bar shows one sd, n = 6. The three operators produced strengths that are not significantly different from each other (one-way analysis of variance [ANOVA]; p = 0.10).

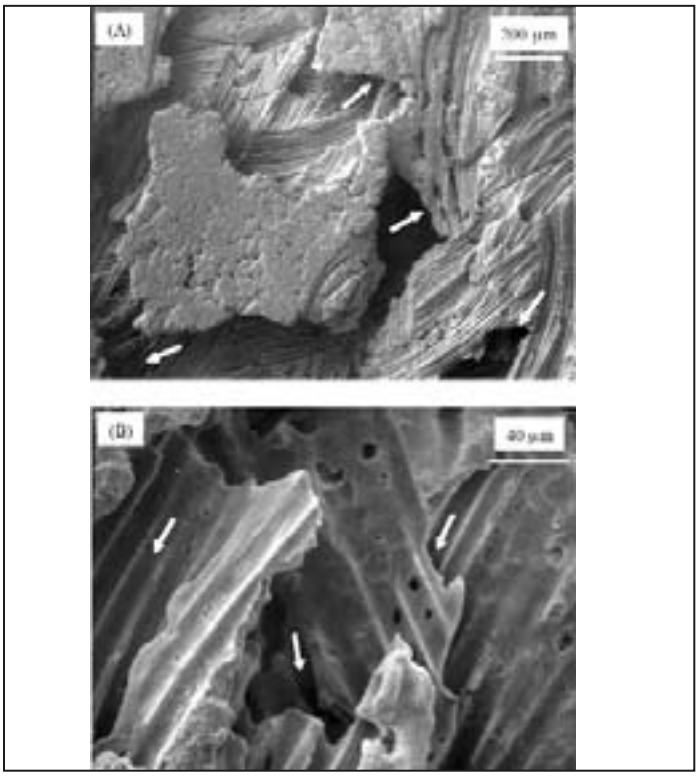

Figure 2. *SEM of pore channels in CPC-suture fiber composite scaffold after suture fiber dissolution. Arrows indicate the flow of the interconnected pore channels beneath the CPC surface.*

The above random suture fiber-CPC paste may be useful to fill a volume of bone loss, for example, due to trauma to a long bone. On the other hand, two-dimensional fiber mesh reinforcement may have potential for craniofacial and thin bone repairs, such as the reconstruction of parietal bone in the skull or other shell structures. To test the operator sensitivity, again the three operators each made six specimens. For each specimen, six sheets of an absorbable polymer fiber mesh of 4 millimeters wide and 25 millimeters long were placed into the same mold, and the CPC paste was placed on top of the mesh to fill the mesh pores and the mold, and set to form a solid specimen. Flexural strengths of mesh specimens at 1-day immersion are plotted in Fig. 2 (A), with no significant difference between each other (One-way ANOVA; p = 0.17). To show the extent of reinforcement, the three operators also made CPC control specimens without fibers or meshes. The strengths (mean ± sd; n = 6) of CPC control specimens after one day immersion in the physiological solution were shown in Fig. 2 (B). Error bar shows one sd, n = 6. The strengths of the reinforced CPC were about 4 to 5 fold higher than those of the unreinforced CPC control.

Examples of macropore channels in CPC after suture fiber dissolution are shown in Fig. 3. In (A), the arrows indicate the flow of the interconnected pore channels beneath the CPC surface. The higher magnification in (B) shows the imprints of the individual fibers of the suture bundle in the CPC,

suggesting an intimate contact between the fibers and the CPC paste. The random orientations of the pores are visible as indicated by the flow of pore channels in (A) and the pores from individual fibers in (B).

Because cell culture toxicity assays are the international standard for biocompatibility screening, *in-vitro* cell culture was performed to evaluate the biocompatibility of the new CPC formulation. MC3T3-E1 osteoblast-like cells were cultured following established protocols. Cells were cultured in flasks at 37 ∞C and 100 percent humidity with 5 percent CO2 in α modified Eagle's minimum essential medium. The medium was supplemented with 10 percent volume fraction of fetal bovine serum and kanamycin sulfate and changed twice weekly. The cultures were passaged with 2.5 g/L trypsin containing 1 mmol/L EDTA once per week. Cultures of 90 percent confluent cells were trypsinized, washed and suspended in fresh medium. Fifty thousand cells diluted into 2 mL of medium were added to each well containing a cement specimen.

A scanning electron microscope (SEM) was used to examine the specimens and the cells. Cells cultured for 1 d on cement specimens were rinsed with saline, fixed with 1 percent volume fraction of glutaraldehyde, subjected to graded alcohol dehydrations, rinsed with hexamethyldisilazane, and then sputter-coated with gold. Interactions between osteoblast cells and macroporous scaffold are shown in Fig. 4 with cells cultured for 1 day. This CPC scaffold contained a biopolymer chitosan, and the pores were formed by the dissolution of water-soluble mannitol crystals. In (A), osteoblast cells (O) attached to the scaffold near the edge of a macropore. The cell developed long cytoplasmic extensions (E) across the opening of the pore and anchored on the other side of the CPC. Cytoplasmic extensions (also termed "filopodial extensions") are regions of the cell plasma membrane that contain a meshwork or bundles of actin-containing microfilaments, which permit the movement of the migrating cells along a substratum. In (B), cells appeared to have migrated into two macropores that were interconnected with each other. In (C), cells colonized and anchored on the pore bottom, established cell-cell junctions and interactions, and formed a three-dimensional cell web.

