2025 BMES CMBE Conference

"Cell Engineering for Mechanomedicine and Rejuvenation"

January 3-6, 2025

Cape Rey Carlsbad Beach Hilton | Carlsbad, CA

Thursday, January 2, 2025

2:00 – 8:00 PM	Registration and Badge Pick Up	Shearwater Prefunction 1

Friday, January 3, 2025

7:00 AM – 1:00 PM	Registration	Shearwater Prefunction 1
7:00 AM	Breakfast	Shearwater Prefunction 3
8:00 AM	*Welcome & Introduction* Ngan Huang & Keyue Shen	Shearwater Ballroom
8:10 – 10:05 AM	**Platform Session 1:** Advances in Regenerative Medicine (Moderator: Stephanie Seidlits)	Shearwater Ballroom
8:10 AM	*Keynote Speaker* Pro-regenerative biomaterials and medical devices **Guillermo Ameer (Northwestern University)**	Shearwater Ballroom
8:40 AM	*Rising Star* Functional repair and regenerative engineering of composite bone-muscle injury in mouse lower extremity trauma **Karina Nakayama (Oregon Health & Science University**	Shearwater Ballroom
8:55 AM	*Rising Star* Stem Cell Derived Placental Organoid Model to Investigate Maternal-Fetal Crosstalk **Quinton Smith (UC Irvine)**	Shearwater Ballroom
9:10 AM	*Rising Star* Local photo-crosslinking of native tissue matrix regulates alveolar epithelial cell function **Claudia Loebel (UMich)**	Shearwater Ballroom

9:25 AM	*Short Talk* A hybrid hPSC differentiation strategy for region-specific spinal and sensory neurons **Nisha Iyer (Tufts)**	Shearwater Ballroom
9:40 AM	*Short Talk* Directing the Cellular Organization in 3D Gels Using Filamented Light Biofabrication for Cell Therapy **Johnson V. John (Terasaki)**	Shearwater Ballroom
9:55 AM	*Postdoctoral Travel Award* Targeted Mitochondria Delivery to Repair and Regenerate Injured Vascular Endothelium **Brandon Applewhite (Northwestern University)**	Shearwater Ballroom
10:05 – 10:30 AM	Coffee Break + Booth Viewing	Shearwater Prefunction 3
10:30 AM – 12:40 PM	**Platform Session 2:** Mechanobiology of Rejuvenation (Moderator: Guohao Dai)	
10:30 AM	*Keynote Speaker* Cytoplasmic Dynamics and Mechanics in the Maturation and Aging of Mammalian Oocytes **Rong Li (NUS)**	Shearwater Ballroom
11:00 AM	*Rising Star* Dissecting the Molecular Mechanism of Cell Mechanobiology using a Nano-ruler Platform **Haogang Cai (NYU)**	Shearwater Ballroom
11:15 AM	*Rising Star* Multiplexed spatial mapping of chromatin features, transcriptome, and proteins in tissues **Yanxiang Deng (UPenn)**	Shearwater Ballroom
11:30 AM	*Short Talk* Imaging the dynamic mechanical environment of embryonic development in live mouse model **Shang Wang (Stevens Institute of Technology)**	Shearwater Ballroom
11:45 AM	*Short Talk* Computational Modeling of Energy Supply and Demand during Mechanotransduction in Inner Ear Hair Cell Stereocilia **Robert Raphael (Rice)**	Shearwater Ballroom
12:00 PM	*Short Talk (Late Breaking)* Monocytes use protrusive forces to generate migration paths in viscoelastic collagen-based extracellular matrices **Kolade Adebowale (UCSD)**	Shearwater Ballroom

