2024 OSTEOST SCIENCE FOUNDATION
BONE SYMPOSIUM
February 15-17
Silverado Resort, Napa Valley, CA

A Multidisciplinary Approach to Contemporary Bone Science
Supporting Regenerative Methods of Alveolar Ridge Reconstruction

www.osteoscience.org
Dear Friends and Colleagues,

Many of you have attended previous Osteo Science Foundation Symposia, which focused on solutions and techniques in regenerative medicine and surgery. The Foundation is now adding a second, distinctive series that we plan to alternate with the previous format: a focused Bone Symposium. We have developed a multidisciplinary faculty from basic and clinical sciences who will review contemporary concepts of bone anatomy, physiology, and development as it applies to bone healing and regeneration. All aspects of the tissue engineering triad will be addressed including contemporary and future treatments using cells, cytokines and constructs. We have also added lectures on what we term the fourth dimension of bone regeneration: medical optimization of the surgical patient.

The inaugural Bone Symposium will be held February 15-17, 2024, in Napa, California, at the Silverado Resort and Conference Center.

On behalf of the Board of Directors of Osteo Science Foundation, we are very pleased to invite you to join us for this three-day educational symposium where you will meet, hear, and interact with experts in bone science. The presentations will feature a variety of aspects of bone, all of which are relevant to our OMS practice. But what makes this symposium truly unique is the integration of clinical cases, carefully selected and presented by our OMS colleagues to highlight exactly the issues and challenges that will be presented during the lectures.

We look forward to an entire day of clinical cases and an active panel discussion during which all speakers will participate. Our OMS colleagues will also join in the panel discussion, sharing how they personally would treat patients. Expect to hear multiple opinions on a single case and be prepared to contribute to the conversation!

As you know, advancing regenerative medicine in hard and soft tissues is the mission of Osteo Science Foundation. This truly unique meeting has the potential to challenge currently held ideas about bone, push the boundaries of what is currently accepted and understood as optimal patient care, and ultimately leave participants with a genuine desire to advance the field of bone science as we know it.

The theme of our Welcome Reception is “A Taste of Napa,” and we are sure you will agree that the region has much to offer in terms of taste!

Register online at www.osteoscience.org. And of course, if you have any questions or need further information, don’t hesitate to reach out. We hope to see you in Napa!

Sincerely,

Paul Tiwana, DDS, MD, FACS
Chair, Osteo Science Foundation Board of Directors

Daniel B. Spagnoli, DDS, PhD
Conference Chair
Director, Osteo Science Foundation Board
Join us for a taste of Napa

Napa Valley may be small in size but it packs a punch with over 400 wineries and tasting rooms to explore and an impressive collection of arts and culinary hotspots sure to tantalize even the most discerning foodies’ taste buds.

Osteo Science Foundation warmly invites you to a memorable and delicious “market-style sampling” of the region’s local treasures - including great wine and exquisite food all under one roof and combined with some of the finest views in Northern California.

Ballroom at the Silverado
Thursday, February 15, 2024
6 - 8 PM
Thursday, February 15, 2024

7:15 – 8:00 AM  Registration and Breakfast with Exhibitors

8:00 – 8:10 AM  Introduction and Welcome: Paul Tiwana, DDS MD, FACS
Chair Science Foundation Board of Directors

Clinical Section 1:

8:10 – 8:45 AM  Daniel Spagnoli, DDS, PhD
• Introduction of Clinical Cases
• Regenerative Approach to Treatment of Typical and Difficult Alveolar Ridge Defects

Didactic Section I:

8:45 – 9:45 AM  Lynda Bonewald, PhD
• The Role of the Osteocyte in Mechanotransduction

9:45 – 10:45 AM  Vicki Rosen, PhD
• Studying Skeletal Development to Enhance Bone Repair

10:45 – 11:05 AM  Emily Moore, PhD
• The Role of Periosteal Cell Mechanotransduction in Load-Induced Bone Formation

11:05 – 11:30 AM  Break with Exhibitors

Didactic Session II:

11:30 AM – 12:30 PM  George Muschler, MD
• Stem Cell Science: Asking Questions, Solving Problems, Creating Opportunities

12:30 – 1:15 PM  Lunch and Learn generously sponsored by MTF Biologics

1:15 – 2:15 PM  Robert Guldberg, MS, PhD
• The Intersection of Immune Biology, Mechanobiology, and Bone Regeneration

2:15 – 2:35 PM  Genny Romanowicz, DDS, PhD
• Advancing Tissue Engineering Therapies via Testing in a Clinically Relevant Craniofacial Defect Model

2:35 – 2:55 PM  Simon Young, DDS, MD, PhD, FACS
• Developing a Challenging Preclinical Model of Compromised Wound Healing

