



COMPUTATIONAL MUSEOLOGY: FUTURES FOR ARCHIVES

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The ideas I will discuss today explore the work of the laboratory for experimental museology at EPFL. It is a transdisciplinary initiative at the intersection of cultural heritage, imaging technologies, immersive visualisation, visual analytics and digital aesthetics. eM+ engages in research from scientific, artistic and humanistic perspectives and promotes a post-cinematic multisensory engagement using experimental platforms. Our research explores the ways in which mechanistic descriptions of database logic can be replaced and computation can become ‘experiential, spatial and materialized; embedded and embodied’, a landscapes for the senses. I propose the title for this talk of ‘computational museology’ a framework that unites, for example, machine intelligence with data curation, and ontology with visualization.

Computational museology contends with the gap of a common lexicon between the humanities and computer science. Taking a systems thinking approach, theorists have proposed that museums should operate as open, dynamic, and learning systems as opposed to closed, stagnant, and status quo systems that are compartmentalized and hierarchical. Systems thinking “emphasize[s] interconnectedness, non-separability, nonlinearity, and polyvocality—from within the museum and without—allow[ing] new modes of interpretive planning to flourish in creating dynamic, inventive, and fresh installations of art”. Within systems thinking, computational museology allows us to conceive ‘whole of environment’ digitization as the basis for new trajectories that link all forms of materiality: performance, objects, knowledge systems, representation and participation. While the implications of such a framework has yet to be fully theorised it is evident that a new paradigm

of materiality is taking shape in museums, which signals a break with Western historiographic orthodoxies of curation and begins to explore new modes of ownership of cultural heritage. encompassing diverse modalities such as distribution through blockchain and the application of GANs with the potential to liberate objects from their art historical and colonial discourses.



For 20 years I've designing interactive frameworks for public engagement with cultural heritage. This work was located initially at Museum Victoria in which I started to build large scale systems and experiences for mass public.

