ALL RESEARCHES LEAD TO ROME

EORS 2021 ROME

PROGRAM

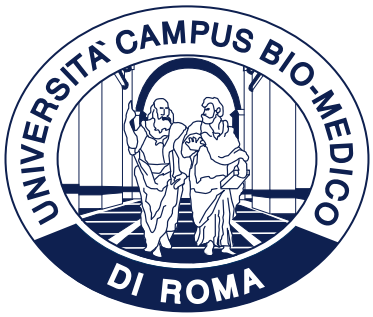
29th Annual Meeting

EUROPEAN ORTHOPAEDIC RESEARCH SOCIETY

15-17 SEPTEMBER 2021

www.eors2021.org

UNDER THE AUSPICES OF



Dear colleagues,

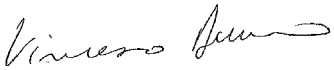
A warm welcome to all the esteemed clinicians and researchers gathered in Rome at this cutting-edge conference with high-level scientific content. The meeting is focused on sharing experiences and innovation in the field of translational orthopedic research.

Indeed, research is the solid pillar of clinic. Already Plato claimed that his mentor Socrates said "A life without research is not worth living" which is confirmed by the fact that often prestigious researchers are clinical leaders who seek translational innovation to be applied in daily clinical practice. Therefore, research is an ethical need for those who want to fulfill the great mission of caring the human being. Thus, the EORS meeting represents a bridge between basic and clinical research and will provide a wonderful forum to explore the innovation in Orthopedic Science and Medicine.

Rome is one of the most visited cities in the world, a unique jewel in Italy, and it is not difficult to understand why: its historical and archaeological heritage, the culinary tradition, the wonderful balance between modern and contemporary architecture make the city a melting pot that unites continents, cultures and people.

We are looking forward to welcoming you at Rome for an outstanding EORS 2021 meeting.

Honorary Chair
Vincenzo Denaro
Campus Bio-Medico
University of Rome



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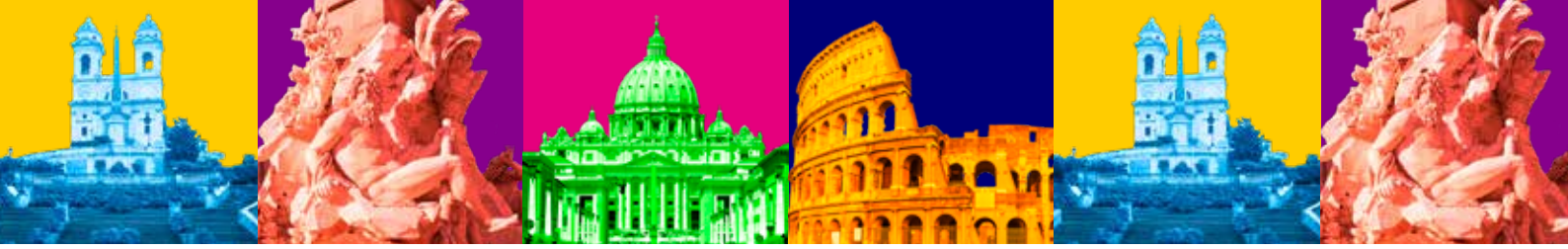


Dear EORS Members, Colleagues, and Friends,

A warm welcome to 29th Annual Meeting of the European Orthopedic Research Society (EORS)!

It is a great honour and pleasure to host you in the beautiful city and capital of Italy, Rome. EORS organizes the Meeting in collaboration with the Department of Orthopedics and Trauma Surgery of the Campus Bio-Medico University of Rome.

The EORS Annual Meeting represents for all of us a point of reference in the field of orthopedic and musculoskeletal research; that we are surgeons, biologists, engineers, veterinarians, we all share a passion for research. Therefore, EORS 2021 will provide a wonderful forum for sharing knowledge and exploring the latest trends in orthopedic science and surgery. The organizing team will strive to offer numerous networking opportunities, giving you the opportunity to meet and interact with leading scientists and researchers, friends and colleagues, as well as sponsors and exhibitors.

This year is a bumper year due to the long-term impact of the COVID-19 pandemic which prevented us from meeting face to face for a while. EORS 2021 will allow us to renew our friendship, networking, partnerships and celebrate our society together again, in person.

The virtual format will guarantee those who cannot travel the opportunity to participate in the meeting and present their work.

Representing several continents and different scientific backgrounds, an impressive number of authors have brought their contribution to build a rich program including: 30 symposia with more than 120 prominent speakers, 5 Presidential Guest Lectures and 30 invited keynote lectures, 120 oral presentations in 30 sessions, and over 130 e-posters.

There is a famous expression “all roads lead to Rome” and we are confident and ambitious that the EORS 2021 Congress will bring orthopedic researchers from all over the world back to Rome.

We warmly welcome you, hoping to make EORS2021 in Rome a memorable experience for you.

With our best regards,

Congress Chair and EORS President
Gianluca Vadalà
Campus Bio-Medico
University of Rome

Congress Chair
Rocco Papalia
Campus Bio-Medico
University of Rome

Dear EORS Members, Colleagues, and friends,

On behalf of the EORS Executive Board, I would like to welcome you to EORS 2021, our 29th Annual Meeting. This is a special event, as it the first reunion of our Society after the beginning of the Covid-19 pandemic and the first international orthopedic meeting we can attend in person. I am personally really excited to see you after these long months.

On behalf of the EORS members I would like to thank prof. Feza Korkusuz and his team for the tremendous work done for a successful EORS 2020 Virtual meeting, that was attended by over 250 people.

The popularity of EORS continues to increase. We now have over 400 registered delegates participating in the meeting, with over 250 delegates attending in person, despite the uncertain travelling situation. Our delegates come from all over Europe and from countries as far as South Korea and USA. Above all, I would like to thank ORS for the support given as Guest Nation to this meeting.

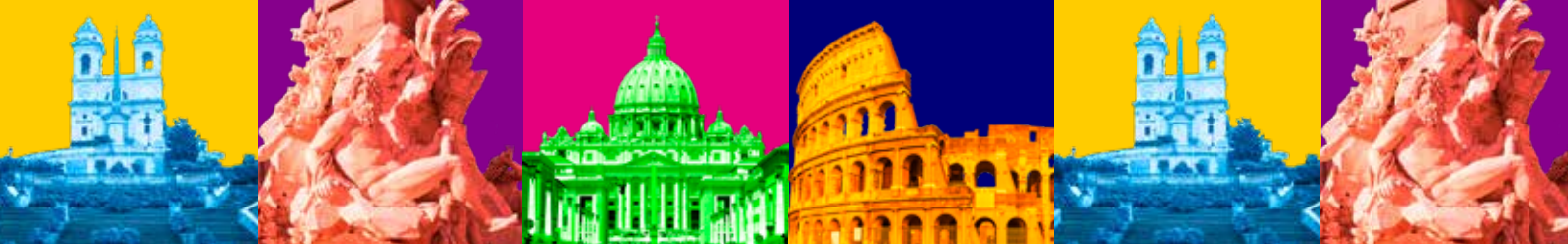
I am particularly pleased that we continue to have a large and rising number of young investigators. Indeed, our society has a notably young and vibrant membership, with an excellent gender balance. For this reason, young investigators receive focused attention by dedicated activities, including co-chairing sessions, special awards, a dedicated symposium, and an enthusiastic social event.

We congratulate those of you who will be presenting your work at this meeting and encourage you to seek collaborations. The EORS Annual Meeting provides many opportunities for us to network, to learn, and to be inspired.

Thank you to all of our many dedicated volunteers and members. The success of the Society and the Annual Meeting would not be possible without your support!

Enjoy EORS2021 in Rome!

Congress Chair and EORS President
Gianluca Vadalà
Campus Bio-Medico
University of Rome



SCIENTIFIC AND ORGANIZING COMMITTEE

SCIENTIFIC COMMITTEE

HONORARY CHAIR

Vincenzo Denaro
Emeritus Chairman of the Department of Orthopedic Surgery
Campus Bio-Medico University of Rome, Rome, Italy

CONGRESS CHAIRS

Rocco Papalia
Chairman of the Department of Orthopedic Surgery
Campus Bio-Medico University of Rome, Rome, Italy

Gianluca Vadalà
Head of the Laboratory for Regenerative Orthopedic
Campus Bio-Medico University of Rome, Rome, Italy

EORS EXECUTIVE COMMITTEE

President **- Gianluca Vadalà** - *Italy*
1st Vice-President **- Holger Jahr** - *Germany*
2nd Vice-President **- Boyko Gueorguiev** - *Switzerland*
Past-President **- Denitsa Docheva** - *Germany*
Segretary-General **- Eduardo García-Rey** - *Spain*
Tresurer **- Jeannette Østergaard Penny** - *Denmark*

LOCAL ORGANIZING COMMITTEE

Luca Ambrosio - *Campus Bio-Medico University of Rome, Rome, Italy*
Francesca Cannata - *Campus Bio-Medico University of Rome, Rome, Italy*
Stefano Campi - *Campus Bio-Medico University of Rome, Rome, Italy*
Claudia Cicione - *Campus Bio-Medico University of Rome, Rome, Italy*
Giuseppina Di Giacomo - *Campus Bio-Medico University of Rome, Rome, Italy*
Lorenzo Diaz Balsano - *Campus Bio-Medico University of Rome, Rome, Italy*
Giuseppe Umile Longo - *Campus Bio-Medico University of Rome, Rome, Italy*
Giuseppe Papalia - *Campus Bio-Medico University of Rome, Rome, Italy*
Giorgia Petrucci - *Campus Bio-Medico University of Rome, Rome, Italy*
Fabrizio Russo - *Campus Bio-Medico University of Rome, Rome, Italy*
Sebastiano Vasta - *Campus Bio-Medico University of Rome, Rome, Italy*
Biagio Zampogna - *Campus Bio-Medico University of Rome, Rome, Italy*

YOUNG INVESTIGATOR AND SOCIAL MEDIA COMMITTEE

Luca Ambrosio - *Campus Bio-Medico University of Rome, Rome, Italy*
Stijn Bolink - *Deventer Hospital, Deventer, The Netherlands*
Jeroen Geurts - *Lausanne University Hospital, Lausanne, Switzerland*
Gabriela Graziani - *Istituto Ortopedico Rizzoli, Bologna, Italy*
Girish Pattappa - *University Medical Centre Regensburg, Regensburg, Germany*

FEMALE LEADERSHIP

Federica Masieri - *University of Suffolk, Ipswich, United Kingdom*
Elizabeth Rosado Balmayor - *Merlin Institute - Maastricht University, Maastricht, The Netherlands*

ADVISORY BOARD

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Jeffrey Lotz - *University of California, San Francisco, USA*
Nicola Maffulli - *Salerno University, Salerno, Italy*
Ivan Martin - *University of Basel, Basel, Switzerland*
Federica Masieri - *University of Suffolk, Ipswich, United Kingdom*
Hans-Jörg Meisel - *BG Klinikum Bergmannstrost, Halle, Germany*
Jeannette Østergaard Penny - *Zealand University Hospital, Køge, Denmark*
Abhay Pandit - *National University of Ireland Galway, Galway, Ireland*
Girish Pattappa - *University Medical Centre Regensburg, Regensburg, Germany*
Ole Rahbek - *Aalborg University Hospital, Aalborg, Denmark*
Maria Grazia Raucci - *Institute of Polymers, Composites and Biomaterials, National Research Council, Naples, Italy*
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Elizabeth Rosado Balmayor - *Merln Institute, Maastricht University, Maastricht, The Netherlands*
Daisuke Sakai - *Tokai University School of Medicine, Tokai, Japan*
Martin Stoddart - *AO Research Institute Davos, Davos, Switzerland*
Marianna Tryfonidou - *Utrecht University, Utrecht, The Netherlands*
Feng-Sheng Wang - *Chang Gung University College of Medicine, Kaohsiung, Taiwan*
Britt Wildemann - *University Hospital Jena, Jena, Germany*
Dimitrios I. Zeugolis - *National University of Ireland Galway, Galway, Ireland*

GENERAL INFORMATION

ORGANISING SECRETARIAT

Viale Giacomo Matteotti, 7 - 50121 Florence, Italy
Tel +39 055 50351 | infoEORS2021@oic.it

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REGISTRATION DESK

The Organizing Secretariat Desk will be open for registration and information according to the following time schedule:

Wednesday, 15 September 2021	from 07:30 to 19:00
Thursday, 16 September 2021	from 07:30 to 19:00
Friday, 17 September 2021	from 07:30 to 17:00

CONGRESS VENUE

Auditorium Antonianum
Viale Manzoni, 1 - 00185 Rome, Italy
Tel/Fax +39 06 45582593 | www.auditoriumantonianum.it

REGISTRATION FEES

FACE TO FACE PARTICIPATION REGISTRATION FEE

Delegate Non-Member*	780 €
EORS Delegate Member*	680 €
Delegate Non-Member Young Invest., Residents, Students**	600 €
EORS Member Young Invest., Residents, Student**	500 €

**EORS membership fee for a new member/2021 membership renewal is included. The reduced fee will be applied only to members with regular membership payments*
***Application for the Student/Young investigator/Resident (under 35) fee should be certified by a letter from the Head of the Department or Student card stating the applicant's status at the time of registration, to be up-loaded (pdf and jpg format is required) during the registration process.*

VIRTUAL PARTICIPATION REGISTRATION FEE

Delegate Non-Member*	400 €
EORS Delegate Member*	300 €
Delegate Non-Member Young Invest., Residents, Students**	300 €
EORS Member Young Invest., Residents, Student**	200 €

**EORS membership fee for a new member/2021 membership renewal is included. The reduced fee will be applied only to members with regular membership payments*
***Application for the Student/Young investigator/Resident (under 35) fee should be certified by a letter from the head of the department or Student card stating the applicant's status at the time of registration, to be up-loaded (pdf and jpg format is required) during the registration process.*

Registration fees are in Euro (VAT 22% included).
Registration fees will be adjusted according to VAT charge alignment.
If the membership fee has been already paid via http://eors.wildapricot.org/, the certificate should be provided and €50 will be detracted from the registration fee

BADGES

Participants are kindly requested to wear the name badge when entering the congress venue and to access any offered services. The access to the above mentioned area and services is not allowed without the badge.

CATERING FACILITIES

Lunch boxes and coffee breaks are included in the registration fee. Bar and a self-service cafeteria are also available.

CERTIFICATE OF ATTENDANCE

Registered participants will receive a certificate of attendance.

INSURANCE

The Congress Organisers do not assume any liability for personal injuries sustained or loss of, or damage to, property belonging to congress participants (or their accompanying persons), either during or as result of the congress. Participants are requested to make their own arrangements with respect to health and travel insurance.

LANGUAGE

The official language of the 29th Annual Meeting of the EORS is English. All participants are encouraged to join discussions, independently of their fluency in English as the exchange of ideas and critical evaluation of presentations is the main purpose of the event.

WI-FI INTERNET CONNECTION

Wi-Fi internet connection is available in the meeting rooms and common areas.

USEFUL TELEPHONE NUMBERS

Medical emergency: 118
Police: 113
Fire emergency: 115
Radio taxi Rome - 06 3570
For international calls from Italy: 00+Country code + number
For international calls to Italy: +39+City code (with 0) + number

ABOUT ROME

Rome wasn't built in a day and not even a lifetime is enough to know all of its treasures. Monuments, museums, cultural activities and beautiful gardens: the list is endless and the sooner you plan what you want to see during your visit, the better you will experience Rome. If it's the first time you visit Rome, you probably want to be sure you see all the most iconic monuments you have dreamt about. According to your main interests, there are two recommended itineraries: archeological and religious. If you're fond of ancient ruins you should go from Colosseum to Colle Palatino, and from Ara Pacis to the Circus Maximus, while if you are more interested in the religious side of the Capital be sure you don't miss San Peter's Square, the Vatican Museums and the most beautiful Churches: San Giovanni in Laterano, San Pietro in Vincoli (where you can find the breathtaking sculpture "Mosè" by Michelangelo) and Santa Maria Maggiore. A long walk in the city centre will let you appreciate Trinità dei Monti, Piazza del Popolo, Piazza Navona and the Trevi Fountain, while crossing the shopping district: via Condotti, via Frattina, via del Babuino, via del Tritone or via del Governo Vecchio. Art lovers will be overwhelmed by the permanent collections and exhibitions they can find in Roman museums: Ara Pacis, Vittoriano, Palazzo delle Esposizioni, the National Etruscan Museum of Villa Giulia, the Capitolini Museums, the National Gallery of Modern art and the MAXXI - National Museum of the arts of the 21stcentury - just to mention a few.

GENERAL INFORMATION

USA GUEST NATION AT EORS 2021

Dear EORS Congress Chairs and Committees,
On behalf of the Orthopedic Research Society (ORS), it is my honor to accept your kind invitation to be the guest country at your upcoming EORS 2021 meeting, 15 - 17 September in Rome, Italy.
As our organizations strive to achieve our missions and improve orthopedic patient care, it is important that we come together to identify and solve current clinical challenges through the translation of basic science. The ORS will be happy to propose a scientific program that aligns with the theme of your meeting and welcomes any suggestions of topics that you feel might complement your current program.
Again, thank you for your invitation.
Best regards.

Peter C. Amadio, MD
President Orthopedic Research Society

UEMS CREDITS

The EORS 2021 is accredited by the European Accreditation Council for Continuing Medical Education (EACCME) to provide the following CME activity for medical specialists. The EACCME is an institution of the European Union of Medical Specialists (UEMS), www.uems.net. The EORS 2021 is designed for up to 24 hours of European external CME credits. Each medical specialist should claim only those hours of credits that he/she actually spent in the educational activity. Through an agreement between the European Union of Medical Specialists and the American Medical Association, physicians may convert EACCME credits to an equivalent number of AMA PRA Category 1 Credits™. Information on the process to convert EACCME credit to AMA credit can be found at www.ama-assn.org/go/internationalcme. Live educational activities, occurring outside of Canada, recognized by the UEMS-EACCME for ECMEC credits are deemed to be Accredited Group Learning Activities (Section 1) as defined by the Maintenance of Certification Program of The Royal College of Physicians and Surgeons of Canada.
The link to apply for CME credits will be sent by email after the Congress to all EORS2021 participants. Attendance to the accredited sessions will be mandatory in order to receive CME credits and it will be monitored through scanner devices. In order to receive CME credits for your Congress participation, make sure to scan your badge at the entrance and at the exit of Congress area.

AWARDS

The best overall oral presentation of the meeting will receive the Edward R. Valstar Award.
EORS recognizes the importance of Young Investigators (YI) for the future of orthopedic research. Therefore, the best oral presentation and poster presented by YI will be selected for the following awards:

- Best Biomechanics YI Oral Presentation
- Best Clinics YI Oral Presentation
- Best Biology YI Oral Presentation
- Best Biomechanics YI Poster
- Best Clinics YI Poster
- Best Biology YI Poster

The winner of each award will have the opportunity to attend the next Annual Meeting free of charge and so continue to further their network and valued work in orthopedic research.
The winner of best overall oral presentation will receive 400 CHF from Journal Applied Sciences (ISSN 2076-3417; Impact Factor: 2.679)
The winner of Best Biomechanics YI Oral Presentation has an opportunity to publish one paper free of charge in Applied Sciences (ISSN 2076-3417; Impact Factor: 2.679)
Awards will be delivered during the Closure Ceremony on Friday 17 September 2021.

ON Foundation initiatives

EORS and ON have collaborated to provide opportunities to advance the field of orthopedic tissue regeneration.
Awarded five ON Education Scholarships (€ 1,000). Congratulations to the winners:
Andrea Schwab *(Davos - Switzerland)*
Morena Francesca Fiordalisi *(Porto - Portugal)*
Josephine Luk *(Columbia - USA)*
Isabel Amado *(Dublin - Ireland)*
Fatma Nur Depboylu *(Ankara - Turkey)*

The ON Foundation will also award € 1,000 for the best "Orthoregeneration Paper" presented for the annual EORS meeting.

EORS and ON Foundation present a joint session on research topics on innovative regeneration. The winning question in the survey will result in a Kick-Starter Grant of CHF 10,000. The topic and application details will be announced during the meeting.

SLIDE CENTER

It is open at the following times:

Wednesday, 15 September 2021	from 08:00 to 18:00
Thursday, 16 September 2021	from 08:00 to 18:30
Friday, 17 September 2021	from 08:00 to 17:00

Digital presentations must be delivered to the Slide Center at least one hour before the beginning of the session, or the day before in case of early morning sessions.

SOCIAL PROGRAM

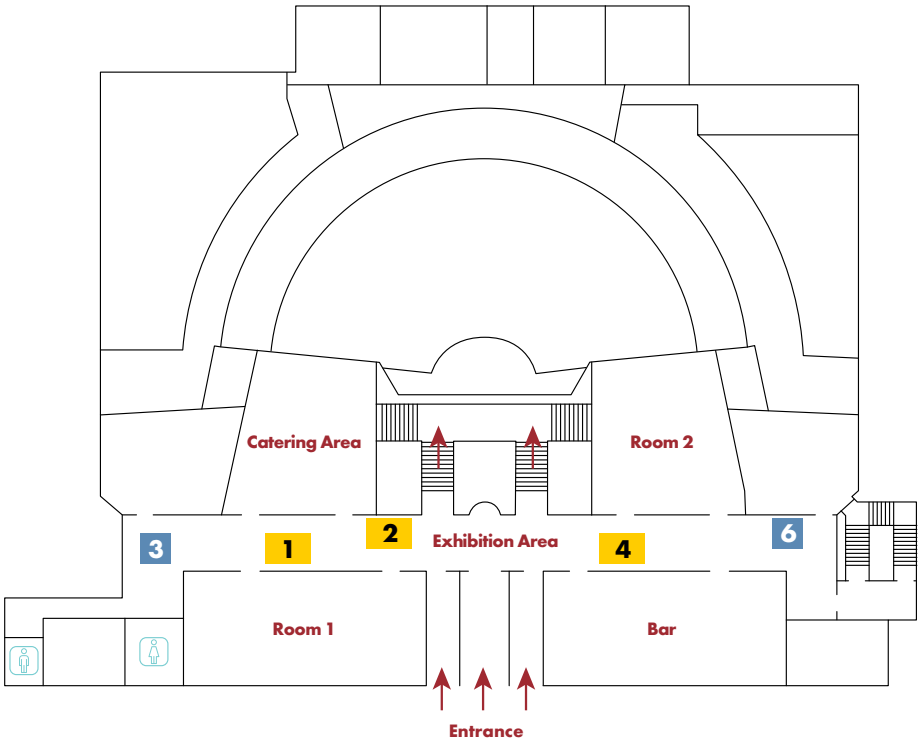
Wednesday, 15 September - 17:50-18:50
WELCOME RECEPTION
Auditorium Antonianum
EORS 2021 Welcome Reception will be held on Wednesday, 15 September, at the Auditorium Antonianum Center Congress (Exhibition & Catering Area), starting from 17:50.

Wednsday, 15 September, - 19:00-21:00
YI-ONLY LOUNGE-PARTY
Voodoo Bar The Sanctuary
Via delle Terme di Traiano, 4A, Rome
It is a good chance for all the young investigators to let loose, socialise and spend time together enjoying music while sipping a real Italian style aperitivo! The Young Investigator Only Event will take place at Voodoo Bar The Sanctuary. It will be a great opportunity to encourage professional networking and start new friendships in a relaxed atmosphere. No supervisors allowed.
Please obtain your invitation card at the Social Program Desk before Wednsday, 15 September, at 13:00.

Thursday, 16 September - 20:30
SOCIAL DINNER
Ristorante Camponeschi
Piazza Farnese, 50/50a, Rome
The Social Dinner will be held at the Camponeschi Restaurant, an elegant and romantic restaurant in the center of Rome, one of the best restaurants ever.
Please obtain your invitation card at the Social Program Desk before Thursday, 16 September, at 12:00.
Using your pre-booked Voucher.
Dress code: Semi-formal.

