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Letter from the President

Dear TERMIS Members,

We hope that you all are enjoying the last weeks of your summer.

The TERMIS-EU conducted a very successful 2017 conference that was held in Davos, Switzerland in June. The organization was led by Drs. R. Geoff Richards and Mauro Alini from the AO Research Institute Davos. With over 1,300 registrants, it was the highest attendance for any Chapter conference to-date.

By the time this newsletter is released, the TERMIS-AP will be hosting its conference in Nantong, China at the Jinshi International Hotel. The chairs of the conference are Drs. Xiaosong Gu, Xiobing Gu and Yilin Cao. Plenary speakers that will be presenting in the meeting are: Prof. Zhengguo Wang from the Third Military Medical University, Chongqing, China; Prof. David F. Williams from the Institute for Regenerative Medicine, Wake Forest School of Medicine, Winston-Salem, USA; Prof. Kam W. Leong, Columbia University, New York City, New York, USA; Prof. Yilin Cao, Shanghai 9th People's Hospital, Shanghai, China; and Prof. Yasuhiko Tabata, Kyoto University, Kyoto, Japan. This will be complemented with several symposia with leading keynote speakers.

In December, the TERMIS-AM will host its annual conference in Charlotte, North Carolina, USA, at the Charlotte Convention Center. The theme of the conference is "The Path Forward for Regenerative Medicine: Traversing the Lab to the Patient." Confirmed plenary speakers are: Dr. Samuel Stupp - Board of Trustees Professor of Materials Science and Engineering, Chemistry, Medicine, and Biomedical Engineering at Northwest University, USA; Dr. George V. Ludwig - Principal Assistant for Research and Technology where he exercises scientific oversight and/or management of the Army and DoD medical Science and Technology programs in USA ($1.5 billion in FY16); and Dr. Kiran Masunuru - Associate Professor of Cardiovascular Medicine and Genetics in the Perelman School of Medicine at the University of Pennsylvania, USA. Drs. Anthony Atala, Shay Soker and James Yoo look forward to welcoming you to Charlotte.

2018 Kyoto, Japan, will host the 5th World Congress from September 4-7 at the Kyoto International Conference Center. The program will consist of 7 Parallel Oral Sessions, 3 Poster Sessions (one day without parallel session). The theme of the conference is: "Integration of Industry, Government, and Academia for Regenerative Medicine." The conference co-chairs Drs. Yasuhiko Tabata and Yoshiki Sawa and the program chair Dr. Yoshiki Sawa encourage you to submit a symposia proposal before the deadline on September 30th. The call for abstracts opens November 15th.

We thank all our members for submitting and sharing their research at our meetings. If you have any questions regarding the TERMIS conferences or about your membership, please do not hesitate to contact myself or swilburn@termis.org.

Sincerely,
Rui L. Reis
TERMIS President

Plenary Speakers

Dr. Samuel Stupp (bio)
Board of Trustees Professor of Materials Science and Engineering, Chemistry, Medicine, and Biomedical Engineering at Northwest University. He directs at Northwestern the Simpson Querrey Institute for BioNanotechnology and the Energy Frontiers Research Center for Bio-Inspired Energy Science funded by the Department of Energy

Dr. George V. Ludwig (bio)
Principal Assistant for Research and Technology where he exercises scientific oversight and/or management of the Army and DoD medical Science and Technology programs ($1.5 billion in FY16).

Dr. Kiran Masunuru (bio)
Associate Professor of Cardiovascular Medicine and Genetics in the Perelman School of Medicine at the University of Pennsylvania

Program-at-a-Glance

Early Bird Registration Available Until November 6th

WFIRM Young Investigator Awards - Nominations Due October 13th

Student and Young Investigator (SYIS) Activities Sign Up

Call for Symposia - Due September 30, 2017

Call for Symposia Proposal Form

Abstract submission OPENS November 15, 2017

TERMIS-EU 2017 meeting in Davos was the most successful European TERMIS meeting to date for both science and networking, thanks to participants submissions, presentations and active discussions – thank you all for having helped make this possible.
We had the largest TERMIS-EU attendance, with 1301 registered participants, 21 society symposia, 42 standard symposia, 1159 accepted abstracts, 227 oral presentations and 831 poster presentations. Our

participants were from 51 unique countries, including Colombia, Mongolia, Costa Rica, Lebanon, Iran, Chile, South Africa and Indonesia (all emerging countries). We invited plenary speakers who had not spoken at a previous TERMIS-EU chapter meetings in order to enhance the meeting quality and minimize the redundancy with previous conferences.