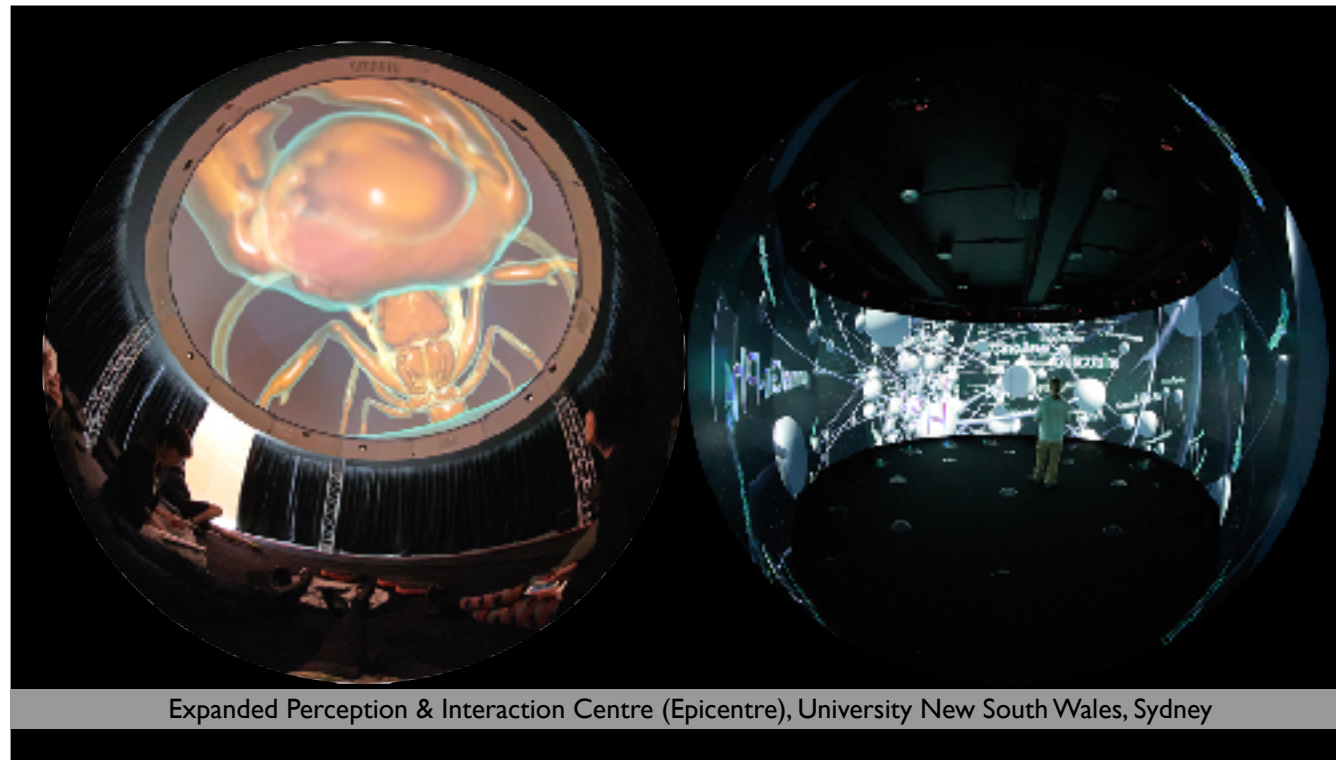


iCinema Research Centre (iCinema), University of New South Wales, Sydney

I then started to work with university to sustain this research and its infrastructure.



Applied Laboratory for Interactive Visualization and Embodiment (ALIVE), City University of Hong Kong



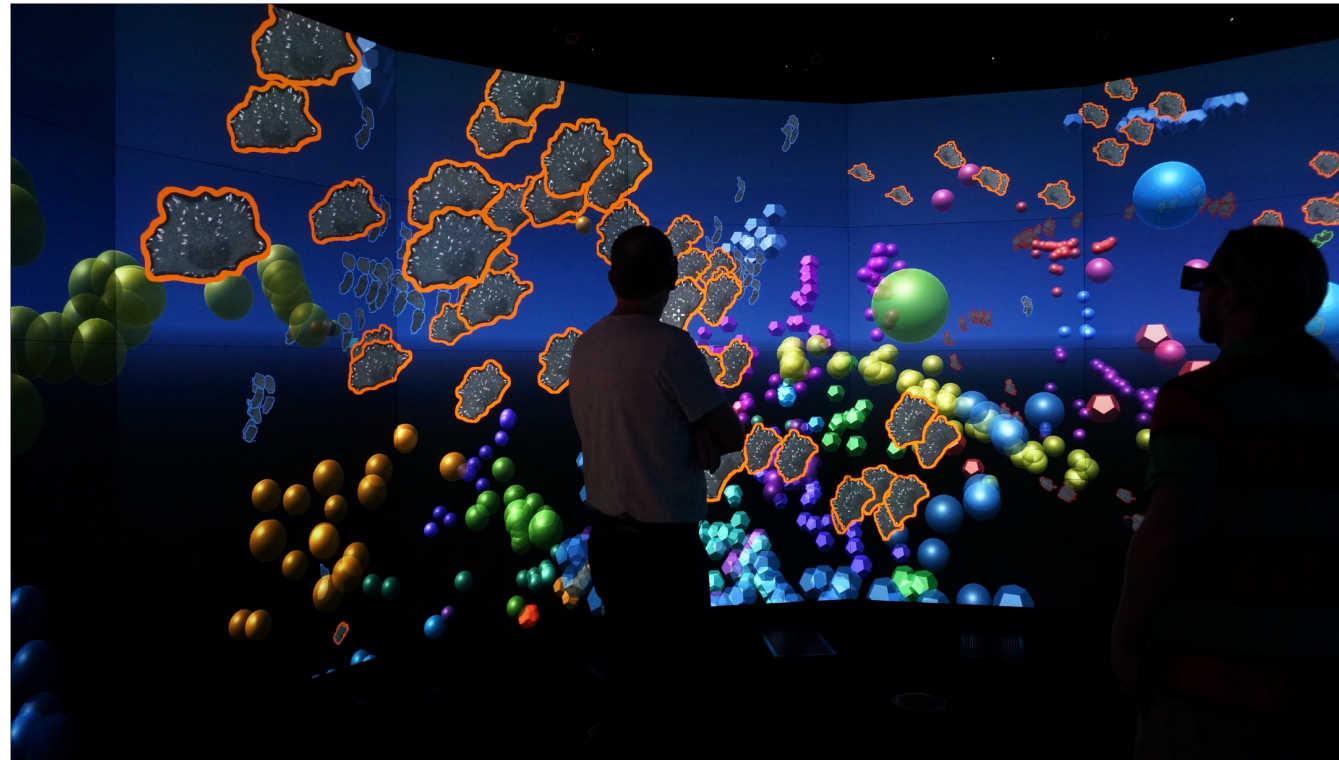
Expanded Perception & Interaction Centre (Epicentre), University New South Wales, Sydney

