First, can you provide an overview of the AlloSphere project? What role have you played in this grand venture?

I created the AlloSphere project and instrument. It is the culmination of 28 years of my research in media language/systems design. From my background as a composer and a media systems researcher, the language and instrument have been designed based on the creative process of musical composition and ensemble performance. Think of the AlloSphere as a large immersive scientific, artistic instrument, in which researchers – typically an interdisciplinary team of artists, scientists and engineers – work together data mining very large and/or complex information.

How have you achieved holistic rethinking in aspects of the creative medium, such as data process, perception, interaction, immersion and evaluation?

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 that you can interact with – 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, the way that artists do.

We can represent any information as visual and audio frequencies by mapping their vibratory spectrum into the light and sound domain. This is well understood by mapping heat through infrared light. For instance, when atoms vibrate they create waveforms that behave as sound waves. Scaling these down into the audio domain will allow us to use our hearing to understand their complex behaviour. We are thus finding patterns in this complex information that may lead to new scientific discoveries as well as creating new and unique art forms.

'Big data' is becoming a hot topic among researchers. Could you explain what it means to your project?

We believe that one of the most difficult tasks of understanding big data is the ability to quickly find new patterns in voluminous amounts of information and to retain the information from pages and pages of numbers in one’s memory. If there is a way to translate this information into tangible visual and audio taxonomies, we may be able to retain this information much more readily.

In what way do mathematical algorithms inform visual and sonic representations within the AlloSphere?

Information can be represented through mathematical models which can be translated into visual and aural frequencies. These mappings can be very literal when one is mapping scientific information. They become more abstract with data such as financial information, social networks and economic data. For example, with scientific data, such as atoms and sub atomic particles, they vibrate at frequencies outside of the visual and audio domain. Through a mathematical transformation, they can be scaled down into the sense domain where they can be perceived, the
A new way to understand scientific data

For the past 13 years, researchers at the University of California, Santa Barbara, have been developing the AlloSphere – a large-scale laboratory that intersects science, engineering and new media

THE ABILITY TO explore data in a multi-dimensional format, with rich visualisations and sounds, has been a scientific pipedream for many years. Imagine a place where scientists could use their senses to study data and understand it at a perceptual level, as if shrunken down, coming face to face with their research. Such insights are considered crucial for advancements in certain areas of science and engineering, and since 1997, a group of digital media researchers at the University of California, Santa Barbara (UCSB) has been developing a holistic field that brings these industries together through discoveries in new media; an intersection of arts, science, engineering and the creative process.

These discoveries have given birth to a new kind of immersive laboratory, which allows for the visual and aural representation of mathematical and scientific data. Increasingly, scientific challenges that have traditionally been tackled analytically, are now being approached computationally, with the answers represented visually.

At its most fundamental level, the AlloSphere, is a digital microscope powered by a supercomputer: a 30-foot diameter ball, set within a three-storey, echoless cube, which offers researchers an opportunity to synthesise, manipulate and analyse large datasets and so called ‘big data’ in a virtual reality environment; one that can be interacted with on a sensorial level. Aside from visualisation, the AlloSphere facilitates various channels of inquiry, including numerical simulations, data mining, abstract data representations, systems integration and human perception.

Leading the project is the AlloSphere’s conceiver, Professor JoAnn Kuchera-Morin, who designed it as a visual and aural limiting multimedia device for both artistic and scientific endeavour. The Allosphere’s original purpose was to provide an intersection, where researchers from different fields could share insight and collaboratively explore phenomena such as symmetry, beauty and pattern formation. The project is unique in its grounding in both science and art (without being bound to either one), urging a holistic revision of certain components of the creative medium, including data, process, perception, interaction, immersion and evaluation.

INTEGRATION, DESIGN AND THE ALLOBRAIN

The collaborative research team is highly multidisciplinary and represents media arts, science and engineering. Each team member performs a specific function, as Kuchera-Morin explains: “The media artist, who knows how to represent very complex and abstract information visually and sonically in time and space, works closely with the domain researcher, who understands what is important in their information. Working together they make decisions on how the data will be mapped, with the domain researcher highlighting the most important characteristics of the data that is unfolding spatially and in the time dimension, and the media artist choosing the proper display techniques to represent the data’s salient characteristics”. Therefore, by representing data through the senses, the media artist is channeling a new intuitive language, which can then be utilised by the scientist to perceive information, using the same visual and aural information that the artist uses to ‘create’. This innovative language will enable scientists to more readily find patterns in their data, as well as allow artists to make ‘truthful’ and fascinating works of art. Indeed, one of the project’s key goals is to uncover new worlds through simulations and visualisations; encouraging the concept of ‘beauty as truth’.

The AlloSphere’s multimodality consists of visual, audio and interactive components. 12 projectors
Kuchera-Morin elucidates. Fantastic as it may seem, the study will lead to the development of several key applications, including new information technology systems, ranging from full surround platforms to mobile devices; interactive visual and audio displays; and human computer interaction systems featuring haptics and other senses.

But the potentiality of applications does not stop there. In terms of content, application is relevant to medical technologies, particularly in the fields of biomedicine, telemedicine, remote diagnostics and therapy, and targeted nanomedicine for treating cancer as well as other illnesses. It is also relevant new materials for IT systems, energy efficient materials and smart clothing. Furthermore, it could be integrated into the field of arts and entertainment, for example in immersive cinemas and computer games, as well as 3D content and interaction.

The research at UCSB is turning computation into an interactive multimodal instrument

The dual focus of the project is leading to groundbreaking developments in media design, firstly through integrated media systems, and secondly through multimodal representations of complex scientific and abstract information (as well as the creation of new art forms based on this information). Kuchera-Morin sees a future that is fully immersed with the technology: “As we scale the AlloSphere instrument and the computational language to distributed media platforms moving to embedded systems, I see the technology moving to wearable computing LED wallpaper – the AlloSphere in the palm of your hand with eye glass devices, like sunglasses, and the computer in your pocket or embedded in the sleeve of your shirt. The virtual and the material will be totally integrated into a seamless space”. The implication is not only an ability to pluck virtual information from the ether, using only our senses to compute, but a better understanding of such areas as quantum information, the subatomic and the human genome.