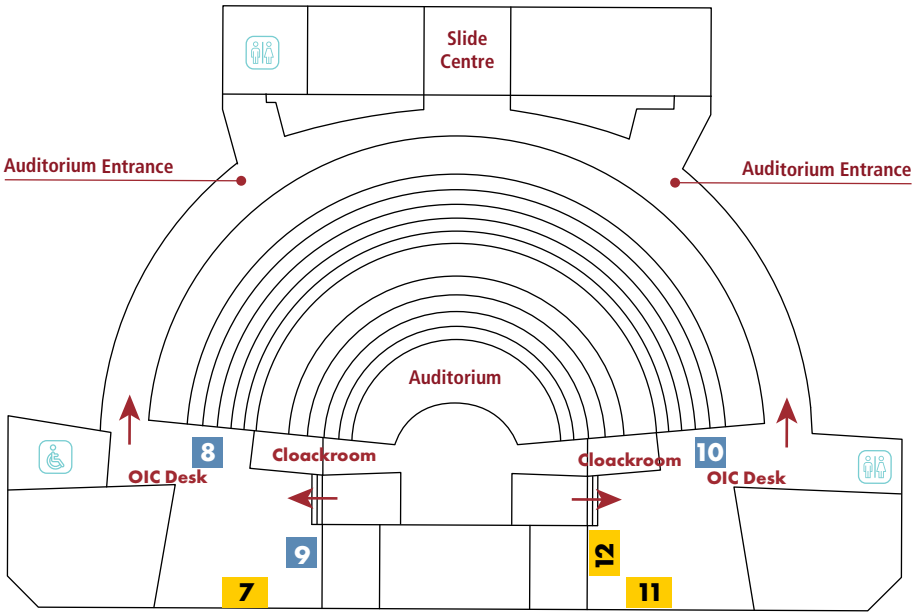
EXHIBITION MAP

GROUND FLOOR

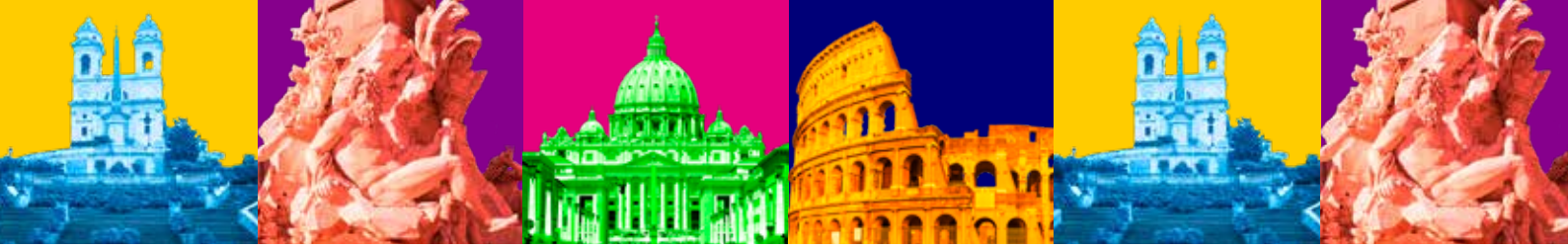


COMPANY	STAND
Brainlab	2
Cerapedics	9
Curvebeam	7
INEB	6
Lipogems	10
Medacta	3
Nuvasive	1
ON foundation	12
Smith&Nephew	4
Uriach	8
Vivabiocell	11

BASEMENT



SCIENTIFIC PROGRAM

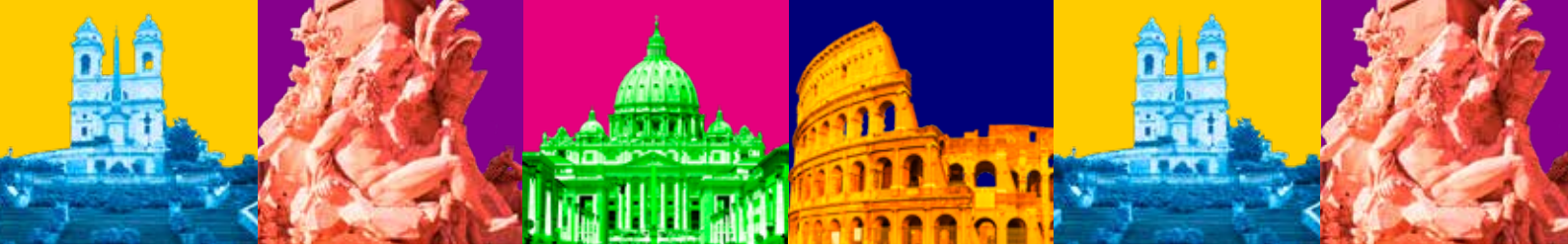


WEDNESDAY 15 September 2021

	AUDITORIUM	ROOM 1	ROOM 2	ROOM 3	ROOM 4
08:00-10:00	Registration				
10:00-11:00	**Boyko Gueorguiev** **OC04** Biomechanics	**Abhay Pandit** **OC02** Biomaterials	**Umberto Tarantino** **OC01** Fracture healing	**OC03** Arthroplasty	**OC05** Bone biology and pathophysiology
11:00-11:30	Coffee Break & Poster Session				
11:30-12:30	**S01** Active implementation of the 3R principle in musculoskeletal research	**S02** Frontiers in translational orthopedic and musculoskeletal research	**S03** Future additively manufactured (AM) porous (absorbable) metallic implants	**S04** Shape modelling for routine clinical practice in hip, knee and ankle pathology	**11:30-12:00** **S05** Regulators of cartilage calcification: implications for osteoarthritis progression and therapy **Frank Barry**
12:40-13:10	**Plenary Lecture 1** **Mauro Alini** 30 Years of spine basic research: nothing new on the clinical horizon?				
13:10-14:10	Lunch & Poster Session				
14:10-15:10	**Giuseppe Peretti** **OC07** Cartilage tissue engineering	**Peter Amadio** **OC06** Hand and shoulder	**Joao Espregueira-Mendes** **OC08** Sports medicine	**Florelle Gindraux** **OC09** Trauma research	**Jeffrey Lotz** **OC10** Orthopedic clinical research
15:10-15:40	Coffee Break & Poster Session				
15:40-17:10	**15:40-16:25** **S09** Women leadership and representation in orthopedic and musculoskeletal research: challenging the status quo **16:25-17:10** **S09B** Young Investigators Career symposium. Building a career in research and clinic: successful young investigators' perspective	**S10** The digital transformation of orthopedic surgery	**S08** MIRACLE Symposium - A bright new future for arthroscopy	**S07** Biosurfaces for bone implants: new perspectives from research and clinical experience	**S06** ORS Research Section 2021 Highlights
17:20-17:50	**Plenary Lecture 2** **Eugenio Guglielmelli** Biorobotic and bionic enabling technologies for orthopedic medicine				
17:50-18:50	**Opening Ceremony**				

THURSDAY 16 September 2021

	AUDITORIUM	ROOM 1	ROOM 2	ROOM 3	ROOM 4
09:00-10:00	**Daisuke Sakai** **OC11** Disc degeneration and regeneration	**Nicola Napoli** **OC12** Trauma research	**Stefano Zaffagnini** **OC13** Biomechanics	**Biagio Zampogna** **OC14** Hip arthroplasty	**Luigi Ambrosio** **OC15** Biomaterials
10:00-10:30	Coffee Break & Poster Session				
10:30-12:00	**S11** Biological treatment for IVD related chronic back pain	**S14** From surgical training to patient outcome - digital transformation in orthopedics	**S12** Osseointegrated and bionic prosthesis for amputees: the Italian experience	**S13** 3D printing in orthopedic surgery: present and future	**S15** Spin-offs for bones and joints
12:10-12:40	**Plenary Lecture 3** **Freddie H. Fu** What is the ACL?				
12:55-13:55	Industry Symposium, Lunch & Poster Session				
14:05-15:05	**Christian Jorgensen** **OC16** Cell-based therapy	**Francisco Forriol** **OC20** Knee arthroplasty	**Nicola Baldini** **OC18** Bone biology and pathophysiology	**Geoff Richards** **OC19** Infection	**Muturi Muriuki** **OC17** Biomechanics
15:15-16:15	**S16** ON cartilage regeneration research battle	**S17** Complex orthopedic models	**S19** Antibacterial and pro-osseointegrative nanobiomaterials for orthopedics in the Lab and in Industry: new perspectives in manufacturing and validation	**S18** Bone and cartilage biology - pathophysiological microenvironmental cues	**S20** Validation of prosthesis position and its impact on knee kinematics during knee replacement surgery
16:15-16:45	Coffee Break & Poster Session				
16:45-17:15	**Plenary Lecture 4** **Cesare Faldini** Innovation in complex deformity correction in orthopedic surgery				
17:25-18:25	**General Assembly**				



FRIDAY 17 September 2021

	AUDITORIUM	ROOM 1	ROOM 2	ROOM 3	ROOM 4
09:00-10:00	**S24** Challenges and novel solutions in orthopedics 2021-2026	**S22** Advances in biophysical stimulation of articular cartilage	**S23** The role of adipomyokines in muscoloskeletal diseases	**S21** mRNA therapeutics: how technology from the COVID Vaccine can translate to regenerative medicine in orthopedic trauma	**S25** Weightbearing CT imaging in the Foot and Ankle
10:10-11:10	**Ivan Martin** **OC22** Tissue engineering	**Vincenzo Salini** **OC21** Trauma research	**Umile Giuseppe Longo** **OC23** Shoulder	**Hans-Jörg Meisel** **OC24** Spine	**Paolo Domenico Parchi** **OC25** Robotics, navigation and virtual reality
11:10-11:40	Coffee Break & Poster Session				
11:40-12:10	**Plenary Lecture 5** **Sergio Iavicoli** Tackling musculoskeletal disorders through innovative technologies: an integrated approach from prevention to return to work				
12:20-13:20	**S26** Secreted signals - Novel cell-free therapeutics for orthopedic regeneration	**S27** Bioengineered cell instructive tactics for biological tendon repair and regeneration	**S28** Hip & knee revision arthroplasty - Clinical demands and advanced biomechanical testing methodologies	**S29** Deep phenotyping in osteoarthritis; current state of the art and future potential	**S30** Convergence of expertise towards a precision bone regenerative therapy
13:20-14:20	Lunch & Poster Session				
14:20-15:20	**Gun-il Im** **OC26** Regenerative orthopedic	**Johnny Huard** **OC27** Tendon biology and pathophysiology	**Biagio Moretti** **OC28** Hip arthroplasty	**John Antoniou** **OC29** Osteoarthritis	**Lorenzo Moretti** **OC30** Trauma research
15:30-16:30	**Awards & Closing Ceremony**				

AUDITORIUM 10:00-11:00

OC04 BIOMECHANICS

10:00 **K4 KEYNOTE LECTURE 4**

Nonunions - Just a biomechanical problem?

Boyko Gueorguiev *(Davos - Switzerland)*

Chair: **Boyko Gueorguiev** *(Davos - Switzerland)*
Young Investigator Co-Chair: **Henriëtte Eijking** *(Maastricht - The Netherlands)*

10:20 OC04.1 Muscle length and muscle force characteristics in patients with spastic cerebral palsy are weakly correlated
Cemre Su Kaya, Can A. Yucesoy *(Istanbul - Turkey)*

10:30 OC04.2 Superimposition of ground reaction force on proximal tibial morphology: an original methodology supporting diagnosis and post-operative evaluations in hightibial osteotomy
Claudio Belvedere[1], Alberto Leardini[1], Richie Gill[2], Miriana Ruggeri[1], Giacomo Dal Fabbro[1], Alberto Grassi[1], Stefano Durante[1], Stefano Zaffagnini[1] *([1]Bologna - Italy, [2]Bath - United Kingdom)*

10:40 OC04.3 The role of the iliofemoral ligament in energy efficient walking
Kate Duquesne, Emmanuel Audenaert *(Ghent - Belgium)*

10:50 OC04.4 Double plating of unstable distal femoral fractures: is augmented lateral plating with a helically shaped medial plate biomechanically advantageous over a straight medial plate?
Boyko Gueorguiev[1], Ivan Zderic[1], Torsten Pastor[1,2], Dominic Gehweiler[1], Geoff Richards[1], Matthias Knobe[2] *([1]Davos - Switzerland, [2]Lucerne - Switzerland)*

ROOM 1 10:00-11:00

OC02 BIOMATERIALS

10:00 **K2 KEYNOTE LECTURE 2**

Understanding the regenerative response induced by biomaterials systems: insight into the role of glycosylation

Abhay Pandit *(Galway - Ireland)*

Chair: **Gabriela Graziani** *(Bologna - Italy)*
Young Investigator Co-Chair: **Loic Scomazzon** *(Reims - France)*

10:20 OC02.1 Understanding the immunobiology of orthopedic biomaterials
Shannon Jamieson, Alison Tyson-Capper, Philip Hyde, John Kirby *(Newcastle upon Tyne - United Kingdom)*

10:30 OC02.2 Bridge local cartilage defects with a titanium-foam-polymer compound?
Thomas Imwinkelried[1], Roman Heuberger[1], Stefan Eggli[2] *([1]Bettlach - Switzerland, [2]Bern - Switzerland)*

10:40 OC02.3 The effect of simvastatin on cobalt mediated inflammatory cytokine expression
Sami Anjum, Shannon Jamieson, David Deehan, John Kirby, Alison Tyson-Capper *(Newcastle upon Tyne - United Kingdom)*

10:50 OC02.4 In vitro and in vivo response to hybrid functionalized collagen membrane for dental applications
Marie Dubus[1], Hassan Rammal[1], Loïc Scomazzon[1], Adrien Baldit[2], Julien Braux[1], Cédric Mauprivez[1], Halima Kerdjoudj[1] *([1]Reims - France, [2]Metz - France)*

ROOM 2 — 10:00-11:00

OC01 FRACTURE HEALING

10:00 **K1 KEYNOTE LECTURE 1**

Skeletal system biology and smoke damage: from basic science to medical clinic

Umberto Tarantino *(Rome - Italy)*

Chair: **Giacomo Rizzello** *(Rome - Italy)*
Young Investigator Co-Chair: **Saran Santhosh** *(Nottingham - United Kingdom)*

10:20 OC01.1 Meta-analysis of healing rate of nonunion and delayed union for low-intensity pulsed ultrasound (LIPUS)
Maya Hara, Ken Yamazaki *(Kanagawa - Japan)*

10:30 OC01.2 A robust treatment algorithm for pilon fractures: our management and outcomes
Victor Lu, James Zhang, Azeem Thahir, Jiang An Lim, Matija Krkovic *(Cambridge - United Kingdom)*

10:40 OC01.3 Platelet-released factors induce an immune regulatory signature in bone marrow mesenchymal stromal cells
Drenka Trivanovic[1], Noah Volkmann[1], Magdalena Stoeckl[1], Tobias Tertel[2], Bianca Schlierf[1], Theresa Kreuzahler[1], Bernd Giebel[2], Maximilian Rudert[1], Marietta Herrmann[1] *([1]Wuerzburg - Germany, [2]Essen - Germany)*

10:50 OC01.4 Is postoperative non-weight-bearing necessary? (INWN) a pragmatic randomised multicentre trial of operatively treated ankle fracture
Ramy Khojaly[1,2], Fiachra E. Rowan[1], Matthew Nagle[3], Muhammad Shahab[1], Amir Sohaib Ahmed[1], Marie Dollard[1], Colm Taylor[3], May Cleary[1,3], Ruairí Mac Niocaill[1,2] *([1]Waterford - Ireland, [2]Dublin - Ireland, [3]Cork - Ireland)*

ROOM 3 — 10:00-11:00

OC03 ARTHROPLASTY

Chair: **Eduardo García-Rey** *(Madrid - Spain)*
Young Investigator Co-Chair: **Cornelius Laubscher** *(Cape Town - South Africa)*

10:00 OC03.1 Trauma and acute orthopedics workload during COVID-19 lockdown
Prince Singh, Conor Gouk, Charles Tuffley, Julian Gewin *(Cairns - Australia)*

10:10 O0C3.2 Residual functional impairment following hip and knee arthroplasty
Noa Ponds[1], Ellie Landman[1], Erik Lenguerrand[2], Mike Whitehouse[2], Ashley Blom[2], Bernd Grimm[3], Stijn Bolink[1] *([1]Deventer - The Netherlands, [2]Bristol - United Kingdom, [3]Strassen - Luxembourg)*

10:20 OC03.3 A randomised controlled trial of total hip arthroplasty versus progressive resistance training in patients with severe hip osteoarthritis: study protocol for the prohip trial
Thomas Frydendal[1,2], Robin Christensen[2,3], Inger Mechlenburg[4], Lone Ramer Mikkelsen[4], Søren Overgaard[3], Kim Gordon Ingwersen[1,2] *([1]Vejle - Denmark, [2]Odense - Denmark, [3]Copenhagen - Denmark, [4]Aarhus - Denmark)*

10:30 OC03.4 Clinical and functional outcomes of kinematic aligned total knee arthroplasty with medial pivot design: a short-term follow up
Corrado Sosio, Paolo Sirtori, Ricardo Ciliberto, Michele Davide Maria Lombardo, Laura Mangiavini, Giuseppe Peretti *(Milan - Italy)*

10:40 OC03.5 CT-based preoperative planning and 3D-reconstructions with allograft bone in reverse shoulder arthroplasty revision surgery associated with critical size bone defect: a case report
Elisa Troiano, Andrea Facchini, Martina Di Meglio, Giacomo Peri, Pietro Aiuto, Nicola Mondanelli, Stefano Giannotti (Siena - Italy)

10:50 OC03.6 Performance of lower limb peripheral nerve blocks among different orthopedic sub-specialties: a single institution experience in 246 patients
Arash Ghaffari, Marlene Jørgensen, Helle Rømer, Maibrit Søensen, Søren Kold, Ole Rahbek, Jannie Bisgaard *(Aalborg - Denmark)*

ROOM 4 — 10:00-11:00

OC05 BONE BIOLOGY AND PATHOPHYSIOLOGY

Chair: **Nicola Baldini** *(Bologna - Italy)*
Young Investigator Co-Chair: **Francesca Cannata** *(Rome - Italy)*

10:00 OC05.1 The impact of syndecan-1 on angiogenesis during bone aging
Melanie Timmen, Christian Arras, Gabriele Bixel, Ralf H. Adams, Richard Stange *(Muenster - Germany)*

10:10 OC05.2 The effect of chemical and mechanical damage in a novel osteochondral explant for PTOA
Isabel Amado, Tom Hodgkinson, Ciara Murphy, Oran Kennedy *(Dublin - Ireland)*

10:20 OC05.3 The effect of tesosterone treatment upon bone remodelling in testosterone deficient ApoE-/- mice fed a high fat diet
Alexander Williamson, Lauren E.R. Bateman, Christine Le Maitre, Daniel Kelly, Nicola Aberdein *(Sheffield - United Kingdom)*

10:30 OC05.4 Development of a bone-on-a-chip based on a 3D osteocytic network for the screening of anti-osteoporotic drugs
Sofia Avnet, Maria Veronica Lipreri, Gemma Di Pompo, Gabriela Graziani, Elisa Boanini, Nicola Baldini *(Bologna - Italy)*

10:40 OC05.5 Bone microarchitecture in a pre-clinical rat model for type 2 diabetes
Chiara Micheletti[1,2], Furqan Ali Shah[2], Kathryn Grandfield[1], Anders Palmquist[2] *([1]Hamilton - Canada, [2]Gothenburg - Sweden)*

10:50 OC05.6 Osteonecrosis of the femoral head is related to impaired osteoblast function
Leila Maestro, Eduardo García-Rey, Fatima Bensiamar, Laura Saldaña *(Madrid - Spain)*

AUDITORIUM — 11:30-12:30

S01 SYMPOSIUM ACTIVE IMPLEMENTATION OF THE 3R PRINCIPLE IN MUSKOLOSKELETAL RESEARCH

Chair: **Riccardo Gottardi** *(Philadelphia - USA)*

Co-chair: **Annemarie Lang** *(Berlin - Germany)*

Preclinical studies are highly needed to tackle remaining unmet clinical needs in the musculoskeletal research field, especially with respect to an aging population and the increase of comorbidities. Today's gold standard of preclinical drug or compound screening and risk assessment is the use of animal models, mainly rodents (mice and rats). The 3R principle (1959; Russel & Burch) serves as a roadmap towards a responsible "humane" use of animals in research including the prioritization of alternative methods (Replace), the optimization of studied individuals (Reduce) and the adjustment of procedures to improve animal welfare (Refine). Although the awareness for the 3R principle has increased in the past few years, its implementation into daily lab routines is still limited. With this symposium, we aim at highlighting current approaches for the active implementation of the 3R principle in musculoskeletal research to stimulate the discussion among scientists and to motivate the development of own solutions. The speakers will illustrate multiple examples that could be implemented in different laboratories, and will elaborate on (i) the simulation of the in-patient situation using novel in vitro or ex vivo approaches to Reduce/Replace lab animal usage and (ii) the optimization of pain management in mouse femoral fracture models as an effective example Refinement that implements the limitations of unnecessary pain and stress.

11:30 S01.1 In vitro models for musculoskeletal translation
Martinijn Van Griensven *(Maastricht - The Netherlands)*

11:42 Discussion

11:45 S01.2 Development of a realistic stimuli-responsive ex vivo OA model to study the gut-joint axis
Roberto Di Gesù *(Palermo - Italy)*

11:57 Discussion

12:00 S01.3 Pre-clinical testing of implant fixation in an ex vivo live-bone model
Nupur Kohli *(London - United Kingdom)*

12:12 Discussion

12:15 S01.4 Evidence-based pain management in mouse femoral fracture models
Annemarie Lang *(Berlin - Germany)*

12:27 Discussion

ROOM 1 — 11:30-12:30

S02 SYMPOSIUM
FRONTIERS IN TRANSLATIONAL ORTHOPEDIC AND MUSCULOSKELETAL RESEARCH

Chair: **Francesca Masieri** *(Ipswich - United Kingdom)*

Co-chair: **Vanessa Ward** (Ipswich - United Kingdom)

The proposed symposium aims to present and discuss novel and emerging frontiers in the areas of musculoskeletal (MSK) cell therapies, encompassing in vitro, quasi vivo, and pre-clinical promising models with a chance of being quickly translated into the clinics. Innovative clinical approaches will also be discussed.
We have four invited speakers who will lead the audience through crucial aspects of orthoregeneration. The first speaker has extensive expertise into the complexities surrounding Advanced Therapy Medicinal Products (ATMPs) and will also provide an overview of key regulatory aspects in this area. The second speaker has worked extensively in the field of quality-control tools for the therapeutic use of minimally-manipulated, bone-derived MSC for bone repair applications, and joint resident MSCs for cartilage regeneration in osteoarthritis. Our third speaker in an expert in pioneering biomaterials for orthopedic regeneration. Our final speaker on the list will provide a perspective of current orthopedic regenerative medicine clinical approaches.

11:30 **S02.1** Stem cells from the hair follicle outer root sheath - spare parts bag revisited
Vuk Savkovic *(Leipzig - Germany)*

11:40 **S02.2** Native subchondral bone and synovial fluid MSC in osteoarthritis - current status and future directions
Elena Jones *(Leeds - United Kingdom)*

11:50 **S02.3** Innovative therapeutic bionanomaterials with anticancer and regenerative properties
Maria Grazia Raucci *(Naples - Italy)*

12:00 **S02.4** Stem cells for knee OA - clinical perspective
Elizaveta Kon *(Milan - Italy)*

12:10 Discussion

ROOM 2 — 11:30-12:30

S03 SYMPOSIUM
FUTURE ADDITIVELY MANUFACTURED (AM) POROUS (ABSORBABLE) METALLIC IMPLANTS

Chair: **Holger Jahr** *(Maastricht - The Netherlands)*

Co-chair: **Yageng Li** *(Beijing - China)*

Treating large bone defects is still a major clinical challenge without a perfect solution, mainly due to the unavailability of suitable bone implants. Additively manufactured (AM) porous metals provide unparalleled opportunities to realize the challenging requirements for bone-mimetic implants. Mechanical meta-biomaterials are architected materials that are designed to exhibit unusual properties and this principle can be applied to AM porous metals implants. Here, we will discuss state-of-the-art topological designs of future Orthopedic implants, the latest insights into their production, and associated technological challenges thereof. The symposium will focus on absorbable metal families and particularly on magnesium and zinc and their alloys. We will further elaborate on their general corrosion behaviour, alloying-dependent insights, the impact of the in vitro test environment on corrosion testing, as well as specific design- and post manufacturing aspects. Current knowledge gaps and the recent status quo of their biocompatibility and clinical application potential will be addressed as well.

