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#### Edited and Compiled by:

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Queensland University of Technology

Sarah Wilburn  
TERMIS Administrator

### Letter from the Editor

This month, Abdallah S. Daar and Heather L. Greenwood from the Program on Life Sciences, Ethics and Policy at the University of Toronto, published a paper titled “A proposed definition of regenerative medicine.” The authors argue that there is a lack of consensus regarding the definition of regenerative medicine among our society. At the same time, we as members are asked to participate in the discussion and to give feedback regarding the definition given in this paper. Even so, it might be argued that such a discussion has a strong philosophical nature; from my perspective such a discussion is helpful as it stimulates our thinking from several angles. For example, our society would benefit from a greater participation of surgeons and clinicians, as well as, stem cell biologist.

What are the reasons for that and more importantly how can we attract more colleagues from these disciplines to become active in our society? From my PhD students, as well as, students I have met during our conferences and specifically during the “Student-Meet-Mentor sessions” organized by the SYIS Chapters from our society, I know that it is very attractive to work in a highly interdisciplinary field. However, there is also the danger to get lost in no man’s land in between all the disciplines. Hence, I look forward to seeing a large number of our members participating in those discussions.

Our upcoming regional meetings in London and Tokyo are the ideal communication platforms!

Sincerely,  
Dietmar W. Hutmacher

## TERMIS-AP News

**Hai Bang Lee, PhD - Continental Chair**

### Solicitation of proposals for the 2011 TERMIS-AP Chapter Meeting

The TERMIS-AP Chapter Council would like to announce the solicitation of proposals for hosting the 2011 TERMIS-AP Chapter meeting. If you are interested in hosting the 2011 TERMIS-AP Chapter meeting, please submit your request to Sarah Wilburn at [swilburn@termis.org](mailto:swilburn@termis.org). You will be provided with a meeting host form that asks detailed questions about the meeting organizers, location/venue, program, and meeting financials. When proposals are submitted, they are reviewed by the respective chapter council and an official vote is conducted. [Click here](#) to view details about hosting a TERMIS meeting.

### TERMIS-AP 2007 Tokyo Meeting

The organizers of the 2007 TERMIS-AP meeting in Tokyo would like to announce the confirmed list of invited speakers:

Ian Wilmut  
(Roslin Institute, England)

Yi Lin Cao  
(Shanghai Second Medical University, People's Republic of China)

Jeffrey A. Hubbell  
(Ecole Polytechnique Fédérale de Lausanne, Switzerland)

Dietmar W. Huttmacher  
(National University of Singapore, Singapore)

Hai Bang Lee  
(Korea Research Institute of Chemical Technology, Republic of Korea)

Norio Nakatsuji  
(Institute for Frontier Medical Sciences Kyoto University, Japan)

Shinichi Nishikawa  
(RIKEN Center for Developmental Biology, Japan)

Wolfram-Hubertus Zimmermann  
(University Hospital Hamburg-Eppendorf, Germany)

### REGISTRATIONS

Registrations for the meeting will be accepted until July 25, 2007.

Please complete your registration by logging-in to your Personal Page. If you have not yet registered your personal information, please first complete the required items on ID Application page in order to acquire your ID and Password.

Major credit cards are accepted. Upon receipt of your online registration information, a confirmation will be faxed or e-mailed to you after your payments is confirmed. **Please bring this confirmation slip with you and present it to the Registration Desk**

### HOTEL RESERVATIONS

Please complete your reservation by logging-in to your Personal Page. \*If you have not yet registered your personal information, please first complete the required items on the ID Application page in order to acquire your ID and Password.

Major credit cards are accepted. In order to make your hotel reservation, a full deposit will be necessary.

A number of hotels are available for you to choose from. A complete list of instructions on hotel reservation procedure is available at <https://www.crs-pac.net/registrye/registrye.asp?wci=procedure&mode=2>

### CONFIRMATION

Your reservation confirmation will be sent to you either by fax or e-mail after receiving your on-line reservation information and verifying

your payment of deposit.  
Please bring this confirmation slip with you and present it to the reception desk upon checking-in.

The deadline for Reservations on this site is  
Noon 12:00 of November 16, 2007, Japan  
Standard Time (GMT+9)

(Please note that reservations will also be closed

when all the accommodations have become full.)

#### CONTACT HOTEL RESERVATIONS

JTB Business World Tokyo Corp., Toranomon  
Overseas Travel Office  
TERMIS-AP 2007 Desk  
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#### Upcoming Asian-Pacific Meetings

1. 9th Annual Meeting of Korean Tissue Engineering and Regenerative Medicine Society (KTERMS) was held on June 1(Fri) 2007 at Seoul National University. Registered participants were 134 general members and 178 students (total 312). Six foreign speakers were invited as Teruo Okano(Japan), Nan Huang(China), Dietmer Hutchmacher(Singapore), Jon Hilborn(Sweden), James J Yoo(USA) and Yasuhiko Tabata(Japan) as well as Five domestic speakers as Youngsook Son, Dae Won Moon, Youngkeun Ahn, Dong-wook Kim, and Chang-Whan Park. 10 oral presentations and 155 poster presentations were presented.
2. 5th 2007 Seoul Stem Cell Symposium will be held on Nov 15~16, 2007 at Korea University. 12 foreign and 10 domestic Invited Speakers will be presented. We expect that over 1,000 participants will be attended.
3. BIOKOREA2007 support by Korea Ministry of Wealth and Welfare will be held on Sept 13~14, 2007 on COEX, Korea. 20 session tracks will be open. Among of 20 Scientific and Industrial Sessions, Stem Cell and Regenerative Medicine/Tissue Engineering Sessions will be held on Sept 13 and 14, respectively. For Regenerative Medicine/Tissue Engineering Sessions, three foreign speaker will be invited as Minoru Ueda(Japan), Toshihiro Akaike(Japan) and Rui Reis(Portugal).

#### Australasian Wound & Tissue Repair Society

The first issue of the AW&TRS newsletter states that the scope of the Society is as follows: "The Australasian Wound & Tissue Repair Society is a non-profit making organization founded in 2007, which aims to promote knowledge and interchange between scientists, healthcare professionals, industry and other individuals that have an interest in wound healing and tissue repair. The Society will provide a forum for interaction among scientists, physicians, licensed practitioners, allied health, and industrial representatives. Membership to the Society is open to any individual who has a demonstrated interest in the field of wound healing and tissue repair. The Society will hold a bi-annual meeting and a number of focus meetings each year concentrating on different aspects of wound healing and tissue repair, ranging from basic science to clinical aspects of healing."

The AW&TRS will hold its first meeting the 6<sup>th</sup> – 7<sup>th</sup> May 2008 in Darwin. Further information on the first AW&TRS conference will be provided on the Society's website shortly.

### Feature on Tissue Engineering Laboratory - Asia-Pacific

#### **Tissue Engineering and Regenerative Medicine at the Institute of Advanced Biomedical Engineering and Science, Tokyo Women's Medical University**

**Teruo Okano**, Director & Professor

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We are currently facing a new era, where innovative medical technologies are being actively developed and unified to enhanced evidence-based advanced therapeutics such as regenerative medicine. In order to meet the medical needs of today's patients, as well as the certain challenges of tomorrow, the integration of basic sciences, with new innovations, changes in regulatory science and scientific validation methods are required. Further, new medical logistics, medical business models, and appropriate finance schemes have to be designed for the evolving industry to cover world patients. If tissue engineering and regenerative medicine is to initiate brand new therapy and replace existing treatments which fit within the established medical system, it is essential for our society to reach proper informed consent, and "informed choices" to develop into a new advanced medical system.



The Institute of Advanced Biomedical Engineering and Science ("ABMES"), by following the Institute of Biomedical Engineering established in 1969, was formed in 2001 at Tokyo Women's Medical University, whose hospital is well known in Japan through its well-established programs in cardiovascular and neuro surgery. With more than 100 members including research staff and students, ABMES is currently directed by Professor Teruo Okano. Professor Okano was originally polymer chemist, and has now established an interdisciplinary institute combining basic medical sciences with engineering technologies for tissue engineering and regenerative medicine. Professor Okano currently serves on the editorial boards of numerous scientific journals and based on his research in drug delivery systems and tissue engineering has been the recipient of several awards such as the Clemson Award from the Society of Biomaterials, the

Founders Award, the Nagai Innovation Award from the Controlled Release Society, and the Leo Ezaki Prize in Nanotechnology, in honor of Dr. Ezaki, the Nobel Laureate in Physics.

The origin of ABMES can be traced to 1969 as mentioned, when Professor Emeritus Yasuhisa Sakurai established the Institute of Biomedical Engineering at Tokyo Women's Medical University, as one of the first ever biomedical research institutes in Japan. Currently Professor Sakurai continues to actively serve the biomedical research community, as a member of several governmental committees in this field. Based on this background, ABMES has developed an active research environment that encourages and stimulates collaboration between physicians and scientists with the combination of advanced science and technologies in fields such as, material science, mechanics, informatics, cell biology, and pharmaceutical sciences.

## **I. Introduction of unique research characteristics of ABMES**

### **1. Core research themes and achievements are:**

(1) Tissue regenerative medicine: A new medical concept with clear therapeutic benefits based on the core technology of cell sheet engineering, as well as the development of new approaches. We have attempted to reconstruct various tissues by engineering cell sheet as tissue-based medicine, with applications in organ replacement from cells. By making concurrent approaches to various tissues and

organs, such as periodontum, myocardium and liver. Recently, early clinical applications, such as the regeneration of the corneal epithelium have already been initiated. More detailed info on major research activities will follow later.