EXPANDED PERCEPTION & INTERACTION CENTRE (EPICENTRE), UNIVERSITY NEW SOUTH WALES, Sydney where I created the world highest resolution visualisation environment seen here on the right with 56 projectors and 29 computers

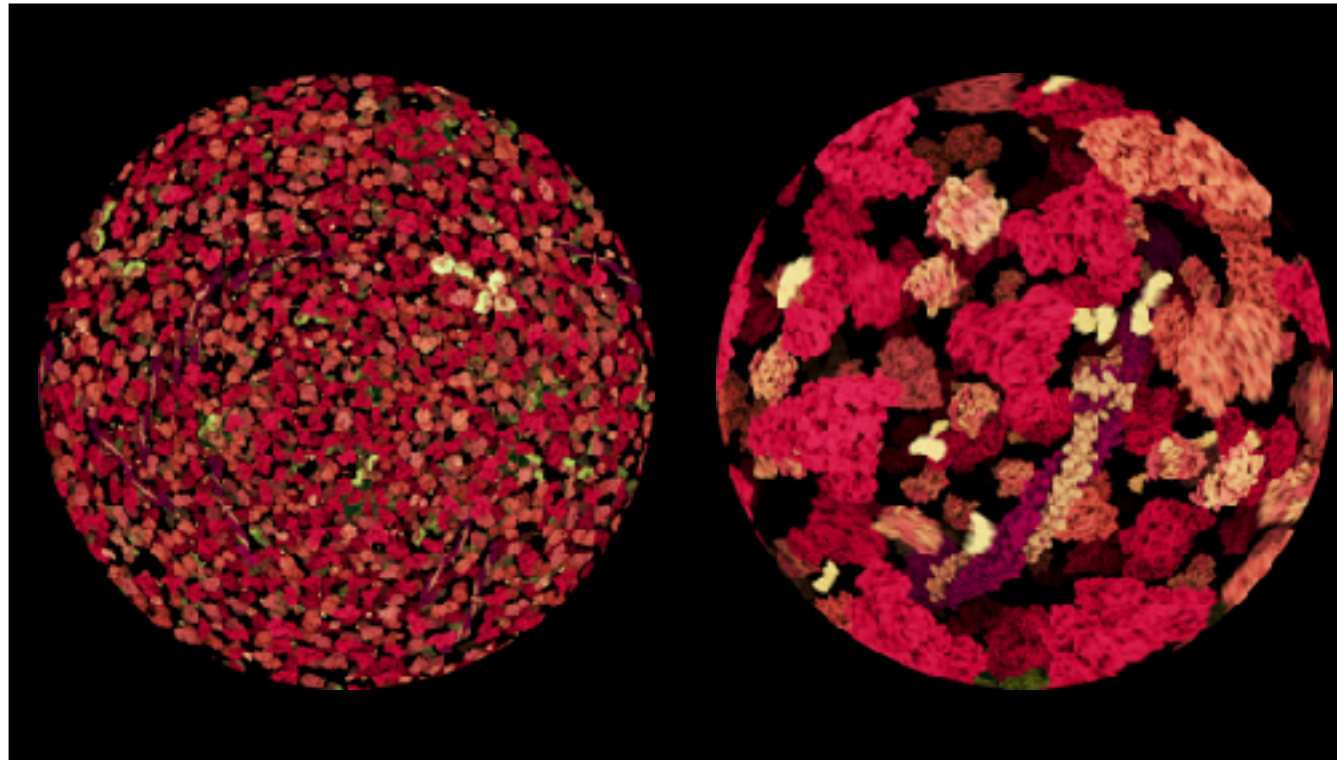
At the edge of human visual acuity the panorama was created to solve visualisation problems for complexity and big data for humanities and sciences.



