Biennial Meeting



Introduction from Dr. Hamish Simpson

Dear ISFR Community,

I look forward to continuing the society's strong leadership under the tenure of Dr. Chelsea Bahney and thank her for all her impactful contributions to the ISFR.

I wanted to take this opportunity to thank the many of you who joined the annual ORS ISFR Scientific Meeting during the ORS 2023 Annual Meeting in Dallas, TX. This year, the ISFR Plenary Session centered on the *"Mechanobiology of Fracture Healing"* with special emphasis on the basic, translational, and clinical perspectives. I hope that you enjoyed the scientific talks and networking. I was glad to connect with so many of you at our ISFR Scientific Meeting and our dedicated reception afterwards.

An important part of <u>ISFR</u> is also supporting and celebrating ORS members who are dedicated to our mission *to advance the science of bone biology, bone regeneration, fracture healing/repair, and trauma leading to improved patient care.* For the annual Research Section Scientific Meeting we were excited to award 10 Travel Awards to student and post-graduate trainee section members with the highest scoring abstracts. There were also 8 podium and 9 poster award finalists. We celebrated four emerging ISFR leaders, who were awardees from the 2022 ISFR Biennial Meeting (Verena Fischer), 3MT competition (Torie Duke), ISFR Diversity Award (Nafisa Elghazali) and Collaborative Exchange Award Winner (Benjamin Osipov). I would also like to congratulate our lifetime achievement awardee, Dr. Matthias Bostrom. Additional award opportunities will be available throughout the coming year for the 3MT Research Pitch, Collaborative Exchange, and Scientific Section Meeting. Award announcements will be available through the *Breakthroughs* newsletter, the @isfrfractures Twitter account, and posted online.

As we look forward to the upcoming year, I invite all our existing and potential members to connect with society news and events online via the @isfrfractures account, ISFR website, and by following ISFR communications committee members online. We also have a wide range of upcoming programming including the 3MT competition on the 21st June, our cross-over event during Orthopedic Trauma Association Annual Meeting in October 2023,

and the Biennial Meeting in 2024 in Montreal, Canada. From new members to those in leadership roles, I am excited to grow the impact of the ISFR as the premier source for fracture-related research and look forward to hearing your ideas on how we can achieve this. Please connect with our leadership and other members through @isfrfractures and through other key handles and hashtags such as @ORSsociety#fracturefriday #bonehealing #ORSNation #boneregeneration.

Sincerely,

Hamish Simpson ISFR Section Chair MA(CANTAB), BM, BCH(OXON), FRCS, DM(OXON), University of Edinburgh





Highlights of the ISFR Section at ORS 2023

The ISFR section and annual meeting "ISFR Plenary Session: Mechanobiology of Fracture Healing" on Friday February 10, 2023 featured invited talks by Joel Boerckel (UPenn), Martin Stoddart (AO Davos), Lukas Engelhardt (OSORA) moderated by Drs. Katherien Hixon and Melanie Haffner-Luntzer. Spotlight talks were broken up into 3 distinct sections/topic areas including the basic science/engineering perspective, translational perspective, and clinical perspective which are summarized next.

The Basic Perspective

Dr. Joel Boerckel, at the University of Pennsylvania, talked about a longstanding question in the hypoxia field related to fracture repair using fundamental biological principles. Despite the lack of methods available for intracellular hypoxia measurement, Dr. Annemarie Lang (Postdoctoral Researcher) in Dr. Boerckel's lab used a technique that exploits the chemistry and biology of nitroimidazoles for precise quantification of intracellular hypoxia. They analyzed intracellular hypoxia levels in the bone marrow and early fracture callus. These measurements challenged the conventional assumption of elevated hypoxia in the fracture gap and revealed that the fracture gap is, contrary to the prior belief, not as hypoxic compared to intact bone! This discovery, which not only involved the development of a robust hypoxia measurement technique but also questioned a long-standing assumption, carries important implications for the field of fracture repair. Check out <u>ORS basic science tips</u> and <u>Boerckel Lab</u> for more details about this exciting work!

The Translational Perspective

Martin Stoddart, PhD, AO Research Institute, Davos shared his view on the engineering aspects of fracture healing mechanobiology–from the perspective of a cell biologist. Unidirectional cyclic loading of a wedge osteotomy leads to endochondral ossification with visible callus on the compression side and non-union on the tension side. 3D-cell culture model indicates shear-mediated activation of TGF-beta is the key to chondrocyte differentiation in a construct that models the relatively compliant fracture hematoma and early callus. Biology and mechanics working together! Read more about <u>Dr. Stoddart</u>, <u>AO Foundation</u> here.