(2) Novel Organ replacement: Composed of three groups "biomaterials", "tissue and organ transplantation", and "artificial organs". We have defined cell-based therapies as multifunctional systems and new applications of biomaterials to support novel drug delivery systems and bio-sensing cells. Major research themes are 1) development of temperature responsive culture surfaces, 2) novel isolation systems utilizing the characteristics of surfaces fixed with PIPAAm and its change by temperature as an on-off switch, such as water-based chromatography system 3) capillary vessel modeling, 4) bio-sensor development combining temperature-responsive polymers and microfluidics 5) development of unique biochips combined with oligo cells and genes.

(3) Gene Medicine: Composed of four groups: 1) tailor-made healthcare treatment based on statistical analysis of genomic data, 2) molecular genetic research and development of treatment procedures for genetic diseases, 3) Elucidation of pathogenesis and clinical condition by comprehensive gene therapy and 4) Advanced DDS such as intracellular drug delivery and therapy by temperature-responsive nano-polymeric micelle. Advanced DDS technology development can be expected to realize active targeting. This group drives not only scientific research on such DDS technologies, but makes special efforts to provide tailor-made medicine for rheumatoid or genetic disease patients in Japan, as well as to provide refined individual counseling on lifetime care for infant patients suffering from genetic diseases.

(4) Advanced techno-surgery: Research and development of new assist technologies to assure safe, more complete, and traceable surgical operations. As advanced eyes for surgeons, intra-operative open MRI and precision-guided device/systems have been developed in the operating room. As advanced micro hands, surgical robots and multifunctional surgical instruments have been developed for further accuracy. This team also supports development of new medical devices to for tissue transplantation through endoscopic or minimal invasive surgical processes. As an advanced brain for surgeons, surgical strategy desk supports surgeons and secures medical traceability and recording.



## 2. Unique research management and goal setting: Bench to Bedside & Back:

(1) Participation of more than 30 specialist physicians and surgeons in active research collaboration. In cooperation with several other departments in Tokyo Women's Medical University, as well as other Japanese universities such as Tohoku University Graduate School of Medicine and Osaka University Medical School, these clinicians are committed to developing new clinical applications of tissue engineering, in conjunction with researchers from ABMES.

(2) Our goal is to treat patients, with a strong focus on applying creative ideas to specific advanced treatment. This aim is based on a passion for innovation and a sense of duty to the patients of tomorrow.

(3) Creation of new technologies to solve medical needs: To design new therapy concepts to overcome the bottleneck limitations of regenerative medicine, ABMES welcomes specialized scientists from a wide range of backgrounds, to bring new perspectives into the development of new research concepts. This environment aims to create brand new ideas and breakthrough technologies.

(4) Establishment of translational venture companies: To promote the translation of bench-side technologies to bedside, two venture companies, Nanocarrier (polymer micelle DDS technology) and CellSeed (temperature-responsive culture dishes and cell sheet regenerative medicine) have been established and hope to lead the development of new medicine for formal approval not only in Japan but globally.

(5) The PhD program in Biomedical Engineering at Tokyo Women's Medical University was established at ABMES in 2001 and seeks to attract industry researchers, medical doctors, and technicians, whom are interested in becoming involved in one of our research projects.

## 3. Active involvement in national projects, industrial collaboration, and education of biomedical specialists in the society

(1) ABMES was awarded a 7-10 year government grant in April 2006 sponsored by the Japan Science & Technology Agency and was selected to establish "Innovative Center of Regenerative Medicine" in Japan by integrating all the related advanced technologies to bring cell sheet engineering technologies to the bedside. In addition to international collaboration and joint ventures with our appointed industry partners, we committed to develop novel mass production and logistics technologies in an effort to achieve regenerative medicine (cornea, heart, teeth, cartilage, liver and esophagus) clinical trials. ABMES is also organizing a special industry education program on advanced DDS technologies later this year under the support from NEDO ("New Energy and Industrial Technology Development Organization"), to integrate Engineering and Energy technologies into DDS.

(2) 38 years of experience in organizing Tokyo Women's Medical University's Biomedical curriculum for industry students. More than 1,700 graduates from various industries have formed a close link as "the Society of Future Medicine". These graduates have been actively developing advanced medical treatment devices such as endoscope or ??64CT?? .

(3) In April 2008, ABMES will form a Union Graduate School with Waseda University(Slide1), to establish a new educational environment whereby researchers from both universities can discuss freely and collaborate at one place.

## Fusion biomedical school & Integrated research center

(Slide 1: Union Graduate School &  
Integrated Research Center)

Open in April 2008



## II. Major research activities in the field of tissue engineering & regenerative medicine

### 1. Temperature-responsive intelligent surfaces and cell sheet engineering: A novel method

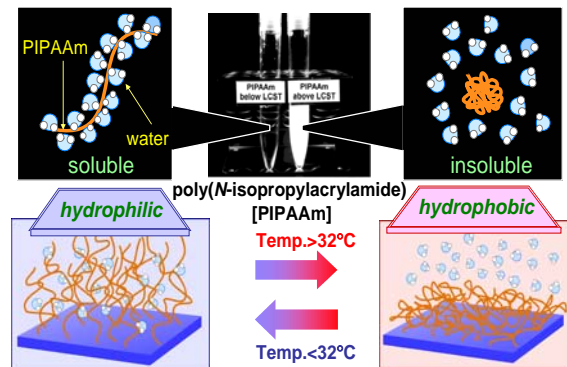
We propose “cell sheet engineering” as a novel approach for tissue reconstruction. By considering the components of tissues not as isolated single cells but “cell sheets” containing interconnected cells, we have attempted to reconstruct 3-D structures without scaffolds, but mimicking living tissues as a breakthrough technology. In conventional methods, cells cannot be harvested as intact “sheets” because the proteolytic enzymes such as trypsin or collagenase used for collecting cells degrade the proteins between cells and in connection with the extra-cellular matrix.

We have successfully harvested cells as intact sheets that maintained cell adhesion by applying temperature-responsive culture dishes with adjustable hydrophilic/hydrophobic properties of the surface. When we seed cells on cell culture dishes grafted with the temperature-responsive polymer poly(N-isopropylacrylamide) (PIPAAm), cells attach to the surface, and grow over the entire surface at 37 °C. PIPAAm fixed on the surface of ordinary culture dishes becomes hydrated when the temperature is reduced from 37 °C to 20 °C and the surface of the dish changes from hydrophobic to hydrophilic. This change enables the cultured cells to be detached and non-invasively harvested from the dish without any damage [1](Slide2). Such a feature of the intelligent culture surfaces is feasible only if the PIPAAm is fixed at nano-scale thickness (20 nm thick). In addition we have also developed methods to prepare functionalized temperature-responsive culture surfaces to promote the growth and proliferation of cells without animal-derived cells or serum[2]. It is hoped that these functionalized intelligent surfaces may be applicable for the development of engineered tissues that can be approved by regulatory agencies for human trials

We are currently attempting reconstruction and clinical applications for various tissues by single-layer cell sheet (corneal surface, periodontal ligament, and skin), (2) with layered sheets of the same cell type (cardiac muscle), and (3) with heterotypically stratified structures utilizing sheets of different cell types (liver lobules and kidney glomeruli). Vascularization within these tissue constructs is also a key focus in an effort to create thicker layered tissues. The following are some of our applications for tissue regeneration.

(Slide 2: Temperature-responsive cell culture dish)

### Temperature-Responsive Polymer grafted Surfaces

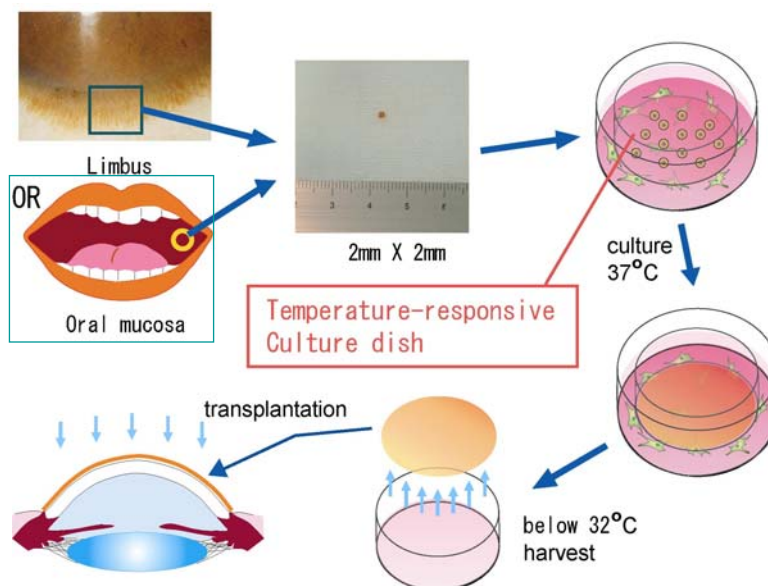


## 2. Cornea

From a biopsy of 2-by-2 mm of limbal tissues from patients, which is located between the cornea and conjunctiva, we can collect epithelial stem cells to create cultured corneal epithelial cell sheets.[3] For patients with damage to both eyes, we have also established a method to transplant epithelial cell sheets created using cells isolated from the patient's own oral mucos [4].(slide3) Using these methods clinical applications have already been successfully initiated in patients suffering from corneal epithelial disorders.