12:15 PM	*Postdoctoral Travel Award* Mechanics in a Human Engineered Heart Tissue Model of Lamin Cardiomyopathy **Benjamin Lee (UPenn)**	Shearwater Ballroom
12:25 PM	*Lightning (3 min)* Piezo1 Mediated Mechanotransduction Regulates Lipid Accumulation in Microglia **Daanish Kulkarni (UCI)** Margination Behavior of a Circulating Cell in a Tortuous Microvessel **Ali Kazempour (NJIT)** Cracking the Code of Nuclear Rigidity: New Frontiers in Cell Migration and Therapy **Yerbol Tagay (PSU)** Viscoelastic Extracellular Matrix Enhances Epigenetic Remodeling and Cellular Plasticity **Yifan Wu (UCLA)**	Shearwater Ballroom
12:40 – 2:00 PM	Lunch on your own	
12:40 – 2:00 PM	Meet the Leaders Lunch for Rising Stars and Travel Awardees (by invitation only)	Pelican Watch
2:00 – 3:30 PM	*Session* Meet the Grant Agencies (Moderator: Dennis Discher) 2:00 – 2:30: **Ross Okamura (CIRM)** 2:30 – 3:00: **Shivani Sharma (NSF)** 3:00 – 3:30: **Rahul Thakar (NIH/NHLBI)**	Shearwater Ballroom
3:00 – 4:30 PM	Break	

3:30 – 4:30 PM	CMBE Council Meeting (by invitation only) (BMES staff included)	Pelican Watch
4:30 – 6:00 PM	**Poster Session 1** (with refreshments)	Shearwater Ballroom 1+2
5:30 – 7:00 PM	Welcome Reception (hor d'oeuvres and drinks)	Shearwater Prefunction Foyer 1

Saturday, January 4, 2025

7:00 AM – 2:30 PM	Registration	Shearwater Prefunction 1
7:00 AM	Breakfast	Shearwater Prefunction 3
8:00 – 9:55 AM	**Platform Session 3:** Engineering Rejuvenation and Regeneration (Moderator: Song Li)	Shearwater Ballroom
8:00 AM	*Keynote Speaker* Pathways to Rejuvenation of Adult Stem Cells **Thomas Rando (UCLA)**	Shearwater Ballroom
8:30 AM	*Rising Star* Ocular fluid outflow on-chip reveals ALK5/VEGFC-mediated Schlemm's canal endothelial dysfunction in glaucoma **Esak Lee (Cornell)**	Shearwater Ballroom
8:45 AM	*Rising Star* P-cadherin dependent adhesions mediate cell protrusions required for epithelial morphogenesis **Priscilla Hwang (Virginia Commonwealth)**	Shearwater Ballroom
9:00 AM	*Rising Star* M-MDSCs and Neutrophil Dysfunction: Unveiling a Mechanism of Post-Sepsis Immunosuppression **Laurel Hind (UColorado – Boulder)**	Shearwater Ballroom
9:15 AM	*Short Talk* Elucidating distinct roles of extracellular matrix in cardiac aging **Jennifer L. Young (NUS)**	Shearwater Ballroom

