fMRI Study of Architecturally-Induced Contemplative States

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\textit{NOTE: for more info on the authors, see attached sheet}

This presentation reports on an interdisciplinary investigation testing whether the perception of environments designed for contemplation elicit brain activations similar to those found under contemplative states. If architecture is shown to be an effective ‘external method’ to facilitate contemplation, then the beneficial effects of internally-driven contemplative practices (e.g., prayer, meditation) shown by recent neuroscience research could be extended to exposure to architectures designed for that purpose. Our long-term goal is to investigate cognitive, emotional, and health effects of contemplative/sacred architecture on the wider population.

In order to test the hypothesis that buildings designed for contemplation elicit neuro-signatures associated with meditative states, we devised a pilot project combining a \textit{functional Magnetic Resonance Imaging} (fMRI) based experiment and current neuroscience literature on the meditative states. We recruited 13 architects and asked them to view images of ordinary buildings (‘Control’ Block) and contemplation-inducing (‘Experimental’ Block) edifices while their brains were being scanned. A building was depicted through 4 images at 20 seconds each (totaling 80 sec) separated from the next set by a 40 sec recovery period (gray plate). Each Block started with a Baseline period in which a gray color plate was presented for 60 sec. There was a short questionnaire after each Block and a 20-minute Exit Interview.

Briefly, we found that: (1) \textit{Brain regions activated in subjects with architecture expertise when viewing contemplative buildings overlap} with brain regions activated in adept meditators during meditation (with some differences); (2) \textit{Markedly distinct} neural activations occur when subjects experienced ordinary vs. contemplation-inducing buildings; and (3) \textit{There are correlations between subject-reported anxiety, depth of experience and brain physiology attributable to the induced contemplation}. In short, our fMRI study supports the hypothesis that specially designed buildings may induce phenomenologies similar to those under contemplation. Here are some details:

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We hope that this research effort (1) extends our understanding of alternative means to foster contemplation at an individual and collective scale; (2) opens new avenues of investigation in neuroscience; (3) advances the scientific examination of architecture (sacred and otherwise); and (4) provides an empirical foundation for the effects of centuries’ old architectural traditions on human phenomenology.
Julio Bermudez, Ph.D., Associate AIA, is a tenured Associate Professor at the Catholic University of America School of Architecture and Planning where he directs the Cultural Studies and Sacred Space graduate concentration program. He holds a Bachelor of Architecture from Catholic University in Argentina (1982), a Master's in Architecture (1990) and a Ph.D. in Education (1994) degrees from the University of Minnesota. Prior to joining CUA, Bermudez was a tenured faculty at the University of Utah, Salt Lake City. Bermudez’s research focuses in the study of architectural phenomenology and the relationship between architecture, culture and spirituality. He has lectured, led symposia, and published articles in these areas nationally and internationally. Current projects include a fMRI study of architecturally induced contemplative states at the Utah Brain Institute, the analysis of results from a massive survey on profound experiences of place, and work on a book on the architectural extraordinary. Bermudez co-founded the Forum for Architecture, Culture and Spirituality in 2007, an international group dedicated to the investigation of the interactions between buildings, social customs/beliefs, and spirituality. Prior to this work, Dr. Bermudez pioneered the application of architectural concepts and methods to the interdisciplinary design of data environments. This 10 year long effort attracted over $4.5M in funding, and generated an extensive number of lectures, performances, workshops, and publications in the U.S. and abroad. This work also produced several patents, commercialization contracts, and spin-off companies. Professor Bermudez has received several national and international recognitions including the 1998 AIA Education Honors Award, the 2004-05 ACSA Creative Achievement Award, the 2005 Premio Trayectoria Creativa Arturo Montagu (conferred by SIGraDI, Latin America), the 2007 Premio Trayectoria Creativa Arturo Montagu (conferred by CONACyT, Mexico), and the 2007 Premio Trayectoria Creativa Arturo Montagu (conferred by ACANDE, Canada).

David Krizaj, Ph.D. is an Associate Professor at the Department of Ophthalmology and Visual Sciences and the Department of Physiology, at the University of Utah School of Medicine. He is also the Deputy Director of Research at the University of Utah John Moran Eye Center. Dr. Krizaj’s expertise is on visual neuroscience and physiology. He has published in these areas extensively and is currently directing two projects: Regulation of Neurotransmission in the Retina (supported by the NIH/NEI) and Specifics of Sight Limitations (supported by the Foundation Fighting Blindness). Dr. Krizaj has a BS in Animal Physiology and Molecular Biology from the University of Ljubljana in Slovenia (1986), a PhD in Physiology and Biophysics from New York University in New York city (1994) and a Postdoc on Neurobiology from the University of California-San Francisco (1997).

David Lipschitz, Ph.D. is a Post-doctoral Research Associate in the Department of Anesthesiology’s Pain Research Center at the University of Utah. His areas of specialty are neuroendocrinology and sensory neuroscience. He is presently supporting several research projects in these areas. Dr. Lipschitz’s record include many peer-reviewed publications, experimental design, research logistics support, etc. He holds a BS in Zoology and Genetics (1983), a M.S. (1988) and a PhD in Zoology (1994) from the University of Witwatersrand in Johannesburg, South Africa.

Deborah Yurgelun-Todd, Ph.D., is the Director of the Cognitive Neuroimaging Laboratory at the University of Utah School of Medicine and the Associate Director of the MIRECC (Mental Illness Research, Education, and Clinical Centers) in the VA Health Care System in Salt Lake City, UT. Her area of expertise is MR imaging methods, and emotional and cognitive processing. She has received many awards and recognitions and her publication record includes over 240 articles. Dr. Yurgelun-Todd is a national leader in using Neuroimaging to study complex human responses. She holds a M.A in Psychology (1986) and a PhD in Neuropsychology (1988) from Harvard University. She was an Associate Professor of Psychiatry at Harvard Medical School before joining the University of Utah.

Yoshio Nakamura, Ph.D., is an Assistant Research Professor at University of Utah Department of Anesthesiology and Director of the Utah Center for Exploring Mind-Body Interactions. His expertise is on mind-body research and cognitive neuroscience, areas in which he has published widely. Dr. Nakamura is currently investigating the Clinical Benefits of a Novel Sleep-Focused, Mind-Body Program on Gulf War Illness Symptoms (supported by the DoD/CDMRP). Dr. Nakamura holds a B.A in Psychology from the University of California-Santa Cruz (1983), a PhD in Cognitive Psychology from the University of California-San Diego (1989) and a Postdoc on Emotion Theory and Research from the University of Wisconsin-Madison (1992).