

Data to Dome

Mark SubbaRao

President

INTERNATIONAL PLANETARIUM SOCIETY, INC.
IPS

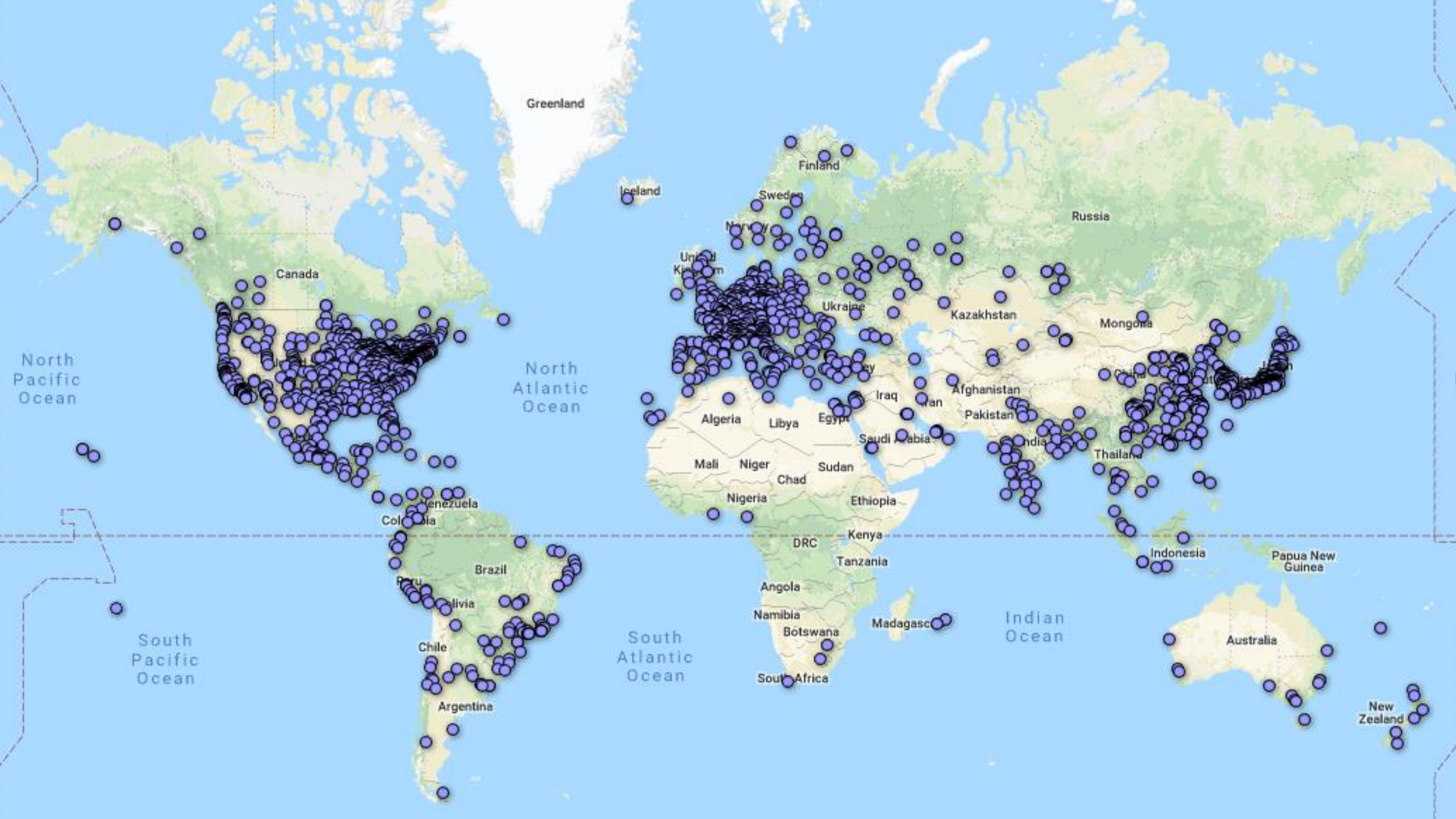
@marksubbarao

Director