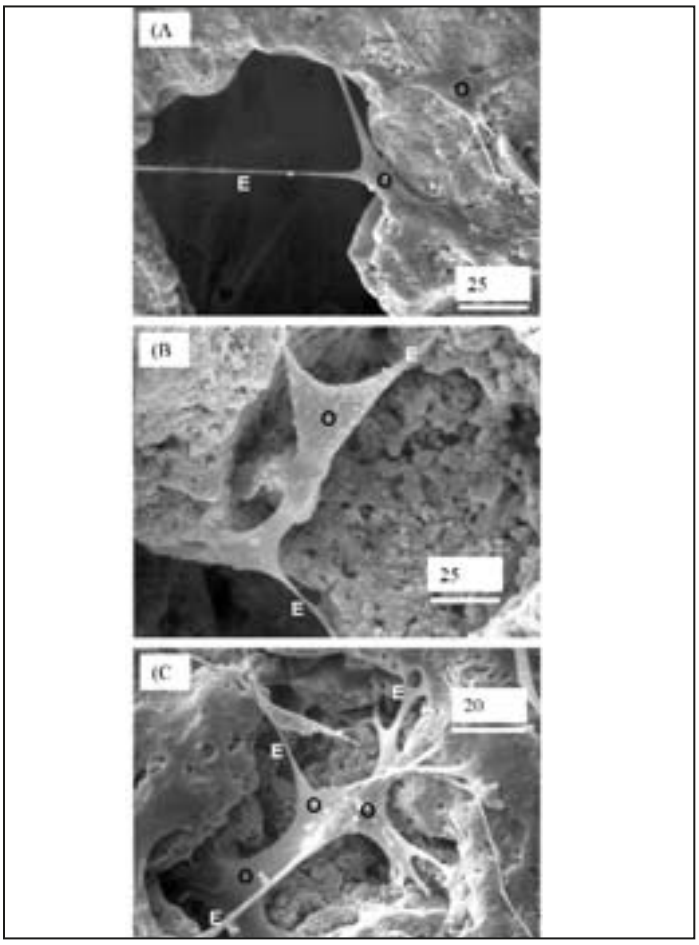

Figure 4. *SEM showing osteoblasts migrating into the macropores of a CPC scaffold. "O" = osteoblasts, "E" = cytoplasmic extensions. (A) Osteoblast cell attached near the edge of a macropore. (B) Cells migrated into macropores. (C) Cells colonized on the pore.*

The composite methods described in the present study imparted substantial reinforcement and macroporosity to a moldable, *in-situ* setting and resorbable hydroxyapatite graft. The mechanical strength and fracture resistance of the new CPC scaffold were increased to exceed those of sintered porous hydroxyapatite implants and approach that of natural bone. Compared to sintered hydroxyapatite, CPC had the advantage of self-hardening *in-situ* without machining, intimately conforming to complex cavity shapes, and being able to be resorbed and replaced by new bone. The new compositions were non-cytotoxic and supported the adhesion and spreading of osteoblast-like cells. Compared to the conventional CPC without macropores, the increased macroporosity of the new apatite scaffold may help facilitate bone ingrowth, implant fixation, and more rapid new bone formation. The CPC-suture fiber composite may be useful in moderate stress-bearing applications. When implanted *in vivo*, the suture fibers would provide strength and then dissolve to form macropores. The strengthening of CPC from new bone ingrowth should offset the weakening of CPC due to fiber degradation. In addition, the long cylindrical macropore channels in CPC should be beneficial in facilitating cell infiltration and bony ingrowth deep into the implant. These features are expected to expand the use of CPC in orthopedic repairs. The method of using absorbable fibers in grafts for strength and then formation of long cylindrical macropores for tissue ingrowth may have applicability to other tissue engineering materials.

This study was supported by USPHS NIDCR grant DE14190 (to Xu), NIST, and the ADAF. The authors thank Mr. A. A. Giuseppetti, Dr. J. B. Quinn and Dr. G. E. Schumacher for experimental assistance. For more information, please contact Dr. Hockin Xu at hockin.xu@nist.gov. This official contribution of the National Institute of Standards and Technology is not subject to copyright in the United States.

[1] Paffenbarger Research Center, American Dental Association Foundation
[2] National Institute of Standards and Technology

Has the Dew Come off the Rose?

By Elaine Duncan,
Special Interest Group Representative

Special Interest Group (SIG) membership is down. Responsiveness of SIG officers is at an all time low. Creativity seems to have gone by the wayside. Is the dew off the rose? That old expression means that the eagerness of new ideas fades even as the sun shines.

