

The IPS Data to Dome Initiatives

Mark SubbaRao



Data to Dome

Mark SubbaRao

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Benjamin Rota

Tom Kwasnitschka

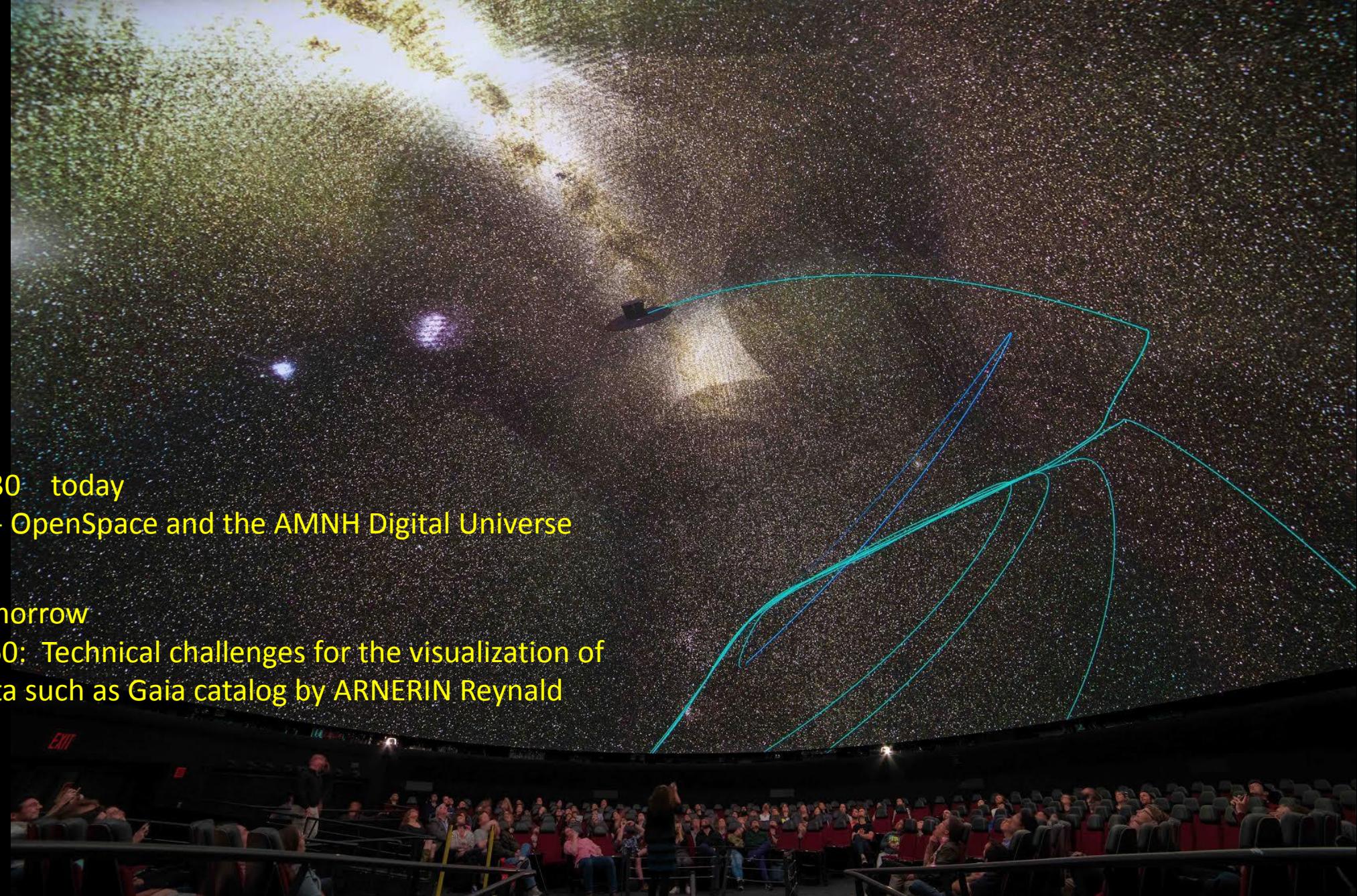
Jaap Vreeling





The mission of the IPS Science and Data Visualization Task Force is to streamline the process of going from data to dome, increasing the potential for **scientific communication** and **storytelling** in the planetarium.