11:30 **S03.1** Additively manufactured functionally graded porous absorbable zinc implants
Yageng Li *(Beijing - China)*

11:43 Discussion

11:45 **S03.2** Zn-Mg alloys for bioresorbable medical implants manufactured by laser powder bed fusion
Maximilian Voshage *(Aachen - Germany)*

11:58 Discussion

12:00 **S03.3** Meta-biomaterials
Amir Zadpoor *(Delft - The Netherlands)*

12:12 Discussion

12:15 **S03.4** Corrosion behaviour and clinical application potential of AM porous implants
Holger Jahr *(Maastricht - The Netherlands)*

12:28 Discussion

ROOM 3 — 11:30-12:30

S04 SYMPOSIUM
SHAPE MODELLING FOR ROUTINE CLINICAL PRACTICE IN HIP, KNEE AND ANKLE PATHOLOGY

Chair: **Emmanuel Audenaert** *(Ghent - Belgium)*

Co-chair: **Jonas Grammens** *(Antwerp - Belgium)*

The mini symposium entitled "Shape modelling for routine clinical practice in hip, knee and ankle pathology", aims to present recent developments in the translational field of computational anatomy (statistical shape and kinematics modelling), its applications in clinical practice and beyond. As these techniques are uttermost fit to model the influence of shape in osteoarthritis, the symposium will focus on hip, knee and ankle joint degeneration from diagnostics and risk assessments to innovative treatment algorithms. Advanced 3D imaging techniques and shape modelling provide a deeper understanding of the anatomy on a population level by describing morphological variation in a unique way. Furthermore, state-of-the-art techniques powered by artificial intelligence and big data can discover new patterns of diagnostic and prognostic value. Instead of a range of normal values, patient-specific parameters can be inferred as a target for reconstructive surgery. With the emerging techniques of 3D printing for a variety of biocompatible materials, implants can be designed to fit seamlessly, and PSI-aided osteotomies can be executed with high precision. Contributions to this mini symposium will focus on innovative methodology, validation or application of statistical shape analysis in solving clinical problems.

11:30 S04.1 Is shape of the femur and tibia a prognostic factor for therapeutic response after arthroscopic partial meniscectomy?
Jonas Grammens *(Antwerp - Belgium)*

11:42 S04.2 Clinical relevance of sex dimorphism in the pelvis
Emmanuel Audenaert *(Ghent - Belgium)*

11:54 S04.3 Multi-object shape analysis: introduction and orthopedic applications
Tinashe Mutsvangwa *(Cape Town - South Africa)*

12:06 S04.4 Statistical shape and pose model of the limbs
Femke Danckaers *(Antwerp - Belgium)*

12:18 Discussion

ROOM 4 — 11:30-12:30

S05 SYMPOSIUM
REGULATORS OF CARTILAGE CALCIFICATION: IMPLICATIONS FOR OSTEOARTHRITIS PROGRESSION AND THERAPY

Chair: **Solvig Diederichs** *(Heidelberg - Germany)*

Co-chair: **Jessica Bertrand** *(Magdeburg - Germany)*

Hundreds of millions of people worldwide are suffering from osteoarthritis and there is an urgent need for new therapeutic solutions. Cartilage calcification is commonly observed during osteoarthritis and is directly linked to the disease severity. However, only little knowledge exists about the effects of calcium crystals on chondrocytes and the signalling pathways involved in their generation. Uncovering the mechanisms that drive cartilage calcification will allow to find novel and improved therapeutic approaches for osteoarthritis. Interestingly, in vitro chondrogenesis of mesenchymal stromal/stem cells induces a hypertrophic chondrocyte phenotype which makes cells highly prone to calcification. Much can be learned regarding key drivers of this pathological development from this valuable model of osteoarthritis. This symposium will bring together experts in cartilage regeneration who have investigated regulation of cartilage calcification from very different angles. The keynote speakers will illuminate how calcium crystals regulate the chondrocyte phenotype, highlight latest advances to suppress chondrocyte hypertrophy/calcification and introduce induced pluripotent stem cells as novel in vitro model. Moreover, this symposium offers a unique forum for researchers and clinicians from various backgrounds all working toward the treatment, repair and regeneration of cartilage to share their insights into the mechanisms regulating the fatal events leading to cartilage calcification.

11:30 S05.1 BCP and CPPD crystalophathies in OA are associated with a distinct chondrocyte phenotype
Jessica Bertrand *(Magdeburg - Germany)*

11:40 Discussion

11:45 S05.2 Regulating the chondrocyte phenotype: lessons from in vitro models
Solvig Diederichs *(Heidelberg - Germany)*

11:55 Discussion

12:00 OC31.1 Cartilage oligomeric matrix protein level as a labaratory marker for objective classification of osteoarthritis
Nachappa Sivanesan Uthraraj, Meghna Prakash *(Davanagere - India)*

12:10 KS5 KEYNOTE LECTURE S05

Cellular therapy for osteoarthritis: cell characterisation and mechanism of action

Frank Barry *(Galway - Ireland)*

AUDITORIUM 12:40-13:10

12:40 **PL1 PLENARY LECTURE 1**

Chairs: **Rocco Papalia** *(Rome - Italy),*
Gianluca Vadalá *(Rome - Italy)*

30 Years of spine basic research: nothing new on the clinical horizon?

Mauro Alini *(Davos - Switzerland)*

AUDITORIUM 14:10-15:10

OC07 CARTILAGE TISSUE ENGINEERING

14:10 **K7 KEYNOTE LECTURE 7**

Meniscus repair: from basic science to preclincal studies

Giuseppe M. Peretti *(Milan - Italy)*

Chair: **Jerome Guicheux** *(Nantes - France)*
Young Investigator Co-Chair: **Clemens Leo Gögele** *(Nuremberg - Germany)*

14:30 OC07.1 Mesenchymal stromal cell spheroids - Effect of cell packing and biomaterial composition on chondrogenic differentiation in vitro
Flurina Staubli, Martin Stoddart, Matteo D'Este, Andrea Schwab *(Davos Platz - Switzerland)*

14:40 OC07.2 Implications of polymer infiltration in a new developed bioactive glass scaffolds (CAR12N) for cartilage tissue engineering?
Clemens Leo Gögele[1,2], Silvana Müller[1], Andreas Pradel[1], Sven Wiltzsch[1], Armin Lenhart[1], Markus Hornfeck[1], Achim Rübling[1], Hannes Kühl[1], Kerstin Schäfer-Eckart[1], Thomas Martin Weiger[2], Gundula Schulze-Tanzil[1] *([1]Nuremberg - Germany, [2]Salzburg - Austria)*

14:50 OC07.3 Physioxia enhances clonogenicity and differentiation potential of vascular and avascular meniscal cells
Girish Pattappa, Franziska Reischl, Judith Jahns, Siegmund Lang, Johannes Zellner, Denitsa Docheva, Peter Angele *(Regensburg - Germany)*

15:00 OC07.4 Extracellular calcium differentially regulates cartilage matrix production by articular chondrocytes and mesenchymal stroma cells
Tim Hammersen, Severin Zietzschmann, Wiltrud Richter *(Heidelberg - Germany)*

ROOM 1 14:10-15:10

OC06 HAND AND SHOULDER

14:10 **K6 KEYNOTE LECTURE 6**

Carpal tunnel syndrome - A disease of cellular senescence?

Peter C. Amadio *(Rochester - USA)*

Chair: **Peter C. Amadio** *(Rochester - USA)*
Young Investigator Co-Chair: **Pietro Gregori** *(Perugia - Italy)*

14:30 OC06.1 Outcomes of long head of biceps tenotomy are comparable to tenodesis: a systematic review and meta-analysis
Alexander Hartland[1], Raisa Islam[2], Kar Teoh[2], Mustafa Rashid[3] *([1]Chelmsford - United Kingdom, [2]Harlow - United Kingdom, [3]Oxford - United Kingdom)*

14:40 OC06.2 Clinical effectiveness of intra-operative tranexamic acid use in shoulder surgery: a systematic review and meta-analysis
Alexander Hartland[1], Kar Teoh[2], Mustafa Rashid[3] *([1]Chelmsford - United Kingdom, [2]Harlow - United Kingdom, [3]Oxford - United Kingdom)*

14:50 OC06.3 Does a rotator cuff tear impair physical function and quality of life in patients who sustain a proximal humerus fracture? A prospective cohort study
Helle Kvistgaard Østergaard[1,2], Antti Pekka Launonen[3], Marianne Toft Vestermark[2], Inger Mechlenburg[1] *([1]Aarhus - Denmark, [2]Viborg - Denmark, [3]Tampere - Finland)*

15:00 OC06.4 The effects of carpal tunnel release surgery on handwriting and digital writing performance
Lorenzo Alirio Diaz Balzani, Erika Albo, Benedetta Tirone, Guglielmo Torre, Giovanna Stelitano, Chiara Capperucci, Vincenzo Denaro *(Rome - Italy)*

ROOM 2 14:10-15:10

OC08 SPORTS MEDICINE

14:10 **K8 KEYNOTE LECTURE 8**

Objective measurement of knee laxity in MRI - Porto knee testing device

Joao Espregueira-Mendes *(Porto, Braga, Guimarães - Portugal)*

Chair: **Edoardo Monaco** *(Rome - Italy)*
Young Investigator Co-Chair: **Sebastiano Vasta** *(Rome - Italy)*

14:30 OC08.1 Towards automated ligamentous injury evaluation in syndesmotic ankle lesions
Matthias Peiffer[1], Arne Burssens[1], Sophie De Mits[1], Thibault Heintz[1], Kris Buedts[2], Victor Jan[1], Emmanuel Audenaert[1,2,3] *([1]Ghent - Belgium, [2]Antwerp - Belgium, [3]Cambridge - United Kingdom)*

14:40 OC08.2 Local infiltration anaesthesia (LIA) is equally effective as adductor canal blocks (ACB) for pain relief in hamstring graft anterior cruciate ligament (ACL) reconstructions
Mohammad Salhab[1,2], Sonal Sonalwalkar[1], Sanjeev Anand[1] *([1]Leeds - United Kingdom, [2]Bradford - United Kingdom)*

14:50 OC08.3 ACL graft source influences fibroblastic response to tension load in vitro
Sebastian Cardona Ramirez, Aaron Stoker, James Cook, Richard Ma *(Columbia - USA)*

15:00 OC08.4 Immunohistochemistry on osteochondral allografts suggest impact in failure mechanisms
Josephine Luk, Chantelle Bozynski, Aaron Stoker, James Stannard, Emma Teixeiro, James Cook *(Columbia - USA)*

ROOM 3 14:10-15:10

OC09 TRAUMA RESEARCH

14:10 **K9 KEYNOTE LECTURE 9**

Human amniotic membrane potential for bone repair: from the lab to the clinic

Florelle Gindraux *(Besançon - France)*

Chair: **Giulio Maccauro** *(Rome - Italy)*
Young Investigator Co-Chair: **Luke Visscher** *(Brisbane - Australia)*

14:30 OC09.1 Effects of age on fracture healing after severe blood loss
Katrin Bundkirchen[1], Weikang Ye[1], Baolin Xu[2], Christian Krettek[1], Borna Relja[2], Claudia Neunaber[1] *([1]Hannover - Germany, [2]Magdeburg - Germany)*

14:40 OC09.2 In vivo preclinical application of an active fixator system for the systematic investigation of the influence of the mechanical environment on fracture healing
Jan Barcik, Manuela Ernst, Tim Buchholz, Caroline Constant, Stephan Zeiter, Boyko Gueorguiev, Markus Windolf *(Davos - Switzerland)*

14:50 OC09.3 Electrical impedance correlates with radiographic bone healing in rabbits
Laura Rytoft, Markus Winther Frost, Ole Rahbek, Ming Shen, Kirsten Duch, Søren Kold *(Aalborg - Denmark)*

15:00 OC09.4 Young men and scaphoid fractures - A qualitative investigation of attitudes and behaviour
Saran Santhosh[1], Joseph Dias[2], Stephen Brealey[3], Paul Leighton[1] *([1]Nottingham - United Kingdom, [2]Leicester - United Kingdom, [3]York - United Kingdom)*

ROOM 4 14:10-15:10

OC10 ORTHOPEDIC CLINICAL RESEARCH

14:10 **K10 KEYNOTE LECTURE 10**

Deep phenotyping chronic back in patients for precision medicine

Jeffrey Lotz *(San Francisco - USA)*

Chair: **Jeannette Østergaard Penny** *(Køge - Denmark)*
Young Investigator Co-Chair: **Noa Ponds** *(Deventer - The Netherlands)*

14:30 OC10.1 The accuracy of a patient specific guide mediated high tibial osteotomy for posterior slop e and metaphyseal varus correction: a case study
Romy ten Heggeler[1,2], Femke Schröder[1,2], Feike de Graaf[1], René Fluit[2], Diana Becea[2], Nico Verdonschot[2], Roy Hoogeslag[1,2] *([1]Hengelo - The Netherlands, [2]Enschede - The Netherlands)*

14:40 OC10.2 Emergency department visits for non-traumatic low back pain episodes during the COVID-19 pandemic: a retrospective analysis
Adi Lichtenstein, Joshua Ovadia, Assaf Albagli, Raphael Kresp, Dani Rotman, Omer Lichter, Ben Efrima *(Tel Aviv - Israel)*

14:50 OC10.3 A review of outcomes associated with femoral neck lengthening osteotomy in patients with coxa brevis
Arash Ghaffari, Søren Kold, Ole Rahbek *(Aalborg - Denmark)*

15:00 OC10.4 Should we continue to use anti-embolism graduated compression stockings?
Mahmoud Awadallah[1], Kurinchi Gurusamy[2], Sophie Easey[1], Martyn Parker[1] *([1]Peterborough - United Kingdom, [2]London - United Kingdom)*

AUDITORIUM 15:40-16:25

S09 SYMPOSIUM WOMEN LEADERSHIP AND REPRESENTATION IN ORTHOPEDIC AND MUSCULOSKELETAL RESEARCH: CHALLENGING THE STATUS QUO

Chair: **Federica Francesca Masieri** *(Ipswich - United Kingdom)*

Co-chair: **Elizabeth Rosado-Balmayor** *(Maastricht - The Netherlands)*

Co-chair: **Jeannette Østergaard Penny** *(Køge - Denmark)*

This symposium aims at presenting and discussing inspiring, high-quality contributions in orthopedic and musculoskeletal research made by eminent female scientists. We want to provide a comprehensive discussion platform to emphasise the progresses accomplished and reflect on the work still to be done in a science area often perceived as one of the least open to diversity and inclusion. Relevant topics such as female representation in science, gender equality and the impact of females on scientific work will be discussed. We wish also to provide an allied platform for the LGBTQIA+ community and their intersectionality with women representation. We recognise that gender inequalities, unconscious bias, and associated patterns are transversal instances, often hindering the opportunity for fair representation in academia, industry, and the wider society. These disparities have been unfortunately further enhanced by the ongoing COVID-19 pandemic.

15:40 S09.1 Being a woman in orthopedic surgery and research
Elizaveta Kon *(Milan - Italy)*

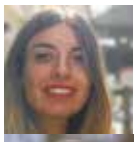
15:55 S09.2 The road less travelled, thoughts on how to support the next generation of female trainees
Caroline Hing *(London - United Kingdom)*

16:10 Discussion

AUDITORIUM 16:25-17:10

S09B SYMPOSIUM
YOUNG INVESTIGATORS CAREER SYMPOSIUM. BUILDING A CAREER IN RESEARCH AND CLINIC: SUCCESSFUL YOUNG INVESTIGATORS' PERSPECTIVE

Chair: **Gabriela Graziani** *(Bologna - Italy)*



Co-chair: **Jeroen Geurts** *(Lausanne - Switzerland)*

This symposium aims at helping EORS Young Investigator members navigating and developing a successful career in orthopedic research and/or clinics. Successful Young Investigators from the field will share their main achievements and discuss pitfalls and challenges they faced during career development, which will resonate with attendees currently seeking to pursue their career. Speakers will highlight existing and emerging career opportunities in the field and exchange perspectives with EORS Young Investigators on tackling major hurdles in professional career development. The symposium will be followed by a Young Investigator social event aimed at fostering interaction and networking between the future leaders of orthopedic research.

16:25 **S09B.1** Biofabrication and bioprinting: research advances and opportunities for regenerative medicine
Riccardo Levato *(Utrecht - The Netherlands)*

16:40 **S09B.2** Merging clinical and research practice
Stijn Bolink *(Deventer - The Netherlands)*

16:55 Discussion

ROOM 1 15:40-17:10

S10 SYMPOSIUM
THE DIGITAL TRANSFORMATION OF ORTHOPEDIC SURGERY

Chair: **Peter Pilot** *(Schijndel - The Netherlands)*

Co-chair: **Walter Van Der Weegen** *(Geldrop - The Netherlands)*

Big data, artificial intelligence and machine learning are the current buzz words in health care. But incorporation of these techniques still seems far-fetched in daily orthopedic practice. However, quite rapidly the first practical applications are surfacing, and not only in highly specialized hospitals. In this workshop we demonstrate and discus several practical applications of open-access, user friendly big data systems and machine learning algorithms which will change the way orthopedic care will be delivered, as well as the total patient journey in the near future. This will range from doing your history taking at home with AI diagnostics incorporated, to robotic surgery coupled with Patient Reported Outcomes. Of course automated radiographic image analysis will play a role, not only for fracture or osteoarthritis recognition but also for predicting future pathology.

15:40 **S10.1** Application of natural language processing, machine learning and deep learning (computer vision) in orthopedic surgery. An overview
Job Doornberg *(Groningen - The Netherlands)*

15:52 Discussion

15:55 **S10.2** New data from robotic joint replacement surgery and patient engagement platforms; the digital patient journey
Peter Pilot *(Schijndel - The Netherlands)*

16:07 Discussion

16:10 **S10.3** From orthopedic surgeon to data specialist? How can I learn AI for my practice
Joost Kuipers *(Tilburg - The Netherlands)*

16:22 Discussion

16:25 **S10.4** Machine learning applied to digital history taking. Does is work in daily practice?
Walter Van Der Weegen *(Geldrop - The Netherlands)*

16:37 Discussion

16:40 **S10.5** From fiction to reality: present and future of digital orthopedics
Fabrizio Billi *(Los Angeles - USA)*

16:52 Discussion

16:55 **S10.6** Looking over the horizon: the digitalization of orthopedic surgery
Stefano Bini *(San Francisco - USA)*

17:07 Discussion

ROOM 2 — 15:40-17:10

S08 SYMPOSIUM
MIRACLE SYMPOSIUM - A BRIGHT NEW FUTURE FOR ARTHROSCOPY

Chair: **Gabriela Lorite Yrjänä** *(Oulu - Finland)*

Co-chair: **Simo Saarakkala** *(Oulu - Finland)*

Osteoarthritis constitutes a major challenge for the health systems and affects 242 million people globally. Currently, surgeon's decision-making during arthroscopy is based on visual inspection and manual probing of the cartilage tissue which is highly subjective and of poor repeatability. Untreated or not-correctly treated joint injury will most likely progress towards osteoarthritis. Hence, the development of advanced cartilage assessment tools is urgently needed. The MIRACLE team is developing the first mid-infrared attenuated total reflection (MIR-ATR) arthroscopy system for realtime, in-depth, clinical examination and diagnosis of degenerative joint diseases such as osteoarthritis. This device will allow orthopedic surgeons to obtain real-time information about the biochemical composition of the cartilage tissue, leading to objective intra-operative decision-making on the most adequate treatment course, enhancing patient's well-being and reducing the need for follow-up surgery. The MIRACLE symposium will focus on the innovative aspects of the MIRACLE device from a manufacture's perspective, while case studies will be presented by a surgeon who will share his experience with the device. Lastly, a roundtable will join experts in the field discussing the limitations of conventional arthroscopy and how MIRACLE will circumvent these problems, pushing forward the market of arthroscopy devices and impacting the early diagnosis of osteoarthritis.

15:40 Introduction
S08.1 **Gabriela Lorite Yrjänä** *(Oulu - Finland)*

15:45 Mid-infrared arthroscopy: a real-time
S08.2 cartilage assessment tool
Boris Mizaikoff *(Ulm - Germany)*

16:00 MIRACLE arthroscopy system: from the perspective
S08.3 of a surgeon
Harold Brommer *(Utrecht - The Netherlands)*

16:15 ROUND TABLE - Rethinking the Future of Arthroscopy
S08.4 **Harold Brommer** *(Utrecht - The Netherlands)*
Boris Mizaikoff *(Ulm - Germany)*
Ali Mobasheri *(Oulu - Finland)*
Simo Saarakkala *(Oulu - Finland)*




17:00 Concluding remarks
S08.5 **Simo Saarakkala** *(Oulu - Finland)*

ROOM 3 — 15:40-17:10

S07 SYMPOSIUM
BIOSURFACES FOR BONE IMPLANTS: NEW PERSPECTIVES FROM RESEARCH AND CLINICALE XPERIENCE

Chair: **Silvia Spriano** *(Turin - Italy)*

Co-chair: **Alessandro Bistolfi** *(Turin - Italy)*

The outcome of a bone implant depends on several issues (surgery procedure, implant design, materials and treatments, patient clinical factors, risk of infection...). The aim of the symposium is to make a focus on the role of the surface of the implant in its clinical outcome. Several postimplantation events are related to the surface features and are covered by the symposium: protein adsorption; osseointegration through cell adhesion, proliferation, and differentiation; eventual release of ions due to corrosion; eventual infection, biofilm formation or release of anti-bacterial agents or drugs; early and eventually chronic inflammation; eventual fibrotic encapsulation; fretting or wear; excessive growth of bone on the surface of temporary implants. Researchers, materials scientists, and biologists involved in developing advanced and innovative surfaces for orthopedic implants and clinicians with experience in failure or positive outcome of bone implants, dealing with any surface feature, are invited to show and discuss their results.

15:40 Modified titanium surfaces for different
S07.1 purposes: from osseointegration of prostheses to anti-adhesive and -inflammatory surfaces for temporary devices
Silvia Spriano *(Turin - Italy)*

15:52 Discussion

15:55 Surface treatments for joint arthroplasty:
S07.2 the clinical outcome
Alessandro Bistolfi *(Turin - Italy)*

16:07 Discussion

16:10 When the osteoblasts and macrophages meet
S07.3 an implant surface: the osseointegration and inflammatory events
Paulo Tambasco *(Sao Paulo - Brazil)*

16:22 Discussion

16:25 Biomimetic nanocoatings for joint
S07.4 arthroplasty surfaces
Anuj Bellare *(Boston - USA)*

16:37 Discussion

16:40 Fuctionalization of bone substitutes surfaces
S07.5 for orthopedics
Riccardo Ferracini *(Genoa - Italy)*

16:52 Discussion

16:55 Biofilm formation on bone implants: how can
S07.6 we fight it?
Lia Rimondini *(Novara - Italy)*

17:07 Discussion

ROOM 4 — 15:40-17:10

S06 SYMPOSIUM
ORS RESEARCH SECTION 2021 HIGHLIGHTS

Chair: **Peter C. Amadio** *(Rochester - USA)*

Co-chair: **Suzanne Maher** *(New York - USA)*

This symposium will highlight the award-winning abstracts as presented by ORS Research Section members on the topics of: meniscus, tendon, spine, implants, fractures, and preclinical models.

