



# UC Santa Barbara CENTER FOR BIOENGINEERING

bioengineering.ucsb.edu



## Current Topics in Bioengineering Career Talk

Thursday, May 4, 2017

Elings 1601

2:00 - 3:00 pm

Allosphere Tour for Attendees to follow the seminar

*Allosphere tours may exceed the 3pm typical seminar time*

*\*Light refreshments will be provided\**

RSVP at: <https://csep.cnsi.ucsb.edu/forms/PDS/Registration.php>



### JoAnn Kuchera-Morin, Ph.D.

Professor, Media Arts & Technology and Music  
Media Arts & Technology Graduate Program

### Using the Creative Process as a Computational Framework for Unfolding Complex Systems

In my research one picture is worth approximately 60 million numbers. How can one find patterns in complex information and work with the information creatively and intuitively leading to new and unique innovation? Visualization of a complex system is not the end goal. It is the beginning of the representation of immersive, interactive, data, mathematical information that can then be transformed through experimentation and simulation on the proper computational platform. A mathematical/computational language that can parse a complex system, encompassing the physics, chemistry, and biology of that system, through visual/aural frequency representation and transformation. By applying the creative compositional process of sketching in building our computational language and representing very complex information through our senses, namely visual and audio representations, we are enabling the same right brain/left brain process that artists experience when they create a work of art, for scientists and other researchers. This will facilitate the uncovering of new patterns in complex information, and allow scientists and engineers to work with their information perceptually and intuitively.

In working with our instrument and open source software, we do scientific visualization and virtual, interactive experimentation of complex data. We work with real data from instruments, simulations, and mathematical models. The AlloSphere is a large immersive instrument designed for this research by myself, composer, JoAnn Kuchera Morin and constitutes 32 years of my research in media systems design. Our open source software facilitates the combination of diverse types of information in order to conduct holistic virtual experiments. We can incorporate physics, mathematics, chemistry and biological information, both real spatio-temporal data as well as information visualization regarding this data.

Currently we have designed and implemented the data discovery-rendering cluster and we are moving toward tying in high performance computing for simulations as well. Our open source software is modular and we are currently nearing full support of Paraview and other standard data visualization tools. Specific areas of research that we focus on but are not limited to: 1) Materials research, 2) Physics research, 3) Bio-generative research. These specific areas above tie directly into the CNSI. We also do research that can include climate change, clean green technology, biological eco-systems, virtual reality, arts and entertainment research are important in pushing the real-time interactive platform. The instrument is particularly suited for simulated instrument design that will facilitate the fabrication of new devices.

**Allosphere:** The AlloSphere is a 3-story tall audio and visual immersive instrument and laboratory that allows one to literally step inside a representation of experimental data. Approximately 20 researchers can be immersed in their data performing analysis as well as synthesis on a data set. Researchers enter a near-to-anechoic room containing a custom-built close-to-spherical screen, ten meters in diameter. The sphere environment integrates visual, sonic, sensory, and interactive components, 26 immersive projectors connected to a 14-compute rendering cluster, 54.1 channels of sound, with multi-user interactivity. Use of the laboratory requires collaborative research funding partnerships through grants and gifts as well as industrial affiliations.