Preparing planetaria for the big data streams
that will come from next generation
telescopes, satellites, experiments and
computational simulations.



17:30 - 18:30 today

Session 29 - OpenSpace and the AMNH Digital Universe

11AM tomorrow

In Session 60: Technical challenges for the visualization of massive data such as Gaia catalog by ARNERIN Reynald

EXIT

11A

Image c/o Jackie Faherty, photograph by Matt Stanley,
octree implementation by Adam Alsegard

900 Million Gaia stars visualized in realtime on New York's Hayden Planetarium using OpenSpace

DATA TO DOME

More in this Section... ▾

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Data to Dome is an initiative or project of the IPS [Science Data & Visualization Task Force](#) to make it easier to visualize scientific data in a planetarium. "Data to Dome" as a broad IPS led initiative should not be confused with "data2dome" which refers to the ESO led data standard that we consider a part of the larger *Data to Dome* vision.

Data to Dome Tutorials, Workshops, Standards and Datasets:

- [IPS Science & Data Visualization Task Force page](#)
- [Science & Data Visualization Task Force 2016 report \(Warsaw\)](#)
- The task force maintains an evolving set of tutorials, workshops, and datasets on techniques for visualizing data. This material can be found on GitHub - <https://github.com/IPSScienceVisualization/>.
- The Science and Data Visualization Task Force began writing columns for *The Planetarian* starting in March 2014:
 - [Planetarian Sep 2014 "Data to Dome: How to acquire and visualize an extragalactic dataset" by Mark SubbaRao](#)
 - [Planetarian Jun 2014 Data to Dome "The ground beneath our feet: Earth sciences in the planetarium" by Tom Kwasnitschka, Ka Chun Yu, Matthew Turk](#)
 - [Planetarian Mar 2014 Data To Dome 3/14 "About Time" by Mark SubbaRao](#)
- [Article in Digistar News](#)

Creating professional development opportunities
aimed at developing more "data savvy"
planetarians.

Data to Dome Workshop

Mar. 2 - 3 , 2017 at NAOJ

©2015 Tomoaki Ishiyama, Hirotaka Nakayama, 4D2U Project, NAOJ

Data to Dome

Invitation from Chair

The International Planetarium Society and the National Astronomical Observatory invite you to participate in the 'Data to Dome' workshop to be held Mar. 2 and 3 on the NAOJ campus in Tokyo Japan. The workshop will bring together

Hosts

Hosts
International Planetarium Society(IPS)
National Astronomical Observatory of
Japan (NAOJ)

Cooperators

Graduate University for Advanced

Organizers

Chair

Mark SubbaRao (Adler Planetarium)

Committee

Carter Emmart (American Museum of
Natural History)

Thomas Kraupe (Planetarium Hamburg)

The workshop will bring together planetarium professionals, astronomers, and visualization experts to advance the state of the art in big data visualization in the planetarium.





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Tutorials from the IPS/NAOJ Data to Dome workshop, held March 2-3, 2017 on the NAOJ campus.

This Document contains tutorial content for the IPS/NAOJ Data to Dome Workshop: <http://prc.nao.ac.jp/fukyu/dtod/>

For instructions on how to install the software packages used in these tutorials please consult this [document](#):

Python Tutorials

Beginning python/Jupyter notebook users should start with Tsunehiko Kato's Introduction tutorial since it provides an excellent introduction to working in this programming environment.