Space Visualization Laboratory

ADLER
PLANETARIUM



4,000 Planetariums, 150 million visitors¹

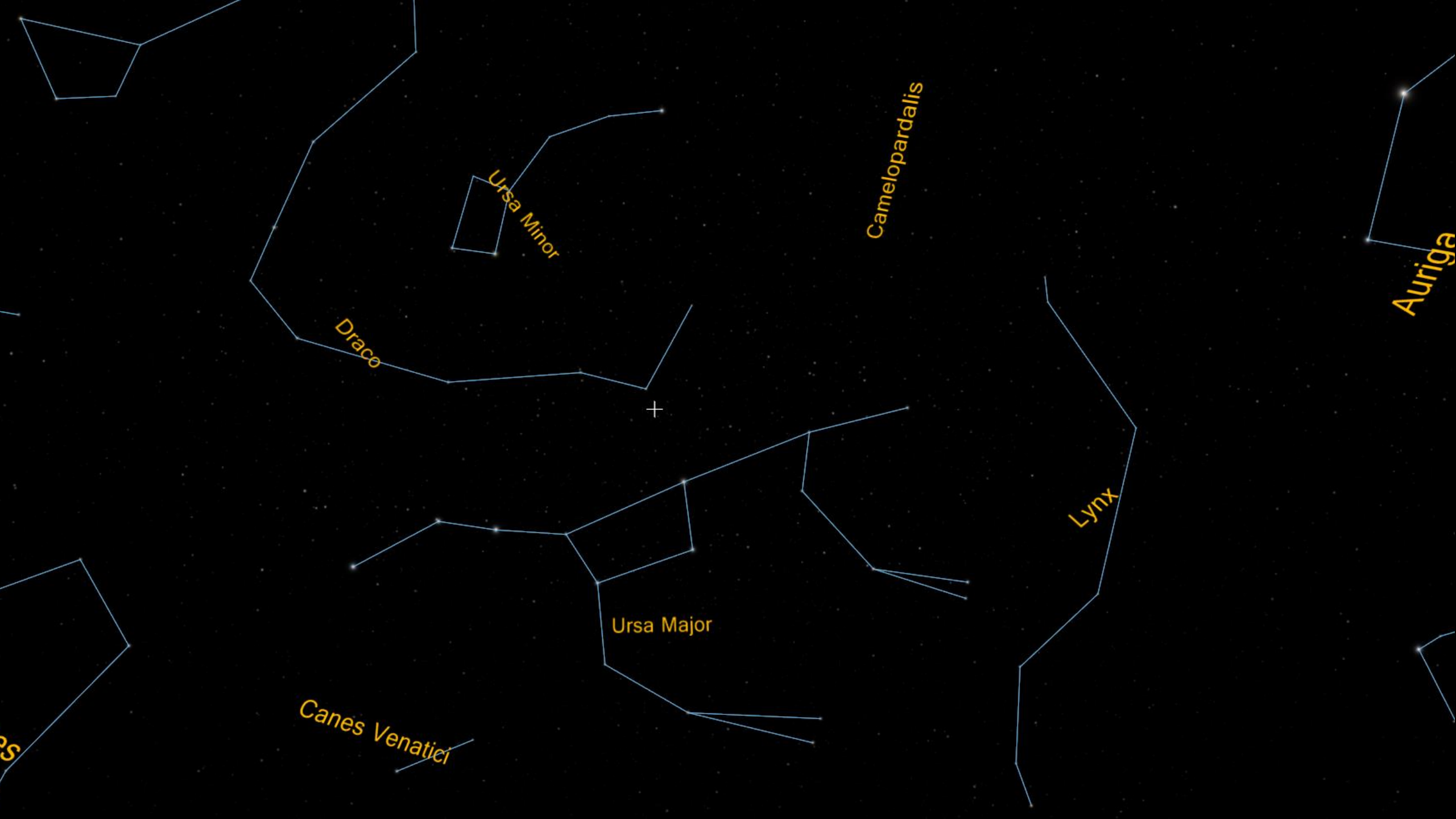




AFRICAN
PLANETARIUM