15:40 Opening and introduction
S06.1 **Peter Amadio** *(Rochester - USA)*
Suzanne Maher *(New York - USA)*

15:43 Gradients in Media Recapitulate Native
S06.2 Collagen Fiber Organization Within Tissue Engineered Enthesis
Jongkil Kim *(Ithaca - USA)*

15:55 Macrophage subtype influences
S06.3 intervertebral disc degeneration and inflammation
Lauren Lisiewski *(New York - USA)*

16:07 MRL/MpJ Tendon-derived provisional extracel-
S06.4 lular matrix and secretome modulate canonical healing tendon cells toward regenerative behavior
Jason C. Marvin *(Ithaca - USA)*

16:19 Modulating implant stiffness with additive
S06.5 manufacturing: a preliminary investigation with rib fracture reconstruction
Michael Hast *(Philadelphia - USA)*

16:31 A fat-free lipodystrophic mouse model to
S06.6 study osteoarthritis
Kelsey Collins (*St. Louis - USA)*

16:43 Collagen X biomarker indicates early healing
S06.7 trajectory in a longitudinal fracture cohort
Zachary Working *(Portland - USA)*

16:55 Discussion

AUDITORIUM — 17:20-17:50

17:20 **PL2 PLENARY LECTURE 2**

Chairs: **Rocco Papalia** *(Rome - Italy)*,
Gianluca Vadalá *(Rome - Italy)*

Biorobotic and bionic enabling technologies for orthopedic medicine

Eugenio Guglielmelli *(Rome - Italy)*

AUDITORIUM — 17:50-18:50

OPENING CEREMONY

Gianluca Vadalà, EORS President and Congress Chair

Rocco Papalia, Congress Chair

Vincenzo Denaro, Honorary Congress Chair

Eugenio Guglielmelli, Prorector for Research UCBM

Peter C. Amadio, ORS President

AUDITORIUM 09:00-10:00

OC11 DISC DEGENERATION AND REGENERATION

09:00 **K11 KEYNOTE LECTURE 11**

Role of TIE2 positive nucleus pulposus progenitor cells in disc degeneration and its use in regenerative medicine

Daisuke Sakai *(Tokai - Japan)*

Chair: **Sibylle Grad** *(Davos - Switzerland)*
Young Investigator Co-Chair: **Luca Ambrosio** *(Rome - Italy)*

09:20 OC11.1 Traction to optimize intervertebral disc mechanobiology: a bovine organ model feasibility study
Astrid Soubrier[1,2], Hermann Kasper[1], Mauro Alini[1], Ilse Jonkers[2], Sibylle Grad[1] *([1]Davos - Switzerland, [2]Leuven - Belgium)*

09:30 OC11.2 Notochordal cells in disc regeneration
Shaghayegh Basatvat[1], Rebecca Williams[1], Joseph Snuggs[1], Lisanne Laagland[1], Adel Medzikovic[1], Frances Bach[1], Deepani Liyanage[1], Keita Ito[2], Marianna Tryfonidou[1], Christine Le Maitre[1] *([1]Sheffield - United Kingdom, [2]Eindhoven - The Netherlands)*

09:40 OC11.3 MicroRNAs associated with TLR-2-induced inflammation in intervertebral disc pathophysiology
Petra Cazzanelli[1], Oliver Nic Hausmann[2,3], Karin Wuertz-Kozak[1,4] *([1]Rochester - USA, [2]Lucerne - Switzerland, [3]Bern - Switzerland, [4]Munich - Germany)*

09:50 OC11.4 The in vitro effects of MSC secretome on human nucleus pulposus cells in a 3D culture model
Veronica Tilotta, Claudia Cicione, Giuseppina Di Giacomo, Luca Ambrosio, Fabrizio Russo, Rocco Papalia, Gianluca Vadalà, Vincenzo Denaro *(Rome - Italy)*

ROOM 1 09:00-10:00

OC12 TRAUMA RESEARCH

09:00 **K12 KEYNOTE LECTURE 12**

WNT regulation in bone of Type 2 diabetes patients

Nicola Napoli *(Rome - Italy)*

Chair: **Stijn Bolink (Deventer -** *The Netherlands)*
Young Investigator Co-Chair: **Jan Barcik** *(Davos - Switzerland)*

09:20 OC12.1 Malunion after trauma - Knee arthritis correlates with malalignment
Luke Visscher, Jordy White, Kevin Tetsworth, Cathal McCarthy *(Brisbane - Australia)*

09:30 OC12.2 Weight-bearing allowed following internal fixation of ankle fractures, a systematic literature review and metaanalysis
Ramy Khojaly[1,2], Fiachra E. Rowan[1], Mekki Hassan[1], Sammy Hanna[3], May Cleary[1,4], Ruairí Mac Niocaill[1,2] *([1]Waterford - Ireland, [2]Dublin - Ireland, [3]London - United Kingdom, [4]Cork - Ireland)*

09:40 OC12.3 Do patients with neuromuscular disorders have a higher risk of dislocation of hip hemiarthroplasty?
Mahmoud Awadallah[1], Joshua Ong[2], Niroshan Kumar[3], Pushparaj Rajata[1], Martyn Parker[1] *([1]Peterborough - United Kingdom, [2]Harlow - United Kingdom, [3]Hamilton - New Zealand)*

09:40 OC12.4 The influence of the ubiquitin-editing enzyme A20 after major trauma and subsequent remote lug injury in relation to the suppression of NF-KAPPAB signaling
Laurens Noack[1], Baolin Xu[1], Aleksander Nowak[1], Andrea Janicova[1], Weikang Ye[2], Marija Simic[1,2], Katrin Bundkirchen[2], Claudia Neunaber[2], Borna Relja[1] *([1]Magdeburg - Germany, [2]Hannover - Germany)*

ROOM 2 09:00-10:00

OC13 BIOMECHANICS

09:00 **K13 KEYNOTE LECTURE 13**

Patient specific instrumentation in high tibial osteotomy: state of the art and preliminary results of a new customised 3D printed device

Stefano Zaffagnini *(Bologna - Italy)*

Chair: **Thomas M. Grupp** *(Tuttlingen - Munich - Germany)*
Young Investigator Co-Chair: **Giuseppe Rovere** *(Rome - Italy)*

09:20 OC13.1 A longitudinal study on the geometrical, structural and material properties of type-2 diabetic bone using a Zucker Diabetic Fatty (ZDF) rat model
Genna Monahan, Jessica Schiavi, Ted Vaughan *(Galway - Ireland)*

09:30 OC13.2 Medial helical versus lateral straight plating of distal femoral fractures. A biomechanical comparative study
Torsten Pastor[1,2], Ivan Zderic[1], Geoff Richards[1], Boyko Gueorguiev[1], Matthias Knobe[2] *([1]Davos - Switzerland, [2]Luzern - Switzerland)*

09:40 OC13.3 Radiological comparison of three techniques of scapholunate econstruction for scapholunate instability: a cadaver study
Can Yener, Omar Aljasim, Mesut Demirkoparan, Okan Bilge, Erdal Binboğa, Mehmet Argın, Levent Küçük, Nadir Özkayın *(Izmir - Turkey)*

09:50 OC13.4 The flexion - extension axis of the knee and its relationship to the rotational alignment of tibia in knee osteoarthritis. The concept of proximal tibial twist
Luca Farinelli, Marco Baldini, Andrea Faragalli, Flavia Carle, Antonio Pompilio Gigante *(Ancona - Italy)*

ROOM 3 09:00-10:00

OC14 HIP ARTHROPLASTY

09:00 **K14 KEYNOTE LECTURE 14**

Hybrid cooperative complex of hyaluronic acid and sodium chondroitin, clinical evidences

Biagio Zampogna *(Rome - Italy)*

Chair: **Nicola Papapietro** *(Rome - Italy)*
Young Investigator Co-Chair: **Corrado Ciatti** *(Piacenza - Italy)*

09:20 OC14.1 Restoring global offset and lower limb length in total hip arthroplasty with a 3 offset option double-tapered stem. A monocentric five-years follow-up experience
Andrea Camera[1,2], Riccardo Tedino[1,2], Gabriele Cattaneo[1,2], Andrea Capuzzo[1,2], Stefano Biggi[1,2], Stefano Tornago[2] *([1]Alessandria - Italy, [2]Albenga - Italy)*

09:30 OC14.2 Anterior and lateral approach comparison in femoral neck fractures: radiographic analysis of hip hemiarthroplasty
Luigi Giulio Conforti, Marianna Faggiani, Salvatore Risitano *(Turin - Italy)*

09:40 OC14.3 Experimental bone strain evolution associated of hip press-fit acetabulum looseing
António Ramos, Mariana Matos *(Aveiro - Portugal)*

09:50 OC14.4 Experience, results, critical issue and technical innovations aimed at improving survival rates of antiprotrusio cages
Luigino Turchetto, Stefano Saggin *(Portogruaro - Italy)*

ROOM 4 09:00-10:00

OC15 BIOMATERIALS

09:00 **K15 KEYNOTE LECTURE 15**

Injectable bioactive biomaterials for bone repair and regeneration

Luigi Ambrosio *(Naples - Italy)*

Chair: **Maria Grazia Raucci** *(Naples - Italy)*
Young Investigator Co-Chair: **Josephine Luk** *(Columbia - USA)*

09:20 OC15.1 Bone beyond borders - Monetite-based calcium phosphate induces bone formation outside the skeletal envelope in an ovis aries occipital bone model
Martina Jolic[1], Furqan Ali Shah[1], Omar Omar[1], Lena Emanuelsson[1], Birgitta Norlindh[1], Håkan Engqvist[2], Thomas Engstrand[2,3], Anders Palmquist[1], Peter Thomsen[1] *([1]Gothenburg - Sweden, [2]Uppsala - Sweden; [3]Stockholm - Sweden)*

09:30 OC15.2 Chlorhexidine triphosphate loaded bone cement: handling, setting, mechanical, release and antimicrobial properties
Matthew Skeats, Darryl Hill, Michele Barbour *(Bristol - United Kingdom)*

09:40 OC15.3 New coatings for orthoregeneration: the role of biomimetic composition and multiscale morphological cues in directing cells response
Gabriela Graziani[1], Maria Sartori[1], Milena FiniV, Enrico Sassoni[1], Marco Boi[1], Silvia Farè[2], Nicola Baldini[1] *([1]Bologna - Italy, [2]Milan - Italy)*

09:50 OC15.4 Use of crosslinked Wharton's jelly in guided bone regeneration
Loïc Scomazzon[1], Marie Dubus[1], Julie Chevrier[1], Jennifer Varin-Simon[1], Julien Braux[1], Adrien Baldit[2], Sophie Gangloff[1], Cédric Mauprivez[1], Fany Reffuveille[1], Halima Kerdjoudj[1] *([1]Reims - France, [2]Metz - France)*

AUDITORIUM 10:30-12:00

S11 SYMPOSIUM BIOLOGICAL TREATMENT FOR IVD RELATED CHRONIC BACK PAIN

Chair: **Lisbet Haglund** *(Montreal - Canada)*

Co-chair: **Karin Wuertz-Kozak** *(Rochester - USA)*

Degenerative disc disease (DDD) is a major contributor to chronic low back pain (cLBP). As existing treatments do not target the molecular mechanisms of the disease, research activities focus on the identification of novel treatments. This includes identification of drug targets, as well as testing of new approaches in-vitro and invivo. This symposium will highlight research activities spanning from basic science investigations to preclinical testing: Transient receptor potential (TRP) channels are implicated in inflammation and pain transmission in numerous tissues. Prof. Wuertz-Kozak will highlight recent findings and discuss the potential of TRP channels as therapeutic targets in DDD. Prof Le Maitre will discuss a three prong attack to stimulate tissue regeneration of the disc utilising a novel injectable hydrogel which restores mechanical function, delivers a regenerative cell source and inhibits the catabolic environment of the degenerate disc. There is growing recognition that senescent cells accumulate with ageing and DDD. Prof. Haglund will discuss the potential of senolytics as a treatment option for disc-related cLBP in human and mice. Tryfonidou will discuss a multidisciplinary effort to advance therapies for disc-related cLBP, with a focus on local controlled drug delivery in preclinical and veterinary clinical studies.

10:30 S11.1 Introduction

10:34 S11.2 Transient receptor potential (TRP) channels as therapeutic targets in the IVD
Karin Wuertz-Kozak *(Rochester - USA)*

10:44 Discussion

10:48 S11.3 Injectable hydrogel to stimulate intervertebral disc regeneration from in vitro to ex vivo organ culture
Christine Le Maitre *(Sheffield - United Kingdom)*

10:58 Discussion

11:02 S11.4 Senolytic treatment for IVD related chronic back pain
Lisbet Haglund *(Montreal - Canada)*

11:12 Discussion

11:16 S11.5 IVD regeneration :preclinical animal studies to bridge the gap from bench to the clinic
Marianna Tryfonidou *(Utrecht - The Netherlands)*

11:26 Discussion

AUDITORIUM 10:30-12:00

S11 SYMPOSIUM
BIOLOGICAL TREATMENT FOR IVD RELATED CHRONIC BACK PAIN *(cont.)*

11:30 Tissue-specific progenitor cells for
S11.6 intervertebral disc repair – science fiction or a possible rescue for mildly degenerated intervertebral discs?
Benjamin Gantenbein *(Bern - Switzerland)*

11:40 Discussion

11:44 Is inflammation a major contributor to disc
S11.7 degeneration? Insights from mouse models
Makarand V. Risbud *(Philadelphia - USA)*

11:54 Discussion

ROOM 1 10:30-12:00

S14 SYMPOSIUM
FROM SURGICAL TRAINING TO PATIENT OUTCOME - DIGITAL TRANSFORMATION IN ORTHOPEDICS

Chair: **Markus Windolf** *(Davos - Switzerland)*

Co-chair: **Geoff Richards** *(Davos - Switzerland)*

Orthopedic treatment with the final goal of safe and sound patient outcome starts with training the orthopedic surgeon for an improved skill set in decision making and execution. The AO Research Institute sees strong potential for digital technologies to significantly enhance the treatment journey. In this symposium various related key projects will be outlined: Virtual training of basic biomechanical understanding and hands-on training of surgical tasks with digital feedback and outcome measurement. Optimized implant designs based on computer simulations and digital aids to improve surgical execution such as simplified fracture reduction. And finally, objective data acquisition during the healing process for evidence based and patient specific rehabilitation. Potentials and hurdles of the proposed concepts will be presented and critically discussed.

10:30 OSapp - Digital osteosynthesis tool for surgical
S14.1 education
Peter Varga *(Davos - Switzerland)*

10:40 Discussion

10:45 Digital enhanced hands-on surgical training
S14.2 **Jan Buschbaum** *(Davos - Switzerland)*

10:55 Discussion

11:00 Computer optimized implant design
S14.3 exemplified on the proximal humerus
Dominic Mischler *(Davos - Switzerland)*

11:10 Discussion

11:15 Digital mapping of bone fracture patterns
S14.4 **Karen Mys** *(Davos - Switzerland)*

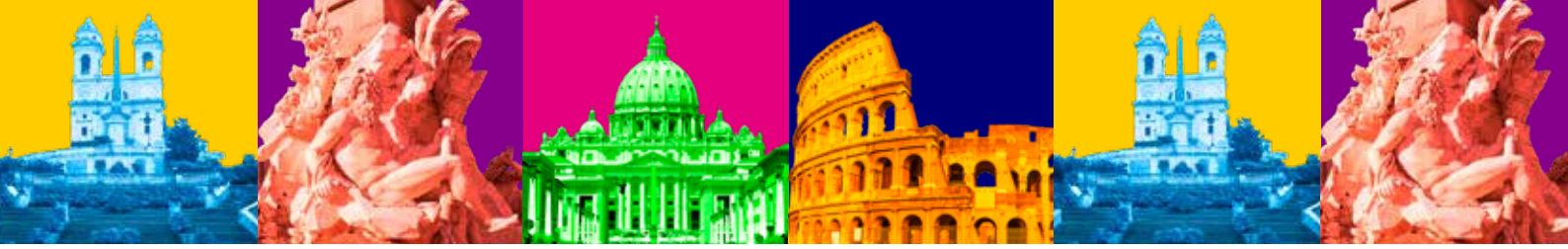
11:25 Discussion

11:30 The AO Fracture Monitor – Current status
S14.5 and capabilities of a novel technology to objectivize rehabilitation
Markus Windolf *(Davos - Switzerland)*

11:40 Discussion

11:45 Spinal Fusion monitoring – Transfer of measuring
S14.6 principles to the spine
Maximilian Heumann *(Davos - Switzerland)*

11:55 Discussion



ROOM 2 — 10:30-12:00

S12 SYMPOSIUM
OSSEOINTEGRATED AND BIONIC PROSTHESIS FOR AMPUTEES: THE ITALIAN EXPERIENCE

Chair: **Stefano Zaffagnini** *(Bologna - Italy)*

Co-chair: **Vincenzo Denaro** *(Rome - Italy)*

Osseointegration represents an alternative method of treatment for amputees with socketrelated problems and low quality of life. It consists of attaching an intramedullary stem directly to the amputated skeletal segment that extends out of the residual limb. A prosthesis is then attached to the metal extension. Osseointegration has many advantages for the patient, including skeletal proprioception, improvement of socket-related skin problems, increased walking speed, improved walking efficiency and better muscle control of the stump. In addition, thanks to the implementation of neural control and sensory feedback, a bidirectional neuromuscular interfacing can be created between the implanted electrodes and the bone-anchored prosthesis for upper limb amputees, which has proven to be functional in the long term. However, osseointegration also presents considerable disadvantages, such as possible infections of the skin stoma, which requires daily cleaning. More and more interest has been placed in this method in recent years. With this symposium, we present the experience gained in Italy after the first cases performed.

10:30 Novel solutions for prosthesis sensory
S12.1 feedback and embodiment
Giovanni Di Pino *(Rome - Italy)*

10:40 Rearrange the upper limb stump aimed
S12.2 to apply an advanced bionic prostheses: combination of TMR and osseointegration
Lorenzo Alirio Diaz Balzani *(Rome - Italy)*

10:50 Osseointegration of the lower limb:
S12.3 technique details
Stefano Zaffagnini *(Bologna - Italy)*

11:00 Rehabilitation path and first results in lower
S12.4 limb osseointegration
Amedeo Amoresano *(Vigorso di Budrio - Italy)*

11:10 Osseointegration in trans-phalangeal
S12.5 amputations
Mario Lando *(Modena - Italy)*

11:20 Myoelectric control techniques for osseointe-
S12.6 grated upper limb prostheses
Christian Cipriani *(Pisa - Italy)*

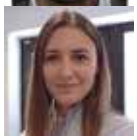
11:30 Discussion

ROOM 3 — 10:30-12:00

S13 SYMPOSIUM
3D PRINTING IN ORTHOAPEDIC SURGERY: PRESENT AND FUTURE

Chair: **Paolo Domenico Parchi** *(Pisa - Italy)*

Co-chair: **Stefania Marconi** *(Pavia - Italy)*



From its first applications in orthopedic surgery in the mid-1980s, 3D Printing is progressively grown and in the last years reached a solid role in preoperative planning especially in a complex case, fabrication of customized implants as in oncologic orthopedic surgery, and education of the new generation of surgeons. The whole process starts from the segmentation patient's medical image dataset (CT o MRI) to create a 3D virtual model of the patient's anatomy. This model is then used for the fabrication of the 3D solid model of the patient's anatomy, through various additive manufacturing techniques, that can be used variously to enhance the anatomy interpretation, (visual and physical evaluation) and to aid in the planning and the execution of the surgical act. In this symposium will be discuss and analyzed the main applications of 3D printing in orthopedic surgery through a series of literature reviews on a specific topic and a special talk describing the experience of a complete "in-house" hospital 3D lab. A particular focus will be on bioprinting an innovative sector for the development of patient-specific 3D cellularized scaffolds that is rapidly developing and that will change the future of tissue engineering surgery.

10:30 3D printing for surgical training: state of the art
S13.1 and future perspectives
Sara Condino (Pisa - Italy)

10:42 Discussion

10:45 3D in orthopedics oncology surgery
S13.2 **Lorenzo Andreani** *(Pisa - Italy)*

10:57 Discussion

11:00 The experience of a clinical 3D printing
S13.3 "in house" laboratory: current and future perspectives
Stefania Marconi *(Pavia - Italy)*

11:12 Discussion

11:15 3D-printing in joint arthroplasty
S13.4 **Alberto Leardini** *(Bologna - Italy)*

11:27 Discussion

11:30 Bioprinting in orthopedics
S13.5 **Carmelo De Maria** *(Pisa - Italy)*

11:42 Discussion

11:45 3D printing in orthopedics: legal issues
S13.6 **Maria Livia Rizzo** *(Bologna - Italy)*

11:57 Discussion

ROOM 4 — 10:30-12:00

S15 SYMPOSIUM
SPIN-OFFS FOR BONES AND JOINTS

Chair: **Ciara Murphy** *(Dublin - Ireland)*

Co-chair: **Antonella Motta** *(Trento - Italy)*

Translational development of research and technologies from the academic stage/early research phase through to the clinic is often quite challenging and cannot be completed through academic institutes alone. Bringing research from TRL 5-7 requires a lot of regulatory input with International Organization for Standardization (ISO) studies under good laboratory practice (GLP) and good manufacturing process (GMP) conditions. It is usually difficult to achieve this through grant funding only, therefore the formation of Start-up companies or cooperation with established companies is necessary. This symposium aims to provide insights from companies within the TERMIS network at different stages and across a range of topics – from biomaterials for therapeutic applications to analytical technologies and patient specific therapies – to showcase how these companies evolved, highlight the challenges faced when translating research to the commercial and clinical field, and advise on what should be considered in designing experiments at early TRL phases.

10:30 **S15.1** Concept to commercialisation: spinning out an orthobiologic medical device start-up
John Gleeson *(Nottingham - United Kingdom)*

10:42 **S15.2** From aging research to diagnostic miRNA
Johannes Grillari *(Vienna - Austria)*

10:54 **S15.3** The bumpy silk road - ligament replacement
Thomas Nau *(Vienna - Austria)*

11:06 **S15.4** Regenerative nanoclays - translating a novel biomaterial
Agnieszka Janeczek *(Chilworth - United Kingdom)*

11:18 **S15.5** High-resolution 3D printing - Enabling novel approaches in TERM
Aleksandr Ovsianikov *(Vienna - Austria)*

11:30 **S15.6** The pursuit of the Medical Device Regulation (MDR), the next challenge for the medical device companies
Elvira Taccarelli *(Bussolengo - Italy)*

11:42 Discussion

AUDITORIUM — 12:10-12:40

12:00 **PL3 PLENARY LECTURE 3**

Chairs: **Rocco Papalia** *(Rome - Italy)*, **Gianluca Vadalá** *(Rome - Italy)*

What is the ACL?