Tsunehiko Kato, Constructing a texture map from Gaia DR1 data (python/Jupyter notebook)

The video for this workshop session is [here](#). The presentation is [here](#)

1. [Introduction](#)
2. [Download Gaia DR1 data](#)
3. [Extracting the data](#)
4. [Making the Intensity Maps](#)

08:30 - 09:30 tomorrow Session 43 - Data to Dome: How do we make it live and interactive?

Data to Dome and LIPS

Once we get the data on the dome, how do we talk about it with our guests?

September 11th, Data to Dome day at LIPS 2018, Seattle

Connecting data suppliers, with vendors and planetarium end-users

by setting, and recommending, standards for real-time scientific content distribution

7:30 - 18:30 today

Session 28 - Break-out session: Standards for
planetarium Audiovisuals



11:00 - 12:00 tomorrow

Session 60 - Managing Data in the Planetarium

DATA2DOME

A Standard for Dome Content Distribution

data2dome.org

Encouraging planetaria to make their facilities available to researchers from their communities to use as a visualization facility.

Encouraging the visualization of a wide range of scientific data in the dome (moving beyond astronomy).

Tom Jarrett, University of Cape Town

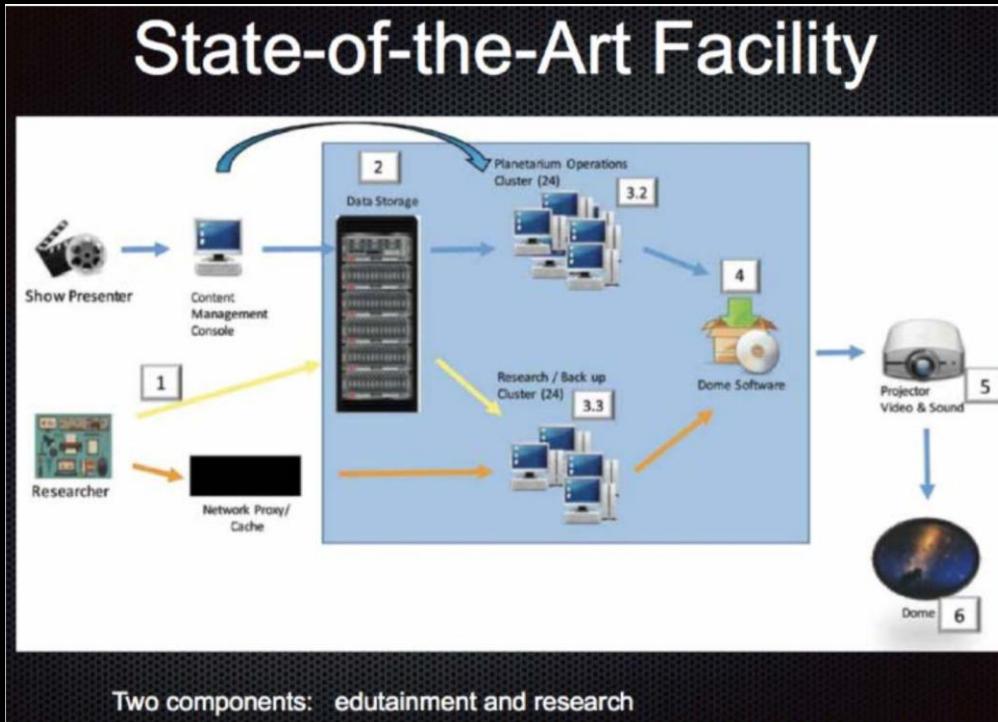


Research with Digital Domes

Planned and conceived as both a conventional planetarium — edutainment — and a research facility for visualisation and computing, the Cape Town's Iziko Planetarium 8K Digital Dome upgrade



Research Facility



Two computer clusters, one for production and shows, the other for research. Each cluster has 14 computers (GPU's) that drive six Sony laser projectors