ASSOCIATION







Ursa Minor

Camelopardalis

Auriga

Draco



Lynx

Ursa Major

Canes Venatici

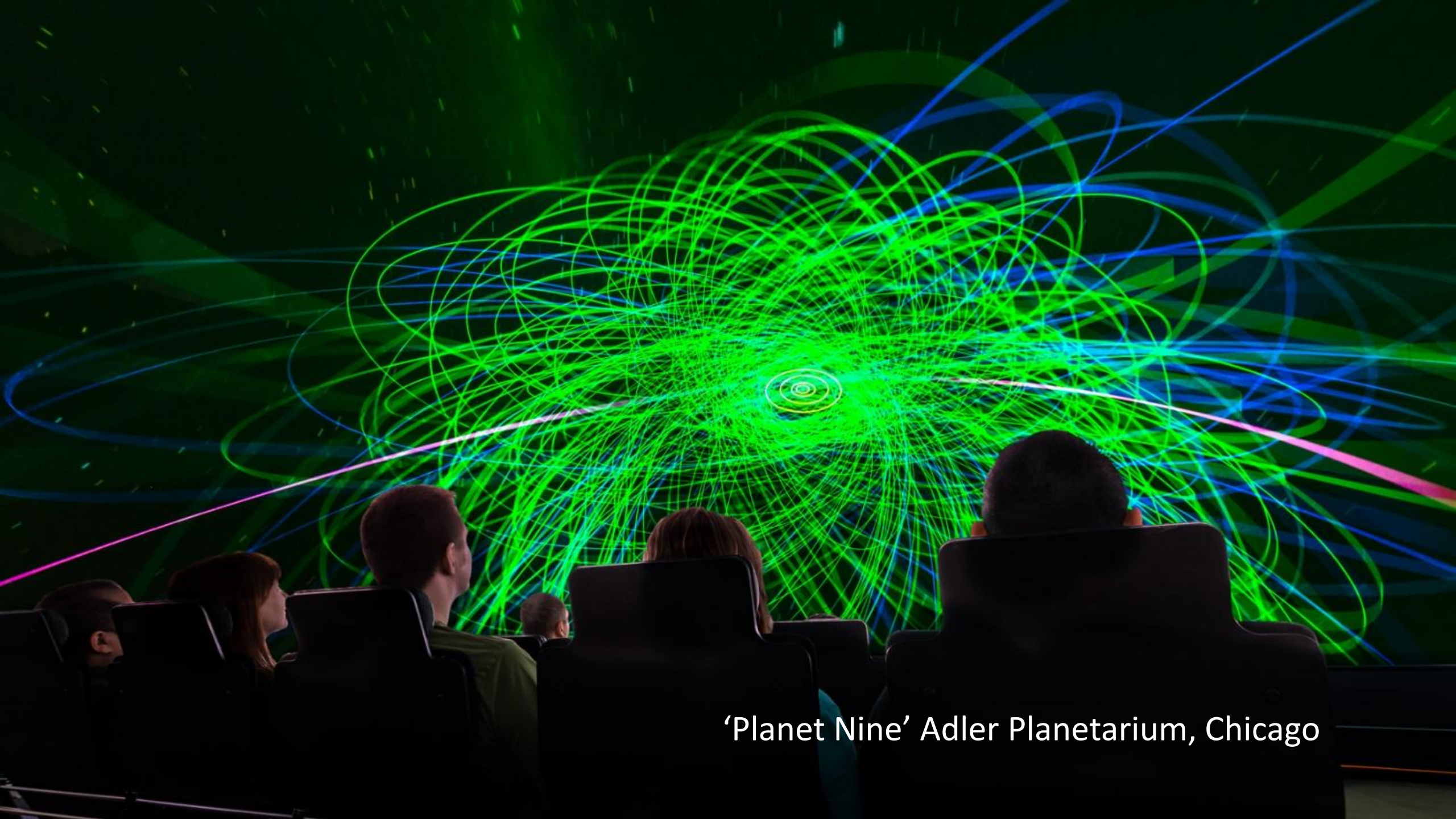
ps