Freddie H. Fu *(Pittsburgh - USA)*

AUDITORIUM — 14:05-15:05

OC16 CELL-BASED THERAPY

14:05 **K16 KEYNOTE LECTURE 16**

RESPINE: European clinical trial of mesenchymal stromal cells in degenerative disc disease

Christian Jorgensen *(Montpellier - France)*

Chair: **Martin Stoddart** *(Davos - Switzerland)*
Young Investigator Co-Chair: **Veronica Tilotta** *(Rome - Italy)*

14:25 **OC16.1** Intra-articular injection of mesenchymal stromal cells encapsulated in micro-molded alginate particles for the treatment of post-traumatic knee osteoarthristis in rabbit
Fabien Nativel[1], Audrey Smith[1], Mélanie Marquis[1], Denis Renard[1], Olivier Gauthier[1], Claire Vinatier[1], Anne des Rieux[2], Jerome Guicheux[1], Catherine Le Visage[1] *([1]Nantes - France, [2]Bruxelles - Belgium)*

14:35 **OC16.2** Autologous mesenchymal stem cells in the treatment of spinal aneurysmal bone cyst
Giovanni Barbanti Bròdano, Cristiana Griffoni, Giancarlo Facchini, Elisa Carretta, Francesca Salamanna, Giuseppe Tedesco, Gisberto Evangelisti, Silvia Terzi, Riccardo Ghermandi, Stefano Bandiera, Marco Girolami, Valerio Pipola, Milena Fini, Alessandro Gasbarrini *(Bologna - Italy)*

14:45 **OC16.3** High-throughput characterization of micro-fragmented adipose tissue for the treatment of musculoskeletal disorders: comparison with unprocessed lipoaspirate
Marco Viganò, Enrico Ragni, Enrica Torretta, Alessandra Colombini, Carlotta Perucca Orfei, Paola De Luca, Francesca Libonati, Cecilia Gelfi, Laura de Girolamo *(Milan - Italy)*

14:55 **OC16.4** Characterization and comparison of different methods to obtain minimally manipulated adipose tissue for the treatment of osteoarthritis
Claudia Cicione, Rocco Papalia, Giuseppina Di Giacomo, Veronica Tilotta, Luca Ambrosio, Fabrizio Russo, Sebastiano Vasta, Gianluca Vadalà, Vincenzo Denaro *(Rome - Italy)*

ROOM 1 — 14:05-15:05

OC20 KNEE ARTHROPLASTY

14:05 **K20 KEYNOTE LECTURE 20**

The Hoffa's fat pad function in the osteoarthritic process of the knee joint

Francisco Forriol *(Madrid - Spain)*

Chair: **Stefano Campi** *(Rome - Italy)*
Young Investigator Co-Chair: **Alexandra Mercader** *(Munich - Germany)*

14:25 OC20.1 The effects of kinesiophobia on outcome following total knee replacement: a systematic review
Oliver Brown[1], Lisi Hu[1], Charis Demetriou[1], Toby Smith[2], Caroline Hing[1] *([1]London - United Kingdom, [2]Norwich - United Kingdom)*

14:35 OC20.2 Tibial tubercle osteotomy in difficult exposure during total knee arthroplasty: midterm results experience of a monocentric study
Andrea Camera[1,2], Riccardo Tedino[1,2], Gabriele Cattaneo[1,2], Andrea Capuzzo[1,2], Stefano Biggi[1,2], Stefano Tornago[2] *([1]Alessandria - Italy, [2]Albenga - Italy)*

14:45 OC20.3 Literature review on outcomes of total knee arthroplasty in post-traumatic vs primary osteoarthritis: is there any difference?
Zaid Abu Al-Rub[1], Ben Tyas[2], Kiran Singisetti[2] *([1]Leeds - United Kingdom, [2]Newcastle - United Kingdom)*

14:55 OC20.4 Overstuff in mechanically aligned total knee replacement: morphometric study with clinical correlations of bone resections
Edoardo Franceschetti[1] Gianmauro De Angelis D'Ossat, Alessio Palumbo, Michele Paciotti, Francesco Franceschi, Rocco Papalia *(Rome - Italy)*

ROOM 2 — 14:05-15:05

OC18 BONE BIOLOGY AND PATHOPHYSIOLOGY

14:05 **K18 KEYNOTE LECTURE 18**

Deconstructing bone tumors: new tools for personalised treatments

Nicola Baldini *(Bologna - Italy)*

Chair: **Britt Wildemann** *(Jena - Germany)*
Young Investigator Co-Chair: **Andrea Facchini** *(Siena - Italy)*

14:25 OC18.1 An ex vivo model of load-induced cortical bone remodelling
Jessica Schiavi, Amala Remo, Laoise McNamara, Ted Vaughan *(Galway - Ireland)*

14:35 OC18.2 MicroRNA-29A mitigates age-mediated osteoporosis through compromising methyl DNA activation of oxidative stress and inflammation
Yu-Shan Chen, Wei-Shiung Lian, Feng-Sheng Wang *(Kaohsiung - Taiwan)*

14:45 OC18.3 Decreased bone structure in mice with XXY karyotype (klinefelter syndrome) may be influenced by the supernumerary X-chromosome and X-chromosome inactivation (XCI)
Melanie Timmen, Niklas Husmann, Joachim Wistube, Richard Stange *(Muenster - Germany)*

14:55 OC18.4 Periprosthetic atypical femoral fractures exist. Prevalence on 115 periprosthetic femoral fractures around a primary hip stem
Andrea Facchini, Roberta Ghezzi, Elisa Troiano, Tiziano Giacchè, Matteo Cacioppo, Nicola Mondanelli, Stefano Giannotti *(Siena - Italy)*

ROOM 3 — 14:05-15:05

OC19 INFECTION

14:05 **K19 KEYNOTE LECTURE 19**

Novel antimicrobial approaches to prevent orthopedic device-related infection

Geoff Richards *(Davos - Switzerland)*

Chair: **Giorgio Gasparini** *(Catanzaro - Italy)*
Young Investigator Co-Chair: **Fatma Nur Depboylu** *(Ankara - Turkey)*

14:25 OC19.1 Intra-rater reliability of digital thermography in detecting pin site infection; a proof of concept study
Marie Fridberg, Ole Rahbek, Hans-Christen Husum, Arash Ghaffari, Søren Kold *(Aalborg - Denmark)*

14:35 OC19.2 Thermal imaging of surface temperature changes in septic arthritis
Huseyin Gunay[1], Murat Celal Sozbilen[1], Javad Mirzazade[2], Ozgur Mert Bakan[1] *([1]Izmir - Turkey, [2]Van - Turkey)*

14:45 OC19.3 Management of contaminated bone defects using a bone substitute eluting different antibiotics
Damiano Papadia[1], Fabrizio Comincini[1], Paolo Pirchio[1], Velia Puggioni[1], Giovanni Bellanova[2] *([1]Trento - Italy, [2]Francavilla Fontana - Italy)*

14:55 OC19.4 Pathogenicity of C. Acnes following interaction with human mesenchymal stem cells
Marie Dubus, Jennifer Varin-Simon, Steve Papa, Sophie Gangloff, Cédric Mauprivez, Xavier Ohl, Fany Reffuveille, Halima Kerdjoudj *(Reims - France)*

ROOM 4 — 14:05-15:05

OC17 BIOMECHANICS

14:05 **K17 KEYNOTE LECTURE 17**

Keeping the head level during axial rotation - The effect on coupled rotations in the cervical spine

Muturi G. Muriuki *(Hines - USA)*

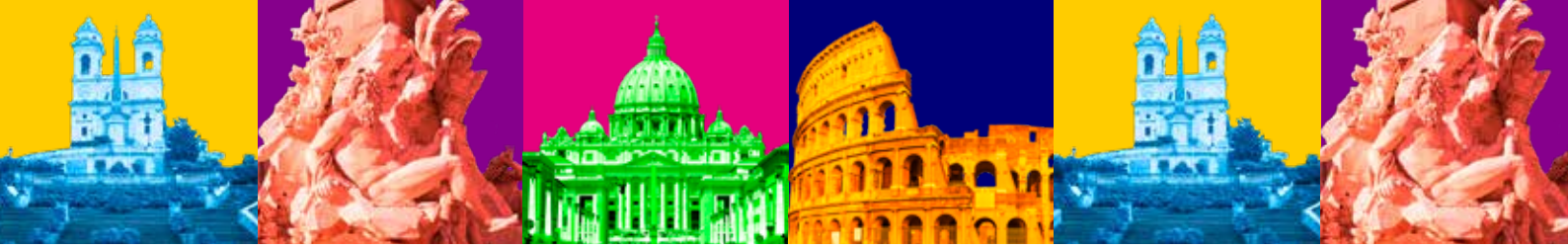
Chair: **Luca Cristofolini** *(Bologna - Italy)*
Young Investigator Co-Chair: **Riccardo Giorgino** *(Milan - Italy)*

14:25 OC17.1 Biomechanical analysis of recently released cephalomedullary nails for trochanteric femoral fracture fixation in a human cadaveric model
Torsten Pastor[1,2], Ivan Zderic[1], Dominic Gehweiler[1], R. Geoff Richards[1], Matthias Knobe[2], Boyko Gueorguiev[1] *([1]Davos - Switzerland, [2]Luzern - Switzerland)*

14:35 OC17.2 Angular stable intramedullary nailing improves construct stability in a distal tibia fracture model - A biomechanical study
Ivan Zderic[1], Jan Caspar[1], Michael Blauth[2], André Weber[2], Roger Koch[2], Karl Stoffel[3], Christopher Finkemeier[4], Martin Hessmann[5], Boyko Gueorguiev[1] *([1]Davos - Switzerland, [2]Zuchwil - Switzerland, [3]Basel - Switzerland, [4]Carmichael - USA, [5]Fulda - Germany)*

14:45 OC17.3 Gait variability before and after total knee arthroplasty: a comparison of medial pivot and posterior stabilized implants
Erik Kowalski, Danilo Catelli, Mario Lamontagne, Geoffrey Dervin *(Ottawa - Canada)*

14:55 OC17.4 Pulley plasty techniques versus resection of single flexor digitorum superficialis slip and venting technique comparison after both tendon repair in zone II. A biyomechanical study
Omar Aljasim, Can Yener, Mesut Demirkoparan, Okan Bilge, Levent Küçük, Huseyin Gunay *(Izmir - Turkey)*

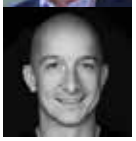


AUDITORIUM 15:15-16:15

S16 SYMPOSIUM ON CARTILAGE REGENERATION RESEARCH BATTLE

Chair: **Norbert Passuti** *(Lucerne - Switzerland)*

Co-chair: **Kay Horsch** *(Lucerne - Switzerland)*



Cartilage regeneration is without doubt one of the hottest topics within the different areas of orthoregeneration. Researchers around the world are working hard to find the holy grail focusing on different approaches in their research. Which strategy will be most successful to regenerate cartilage – PRP, Cells or Scaffolds? In this interactive session, three renowned and eloquent experts will make the case for their personal favourite research area. They will explain current knowledge, share recent findings and point out the future potential. In the interactive battle the audience will decide which of the three research areas is most promising. Directly after the battle the ON Foundation will offer a 10,000 € Kick-starter Grant on the winning topic. All EORS researchers are invited to apply.

15:15 Introduction
S16.1 **Norbert Passuti** *(Lucerne - Switzerland)*

15:20 PRP based biological enhancement of
S16.2 cartilage regeneration
Elizaveta Kon *(Milan - Italy)*

15:32 Cell based biological enhancement of cartilage
S16.3 regeneration
Laura de Girolamo *(Milan - Italy)*

15:44 Scaffold based biological enhancement of
S16.4 cartilage regeneration
Sylvia Nürnberger *(Vienna - Austria)*

11:55 Discussion

16:10 Closing remarks
S16.5 **Norbert Passuti** *(Lucerne - Switzerland)*

ROOM 1 15:15-16:15

S17 SYMPOSIUM COMPLEX ORTHOPEDIC MODELS

Chair: **Martin Stoddart** *(Davos - Switzerland)*

Co-chair: **Sibylle Grad** *(Davos - Switzerland)*

Optimizing therapies for orthopedic applications requires a detailed knowledge of the underlying mechanism of action. This has led to the development of more complex systems, both in vitro and in vivo, to allow the regenerative process to be investigated in more detail. This symposium elaborates on models for bone, cartilage and intervertebral disc. Within this symposium we highlight mechanobiology studies performed both high resolution in vivo studies, and ex vivo models using complex bioreactor systems. Additionally, co-culture models aiming to add the interplay of neuronal interactions will be discussed. Once developed, these models not only increase the understanding of the underlying regenerative process, but they also offer more accurate test beds for new therapies.

15:15 Spatial mechanomics of in vivo bone adaptation
S17.1 and regeneration
Ralph Müller *(Zurich - Switzerland)*

15:30 Clinical relevance of whole intervertebral disc
S17.2 organ models
Sibylle Grad *(Davos - Switzerland)*

15:40 3D dorsal root ganglion model to study the
S17.3 mechanisms associated with discogenic pain
Junxuan Ma *(Davos - Switzerland)*

15:50 Increasing the complexity of in vitro cartilage
S17.4 models
Martin Stoddart *(Davos - Switzerland)*

16:00 Discussion

ROOM 2 — 15:15-16:15

S19 SYMPOSIUM
ANTIBACTERIAL AND PRO-OSSEOINTEGRATIVE NANOBIOMATERIALS FOR ORTHOPEDICS IN THE LAB AND IN INDUSTRY: NEW PERSPECTIVES IN MANUFACTURING AND VALIDATION

Chair: **Nicola Baldini** *(Bologna - Italy)*

Co-chair: **Gabriela Graziani** *(Bologna - Italy)*

Infections are among the most severe complications in surgery, having high societal and economic impact. In spite of the definition of detailed guidelines and procedures for prevention of surgical site infections, their rate is sharply increasing. Metallic-based compounds are promising to tackle this challenge, but they experienced a widespread application, negligent of the characteristics of the device and of bacterial contamination, that are crucial to determine their success in the clinic. In addition, in orthopedics, implants/bone substitutes must not only fight infections, but also facilitate osseointegration. Avoiding any detrimental interference between these two actions is not trivial, as antibacterial compounds can be toxic to the bone-cells, while all features that promote integration (i.e. porosity, high surface roughness, patterning, etc.) favour bacterial adhesion and proliferation. The symposium will discuss new strategies to tackle these needs, by merging research and industrial perspectives and by examining the new trends and open challenges in the development of antibacterial and bioactive devices and on new 3D in vitro methods for their validation. Special attention will be devoted to metal-based biomaterials and nanomaterials, their capability to overcome the progressive development of multi-drug resistant organisms and their industrial scalability, moving towards a personalized medicine in infection.

15:15 S19.1 Metal-based antibacterial and bioactive coatings and the evaluation of their antimicrobial and antibiofilm activity: towards a personalized medicine in the prevention of infection
Gabriela Graziani *(Bologna - Italy)*

15:27 S19.2 New trends in functional surface modification of biodegradable and stable implant devices
Julietta V. Rau *(Rome - Italy)*

15:39 S19.3 Multifunctional biomaterials for bone regeneration: new trends in manufacturing and validation
Maria Chatzinikolaidou *(Crete - Greece)*

15:51 S19.4 Antibacterial and smart nanostructured materials for the treatment of infection, an industrial perspective
Giovanni Baldi *(Sovigliana-Vinci - Italy)*

16:03 Discussion

ROOM 3 — 15:15-16:15

S18 SYMPOSIUM
BONE AND CARTILAGE BIOLOGY - PATHOPHYSIOLOGICAL MICROENVIRONMENTAL CUES

Chair: **Feng-Sheng Wang** *(Kaohsiung - Taiwan)*

Co-chair: **Holger Jahr** *(Maastricht - The Netherlands)*

In this symposium, we will give an update on how microenvironmental cues, like mechanobiological triggers, oxidative stress, or bioactive molecules may be used to alter the course of bone regeneration and cartilage deterioration. We will provide latest insights on how epigenetics governs the progression of osteoarthritis. We will show how customized geometrically micro-patterned surfaces may be used to control the phenotype of human chondrocytes for translational cell-based cartilage repair options. Furthermore, the impact of adipomyokine-derived hormone-like soluble factors of the articular cartilage secretome on the chondrocyte metabolism will be reported by using Fndc-5 as an example. Last-not-least, insights on the role of other bioactive molecules as well as data in support of a novel role for the oxidative stress response master regulator Nrf2 in bone fracture healing will be presented.

15:15 S18.1 Controlling human chondrocyte phenotype through geometrically customized micropatterned surfaces
Bernd Rolauffs *(Freiburg - Germany)*

15:28 Discussion

15:30 S18.2 Effects of Fndc5-derived hormone-like myokines on cartilage metabolism
Wei-Shiung Lian *(Kaohsiung - Taiwan)*

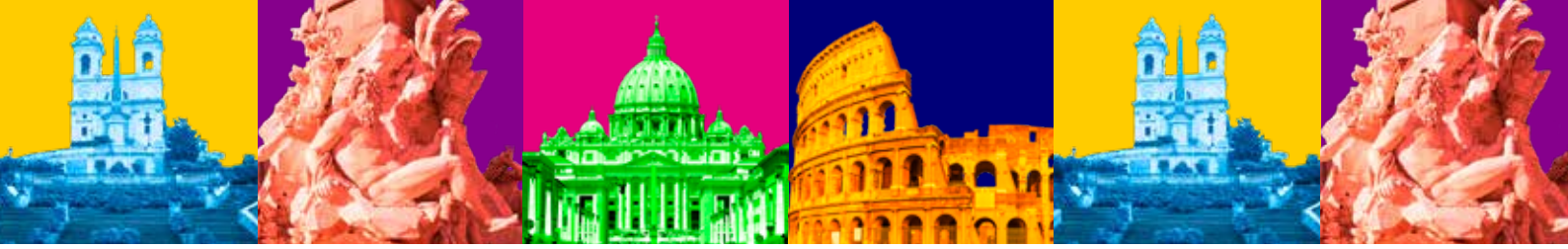
15:43 Discussion

15:45 S18.3 The role of bioactive molecules in bone and cartilage pathobiology
Feng-Sheng Wang *(Kaohsiung - Taiwan)*

15:58 Discussion

16:00 S18.4 An update on oxidative stress in osteoarthritis and bone fracture healing
Holger Jahr *(Maastricht - The Netherlands)*

16:13 Discussion



ROOM 4 — 15:15-16:15

S20 SYMPOSIUM
VALIDATION OF PROSTHESIS POSITION AND ITS IMPACT ON KNEE KINEMATICS DURING KNEE REPLACEMENT SURGERY

Chair: **Heinz Röttinger** *(Munich - Germany)*

Nowadays, about 20% of patients are dissatisfied after Total Knee Arthroplasty (TKA). This is mainly caused by anterior pain. This pain can be partly explained by a change in the kinematics of the knee after replacing the joint. In order to better visualize this change and to better predict the ideal position of the prosthesis, an innovative 3D model of the patient is presented that reproduces the exact flexion movement of the knee, measured prior to surgery on the patient. The latest technological advances in the field of 3D printing make it possible to quickly reconstruct a model of the patient's knee. The patient's knee is printed identically and allows a better visualization of the geometry of the femur, the tibia and the patella. Both the patellofemoral and tibiofemoral joints play an important role in knee replacement surgery. The rollback effect must be taken into account when cutting in order to respect the initial flexion movement of the knee. The surgeon must also ensure that the patella is sufficiently aligned with the forces of the patellar ligament and the quadriceps. This allows for smooth movement of the patella and reduces postoperative problems. In order to control all these parameters and to visualize the influence of the position of the prosthesis on the kinematics of the knee, the 3D model is used for the prosthesis placement. This allows to compare the postoperative result with the preoperative movement. In addition, several prosthesis positions can be tested and used for comparison. The operation on the model allows the surgeon to practice on a copy of the patient and also to understand the influence of different prosthesis configuration modifications on the knee movement.

15:15 Challenges in Total Knee Arthroplasty
S20.1 **Heinz Röttinger** *(Munich - Germany)*

15:25 3D model of bones from CT images
S20.2 **Amir Bigdeli** *(Munich - Germany)*

15:35 A novel tool to validate the position of the
S20.3 prosthesis before TKA
Alexandra Mercader *(Munich - Germany)*

15:50 Benefits of the knee model for surgeons
S20.4 **Timon Röttinger** *(Munich - Germany)*

15:55 Discussion

AUDITORIUM — 15:15-16:15

16:45 **PL4 PLENARY LECTURE 4**
Chairs: **Rocco Papalia** *(Rome - Italy)*,
Gianluca Vadalá *(Rome - Italy)*

Innovation in complex deformity correction in orthopedic surgery

Cesare Faldini *(Bologna - Italy)*

AUDITORIUM — 17:25-18:25

GENERAL ASSEMBLY

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Holger Jahr - Vice-President *(Germany)*

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Jeannette Østergaard Penny - Treasurer *(Denmark)*

Gabriela Graziani - Young Investigator Co-Chair *(Italy)*

Girish Pattappa - Social Media Chair *(Germany)*

AUDITORIUM 09:00-10:00

S24 SYMPOSIUM
CHALLENGES AND NOVEL SOLUTIONS IN ORTHOPEDICS 2021-2026

Chair: **Nicola Baldini** *(Bologna - Italy)*

Co-chair: **Gianluca Vadalà** *(Rome - Italy)*

09:00 EORS Roadmap 2016 - 2021
S24.1 **Nicola Baldini** *(Bologna - Italy)*
Bernd Grimm *(Luxembourg - Luxembourg)*

09:10 New trends in biomaterials & biofabrication
S24.2 **Riccardo Levato** *(Utrecht - The Netherlands)*

09:20 Perspectives in surgery and robotics
S24.3 **Gianluca Vadalá** *(Rome - Italy)*

09:30 Wearable systems for physiological monitoring
S24.4 and rehabilitation
Emiliano Schena *(Rome - Italy)*

09:40 Discussion

ROOM 1 09:00-10:00

S22 SYMPOSIUM
ADVANCES IN BIOPHYSICAL STIMULATION OF ARTICULAR CARTILAGE

Chair: **Leo Massari** *(Ferrara - Italy)*

Co-chair: **Roy K. Aaron** *(Providence - USA)*

In recent years, the therapeutic approach for osteoarthritis has focused on nonpharmacologic strategies, owing to the evidence that nonpharmacologic approaches are more likely to relieve symptoms in the long term and to delay or prevent functional decline. Biophysical stimulation (i.e. the application of nonionizing physical energies for therapeutic purposes) proved to be an effective chondroprotective treatment. Pulsed Electromagnetic Field (PEMF) increase the anabolic activity of chondrocytes and cartilage explants and antagonize the catabolic effects of inflammation through the agonistic activity on A2A adenosine receptors (A2A ARs). In Dunkin Hartley, PEMFs were able of halting the progression of osteoarthritis, preserving cartilage thickness and preventing sclerosis of the subchondral bone. Similarly, electrical stimulation could lead to improved quality of regenerated cartilage tissue in vitro. The recent scientific evidence suggesting that cartilage regeneration is now an achievable goal raises new challenges. The modulation of resident stem cells and the control of chondrocyte senescence, oxidative stress and mitochondrial dysfunction play a major role in maintaining and restoring the integrity of articular cartilage. A2A ARs activation has been reported to counteract both cellular senescence and mitochondrial dysfunction, suggesting the opportunity to apply biophysical stimulation not only for chondroprotective purposes but also for cartilage regenerative treatments.

09:00 Complimentary results of PEMF effects on
S22.1 cartilage from several laboratories increases confidence in the reliability of the observations
Roy K. Aaron *(Providence - USA)*

09:12 Discussion

09:15 Complex-multiaxial loading Induces
S22.2 chondrogenesis ex vivo: towards regenerative rehabilitation
Mauro Alini *(Davos - Switzerland)*

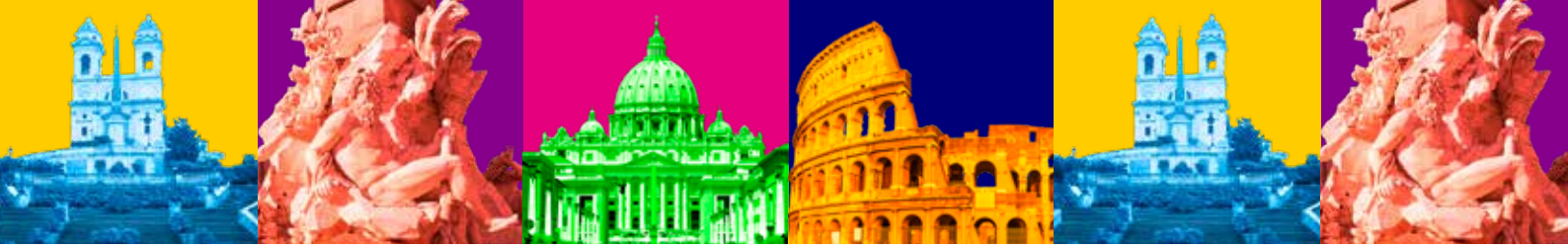
09:27 Discussion

09:30 Effects of pulsed electromagnetic fields on
S22.3 osteoarthritis preclinical models
Milena Fini *(Bologna - Italy)*

09:42 Discussion

09:45 Time-dependent effects of electrical stimulation
S22.4 on the differentiation of human chondrocytes
Reiner Bader *(Rostock - Germany)*

09:57 Discussion



ROOM 2 — 09:00-10:00

S23 SYMPOSIUM
THE ROLE OF ADIPOMYOKINES IN MUSCOLOSKELETAL DISEASES

Chair: **Holger Jahr** *(Aachen - Germany)*

Co-chair: **Luca Ambrosio** *(Rome - Italy)*

In the last decade, several studies have outlined the unique capacity of the skeletal muscle and adipose tissue to release biological mediators with pleiotropic functions, namely adipomyokines. Indeed, these molecules have been shown to establish a crosstalk between muscle and fat tissue and, possibly, to mediate the positive effects of physical exercise on numerous organs, including the liver, brain, and the musculoskeletal systems. In particular, irisin is raising a great interest in the orthopedic research field due to its ability to improve muscle mass and metabolism, increase bone mineral density and matrix deposition, and to foster cartilage anabolism while reducing osteoarthritic changes. This symposium aims to highlight the latest advances in adipomyokine research in the musculoskeletal field. The speakers will illustrate the main mechanisms sustaining oxidative stress in osteoarthritic chondrocytes as well as the newly described beneficial effects of irisin on cartilage degradation and chondrocyte senescence. Moreover, gaps of the current knowledge and the high translational potential of a therapeutic use of these molecules will be thoroughly discussed.