It could be because we are all a bit tired and road weary. After all, we have served that extra year and many people have moved on with their careers and lives. The energy that drove us to succeed years ago may have waned. Or it could be a result of the World Congress in Australia this past year that took a lot out of those who attended, and may have disenfranchised those that did not.

Also, we must consider all we have on our plates in preparation for Memphis! The abstract work is tough when it comes right after the term begins again—so much to do and so little time!

If we look back before we look ahead, we can consider some facts:

- Special Interest Groups seem to orient to the annual meetings. That structure is tangible with finite goals. Without an annual meeting (and not just a special topic meeting) held on the continent, SIGs seem to be a ship without a rudder. SIGs have become dependent upon symposium and workshops organized within the annual meeting and do not work outside this structure. Only a few SIGs have even requested meeting endorsements this year.

- Special Interest Groups depend upon annual meetings for their membership activities and focus. SIGs were formed with the objective of reaching beyond annual meetings to enrich the science of biomaterials, and yet, few have. If anything, sometimes it appears to me that SIGs are a ready-made audience for "cherry picking" by other organizations.

- Despite numerous, well-organized Society For Biomaterials activities, some SIGs have become so oriented to their own "student-award" that there is no interaction with the Society's council level committee for Education and Professional Development or the Awards and Nominations Committee. Instead of identifying strong candidates in the respective special interest for student awards, there is no interest unless the SIG picks the student and hands out the cash. There were few, if any, 2004 Biomaterials Day activities sponsored by SIGs at colleges and universities where there are student Society For Biomaterials members.

However, in 2004, we did make some progress for setting SIGs on the entrepreneurial track. Here are a few highlights:

- Associate members can now vote and hold office in the SIGs. Perhaps this will help develop SIGs as an entry point, however, membership requirements have changed so some of the past issues went away with that change.

- Each SIG was asked to contact lost members and recover them. Fortunately, some members (and officers) who had not paid their 2004 dues have been regained.

- The "SIG Rep" to Council is now a member of the Board of Directors. This should hold the SIGs more accountable to the Board and Council for yearly performance.

- There is a Web site initiative to improve communication, develop a responsive editor's position, and update Web information that should help revitalize the SIG officers, although it may be too little, too late.

The upcoming Memphis meeting should help to regenerate SIGs. We are working toward independent time and room assignments for SIG meetings. NO OVERLAP! Planning should begin now to make a SIG-based annual meeting for 2008, the next World Congress year. Program chairs for the SIGs should start plans now and begin working with our management company to make a proposal. I will help the new SIG-REP get this effort underway right away.

To help work out the details for 2005 leading up to Memphis, three subcommittees are being formed from current officers: Election Committee, Membership Development Committee, and Annual Meeting Committee. There is much to be done!

With revitalization that comes with new elections, an annual meeting at a highly accessible and attractive site, and some hard work, SIGs can jazz it up. Contact your SIG officer or the SIG-REP if you have any ideas or can help us make our way down to Memphis!

Dental/Craniofacial Biomaterials News: Clinical Use of a New Microstructured Surface

By John L. Ricci

Biomaterials scientists recognize the significance of using surface microstructure modification to help control the tissue/biomaterial interface. Whether this involves use of microporous scaffolds for tissue ingrowth, or roughening of orthopaedic and dental implants for enhanced osseointegration, surface microstructure modification has been both an empirically-based clinical solution and a topic of extensive research for decades. While surface microstructure modification has been used for decades, how it works is not exactly understood. In the dental biomaterials field this is extremely important since many different biomaterials and biomedical devices rely on surface microstructure modification for successful performance when interfaced with soft tissue, enamel, dentin, and bone.

Recently the United States Food and Drug Administration (FDA) approved the BioLok LaserLok™ Silhouette dental implant, a device partially developed by the author. This implant relies on the use of a laser-microstructured titanium alloy interface (the LaserLok™ component) for successful soft tissue attachment, bone attachment, and retention of crestal bone. The LaserLok™ surface uses controlled, micron-scale laser machining to produce a microstructured surface with features designed to modulate cellular interaction; specifically cell spreading, orientation, migration, proliferation, and differentiation. Significantly, the new surface probably represents the first truly tissue-engineered microstructured biomaterial interface in clinical use. Its use suggests that: (1) the technology is now cost effective to produce these surfaces, and (2) a better understanding of the tissue/biomaterial interface is being developed. Clinical use of this surface also represents a significant shift in the way we think about microstructured surfaces; from the use of random textures to increase surface area, to the use of controlled microstructure to modulate cell and tissue interaction. It probably represents the first of many of this type of interface.

Drug Delivery: Engineering Principles for Drug Therapy

Book Review
By Liisa Kuhn

W. Mark Saltzman
Copyright 2001, Oxford University Press, New York, New York. 372 pages.

Description
If you are a researcher in drug delivery, then this book should be on your shelf. Why? If you do a search for drug delivery books on the Amazon Web site you will find other options; however, based on my reading of this book and the descriptions of the others available, this one was the best suited for a biomaterials scientist seeking to understand fundamental issues of drug transport, diffusion, and drug delivery design. The other textbooks available were more narrowly focused on either pharmaceutics/pharmacokinetics, e.g. "Drug Delivery and Targeting: For Pharmacists and Pharmaceutical Scientists," by A.M. Hillery, or commercialization and marketing aspects of new drug delivery technologies, e.g. "Drug Delivery Systems," Second Edition by V.V. Ranade and M.A. Hollinger.