Lukas Engelhardt, PhD, CEO OSORA – Presented OSORA's vision of using medically and biomechanically informed 3D digital twins of individuals' fractured bones to simulate the course of healing and thereby inform surgical planning and clinical decision making. Thus far the platform has been "trained" on a set of relatively healthy fracture patients with good prediction vs. outcomes. OSORA is looking to the community to help expand the training set, especially in fracture patients with potential comorbidities known to influence healing. This medical fracture analytics platform also has high educational potential and is detailed at <u>ORSORA's</u> website.

The Clinical Perspective

Will Lack, MD, University of Washington, specializes in orthopaedic trauma arthroplasty care. He has a specific research interest and <u>program in mechanobiology</u> related to fracture motion and healing. He presented on a collaboration with the UW CoRE laboratory and VA Puget Sound Center for Limb Loss and MoBility (CLiMB) laboratory in the development of novel, noninvasive methods of measuring fracture site motion in patients after surgery. These methods include X-rays taken from two views simultaneously while the patient walks as well as complex computer modeling that incorporates patient-specific factors including bone quality, weight, fracture geometry, and the method used to fix the fracture. The goal is to improve our understanding of how the fractured parts of a bone move relative to each other and how this in turn affects healing. Ultimately this will help surgeons determine fracture fixation methods/constructs and guide postoperative rehabilitation in a way that will maximize the chances that the bone will successfully heal.

Emerging Research Leaders in ISFR

Following a brief business meeting, the program then shifted to presentations celebrating our four emerging ISFR leaders, who were awardees from the 2022 ISFR Biennial Meeting (Verena Fischer), 3MT competition (Torie Duke), ISFR Diversity Award (Nafisa Elghazali) and Collaborative Exchange Award Winner (Benjamin Osipov). We also celebrated our lifetime awardee Dr. Matthias Bostrom. Congrats to all!

ISFR Biennial Meeting Podium Award Winner

- Verena Fischer, PhD. Post-Doctoral Fellow, Universitätsklinikum Ulm
- ISFR Travel Award Winner
 - Benjamin Osipov, PhD. Post-Doctoral Fellow, University of California Davis
- ISFR 3 Minute Research Pitch Winner
 - Torie Duke. PhD Candidate, Oregon Health Science University (OHSU)
- ISFR Diversity Award Winner
 - Nafisa Elghazali. PhD Candidate, University of California San Francisco

ORS Lifetime Achievement Award

• Mathias Bostrom, MD. Hospital for Special Surgery

ISFR Abstract Finalists at ORS 2023 Annual Meeting

Podium

- Evan Buettmann, PhD Virginia Commonwealth University
- Marc Phillipon, Jr., BA Steadman-Phillipon Research Insitute
- Alessandra Esposito, PhD University of Chicago
- Feini Qu, VMD, PhD Washington University in St. Louis
- Joanna Sadowska, PhD Royal College of Surgeons in Ireland
- Jiatong Liu, MS University of Rochester Medical Center
- Sanja Novak, PhD University of Connecticut Health Center
- Yingfang Fan, MD, PhD Massachusetts General Hospital

Poster

- Hannah Dailey, PhD Lehigh University
- Sharon Shaw, BS University of Michigan
- Joseph Collins, BS University of Pennsylvania
- Verena Fischer, PhD Universitätsklinikum Ulm
- Reyad Elbarbary, PhD The Pennsylvania State University
- Augustine Saiz, MD UC Davis Health
- Kyle Maas, BS University of Michigan
- Annemarie Lang, DVM, PhD University of Pennsylvania



ISFR Member Awardees at ORS 2023 Annual Meeting

- Fellow Inductees
 - Matthew Silva, PhD Washington University in St. Louis
- NIRA Awardees
 - Joseph Roberts, PhD Emory University
 - Nicole Gould, PhD Washington University in St. Louis
 - Joanna Sadowska, PhD Royal college of Surgeons in Ireland
- Early Career Outreach Awardees
 - Chris Panebianco, PhD University of Pennsylvania
 - Rodolfo de la Vega, MD Mayo Clinic



ISFR Members Become ORS Fellows and NIRA Awardees

Implementing the 3Rs in Fracture Healing Research: In Vitro, In Silico, and Refined In Vivo Models

This special ISFR section workshop organized by Drs. Katherine Hixon and Melanie Haffner-Luntzer featured 3 invited talks from Drs. Oreffo, Dailey, and Lang that introduced new model considerations that should be implemented in fracture healing research to improve laboratory animal welfare and scientific outcomes. The following workshop, which received positive comments in the annual meeting survey, is summarized below.