09:00 **S23.1** Physical exercise and oxidative stress in chondrocytes and osteoarthritis
Holger Jahr *(Aachen - Germany)*

09:13 Discussion

09:15 **S23.2** Irisin is a new senolytic target in chondrocytes and osteoarthritis
Feng-Sheng Wang *(Kaohsiung - Taiwan)*

09:28 Discussion

09:30 **S23.3** Chondroprotective effects of irisin
Luca Ambrosio *(Rome - Italy)*

09:43 Discussion

09:45 **S23.4** Fndc5-derived hormone irisin mitigates oxidative stress in chondrocytes
Wei-Shiung Lian *(Kaohsiung - Taiwan)*

9:58 Discussion

ROOM 3 — 09:00-10:00

S21 SYMPOSIUM
MRNA THERAPEUTICS: HOW TECHNOLOGY FROM THE COVID VACCINE CAN TRANSLATE TO REGENERATIVE MEDICINE IN ORTHOPEDIC TRAUMA

Chair: **Chelsea S. Bahney** *(Vail - USA)*

Co-chair: **Elizabeth Rosado Balmayor** *(Maastricht - The Netherlands)*

Fractures are one of the most common injuries worldwide. While most bone injuries regenerate well, 10-15% of normal fractures demonstrate impaired healing in the for m of delayed- or non-union. Delayed- or non-union rates increase to 50% of fractures when coupled with vascular damage or a high co-morbidity burden. Clinically, these non-unions are difficult and costly to treat as physicians are reluctant to diagnose until 6-9 month without radiographic evidence bone formation. Current standard of care for non-unions is surgical intervention to increase biomechanical stability or promote healing through application of bone graft. As such, there is an unmet clinical need for osteoinductive therapeutics that stimulate fracture healing through a non-surgical delivery platform. Delivery of mRNA is an attractive tool recently popularized by the novel coronavirus vaccine that delivers genetic material without genomic integration. To date, broad application of mRNA-based therapeutic platforms has been limited due to challenges associated with mRNA stability, toxicity of delivery vectors and immunogenicity. Here we discuss how we can harness the latest research advances in mRNA therapeutics.

09:00 **S21.1** Introduction: why mRNA over traditional protein or gene-based therapeutics?
Chelsea S. Bahney *(Vail - USA)*

09:08 **S21.2** Chemical modifications of mRNA for therapeutic applications
Elizabeth Rosado Balmayor *(Maastricht - The Netherlands)*

09:20 **S21.3** Engineered scaffolds for delivery of RNA therapeutics
Fergal O'Brien *(Dublin - Ireland)*

09:32 **S21.4** Clinical need and readiness for novel orthobiologics for trauma care
Zachary Working *(Portland – USA)*

09:40 Discussion

ROOM 4 09:00-10:00

S25 SYMPOSIUM
WEIGHTBEARING CT IMAGING IN THE FOOT AND ANKLE

Chair: **Arne Burssens** *(Ghent - Brussels)*

Co-chair: **Claudio Belvedere** *(Bologna - Italy)*

Acquired foot and ankle deformities compromise complex 3D modifications of the articulating bones. In this context, medical imaging under weightbearing conditions is fundamental to enhance pre- and post-treatment evaluations. Over the past decades, weightbearing radiographs of the foot and ankle have been performed to meet this requirement. Unfortunately, several important drawbacks of this imaging modality are reported: superimposition of the osseous structures, the radiograph contains a 2D projection of three-dimensional structures, difference in patient positioning relative to radiographic beam resulting in marked alternations in the angular alignment, and general manually-based assessments. The recent advent of weightbearing CT imaging has demonstrated to overcome these limitations. The measurements based on this imaging modality contain a high reliability and have a superior accuracy when compared to 2D weightbearing radiographs. Recent advances are now focussed on using 3D computed measurement that can be performed semi-automatic, implemented in a pre- and post-operative planning and used to generate patient specific assisted instrumentation. The aim of the present symposium proposal is to offer an overview this imaging modality, including the applications these state-of-the-art devices and related findings in terms of complex foot and ankle pathology.

09:00 **S25.1** Three-dimensional models of the foot and ankle based on weightbearing CT imaging
Alberto Leardini *(Bologna - Italy)*

09:12 Discussion

09:15 **S25.2** Instability of the Hindfoot assessed by weightbearing CT imaging
Alexej Barg *(Hamburg - Germany)*

09:27 Discussion

09:30 **S25.3** Objective 3D assesments of planovalgus deformity using weightbearing CT imaging
Kevin N. Dibbern *(Iowa City - USA)*

09:42 Discussion

09:45 **S25.4** Objective 3D assesments of cavovarus deformity assessed by weightbearing CT imaging
Alessio Bernasconi *(Naples - Italy)*

09:57 Discussion

AUDITORIUM 10:10-11:10

OC22 TISSUE ENGINEERING

10:10 **K22 KEYNOTE LECTURE 22**

Engineered and devitalized extracellular matrices as off-the-shelf osteoinductive grafts

Ivan Martin *(Basel - Switzerland)*

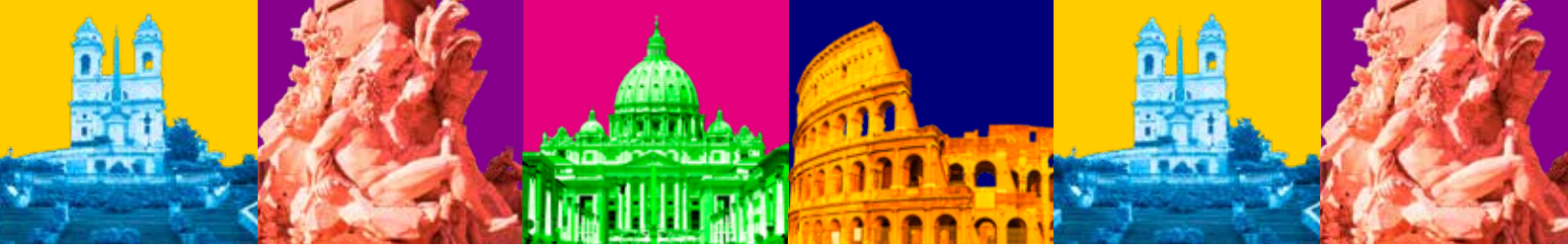
Chair: **Manuela Gomes** *(Gumarães - Portugal)*
Young Investigator Co-Chair: **Morena Francesca Fiordalisi** *(Porto - Portugal)*

10:30 **OC22.1** The effects of graphene-containing polycaprolactone scaffolds on healing in large osteochondral defect model
Özgür Başal[1], Ozlem Ozmen[2], Aylin Müyesser Deliormanli[3] *([1]Kocaeli - Turkey, [2]Burdur, Turkey, [3]Manisa - Turkey)*

10:40 **OC22.2** Long bone healing in rat segmental femur defect with use of graphene-coated borate-based 13-93B3 bioactive glass scaffolds
Özgür Başal[1], Ozlem Ozmen[2], Aylin Müyesser Deliormanli[3] *([1]Kocaeli - Turkey, [2]Burdur - Turkey, [3]Manisa - Turkey)*

10:50 **OC22.3** Matrix stiffness regulates paracrine actions of mesenchymal stem cells on macrophages and osteoblasts
Leila Maestro, Eduardo García-Rey, Fatima Bensiamar, Luis Rodriguez-Lorenzo, Nuria Vilaboa, Laura Saldaña *(Madrid - Spain)*

11:00 **OC22.4** Low-intensity pulsed ultrasound stimulation enhances chondrogenic differentiation of ASCS in a 3D hydrogel
Cristina Manferdini[1], Elena Gabusi[1], Diego Trucco[1,2], Paolo Dolzani[1], Yasmin Saleh[1], Andrea Cafarelli[2], Leonardo Ricotti[2], Gina Lisignoli[1] *([1]Bologna - Italy, [2]Pisa - Italy)*



ROOM 1 — 10:10-11:10

OC21 TRAUMA RESEARCH

10:10 **K21 KEYNOTE LECTURE 21**

Grafting techniques in management of great bone defects

Vincenzo Salini *(Milan - Italy)*

Chair: **Lorenzo Alirio Diaz Balzani** *(Rome - Italy)*
Young Investigator Co-Chair: **Ramy Khojaly** *(Waterford - Ireland)*

10:30 OC21.1 Arthroscopic evacuation of hematoma in dislocated and articular fractures: can arthrofibrosis and early secondary arthrosis be prevented?
Francesco Manfreda[1], Pietro Gregori[1], Fabrizio Marzano[1], Auro Caraffa[1], Andrea Donis[2] *([1]Perugia - Italy, [2]Turin - Italy)*

10:40 OC21.2 A systematic review and meta-analysis of the wide-awake local anaesthetic no tourniquet technique for distal radius fracture fixation
Brian Rigney, Conor Casey, Ciaran Mc Donald, Eoghan Pomeroy, May Cleary *(Waterford - Ireland)*

10:50 OC21.3 A multicentre evaluation of fibula nail outcomes (MEFNO)
Maryam Ahmed[1], Andrew Barrie[1], Arun Kozhikunnath[1], Abilash Thimmegowda[1], Sebastian Ho[2], Kumar Kunasingam[2], Enis Guryel[1], MEFNO Collaborative *([1]Brighton - United Kingdom, [2]Croydon - United Kingdom)*

11:00 OC21.4 Slipped capital femoral epiphysis: gait alterationsbin children treated with in situ fixation compared to typically developed children
Frederike Mulder[1], Rachel Senden[1], Heleen Staal[1], Robin de Bot[1], Florens van Douveren[3], Jaap Tolk[2], Kenneth Meijer[1], Adhiambo Witlox[1] *([1]Maastricht - Thr Netherlands, [2]Veldhoven - The Netherlands)*

ROOM 2 — 10:10-11:10

OC23 SHOULDER

10:10 **K23 KEYNOTE LECTURE 23**

Shoulder pathology: from rotator cuff tears to shoulder osteoarthritis

Umile Giuseppe Longo *(Rome - Italy)*

Chair: **Giuseppe Peretti** *(Milan - Italy)*
Young Investigator Co-Chair: **Alexander Hartland** *(Chelmsford - United Kingdom)*

10:30 OC23.1 Endoprosthesis length affects stress shielding in proximal humeral replacement for tumour excision
Pivatidevi Pareatumbee, Andy Yew, Joyce Suang Bee Koh, Tet Sen Howe, Suraya Zainul Abidin, Mann Hong Tan *(Singapore - Singapore)*

10:40 OC23.2 Pre-operative CT-based planning integrated with intra-operativenavigation in reverse shoulder arthroplasty: data acquisition and analysis protocol, and mid-term resultsnof navigated vs conventional surgery
Andrea Facchini, Elisa Troiano, Marco Saviori, Martina Di Meglio, Roberta Ghezzi, Nicola Mondanelli, Stefano Giannotti *(Siena - Italy)*

10:50 OC23.3 Periprosthetic intraarticular corticosteroid injection following total shoulder arthroplasty: is it effective and safe?
Pietro Gregori[1], Arjun Singh[2], Thomas Harper[2], Francesco Franceschi[3], Olivia Blaber[1], John G. Horneff[1] *([1]Perugia - Italy, [2]Philadelphia - USA, [3]Rome - Italy)*

11:00 OC23.4 Acute pain management following elective orthopedic shoulder surgery
Mohammad Salhab[1,2], Paul Cowling[1] *([1]Leeds - United Kingdom, [2]Bradford - United Kingdom)*

ROOM 3 10:10-11:10

OC24 SPINE

10:10 **K24 KEYNOTE LECTURE 24**

AO Spine guideline for using osteobiologics in spine degeneration (AO-GO) - Chapter I ACDF

Hans-Jörg Meisel *(Halle - Germany)*

Chair: **Alberto Di Martino** *(Rome - Italy)*
Young Investigator Co-Chair: **Sergio De Salvatore** *(Rome - Italy)*

10:30 OC24.1 Spinal deformities in patients with pectus carinatum
Ahmed Heydar, Serdar Şirazi *(Istanbul - Turkey)*

10:40 OC24.2 Efficacy of perioperative halo-gravity traction in the treatment of severe spinal deformity in children
Gonzalo Mariscal[1], Jorge Nuñez Camarena[2], Teresa Galvañ[1], Carlos Barrios[1], Pedro Fernández[1] *([1]Valencia - Spain, [2]Barcelona - Spain)*

10:50 OC24.3 Artificial intelligence accurately detects traumatic thoracolumbar fractures on sagittal radiographs
Guillermo Sánchez[1,2], Andrea Cina[3], Pietro Giorgi[3], Giuseppe Schiro[3], Boyko Gueorguiev[1], Mauro Alini[1], Peter Varga[1], Fabio Galbusera[3], Enrico Gallazzi[3] *([1]Davos - Switzerland, [2]Lachen - Switzerland, [3]Milan - Italy)*

11:00 OC24.4 Successful salvage anterior retroperitoneal approach in revision surgery for failed transforaminal or posterior interbody fusion (TLIF-PLIF). Technical consideration on consecutive 32 cases
Carlotta Morselli, Agostino Cirullo, Roberto Bassani *(Milan - Italy)*

ROOM 4 10:10-11:10

OC25 ROBOTICS, NAVIGATION AND VIRTUAL REALITY

10:10 **K25 KEYNOTE LECTURE 25**

Augmented reality in orthopedic surgery: present and future prospective

Paolo Domenico Parchi *(Pisa - Italy)*

Chair: **Fabrizio Russo** *(Rome - Italy)*
Young Investigator Co-Chair: **Stefano Stallone** *(Bologna - Italy)*

10:30 OC25.1 No difference of gait parameters in patients with image-free robotic-assisted medial unicompartmental knee arthroplasty compared to a conventional technique: a randomized controlled trial
Cécile Batailler[1], Timothy Lording[2], Alexandre Naaim[1], Elvire Servien[1], Laurence Cheze[1], Sébastien Lustig[1] *([1]Lyon - France, [2]Windsor)*

10:40 OC25.2 Virtual surgical planning for correcting complex deformities of long bones in children
Stefano Stallone, Giovanni Trisolino, Paola Zarantonello, Daniele Ferrari, Paola Papaleo, Francesca Napolitano, Gian Maria Santi, Leonardo Frizziero, Alfredo Liverani, Giovanni Luigi Di Gennaro *(Bologna - Italy)*

10:50 OC25.3 Can robot-assisted total knee arthroplasty be a cost-effective procedure? A MARKOV-decision analysis
Hannes Vermue[1], Philip Tack[1], Victor Jan[1] *(Ghent - Belgium)*

11:00 OC25.4 Innovative educational pathways in spine surgery: advanced virtual reality-based training
Riccardo Giorgino[1], Andrea Luca[1], Emanuele Ruberto[1], Gianluca Besozzi[2], Giuseppe Banfi[1], Giuseppe Peretti[1] *([1]Milan - Italy, [2]Lecce - Italy)*

AUDITORIUM 11:40-12:10

12:00 **PL5 PLENARY LECTURE 5**
Chairs: **Rocco Papalia** *(Rome - Italy)*,
Gianluca Vadalá *(Rome - Italy)*

Tackling musculoskeletal disorders through innovative technologies: an integrated approach from prevention to return to work

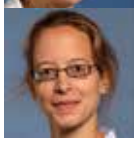
Sergio Iavicoli *(Rome - Italy)*

AUDITORIUM 12:20-13:20

S26 SYMPOSIUM
SECRETED SIGNALS - NOVEL CELL-FREE THERAPEUTICS FOR ORTHOPEDIC REGENERATION

Chair: **Sibylle Grad** *(Davos - Switzerland)*

Co-chair: **Astrid Soubrier** *(Davos - Switzerland)*



Cell based therapies are widely investigated in orthopedic research. In recent years, the trophic effect of implanted cells has gained increasing attention. With respect to mesenchymal stem cells (MSCs), there is strong evidence that paracrine signals play a major role in their therapeutic effect. The secretome of MSCs has been shown to exhibit significant anti-inflammatory, immune-modulatory, anabolic, and regenerative activity. This effect is based on the release of soluble mediators and extracellular vesicles than contain lipids, hormones, proteins, bioactive small molecules, and nucleotides. Non coding RNAs such as micro-RNAs that are important transcription regulators are mainly delivered through this mechanism. For orthopedic regeneration, formulations based on trophic signals offer several advantages compared to cell transplantation therapies. Certain safety risks such as unwanted differentiation are eliminated, and an off-the-shelf preparation can be foreseen. Local treatments with exosomes or microvesicles are therefore promising for repair and regeneration of traumatic or degenerative musculoskeletal disorders. In this symposium, recent advances in the characterization and application of secretomes and extracellular vesicles will be discussed.

12:20 **S26.1** Isolation and characterization of extracellular vesicles in musculoskeletal diseases
Frank Schildberg *(Bonn - Germany)*

12:32 **S26.2** Evaluation of different separation techniques to isolate EV subpopulations from synovial fluid
Daniele D'Arrigo *(Lugano - Switzerland)*

12:44 **S26.3** Harnessing the regenerative potential of huUC-MSC-EVs for enthesis repair
Andreas Traweger *(Salzburg - Austria)*

12:56 **S26.4** MSC secretome for intervertebral disc: a plausible therapy?
Raquel Gonçalves *(Porto - Portugal)*

13:08 Discussion

ROOM 1 12:20-13:20

S27 SYMPOSIUM
BIOENGINEERED CELL INSTRUCTIVE TACTICS FOR BIOLOGICAL TENDON REPAIR AND REGENERATION

Chair: **Manuela Gomes** *(Gumarães - Portugal)*

Due to accidents and ageing, tendon diseases present major clinical and financial challenges in orthopedics, accounting for a considerable share of musculoskeletal pathologies. In recent years, a growing interest on tendon biomechanical properties has highlighted potential studies towards improved therapeutic strategies in the orthopedic field. Tissue engineering approaches are being increasingly studied in order to create successful alternatives for tendon repair and regeneration. Recent advances in tissue engineering and regenerative medicine envision the reconstruction of the tendon microenvironment ensuring appropriate cell and biomaterial interactions, to tackle tendon disease. In turn, this bioengineered environment will trigger key biochemical and biomechanical signals that steer desirable and stable cell behaviour. Therefore, this symposium will address cell-to-matrix and material interactions controlling cell behaviour, 3D niches, tendon engineering strategies, as well as repair/regeneration models.

12:20 **S27.1** Tenomodulin is required for optimal Achilles tendon repair
Manuel Delgado Cáceres *(Regensburg - Germany)*

12:45 Discussion

12:50 **S27.2** Magnetically trigger of TGF-B/Smad2/3 signaling in hASCs laden on magnetic scaffolds
Ana Gonçalves *(Gumarães - Portugal)*

13:02 Discussion

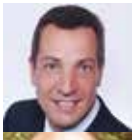
13:05 **S27.3** Design of three-layer collagen-based scaffolds to spatially direct tissue-specific differentiation of bone marrow stromal cells for the tendon-to-bone interface
Eugenia Pugliese *(Galway - Ireland)*

13:17 Discussion

ROOM 2 12:20-13:20

S28 SYMPOSIUM
HIP & KNEE REVISION ARTHROPLASTY - CLINICAL DEMANDS AND ADVANCED BIOMECHANICAL TESTING METHODOLOGIES

Chair: **Thomas M. Grupp** *(Tuttlingen - Germany)*



Co-chair: **Luca Cristofolini** *(Bologna - Italy)*

In total hip arthroplasty a major cause of hip revision is aseptic loosening of the acetabular component. Such failure is typically accompanied with defects in and around the acetabulum that must be restored during revision surgery. Morselized bone graft represents the golden standard for the reconstruction. Due to its limited availability, synthetic bone graft substitutes are adopted as an alternative material In the treatment of severe contained defects bone graft substitutes were tested in human donor pelvises and bone/implant motions were measured by digital image correlation. In complex knee revision cases accompagnied by instable ligaments or for patients with severe varus or valgus deformities, a rotating hinge knee prosthesis is a viable clinical option. Hybrid fixation with cementless stems to enable a stem revision without extended bone removal is a method of choice in case of peri-prosthetic joint infection. End-of-Stem Pain is localized pain in the region around the tip of the stem of a prosthesis after revision total knee arthroplasty. Surface deformations were measured on human femora under dynamic load using digital image correlation. High deformations were detected at the tip of the stem during simulated stair climbing and chair raising activities, which may be relevant for End-of-Stem Pain.

12:20 **S28.1** Hip revision arthroplasty – clinical demands and strategies in acetabular reconstruction
Francesco Traina *(Bologna - Italy)*

12:32 Discussion

12:35 **S28.2** Advanced biomechanical evaluation of primary and revision hip acetabular implants including defect models in human pelvises
Luca Cristofolini *(Bologna - Italy)*

12:47 Discussion

12:50 **S28.3** Knee revision arthroplasty – principals, clinical demands and strategies. Status and results of rotating hinge knees using hybrid fixation
Alexander Giurea *(Vienna - Austria)*

13:02 Discussion

13:05 **S28.4** End-of-Stem Pain - A biomechanical analysis based on 3D CT scans and optical surface strain measurements under dynamic load on human femora
Thomas M. Grupp *(Tuttlingen - Germany)*

13:17 Discussion

ROOM 3 12:20-13:20

S29 SYMPOSIUM
DEEP PHENOTYPING IN OSTEOARTHRITIS; CURRENT STATE OF THE ART AND FUTURE POTENTIAL

Chair: **Ali Mobasheri** *(Oulu - Finland)*

Co-chair: **Holger Jahr** *(Aachen - Germany)*

Osteoarthritis (OA) is the most common form of arthritis with significant healthcare costs and unmet needs in terms of early diagnosis and treatment. Many of the drugs that have been developed to treat OA failed in phase 2 and phase 3 clinical trials. High throughput omics technologies are a powerful tool to better understand the mechanisms of the development of OA and other arthritic diseases. In this speakers outline the strategic reasons for increasingly applying deep phenotyping in OA for the benefit of gaining a better understanding of disease mechanisms and developing targeted treatments. High throughput omics technologies are increasingly being applied in mechanistic studies of OA and other arthritic diseases. Applying multi-omics approaches in OA is a high priority and will allow us to gather new information on disease pathogenesis at the cellular level, and integrate data from diverse omics technology platforms to enable deep phenotyping. This symposium is intended to raise further interest and awareness in the application of omics technologies for deep phenotyping in OA. New knowledge in this area will unleash the power of Big Data Analytics and resolve the extremely complex cellular taxonomy of OA and potentially reveal "druggable pathways", thus facilitating future drug development.