As a biomaterial scientist, you are well aware that successful biomedical engineering requires a multidisciplinary approach. This book contains the essential elements of biomaterials science, chemical engineering, physiology, pharmacy, chemistry, and mathematics that are essential for development of a successful drug delivery system. The first half of the book is focused on the theory of diffusion, drug transport, and pharmacokinetics, yet is interspersed with experimental data from a variety of systems, which keeps the math from becoming overwhelming, and provides useful, practical data for reference. What makes this text different from a chemical engineering transport phenomenon text are the sections about diffusion in biological systems, and drug permeation through biological barriers, such as cells and tissue.

This is a substantial, integrated text, not merely a string of slightly related, contributed articles. Each chapter is well-thought out and flows from the previous. The text is based on courses taught by the author while at Johns Hopkins University and Cornell University. Homework problems are not provided. Each chapter begins with a quote from a diverse selection of literature, a subtle indication of the intellectual breadth of the author. Historical reviews are included where appropriate, which also adds to the depth of this text. One of the bonus features of this book is the information contained in the appendices. Appendix A is an overview of polymeric biomaterials: non-degradable polymers, biodegradable polymers, and water-soluble polymers. The background, nomenclature, typical applications, synthesis, and chemical variations are covered in more detail than other texts purporting to be only about absorbable and biodegradable polymers. Appendix B has useful data and nomenclature: e.g. physiological parameters, cardiovascular system information, volumes, and blood supplies of different body regions for a standard man. W.M. Saltzman has authored a comprehensive, classic, and authoritative textbook on this complex field.

Audience
This book is an excellent resource for academic and corporate researchers of any specialty working in the field of drug delivery. This book would also make a valuable addition to university libraries and biomedical engineering department libraries.

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BioInk

Access Pharmaceuticals Inc. (Dallas, Texas) disclosed that it has entered into a research collaboration with a United States major drug delivery company to assess the Nanoparticle Aggregate Technology for the delivery of therapeutic proteins. The Nanoparticle Aggregate Technology is being developed primarily for the controlled release of water-soluble proteins. Access has demonstrated that these proteins can be incorporated into the aggregate in a simple cost-effective manufacturing process using aqueous solutions at room temperature and that release of the protein from the nanoparticle aggregate can be tailored to meet the desired profile, allowing delivery lasting from several days, up to a projected six-month period.

AdvaMed, the Advanced Medical Technology Association, named Martyn W.C. Howgill to serve as the first executive director of its newly created independent research and education foundation, The Institute for Medical Technology Innovation. Howgill most recently served as vice president for international business development and chief marketing officer of the University of Texas M. D. Anderson Cancer Center in Houston. The Institute, which will operate independently of AdvaMed and will not be involved in AdvaMed's advocacy efforts, will commission original research that investigates the health and economic impact medical technology has on patients, health care delivery, and society. These findings will form the basis for building public understanding about the benefits of and the barriers to continuing innovation in medical technology.

In a preview of things to come from the fledgling scientific field of "synthetic biology," researchers with Lawrence Berkeley National Laboratory's Physical Biosciences Division (PBD) and the University of California at Berkeley's Chemical Engineering Department are developing a simple and much less expensive means of making one of the most promising and potent of all the new **antimalarial drugs**. By adding new genes and engineering a new metabolic pathway in Escherichia coli bacteria, the researchers can quickly and cheaply synthesize a precursor to the chemical compound artemisinin. This next-generation antimalarial drug has proven to be effective against strains of the malaria parasite that are resistant to current front-line drugs. Unfortunately, it is currently far too expensive for the countries in Africa and South America where it is needed most.

Avanta Orthopedics LLC, (San Diego, Calif.) has agreed with Artimplant, a Swedish biomaterials and orthobiologics company, to license Artimplant's newly available bioabsorbable implant technology. The specifics of the agreement include the global license, supply, and distribution rights for Artimplant's Artelon CMC-I Spacer, a resorbable implant for treating arthritis at the base of the thumb. The Artelon CMC-I Spacer was cleared for sale by the United States Food and Drug Administration in September 2004. Arthritis in the base of the thumb is prevalent in up to 30 percent in women and in 10-15 percent in men over the age of 50. According to Artimplant, clinical trials have shown pain-free patients and better grip strength compared to tendon interposition (APL), the current standard of care.

Barr Pharmaceuticals Inc. (Woodcliff Lake, N.J.) announced that its subsidiary, Barr Laboratories Inc., has received approval from the United States Food and Drug Administration for its generic version of Bristol Myer Squibb's Videx® EC (Didanosine) Delayed-release Capsules, 200 mg, 250 mg, and 400 mg. The FDA granted expedited review of Barr's ANDA under the President's Emergency Plan for AIDS Relief (PEPFAR). The company plans to launch its generic product immediately.