This Ex Vivo Chorioallantoic Membrane Assay and the Ex Vivo Organotypic Culture for Bone Regeneration Richard Oreffo, DPhil DSc University of Southampton

Dr. Oreffo discussed the use of the Embryonic Chick as a Model System to test bone fracture healing inventions as shown in <u>Kanczler et al. Tiss Eng 2012</u>. This novel system allows one to

test 20-30 formulations of scaffold (Responsive to VEGFA, Vitamin D3, TGFB, and Parathyroid Hormone) before selecting 1-2 for implantation in mouse and 1 for large animal development thereby greatly refining and reducing experimentation on more sentient animal species. Check out more of Dr. Oreffo's work <u>here</u>.

In Silico Models for Outcome Assessment in Bone Healing Research Hannah Dailey, PhD Lehigh University

Dr. Dailey discussed mechanical virtual material models as a way to help enrich fracture healing findings that other traditional radiographic measures may miss or improperly diagnose healing problems. The need for virtual mechanical testing (VMT) stems from the fact that current radiographic assessment of fracture healing is subjective, hard to quantify, and doesn't usually correlate with mechanical strength of union. In contrast, VMT using microCT imaging and finite element modeling has been successfully utilized in preclinical studies. Did we mention this technique is statistically robust, objective, lowers experimental costs, and reduces animal numbers. Check out more of the Dailey Lab's work here, in the selected articles section and on twitter @DaileyOrthoLab.

Refining Animal Experiments: Pain Assessment and Management in Mouse Femoral Fracture Models Annemarie Lang, DVM, PhD University of Pennsylvania

Dr. Lang discussed how we can refine classic measures of pain and nociception and good practices for fracture work moving forward. Pain Assessment is currently measured by various clinical parameters (food uptake, BW), behavioral parameters (nest building performance, MGS, activity, grimace score, grooming), and model-specific parameters (limping, CatWalk, Weight-bearing). However, evidenced based pain management is rare in preclinical models of fracture repair. Dr. Lang suggested that all these approaches be included in fracture healing studies with additional considerations such as taking baseline measurements in the naïve state before surgery, rodent tunnel handling versus tail handling, and positive enrichment in cages for thermoregulation (treats, nestlets, huts, etc). Check out more of the <u>Annemarie's work at ORS</u> detailing how Buprenorphine SR Lab, a common analgesic, is needed during fracture healing studies using intramedullary pin fixation to ensure adequate post-surgical analgesia. However Buprenorphrine SR Lab's usage may also induce an adaptive immune reaction when repeatedly injected. This underscore how modelspecific studies on pain management are crucial to provide evidence-based analgesia protocols to enhance animal wellbeing, data reproducibility, and translation. Follow Dr. Lang in the **Boerckel** Lab and on twitter @AmiLang_Science.



Get to Know The ISFR Communications Committee

2023-2024 Members

Our goal is to use online communications to increase international awareness of ORS ISFR and the importance of research in our field and to highlight our members. Be sure to follow us on social media and the @isfrfractures account for the latest up to date information about the section!



Evan Buettmann, PhD



Augustine M. Saiz, MD



Nicole Gould, PhD



Andrea Alford, PhD



Madhura Nijsure



Rodolfo E. de la Vega, MD

Meet the Committee

Upcoming Events and Awards

ISFR 3 Minute Pitch Competition

Back by popular demand! Join us for the virtual ORS ISFR 2023 Research Pitch Competition that will be held Wednesday, June 21st, 2023 at 12-2 PM (CENTRAL) LIVE via Zoom! <u>Submit your graphical abstract by May 31st, 2023 to join the competition here</u>. Not sure how to get started, check out these great examples from previous ISFR competition winners!



racture Repai

progenitor cell

Does VEGFA affect Osx cell proliferation

See more at my talk on March 13th (Paper #313)

Jeffrey Nielsen – 2018 Competition



Selected finalists will be notified on **June 7th**. Each finalist will have three minutes to present their work using one slide about <u>what they are working on and why it is important</u> to the field of research of bone regeneration, fracture repair, trauma or related. Following each three-minute presentation, two minutes are allowed for one question from the audience or judges. Selected participants will be expected to present the summation of body of work from their graduate or post-graduate training completed over multiple years, not necessarily an individual project.