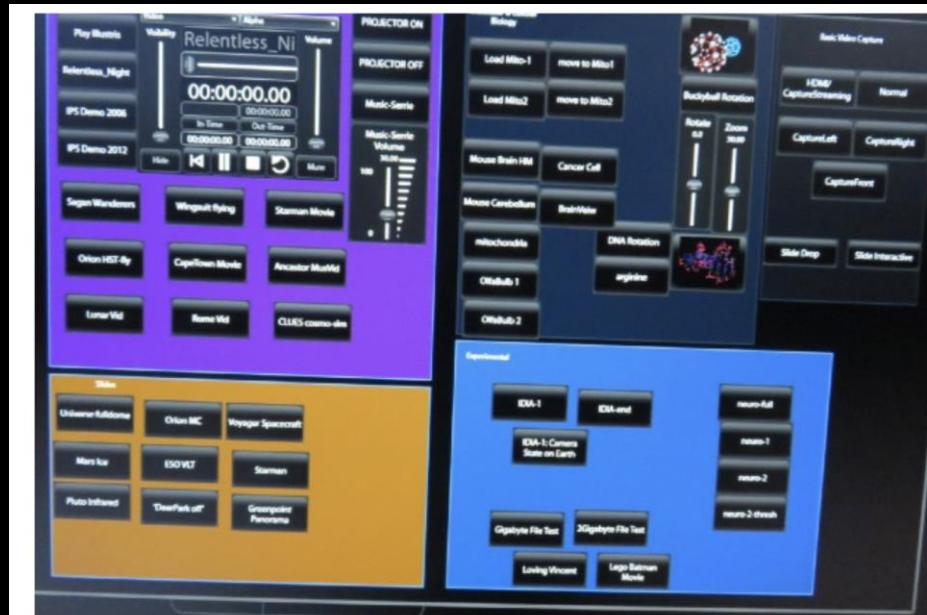
Sky-Skan was the primary contractor, and Ds-DM is the workhorse control software



University Consortium Data

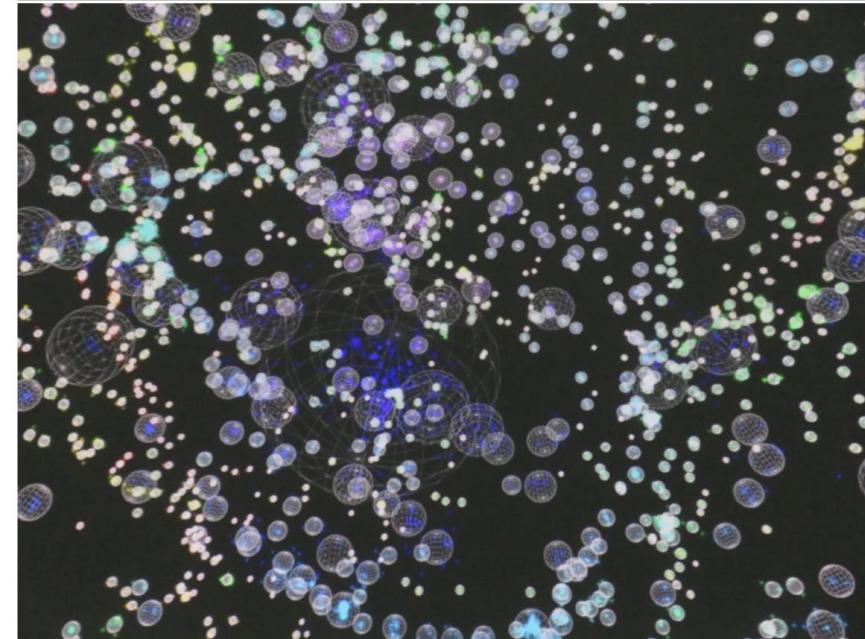
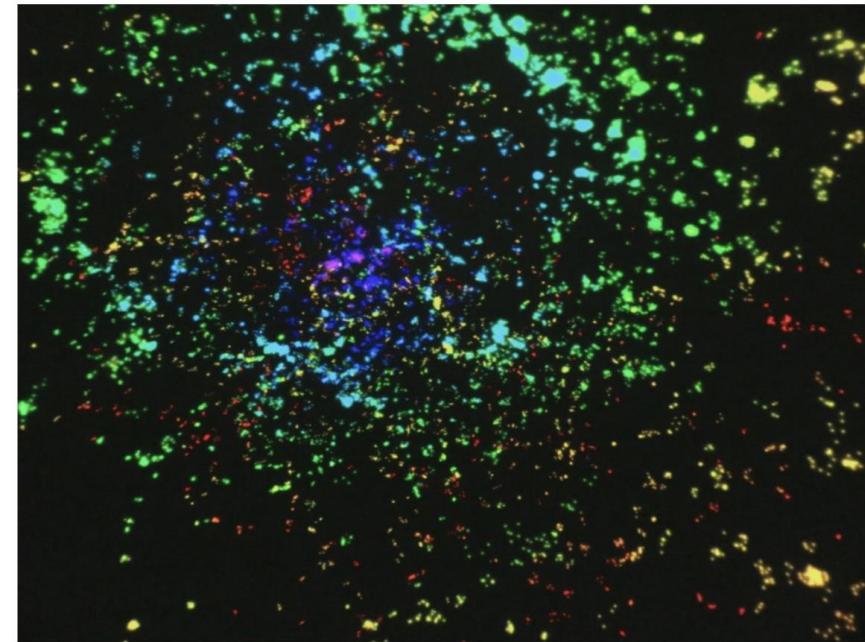
The DS-DM “work space” page of T. Jarrett

