

TIME TABLE

TIME	Monday June 22	Tuesday June 23	Wednesday June 24	Thursday June 25	Friday June 26
9.00 - 9.45	Registration	Duda	Klein-Nulend	Duda	Klein-Nulend
9.45 - 10.30	van Rietbergen	Duda	Klein-Nulend	Duda	Klein-Nulend
11.00 - 11.45	Klein-Nulend	Fratzl	Müller	Fratzl	Duda
11.45 - 12.30	Klein-Nulend	Fratzl	Müller	Fratzl	Duda Q&A
14.00 - 14.45	Müller	van Rietbergen	Skerry	van Rietbergen	
14.45 - 15.30	Müller	van Rietbergen	Skerry	van Rietbergen	
16.00 - 16.45	Skerry	Müller	Fratzl	Skerry	
16.45 - 17.30	Skerry	Müller Q&A	Fratzl Q&A	Skerry Q&A	

ADMISSION AND ACCOMMODATION

The registration fee is of 575,00 Euro + VAT taxes*, where applicable (bank charges are not included).

The registration fee includes a complimentary bag, four fixed menu buffet lunches (Friday subject to numbers), hot beverages, downloadable lecture notes and wi-fi internet access.

Applicants must apply at least one month before the beginning of the course. Application forms should be sent on-line through our web site: <http://www.cism.it> or by post.

A message of confirmation will be sent to accepted participants. If you need assistance for registration please contact our secretariat.

Applicants may cancel their course registration and receive a full refund by notifying CISM Secretariat in writing (by email) no later than two weeks prior to the start of the course.

If cancellation occurs less than two weeks prior to the start of the course, a Euro 50,00 handling fee will be charged. Incorrect payments are subject to Euro 50,00 handling fee.

A limited number of participants from universities and research centres who are not supported by their own institutions can be offered board and/or lodging in a reasonably priced hotel or students' dormitories, if available.

Requests should be sent to CISM Secretariat by **April 22, 2015** along with the applicant's curriculum and a letter of recommendation by the head of the department or a supervisor confirming that the institute cannot provide funding. Preference will be given to applicants from countries that sponsor CISM.

Information about travel and accommodation is available on our web site, or can be mailed upon request.

* Italian VAT is 22%.

For further information please contact:

CISM
 Palazzo del Torso
 Piazza Garibaldi 18
 33100 Udine (Italy)
 tel. +39 0432 248511 (6 lines)
 fax +39 0432 248550
 e-mail: cism@cism.it



BONE CELL AND TISSUE MECHANICS

Advanced School
 coordinated by
Bert van Rietbergen
 Eindhoven University
 of Technology
 The Netherlands

Udine June 22 - 26 2015

BONE CELL AND TISSUE MECHANICS

Bone is a remarkable material: it is strong yet lightweight, can adapt itself to changes in mechanical loading, lasts for a lifetime and can repair itself after a fracture. Although biology has revealed many secrets of how bone cells can form and remove bone tissue, the mechanisms that control these processes, and the role of mechanical loading in this, are still not well understood. The goal of this course is to provide state-of-the-art information on this topic. To do so, the course will review the entire area of bone cell and tissue mechanics at all three commonly distinguished levels of structural organization of bone: the bone organ level, the bone tissue level and the bone cell level. The course will be of a multi-disciplinary nature and

include topics like bone biology, imaging and computational modeling. At the bone organ level, the focus will be on the diagnosis of bone strength using imaging and computational techniques. Bone remodeling at this level is often considered as an optimization process that adapts bone density and shape to the mechanical loading conditions. Hypothetical models that are developed to describe such adaptations of bone are discussed. At the bone tissue level, bone can form remarkably complex porous architectures. This capability provides bone with the possibility to form bone with mechanical properties in a wide range. Methods to visualize and model such structures in 3D have

become available only over the last two decades. Hypothetical models describing how these structures evolve, how they can adapt to mechanical loading and how they can be affected by bone diseases are discussed. At the level of the cell, promising candidates for the mechanosensory system will be discussed, as well as possible signaling pathways for the communication between bone cells. At this level, the porosity of the bone tissue itself also becomes an important factor since it is assumed that fluid flow plays an important role in the mechanosensory system. The visualization and modeling at this level still is a challenging field of research.