We had active input from the TERMIS-EU 2017 Conference Scientific Advisory Committee, including proposing plenary and keynote speakers (covering young and more experienced keynotes), reviewing abstract within their area of expertise, chairing or co-chairing sessions and actively advertising the event in their country and to local societies.

International Guest Nation
TERMIS-EU 2017 Davos introduced the new concept of International Guest Nation for the TERMIS-EU congresses, which hopefully will be continued and followed by the other TERMIS chapters. The International Guest Nation is chosen from a non-host Chapter country (*e.g.* for TERMIS-EU, the International Guest Nation is chosen from outside Europe) to encourage cross fertilisation of science and increase networking among world meetings. In recognition of South Korea's strong attendance to previous TERMIS-EU meetings it was decided that the inaugural International Guest Nation of TERMIS-EU would be South Korea. KTERMS accepted this invitation and nominated 4 ambassadors to represent them at the Davos meeting, together with just under 100 participants from South Korea.

KTERMS held two society symposia at the Davos meeting and Korean Orthopaedic Research Society held one. This was a superb start to this new Guest nation concept. We wish to congratulate KTERMS for this honor of being the first International Guest Nation and especially Gun-Il Im and his ambassador colleagues for having worked hard to help achieve this result.

Attraction of clinicians
Termis-EU Congress 2017 was granted 23 European CME credits (ECMEC) by the European Accreditation Council for Continuing Medical Education (EACCME). We aimed to attract clinicians, who earn credits for attending meetings, and we included a conflict of interest section for all presenters, which is standard practice at medical conferences. As it will benefit TERMIS to have more clinicians attending the chapter and world meetings, we recommend that future meetings apply for this accreditation.

SYIS, Industry day, Business Plan Competition, Women's forum, the Davos Debate, Publishing Debate, Society and standard Symposia
In these cases, we followed the established modes and, where appropriate, added some ideas to enlarge their scopes and attractiveness, such as SYIS having their own presentation room for the whole meeting to allow for more students and young investigator presentations. We would like to thank the organizers of these sessions who did a lot of background work to make them a success.

TERMIS Abstracts
TERMIS abstracts have been moved to eCM conferences Open Access online periodical (ISSN: 2522-235X). You can find here TERMIS-EU 2016 abstracts and TERMIS-EU 2017 abstracts. For the reasons behind this change please check http://www.ecmjournal.org/supplements.html

Again, thank you for attending TERMIS-EU 2017 Davos, you as the participants helped make this meeting such a success for the TERMIS society and field. We look forward to seeing you all at the TERMIS world conference in Kyoto in 2018 and as many as possible at TERMIS-EU 2019 in Greece.

Sponsors, Exhibitors
We would like to especially thank all of our sponsors and exhibitors who made the long journey to Davos on the promise of a great exhibition and exposure. From the survey, space, time, location with customer traffic (within the coffee break area and lunch area) and exposure really worked well. Thank you for the trust and please come back to TERMIS-EU 2019 in Greece.

Thank you to all the participants who filled in the survey to help for future TERMIS conferences. Your feedback will design future meetings and help build a sustainable society.

SAVE the Date eCM

2018 eCM XVIII**: Cartilage & Disc: Repair and Regeneration,** 25th-28th June 2018, Congress Centre, Davos, Switzerland.
Since the inaugural meeting in 1999, eCM Conferences have been the place where scientists (including biologists, engineers and material scientists), clinicians and industry meet. Together they bring clinical problems to the table, consider industrial requirements of possible solutions and often initiate collaborative projects. The limited number of participants (max 200) ensures ample opportunities for knowledge sharing in basic, translational and clinical research in addition to developments in the field. As eCM Conferences do not have parallel sessions it permits in-depth multidisciplinary discussions about how to advance the research area.
eCM Conferences, Science with Open Discussion

Sincerely
Local Organisers: Dr Sibylle Grad, Dr Sophie Verrier, Dr David Eglin, Prof. Martin Stoddart.