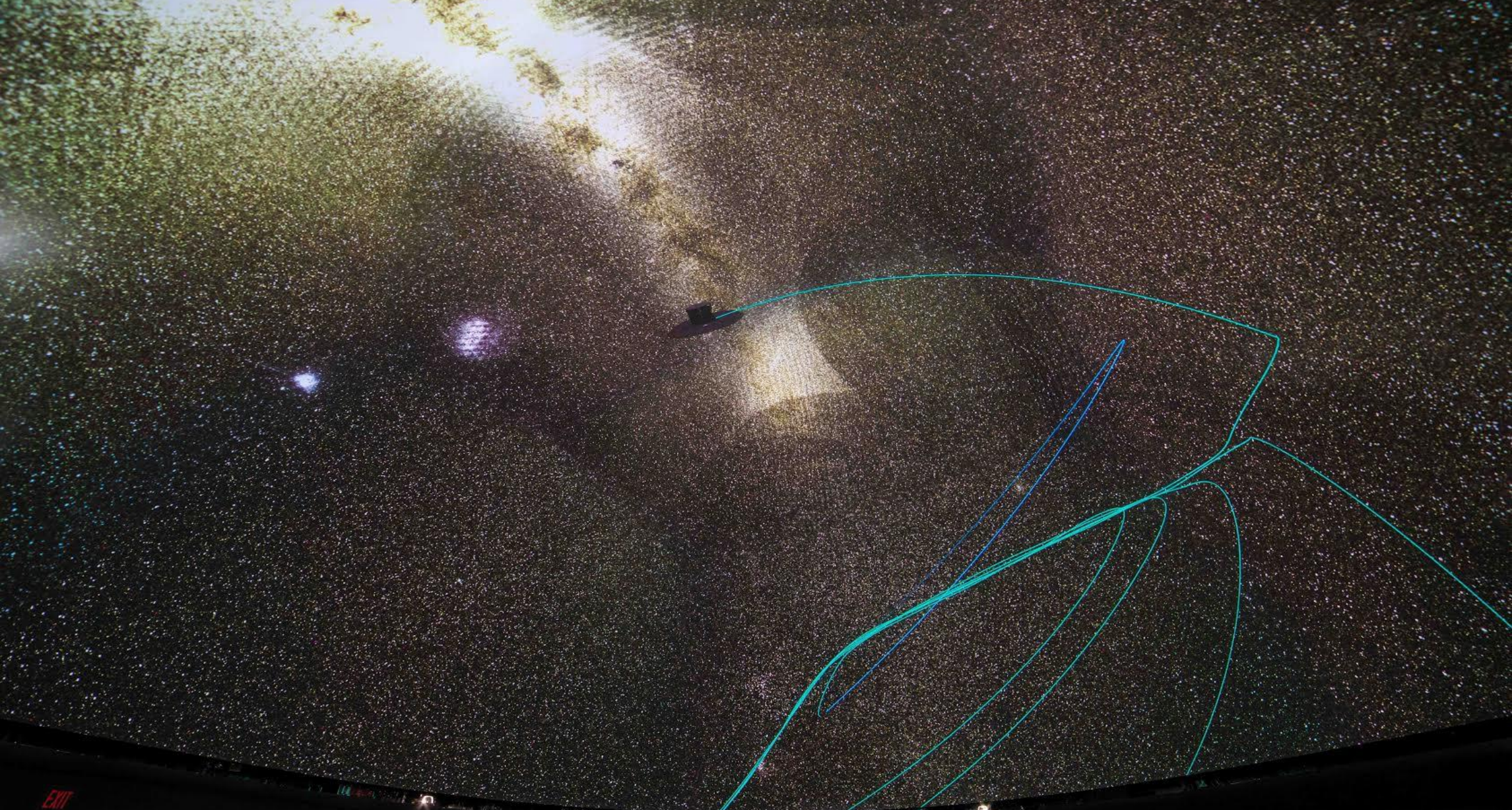
Hendrik Jacob Hoet, 1720



(1679) Pierre Mignard



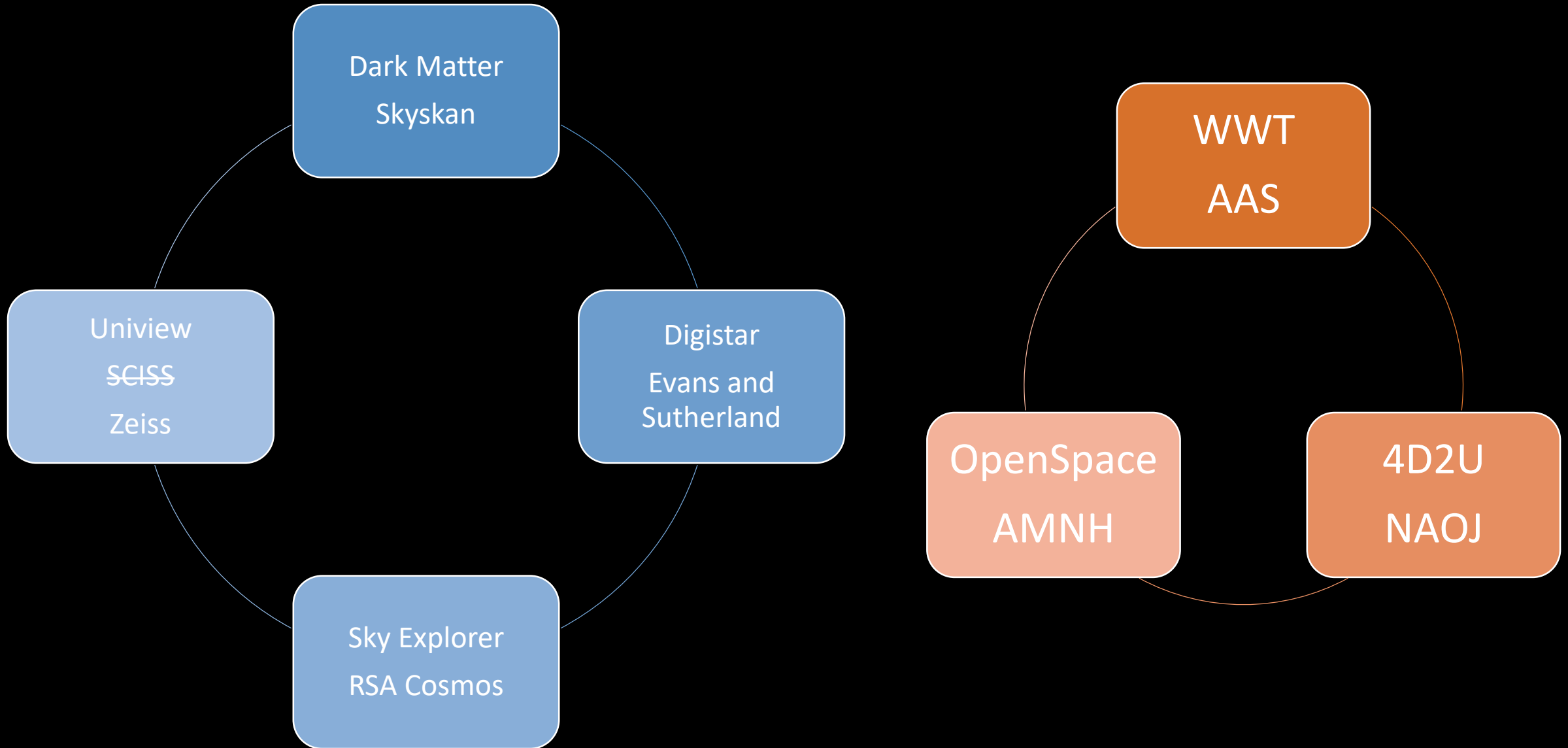
'Planet Nine' Adler Planetarium, Chicago



