

**Title****The Neuroscience of Extraordinary Places: Examining Machu Picchu and the Great Wall of China****Mike Torrey<sup>4</sup> & Eve A. Edelstein<sup>1 2 3</sup>**<sup>1</sup> Calit2, University of California San Diego,<sup>2</sup> Innovative Design Science<sup>3</sup> NewSchool of Architecture & Design<sup>4</sup> Mike Torrey Photography**Corresponding Author:**Dr. Eve A. Edelstein  
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[REDACTED]**See Bios of presenters on the following pages****Abstract**

A neuroscientist in collaboration with a professional architectural photographer will explore how the *rigor and scale* of the scientific method and research may provide insights about the human response to extraordinary built environments. Can science really explain the relationship between form and delight? Can neuroscience add *grit and grain* to our understanding of the human experience of place? Integrating diverse disciplinary perspectives, photographic imagery of two architectural 'Wonders of the World', Machu Picchu and the Great Wall of China, will be used to consider how brain processes may influence our reaction to such extraordinary design.

The photographer's perspective will reveal the value of capturing light, depth, and form to convey the exquisite interaction between people, architecture and nature, and the process of recreating this experience of space in 2D photographs in order to capture built form as it evokes and inspires awe.

Neuroscientific studies that reveal visual attention to built form, architectural features, proportions, and perspectives will be described. Reviews will include data from the AIA College of Fellows Latrobe experiment on the human perception of color and light on brainwave independent components and a highly significant influence of color and light intensity on heart rate reactivity ( $p < 0.001$ ) (Edelstein et al. 2008), the cardiac and autonomic nervous system's response to environmental stressors and conditions (Thayer et al. 2010), along with recent studies of the biophilic desire for natural settings, and the influence of movement on spatial cognition (Edelstein et al. 2012). Recently developed technologies will be described that may be used to assess visual attention to evocative designs, while synchronously measuring brain and body responses. (Zhang et al. 2010).

Ultimately, scientific research that reveals sensory, motor, and cognitive reactions to built features may contribute to ANFA's mission to inspire and inform neuro-architectural hypotheses, and generate principles of design to enhance the spirituality of built spaces and our understanding of the relationship between form, function and delight.

**Presenters: Biographies & Contact Information****Mike Torrey**Mike Torrey Photography  
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Mike Torrey has spent his entire career actively involved with the built environment; first as an energy consultant working on the functional aspects of buildings, and then as an award winning architectural photographer. In 2006, Mike's image of the famed Bonaventure Hotel in Los Angeles was recognized by the American Institute of Architects at its annual convention. Today, his list of clients includes major hotels, architectural firms and corporations. Previously, he was an adjunct professor at the NewSchool of Architecture and Design where he taught photography to architecture students. Mike is the author of *Stone Offerings: Machu Picchu's Terraces of Enlightenment*, a coffee table photography book and winner of the 2010 Benjamin Franklin Award for Best Arts book. Mike has presented his Machu Picchu program to audiences across the country including the Smithsonian Institution, Library of Congress, Bowers Museum and Museum of Photographic Arts. He is currently a steering committee member for the Friends of San Diego Architecture which presents a lecture series on the built environment. Mike holds a Bachelor of Science degree from San Diego State University and a Masters of Business Administration degree from the University of San Diego.

**Eve Edelstein, MArch, MS, PhD, EDAC, Assoc AIA, F-AAA**



Dr. Eve Edelstein is a Fellow of the American Academy of Audiology and has degrees from the Institute of Neurology (Ph.D. University College London, UK), neurophysiology (M.S. Neuro-communications), Architecture (M.Arch. NewSchool of Architecture & Design) and Anthropology (B.A. University California Berkeley). Eve is a research fellow with the Academy of Neuroscience for Architecture, research specialist at the California Institute for Telecommunications and Information Technology (Calit2) University California, San Diego, President of Innovative Design Science a research-based design consultancy, and is faculty at the NewSchool of Architecture & Design where she teaches Neuroscience for Architecture, Immersive 4D Design, Research in Design, and Thesis Design Studios. Current coursework explores how the biomedical sciences and emerging sensors and virtual technologies can be harnessed to evaluate the dynamic relationship between buildings and their users. Directed studies include virtual mockups of the Salk Institute, UCSD Jacobs Medical Tower & Radiology rooms, and immersive experience of Phase II of the Rady School of Management by EllerbeBecket and HMC Architects.

Edelstein's background in research and clinical service at the National Hospital for Neurology & Neurosurgery, London UK, the Harvard/MIT Hearing Sciences Lab, Boston, the US Naval Medical Center, San Diego and State of California Department of Health developed and applied electrophysiologic (EEG) techniques to measure auditory (OAE & ABR), vestibular and electro-oculography (EOG) responses in laboratory and clinical studies in adults, infants and newborns.

Edelstein currently collaborates with Virtual and Sonic teams at Calit2 to develop systems and sound-scenes in the CAVE to explore how design may reduce human error, and improve provider and user performance and outcomes. Research tests architectural conditions associated with 'look-alike-sound-alike' medication errors using virtual reality CAVE mockups. Studies with the Calit2 'neuroarchitecture' team have explored spatial cognition and wayfinding using synchronous EEG and 4D-EOG algorithms in novel interactive and immersive real-time 4D rendering software (CAVE-CAD). As president of Innovative Design Science, Edelstein's projects include innovative technology ideation, planning, programming and design development for UCSD Health Systems, a 1 million square foot mental health and academic medical center for the Canadian Health Ministry with Zeidler architects. In her previous role as Senior Vice President Research in Design at HMC Architects, Edelstein contributed to an AIA International award-winning project outlining evidence-based design guidelines for a 2.4million square foot hospital campus and design development for a school serving children with autism, developmental delay, and motor disabilities.

As Principal Investigator for the AIA College of Fellows Latrobe Research project on Evidence-Based Design in Practice, rigorous studies of circadian light and health measured heart rate variability and independent component analysis (ICA) of EEG, with translation into design implications for all architectural environments. For the AIA Academy of Architecture for Health Foundation and the Center for Health Design, Edelstein contributes to literature studies and knowledgebase development. Dr. Edelstein is on the Editorial Board of the Health Environments Research & Design Journal, the board of the International Academy for Health & Design, the AIA Technology in Architectural Practice Research Committee, is a juror for research design awards at World Congress for Health Design and the Healthcare Design Conference. Dr. Edelstein lectures internationally and has presented to the AIA Large Firm Round Table, the California Energy Commission Special Symposium on Light and Health, and the AIA Knowledge Leadership Committee. Edelstein's scholarly contributions in peer reviewed book chapters include the *'Sustainable Environmental Design in Architecture: Impacts on Health'* (Ed. Univ. Cambridge) and the 'Introduction to Evidence-based design in Healthcare' (Center for Health Design); peer reviewed journal articles for the International Conference of the IEEE Engineering in Medicine and Biology Society, the Transregional Collaborative Research Center on Spatial Cognition, and the *'Health Environments Research & Design Journal'*. Media features include contributions to the Architect, New York Times, Scientific American Mind, PBS and BBC specials.