(Slide 3: Medical process of cornea regenerative medicine)

### Transplantation of carrier-free tissue-engineered epithelial cell sheet



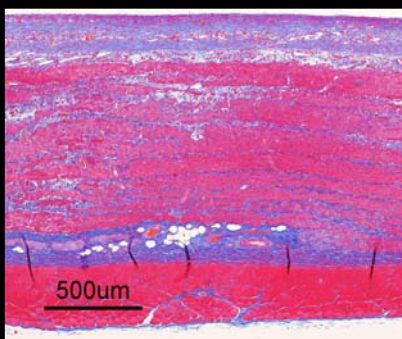


### 3. Cardiac tissue

We have created “cardiac patches” of multilayered cardiomyocyte sheets, whose macroscopic spontaneous beatings can be seen with the naked eye [5] In rat transplant experiments, the continuous beatings of the patches have been observed for more than a year and can improve the function of damaged hearts. We have also developed a multi-step transplantation method to achieve 1 mm thick myocardial tissue grafts that have organized microvascular networks and show synchronized pulsations [6] Further functional improvement of damaged hearts can be expected if cardiac patches and thick tissues accompanied with microvascular network can be transplanted onto the infarcted heart.(slide 4,5,6) In conjunction with our collaborators, we have also examined skeletal myoblast[7,8] and mesenchymal stem cell sheets[9] for the repair of damaged hearts.

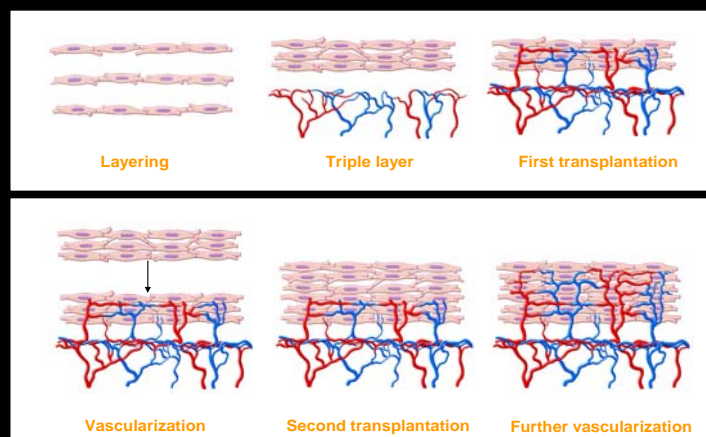
(Slide 4 & 5: T.Shimizu et al. FASEB J 20(6)(2006), P709)

#### Multi-layer Myocardial Tissue Graft

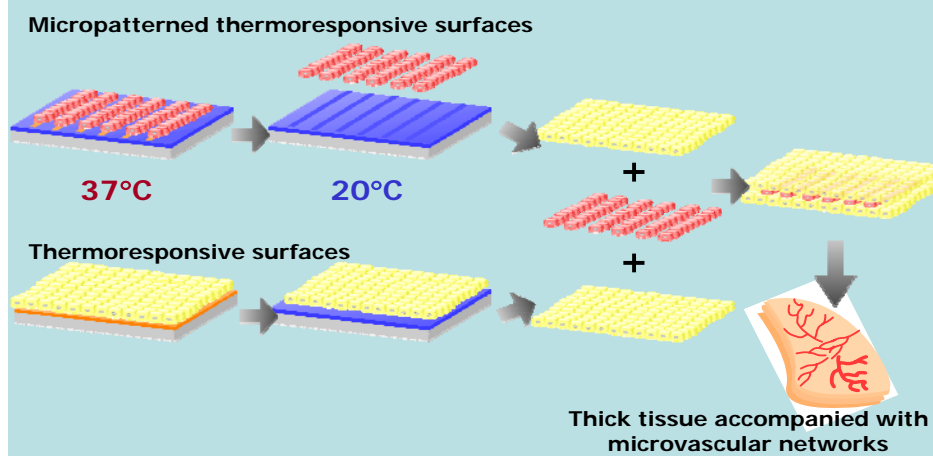


(3 sheets x 10 times, 1 day intervals)

#### Multi-Step Transplantation of Layered Cell Sheets



#### 3-D Constructs with Combination of Cell Sheets and Micropatterned Cells



(Slide 6: 3-D construction with multi-layered cell sheets)

#### 4. Periodontal Ligament

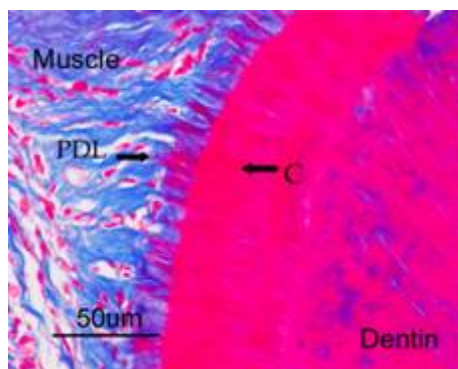
The regeneration of periodontium using various methods had been difficult and thus far been met with limited success. However, using cell sheets created from periodontal cells of wisdom teeth, we are now initiating early clinical applications. We are attempting to establish a novel strategy for periodontal regeneration by the transplantation of tissue-engineered multilayered human periodontal ligament (PDL) utilizing cell sheet engineering technology.

Periodontitis is one of the most prevalent infectious diseases and is characterized by the destruction of the tissues surrounding and supporting the teeth such as alveolar bone, cementum and periodontal ligament. The final goal of the therapy is the complete regeneration of periodontal tissues, particularly where gross periodontal destruction has compromised the support of the tooth. This aim requires the attachment of a new connective tissue to the previous denuded root surface with the formation of new cementum, new bone and functionally oriented collagen fibers emanating from the root.

Recently, stem cells were found in human PDL cells [10,11]. An application of this novel cell sheet technique was performed for periodontal therapy using human PDL cells. We previously harvested human PDL cell as a contiguous cell sheet and then transplanted into a periodontal defect model in athymic rats. The histological findings showed the most outer layer of curetted root dentin surfaces were attached with newly formed periodontal tissue [12]. This orientation highly resembled native periodontal ligament fibers.

Additionally, we have shown that PDL cell sheet transplantation in a dog model results in partial success of the periodontal regeneration including collagen fibers inserted perpendicularly into the newly formed bone and cementum [13].

Our recent results have also clarified the ability of transplantable human PDL cell sheets in developing a cementum-periodontal ligament complex formation in vivo in an ectopic implantation site. In order to reinforce the periodontal cell sheet, three layers of PDL cell sheet were constructed with the help of fibrin gel. The data revealed that collagen fibers inserted perpendicularly into the newly formed cementum-like tissue and this orientation closely resembles native periodontal fibers called Sharpey's fibers [14](Slide7). For the periodontal regeneration, the key issue is to regenerate cementum including Sharpey's fibers.



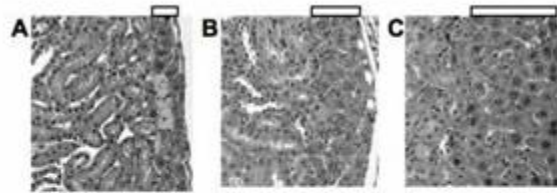
(Slide7) Six week after transplantation of multi-layered human periodontal cell sheet with dentin block (D). Collagen fibers (F) inserted perpendicularly into the newly formed cementum-like tissue (C) and this orientation closely resembles native periodontal fibers called Sharpey's fibers. [14]

#### 5. Liver tissues

Hepatic tissue engineering using primary hepatocytes is considered a valuable new therapeutic modality to various types of liver diseases; yet many challenges must be overcome such as limited periods of hepatocyte survival at extra-hepatic sites and difficulties in maintaining the functionality of the engineered tissues.

The goals of the liver team in this institute are to establish scientific principles to develop technologies for the engineering of functional liver systems in vivo. While our ultimate aim is to create new therapeutic modalities to treat liver diseases, we also seek to address the basic biological questions that are important for liver cell functions and maintenance.

Our team has established new technologies to engineer liver tissues in mice that could persist indefinitely (>200 days) at extra-hepatic sites including the kidney capsule space and subcutaneous space. Furthermore, the engineered structures could develop into 3-dimensional thick tissues using liver regeneration stimulus induced in the recipient body [15-17, figure]. (Slide8)



Histological examination of the engineered liver tissues under the kidney capsule in mice (H&E staining). Isolated hepatocytes mixed with extracellular matrix components were transplanted under the kidney capsule space. A, Liver tissues in mice of non-hepatectomy group. B, Liver tissue in mice that received hepatectomy 70 days after hepatocyte transplantation. C, Liver tissue in mice that received initial hepatectomy at day 70 followed by additional hepatectomy at day 130. White bars denote liver tissue layer under the kidney capsule space. Note that liver tissue become thicker into 3-D structure as hepatectomies performed.

More recently, our team has successfully engineered miniature ectopic liver systems using hepatic tissue sheets created on temperature-responsive culture surfaces [18]. This approach is highlighted by its simple, minimal invasive, and exclusion of biodegradable scaffolds. We are currently enhancing these cell sheet-based technologies to increase tissue functions by combining other types of cells[19, 20]. This method for construction of layered structures with co-cultured cell sheets can also be expected for tissue regeneration applications of various other tissues, such as kidney and bladder.

### III. Challenge for future

With the ever developing field of tissue engineering and regenerative medicine, the possibilities for new treatments are endless. We therefore welcome active collaboration, and hope to continue to help tissue engineering reach its immense potential.

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## TERMIS-EU News

### Ivan Martin, PhD – Continental Chair

One of the most important components in the mission of TERMIS-EU is certainly to offer members new opportunities for interaction, open discussion and debate. In this light, I'm happy to acknowledge that several interesting initiatives and programs have been organized or implemented in the past few months.

On June 1<sup>st</sup> 2007, Rui Reis kicked off the first TERMIS-EU summer school, in Madeira. The meeting, addressing "Key Elements of Tissue Engineering", was attended by 64 people from a total of 23 countries, out of which 14 within Europe. The program not only included an international panel of keynote speakers, but also offered students and young investigators the possibility to present and discuss their own work in front of a friendly but scientifically rigorous audience. A few presentations selected by the panel received an official recommendation to be submitted to the journal Tissue Engineering, in order to underline the link between TERMIS initiatives and the official journal of the Society. The meeting was also taken as a chance to celebrate Rui Reis' 40<sup>th</sup> birthday, with a dedicated speech by David Williams (see picture).