Prof. R. Geoff Richards FBSE, FIOR
Conference Chair

and

Prof. Mauro Alini, FIOR
Conference Program Chair

Thank you!

We specially want to thank Geoff Richards, Mauro Alini and their team for this fantastic meeting in any aspect. It was the largest chapter meeting ever (1´300 participants). In particular the TERMIS-EU chapter is especially thankful for their generous donation to our society funds, which meanwhile are back in Europe. We thank Sarah and TERMIS international for the help in between.

Regards, Heinz Redl – TERMIS-EU Chair
Gerjo van Osch – TERMIS-EU Chair-Elect

Employment Opportunities

Current Job Postings

Please contact the Executive Administrator if you are interested in posting an opening.

TERMIS-EU News: Rebirth of the Chapter

In June, during the 2017 TERMIS-EU Conference in Davos, Switzerland, the Executive Committee and three council members gathered with the notary to sign the charter officially making the TERMIS-EU a registered Society within Switzerland (Picture is Above).

First and foremost, we would like to thank David Eglin. David was our local coordinator with the legal counsel and notary in Switzerland. His assistance with communicating with the Swiss authorities to formulate the charter and by-laws (that mirror the TERMIS global by-laws) and to submit the appropriate documentation to register the Society was vital to the registration process.

The Council would also like to thank Prof. R. Geoff Richards, the Director of the AO Research Institute in Davos, Switzerland for his assistance with the registration of the Chapter and offering for the AO Research Institute to be the official mailing address for the Chapter.

For the last couple of years, the TERMIS-EU funds were being held by TERMIS global (as US based bank account). With the completion of the registration in Switzerland, the TERMIS-EU was able to open a Swiss bank

account in Euros.

As members of the Society, you are aware of the longevity of facilitating the registration process. As a council, we wanted to ensure that the proper steps were followed to dissolve the Society in Germany and to ultimately reach our final goal of registration the TERMIS-EU in Switzerland.

If you have any question regarding this process or have ideas on ways to continue to support TERM within the European Chapter, please do not hesitate to contact myself, the TERMIS Executive Administrator or any members of the TERMIS-EU Council. We are more than happy to listen your ideas, comments or concerns.

Sincerely,
Heinz Redl
TERMIS-EU Chair

And

Gerjo van Osch
TERMIS-EU Chair-Elect

TERMIS Editorial Committee

Interview with Jeroen Rouwkema - 2017 TERMIS-EU Young Investigator Award Recipient

Jeroen is Associate Professor at the University of Twente in the Netherlands. He works in the Department of Biomechanical Engineering where he leads the Vascularization Lab (www.vascularizationlab.com).

1. Tell us about your research area

One of the goals of tissue engineering is to generate tissues that can be used as alternatives for donor material to repair or replace damaged tissues or organs. Tissues generated for this purpose will generally be of a size larger than the diffusional limit for nutrients and oxygen. This means that after implantation, the tissue will require a vascular network to supply nutrients to all cells within the tissue.

As part of the foreign body response, a vascular network will generally invade implanted engineered tissues. However, this is a process that takes days or weeks, resulting in suboptimal tissue integration or cell death. The main goal of the Vascularization Lab is to include a vascular network during culture in the lab, which can connect to the vascular network of the patient after implantation. In order to achieve optimal tissue integration and anastomosis of the vascular structures, the lab focuses on the organization and maturation of the vascular network, but also of the tissue in which the vascular network is present.

In this aspect, we pay specific attention to the effect of mechanical signals on tissue organization and development. This ranges from the mechanical environment of the cells within the tissue such as the stiffness of the materials we use, to tissue compaction, and active mechanical stimulation via for instance compression and perfusion.