2:55 – 3:15 PM  Venu Varanasi, PhD, and Lukasz Witek, MSci, PhD
• Novel Approaches for Bone Grafting the Compromised Wound Healing Environment

3:15 PM  Conclude Session for Thursday

6:00 – 8:00 PM  Welcome Reception: “A Taste of Napa”
Friday, February 16, 2024

7:15 – 8:00 AM  Breakfast with Exhibitors

8:00 – 9:00 AM  John Fisher, PhD
• 3D Printing Strategies for Bone Engineering

9:00 – 10:00 AM  Antonios Mikos, Dipl. Eng., PhD
• Biomaterials for Biomolecule and Cell Delivery in Tissue Engineering Applications

10:00 – 10:30 AM  Break with Exhibitors

10:30 – 11:30 AM  Lynda Bonewald, PhD
• Muscle and Bone: Partners for Life

11:30 – 12:30 AM  Robert Marx, DDS
• Oral and Maxillofacial Surgery Bone Grafting: Past, Present and Future

12:30 – 1:30 PM  Lunch / Break with Exhibitors

1:30 – 2:30 PM  Steven Cummings, MD
• Common Drug Treatments for Osteoporosis

2:30 – 3:30 PM  Tara Aghaloo, DDS, MD, PhD
• Medical Optimization of the Oral and Maxillofacial Surgery Patient: A Surgeon’s Perspective

3:30 PM  End of Session... Enjoy Napa!

Saturday, February 17, 2024

7:15 – 8:00 AM  Breakfast with Exhibitors

8:00 – 10:00 AM  Daniel Spagnoli, DDS, PhD, and Alan Herford, DDS, MD
Clinical Case Presentations

10:00 – 10:30 AM  Break with Exhibitors

10:30 – 11:15 AM  Discussion with all Program Presenters and OMS Panelists to Focus on Clinical Implications

11:15 – 11:45 AM  Daniel Spagnoli, DDS, PhD
Research Ideas and Future Directions
**FEATURED SPEAKERS**

**Tara Aghaloo, DDS, MD, PhD**

Dr. Tara Aghaloo is Professor in Oral and Maxillofacial Surgery at UCLA. She completed her DDS at UMKC, and OMFS residency, MD, and PhD at UCLA. She is a diplomate of the American Board of Oral and Maxillofacial Surgery, and her clinical practice focuses on bone and soft tissue regeneration, and dental implant surgery. She is a board member of the Osteo Science Foundation, Past President of the AO, and Associate Editor of the JOMS.

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**PRESENTATION SYNOPSIS**

**Medical Optimization of the Oral and Maxillofacial Surgery Patient: A Surgeon’s Perspective**

Although surgeons train to become technical experts who manage intraoperative and postoperative challenges, our patients are becoming significantly more complex. Whether we perform elective surgery on patients at extremes of age or patients present with more chronic diseases than we can count, we must be able to deliver predictable outcomes and surgical success. But, how do we get there? Gone are the days of only operating on young, healthy patients. Now, as oral and maxillofacial surgeons (OMSs), our patients often have several medical providers, take a plethora of prescription and herbal supplements (not to mention an occasional illicit substance), and fail to maintain a healthy diet and fitness regimen. Favorable surgical outcomes depend greatly on an optimized patient who can handle anesthetic medications, quickly resume normal daily activities, heal hard and soft tissues without undue sequelae, and take in adequate nutrition. Post-surgical recovery is clearly coupled with maximized systemic health, where patients may need a preoperative “tune-up”. This presentation will identify important risk factors, state-of-the-art diagnostics, and the latest regenerative strategies to help practicing OMSs optimize our aged, osteoporotic, and compromised patients before surgical intervention.

**Learning Objectives**

- This presentation will discuss medically compromised patients and risk factors associated with poor surgical outcomes
- This presentation will discuss optimizing aged and compromised patients prior to surgical intervention
- This presentation will familiarize the participant with growth factors and cellular therapies to enhance hard and soft regeneration
Lynda Bonewald, PhD

Dr. Bonewald is the Founding Director of the Indiana Center for Musculoskeletal Health, ICMH, with over 100 members from 27 schools and four campuses. She received her PhD in Immunology/Microbiology from the Medical University of South Carolina, was promoted from Assistant to Full Professor at the University of Texas Health Science Center at San Antonio, and served as director of the Bone Biology Research Program and as Vice Chancellor for Research at the University of Missouri-Kansas City. She is a Past-President of the American Society for Bone and Mineral Research and the Association of Biomolecular Resource Facilities. She has served as Chair of the Board of Scientific Councilors for the NIH NIDCR and served on Council for NIH NIAMS. She received the IADR “Basic Research in Biological Mineralization Award,” the Sun Valley “RIB Award,” and the prestigious ASBMR William F. Neuman award and is a UM Curators Professor Emeritas, an IU Distinguished Professor, and an AAAS Fellow. She has been continually funded by NIH for over 30 years and is best known for her work in the study of osteocytes. She is responsible for tools used by researchers globally to determine osteocyte biology and function, and is currently studying bone and muscle crosstalk with aging.