Examples from the scientific projects; include phoneme network visualisation together with Imperial College London.



And single molecule science, single cell microscopy in which 53 parameters reduced to a 3D space.



And here sequences for a molecular dome visualisation of the proteins found in your blood and the 'common cold' Rhino virus, magnified 1 billion times.



Located in a 1500 sqm space at EPFL in Switzerland, I have conceived eM+ as a new transdisciplinary initiative at the intersection of immersive visualisation technologies and cultural (big) data. These systems offer us strategies for multi-sensory engagement, emphasising human to human as well as human-machine interaction, giving us powerful ways to reformulate narrative in a digital context.



My research harnesses technologies that now have unprecedented abilities to capture the world around us. Laser scanning, for example collects billions of points to represent places, such as the heads at Mount Rushmore scanned by the Scottish Ten.



We can create precious objects in 3D, and then peer inside and see what was previously unseen.



We can also capture art in a way that it lets us zoom in the the tiniest brushstroke, to reveal more than the naked eye can see.



Advances in ML are also an emerging trend of our work. We recently installed the photogrammetric Nefertari's tomb collected in ONLY 8 hours of photography in which ML is used to create a model of billions of points [CLICK]. This model was then transferred to a 360 3D environment of 40 millions pixels, as a world first demonstrator for Unreal Engine's nDisplay technology, synchronised across a powerful 11 PC graphics cluster.



And, we're subjecting our cultural treasures to various bombardment by x-ray fluorescence at the Synchrotron in efforts to reveal the chemical materialities. Here the mercury map of a painting of Henry VIII in the collection of the AGNSW.