A major milestone in industrial biotechnology has been achieved with the first commercial shipment of **bioethanol**. Unlike conventional ethanol, bioethanol is made not from grain, but from cellulosic biomass, such as wheat straw, sugar-cane bagasse, and corn stovers and stalks left over after harvesting. This green alternative fuel, compatible with current automobile engines, could significantly reduce greenhouse gas emissions. The commercial production breakthrough reported by a Canadian biotech company, logen Corp., involved using recombinant DNA-produced enzymes to break apart cellulose. Using this technology, raw materials such as wood-product manufacturing residues, municipal solid waste, and garden waste could supply more than 500 million dry tons of biomass - enough to make more than 50 billion gallons of ethanol, equivalent to approximately a quarter of current United States gasoline consumption.

Exactech Inc. (Gainesville, Fla.) announced today that the company's new Equinoxe shoulder system has received 510(k) clearance from the United States Food and Drug Administration. The Equinoxe Shoulder System includes primary implants designed to provide surgeons with anatomic precision, as well as a straightforward technique, and a robust scope that maximizes intraoperative flexibility. The primary prosthesis offers multiplanar adjustability to facilitate intraoperative reproduction of the individual patient's anatomy and soft tissue balancing. The system's fracture stem is based on significant anatomic study and represents a new generation in the treatment of complex fractures of the shoulder. These features will be helpful to the surgeon in improving patient outcomes.

FONAR Corporation (Melville, N.Y.) demonstrated the latest application of its Upright™ MRI - obtaining images of the beating heart and the blood-vascular system with the patient in the vertical position - at the Technical Exhibit of the 90th Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA), in Chicago. "When physicians evaluate cardiac patients with heart failure, they would prefer to see the heart performing against its normal physiological uphill load rather than in the lying down position, where the blood is practically running downhill. Moreover, imaging blood vessels vertically where flow is against gravity is more likely to visualize the full impact of vascular pathologies on blood flow that is not evident when blood is flowing horizontally. In the gravity-affected vertical position, multiple factors may lead to decreased arterial or venous circulation, such as decreased cardiac output or loss of auto regulation," commented the company.

Researchers at **Millennium Pharmaceuticals Inc.** (Cambridge, Mass.) and the Brigham and Women's Hospital presented results from seven studies in rheumatoid arthritis (RA) that could pave the way for the development of more-effective, less-toxic therapies that are custom-designed for each patient based on his or her genetic make-up. The research, which was shared during the American College of Rheumatology meeting in San Antonio, Texas, offers new insight into genetic clues to better understand RA risk, underlying disease mechanisms, and response to treatment. The studies are made possible by the rheumatoid arthritis patient registry Millennium established with Brigham and Women's Hospital in Boston in 2002. The registry, believed to be one of the world's largest RA cohorts for the evaluation of genetic and proteomic data, is profiling and prospectively following approximately 1,000 patients with RA for a period of five years.

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Cato Laurencin Elected to the Institute of Medicine of the National Academy of Sciences

A member of the Society For Biomaterials, Cato T. Laurencin, Lillian T. Pratt Distinguished Professor and Chair of the Department of Orthopedic Surgery at the University of Virginia Health System, was elected to the National Academy of Sciences Institute of Medicine (IOM). Laurencin, a world-renowned expert in shoulder and knee surgery and an international leader in biomaterials and tissue engineering research, said, "I am deeply honored to have been chosen." He joined the University of Virginia as a professor and chair of orthopedic surgery in 2003. Laurencin is currently Speaker of the House of Delegates of the National Medical Association and a member of the National Science Board of the Food and Drug Administration.

Cato T. Laurencin

Members of the IOM elect new members from among candidates nominated for their professional achievement and commitment to service. An unusual diversity of talent is assured by the Institute's charter, which stipulates that at least one-quarter of the membership must be selected from outside the health professions, from such fields as the natural, social, and behavioral sciences, as well as law, administration, engineering, and the humanities. Laurencin joined 64 other new members of the Institute in 2004, bringing total active membership to 1,416.

"It is a great pleasure to welcome these distinguished and influential individuals to the Institute of Medicine," said IOM President Harvey V. Fineberg. "Members are elected through a highly selective process that recognizes people who have made major contributions to the advancement of the medical sciences, health care, and public health. Election is considered one of the highest honors in the fields of medicine and health."

The Institute of Medicine is unique for its structure as both an honorific membership organization and an advisory organization. Established in 1970 by the National Academy of Sciences, the Institute has become recognized as a national resource for independent, scientifically informed analysis and recommendations on issues related to human health. With their election, members make a commitment to devote a significant amount of volunteer time as members of IOM committees, which engage in a broad range of studies on health policy issues.