PRESENTATION SYNOPSIS

1. The Role of the Osteocyte in Mechano-transduction

The osteocyte is a mechanosensory, multifunctional cell regulating calcium and phosphate mineral homeostasis and regulating osteoblast and osteoclast function. Where as mechanosensation and mechanotransduction does not appear to affect the osteocyte’s ability to regulate mineral metabolism, it does play a critical role in the expression of factors that target osteoblasts and osteoclasts. For example, mechanical loading stimulates the production of factors such as PGE2 and Wnts that have positive effects on osteoblastic bone formation. Conversely, unloading results in an increase in molecules such as sclerostin which inhibits bone formation, and RANKL that promotes osteoclastic bone resorption. Osteocytes form a highly connected intricate network within the bone matrix that can communicate with cells on the bone surface through their dendritic processes, extracellular vesicles, and soluble factors. Loading of bone is transmitted though the bone fluid which applies fluid flow shear stress to the cell body and dendrites, but the dendrites have the greatest sensitivity. Osteocytes can live for decades in the bone matrix; however, with age, the osteocyte become susceptible to several states, thought to negatively affect the capacity of the cell to sense mechanical load. Aged cells are exposed to increased reactive oxygen species making the cell more susceptible to apoptosis while at the same time some cells become senescent. A portion of the cells develop a hypermineralized perilacunar matrix, and a portion die resulting in empty lacunae that fill in with mineral, called microbritosis, but the majority develop a senescence-associated secretory phenotype, SASP. This results in a highly compromised osteocyte lacunocanalicular network with fewer cells, fewer dendrites per cell, and less connectivity. This reduced connectivity may be responsible for the loss of bone response to loading. In contrast to the young animal where loading induces
new bone formation, in the aged skeleton, there is either little or no response to exercise. Exercise can delay the negative effects of aging and we have found that contracted muscle secreted factors can synergize with suboptimal loading of bone to promote new bone formation. Understanding osteocyte mechanosensation and transduction provides key insights into the beneficial effects of exercise.

**Learning Objectives**

- Osteocytes are the key mechanosensory cells in the skeleton
- Mechanically loaded osteocytes produce factors that promote bone formation, whereas unloading induces osteocytes to make factors that promote bone resorption
- Aging compromises the osteocyte and its network making the skeleton less responsive to loading

2. **Muscle and Bone: Partners for Life**

Originally, it was assumed that only a mechanical interaction existed between bone and muscle where the muscle pulled on the bone to allow movement. Now we know that each organ secretes factors, myokines and osteokines, that have effects on the opposing tissue. Bone and muscle are tightly intertwined throughout life, from development through aging. Genetic disease with mutations in muscle can have effects on bone and vice versa. With trauma, muscle accelerates bone healing. With aging, frequently osteoporosis and sarcopenia occur simultaneously. Loaded bone produces factors that have positive effects on muscle generation and function such as prostaglandin E2, and Wnts, while resorbing bone produces factors such as Receptor activator of nuclear factor kappa-ligand, RANKL, and Transforming Growth factor beta that have negative effects on muscle. Conversely, static, resting muscle produces factors such as myostatin, which has not only negative autocrine effects but also has negative effects on bone. Contracted or exercised muscle produces factors such as irisin and beta-aminoisobutyric acid, BAIBA, which have positive effects on bone but through very different receptors and signaling mechanisms. The combination of these biochemical signals with mechanical loading can synergize to increase bone or muscle mass. This synergy emphasizes the importance of exercise where not only is muscle contracted but, in addition, bone is loaded to maintain a healthy musculoskeletal system and whole body health.

**Learning Objectives**

- Though both muscle and bone are mechanical organs, they also produce factors that have effects on the opposing organ
- Contraction of muscle and loading of bone induces anabolic factors, whereas static muscle and unloaded bone produce catabolic factors
- Muscle factors interact with suboptimal loading to induce bone formation
Dr. Steven Cummings is a Senior scientist of California Pacific Medical Center Research Institute; Emeritus Professor of Medicine & Epidemiology, UCSF. Led pivotal trials of alendronate, denosumab, and zoledronate for osteoporosis. He has received awards from all major osteoporosis societies for his research on prevention of fractures. He was elected to the National Academy of Medicine.