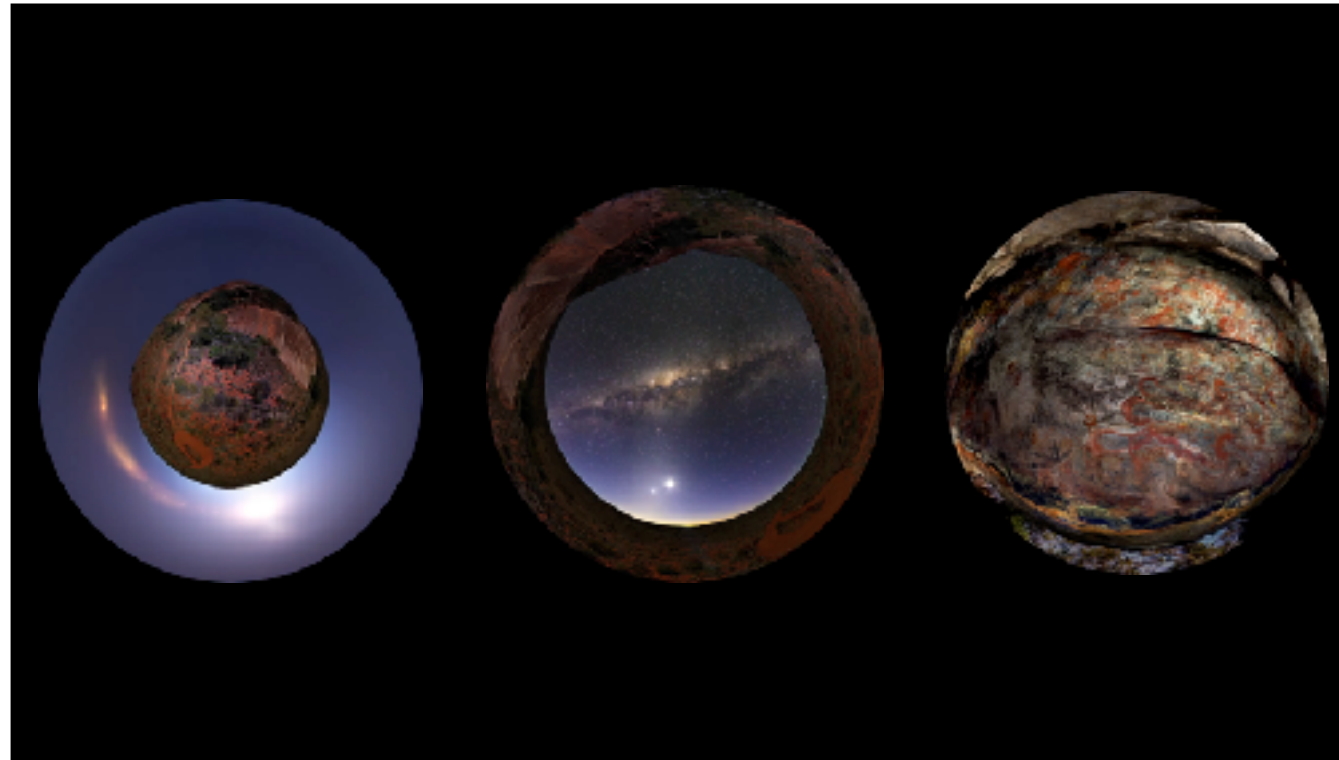


And we are capturing intangible cultural heritage through various forms of motion capture and motion of time analytics.

I will show just briefly two examples.



The first in collaboration with National Museum of Australia, Travelling Kung-karang-kalpa, the Songline of the seven sisters portrays one of the most defining and predominant meta-narratives chronicled in ancient mainland Australia but never told in the public domain until this exhibition. This project was seven years in the making from the day Anangu elder asked for help to put back together their broken songline. A digital dome was used for this project to simultaneously express the sphere of the world around us, the sky above and the ground below, enveloping viewers in depictions of the Seven Sisters as they travel through country. As these creation beings travel, they leave land formations in their wake and the constellations of Pleiades and Orion in the southern night sky. And thus it represents a culturally inclusive depiction of cosmos that should be as valued as the sciences of space.