Data Set	Researcher	Type	Notes/Published
GAMA-WISE G12	Jarrett (UCT) & Cluver (UWC)	galaxies; catalogue;	Jarrett, Cluver et al. 2017
2MPZ	Bilicki (Leiden) Jarrett (UCT)	galaxies catalogue	Bilicki et al. 2015; Jarrett 2004
Cosmos	Marchetti (UCT/UWC)	photo-z galaxies	high-redshift, pencil beam
2MRS	Lambert & Jarrett (UCT)	galaxies and groups; LSS	redshift-bias corrected
GAIA DR1	C. Carter	Milky Way stars	precise 3D positions
CLUES	Subbarao (Adler)	3D cosmological simulation	https://arxiv.org/abs/1005.2687
Cell death	B. Loos (SU)	volume rendering	Alzheimer's Disease research
Mouse Cerebellum	A. Du Toit (SU)	volume rendering	heat mapping in 3D
Olfaction	A. Du Toit (SU)	volume rendering	Olfactory bulb 3D mapping
Brain scan	U. Rohlwink (UCT)	volume rendering	Neurological research



Cape Town universities formed a consortium to fund the upgrade and to utilize the system as a ‘visualization’ facility

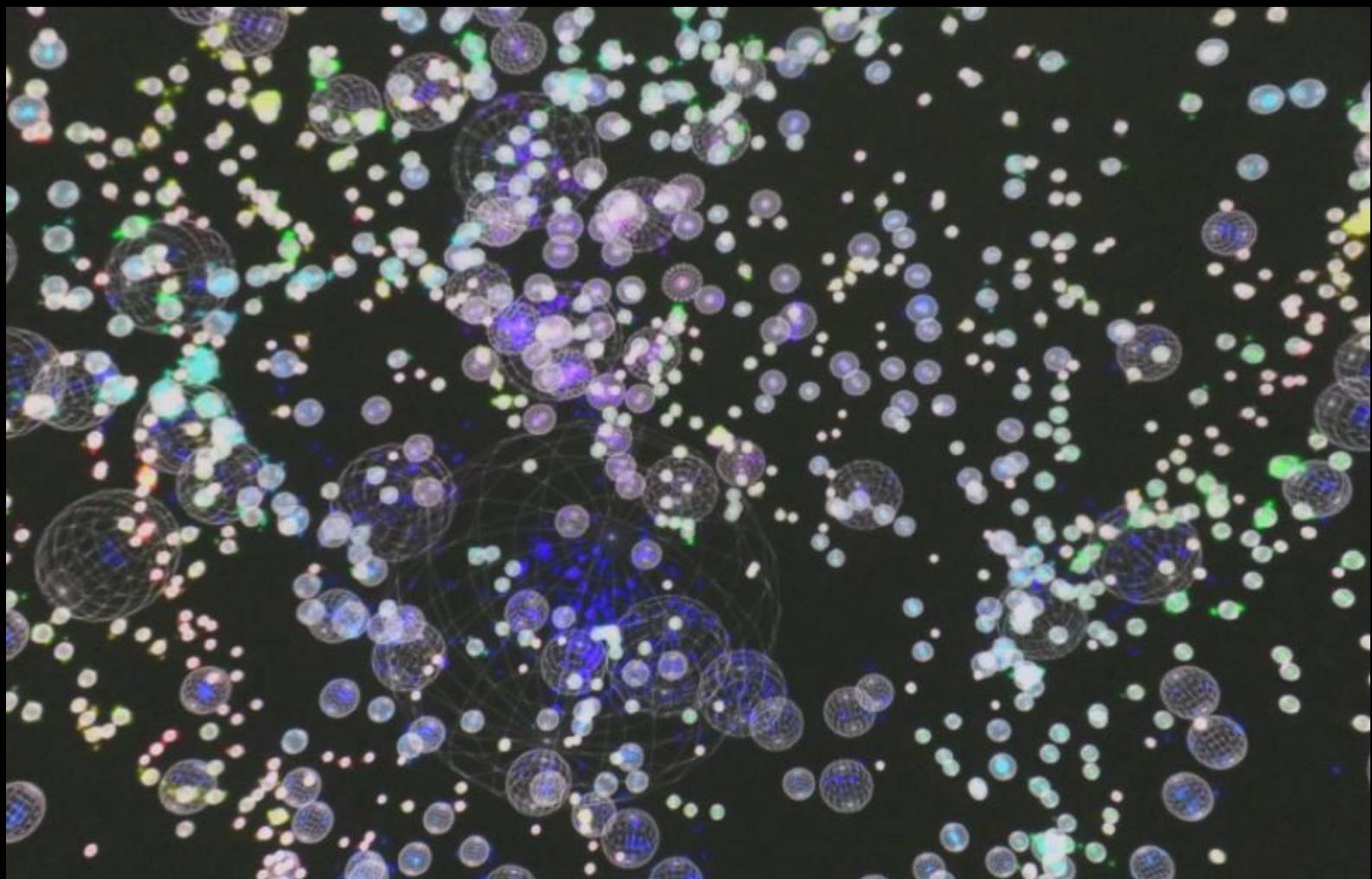




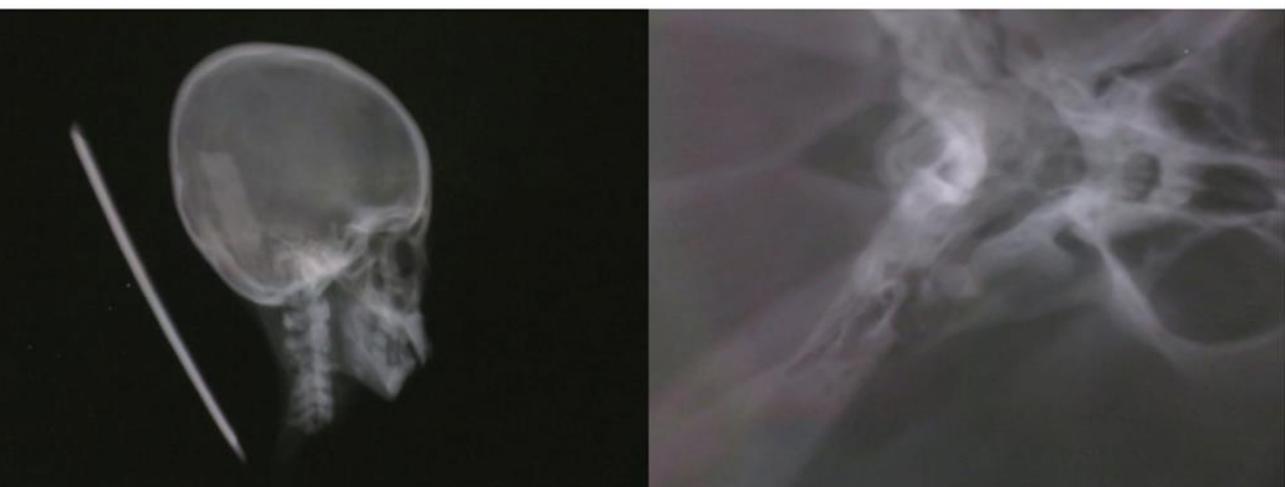
Two Micron Redshift Survey (2MRS), now viewed in a completely different way — namely, the redshift bias “finger of god” artifacts have been removed through identification of all groups and clusters. These physical groupings are indicated with the spherical mesh; note the large