**PRESENTATION SYNOPSIS**

**Common Drug Treatments for Osteoporosis**

The most commonly used initial treatments for prevention of fracture, alendronate (a bisphosphonate) and denosumab, inhibit bone resorption. Bisphosphonates bind to the surface of bone and their effects gradually wane after discontinuation. Denosumab is a more potent antiresorptive that inhibits the development and action of bone resorbing osteoclasts. Bone resorption rebounds with bone loss and increased risk of vertebral fracture when it is discontinued after \( \geq 3 \) years. Alendronate and denosumab reduce the risk of all types of fractures. Bone forming drugs, such as romosozumab, are more effective and are warranted in patients at very high risk by a bone density (BMD) T-score < -3 or a recent fracture. Romosozumab is given for 12 months and must be followed by treatment with an anti-resorptive to maintain the BMD.

**Learning Objectives**

- Understand: 1) comparative efficacy of these 3 common drugs for osteoporosis, 2) the adverse effects of those treatments, and 3) the different consequences of stopping treatments

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**PRESENTATION SYNOPSIS continued**

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  - Muscle factors interact with suboptimal loading to induce bone formation
John Fisher, PhD

Dr. John P. Fisher is the MPower Professor, Distinguished Scholar Teacher, Fischell Family Distinguished Professor, and Department Chair in the Fischell Department of Bioengineering at the University of Maryland. Dr. Fisher is also the Director of the Center for Engineering Complex Tissue (CECT), that aims to create a broad community focusing on 3D printing and bioprinting for regenerative medicine applications. Dr. Fisher’s group investigates biomaterials, stem cells, bioprinting, and bioreactors for regenerating lost tissues, particularly bone, cartilage, and soft tissues. Dr. Fisher’s laboratory has published over 200 articles, book chapters, editorials, and proceedings (14,500+ citations / 69 h-index) and delivered over 350 invited and contributed presentations, with support from NIH, NSF, FDA, NIST, DoD, and other institutions.

PRESENTATION SYNOPSIS

3D Printing Strategies for Bone Engineering

Generating complex tissues has been an increasing focus in tissue engineering and regenerative medicine. With recent advances in bioprinting technology, our laboratory has focused on developing platforms for treating and understanding clinically relevant problems, with a particular focus on bone and cartilage. We utilize digital light processing-based and extrusion-based additive manufacturing to generate biomaterial implants, cell-laden constructs, and bioreactors to expand critical populations. This presentation will cover the diverse range of materials and processes developed in our laboratory and their application to relevant, emerging problems in orthopedic tissue engineering.

Learning Objectives

• Identify key bioprinting strategies particularly useful in bone engineering, including extrusion bioprinting and digital light processing printing
• Explain the utility of computational assisted design (CAD) and associated modeling in the design and assessment of osteochondral implants
• Describe the fabrication of cell-biomaterial constructs in bone engineering
Robert E. Guldberg is the DeArmond Executive Director of the Phil and Penny Knight Campus for Accelerating Scientific Impact and Vice President of the University of Oregon. His research focuses on musculoskeletal mechanobiology, regenerative medicine, and orthopaedic medical devices. Dr. Guldberg has produced over 280 peer-reviewed publications and co-founded six start-ups. He is past Chair of the Americas Chapter of the Tissue Engineering and Regenerative Medicine International Society (TERMIS) and serves on the Leadership Council of the Wu Tsai Human Performance Alliance, a $220 million global initiative to promote wellness and peak performance through scientific discovery and innovation.

**PRESENTATION SYNOPSIS**

**The Intersection of Immune Biology, Mechanobiology, and Bone Regeneration**

Complex musculoskeletal trauma with injury to bone and soft tissue is associated with high complication rates and poor functional recovery. Advances in biomaterials-mediated delivery strategies have shown promise for promoting functional regeneration. However, the response to advanced treatments remains variable with nonresponding patients suffering prolonged pain and disability. There is increasing recognition that patient-specific immune responses and the local mechanical environment can potently affect the efficacy of advanced regenerative therapies. Our lab has identified systemic immune response biomarkers to predict patient outcomes as well as time-dependent windows of local mechanical signals that promote vascular bone regeneration. This presentation will review our recent work, including efforts to apply our findings to develop new therapeutic intervention strategies.

**Learning Objectives**

- Identify the effects of local mechanical loading on bone healing
- Explain how immune responses correlate with bone healing outcomes
- Determine how the interactions of immune biology, mechanobiology, and bone regeneration can suggest new therapeutic strategies
Robert E. Marx, DDS, FACS

Robert E. Marx, DDS, is Professor of Surgery and Chief of the Division of Oral and Maxillofacial Surgery at the University of Miami Miller School of Medicine as well as Chief of Surgery at Jackson South Community Hospital in Miami. He is well known as an educator, researcher, and innovative surgeon. He has pioneered new concepts and treatments for pathologies of the oral and maxillofacial area as well as new techniques in reconstructive surgery including stem cell therapies. He is a prolific author, including multiple OMS textbooks as well as fiction medical mystery novels.