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Breast Cancer Research Program Era of Hope Scholar Award Given to Karen Burg

Karen Burg

Karen Burg, a member of the Society For Biomaterials, and an associate professor of bioengineering at Clemson University, received a coveted Era of Hope Award from The Department of Defense (DOD) Breast Cancer Research Program (BCRP) last November. This award was given to 10 exceptionally talented, early-career scientists who have demonstrated that they are the best and brightest in their field through extraordinary creativity, vision, and productivity, and who have shown a strong potential for leadership in the breast cancer research community, as well as a vision for the eradication of breast cancer. Era of Hope Scholars have the ability to look beyond tradition and convention. These awards allow emerging innovators to implement their vision and assume leadership roles in the breast cancer research community, and successfully challenge the status quo through creative, high-risk research that may ultimately lead to the eradication of breast cancer.

Burg has established herself as a leading scientist through her innovative approaches to technical issues in tissue engineering. Her research has been recognized at the forefront of science and engineering by the National Science Foundation from which she received the Presidential Early Career Award for Scientists and Engineers. "Technology Review," MIT's Magazine of Innovation, included Burg on its 2003 list of the world's 100 Top Young Innovators. Her research focuses on tissue engineering with an emphasis on scaffold design for tissue reconstruction using minimally invasive implantation, and novel tissue-engineered techniques for tissue repair. Burg's biomaterials research involves injectable composite systems for soft tissue repair with high mechanical integrity and high cell affinity that could one day provide breast cancer patients a viable reconstructive surgical solution for damage left by lumpectomies and other invasive procedures.

The U.S. Army Medical Research and Materiel Command (USAMRMC) manages biomedical research programs that are part of the Department of Defense (DOD) and Army budget submission. Additionally, as directed by Congress, the USAMRMC manages congressionally targeted biomedical research programs. One of the congressional research programs managed by the USAMRMC Office of Congressionally Directed Medical Research Programs (CDMRP) is the Breast Cancer Research Program (BCRP). The overall goal of the BCRP is to promote research to eradicate breast cancer.

West Wins Annunzio Award

The Christopher Columbus Fellowship Foundation recently named Rice University bioengineer Jennifer West as the 2004 Frank Annunzio Award Columbus Scholar. One of the nation's most prestigious and competitive honors, the Annunzio Award includes a $50,000 prize.

West, the Isabel C. Cameron Professor of Bioengineering and Professor of Chemical Engineering, is internationally recognized for cutting-edge research in two of bioengineering's most competitive fields-nanotechnology and tissue engineering.

"This award places Jennifer squarely within the nation's scientific elite," says Rice President David Leebron. "Her research, especially her use of revolutionary technologies in the treatment of disease, holds extraordinary promise to improve the health and well being of us all."

Past winners of the Annunzio Award include Dr. James Thomson, the first researcher to isolate and culture embryonic stem cells; Nobel laureate Dr. James Cobey, an active leader in the International Campaign to Ban Landmines; influential architect Michael Graves, who designed several buildings on the Rice campus; and Dr. Anthony S. Fauci, a pioneer in the study of AIDS and HIV.

West's research in biomaterials and tissue engineering focuses on the synthesis, development, and application of novel biofunctional materials. In one project, her group is creating new materials for small-diameter vascular grafts that could eliminate the need for doctors to use veins from a patient's leg for heart bypass surgery. West is developing techniques to use a patient's own cells to grow replacement blood vessels in the lab, blood vessels that can be used in procedures like coronary artery bypass grafting for patients with advanced heart disease. To achieve this, she is synthesizing so-called scaffold materials, novel new materials that mimic extracellular matrix and provide a structure for the growth of replacement blood vessels.

The Christopher Columbus Fellowship Foundation is a federal government agency established to "encourage and support research, study and labor designed to produce new discoveries in all fields of endeavor for the benefit of mankind." Governed by a Presidential appointed Board of Trustees, the Foundation seeks to nurture and recognize pioneering individuals and programs that reflect the visionary spirit and pioneering heritage of Christopher Columbus.

Membership Dues...

(Continued from page 5)

information (phone numbers, addresses, and e-mail addresses) of other members. You can also use the Society's Career Center on the Web site to help you identify jobs in your field and submit your resume for the appropriate positions. Your dues also help to support the Society's advocates in Washington to increase awareness and support for the field of biomaterials science and industry. Not a bad deal for just $45.

Why do we ask for the $45 now? Our budget is approved for the January to December cycle. In addition, paying your dues now helps prevent a disruption in your journal subscription. So, please submit your dues renewals now rather than later.

A Time of Change

(Continued from page 5)

attendance. Perhaps such a smaller meeting in addition to our regular annual meeting can become standard in the future.

Over the past 18 months, our Society has been guided by two very able Presidents, Drs. Nicholas Peppas and Anne Meyer. But more so, we have been able to successfully negotiate changes because member volunteers stepped up to the tasks. Such volunteerism catches the essence of our Society and will continue to help it grow in the future.

Fun, Food, and Music - The Memphis Way

(Continued from page 6)

local artist galleries, antique shops, and specialty stores as well as the National Civil Rights Museum. Take the Monorail (featured in the movie "The Firm" starring Tom Cruise) to Mudd Island River Park for an up-close view of the Mississippi River and the 18-gallery Mississippi River Museum with its 5-block-long Riverwalk model. If you have a car or want to take a cab, other recommended attractions include: Stax Museum of American Soul Music, National Ornamental Metal Museum, Graceland, the Dixon Gallery and Gardens, and Sun Studios.