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9:30 AM	*Short Talk* Precision Mechanomedicine for Zone-Specific Meniscal Repairs Using a Tunable Meniscus ECM-Based Hydrogel System **Su Chin Heo (UPenn)**	Shearwater Ballroom
9:45 AM	*Postdoctoral Travel Award* Spatiotemporal dynamics of mammalian brain development and neuroinflammation by multimodal tri-omics mapping **Di Zhang (Yale University)**	Shearwater Ballroom
9:55 – 10:30 AM	Coffee Break + Booth Viewing	Shearwater Prefunction 3
10:30 AM – 12:40 PM	**Platform Session 4:** Advanced Biomaterials for Immunomodulation and Drug Delivery (Moderator: Jenny Jiang)	Shearwater Ballroom
10:30 AM	*Keynote Speaker* Tuning the "Structure" of Biomaterials: Implications for Cell-Based Therapy and Drug Delivery **Tejal Desai (Brown University)**	Shearwater Ballroom
11:00 AM	*Rising Star* Ultra-Long-Term Delivery of Hydrophilic Drugs Using Injectable In Situ Cross-Linked Depots **Nitin Joshi (Brigham Women's Hospital)**	Shearwater Ballroom
11:15 AM	*Rising Star* Affinity-Controlled Delivery of Multiple Angiogenic Proteins Enhances Vascular Network Formation **Marian Hettiaratchi (University of Oregon)**	Shearwater Ballroom
11:30 AM	*Rising Star* Determining sex-specific drug combinations targeting aortic valve myofibroblast activation using an artificial intelligence-derived platform **Brian Aguado (UCSD)**	Shearwater Ballroom
11:45 AM	*Short Talk* Phenotype-Instructive Nanomaterials for Augmentation of Macrophage Cell Therapies **John Clegg (University of Oklahoma)**	Shearwater Ballroom
12:00 PM	*Short Talk* Engineering Cyborg Mammalian Cells as Therapeutic Materials **Cheemeng Tan (UCDavis)**	Shearwater Ballroom
12:15 PM	*Postdoctoral Travek Award* Surface-Functionalized Microgels as Artificial Antigen-Presenting Cells to Regulate Expansion of T Cells **Junzhe Lou (Harvard)**	Shearwater Ballroom

12:25 PM	*Lightning (3 min)* Modulators of LFA-1 signaling control leukocyte upstream migration **Ai Mochida (UPenn)** T Cell Targeting Nanoparticles to Modulate the Immune Response in Hypertension **Karla Lambaren (USC)** Design of a high-throughput screening assay to identify cues promoting distinct alveolar and adventitial lung fibroblast identities **Ana Diaz Espinosa (Mayo Clinic)** Constructing a decellularized extracellular matrix containing interpenetrating network hydrogel to probe cell-material interactions **Tuba Marjan (Purdue)**	Shearwater Ballroom
12:40 – 1:40 PM	*Demo* MaxCyte, Inc Product Demo	Shearwater Ballroom
12:40 – 2:00 PM	Lunch on your own	
2:00 – 3:00 PM	*Workshop* Transitioning to Product Development (Moderator: Ngan Huang) 2:00 – 2:15: **Pratima Labroo (FDA/CBER)** 2:15 – 2:30: **Karen Christman (UCSD)** 2:30 – 2:45: **Robert Tranquillo (University of Minnesota)** 2:45 – 3:00: **Aijun Wang (UC Davis)** 3:00 – 3:15: Q&A	Shearwater Ballroom
3:00 – 4:30 PM	Break	Shearwater Prefunction 3
3:00 – 4:30 PM	Perspectives Manuscript Products Meeting (all are welcome to attend)	
4:30 – 6:00 PM	**Poster Session 2** (with refreshments)	Shearwater Ballroom 1+2

6:00 – 9:00 PM (Bar Open 5:30 PM)	**AAASE Gala Dinner** Welcome & Introduction: Ngan Huang & Keyue Shen Introduction to CMBE 2026 Presentation of Junior Travel Awards Presentation of Senior Awards *Shu Chien Achievement Award* Engineering tissue function: Build, Learn, Repeat **Christopher Chen (Boston University)** *AAASE Induction* **X. Edward Guo (Columbia University)**	Shearwater Ballroom

Sunday, January 5, 2025

7:00 AM – 1:00 PM	Registration	Shearwater Prefunction 1
7:00 AM	Breakfast	Shearwater Prefunction 3
8:00 – 9:55 AM	**Platform Session 5:** Translational Applications of Biomimetic Platforms (Moderator: Aijun Wang)	Shearwater Ballroom
8:00 AM	*Keynote Speaker* Design and Translation of Decellularized Extracellular Matrix Biomaterials **Karen Christman (UCSD)**	Shearwater Ballroom
8:30 AM	*Rising Star* Actuating Extracellular Matrices Enable Decoupling Mechanical and Biochemical Impacts of Exercise **Ritu Raman (MIT)**	Shearwater Ballroom
8:45 AM	*Rising Star* Enhancing therapeutic exosomes: High-efficiency drug loading and large-scale production using biomimetic materials **Yichun Wang (University of Notre Dame)**	Shearwater Ballroom