PRESENTATION SYNOPSIS

Oral and Maxillofacial Surgery Bone Grafting:
Past, Present and Future

Bone grafting has been an inherent part of our specialty since its inception. From the past, nonvascularized block grafts gave way to cancellous marrow grafts and now to today’s free vascular osteocutaneous grafts and in-situ tissue engineered grafts. Numerous innovations and discoveries have paved the way. An incomplete list would include rigid fixation, microvascular techniques with vein couplers, platelet rich plasma, recombinant human bone morphogenetic protein, and bone marrow stem cell aspirates, among others. The result has been more predictable bone regeneration and a better quality of bone with reduced morbidity and in many cases reduced cost.

As oral and maxillofacial surgery proceeds into the future, the vision includes growth factor loaded scaffolds, exosomes, adipose derived stem cells, cartilage together with bone regeneration, and more recombinant growth factors, among others. Although oral and maxillofacial surgery will share the bone regeneration advances with our orthopedic colleagues, we will continue to lead the way forward as we have done in the past.

Learning Objectives

- Learn the various indications for in-situ tissue engineering of bone in the maxillofacial area
- Understand the combinations of cells-signal-matrix using allogeneic bone of the correct particle size, rhBMP-2/ACS, and the stem cells/progenitor cells in bone marrow
- Know of the best dosages of stem/progenitor cells from bone marrow and how to obtain them as well as the best dosages of rhBMP-2/ACS for bone regeneration with reduction in post operative edema
Robert E. Marx, DDS, FACS

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Antonios G. Mikos is the Louis Calder Professor of Bioengineering and Chemical and Biomolecular Engineering at Rice University. His research focuses on the synthesis, processing, and evaluation of new biomaterials for use as scaffolds for tissue engineering, as carriers for controlled drug delivery, as non-viral vectors for gene therapy, and as platforms for disease modeling. He is the author of over 690 publications and the inventor of 32 patents. Mikos is a Member of the National Academy of Engineering, the National Academy of Medicine, the National Academy of Inventors, the Chinese Academy of Engineering, the Academia Europaea, and the Academy of Athens. He is a Founding Editor and Editor-in-Chief of the journal Tissue Engineering.

PRESENTATION SYNOPSIS

**Biomaterials for Biomolecule and Cell Delivery in Tissue Engineering Applications**

Advances in biology, materials science, chemical engineering, computer science, and other fields have allowed for the development of tissue engineering, an interdisciplinary convergence science. Our laboratory has focused on the development and characterization of biomaterials-based strategies for the regeneration of human tissues with the goal of improving healthcare outcomes. In a collaborative effort with physicians, surgeons, and other scientists, we have produced new material compositions and three-dimensional scaffolds, and investigated combinations of biomaterials with cell populations and bioactive agents for their ability to induce tissue formation and regeneration. We have examined the effects of material characteristics, such as mechanical properties, topographical features, and functional groups, on cell behavior and tissue guidance, and leveraged biomaterials as drug delivery vehicles to release growth factors and other signals with spatial and temporal specificity. This presentation will review recent examples of diverse biomaterials-based approaches for regenerative medicine applications and highlight emerging areas of growth.

**Learning Objectives**

- Discuss injectable and 3D-printable biomaterials for use as tissue engineering scaffolds
- Discuss drug delivery systems for bioactive molecules in tissue engineering
- Discuss biomaterials-enabled cell therapies in tissue engineering
George Muschler, MD

Dr. Muschler is a Professor of Orthopaedic Surgery and Biomedical Engineering at the Cleveland Clinic, with a clinical practice that integrates joint replacement, and joint preservation. Dr. Muschler's Regenerative Medicine Laboratory has earned continuous federal funding for over 26 years, focusing on stem and progenitor cell biology, tissue engineering and regenerative medicine. He has served as Vice Chair of Bioengineering (2004-2013); Director of the Orthopaedic Research Center (2005-2013), Vice Chair of the Orthopaedic and Rheumatologic Institute (2007-2013), and has served as Director of the Cleveland Clinic Joint Preservation Center since 2017. Dr. Muschler led the development of several multi-institutional collaborative translational networks. He founded and led the Ohio-based Clinical Tissue Engineering Center (2005-2012), and served as the founding Co-Director of the Armed Forces Institute of Regenerative Medicine (AFIRM) (2008-2011), dedicated to the accelerated development of therapies to serve wounded warriors. He was inducted as a Fellow in the American Association for the Advancement of Science in 2023.

PRESENTATION SYNOPSIS

Stem Cell Science: Asking Questions, Solving Problems, Creating Opportunities

This presentation will explore options for cell sourcing connective tissue progenitor cells (CTPs) and generation of CTP-derived cells for use in cellular therapies musculoskeletal disease, from perspectives of optimal harvest, intraoperative processing options for concentration and selection, as well as methods for in vitro cell selection and expansion, and quality assessment.