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

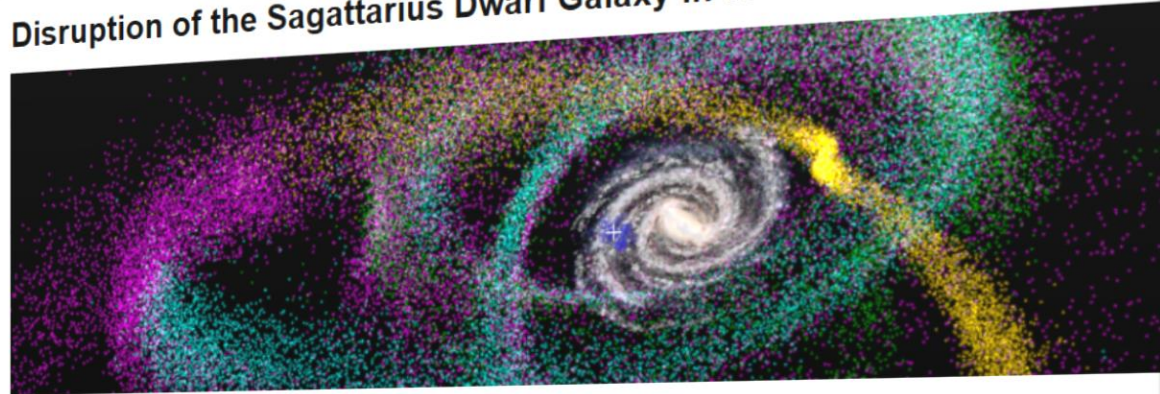
Image c/o Jackie Faherty, photograph by Matt Stanley,
octree implementation by Adam Alsegard

Planetarium Software Landscape





Disruption of the Sagattarius Dwarf Galaxy in WWT



We will visualize an N-body simulation of the tidal disruption of the Sagittarius Dwarf galaxy as described in Law and Majewski 2012 <http://iopscience.iop.org/0004-637X/714/1/229/article> Data files were taken from the website: <http://www.astro.virginia.edu/~srm4n/Sgr/data.html>

```
In [1]: #Set up astropy and astroquery
from astropy.table import Table, Column
from astropy.coordinates import SkyCoord, Distance, CartesianRepresentation
from astropy import units as u
```

The Star Streams

```
In [2]: #Import data set, keep only the columns we need. Convert distances from kpc to pc for WWT
Stars = Table.read('data/SgrTriax_DYN.dat', format='ascii.basic')
Stars.keep_columns(["ra", "dec", "dist", "Pcol"])
Stars['ra'].unit = u.degree
Stars['dec'].unit = u.degree
distCol=Column(1000*Stars['dist'], name='distance', meta={'ucd': 'pos.distance'}, unit='pc')
Stars.add_column(distCol)
del Stars['dist']
Stars
```

```
Out[2]:
```

ra	dec	Pcol	distance
deg	deg		pc
295.968	-42.1607	8	65975.1
284.571	-31.0457	-1	28705.5
300.004	-31.3875	0	24114.8