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9:00 AM	*Rising Star* Real-time probing of pneumonia pathogenesis: dissecting systemic and pulmonary immunity using a novel extracorporeal cross-circulation model **Hadi Nia (Boston University**	Shearwater Ballroom
9:15 AM	*Short Talk (Late-Breaking)* Human microvessel-based vascularization post myocardial infarction in pigs show unprecedented endothelial retention and scar remuscularization **Sara Nunes Vasconcelos (Toronto)**	Shearwater Ballroom
9:30 AM	*Short Talk* Precision biomaterials sustain durable and massive expansion of human CAR-T cells in vitro **Xiao Huang (Drexel)**	Shearwater Ballroom
9:45 AM	*Postdoctoral Travel Award* Engineering a viscoelastic, growth factor sequestering hydrogel for induced pluripotent stem cell cardiomyocyte culture (iPSC-CMs) **Marissa Gionet-Gonzales (UCSB)**	Shearwater Ballroom
9:55 – 10:30 AM	Coffee Break and Booth Viewing	Shearwater Prefunction 3
10:30 AM – 12:35 PM	**Platform Session 6:** Advancing Cancer Mechanomedicine (Moderator: Allen Liu)	Shearwater Ballroom
10:30 AM	*Keynote Speaker* Cell Mechanochemical Sensing and Memory Formation **Konstantinos Konstantopoulos (Johns Hopkins University)**	Shearwater Ballroom
11:00 AM	*Rising Star* Engineering Commensal Bacteria to Neutralize a Microbial Genotoxin Involved in Colorectal Cancer **Jiahe Li (UMich)**	Shearwater Ballroom
11:15 AM	*Rising Star* Pre-exposure to Elevated Hydrostatic Pressure Promotes Downstream Motility by Suppressing Tumor Cell Mechanosensitivity **Panagiotis Mistriotis (Auburn University)**	Shearwater Ballroom
11:30 AM	*Rising Star* Transcriptomic Mechano-Immunology Landscape in Colorectal Cancer in Response to Peristalsis **Abigail Clevenger, on behalf of Shreya Raghavan (Texas A&M)**	Shearwater Ballroom

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11:45 AM	*Short Talk* Cell contractility and paracrine signals drive mechanical memory of oral squamous cell carcinoma **Adam J. Engler (UCSD)**	Shearwater Ballroom
12:00 PM	*Short Talk* The Mechano-Metabolic Crosstalk Driving 3D Breast Cancer Invasion is Regulated by YAP/TAZ Activity **Jacopo Ferruzzi (UTDallas)**	Shearwater Ballroom
12:15 PM	*Postdoctoral Travel Award* Modeling glioblastoma tumor progression via CRISPR-engineered brain organoids **Matthew Ishahak (WUSTL)**	Shearwater Ballroom
12:25 PM	*Lightning (3 min)* Regulation of Mitochondrial Membrane Potential by YAP in Cancer Cells **Bella Raykowski (USC)** Establishing a Microglia-GBM Organoid Model to Study Immune Response and Tumor Interaction in the Brain **Tianyu Chen (Utah State University)**	Shearwater Ballroom
12:35 – 2:00 PM	Lunch on your own	
2:00 – 3:15 PM	*Workshop* Meet the Journal Editors: Best Practices in Manuscript Preparation and Submission (Moderator: Deborah Leckband) 2:00 – 2:10: **Adam Engler (APL Bioengineering)** 2:10 – 2:20: **Song Li (Med-X)** 2:20 – 2:30: **Guillermo Ameer (Sci Advances)** 2:30 – 2:40: **Michael King (CMBE)** 2:40 – 2:50: **Dennis Discher (Molecular Biology of the Cell, PNAS & PNAS Nexus, and Science)** 2:50 – 3:15: Q&A	Shearwater Ballroom
3:15 – 4:30 PM	Break	
4:30 – 6:00 PM	**Poster Session 3** (with refreshments)	Shearwater Ballroom 1+2
6:00 – 7:30 PM	*Reception* (hor d'oeuvres and drinks) Welcome & Introduction: Ngan Huang & Keyue Shen	Shearwater Prefunction 3 + Terrace