12:20 **S29.1** Identifying biomarkers of early osteoarthritis using large-scale OA biobanks
Mohit Kapoor *(Toronto - Canada)*

12:33 Discussion

12:35 **S29.2** The importance of phenotyping in highthrough-put omics studies of osteoarthritis
Shabana Amanda Ali *(Detroit - USA)*

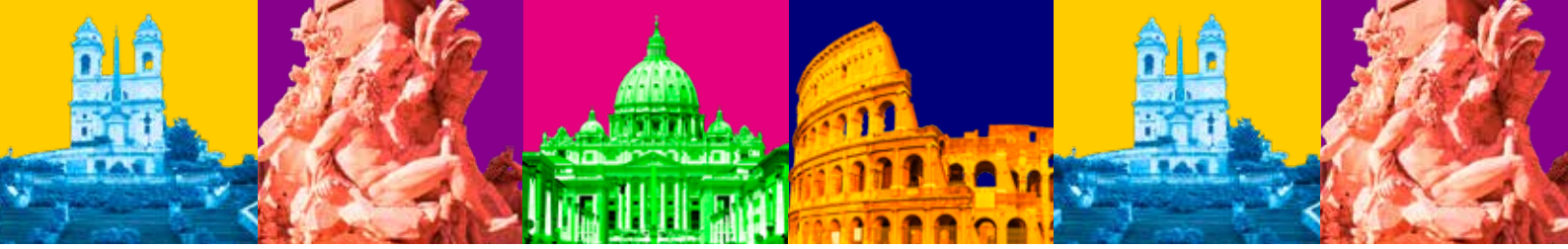
12:48 Discussion

12:50 **S29.3** Using gene expression signatures and transcriptional approaches to understand chondrocyte biology and fracture repair in bone
Annemarie Lang *(Berlin - Germany)*

13:03 Discussion

13:05 **S29.4** Omics phenotyping in osteoarthritis; perspectives from the APPROACH IMI consortium
Ali Mobasheri *(Oulu - Finland)*

13:18 Discussion



ROOM 4 — 12:20-13:20

S30 SYMPOSIUM
CONVERGENCE OF EXPERTISE TOWARDS A PRECISION BONE REGENERATIVE THERAPY

Chair: **Patrina S.P. Poh** *(Berlin - Germany)*

Co-chair: **Gabriela Russow** *(Berlin - Germany)*

Fragility fracture is a common ailment affecting people over the age of 50, costing the health care system billions of dollars annually. Although bone has intrinsic healing capability, impaired fracture healing occurred in up to 30% of cases, commonly leading to bone defects. Currently, bone defect therapeutic approaches include grafting, distraction osteogenesis, or "Masquelet" technique with highly variable healing outcomes due to inevitable physiological changes with chronological ageing, environmental influences and disease comorbidity. Coupling with population ageing necessitates advanced bone regenerative therapy and a holistic view of the bone defect. This call for cross-field collaborations to innovate solutions for the realisation of precision regenerative therapy. This symposium aims to bring together expertise from various research fields, i.e., bioinformatics, clinicians, bioengineers, giving an overview of how each of these seemingly disparate fields contributes towards the clinical translation of precision bone regenerative therapy.

12:20 **S30.1** Clinical problems of fragility fractures and the impact on surgical strategies
Sven Maerdian *(Berlin - Germany)*

12:30 Discussion

12:35 **S30.2** Additive manufacturing for patient-specific bone scaffolds
Patrina S.P. Poh *(Berlin - Germany)*

12:45 Discussion

12:50 **S30.3** Multiscale modelling and optimization for scaffold-aided bone regeneration
Sara Checa *(Berlin - Germany)*

13:00 Discussion

13:05 **S30.4** Privacy-preserving AI in medicine
Jan Baumbach *(Hamburg - Germany)*

13:15 Discussion

AUDITORIUM — 14:20-15:20

OC26 REGENERATIVE ORTHOPEDIC

14:20 **K26 KEYNOTE LECTURE 26**

Regenerative medicine for osteoarthritis

Gunil Im *(Goyang - South Korea)*

Chair: **Catherine Le Visage** *(Nantes - France)*
Young Investigator Co-Chair: **Alessio Giannetti** *(L'Aquila - Italy)*

14:40 **OC26.1** Management of gap non-union tibia of more than 6 cm with 3 ring Ilizarov fixator frame
Ajit Chalak, Pankaj Singh, Sushmit Singh, Shivam Mehra, Prakash D. Samant, Sunil Shetty, Sachin Kale *(Mumbai - India)*

14:50 **OC26.2** Exosomes from mechanically stimulated myoblasts produce differential miRNA cargo
Michael Mullen[1], Chelsea S. Bahney[1], Johnny Huard[1], Nicole Ehrhart[2] *([1]Vail - USA, [2]Fort Collins - USA)*

15:00 **OC26.3** New innovative technique to treat osteoarthritis knee with core decompression and BMAC with poly ester urea's structural scaffold: a prospective clinical study
Amit Lakhani[1], Ena Sharma[2] *([1]Solan - India, [2]Ambala - India)*

15:10 **OC26.4** Microfractures and PRP vs microfractures, PRP and adipose-derived stem cells: analysis of clinical outcomes with arthroscopic second look and histologic examination
Francesco Calafiore, Alessio Giannetti, Manuel Giovanni Mazzoleni, Antonio Ronca, Francesco Taurino, Gerardo Mandoliti, Vittorio Calvisi *(L'Aquila - Italy)*

ROOM 1 — 14:20-15:20

OC27 TENDON BIOLOGY AND PATHOPHYSIOLOGY

14:20 **K27 KEYNOTE LECTURE 27**

The Future of orthobiologics: from the bench-side to the bed-side

Johnny Huard *(Vail - USA)*

Chair: **Holger Jahr** *(Maastricht - The Netherlands)*
Young Investigator Co-Chair: **Manuel Delgado Cáceres** *(Regensburg - Germany)*

14:40 OC27.1 Platelet-rich fibrin (PRF) accelerates the healing of Achilles tendon defect by promoting the proliferation and activation of tenocytes via FGFR/AKT signaling and TGF-B/ SMAD3 signaling
Yoshiyuki Senga, Akinobu Nishimura, Akihiro Sudo *(Tsu - Japan)*

14:50 OC27.2 Molecular and histological changes in rat Achilles tendons in dependence of aging and genetically determined aerobic exercise capacity
Runa Kinitz[1], Estelle Heyne[1], Manuela Thierbach[1], Britt Wildemann[1,2] *([1]Jena - Germany, [2]Berlin - Germany)*

15:00 OC27.3 The vacomycin-wrap has no negative effect on tendons and tenocytes
Michelle Müller[1], Manuela Thierbach[1], Matthias Aurich[2], Britt Wildemann[1] *([1]Jena - Germany, [2]Halle - Germany)*

15:10 OC27.4 Polycaprolactone-based implants for tendon repair produced by electrospinning
Janin Reifenrath[1], Merle Kempfert[1], Andreas Kampmann[1], Nina Angrisani[1], Birgit Glasmacher[2], Henning Menzel[3], Bastian Welke[1], Elmar Willbold[1] *([1]Hannover - Germany, [2]Garbsen - Germany, [3]Braunschweig- Germany)*

ROOM 2 — 14:20-15:20

OC28 HIP ARTHROPLASTY

14:20 **K28 KEYNOTE LECTURE 28**

The physiologic postoperative presepsin levels after primary total hip replacement: a prospective observational study

Biagio Moretti *(Bari - Italy)*

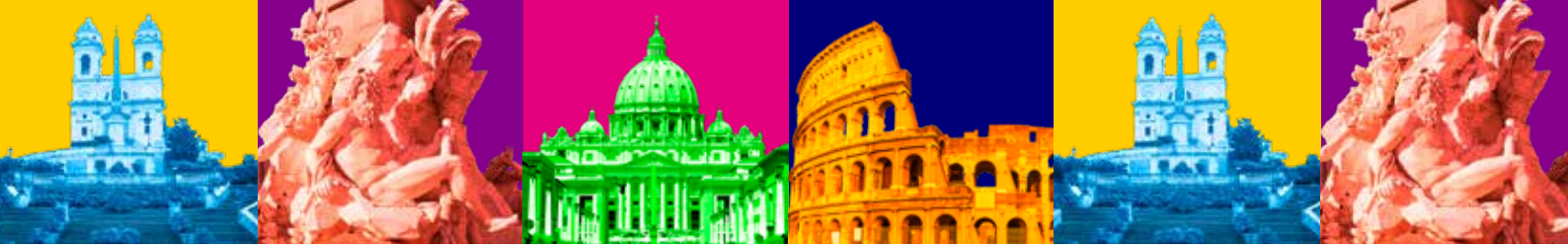
Chair: **Stefano Bini** *(San Francisco - USA)*
Young Investigator Co-Chair: **Ferruccio Vorini** *(Rome - Italy)*

14:40 OC28.1 Validation of a mouse model for post-arthroplasty hip heterotopic ossification
Stefano Negri[1,2], Yiyun Wang[2], Seungyong Lee[3], Qizhi Qin[2], Masnsen Cherief[2], Ginny Ching-Yun Hsu[2], Jiajia Xu[2], Robert J. Tower[2], Benjamin Levi[4], Adam Levin[2], Aaron James[2] *([1]Verona - Italy, [2]Baltimore - USA, [3]Toledo - USA, [4]Dallas - USA)*

14:50 Ceramic on ceramic bearing outcomes in total hip **OC28.2** arthroplasty at a minimum of 10 years
Cathal McCarthy, John Mahon, Gerard Sheridan, Adanna Welch-Phillips, John O'Byrne, Paddy Kenny *(Dublin - Ireland)*

15:00 OC28.3 Clinical comparison of two different ceramic-on-ceramic brands: pure alumina versus alumina matrix composite
Eduardo García-Rey[1], Laura Saldaña-Quero[1], Laurent Sedel[2] *([1]Madrid - Spain, [2]Paris - France)*

15:10 OC28.4 Preoperative factors associated to the length of hospital stay after total hip arthroplasty. Our experience on 743 cases
Rocco Papalia, Guglielmo Torre, Biagio Zampogna, Ferruccio Vorini, Antonio De Vincentis, Vincenzo Denaro *(Rome - Italy)*



ROOM 3 — 14:20-15:20

OC29 OSTEOARTHRITIS

14:20 **K29 KEYNOTE LECTURE 29**

Novel treatment for osteoarthritis and intervertebral disc disease: regenerate, restore & relieve

John Antoniou *(Montreal - Canada)*

Chair: **Ali Mobasheri** *(Oulu - Finland)*
Young Investigator Co-Chair: **Giuseppe Papalia** *(Rome - Italy)*

14:40 OC29.1 Ossifications of the acetabular labrum: probably not a good sign of osteoarthritis or femoroacetabular impigement morphology
Catarina Valente[1], Laura Haefliger[2], Julien Favre[2], Patrick Omoumi[2] *([1]Versailles-Le Chesnay - France, [2]Lausanne - Switzerland)*

14:50 OC29.2 A new wearable transcutaneous electrical nerve stimulation device (Actitens®) is more efficient and better tolerated than weak opioids in the treatment of knee osteoarthritis pain
Emmanuel Maheu[1], Sandrine Soriot-Thomas[2], Eric Noël[3], Hervé Ganry[2], Eric Lespesailles[4], Bernard Cortet[5] *([1]Paris - France, [2]Amiens - France, [3]Lyon - France, [4]Orleans - France, [5]Lille - France)*

15:00 OC29.3 Intercepting oa disease progression by modulating epigenetic profile via TET1 inhibition
Piera Smeriglio, Pier Francesco Indelli, Nidhi Bhutani *(Stanford - USA)*

15:10 OC29.4 In vitro evaluation of the anti-oxidant and anti-inflammatory properties of hyaluronic acid combined with sodium succinate
Enrico Ragni, Marco Viganò, Carlotta Perucca Orfei, Alessandra Colombini, Paola De Luca, Francesca Libonati, Laura de Girolamo *(Milan - Italy)*

ROOM 4 — 14:20-15:20

OC30 TRAUMA RESEARCH

14:20 **K30 KEYNOTE LECTURE 30**

The integrated evaluation with functional, clinical and psychoLogical tests for the return to sport after ACL reconstruction

Lorenzo Moretti *(Bari - Italy)*

Chair: **Francisco Forriol** *(Madrid - Spain)*
Young Investigator Co-Chair: **Brian Rigney** *(Waterford - Ireland)*

14:40 OC30.1 Reliability of the lateral femoral wall thickness for detecting the potential for treatment failure and implant choice in patients with trochanteric hip fractures; a prospective cohort study
Amr Selim[1,2], Nabil Seoudi[2], Ibrahim Algeady[2], Ahmed Samir Barakat[2] *([1]Truro - United Kingdom, [2]Cairo - Egypt)*

14:50 OC30.2 Prevalence of sarcopenia in older South African patients following surgery for fragility fractures of the hip
Cornelius Laubscher, Jacobus Jordaan, Marilize Burger, Magda Conradie, Maria Conradie *(Cape Town - South Africa)*

15:00 OC30.3 Factors associated with increased radiation exposure in proximal femoral fractures
Amr Elbahi, Owain Thomas, Maurice Dungey *(Kettering - United Kingdom)*

15:10 OC30.4 Risk of complications following surgical fixation of femoral diaphyseal fractures in children aged 4 to 12 years: a systematic review and meta-analysis
Tomos Edwards[1], Catriona Daly[2], Richard Donovan[1], Michael Whitehouse[1] *([1]Bristol - United Kingdom, [2]Taunton - United Kingdom)*

AUDITORIUM — 15:30-16:30

AWARDS & CLOSING CEREMONY

Gianluca Vadalà, EORS President and Congress Chair

Rocco Papalia, Congress Chair

Gun-Il Im, ICORS President

Jeannette Østergaard Penny, EORS Award Committee

Geoff Richard, ICORS 2022 Oversight Committee

Manuela Gomes, EORS 2023 Chair

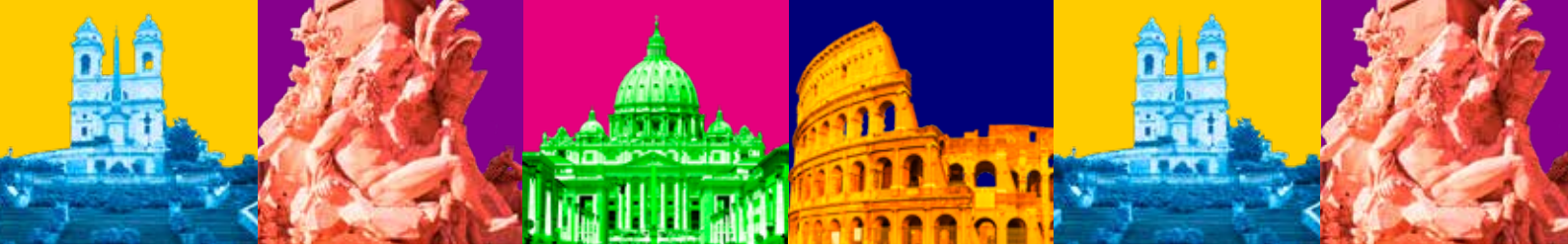
ROOM 1 **12.55-13.55**

WATCH & TRY SMITH & NEPHEW INTRODUCTION TO CORI. VIDEO DEMO AND TALK WITH THE ENGINEER

Smith+Nephew

Chair: **Ezio Policastro** *(Smith & Nephew Director Marketing Robotics EMA)*

Speaker: **Riddhit Mitra** *(Smith & Nephew Product Director Robotics Pittsburgh-US)*



P01 3D-PRINTING

P01.1 Use of a 3D hand-held scanner to capture trochlear groove shape, a proof of concept study
Jatin Mistry, Caroline Hing, Simon Harris *(London - United Kingdom)*

P01.2 Using additively manufactured lattices to control the release of antibiotics from a hip spacer
Sophie Louth[1], Luke Carter[1], Kenneth Nai[2], Moataz Attallah[1], Liam Grover[1], Sophie Cox[1] *([1]Birmingham - United Kingdom, [2]Wotton-under-Edge - United Kingdom)*

P01.3 Designing and 3D-printing of a custom-made drill guides for humeral intracondylar fissure repair
Sara Hassouna Elsayed[1,2], Agnieszka Fracka[1], Matthew Allen[1] *([1]Cambridge - United Kingdom, [2]Alexandria - Egypt)*

P01.4 Physeal bar resection planning with magnetic resonance imaging based 3D printing
Cemil Yildiz[1], Ahmet Metin Özsezen[1], Hatice Tuba Sanal[1], Halil Can Gemalmaz[2] *([1]Ankara - Turkey, [2]Istanbul - Turkey)*

P02 ARTHROPLASTY

P02.1 The mass knee clinic - An opportunity-cost analysis
Lily Li, Haddon Paul Lionel Ganippa, Dinesh Nathwani, Rajarshi Bhattacharya *(London - United Kingdom)*

P02.2 The use of titanium modular necks in total hip arthroplasty: a retrospective study of nine hundred twenty-eight implants with a maximum follow-up of 18 years
Corrado Ciatti[1], Serena Gattoni[2], Francesco Pisanu[1], Andrea Fabio Manunta[1], Carlo Doria[1], Pietro Maniscalco[2] *([1]Sassari - Italy, [2]Piacenza - Italy)*

P02.3 Incidence and surgical treatment of component breakage after unicompartmental and total knee arthroplasty. A single centre long-term experience of this rare but dangerous postoperative complication
Andrea Camera[1,2], Riccardo Tedino[1,2], Gabriele Cattaneo[1,2], Andrea Capuzzo[1,2], Stefano Biggi[1,2], Stefano Tornago[2] *([1]Alessandria - Italy, [2]Albenga - Italy)*

P02.4 What is the role of the acetabular evaluation and treatment in Vancouver B2 postoperative periprosthetic fractures? A standardized and reproducible surgical technique gives better outcomes and lower complication rates
Andrea Camera[1,2], Riccardo Tedino[1,2], Gabriele Cattaneo[1,2], Andrea Capuzzo[1,2], Stefano Biggi[1,2], Stefano Tornago[2] *([1]Alessandria - Italy, [2]Albenga - Italy)*

P02.5 Early bone fixation of cementless total hip arthroplasty using a triple-tapered titanium or a hydroxyapatite-coated straight stem. A matched casecontrol study
Eduardo García-Rey, Fátima Pérez-Barragans, Alba Rubia-Escribano, Laura Saldaña-Quero *(Madrid - Spain)*

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Stefano Negri, Dario Regis, Andrea Sandri, Bruno Magnan *(Verona - Italy)*

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Yoav Zvi, Zeynep Seref-Ferlengez, Mitchell Weiser, Eli Kamara *(Bronx - USA)*

P02.10 Simultaneous L5-S1 anterior lumbar interbody fusion (ALIF) and total hip arthroplasty (THA) through minimally invasive approaches in hip-spine syndrome
Ricardo Ciliberto[1], Paolo Sirtori[1], Roberto Bassani[1], Agostino Cirullo[1], Carlotta Morselli[1,2], Laura Mangiavini[1], Giuseppe Peretti[1] *([1]Milan - Italy, [2]Rome - Italy)*

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Reza Sorbi[1], Nils Rosshirt[1], Hadrian Platzer[1], Babak Moradi[2] *([1]Heidelberg - Germany, [2]Kiel - Germany)*

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Julie Manon[1], Maistriaux Louis[1], Fieve Lies[1], Magnin Delphine[2], Heller Ugo[3], Kadlub Natacha[3], Boisson Jean[3], Rougier Guillaume[3], Evrard Robin[1], Schubert Thomas[1], Lengelé Benoît[1], Behets-Wydemans Catherine[1], Cornu Olivier[1] *([1]Brussels - Belgium, [2]Louvain-la-Neuve - Belgium, [3]Paris - France)*

P03.2 Bacterial adherence evaluation of a cocrmo surface modification
Marta Martín-García, John Aguilera-Correa, Maria-Angeles Arenas, Ignacio M. García-Diego, Ana Conde, Juan-Jose de-Damborenea, Jaime Esteban *(Madrid - Spain)*

P03.3 Bacterial adherence evaluation compared between TI6AL4V and CoCrMo
Marta Martín-García, John Aguilera-Correa, Maria-Angeles Arenas, Ignacio M. García-Diego, Ana Conde, Juan-Jose de-Damborenea, Jaime Esteban *(Madrid - Spain)*

P03.4 An analysis of injectable biomaterial for delivery of notochordal cells for intervertebral disc regeneration
Rebecca Williams[1], Ronak Janani[1], Shaghayegh Basatvat[1], Chris Sammon[1], Joseph Snuggs[1], Marianna Tryfonidou[2], Christine Le Maitre[1] *([1]Sheffield - United Kingdom, [2]Utrecht - The Netherlands)*

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Marie Dubus, Loïc Scomazzon, Julie Chevrier, Julien Braux, Cédric Mauprivez, Halima Kerdjoudj *(Reims - France)*

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Theresia Stich[1], Tomáš Křenek[2], Tomáš Kovářík[2], Volker Alt[1], Denitsa Docheva[1] *([1]Regensburg - Germany, [2]Pilsen - Czech Republic)*

P03.7 How does ECM ageing impact on intervertebral disc regeneration?
Morena Francesca Fiordalisi[1], Joana Rita Ferreira[1], Marta Pinto[2], Cláudia Ribeiro-Machado[1], Mário A. Barbosa[1], Raquel M. Gonçalves[1], Joana Caldeira[1] *([1]Porto - Portugal, [2]Coimbra - Portugal)*

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Alexander Williamson[1], Jussara M. do Carmo[2], Sydney Moak[2], Alexandre A. da Silva[2], John E. Hall[2], Christine Le Maitre[1], Nicola Aberdein[1] *([1]Sheffield - United Kingdom, [2]Jackson - USA)*

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Yusuke Kubo[1], Rainer Beckmann[1], Athanassios Fragoulis[1], Claudius Conrads[1], Prathyusha Pavanram[1], Sven Nebelung[1], Michael Wolf[1], Christoph Jan Wruck[1], Thomas Pufe[1], Holger Jahr[1,2] *(1Aachen - Germany, Maastricht - The Netherlands)*

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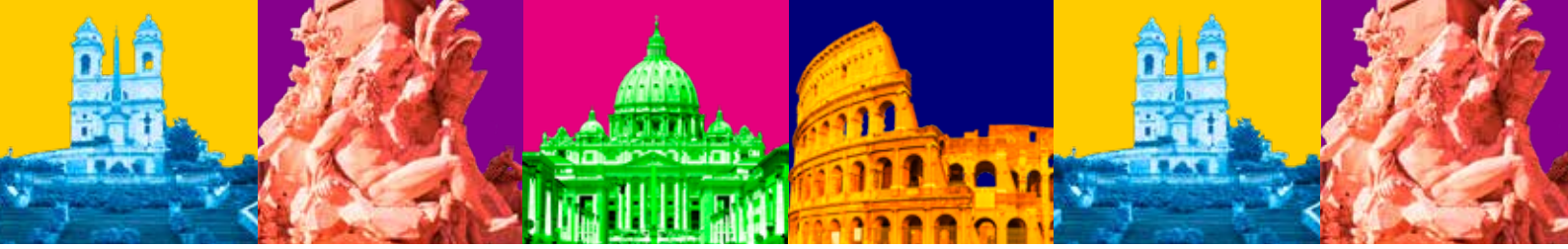

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Victoria Duke[1], Naomasa Fukase[1], Matt Huard[1], Anna Laura Nelson[1,2], Johnny Huard[1], Sealy Hambright1, Chelsea S. Bahney[1,3] *([1]Vail - USA, [2]Fort Collins - USA, [3]San Francisco - USA)*

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Giorgio Cacciola[1,2], Federico De Meo[2,3], Antongiulio Bruschetta[2], Francesco Cavaliere[2], Pietro Cavaliere[2,3] *([1]Turin - Italy, [2]Messina - Italy, [3]Reggio Calabria - Italy)*

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Paola Bermudez-Lekerika[1], Andrea Oberli[1], Karin Wuertz-Kozak[2,3], Christine Le Maitre[4], Benjamin Gantenbein[1] *([1]Bern - Switzerland, [2]Rochester - USA, [3]Munich, Germany, [4]Sheffield - United Kingdom)*

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Kaci Allache, Mohamed Amine Benzemrane *(Blida - Algeria)*

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Alexander Synek[1], Sebastian Baumbach[2], Dieter Pahr[1,3] *([1]Vienna - Austria, [2]Munich - Germany, [3]Krems - Austria)*

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Henriëtte Eijking, Pieter Emans, Tim Boymans, Kenneth Meijer, Loek Verlaan *(Maastricht - The Netherlands)*

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Lily Li, Victoria Bardsley, Andrew Grainger, Phillip Johnston *(Cambridge - United Kingdom)*

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Albert Tang, Azeem Ahmed, John Ranson, Usman Halim, Lucy Morris, Kunal Hinduja, David Murray *(Manchester - United Kingdom)*