Learning Objectives

• Recall the composition and heterogeneity of clinical sources of connective tissue progenitor
• Identify the strengths and weaknesses of intraoperative methods for cell processing
• Recognize the tools and processes becoming available for in vitro selection and expansion of cells for therapeutic purposes

PRESENTATION SYNOPSIS

Studying Skeletal Development to Enhance Bone Repair

Our knowledge of skeletal development has increased exponentially over the last 20 years due in part to the widespread adoption of new experimental techniques focused on regulating gene expression. Information now available on the signaling pathways and skeletal stem and progenitor cells that interact to form the skeleton has led to new strategies for enhancing bone formation in a variety of clinical settings. During my talk, I will discuss osteobiologics currently approved by the FDA or in clinical trials for enhancing bone repair and how we might predict which osteobiologic(s) might be most efficacious in specific clinical settings based on our understanding of skeletal development.

Learning Objectives

• Multiple signaling pathways interact in precise spatial and temporal patterns during skeletal development
• All skeletal stem/progenitor cells are not the same so will not be activated by the same signaling cascades
• The local extracellular matrix and resident cells form a niche that influences bone formation and the capacity for regeneration
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Vicki Rosen, PhD

Dr. Vicki Rosen arrived at Harvard School of Dental Medicine (HSDM) by way of industry, having spent the early part of her career as a scientist at Genetics Institute, a biotechnology company, where she was a member of the research team that identified the bone morphogenetic protein (BMP) genes in 1988. She became a professor in the Faculty of Medicine in 2001, and chair of the Department of Developmental Biology at HSDM in 2005.
The Role of Periosteal Cell Mechanotransduction in Load-Induced Bone Formation

The periosteum is a thin tissue surrounding bone that contains stem/progenitor cells involved in bone development, growth, repair, and load-induced bone formation. BMP signaling is critical for these biological processes. Here, we investigate the role of BMP signaling in appositional growth and mechanically induced osteogenic differentiation of periosteal cells. We designed an ex vivo appositional growth model and generated a periosteum-derived cell line to interrogate BMP2-mediated BMP signaling. Using these tools, we found that Bmp2 expression is upregulated in mechanically stimulated periosteal cells. When BMP2 is removed from periosteal lineage cells, BMP signaling is lost and appositional growth is severely attenuated. This work will enhance our understanding of periosteal activity and the role of BMP2 in load-induced bone formation.

Advancing Tissue Engineering Therapies via Testing in a Clinically Relevant Craniofacial Defect Model

Oro-antral communication (OAC) defects (unnatural openings created between the mouth and the sinus) frequently occur in dentistry and oral maxillofacial surgery as an adverse consequence of complicated extractions, malignancies, or trauma. While alternative surgical or regenerative approaches are of interest to improve functional patient outcomes, there are no widely accepted preclinical models of OAC defects to rigorously test new therapies. Therefore, we have created a new pre-clinical model of OAC which mimics the human condition with failed bone healing at 8 weeks. With this model, we are testing therapeutic delivery systems and regenerative strategies to promote bone and soft tissue regeneration in OAC defects. I will review our ongoing efforts to promote bone regeneration in this challenging craniofacial defect model.
**ABSTRACT PRESENTATION**

**Developing a Challenging Preclinical Model of Compromised Wound Healing**

The craniomaxillofacial (CMF) region is highly complex, composed of morphologically intricate skeletal elements, extensive neural and vascular networks, special sense organs, lining tissues, and the dentition. The loss of tissue owing to traumatic, developmental, and pathological etiologies in a relatively small region presents a considerable reconstructive challenge. Treatment is further complicated in compromised wound healing environments. We will discuss the development of a clinically relevant, reproducible model of compromised wound healing, and how it can be used to inform future strategies aimed at improving bone regeneration in these situations.

**ABSTRACT PRESENTATION**

**Novel Approaches for Bone Grafting the Compromised Wound Healing Environment**

The reconstruction of large, morphologically complex maxillofacial bone defects continues to be a challenge for surgeons. Treatment is further complicated in compromised wound healing environments. We present two novel materials for bone regeneration in these clinically challenging scenarios: 1) Bioactive, 3D-printed ceramic scaffolds, and 2) Plasma Enhanced Chemical Vapor Deposition (PECVD) of semiconductor-based coatings. Promising preclinical data shows these strategies have the capacity to regenerate bone in irradiated critical-size defects and have strong potential for clinical translation.
Daniel B. Spagnoli, DDS, PhD
Conference Chair

Dr. Spagnoli is the author of over 30 articles and book chapters. He has served as section editor of the Cleft Palate-Craniofacial Journal and AAOMFS Knowledge Update. In 2005 and 2006, he co-authored two award-winning papers published in the Journal of Periodontalology and the Journal of Oral and Maxillofacial Surgery. His most recent article, “Dental Implants and the Use of rhBMP-2,” which appeared in the May 2011 issue of Oral and Maxillofacial Surgery Clinics of North America, was reprinted in Dental Clinics of North America that same year. His research, numerous lectures, and continuing education courses are focused on temporomandibular joint disorders and surgery, tissue engineering, and preprosthetic surgery. Dr. Spagnoli, who was formerly the Chair at LSU-New Orleans, is now in private practice in North Carolina.