6:30 – 7:00 PM	*Chris Jacobs Award for Excellence in Leadership* Introduction to Award **Ed Guo (Columbia University)** From bone fluid flow to mechanobiological regeneration - a journey with Chris **Yi-Xian Qin (Stony Brook University)**	Shearwater Ballroom

Monday, January 6, 2025

7:00 – 11:00 AM	Registration	Shearwater Prefunction 1
7:00 AM	Breakfast	Shearwater Prefunction 3
8:00 – 10:00 AM	**Platform Session 7:** Emerging Technologies in Cell and Molecular Bioengineering (Peter Wang)	Shearwater Ballroom
8:00 AM	*Keynote Speaker* Dissecting Kidney Injuries and Repairs with Single-Cell Technologies **Kun Zhang (UCSD)**	Shearwater Ballroom
8:30 AM	*Rising Star* A method to achieve optical transparency in live animals **Guosong Hong (Stanford)**	Shearwater Ballroom
8:45 AM	*Rising Star* Programming of Fibroblasts into Neurons via a Scalable Magnetoelastic Generator Array **Jun Chen (UCLA)**	Shearwater Ballroom
9:00 AM	*Rising Star* Volumetric imaging of intact tissue by distributed molecular networks **Joshua Weinstein (UChicago)**	Shearwater Ballroom
9:15 AM	*Short Talk* MAGIK: A rapid and efficient method to create lineage-specific reporters in stem cells **Xiaojun Lian (PSU)**	Shearwater Ballroom
9:30 AM	*Short Talk* Programmable RNA targeting with DNA-guided CRISPR/Cas Systems **Piyush Jain (University of Florida)**	Shearwater Ballroom
9:45 AM	*Short Talk* Developing High-Throughput In Vivo Screening Technology for Engineered Tissue Formulation **Fan Zhang (UWashington)**	Shearwater Ballroom

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10:00 – 10:30 AM	Coffee Break	Shearwater Prefunction 3
10:30 AM – 12:15 PM	**Platform Session 8:** Advances in Immunobioengineering and Cellular Therapy (Moderator: Keyue Shen)	Shearwater Ballroom
10:30 AM	*Momentum Award* Introduction to Momentum Award: *10:30* **Adam Engler** Decoding Antigen-Specific T Cells: From High-Dimensional Profiling to Biophysics to Therapeutic Development: *10:35* **Ning Jenny Jiang (UPenn)**	Shearwater Ballroom
11:00 AM	*Short Talk* Reprogramming T cells in inhibitory tumor microenvironment with TGFβ redirectors for improved ultrasound controllable CAR-T therapy **Longwei Liu (USC)**	Shearwater Ballroom
11:15 AM	*Short Talk* Synthetic mechanoreceptors derived from clinical anti-tau immunotherapies for regulated gene therapies against neurodegeneration **Jonathan Brunger (Vanderbilt)**	Shearwater Ballroom
11:30 AM	*Closing Remarks and Poster Awards* Ngan F. Huang and Keyue Shen	Shearwater Ballroom
11:45 AM	Meeting Adjourned	

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Your journey begins here.

Since our early roots as an option within electrical engineering in 1963, we have maintained a longstanding tradition of advancing biomedicine through the development and application of novel engineering ideas. Our department, established in 1976, includes over 75 primary and affiliated faculty members that conduct cutting-edge research in a wide variety of areas.. A wide variety of areas, including biomedical devices & imaging, cellular & molecular bioengineering, mathematical/computational biosystems, and neuroengineering.