Besides being informative, it is hoped that the course will function as a forum for the exchange of data, philosophy, and ideas across disciplinary divides and so provide further stimulus for a comprehensive approach to the problems of bone mechanics. The target audience is graduate students, PhD candidates and young faculty members. We expect an audience as diverse in background as the lecturers, that is to say spanning across the professional spectrum from biomedical and structural engineers, to biologists, veterinarians and orthopaedic and dental surgeons.

SUGGESTED PRELIMINARY READINGS

Cowin, S.C. (editor), Bone Mechanics Handbook, CRC Press, Boca Raton, FL, 2001.

Cowin, S.C. and Doty, S.B., Tissue Mechanics, Springer, 2007.

Gefen, A. (editor) Cellular and Biomolecular Mechanics and Mechanobiology, Springer, 2011.

Jacobs, C.R. Introduction to Cell Mechanics and Mechanobiology, Garland Science, 2012.

Silva, M.J. (editor) Skeletal Aging and Osteoporosis: Biomechanics and Mechanobiology, Springer, 2012.

INVITED LECTURERS

Georg Duda - Charité - Universitätsmedizin, Berlin, Germany
5 lectures on:
Bone tissue formation and repair.

Peter Fratzl - Max Planck Institute of Colloids and Interfaces, Potsdam, Germany
5 lectures on:
Bone mineralization and fracture resistance.

Jenneke Klein-Nulend - University of Amsterdam, The Netherlands
6 lectures on:
Bone biology and bone cell mechanosensitivity.

Ralph Müller - ETH Zürich, Switzerland
5 lectures on:
Bone imaging and structure.

Bert van Rietbergen - Eindhoven University of Technology, The Netherlands
5 lectures on:
Bone strength and remodeling.

Tim Skerry - The University of Sheffield, UK
5 lectures on:
The role of loading in skeleton formation and adaptation.

LECTURES

All lectures will be given in English. Lecture notes can be downloaded from the CISM web site, instructions will be sent to accepted participants.

**BONE CELL
AND TISSUE MECHANICS**

Udine, June 22 - 26, 2015

Application Form

(Please print or type)

Surname _____

Name _____

Affiliation _____

Address _____

E-mail _____

Phone _____ Fax _____

Method of payment upon receipt of confirmation (Please check the box)

The fee is 575,00 Euro + 22% Italian VAT taxes, where applicable (bank charges are not included).

I shall send a check of Euro _____

Payment will be made to CISM - Bank Account No. 094570210900,
VENETO BANCA - Udine (CAB 12300 - ABI 05035 - SWIFT/BIC
VEBHIT2M - IBAN CODE IT46 N 05035 12300 09457 0210900).
Copy of the receipt should be sent to the secretariat

I shall pay at the registration counter with check or VISA Credit Card
(Mastercard/Eurocard, Visa, CartaSi)

**IMPORTANT: CISM is obliged to present an invoice for the above sum.
Please indicate to whom the invoice should be addressed.**

Name _____

Address _____

C.F.* _____

VAT/IVA* No _____

(* Only for EU residents or foreigners with a permanent business activity in Italy.)

Only for Italian Public Companies

I ask for IVA exemption (ex law n. 537/1993 - art. 14 comma 10).

Privacy policy: I understand that data received via this form will be used only to provide information about CISM and its activities, within the limits set by the Italian legislative decree no. 196/2003 and subsequent amendments.

Complete information on CISM's privacy policy is available at www.cism.it.

I have read the "Admission and Accommodation" terms and conditions and agree.

Date _____ Signature _____