On June 11<sup>th</sup> 2007, thanks to the dedication of Gerjo van Osch and of Sarah Wilburn, TERMIS-EU launched a searchable directory for the members, collecting contact information and keywords for areas of research/interest. The database is expected to foster communication among members and to support identification of groups with experience in specific areas, which would be especially important for the definition of research consortia for the EU Framework Program VII. However, in order to be fully operative and functional, the database requires that each member of TERMIS-EU fills out the own coordinates and keywords. Please, take a moment to visit <https://www.termis.org/directory.php> and to register with the TERMIS-EU directory.

On September 4<sup>th</sup> 2007, Robert Brown will open the annual meeting of TERMIS-EU, in London. This year a highly interdisciplinary program will be complemented – thanks to the active involvement of Catarina Alves and of Hadi Mirmalek-Sani from the UK Tissue and Cell Engineering Society – by several initiatives offered for the Students and Young Investigators Section (SYIS). These will include dedicated sessions and a competition on project proposals, where SYIS members will be involved in both the presentation/discussion and in the review process of a few selected proposals.

I would like to take the opportunity to thank all people who actively contributed to the organization and consolidation of TERMIS-EU and especially Sarah Wilburn, who has always been promptly reactive to all our queries and requests and is providing a strong support to coordinate interactions among the different working parties within TERMIS.

See you all in London!  
Ivan Martin  
European Continental Chair



**TERMIS-EU 2007 Chapter Meeting**  
**Regent's College Conference Centre**  
**London, United Kingdom**  
**4-7 September 2007**  
[www.termis.org/eu2007](http://www.termis.org/eu2007)

Registrations for the 2007 TERMIS-EU Chapter meeting are now being accepted <http://www.termis.org/eu2007/register.php>. Register before the 15<sup>th</sup> June 2007 and take advantage of the early registration rate!

European funding and research will be highlighted and a showcase session will encourage presentations from Eastern areas of Europe. Conference themes will reflect the traditions of John Hunter (1728-1793, Scientific Surgeon) and Sir Peter Mansfield (Nobel Laureate 2003 for MRI Imaging) to focus on surgical innovations and progress in nano-micro bioengineering.

Young scientists will be encouraged within a UK Tissue and Cell Engineering Society session.

If you have any questions for the conference organizers, please contact:

**Professor Robert Brown**

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 Email: [termiseu@ucl.ac.uk](mailto:termiseu@ucl.ac.uk)

**The TERMIS-EU Council would like to announce the solicitation of proposals to host the TERMIS-EU 2011 Chapter Meeting and the 2012 World Congress that will be held in Europe.**

If you are interested in hosting the 2011 TERMIS-EU Chapter meeting or 2012 World Congress, please submit your request to Sarah Wilburn at [swilburn@termis.org](mailto:swilburn@termis.org). You will be provided with a meeting host form that asks detailed questions about the meeting organizers, location/venue, program, and meeting financials. When proposals are submitted, they are reviewed by the respective chapter council and an official vote is conducted. [Click here](#) to view details about hosting a TERMIS meeting.

**SYIS-EU Activities during the TERMIS-EU London Meeting**  
**Dear Students and Young Researchers:**

The Student and Young Researchers Section (SYIS) of TERMIS-EU is pleased to organize several events at London meeting to be held in September 2007.

The aim is to help and motivate young researchers with networking and interaction with experts in the field and to foster professional development. Students (full-time graduates or undergraduates) and young investigators of any academic discipline who have educational, research, or practical interests in the fields of Tissue Engineering and Regenerative Medicine are eligible to be members of TERMIS-SYIS. Young investigators must have been awarded their doctoral degree within the past 3 years and should not be holding an appointment as a faculty or academic staff in a university/research institute.

***Take advantage of these opportunities!***



### **STUDENT MENTOR HAPPY HOUR**

*Open for all TERMIS-SYIS*

TERMIS-SYIS this year will again be hosting a student-mentor happy hour. This event will allow students and young investigators to network with world-renowned academic and industrial investigators.

This will be an opportunity for students and young investigators to have their questions answered by established research leaders, in a relaxed and open discussion.

Students and young investigators will be assigned to tables based on their mentor preferences. Selections will be made on a first come first serve basis, and complimentary beverages will be served at the event.

*Further updates will be available soon!*

### **SYIS PUB WALK**

*Open for all TERMIS-SYIS*

Following the Student-Meet-Mentor happy hour, we will this year be holding an SYIS Pub walk taking in several historic London pubs on a tour from Regents College towards the heart of the city!

You can try out locally brewed ale and dine on great food, or at the very least soak up the legendary character of some of the oldest and finest pubs in London. Enjoy this chance to meet and network with students and young investigators from around the world who are attending the TERMIS-EU meeting!

Pre-registration will be required and the event will leave following the end of the Student-Meet-Mentor hour.

### **GUIDED POSTER TOUR**

*Open for all TERMIS-SYIS*

TERMIS-SYIS will be hosting a guided poster tour. This event will allow students and young investigators to "follow" poster discussions with

a mentor, to hopefully answer questions posed by posters and allow insight into their research. Pre-registration will be required, and further updates will be available soon.

### **OUTSTANDING STUDENT CONTRIBUTION AWARDS**

SYIS has the pleasure to sponsor awards. An SYIS committee will evaluate talks given by SYIS participants at the London meeting and award a prize to the presentation of the most outstanding paper.

No application is required and a designated committee will give awards following evaluation at the meeting.

### **TERMIS EU MEETING CAREER CENTER**

The Meeting Career Center aims at enhancing professional opportunities for the attendees of the upcoming EU TERMIS Meeting.

The career center will be available for academic laboratories or industry representatives who are interested in a global resource for potential applicants. If you would like to post current job openings within your organization, please send information pertaining to the job opening to our organizing committee. A posting board will be available at the 2007 TERMIS-EU Chapter Meeting.

Further information will follow for all events but if you have any queries please do not hesitate to contact us.

### **Look forward to seeing you all in London!**

2007 TERMIS-EU SYIS Meeting and Fundraising Chair

Sayed-Hadi Mirmalek-Sani – [shms@soton.ac.uk](mailto:shms@soton.ac.uk)

Umber Cheema – [u.cheema@ucl.ac.uk](mailto:u.cheema@ucl.ac.uk)

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Eric Farrell – [e.farrel@erasmusmc.nl](mailto:e.farrel@erasmusmc.nl)

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[miguel.oliveira@dep.uminho.pt](mailto:miguel.oliveira@dep.uminho.pt)

Feature on Tissue Engineering Laboratory - Europe



**The Center for Regenerative Therapies Dresden (CRTD)**  
Dietmar Zechner and Michael Brand

Center for Regenerative Therapies Dresden  
Dresden University of Technology  
Tatzberg 47/49, 01307 Dresden  
Correspondence: michael.brand@biotec.tu-dresden.de

**Introduction**

Regenerative therapies that exploit and stimulate the body's regenerative capacity are a major goal of biomedical research in the 21<sup>st</sup> century. Successful regenerative therapies are already performed with transplanted bone marrow stem cells, but stem cell therapy is not yet a reality in most other clinical fields. Compared to more traditional prosthetic-reconstructive approaches, however, stem cell based therapies hold great promise for controlled tissue regeneration. To realize the potential to cure disease using regenerative medicine, we face several hurdles: cellular mechanisms controlling stem cell activity remain largely unknown; protocols to manipulate various stem cells and successfully integrate them into tissue are not established; procedures integrating biomaterials and cells to generate novel living transplants are not yet optimized; and viable options to suppress immunological rejection of allogeneic transplants or stem cells are unavailable. Clearly, only a multidisciplinary research effort in molecular biomedicine and biomaterials channeled towards application in clinical research programs can overcome these obstacles and lead to success.

**The interdisciplinary CRTD network**

To establish the required research structure to pursue regenerative medicine in Germany, the German Research association (DFG) approved funding for the Center for Regenerative Therapies Dresden (CRTD). After a competitive nation-wide evaluation procedure, the research center opened in 2006 and already consists of a network of more than 70 research groups (<http://www.crt-dresden.de/index.html>). Member scientists come from internationally renowned research centers including the Max-Planck-Institute of Molecular Cell Biology and Genetics (MPI-CBG), the Biotechnological Center (Biotec), the Max Bergmann Center for Biomaterials (MBC), the Max-Planck Institute for Physics of Complex Systems, the Leibniz Institute of Polymer Research, the Fraunhofer Institute IKTS, and the Medical Theoretical Center (MTZ). This diversity provides a wide-range of expertise, covering molecular cell biology, stem cell biology, tissue engineering, and biomaterials, and has involved the CRTD in the clinical application of cell-based therapies within one of the biggest stem cell transplant programs in Germany. In addition, the CRTD has initiated first cooperation with world leading companies, such as Novartis, Amgen, German Red Cross, Miltenyi

Biotec, Leica, and Applied Biosystems and has established partnerships with local companies such as Cenix, Elbion, Gene Bridges, GeSIM GmbH, and Jado Technologies. On July 6<sup>th</sup> 2007 the first CRTD internal Summer Conference on Regenerative Medicine was held thanks to sponsorship by various companies. The conference attracted more than 250 scientists, who listened to internal and external seminar speakers

and debated 120 Posters at two poster sessions (see Fig. 1). This vibrant research community is supported by the largest international PhD program in Germany (<http://www.digs-bb.de/digs-bb>). This program provides outstanding opportunities for university graduates to work towards a PhD or MD/PhD in three interconnected research areas: Molecular Cell and Developmental Biology; Regenerative Medicine; and Nanobiotechnology, Biophysics and Bioengineering. **July 6<sup>th</sup> to 9<sup>th</sup> 2008 the CRTD will host, in conjunction with the SFB 655, the 2<sup>nd</sup> International Congress on Stem Cells and Tissue Formation in Dresden** ([www.stemcellcongress-dresden.org](http://www.stemcellcongress-dresden.org)).