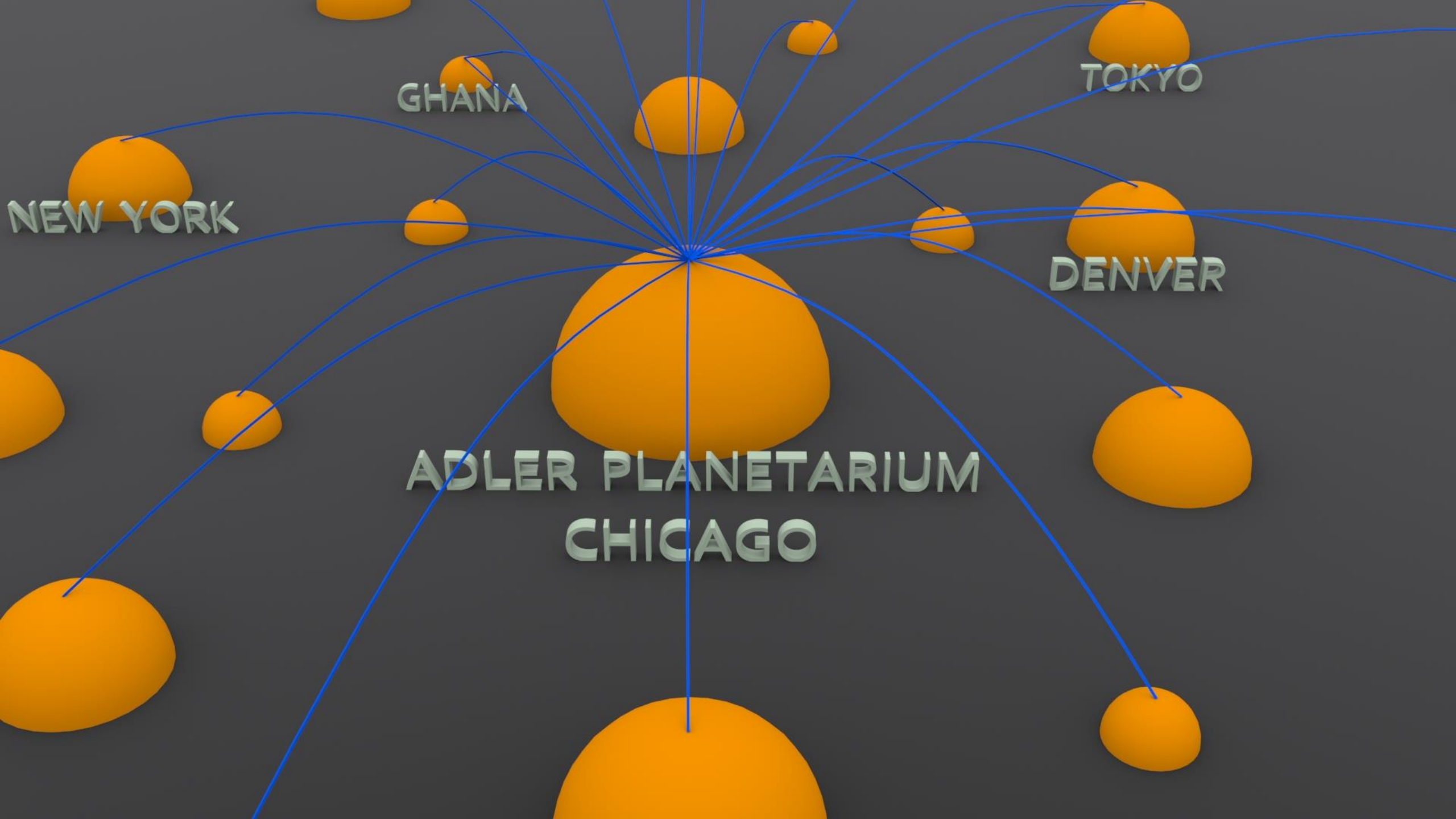
WWT: A platform to view the Virtual Observatory



New Mailing list: <https://bit.ly/wwt-signup>

And Web Forum: <https://wwt-forum.org>

Tuesday Morning : WWT + HiPS, China-VO



GHANA

TOKYO

NEW YORK

DENVER

ADLER PLANETARIUM
CHICAGO



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.