one in the center: the Virgo Galaxy Cluster. This project is part of the MSc/PhD of UCT student Trystan Lambert (under the supervision of Jarrett).

Example of a data set that benefits from a full dome viewing, the all-sky mapping of the cosmic web:

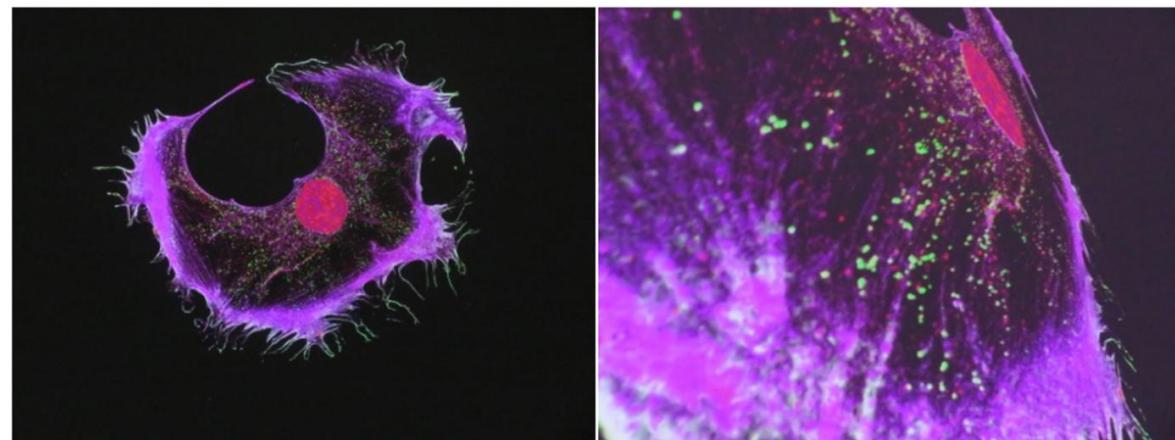
Two Micron Redshift Survey (2MRS), where groupings have been identified and ‘finger of god’ biases removed. These physical groupings are indicated with the spherical mesh; note the large one in the center: the Virgo Galaxy Cluster. This project is part of the MSc/PhD of UCT student Trystan Lambert (under the supervision of T. Jarrett).