2. What inspired you to follow this field of research?

I already started working on vascularized (muscle) tissue engineering during my MSc, when I did a 6-month internship in the group of Bob Langer at MIT where I worked under the supervision of Shulamit Levenberg. During these 6 months, we developed a co-culture system and could show that endothelial cells organized into tubular structures in engineered muscle tissue, without the addition of angiogenic growth factors or other media components. Moreover, after implantation these structures connected to the vasculature of the host, and contributed to tissue perfusion and survival.

Before I embarked on my internship, I had already signed a contract to start as a PhD student upon my return at the company IsoTis under the supervision of Clemens van Blitterswijk. There, I was actually supposed to work on bioreactor development, but since the research at MIT had been so successful, and vascularization was such an important issue for large size tissue engineering, I was given the opportunity to continue my research on vascularized tissues, now focusing on bone. As a result, during my PhD, I focused more and more on cell- and tissue biological questions, even though my BSc and MSc were on (bio)process engineering.

After my PhD, the focus on mechanical signals to further control vascular organization and maturation was inspired by work from Adam Engler and others, who demonstrated that the mechanical environment of cells and tissues can be as important as soluble factors to regulate tissue development. I believe that

this is especially important for vascular tissues, since these are exposed to both strains and fluid flow shear stresses in their natural environment.

3. What do you think is the most exciting emerging area in regenerative medicine?

What is always exciting to me, is the development of enabling 'tools'. Recent and past examples are for instance Induced Pluripotent Stem cells, a wealth of new techniques regarding micro- and nanofabrication, expansion microscopy, and CRISPR/Cas-9. What all of these developments have in common, is that they enable an ever increasing level of control over experimental environments and perturbations, or the amount of data that can be extracted from experiments. New experimental tools offer the possibility to dive deeper into cellular processes, and thus to get a more detailed understanding of all the complex processes that govern tissue- and organ regeneration. As such, breakthroughs in regenerative medicine are often preceded and facilitated by novel experimental techniques.

4. What do you see as the main future challenges for regenerative medicine that we need to overcome?

I personally see complexity as the main challenge for regenerative medicine. This can for instance be structural complexity, meaning that tissues do not consist of a single cell type in a single structure, but contain multiple cell types, support structures like a vascular network, or a zonal organization as can be seen in articular cartilage. Apart from that, tissue development is accompanied by temporal complexity, meaning that for instance the availability of specific growth factors has to vary over time.

This complexity makes it very hard to replicate the development of a truly physiological tissue in vitro, or to induce tissue regeneration in vivo. Fortunately, the cells we use often have a remarkable capacity to regulate themselves and so replicate tissue complexity to some extent, but still the complexity of a tissue both in space and time makes it very hard for an engineer to know exactly what buttons to push when.

5. What are the main challenges for career progression and how do you think can we address them?

I think one of the main challenges currently, especially for scientists who are nearer to the start of their career and still need to establish themselves as well recognized and independent researchers, is funding scarcity.

Since this gives rise to more and more competition, I feel that funding agencies, both national and European, tend to favour well established research groups with an extensive proven track record. And even though this is understandable since the interest of these agencies is often to maximize the return on investment for the (taxpayer) money they spend and thus are more likely to trust projects from groups that already showed that they can deliver on their promise, a by-effect is that younger researchers have more and more trouble getting their ideas funded. As a result, this can delay the transition from being a postdoc or junior staff member in an established lab to having your own independent group.

A possible way to address this could be to put even more emphasis on, and money in, personal grant schemes like the European ERC grants and national equivalents, especially for younger researchers. This will help promising researchers to manage their own research projects and grow their own independent profile.

Thematic Groups Updates

The Promise of Regenerative Rehabilitation in the TERMIS Community

The author is: **Nick J. Willett, PhD,** Assistant Professor, Department of Orthopaedics, Emory University School of Medicine

The field of tissue engineering has long integrated fundamental principles of stem cell biology, biomaterials and mechanical engineering to better design new tissues. Researchers have taken a multi-scale approach, looking at the nano-, micro-, and macro-levels to engineer new regenerative interventions and tissue replacements. This still relatively new field now has a wide variety of tools and technologies available and is just truly beginning to translate into clinical utility, though this has been much slower than initial predictions and hype might have expected (or hoped).