Entertainment

The Beale Street Entertainment District is located in the heart of downtown and consists of approximately three pedestrian blocks of more than 30 nightclubs, restaurants, and retail shops. Music includes traditional blues, jazz, and rock 'n' roll. Rum Boogie, Blues City Café, The Black Diamond, and B.B. King's are some of the most popular places for music and food. In between Beale Street and the Peabody is the Flying Saucer Draught Emporium (beers, beers, more beers, and sandwiches) and the Gordon Biersch Garden (German-style brewed beer and food).

Please be sure to visit the Memphis Convention and Visitors Bureau (www.memphistravel.com) and the Web site www.50yearsrocknroll.com for additional information and discounts on dinning, entertainment, and other special events and attractions.

A Universal Synthetic Methodology...

(Continued from page 9)

of poly(HEMA) prepared by traditional solution ATRP at the similar reaction conditions. This suggested that ATRP synthesis is successful from peptides-loaded Wang resin.

The cell attachment results of poly(HEMA), GRGDS-poly(HEMA), and tissue culture polystyrene were shown in Figure 2. Negligible cell attachment was observed on the poly(HEMA) film after 24 h cell culture, and this is thought to be due to the hydrophilicity of poly(HEMA), which resists the serum protein adhesion necessary for cell attachment. In contrast, cell attachment and spreading was found on the GRGDS-poly(HEMA) film after 24 h cell culture, although which is weaker than on tissue culture polystyrene surface.

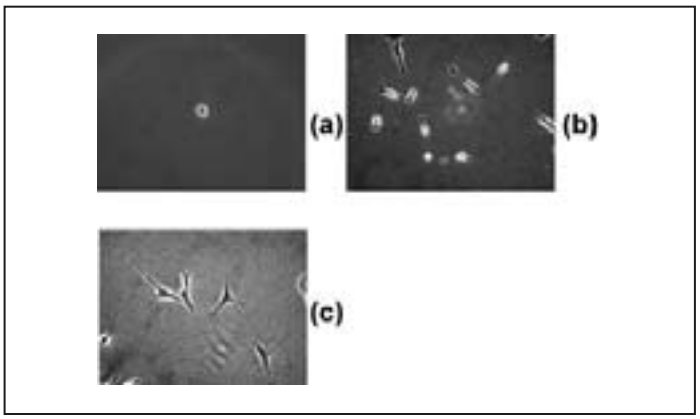


Figure 2. *The microscopic images of fibroblast on poly(HEMA) (a), GRGDS-poly(HEMA) (b), and tissue culture polystyrene (c).*

A universal synthetic strategy to prepare well-defined peptide-polymer hybrid materials has been demonstrated and GRGDS-poly(HEMA) was synthesized as a model compound. The relative low dispersity of the final product indicated the ATRP synthesis from solid support was successful. The cell adhesion and spreading on GRGDS-poly(HEMA) films suggested that the GRGDS short peptide sequence was active in promoting the cell adhesion and spreading. For more information on this topic, contact the author at ying.mei@nist.gov (NIST Polymers Division).

The author thanks Dr. Kathryn L. Beers, Dr. Newell R. Washburn, Dr. David L. VanderHart, H. C. Michelle Byrd and Dr. Matthew L. Becker for technical support, and Dr. Kenneth M. Yamada for supplying the NIH-3T3 fibroblasts used in this study. Dr. Mei can be reached at ying.mei@nist.gov.

Officer Nominees...

(Continued from page 13)

Thomas J. Webster, PhD continued…

prefer other societies to ours. Secondly, is to find solutions. Several strong suggestions I have already heard from our membership when presenting this problem are to increase opportunities for students to voice opinions, increase student involvement in all organizational aspects of the Society, increase member-student mentoring programs (whether a student wants to go to industry, academia, or clinical arenas we can find a mentor for our students), increase the number of times we highlight the best research and involvement in our Society from undergraduate and graduate students, create a more welcoming environment for students through novel social activities at every annual meeting, etc.

These are only a few of the great ideas that I have heard from our membership. Such ideas exemplify the strong interest we all have in the future of our Society. Students. Students. Students. We can't afford to wait to emphasize this part of the future of our Society.

BioInk

(Continued from page 23)

Zimmer Holdings Inc. (Warsaw, Ind.), announced it has entered into a distribution agreement with Baxter Healthcare Corporation that will allow Zimmer to market Baxter's Infusor as part of a pain management kit for orthopaedic and other non-oncology surgical procedures in the United States. The Infusor is a portable, disposable elastomeric infusion device designed to provide a slow, continuous administration of medication given as a result of a surgical procedure. The system then can stay with the patient during recovery and rehabilitation. The benefits of the device fit well with Zimmer Minimally Invasive Solutions Procedures and Technologies. Zimmer expects to begin selling the system in the first quarter of 2005.