#### **Establishing new CRTD research groups**

To enhance the existing infrastructure, DFG funding will mainly be used to attract 5 Professors, 8 junior group leaders and 4 independent research associates to Dresden. Independent research associate positions are novel to Germany and allow successful post-docs to work and publish entirely independent of senior researchers. To support this early career advancement, one technical assistant will be provided along with funding for consumables and equipment. Together, the new groups will form the core of the CRTD. As of yet, 3 professors, 3 junior group leaders and 2 independent research associates are working at the CRTD (see Fig. 2). An additional 4 junior group leaders will join by the end of 2007. Expectations are high considering that the CRTD has already attracted renowned scientists from all over the world. For example, Prof. Bonifacio, from Australia, will head a group working on regenerative therapies to treat diabetes, and US-citizen Elly Tanaka will focus on regeneration using various animal models such as axolotl and mice. In addition, Prof. Gerd Kempermann was recruited to the CRTD after performing research at the Salk Institute in La Jolla and the Max-Delbrück-Centrum in Berlin. His research group will analyze environmental and genetic factors regulating adult neurogenesis. Many other group leaders have also been recruited from internationally well-known places such as University of California Berkeley, Rockefeller University, and Harvard Medical School. **At the moment, the CRTD has positions open for a full professorship in translational research and 2 to 3 independent research associates** (<http://www.crt-dresden.de>).

#### **Additional research building for the CRTD**

New professors and group leaders are currently accommodated in the Max-Planck-Institute of Molecular Cell Biology and Genetics (MPI-CBG), the Biotechnological Center (Biotec), and the Medical Theoretical Center (MTZ). In order to provide long-term accommodation to new groups and give them the opportunity to expand, a new 5000m<sup>2</sup> research building will be built. The 40 million Euros needed to construct this new building will be co-financed by the State of Saxony and the Federal Republic of Germany. This building will also house animal facilities for zebrafish, axolotl and mice, and provide additional space for the CRTD technology platform. The CRTD building will be located on the Medical campus, immediately adjacent to the Biotechnological Center (Biotec) and close to the Max-Planck-Institute of Molecular Cell Biology and Genetics (MPI-CBG) and the Medical Theoretical Center (MTZ). This location will facilitate the sharing of infrastructure and foster tight cooperation between scientists located in different buildings (see Fig. 3).

#### **Research focus and objectives of the CRTD**

The Center for Regenerative Therapies Dresden (CRTD) explores the human body's capacity to regenerate and aims to develop novel regenerative therapies. Therapies based on cell transplantation are already being performed at the CRTD with hematological stem cells. However, for many human diseases, such as diabetes, Morbus Parkinson's, Alzheimer's, bone / cartilage defects, and cardiovascular diseases, novel therapies have not yet been developed. In order to foster new therapies, the CRTD explores and manipulates mechanisms of stem cell physiology both *in vitro* and *in vivo* using animal models including mouse, axolotl and zebrafish (see Fig. 4).

The CRTD focuses on the following research areas:

- Hematology/oncology/immunology: Dresden is home to one of the biggest European bone marrow transplantation centers. Here, HSCs are transplanted into patients in order to regenerate

the hematopoietic system after conditioning therapy. In addition, mesenchymal stem cells (MSCs) isolated from bone marrow are infused to modulate allogeneic immune effects and are seeded on surface engineered scaffolds to generate novel types of transplants for bone and cartilage replacement. Several groups work on either dendritic cells, T-lymphocytes or B-cells, which are manipulated to suppress immunological rejection of transplanted tissue

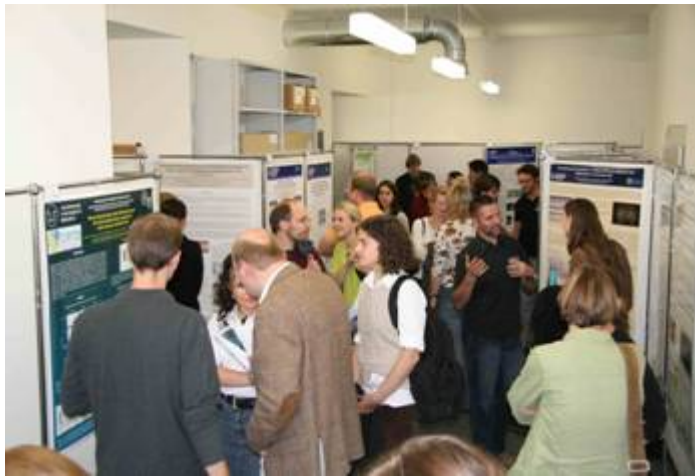
- Diabetes: Pancreatic surgery as well as basic research on insulin producing beta-cells is well established in Dresden. Several research groups at the CRTD analyze signaling pathways that regulate beta-cell proliferation or insulin secretion with the goal of identifying target proteins for pharmacological intervention. In addition, scientists are study obesity and metabolic diseases such as diabetes mellitus type II, and analyze the autoimmune response that leads to diabetes mellitus type I. One goal of the CRTD is to improve immunotherapy for prevention of diabetes mellitus type I. Moreover, several CRTD teams are improving procedures for beta-cell isolation and transplantation to explore novel strategies to cure diabetes.
- Neurodegeneration / degeneration of the retina: Neurodegenerative diseases such as Parkinson's disease, Spinal Cord Injury, Amyotrophic Lateral Sclerosis and Retinal Degradation severely reduce patient quality of life. To find novel approaches to treat diseases such as Parkinson's, scientists at the CRTD are evaluating the beneficial effect of transplanting biomaterials along with neural stem cells. As opposed to the situation in humans, regeneration of nerve cells occurs readily in other vertebrates, including zebrafish and amphibians. Several teams are trying to understand this difference with the goal of establishing novel concepts to treat neurodegenerative diseases. In addition, scientists at the CRTD are studying the influence of environmental and genetic factors on neural stem cell expansion and differentiation. One major focus at the CRTD is cell-based treatment of retinal degeneration.
- Hard tissue replacement: Bone diseases are emerging as one of the major health risks in our ageing society. Novel therapeutic intervention needs to be developed for both bone degeneration caused by osteoporosis and local bone defects resulting from trauma. Scientists at the CRTD are therefore developing and testing new biomaterials for bone replacement. Importantly, these biomaterials are being seeded with various cells, such as human or mouse mesenchymal stem cells, osteoblasts, or osteoprogenitor cells, to generate vital bone mass, then evaluated in a clinical setting. Other CRTD teams focus on understanding biological processes that regulate bone formation in order to develop novel therapies for bone disease. In addition, zebrafish are being used to screen for novel factors that regulate hard tissue regeneration.
- Cardiovascular diseases: In the near future, myocardial diseases have the potential to be treated by tissue regeneration and preservation strategies. CRTD scientists and clinicians will have the opportunity to trial such novel therapeutic applications in one of the largest academic German heart centers. In order to provide a basis for future regenerative heart therapies, CRTD scientists are using zebrafish as a model animal to analyze novel endogenous cardiac stem cells and study novel factors that regulate heart regeneration. Groups at the heart center are also exploring novel strategies of tissue preservation by analyzing the cellular signaling that controls cell growth and cell death in the myocardium. Another important goal of the CRTD is to properly understand and control blood vessel formation. Several groups study molecular mechanisms of angiogenesis/vasculogenesis and are using this acquired knowledge to regulate blood vessel formation in various transplants. Another focus also lies on vascular proliferative diseases such as atherosclerosis and neo-intima formation.

Within these five research areas, interdisciplinary cooperation between medicine, basic biological research, nanotechnology and material science is fostered by:

- A technology platform that provides access to cutting edge imaging methods, techniques for cell manipulation, biomaterials, clinical cell/tissue technologies, bioinformatics, genetic engineering, and high throughput screening.

The main objectives of the CRTD are:

- To develop advanced regenerative therapies in the above mentioned research areas
- To study crucial mechanisms controlling stem cell recruitment, activation, proliferation, homing, and differentiation, in model organisms
- To control these cellular processes using genetics, surface engineering, matrix engineering, and micro devices in order to provide control of stem cell activity and regeneration
- To catalyze clinical translation of basic research results and to test novel regeneration therapies in pre-clinical and clinical trials
- To develop such therapies into marketable products with our commercial partners
- To develop a leading center for Regenerative Therapies in Europe