As regenerative technologies become more prevalent in the clinic, it is becoming increasingly apparent that the rehabilitation regimen and management of the intervention after the delivery/implantation is just as critical to the success of the implant as the fundamental technology itself. Often, the pre-clinical models used to screen these technologies are performed in essentially sedentary animals that are confined to small cages. Whereas, clinically, patients often quickly begin movement and weight bearing (and ideally would start physical therapy) after any regenerative medicine treatment. Recent studies in many fields are beginning to provide evidence that early (near immediate) initiation of controlled and appropriate rehabilitation regimens can improve functional outcomes. This recognition has generated the new integrative field of Regenerative Rehabilitation; however, this

field needs closer dialogue and collaboration between the various disciplines.

Harnessing the capacities of rehabilitation regimens and mechanotherapies has the potential to significantly improve the effectiveness of regenerative therapies. This new interdisciplinary field requires fundamental and dinical research to better understand how rehabilitation—exercise, resistance training, mechanical loading, range of motion, etc.—can be used in synergy with regenerative therapies. Too often conservative rehabilitation regimens are prescribed that call for unloading of the treatment area; this can actually be detrimental to the efficacy of regenerative therapies, but so too can over-loading or too quickly loading the tissue engineered implant. Understanding the optimal goldilocks region of regenerative rehabilitation will require close collaborations with clinical practitioners and basic scientists and holds the promise to improved functional outcomes as these technologies continue to translate into clinical practice.

With the goal of fostering a platform to gather key stakeholders, researchers, and practitioners, TERMIS has established a thematic group on Regenerative Rehabilitation and at recent TERMIS conferences have featured Regenerative Rehabilitation Workshops/Symposium. The goal of the thematic group (https://www.termis.org/thematic_groups.php?mode=rehab) is to "strengthen the relationship between tissue engineering/regenerative medicine researchers and rehabilitation scientists, ultimately accelerating the translation of regenerative medicine and tissue engineering technologies to the clinic." This group has led workshops including one at the TERMIS AM conference in 2016, on "Regenerative Rehabilitation: Optimizing Regenerative Medicine Outcomes Through mechanotherapies," and featured talks by George Christ PhD, Stephen Badylak DVM, PhD, MD, and Fabrisia Ambrosio PhD, MPT. The workshop presented a critical perspective on rehabilitation based mechanotherapies and other physical stimuli as a means improve functional outcomes after various regenerative therapies. A similar symposium was held at the TERMIS EU Conference in 2017 on "Modulation on tissue regeneration and regenerative rehabilitation," with a keynote talk by Fabrisia Ambrosio PhD, MPT, and featured select highlighted talks from submitted abstracts. These workshops together have provided worldwide platforms for the regenerative rehabilitation dialogue to take place with the Tissue Engineering and Regenerative Medicine community. With the success of these events, a workshop on Regenerative Rehabilitation has now been planned for the American Congress of Rehabilitation Medicine planned in the Fall of 2017. Bringing experts from the Tissue Engineering field and Rehabilitation fields to present Workshops has brought this field to larger audiences. It has also highlighted the increase in visibility and growth in the Regenerative Rehabilitation field that has been led by the AR3T (The Alliance for Regenerative Rehabilitation Research and Training; an NIH funded center at the University of Pittsburgh) and the International Consortium for Regenerative Rehabilitation (a partnership between 12 institutions from around the world). This Fall, AR3T will host the Sixth Annual International Symposium on Regenerative Rehabilitation. This year's symposium will be held in Pittsburgh, PA Nov 1-3. This is the premier symposium with the specific goal of fostering the dialogue between these two fields and is endorsed by numerous organizations and stakeholders, including TERMIS. We encourage you all to attend this great event and to engage in the growing interdisciplinary field of Regenerative Rehabilitation.

Vascular Tissue Engineering (VTE)

Dear Colleagues,

It is our pleasure to present the new Thematic Group on Vascular Tissue Engineering (VTE) which has been endorsed by the Society in May 2017 by our President. Our aim is to develop novel and alternative vascular grafts for clinical applications. This ranges from acellular and cell-based stable or biodegradable synthetic to biological or assembled scaffolds for *in vitro* or *in vivo* vascular tissue engineering.