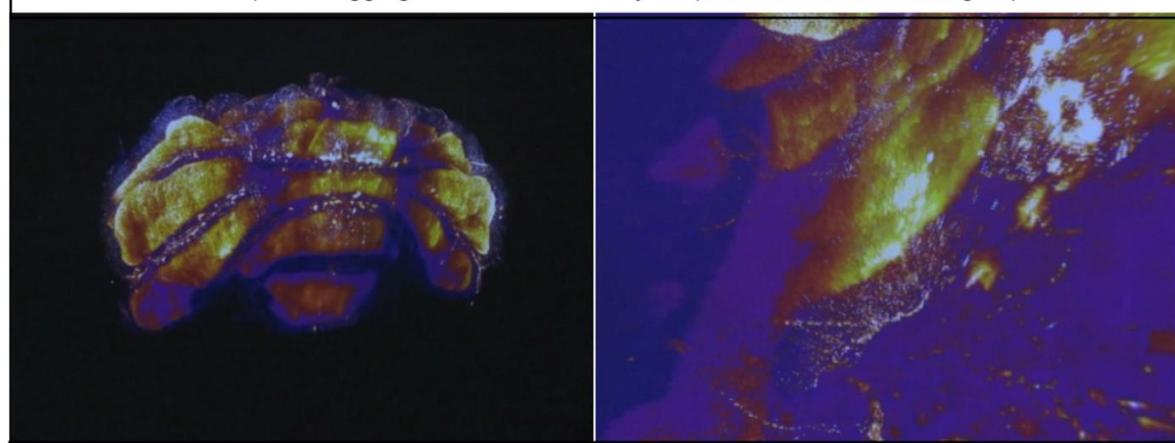
Not just Astronomy ...



Craniums in space ! This is computed tomography (CT) scan of a human skull/spinal column, attempting to find details in the squishy brain matter among the bony bits. Right side: now inside the brain, looking straight down the spinal cavity. U. Rohlwink



Cells in space ! Mouse embryonic fibroblast stained for mitochondrial DNA (red), autophagosomes (green) and actin cytoskeleton (magenta). The process under investigation is associated with neurodegenerative disease, where dysfunctional mitochondria and proteins are aggregating. Normally, these will be captured and removed through the autophagic machinery (green). This is a process that B. Loos research group assess quantitatively, to understand the degree of dysfunction and the level needed to rescue a cell from protein aggregation-induced toxicity. <https://www.neuroresearchgroup.com>



Scent in space ! Olfactory bulb, a neural structure of vertebrate fore-brain involved in the sense of smell. Nuclei are shown in blue (Hoechst stain) and tissue density shown in red (auto-fluorescence). Right side: flying into the Olfaction cell proves to be a colourful experience (note the irony). A. Du Toit

Brains in space ! Mouse cerebellum tissue that forms part of the sensory systems which is involved in the coordination of voluntary movements such as posture and balance, resulting in smooth and balanced muscular activity. Processed using CLARITY, a method that renders tissue transparent by washing out light-scattering lipids and allowing for 3D fluorescent imaging of large tissues. A Carl Zeiss LSM780 confocal microscope was used for tissue imaging. B. Loos & A. Du Toit

D2D Concept carried on ...



data-to-dome

IZIKO PLANETARIUM AND
DIGITAL DOME

"Data to Dome" Public Showings

Prof. Tom Jarrett (UCT) & Associate Prof. Michelle Cluver (UWC) invite you on a tour of the universe! See real astronomy data visualised on the dome, and hear about the research being done by astronomers in Cape Town. See planets, stars, nebulae, galaxies and even the Cosmic Web!

Dates: 11 December 2017 at 14:00
18 December 2017 at 15:00
8 January 2018 at 14:00
15 January 2018 at 14:00

Venue: Iziko Planetarium and Digital Dome
25 Queen Victoria Street, Cape Town
Cost: Adults R60

Enquiries: Kim Lindeboom: Tel. 021 481 3874;
or email klindeboom@iziko.org.za



Inter-University Institute
for Data Intensive Astronomy
from big data to big ideas