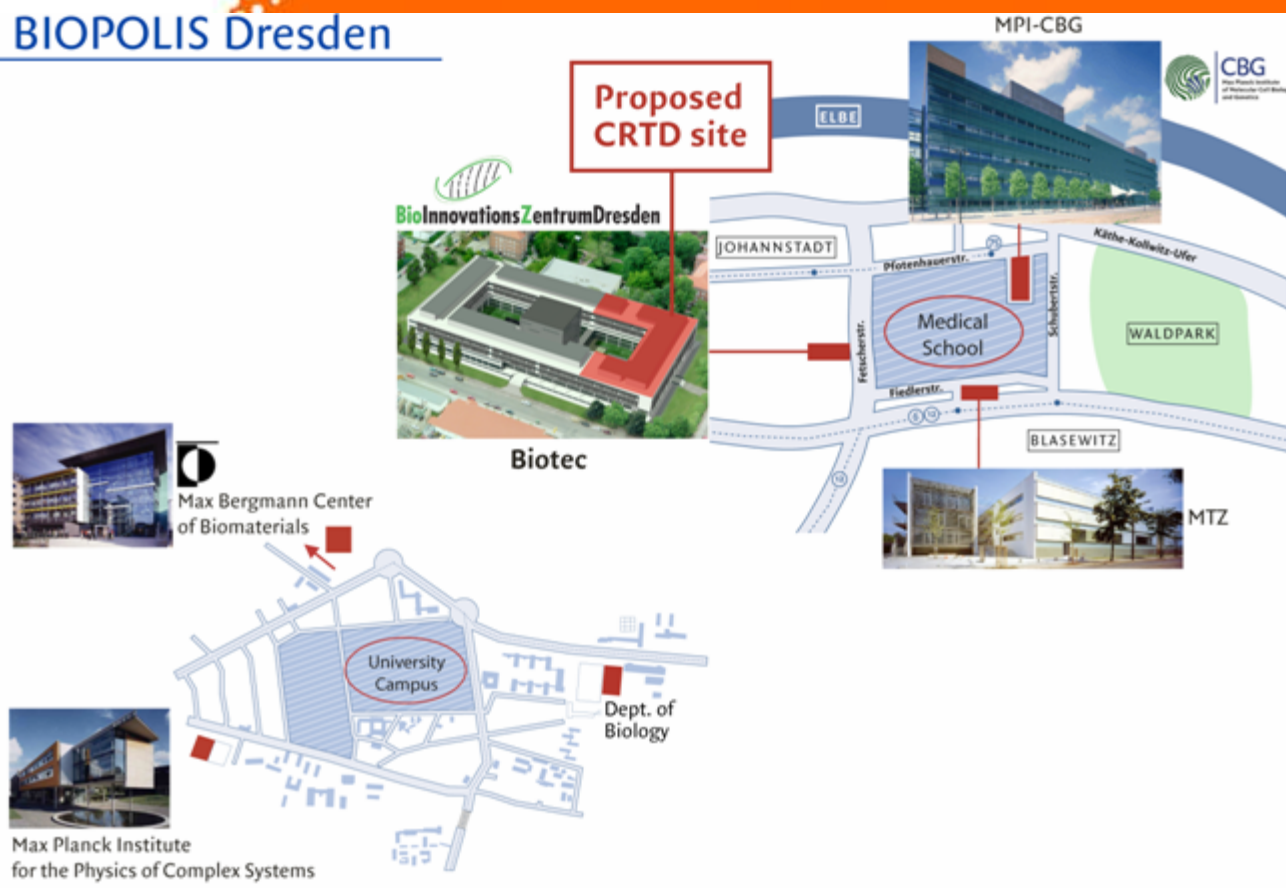
**Fig. 1:** Poster session at the first CRTD Internal Summer Conference on Regenerative Medicine



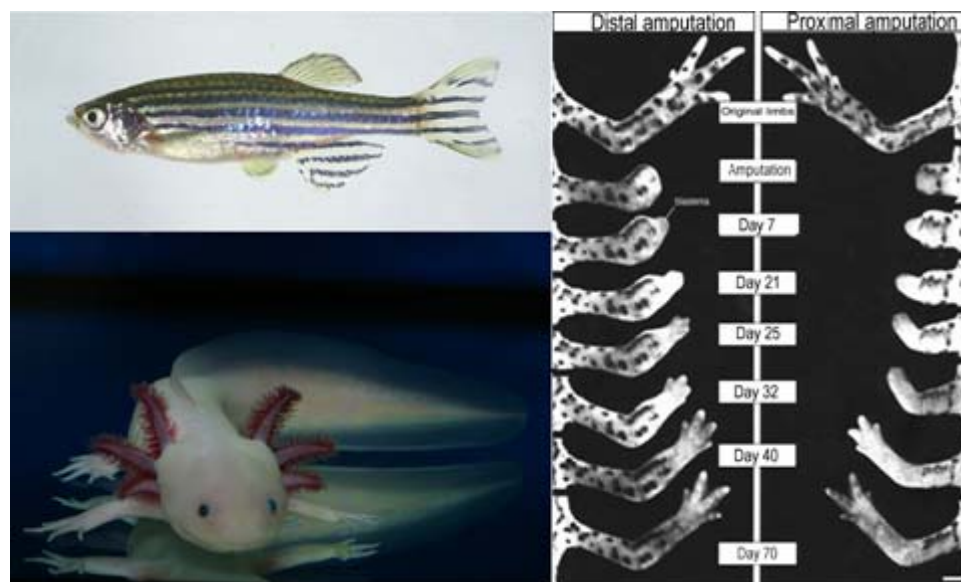
**Fig 2.** New CRTD Professors: Prof. Tanaka, Prof. Bonifacio, and Prof. Kempermann



### BIOPOLIS Dresden



**Fig. 3:** Location of the new CRTD building at the Medical Campus in BIOPOLIS Dresden



**Fig. 4:** Some vertebrates, such as axolotls, salamanders or zebrafish, retain an amazing ability to regenerate tissues (here: limb regeneration in salamander, from Wolpert). One key effort in Dresden is

use regenerating model organisms to learn how to design regenerative therapy strategies.

**TERMIS-NA News****Anthony Atala, MD – Continental Chair**

On behalf of the TERMIS-NA Council, members and staff, I take this opportunity to express our sincerest appreciation for your participation at the 2007 Annual Meeting and Exposition in Toronto. TERMIS-NA is deeply grateful for your support and generosity.

This year's meeting was an extremely successful endeavor, thanks to the individual efforts of Molly Schoichet and Michael Sefton and the entire Advisory Committee in Toronto as well as the corporate representatives who supported the meeting through their sponsorships and exhibiting. In addition, many students, member volunteers and staff contributed enormous resources to attract the 700+ attendees to Toronto and provide them an experience that was both educational and enjoyable. Not only did we have world-class keynote presentations and cutting-edge scientific sessions, we also had a comprehensive student program organized by Doug Baumann and his student team as well as over 250 poster presentations.

Because of your support, and the success of our annual meeting, we continue to strengthen our society and are able to develop new and innovative programs to serve our members and the regenerative medicine community in the future. Many new ideas were suggested at this year's meeting and we plan to offer additional programs, products and services as we build our society together.

As the regenerative medicine emerges from its infancy, TERMIS-NA will continue to lead the charge in providing specialized services to the researchers, medical doctors and business professionals who comprise our Society and work with our friends in the European and Asian Councils to unite this global industry.

Again, thank you for making this mission a reality.

Sincerely,

Anthony Atala  
North American Council Chair

**Save the Date**

December 6-11, 2008  
TERMIS-NA Meeting and Exposition  
San Diego, California

Information will be posted soon at [www.termis.org](http://www.termis.org).

### Feature on Tissue Engineering Laboratory – North America

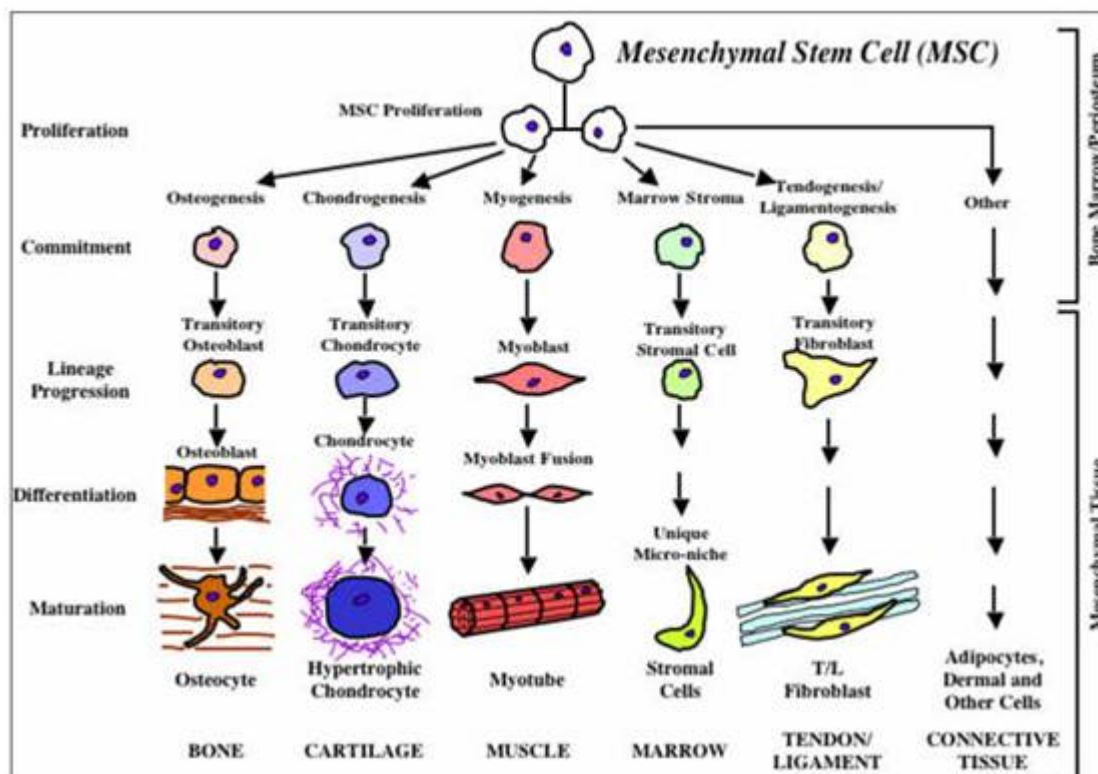
**ARNOLD I. CAPLAN, Ph.D.:**

**The Skeletal Research Center at  
Case Western Reserve University  
Cleveland, Ohio**

Arnold Caplan arrived at CWRU in 1969 fresh from a postdoctoral at Brandeis University with Drs. Edgar Zwilling and Nathan O. Kaplan. During the 1970's and 1980's, his lab worked on embryonic chick limb formation with emphasis on muscle, cartilage, and bone development, maturation, and aging. His extensive interactions with members of the biological science, medical and engineering faculty led to the creation of the Skeletal Research Center (SRC) in 1985 where he is the Director. Indeed, the initiation of the SRC represents the formalization of his efforts in Tissue Engineering and Regenerative Medicine.