Richard E. Bauer, DMD, MD

Richard E. Bauer, DMD, MD, is a graduate of the University of Pittsburgh Schools of Dental Medicine and Medicine. Dr. Bauer completed his residency training in Oral and Maxillofacial Surgery at the University of Pittsburgh Medical Center. He has served on multiple committees for the American Association of Oral and Maxillofacial Surgery and was a full-time faculty member and Residency Program Director at the University of Pittsburgh in the department of Oral and Maxillofacial Surgery. He established his private practice and is focused on dental implant therapy and corrective jaw surgery for congenital, developmental, and sleep apnea purposes. He maintains his board certification and clinical appointments in multiple departments and local hospitals. He has been active in research with focuses on hard and soft tissue regeneration and computer assisted surgery. He continues to collaborate locally, nationally, and internationally on advancing the field of oral and facial regeneration and reconstruction.
Alan S. Herford, DDS, MD

Alan S. Herford, DDS, MD, past Chair of Osteo Science Foundation, is the Chairman of the department of Oral and Maxillofacial Surgery residency program at Loma Linda University School of Dentistry. Dr. Herford was also past President of the American Board of Oral & Maxillofacial Surgery. He is a graduate of Loma Linda University School of Dentistry. His medical degree is from the University of Texas Southwestern Medical School in Dallas. Dr. Herford completed his training in Oral and Maxillofacial Surgery at Parkland Memorial Hospital at the University of Texas Medical Center in Dallas. In 2008, Dr. Herford was named the Philip Boyne & Peter Geistlich Endowed Professor in OMFS.

Dr. Herford is actively involved in research. He has authored multiple publications and has presented his original research at both national and international meetings. Dr. Herford is the primary author on numerous peer-reviewed scientific publications on topics ranging from reconstructing skin cancer defects to the use of growth factors to rebuild jaw defects. He has recently authored book chapters on treatment of mandibular fractures, facial flaps, and treatment of soft tissue injuries. His clinical interests are reconstructive surgery and maxillofacial trauma.

Jay P. Malmquist, DMD

Jay P. Malmquist, DMD, is an Oral and Maxillofacial Surgeon with advanced training and experience with dental implants, bone regeneration, and bone grafting. He is a graduate of the University of Oregon and the University of Oregon Dental School, and completed a rotating internship in the US Army and a residency in Oral and Maxillofacial Surgery at Oregon Health Sciences University. His private practice is in Portland, Oregon. Dr. Malmquist has authored numerous articles and several chapters in textbooks on implants, bone grafting tissue engineering, and bone regeneration. He lectures nationally and internationally on topics of implant placement, bone grafting, and various bone proteins and blood modifiers. He pursued extensive research on bone physiology and regeneration at Emory University in Atlanta, Georgia, and is now actively engaged in research protocols in the evolution of bone proteins and bone grafting techniques.

Dr. Malmquist is a Diplomate of the American Board of Oral and Maxillofacial Surgery as well as a Fellow of the American College of Dentists and the International College of Dentists.

Dr. Malmquist has distinguished himself as the first Treasurer and first President of the American Association of Oral and Maxillofacial Surgeons from the Pacific Northwest. He is currently the chairman of the Foundation for Oral Rehabilitation, Past Chairman of Osteo Science Foundation, and current President-elect of the Academy of Osseointegration.
Peter K. Moy, DMD

Peter K. Moy, DMD, is a clinical professor of oral and maxillofacial surgery in the Division of Diagnostic and Surgical Sciences at the UCLA School of Dentistry. He is the first person to hold the Nobel Biocare Endowed Chair in Surgical Implant Dentistry. He also serves as the Director of the UCLA Dental Implant Center and the Straumann Surgical Dental Clinic. Dr. Moy treats patients in the UCLA Straumann Surgical Dental Clinic as well as in his private practice located in Brentwood, California.

Dr. Moy is a graduate of the University of Pittsburgh School of Dental Medicine. His undergraduate degree is from the University of Pittsburgh. He completed a general practice residency at Queen’s Medical Center in Honolulu, Hawaii, and his oral and maxillofacial surgery training at the University of California Los Angeles Medical Center.