P14.3 Should Xiapex be re-considered in the NHS? - A single-centre study on early results of treatment of Dupuytren's contracture with collagenase injection
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P14.4 Reducing ionising radiation exposure utilising risk stratification scoring in acute traumatic joint injuries to improve patient safety
Nicholas Wong *(Cambridge - United Kingdom)*

P14.5 Evaluation of the cost effectiveness of routine histopathologic femoral head analysis in hip arthroplasty
Zoe Brown *(Maywood - USA)*

P14.6 Neck of femur fractures: streamlined approach to improve consenting practices
Oliver Brown, Andrew Gaukroger, Mohsen Raza, Rhonda Sturley, Magnus Arnander *(London - United Kingdom)*

P14.7 The relation between the anatomic correction and range of motion following 3D guided radius correction osteotomy: preliminary results
Camiel Smees[1,2], Femke Schröder[1,2], Feike de Graaf[1], René Fluit[2], Anne Vochteloo[1,2] *([1]Hengelo - The Netherlands, [2]Enschede - Netherlands)*

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Liu Lijia *(NanJing - China)*

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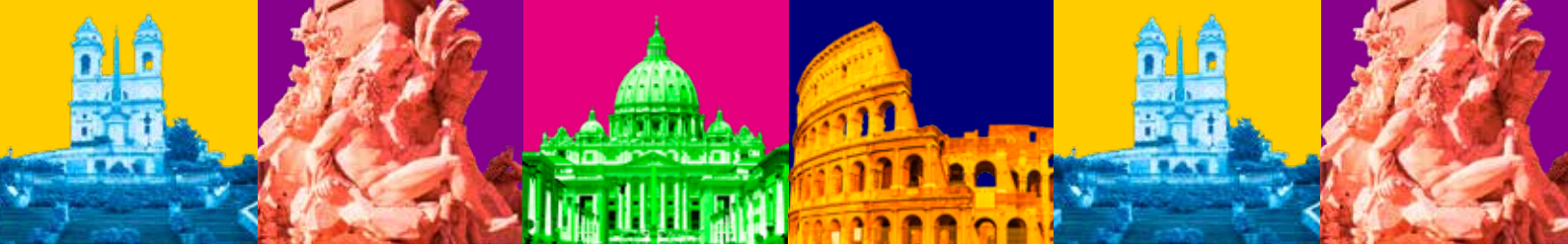
Josefine Beck Larsen[1], Helle Kvistgaard Østergaard[1,2], Theis Muncholm Thillemann[1], Thomas Falstie-Jensen[1], Lisa Reimer[1], Sidsel Noe[2], Steen Lund Jensen[3], Inger Mechlenburg[1] *([1]Aarhus N - Denmark, [2]Viborg - Denmark, [3]Aalborg - Denmark)*



P14.11 Abnormalities and syndromes associated with congenital scoliosis: a retrospective study of 223 pediatric patients
Gonzalo Mariscal[1], Jorge Nuñez Camarena[2], Teresa Galvañ[1], Carlos Barrios[1], Pedro Fernández[1] *([1]Valencia - Spain, [2]Barcelona - Spain)*

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Gonzalo Mariscal[1], Jorge Nuñez Camarena[2], Maria Desviat[1], Teresa Galvañ[1], Carlos Barrios[1], Pedro Fernández[1] *([1]Valencia - Spain, [2]Barcelona - Spain)*

P14.13 Efficacy and safety of the use of guided growth rods in the treatment of early-onset scoliosis
Gonzalo Mariscal[1], Jorge Nuñez Camarena[2], Maria Desviat[1], Teresa Galvañ[1], Carlos Barrios[1], Pedro Fernández[1] *([1]Valencia - Spain, [2]Barcelona - Spain)*

P14.14 Vertebral body tethering (VBT) for treatment of adolescent idiopathic scoliosis
Marco Crostelli, Osvaldo Mazza, Federico Tundo, Carlo Iorio, Valerio Pardi, Alessandro Inserra, Francesca Manfroni *(Rome - Italy)*

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Stefano Negri, Dario Regis, Sara Segalla, Andrea Sandri, Bruno Magnan *(Verona - Italy)*

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Rui Quintino Cardoso[1], Dinis Carmo[2] *([1]Aveiro - Portugal, [2]Porto - Portugal)*

P14.19 Minimally invasive chevron akin versus open osteotomy for hallux valgus correction
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P14.20 Five year follow-up after hip arthroscopic surgery in the Horsens-Aarhus oroacetabular impingement cohort
Signe Kierkegaard[1,2], Inger Mechlenburg[2], Ulrik Dalgas[2], Bent Lund[1] *([1]Horsens - Denmark, [2]Aarhus - Denmark)*

P14.21 Digital platform prototype for telerehabilitation of patients treated with external fixation device after complex tibia fractures
Lili Worre H. Jensen, Nina Aagaard Madsen, Søren Kold, Ole Rahbek, Birthe Dinesen *(Aalborg - Denmark)*

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Agostino Cirullo, Carlotta Morselli, Roberto Bassani *(Milan - Italy)*

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Mital Patel[1], Marshall Williams[1], Merritt Thompson[1], Parth Desai[2] *([1]Macon - USA, [2]New Orleans - USA)*

P14.24 Correction of bunionette deformity with different surgical approaches, a comparative study and 10 years review
Musab Alageel, Nicola Madeley, Rawa Alohali *(Riyadh - Saudi Arabia)*

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Musab Alageel, Rawa Alohali, Ali Alhandi, Sami Alessa *(Riyadh - Saudi Arabia)*

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Musab Alageel, Monerah Annaim, Abdulrahman Bobseit, Wazzan Aljuhani *(Riyadh - Saudi Arabia)*

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Khalid Alsaleh, Abdulrahman Aldowesh, Musab Alageel, Muteb Alqhtani, Abdulmajeed Alzakri, Osama Alrehaili, Waleed Awwad *(Riyadh - Saudi Arabia)*

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Shamunyama Mooya *(Waterford - Ireland)*

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Nachappa Sivanesan Uthraraj, Meghna Prakash *(Davanagere - India)*

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Liu Lijia *(NanJing - China)*

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Zaid Abu Al-Rub[1], Sohail Nisar[1], Thomas Padwick[2], Alison Bliss[1], Mohamed Sabouni[1] *([1]Leeds - United Kingdom, [2]Hull - United Kingdom)*

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P17.2 Do corticosteroids influence the prognosis of osteonecroses?
Kaci Allache, Mohamed Amine Benzemrane *(Blida - Algeria)*

P17.3 Use of clotted vertebral bone marrow to aid tissue regeneration following spinal surgery
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Mathieu Laurent[1], James Murison[1], Arnaud De Rousiers[1], Nicolas De l'Escalopier[1], Didier Lutomski[2], Jean-Marc Collombet[3], Marjorie Durand[3] *([1]Clamart - France, [2]Bobigny - France, [3]Brétigny-sur-Orge - France)*

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Victor Lu, James Zhang, Vikas Khanduja *(Cambridge - United Kingdom)*

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Felicia Klampfleuthner, Benedict Lotz, Wiltrud Richter, Solvig Diederichs *(Heidelberg - Germany)*

P20.2 Periosteum and bone marrow derived stem cell seeded scaffolds effect in femur fracture healing of Wistar albino rats
Cihangir Türemiş, Gizem Baysan, Selma Aydemir, Oylum Çolpankan Güneş, Aylin Ziylan, Başak Baykara, Hasan Havıtçıoğlu *(Izmir - Turkey)*

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Julie Manon, Maistriaux Louis, Fieve Lies, Magnin Delphine, Evrard Robin, Schubert Thomas, Lengelé Benoît, Behets-Wydemans Catherine, Cornu Olivier *(Brussels - Belgium)*

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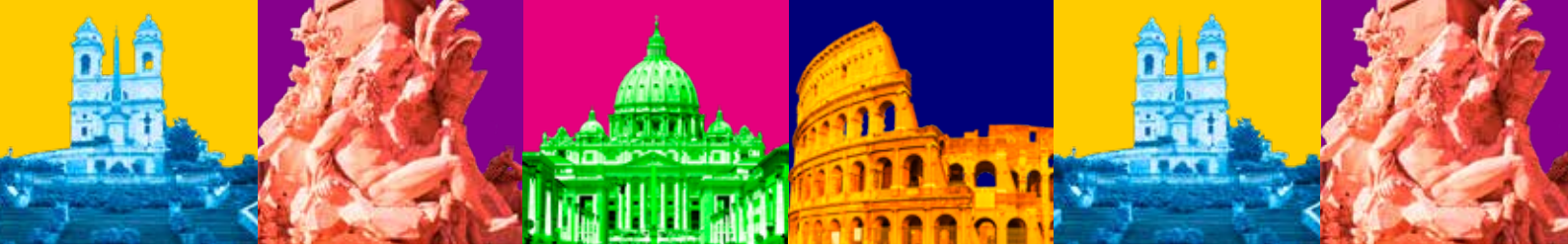
Ingrid Zahn, Tobias Braun, Clemens Leo Gögele, Julia Vogt, Gundula Schulze-Tanzil *(Nuremberg - Germany)*



P20.5 Fabrication and characterization of bioactive extract loaded bilayer scaffolds for osteochondral regeneration
Merve Perpelek, Sedef Tamburaci, Funda Tihminlioglu, Hasan Havıtçıoğlu *(Izmir - Turkey)*

P20.6 In vitro characterization of 3D-printed decellularized bone matrix based scaffolds for bone tissue engineering applications
Sara Hassouna Elsayed[1,2], Ming Yan[3], Matthew Allen[1] *([1]Cambridge - United Kingdom, [2]Alexandria - Egypt, [3]Rochester - USA)*

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Serena Danti, Giovanna Strangis, Stefano Berrettini, Francesca Forli, Gabriele Buda, Patrizia Cinelli, Andrea Lazzeri, Maurizia Seggiani, Paolo Domenico Parchi *(Pisa - Italy)*

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Yazhou Long, Katrin Bundkirchen, Sandra Noack, Christian Krettek, Claudia Neunaber *(Hannover - Germany)*

P21.2 Move initiative: mastering orthopedics in validated environments
Michael Gasik[1], Britt Wildemann[2], Manuela Gomes[3],Dimitrios Zeugolis[4], Feng-Sheng Wang[5], Fehmi Volkan Öztuna[6] *([1]Espoo - Finland; [2]Jena - Germany, [3]Braga - Portugal, [4]Galway - Ireland, [5]Kaohsiung - Taiwan, [6]Mersin - Turkey)*

P21.3 Enhancement of spinal fusion through BMP2 and L51P in an in vivo rat model
Katharina A.C. Oswald, Sebastian Bigdon, Benjamin Gantenbein, Andreas S. Croft, Julien Guerrero, Christoph Albers *(Bern - Switzerland)*

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P22.1 Injury patterns of electric scooter-related orthopedic trauma in central London: a multi-centre study
Nina Jyne Minette Dela Cruz, Catrin Morgan, Rebecca Verity Morgan, Sameera Tanna, Cyrus Talwar, Rupen Dattani, Khaled M. Sarraf, Charles Gibbons *(London - United Kingdom)*

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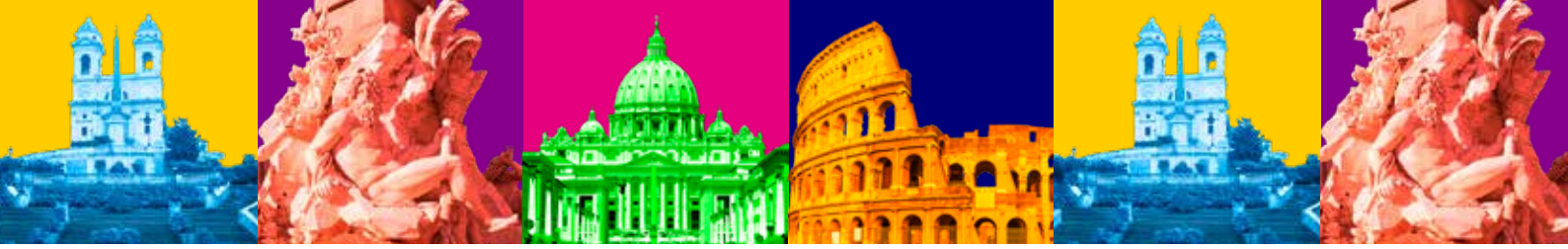

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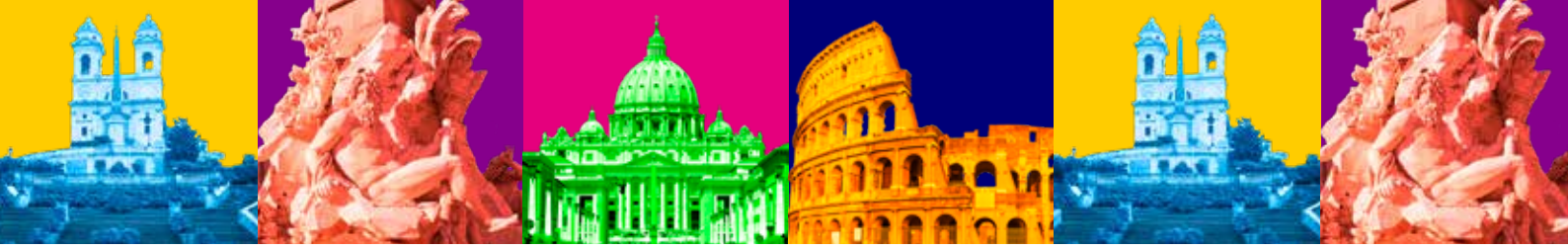

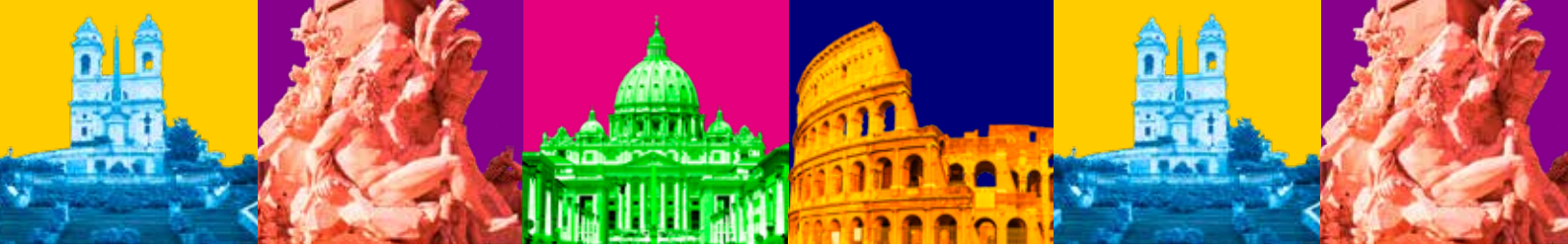

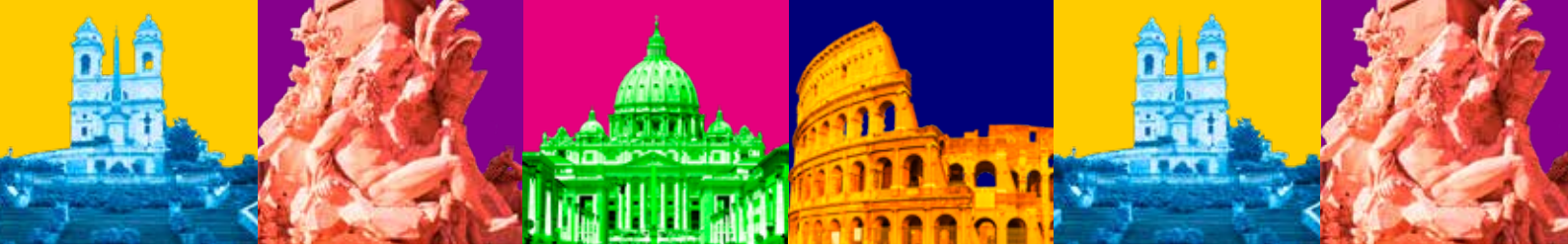


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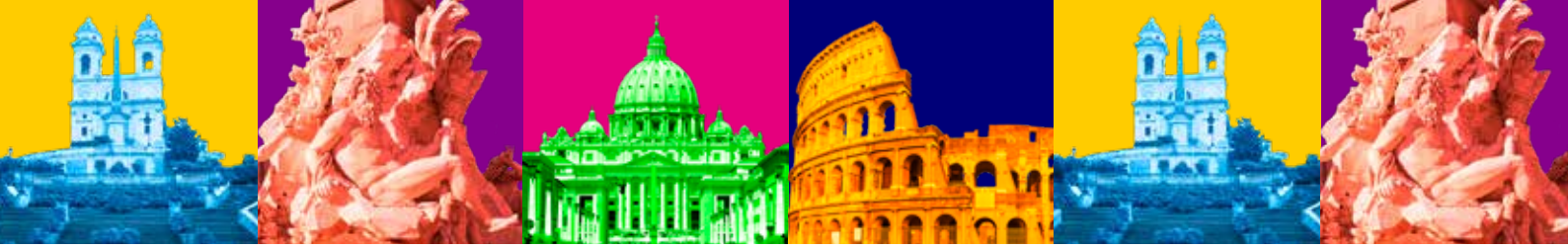


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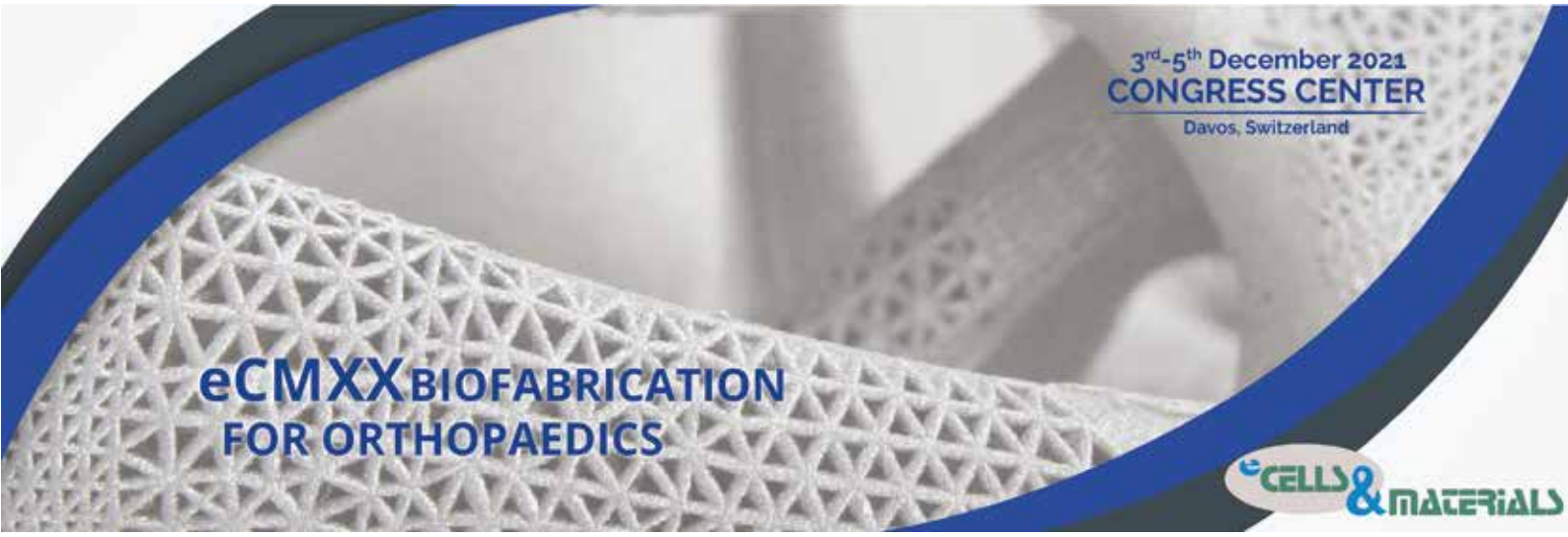

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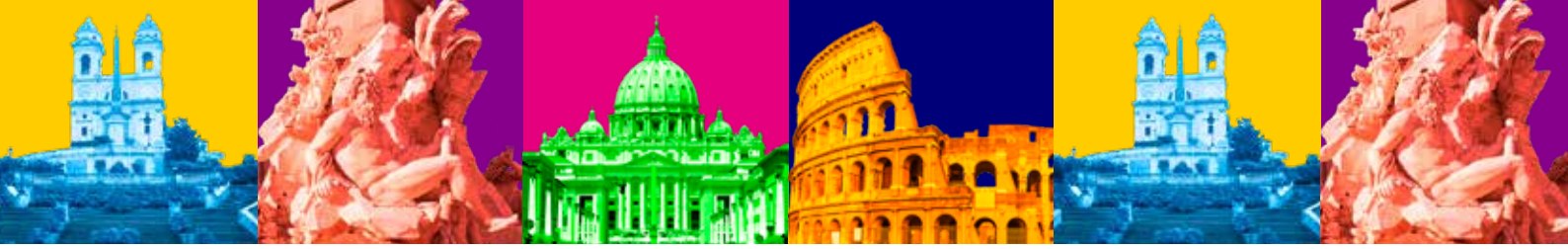

Dear EORS 2021 participants,

We are pleased to inform you that we have negotiated a Special Issue associated with EORS 2021 with Biomaterials and Biosystems, the newest title in Elsevier's biomaterials science portfolio.

Biomaterials and Biosystems accepts the following article types:
- Research Communication: maximum of 5 display items (figures and tables; additional figures and tables can be provided as supplementary information)
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- Progress Report: maximum of 4 display items (figures and tables), maximum of 6,000 words, critical view / perspective of the subject in hand of the last 10 years
- Review: maximum of 8 display items (figures and tables), maximum of 12,000 words, comprehensive literature review of the subject in hand.

The theme of the Special Issue is 'EORS 2021 - Advanced Biomaterials and Cellular Systems in Orthopaedics'. Clinical, commercialisation and educational in nature papers will also be considered.

Please note that all papers will go through the normal peer-review process. Please also note that open access publications charges have been waived.

To submit your manuscript, under select article type, please select VSI: EORS 2021. The deadline for manuscript submission is November 30th, 2021.

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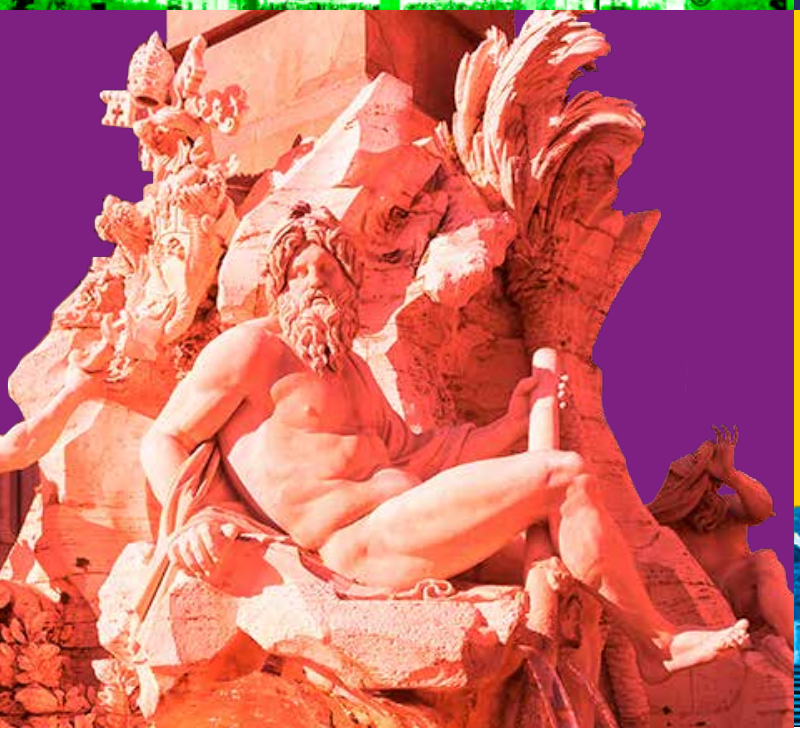

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