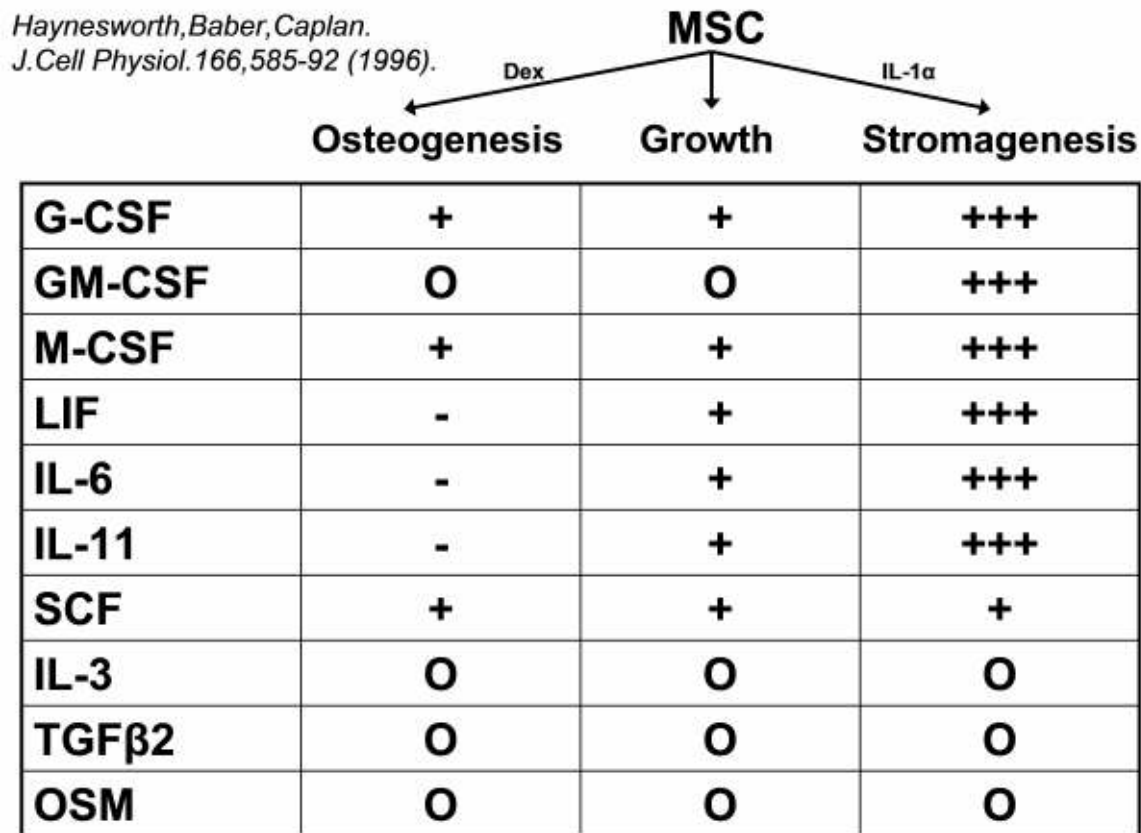
The study of embryonic chick limb mesenchymal cells in culture led him to realize that similar multipotent progenitors must exist in adults. In the late 1980's, he and Stephen Haynesworth developed the technology for isolating and culture-expanding adult human marrow Mesenchymal Stem Cells (MSCs). Their initial studies were based on studies by Owens, Friedenstein, Urist, and others, but the important innovation was the generation of the Mesengenic Process scheme pictured in Figure 1. The formulation of this scheme was predicated on the logics established for Hematopoiesis and the Hematopoietic Stem Cell. The Osteogenic Lineage had been established by Scott Bruder as an M.D.-Ph.D. student in the Caplan lab. Thus, the lineage pathways in Figure 1 were arranged from those on the left, for which relatively more information was known, to those on the right, for which little or no lineage information was available.

Figure 1



There have been a number of published papers on the use of MSCs for tissue engineering constructs for bone, cartilage, marrow stroma, and tendon tissue in preclinical animal models. A key paper published by Haynesworth, Baber, and Caplan in 1996 measured the bioactive molecules synthesized and secreted by human MSCs during growth compared to differentiation into bone or marrow stroma. This paper established a cytokine/growth factor change when cells were switched from growth into the different lineage pathways (Figure 2). The important deduction from the data was that each of the six donor's MSCs had different constitutive levels of bioactive molecules, but that the percent change on switching to differentiation medium tightly clustered for all preparations. It is only recently that it has been established that the secretion profile of MSCs is immunosuppressive for T-cells. This allows the use of allogeneic MSCs for various therapies. Such immunosuppressive therapies include inhibiting graft-versus-host disease, inhibiting Crohn's disease, and potentially inhibiting autoimmune diseases and tissue rejection.

Figure 2

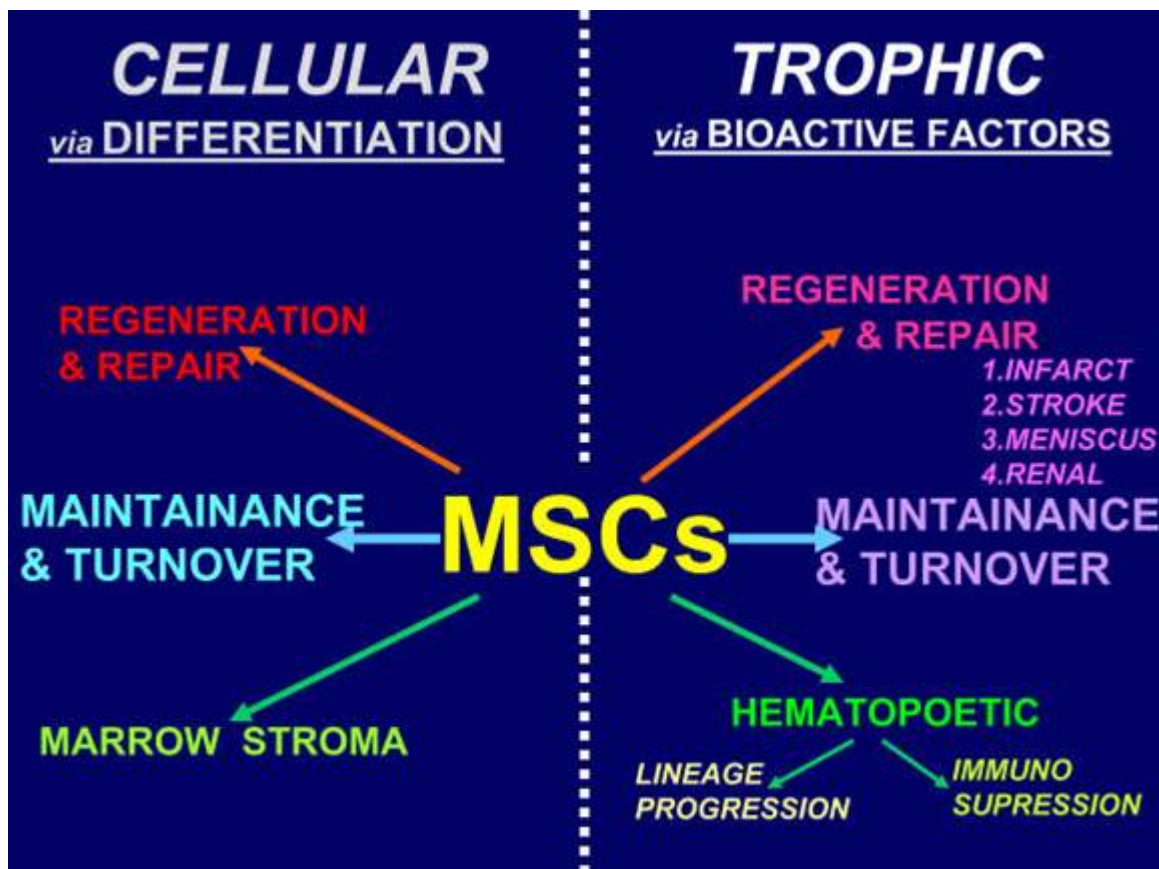


The therapeutic use of MSCs delivered via the bloodstream is formulated on the basis that MSCs secrete bioactive agents that trophically affect injured tissues. These trophic agents appear to limit the fields of tissue damage (inhibit apoptosis), inhibit scarring, stimulate angiogenesis, and stimulate mitosis of tissue-intrinsic progenitors. In preclinical studies in both humans and animals, marrow-derived MSCs have been shown to improve the clinical symptoms for myocardial infarct, stroke, tendinitis, acute renal failure, spinal cord injuries, and meniscus regeneration. Osiris Therapeutics, Inc. of Baltimore, MD, an MSC company started by Drs. Caplan, Haynesworth, and Victor Goldberg, is now conducting clinical trials with allogeneic MSCs for graft-versus-host disease, Crohn's disease, meniscus and knee joint, and acute myocardial infarct. The initial safety and therapeutic results are quite encouraging.



As seen in Figure 3, there are two sides to the MSC studies. On the left is their role in normal tissue maintenance and turnover and the management of these cells in tissue engineering strategies. On the right are the new trophic effects due to their secretion of powerful bioactive molecules that are both immunosuppressive and which establish a regenerative milieu to support the tissue-intrinsic repair of tissue injury.