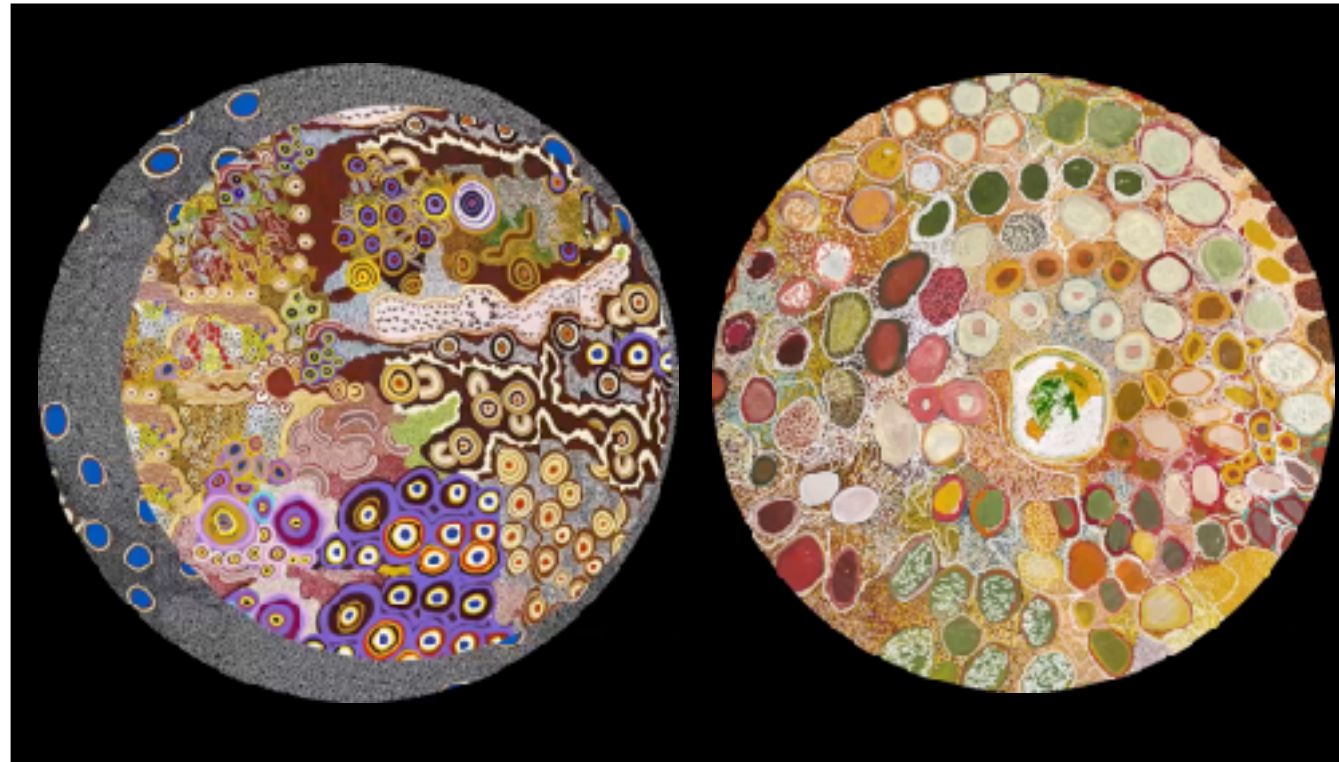
The first work involved photogrammetry of a sacred cave that had never been photographed before, time lapse, drone based panoramas and gigapixel imaging as well as ambisonics, allowing visitors intimate views of the stories contained in its sandstone folds. Archaic dome theatres are typified by the rock art caves found throughout Australia. Theorist Nick Lambert argues that these ancient caves, where etchings and paintings were animated by fire and torch light, represent the beginnings of cinematic imagery and were arguably the first immersive experiences created by humankind. Throughout the ages such arched enclosures have often been used as surfaces upon which to represent “psycho-cosmological constructs” decorated with renderings of “incorporeal archetypes” (McConville 2012, p.69).



The second dome journey immerses visitors in a series of projected artworks made by custodians of the story, and used to tell the story of the Seven Sisters as they travel country and the night sky. In the final scene, three-dimensional models of the extraordinary trussed grass tjandpi figures are seen taking flight, prefiguring their final destination in the constellations.



Each artwork for the dome, was a specific depiction of each part of the narrative.





This is a shot from the opening of this exhibition. It has won every award for museums exhibition possible and is now destined to tour the world. What is most important is the lengthy and complex gestation of 7 years which resulted in a watershed of curatorial and museum relations in Australia.