In 2022, the Alfred E. Mann Foundation for Biomedical Engineering made a generous contribution of $35 million, one of the largest donations to a biomedical engineering department in the United States. This funding will support the expansion of medical engineering research, help recruit leading faculty, and enhance collaboration with the Keck School of Medicine at USC.

The department boasts several renowned research centers, such as the Biomedical Simulations Resource and the Medical Ultrasonic Transducer Technology Research Center, both funded by the NIH, along with the Dr. Allen and Charlotte Ginsburg Institute for Biomedical Therapeutics. It is also linked to the Wallace H. Coulter Foundation's Translational Research Partnership Program and collaborates closely with the Alfred E. Mann Institute for Biomedical Engineering. The faculty are active members of various prestigious centers at USC, reflecting the department's strong research funding and its reputation as a leader in translational and entrepreneurial biomedical engineering. Notable faculty members include innovators recognized by MIT Technology Review and several members of esteemed national academies.

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https://bme.usc.edu/

2025 BMES CMBE Conference (Jan 3-6, 2025)

Poster Session 1

Date	Poster #	Authors	Title	Abstract #
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Fri Jan 3	1-2	Bo Zhang and Song Li	A Polyphenol-Network-Mediated Coating Modulates Inflammation and Vascular Healing on Vascular Stents	48
Fri Jan 3	1-3	Yifan Dai	Biomolecular condensates can function as inherent catalysts	57
Fri Jan 3	1-4	Abhinavya Ambati and Rama Valupadasu	BREAST CANCER PREDICTION USING VISION TRANSFORMERS	89
Fri Jan 3	1-5	Robert Tranquillo	Cell contact guidance via sensing anisotropy of network mechanical	13
Fri Jan 3	1-6	Hye-min Park, Jeong Hun Park, Scott J. Hollister and	Comparative Analysis of 3D-Printing for Patient-Specific Implants	25
Fri Jan 3	1-7	Gisselle Gonzalez, Erin LaMontagne, Thomas Molley, Alyssa R. Holman and Adam Engler	Conductive Microfibers Improve Stem Cell-Derived Cardiac Spheroid Maturation	198
Fri Jan 3	1-8	Mahsa Dabagh, Kianoush Falahkheirkhah and Rohit	Correlation between stresses and malignancy stage of a patient-specific	3
Fri Jan 3	1-9	Yerbol Tagay, Alexis Manning, Chynna Smith, Jian Wang, Nikolay Dokholyan, Rakesh Singh, Sami Alawadhi, Dimitrios Vavylonis, Alexander Zhovmer, Denis Tsygankov, Alexander Cartagena-Rivera and Erdem	Cracking the Code of Nuclear Rigidity: New Frontiers in Cell Migration and Therapy	65
Fri Jan 3	1-10	Abdu-Salam Owodunni and Adewale Adeyemo	Development and Simulation of AI-Integrated Modular Biopharmaceutical Manufacturing for Sustainable Cell Culture Production	185
Fri Jan 3	1-11	Jacqueline Garcia, Yun Weng and Tammy T. Chang	Differentiation of pluripotent stem cell-derived liver organoids in	119
Fri Jan 3	1-12	Sydnee Sicherer, Jasmine Guliani, Sandra Raju, Yash Parikh, Cassandra Martin, Jessi Pridmore, Katherine Coombs and Jonathan Grasman	Effect of ECM Composition on Force Production and Alignment of Muscle Mimetics	86
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Fri Jan 3	1-15	Audrey Todd, Sung-Won Kim, Ni Su, Tayne Kim and Fan Yang	Enhancing Bone Regeneration in Aging Using Stem Cell Membrane-Coated Microribbon Scaffolds	66
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Poster Session 2