Figure 3



Dr. Caplan and his colleagues are now working on ways to target therapeutic cells via the bloodstream to injured tissues to enhance the regeneration of afflicted tissues and organs. These new targeting strategies use technology developed at CWRU by Drs. Caplan and James E. Dennis and technology developed by Dr. Erkki Ruoslahti at the Burnham Institute in La Jolla, CA. This new approach is based on transiently anchoring docking peptides to the cell surface with lipophilic tags that insert into the plasma membrane of all cells. The docking peptides seek tissue-specific docking platforms on blood vessel walls within different tissues. The site-directed delivery of the right cell at the right time to the right place is the next frontier for cell-based therapies.

The SRC and Dr. Caplan continue to contribute to the changing landscape of Tissue Engineering and Regenerative Medicine.



### Upcoming TERMIS Meetings

#### September 2007

TERMIS-Europe: London, England  
Regent's College Conference Centre  
Meeting Chair: Robert Brown  
4-7 September 2007  
[www.termis.org/eu2007](http://www.termis.org/eu2007)

#### December 2007

TERMIS-Asia-Pacific: Tokyo, Japan  
Sankei Plaza

Meeting Chair: Prof. Kazuo Tsubota  
December 3-5, 2007  
<http://www.pac.ne.jp/termis2007/>

#### June 2008

TERMIS-Europe: Porto, Portugal  
Porto Congress Center – Alfândega  
Meeting Chair: Rui Reis  
23-26 June 2008  
[www.termis.org/eu2008](http://www.termis.org/eu2008)

#### November 2008

TERMIS-Asia-Pacific: Chinese, Taipei  
Taipei International Convention Center  
Meeting Chair: Prof. Ging-Ho Hsiue  
November 7-8, 2008

#### December 2008

TERMIS-North America: San Diego, California  
Hyatt Regency La Jolla  
Meeting Chairs:  
Bill Tawil, Bob Sah and Anthony Ratcliffe  
December 6-10, 2008

### 2<sup>nd</sup> World Congress in Seoul Korea

#### August 2009

COEX  
Meeting Chair: Shin-Yong Moon  
August 31 – September 3, 2009

Organizing and Registration Office for 2nd TERMIS WC SEOUL will be officially opening on Aug 1. 2007 as below address:

The Institute of Reproductive Medicine and Population,  
Medical Research Center, Seoul National University  
199-1 Dongsoong-Dong, Chongno-Gu, College of Medicine, Annex Building,  
Seoul 110-510, Korea  
[gskhang@chonbuk.ac.kr](mailto:gskhang@chonbuk.ac.kr)

*Updates for all meetings are available at [www.termis.org](http://www.termis.org).*

**Free Online Access to *Tissue Engineering***

The online version of the journal, *Tissue Engineering*, the official journal of TERMIS, is now available for free to members only. The online journal can be accessed 24 hours a day, 7 days a week by logging on to the online journal website, <http://www.termis.org/journal.php>.

All members of TERMIS have been issued a username and password to access the online version of the journal. If you are experiencing problems logging on to view the online journal or have any questions, please contact Sarah Wilburn either by email at [swilburn@termis.org](mailto:swilburn@termis.org) or by phone at +1 (410) 931-7838.

***Regenerative Medicine Online Journal Package***

Mary Ann Liebert Publishers, Inc. is providing TERMIS members with the opportunity to purchase a Regenerative Medicine Online Journal Package that includes the following journals:

*Tissue Engineering*  
*Rejuvenation Research*  
*Stem Cells and Development*  
*Cloning and Stem Cells*

The Online Journal Package can be purchased for \$295.00. If you are interested in ordering the journal package, please check the corresponding box that is included within the TERMIS online membership form.

**Encourage Your Institution to Subscribe to the journal, *Tissue Engineering***

If your institution does not currently subscribe to the journal, *Tissue Engineering*, we ask that you please complete the library recommendation form and fax to your institution's librarian encouraging them to subscribe to the journal today. (A copy of the librarian recommendation form can be found at <http://www.termis.org/docs/libraryRecommendForm.doc>) Your institution's library can benefit in subscribing to *Tissue Engineering* by providing a publications outlet for yourself and other colleagues within the field of tissue engineering keeping you up-to-date with the latest papers and research. The journal now offers an online version, which offers convenience and ease of accessibility.

Please take a moment to complete the form and fax to your librarian today!

**Genetic Engineering News (GEN)**

In view of your membership with TERMIS a one year complimentary subscription to Genetic Engineering News (GEN) has been reserved for you. Act now to receive 21 free issues of GEN for 2006.

Genetic Engineering News, founded in 1981 was the first in biotech and is now the biggest and most widely read biotech publication in the Industry.

By providing an authoritative insider's perspective into all aspects of biotechnology, GEN is an indispensable resource for everyone involved in the business of translating discoveries at the bench into solutions that fight disease and improve health, agriculture and the environment.

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To sign up for your complimentary subscription to GEN go to: [www.genengnews.com/subscribe.aspx](http://www.genengnews.com/subscribe.aspx).

### Post Your Job Openings

Members of TERMIS have the opportunity to post job openings on the TERMIS website for one month FREE. If you are interested in posting a job opening, please send the job description to Sarah Wilburn at [swilburn@termis.org](mailto:swilburn@termis.org). The TERMIS-SYIS will also post the job openings on the SYIS forum.

### Meetings Endorsed by TERMIS



Bio printing offers the print industry a lucrative new opportunity for high growth and high value products and an entirely new customer base. As with any new technology, this will start with comparatively simple technology, including printing proteins onto diagnostic devices such as pregnancy and diabetes tests. IntertechPira's **Bio Printing** conference will delve into these relatively new topics and explore how you can apply them best!

Bio printing involves highly accurate inkjet printing which in turn enables a replication of DNA and RNA in a repeatable pattern, thus creating a wide range of opportunities like forensics, security inks, and drug development. The real opportunities, however, will be in the field of tissue engineering. If inkjet technologies can be used to recreate human tissue, the market opportunities could be phenomenal. Using the same high precision inkjet technology as the printed electronics industry, a number of

leading innovators are attempting to produce computer aided, automatic, layer by layer deposition, transfer, and patterning of biologically relevant materials.

At this groundbreaking conference, you'll have the first opportunity to hear from both leading medical academics and professionals from top inkjet, printing, and ink companies. Make sure your company has the opportunity to take advantage of this lucrative new market opportunity for the printing industry by attending IntertechPira's **Bio Printing** event!

To register, or to learn more, please contact Paul Squires on +44 (0)1372 802051 or [paul.squires@pira-international.com](mailto:paul.squires@pira-international.com)

<http://www.intertechpira.com/events.asp?step=2&eventID=52482901A54885592BA01A548850A2E081A5488|2EED33|1498AB>

### August 2007

- [Advances in Tissue Engineering Short Course](#)  
Hosted by Rice University, the Advances in Tissue Engineering Short Course will be held from August 15-18, 2007 in Houston, TX. Registrations are now being accepted!
- [MSC 2007](#)  
Conference Dates: August 27-29, 2007  
Conference Location: Cleveland Marriott Downtown at Key Center  
Visit the conference website for registration and program details.

#### September 2007

- [ICRS 2007](#)  
Conference dates: September 29-October 2, 2007  
Location: Warsaw, Poland

#### October 2007

- [3rd World Congress on Regenerative Medicine](#)  
Conference Dates: October 17-19, 2007  
Location: Leipzig, Germany  
Themes: Translation of Regenerative Technologies and Personalized Regenerative Medicine

#### December 2007

- [2nd International Conference on Mechanics of Biomaterials & Tissues](#)  
Conference Dates: December 9-13, 2007  
Location: Lihue - Kau'i, Hawaii  
Organizers: Elsevier in association with Engineering Fracture Mechanics and International Journal of Fatigue  
Call for Papers Abstract Deadline: April 27, 2007
- [International Conference on Cellular and Molecular Bioengineering](#)  
Conference date: December 10-12, 2007  
Location: Singapore  
Organized by the Nanyang Technological University
- [TICME-2007](#): Trento Innovations Conferences in Materials Engineering  
Conference date: 16-19 December 2007  
Location: Trento, Italy  
Organized by the University of Trento

#### May 2008

- [8th World Biomaterials Congress](#)  
Meeting Dates: May 28 through June 1  
Conference Location: RAI Conference Centre in Amsterdam, The Netherlands.  
Please contact [wbc2008-info@ics-online.nl](mailto:wbc2008-info@ics-online.nl) for further details.

As time is flying, the deadline for submitting abstracts for the 8th World Biomaterials Congress is rapidly approaching: 30 September 2007. We herewith would like to remind you to submit your abstract(s) to be on time for the deadline. The Congress will be held in Amsterdam, The Netherlands, from 28 May until 1 June 2008.

The Call for Abstracts & Registration can be found on the congress website, please visit <http://www.wbc2008.com> to check it out!

The next step to build a solid scientific program will be the abstract(s) submitted by you, so do not hesitate any longer, and submit your abstract.

This is your meeting, so your attendance or scientific contribution is the basis for a success of the congress. From our side, we will do our very best to be a good host. Together we will make this a splendid congress! So prepare for Amsterdam 2008, the city awaits you!



*Journal of the Royal Society Interface* is the newest addition to the Royal Society journal list and publishes articles at the interface between the physical sciences (including mathematics) and the life sciences. It draws its authors from all over the world and has a similarly international readership. It has made a big impact on the research community and citations increased by 500% from 2005 to 2006.

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*J. R. Soc. Interface* is published bimonthly and has enjoyed such a rapidly increasing rate of submissions since its launch in 2005 that we

shall increase its frequency to monthly next year. Accepted articles are published online ahead of print and total publication times are typically under 60 days.

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