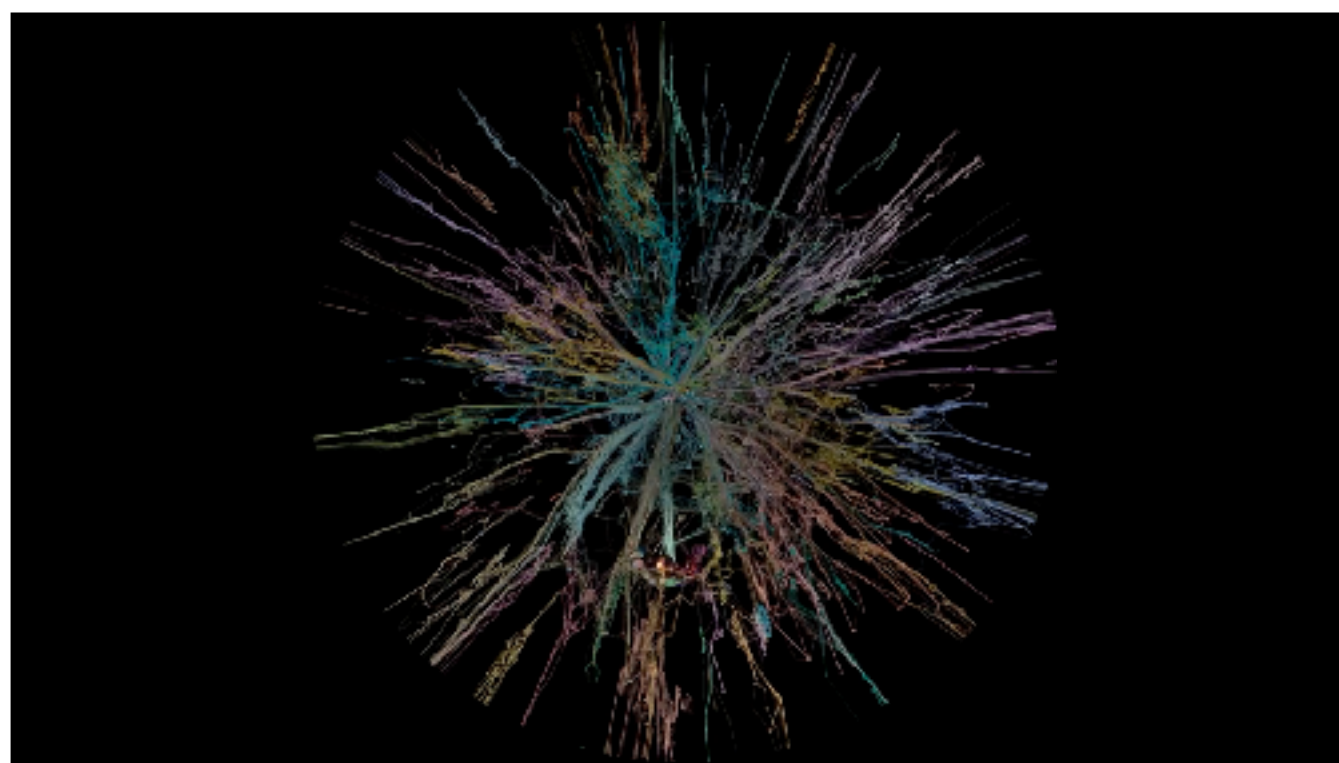
The 2nd example I will share derives from EPFL's seminal Montreux Jazz Archive digitisation project. Jazz Luminaries is based constellations of jazz greats from the archive. The installation cuts, remixes and replays 5400 artists and 13000 videos from the total archive of 11,000 hours of video. The neutral net like image you see here is based on the social network of the artists, and the clustering is based on the numbers of time artists played with other artists. BB King lies at the very centre of the this dense network.



Visitors lie down under the dome and use a spherical interface to navigate this constellation, emulating the hemisphere of the fulldome in which its staged.