Dr. Moy is an associate editor of the International Journal of Oral and Maxillofacial Implants and a reviewing editor of the International Journal of Oral and Maxillofacial Surgery and Clinical Implant Dentistry and Related Research. He is a member of the Supreme Chapter of Delta Sigma Delta, American Dental Association, Western Dental Society, American Association of Oral and Maxillofacial Surgeons, and Western Society of Oral and Maxillofacial Surgeons, and is a Fellow of the Academy of Osseointegration, the International Academy for Oral-Facial Rehabilitation, and the Pierre Fauchard Honorary Dental Society.

Neeraj H. Panchal, DDS, MD, MA

Neeraj H. Panchal, DDS, MD, MA, received his dental degree from Columbia University College of Dental Medicine and his medical degree from the University of Texas Southwestern Medical School. Dr. Panchal additionally earned a master's degree in science education from the Teacher's College at Columbia University. Dr. Panchal completed his Certificate in Oral and Maxillofacial Surgery at the University of Texas Southwestern/Parkland Hospital. He currently is Section Chief of Oral and Maxillofacial Surgery at Penn Presbyterian Medical Center, Section Chief of Oral and Maxillofacial Surgery at the Philadelphia Corporal Michael J. Crescenz Veteran's Affairs Medical Center, and Assistant Professor of Oral Maxillofacial Surgery at the University of Pennsylvania School of Dental Medicine. Dr. Panchal’s clinical interests include maxillofacial reconstruction, dental implantology, craniofacial trauma, trigeminal nerve surgery, and pain management.
Peter K. Moy, DMD

Peter K. Moy, DMD, is a clinical professor of oral and maxillofacial surgery in the Division of Diagnostic and Surgical Sciences at the UCLA School of Dentistry. He is the first person to hold the Nobel Biocare Endowed Chair in Surgical Implant Dentistry. He also serves as the Director of the UCLA Dental Implant Center and the Straumann Surgical Dental Clinic. Dr. Moy treats patients in the UCLA Straumann Surgical Dental Clinic as well as in his private practice located in Brentwood, California.

Dr. Moy is a graduate of the University of Pittsburgh School of Dental Medicine. His undergraduate degree is from the University of Pittsburgh. He completed a general practice residency at Queen’s Medical Center in Honolulu, Hawaii, and his oral and maxillofacial surgery training at the University of California Los Angeles Medical Center. Dr. Moy is an associate editor of the International Journal of Oral and Maxillofacial Implants and a reviewing editor of the International Journal of Oral and Maxillofacial Surgery and Clinical Implant Dentistry and Related Research. He is a member of the Supreme Chapter of Delta Sigma Delta, American Dental Association, Western Dental Society, American Association of Oral and Maxillofacial Surgeons, and Western Society of Oral and Maxillofacial Surgeons, and is a Fellow of the Academy of Osseointegration, the International Academy for Oral-Facial Rehabilitation, and the Pierre Fauchard Honorary Dental Society.

Neeraj H. Panchal, DDS, MD, MA

Neeraj H. Panchal, DDS, MD, MA, received his dental degree from Columbia University College of Dental Medicine and his medical degree from the University of Texas Southwestern Medical School. Dr. Panchal additionally earned a master’s degree in science education from the Teacher’s College at Columbia University. Dr. Panchal completed his Certificate in Oral and Maxillofacial Surgery at the University of Texas Southwestern/Parkland Hospital. He currently is Section Chief of Oral and Maxillofacial Surgery at Penn Presbyterian Medical Center, Section Chief of Oral and Maxillofacial Surgery at the Philadelphia Corporal Michael J. Crescenz Veteran’s Affairs Medical Center, and Assistant Professor of Oral Maxillofacial Surgery at the University of Pennsylvania School of Dental Medicine. Dr. Panchal’s clinical interests include maxillofacial reconstruction, dental implantology, craniofacial trauma, trigeminal nerve surgery, and pain management.

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**EVENT DETAILS**

**Date**
February 15 - 17, 2024

**Location**
Silverado Resort & Spa, Napa Valley
1600 Atlas Peak Rd, Napa Valley, CA 94558
www.silveradoresort.com

**Registration**
To register for this event, visit [www.osteoscience.org](http://www.osteoscience.org).
The registration fees are: $750 General; $295 Military; $150 Resident; $150 Post-doc/PhD Candidate

*Available for three days prior and post event, pending hotel availability. Recommended to reserve early to ensure availability of desired dates.
Lodging
Room block is available at Silverado Resort & Spa, from Wednesday, February 14 through Sunday, February 18, 2024.
Room rate is $299+ per night.*
Complimentary parking
Booking link located at:
www.osteoscience.org/education/educational-events/bone-symposium/

*Available for three days prior and post event, pending hotel availability. Recommended to reserve early to ensure availability of desired dates.

Continuing Education
Up to 15.25 CME/CE credits will be provided for full attendance at this meeting.

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Designation
The PeerPoint Medical Education Institute, LLC designates this live activity for a maximum of 1 AMA PRA Category 1 Credit™. Up to 15.25 CME credits will be provided. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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