The Proposers and Endorsers come from various backgrounds and all continents and are listed on the TERMIS web-site. Our main activity is the organization of dedicated sessions at the annual TERMIS meeting, holding the bi-annual international symposium on Vascular Tissue Engineering, teaching activities and exchange of young researchers interested in the field of VTE, rotating among the three geographical areas of TERMIS.

The International Symposium on Vascular Tissue Engineering
These bi-annual global gathering of scientists working in the field of VTE have been initiated by some of the members of our group in Tianjin under the leadership of Deling Kong, Song Li and Beat H. Walpoth and the first meeting was held in Leiden, Netherlands, 28-29 May 2013, organized by Joris Rotmans. The second was held in Shanghai, China, 28-29 May 2015, organized by Xiumei Mo, Song Li and Deling Kong.

The third Symposium was held in Columbus, Ohio, 5-6 June of this year, organized by Toshi Shinoka, Christopher Breuer and Laura Niklason under the auspices of the Nationwide Children's Hospital. The Columbus meeting gathered over 150 scientists from all continents and had a highly scientific and intense programme spread over two days including invited talks, abstracts and posters. The Guest of Honour awarded the Fung Weyner Lifetime Achievement Award was John Mayer Jr., from Boston Children's Hospital. Furthermore, the meeting brought together some of the pioneers of the tissue engineering concept which was initiated in the '80s at Harvard and MIT.

3rd ISVTE, Columbus, 2017

The next ISVTE will be held in 2019 and until then our Thematic Group will hopefully hold symposia at the various TERMIS meetings.

On behalf of the VTE Committee:

Chair: Beat H. WALPOTH, Geneva, Switzerland
Vice Chairs: Joris ROTMANS, Leiden, Netherlands
Toshiharu SHINOKA, Colombus, USA
Secretaries: Xiumei MO, Shanghai, China
Deling KONG, Tianjin, China

1st TERMIS-EU Workshop in Collaboration with ISBF

3D Bioprinting in Musculoskeletal Tissue Engineering

22-23 March 2018, Warsaw, POLAND
www.termis.org/eu-workshop-2018

Recent advances in 3D printing including bioprinting stimulate development of future medical treatments that are patient specific and highly personalized. 3D printing enables fabrication of customized artificial medical devices, scaffolds and even human tissues and organs.

The workshop will bring together scientists, engineers, clinicians and industry to discuss recent achievements in the field of 3D printing in regenerative medicine with an emphasis on how new discoveries translate into improved clinical practice. The main focus will be on bone and cartilage regeneration; however, repair of soft tissue will be also presented. The important part of the meeting will be hands-on sessions on 3D printing and bioprinting.

The workshop will provide with insights into the state-of-the-art technologies, methods and biomaterials in 3D printing of biomimetic scaffolds and implants that stimulate desirable cellular responses and tissue regeneration. Additionally, the latest developments and future perspectives in the field of 3D bioprinting used to build 3D personalized living tissue/organs substitutes or models will be discussed. The hands-on sessions will provide participants opportunity to see the 3D printing and 3D bioprinting in action to understand how these technologies might be used in engineering of musculoskeletal tissues. Participants will execute the entire process from material selection to conceptualization, designing/modelling, printer setup, process parameters, and printing. They will develop a model for a given problem statement. The best design will be selected and printed during the session.

Organizing Committee:
Co-Chairs: Wojciech Swieszkowski and Zygmunt Pojda

Scientific Advisory Committee:
Ranieri Cancedda
Dietmar Hutmacher
Juergen Groll
Ali Khademhosseini
Malgorzata Lewandowska-Szumiel
Jos Malda
Lorenzo Moroni
Aleks Ovsianikov
Elzbieta Pamula
Heinz Redl
Rui Reis
Wei Sun
Tim Woodfield
Giovanni Vozzi
James Yoo

Gerjo van Osch

Upcoming Meetings

TERMIS Endorsement Request Form

Interested in endorsement by TERMIS. Please complete and submit the form to the TERMIS Administrator. The request will be provided to the TERMIS Endorsement Committee for review and consideration of endorsement. Download Form

List of Upcoming Meetings