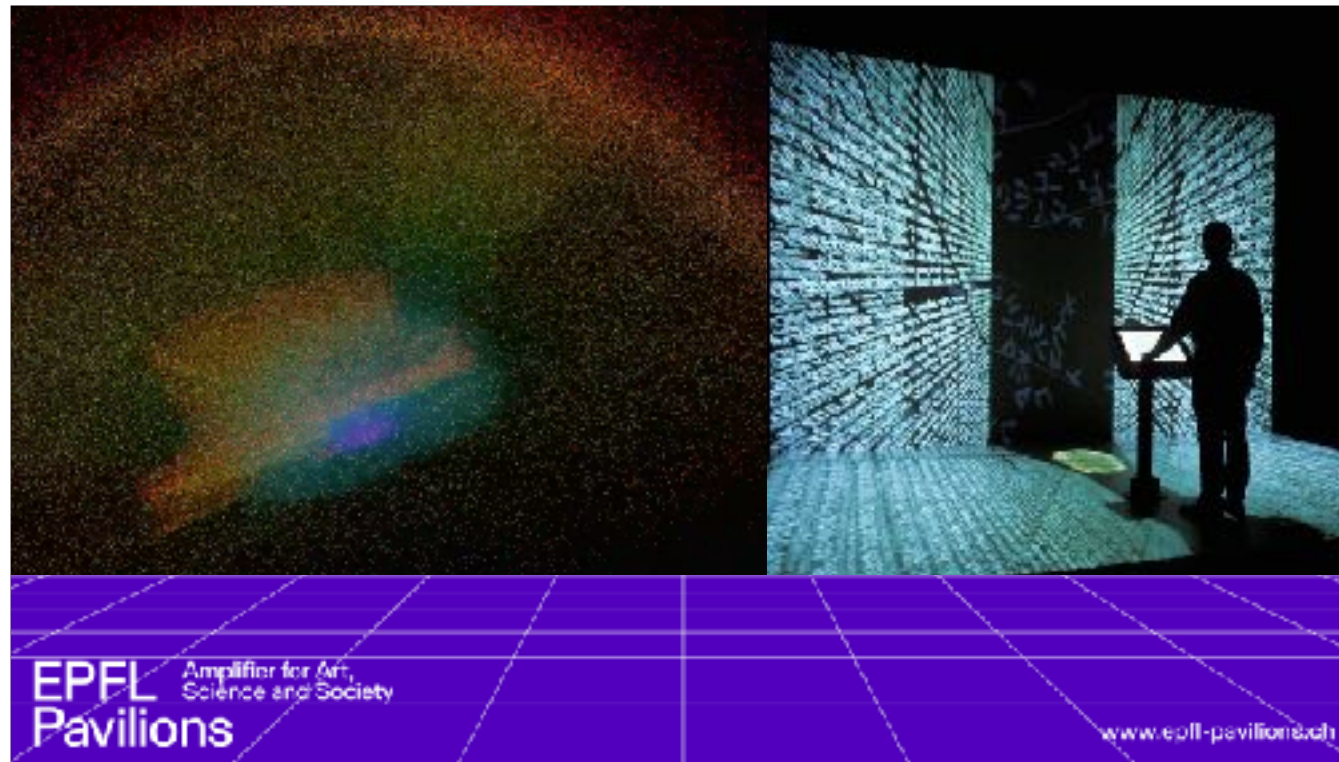


The search paradigm is akin to tuning a radio, search by listening, circumventing the lack of public knowledge into who actually the jazz greats are! hearing what you like drives the design to unfold in 3 layers (sample, all songs, full song).





By way of conclusion I am also the director and curator of EPFL Pavilions with about 2000sqm of exhibition space. This amplifier for art & science in society, blends experimental curatorship and contemporary aesthetics with open science, digital humanism and emerging technologies. In March 2022, we will premiere COSMOS ARCHAEOLOGY: SPACE TIME EXPLORATIONS. In a range of artistically inspired installations and visualizations, a conjoining of art and science, this exhibition will re-conceptualize the wealth of imaging data coming from the Hubble Space Telescope as well as other wide-field ground based telescopes. Various immersive experiences will travel the visitor through space and time, ranging from the Earth's environment, the solar system, exoplanets systems, the nearby stars, the Milky Way disk and the Local Group, up to the outer confines of the Universe. These journeys will allow us to apprehend the hierarchical organization of our universe at different scales and through different optics.



The LASTRO and eM+ collaborate to implement *Immersive Environments for Cosmological Big Data*, exploring the most expansive and complete visualisation of the universe.



The exhibition will also feature, the archive of the personal life and career of Claude Nicollier, within the European Space Agency (ESA) and NASA (National Aeronautics and Space Administration). This archive was digitised by EPFL's CHIC.

The content brings together numerous interviews carried out as part of the production of the documentary 'Destins', including the often unpublished rushes. There are handwritten notes and various publications, press clippings and photographs. These will be reformulated into a spatial temporal browser FOR THE COSMOS ARCHAEOLOGY EXHIBITION, IN A SYSTEM FROM EM+ CALLED the Linear Navigator.



These will be reformulated into a spatial temporal browser, the Linear Navigator.