Did we mention that the winner gets to be featured by ISFR Communication Committee and win up to \$500 in prizes.

To register and find out more about guidelines and eligibility check out the following link:



Save the Date:



eCM Conference in Davos, Switzerland July 10-12, 2023

Special focus on translational fracture healing research from bench to bedside

Vaida Glatt (UT Health San Antonio, USA)

• Engineered fracture hematoma: current status and future clinical implications

Louis Cheung (The Chinese University of Hong Kong)

• External biomechanical stimulation as an approach to stimulate fracture healing

Enrique Barrena (Universidad Autonoma de Madrid, Spain)

• Clinical trials on expanded MSCs for bone regeneration

ISFR Crossover Event During the Orthopaedic Trauma Association (OTA) Meeting in Seattle, Washington October 18th-21st



ISFR Interdisciplinary Exchange Grant (Information Coming Soon!)

Win up to \$5,000 for travel to visit a research lab for the purpose of collaboration and knowledge exchange in the areas of <u>fracture repair and/or bone regeneration research</u>. Check out more at last summer's <u>isfr-exchange-grant application</u>.

ISFR Selected Publications From This Quarter

Read ISFR Publications

Section Member Journal Article Review



Segmental defect healing in the presence or absence of recombinant human BMP2: Novel insights from a rat model

Joseph A. Panos, Michael J. Coenen, Christopher V. Nagelli, Erin B. McGlinch, Aysegul Atasoy-Zeybek, Consuelo Lopez De Padilla, Rodolfo E. De la Vega, Christopher H. Evans (Journal of Orthopaedic Research, February 27, 2023)

Read Full Review

ORS Career Center

Check out the latest opportunities via the ORS Career Center related to the ISFR:

Faculty Position in Equine Sports Medicine and Surgery

Cummings School of Veterinary Medicine at Tufts University North Grafton, Massachusetts

Research Technician

Indiana University Purdue University Indianapolis (IUPUI) Indianapolis, Indiana,

Non-Operative Pediatric Orthopedics Fellowship

Children's Hospital Los Angeles - Jackie and Gene Autry Orthopaedic Center Los Angeles, California

Heersink School of Medicine - Assistant Professor - Orthopaedic Surgery (Pediatrics)

University of Alabama, Birmingham Birmingham, Alabama

Nurse Practitioner, Outpatient Orthopaedics

Cincinnati Children's Hospital Medical Center Cincinnati, Ohio NEW!NEW!

<u>Teaching Associate (Advanced Practice Provider) - UWMC-NW Campus - Orthopedics &</u> <u>Sports Medicine</u> University of Washington Seattle, Washington

Orthopaedic Foot & Ankle Surgeon at Top Ranked Healthcare System in Indiana

Indiana University Health Avon, Indiana

Orthopaedic Surgeon at IU Health West Hospital

Indiana University Health Avon, Indiana

Visit the ORS Career Center for more opportunities and upload your resume/CV.

ORS ISFR New Members

Alex Herzberg MD, MEng Ali Aldiery MD, Certificate of Specialization Amritha Anup BA Ariana Shaari Julia Mehl Kyle Maas BS Lucas Minas BS Maryam Rahmati PhD McKinley Van Klei Patricia McNamara MD William Lu PhD



- Do you have a student, post-graduate trainee, or colleague who is working in fracture repair or bone regeneration and is not a member of ORS ISFR yet?
- Be sure to share this newsletter and tell them about the many <u>benefits</u> of ORS ISFR membership. Our members have exclusive opportunities to compete for Section Member-only awards, get their work featured in our Newsletter, and participate in our many scientific and social events throughout the year at discounted rates. Not an ORS Member? Join the ORS today!

Highlight Your Work with ISFR Communications Committee

- Did you know Associate ISFR Members can request fracture topics, member interviews, and news/announcements to be covered in next ISFR newsletter and via the @isfrfractures Twitter account
- Do you or a colleague have recent achievements you would like highlighted in this newsletter? We want to hear from you! Fill out <u>this</u> form to share your ideas.

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