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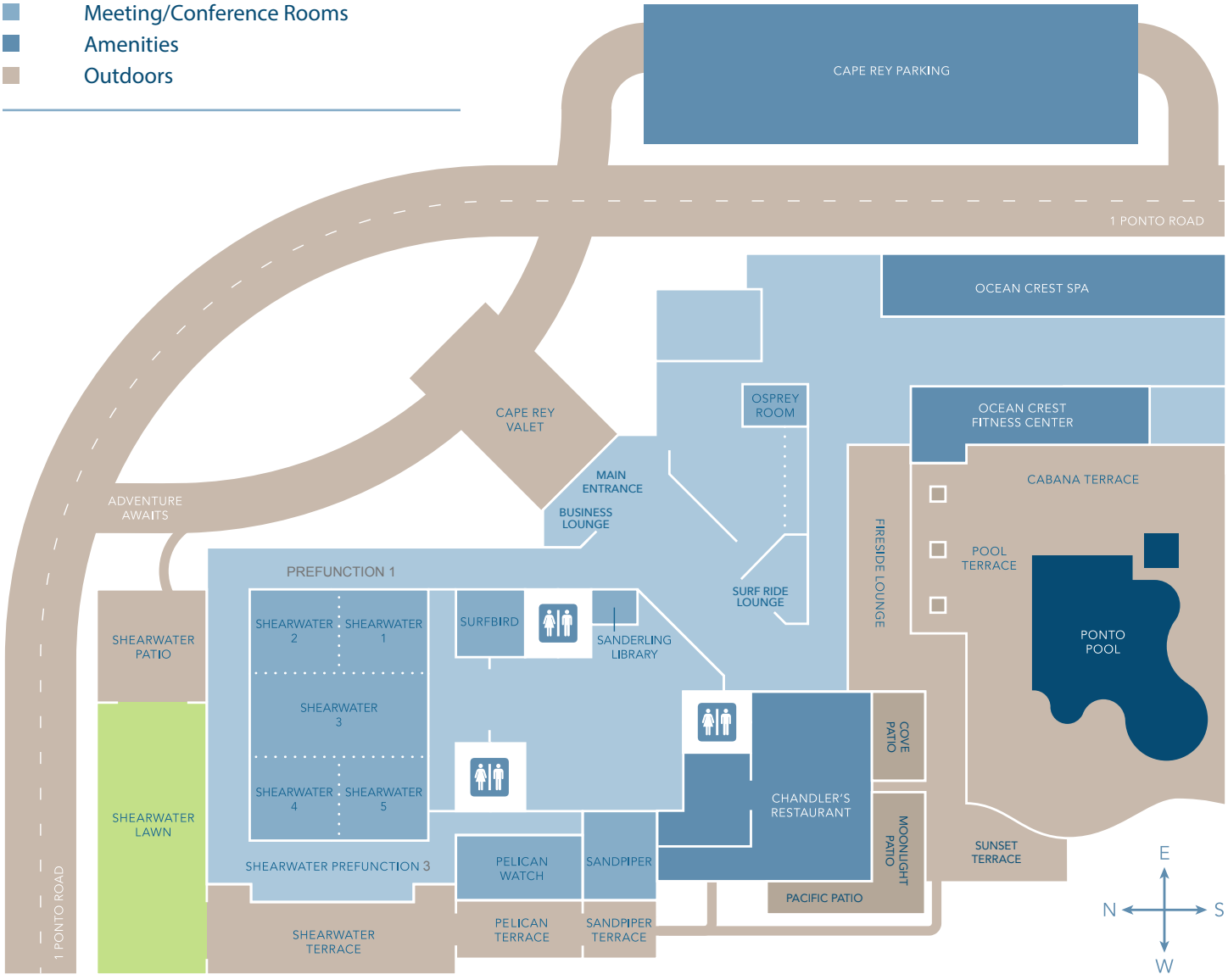

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