VOTable

AVM

data2dome

VOEvent

HiPS

Strasbourg: Un nouveau planétarium en 2021

André Schaaff, Wednesday Education Session



Data2Dome: A Standard for Dome Content Distribution

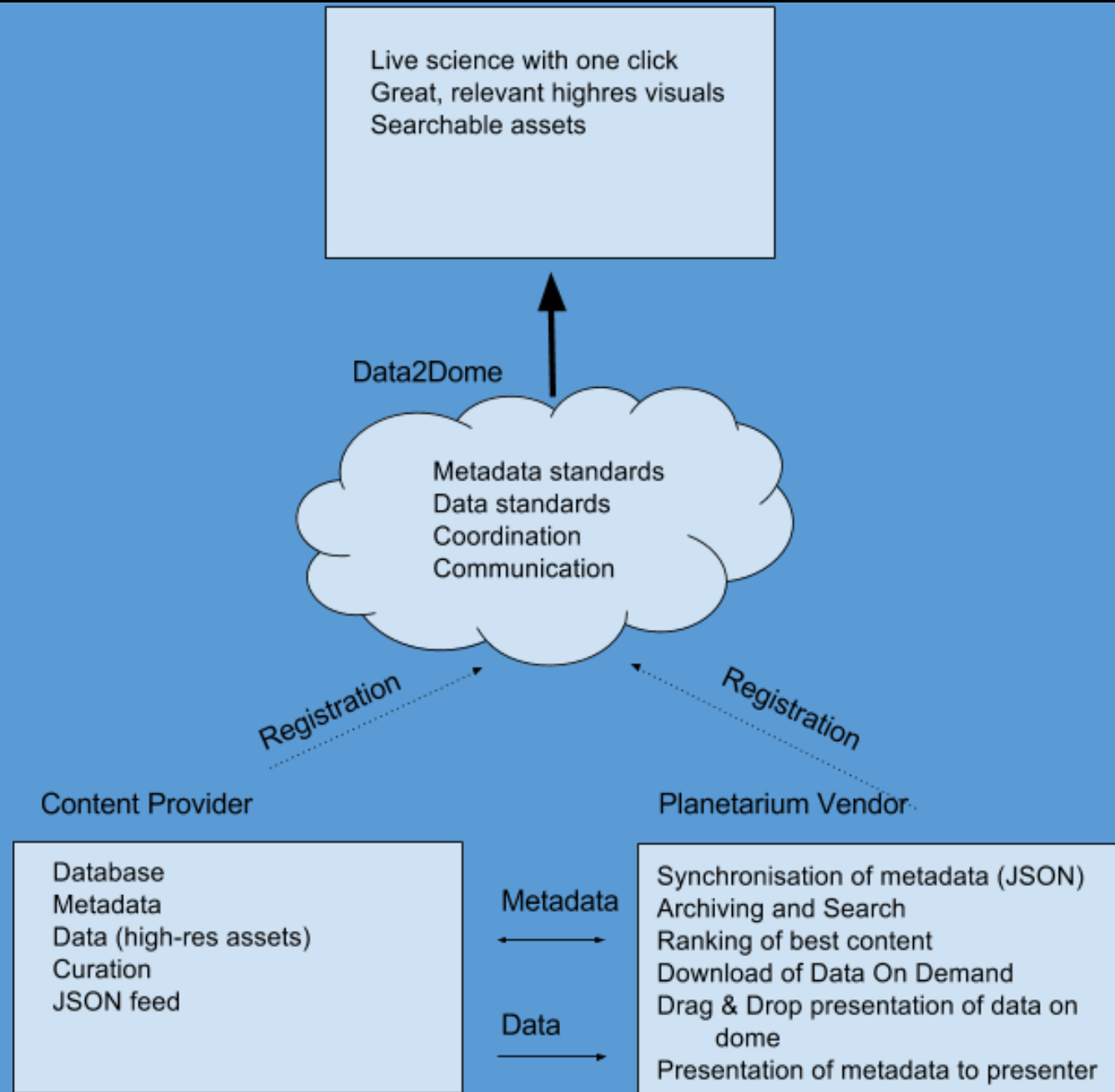


DATA2DOME

European Southern Observatory & the IPS Science and Data Visualization Task Force

data2dome.org

Implementation



Shira Universe 2.0

Shira Universe version 2.0.0

Control Window

Projector Fader Illumination Reset All

Settings Projector Controls Dark Style Unlock Windows Info Power

Manager Window

Sky Manager Media Manager Constellation Manager Presentation Builder Script Manager Data2Dome

Projection Type: Spherical

Title	Created By	Uploaded Date	Projection Type
Reflections on La Silla	European Sout...	02/27/2017	Flat
The New Technology Telescope at...	European Sout...	02/27/2017	Flat
Dawn of a new era for Supernova 1...	European Sout...	02/27/2017	Flat
Milky Way over La Silla	European Sout...	02/24/2017	Flat
A dusk painting	European Sout...	02/24/2017	Flat
A Danish twin	European Sout...	02/24/2017	Flat
Wizened stargazer at La Silla	European Sout...	02/24/2017	Flat
Old friends at La Silla	European Sout...	02/24/2017	Flat
High on the Chajnantor plateau	European Sout...	02/24/2017	Flat
Dusk over La Silla	European Sout...	02/24/2017	Flat
Some perspective on La Silla	European Sout...	02/24/2017	Flat
View of the ESO 3.6-metre telescope	European Sout...	02/24/2017	Flat
Star-speckled night	European Sout...	02/24/2017	Flat
TRAPPIST-south bathed in soft light	European Sout...	02/24/2017	Flat
A cosmic selfie	European Sout...	02/24/2017	Spherical
Fulldome selfie	European Sout...	02/24/2017	Fulldome
MPG/ESO 2.2-metre telescope up i...	European Sout...	02/24/2017	Flat
Joint Garching-Chile Operations M...	European Sout...	02/24/2017	Flat
2017 Band 5 Science workshop in ...	European Sout...	02/24/2017	Flat
Screenshot of ESOcast 96	European Sout...	02/22/2017	Flat
Comparison of the TRAPPIST-1 sy...	European Sout...	02/22/2017	Flat
Comparing the TRAPPIST-1 planets	European Sout...	02/22/2017	Flat