Community Calendar

Wound Healing Society 15th Annual Meeting & Exhibition
May 18-21, 2005
Hyatt Regency Chicago
Chicago, IL, U.S.A.
www.woundheal.org

Regenerate 2005
June 1-4, 2005
Westin Peachtree Plaza
Atlanta, GA, U.S.A.
www.regenerate-online.com

Controlled Release Society 32nd Annual Meeting & Exposition
June 18-22, 2005
Fontainbleau Hilton
Miami Beach, FL, U.S.A.
www.controlledrelease.org

American Society for Artificial Internal Organs 51st Annual Conference
June 9-11, 2005
The Hilton Washington
Washington, D.C., U.S.A
www.asaio.com

American Society for Metals, International Materials & Processes for Medical Devices Conference
September 25-28, 2005
David L. Lawrence Convention Center
Pittsburgh, PA, U.S.A.
(440) 338-5151
www.asminternational.org

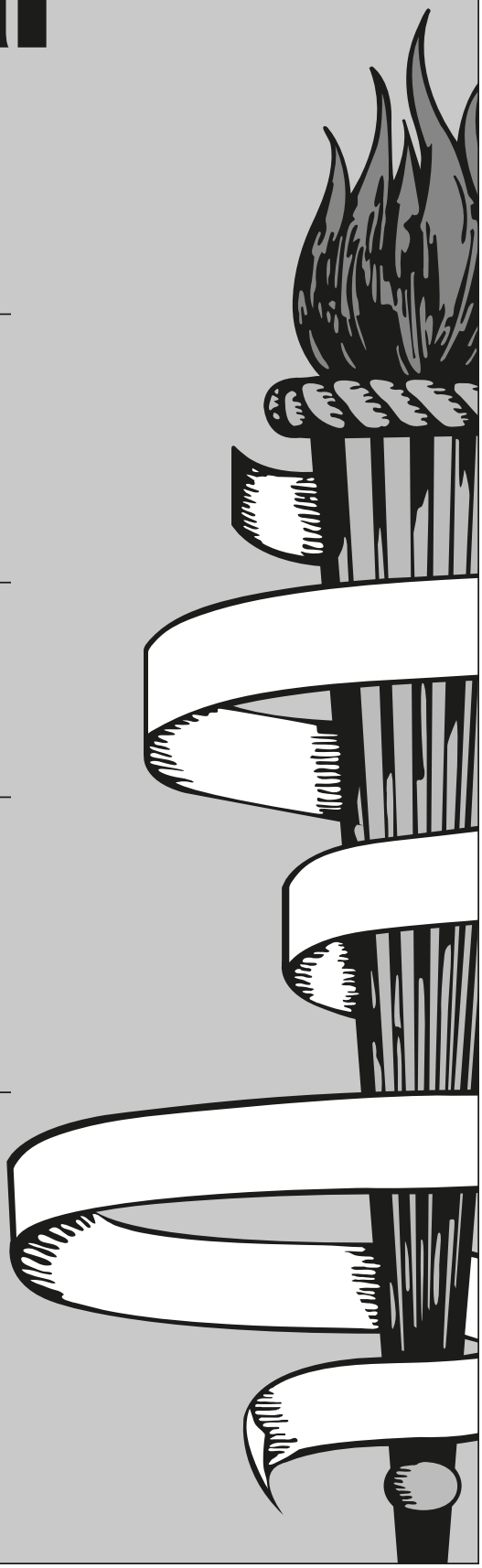
Biomedical Engineering Society
September 28-October 1, 2005
Hyatt Regency
Baltimore, MD, U.S.A.
www.bme.jhu.edu/BMES2005

Biomedical Imaging Research Opportunities Workshop
March 11-12, 2005
Hyatt Regency Bethesda
Bethesda, MD, U.S.A.
(630) 368-3758
www.birow.org

35th Congress of the International Union of Physiological Sciences
March 31-April 5, 2005
San Diego, CA, U.S.A.
www.iups2005.org

First International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion
May 19-22, 2005
The Hotel Hershey
Hershey, PA, U.S.A.
www.hmc.psu.edu/ce/pediatrics

2005 Summer Bioengineering Conference
June 22-26, 2005
Vail Cascade Resort & Spa
Vail, CO, U.S.A.
www.asme.org/divisions/bed/events/summer05.html



Society For Biomaterials

30th Annual Meeting: New Applications and Technologies
Memphis, TN • April 27 - 30, 2005

PRE-REGISTRATION DEADLINE: MARCH 28TH, 2005

The meeting has been organized to emphasize the new and expanding clinical applications and challenges of biomaterials, as well as highlight recent advances and the generation of new knowledge in the discipline. Special program topics include the use and immunological consequences of stem and progenitor cells in regenerative medicine, artificial lung and urological biomaterials and tissue engineering, nanotechnology, smart scaffolds, molecular biology techniques and characterizations, materials for biosensors, educational strategies, and regulatory and business operations. Many opportunities and programs will be held to address specific developments in topics related to orthopedics, cardiovascular and dental/craniofacial devices, organ/tissue engineering, ophthalmology, drug delivery, and surface modifications and interactions.

For more information or to register for the 30th Annual Meeting of the Society For Biomaterials, please visit:
www.biomaterials.org

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