Download Options

0%
Resource Type: **Small** Dimensions: 1280x640 Download

Play Options

Delete Show / Play

Media Type: Image Proj Type: Equirectangular Size: 0 mb
Thumbnail



Striking a pose in the centre of this dramatic image is [ESO Photo Ambassador](#) Petr Horálek. Under the brilliant arc of the Milky Way, Horálek is standing amongst the antennas of the [Atacama Large Millimeter/submillimeter Array \(ALMA\)](#), which studies light of wavelengths between infrared and radio. This gives it the capability to observe some of the coldest objects in the Universe.

Creator:
European Southern Observatory
Karl-Schwarzschild-Strasse 2
Garching bei München
Germany
Web site:

Preview Window

fps: 62.5



Spaceflight Mouse Tracking (Double click Object to set as target)

Close-up View



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.



禁煙
喫煙禁止
2014-10-14-0001

VAIO





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 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](#)

Jupyter notebook/lab, astropy

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

T. HANSTEEN



Planetariums — not just for kids

Planetariums are not just for education, or even astronomy: they could display all sorts of data, if only scientists thought to use them, says Tom Kwasnitschka.

Most researchers think of planetariums, if they think of them at all, as a place to take schoolchildren for whizzy trips through the stars, with nothing to offer serious scientists. But the truth is quite the contrary.

In March, the National Astronomical Observatory of Japan held a joint workshop with the International Planetarium Society (IPS) in Tokyo. The goal? To visualize the most complex astronomical data sets gathered so far and thus explore ideas about the distribution of galaxies, exoplanets and the make-up of comets. And planetariums can display more than astronomical data. In the past five years, I have been immersed in visualizations of neuronal activity, Hurricane Katrina, particle collisions from the Large Hadron Collider, marine food webs along the US Northwestern Pacific coast, and the magma chamber under the Yellowstone Plateau in Wyoming.

With rich detail and dynamic configurations, these visualizations are often works of art. They inspire both wonder and scientific insight.

Rather than chasing grants for immersive-visualization infrastructure, researchers should use what is already available. With up to 20 high-performance video projectors linked to advanced graphics computers, digital dome planetariums host some of the most sophisticated and flexible systems for scientific visualization. The IPS estimates that there are around 1,300 digital domes in operation globally, each measuring between 3 and 30 metres across, and that one is available within easy reach of most academic facilities. What's

similar to studying Mars: because we cannot go there ourselves, we need elaborate robotics to do our exploration. A huge limitation is our inability to see the sea floor with our own eyes, and to gain the sense of presence that field geologists can work from. The displays we created showed us that ocean-floor surveying had not caught up with our visualization capabilities; this led us to develop deep-sea camera technology to enable photorealistic models of the sea floor. (In fact, as I write this, I am on a boat that's scanning the floor of the Mediterranean Sea.)

Planetarium capacity is growing. A US\$2-million digital upgrade of the Iziko Planetarium in Cape Town is being funded by the museum and local universities with the expectation that it will also serve as a facility for researchers. The European Southern Observatory Supernova Planetarium, scheduled to open near Munich, Germany, next year, is charged with supporting both research and education. Already, software originally written for educational planetarium shows is being used by NASA to review space missions and to aid forecasts of 'space weather', such as solar flares that can disrupt radio communications.

The IPS's Data to Dome initiative is working to make it easier to import and explore scientific data across all disciplines. A similar project, headed by the European Southern Observatory and its industrial partners, is currently developing ways for astrophysical data to be broadcast to planetariums, so data sets can be made

**PLANETARIUMS
ARE, FOR THE
FIRST TIME,
ABLE TO GIVE BACK
TO THE SCIENTIFIC
WORLD.**



NOW OPEN

TRANSFORM
the way you look at
THE WORLD!

TO PLAN
DIGIT
The
Full
3-D



South African Museum
and Planetarium



izi
museum





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





DATA2DOME

A Standard for Dome Content Distribution

data2dome.org