

الإلهام طريق
الاكتشاف
Through Inspiration, Discovery

جامعة الملك عبد الله
للعلوم والتقنية
King Abdullah University of
Science and Technology



Scientific Visualization 101: Amira & Avizo - An Introductory Hands-On Workshop

KAUST Visualization Core Lab





Getting Started

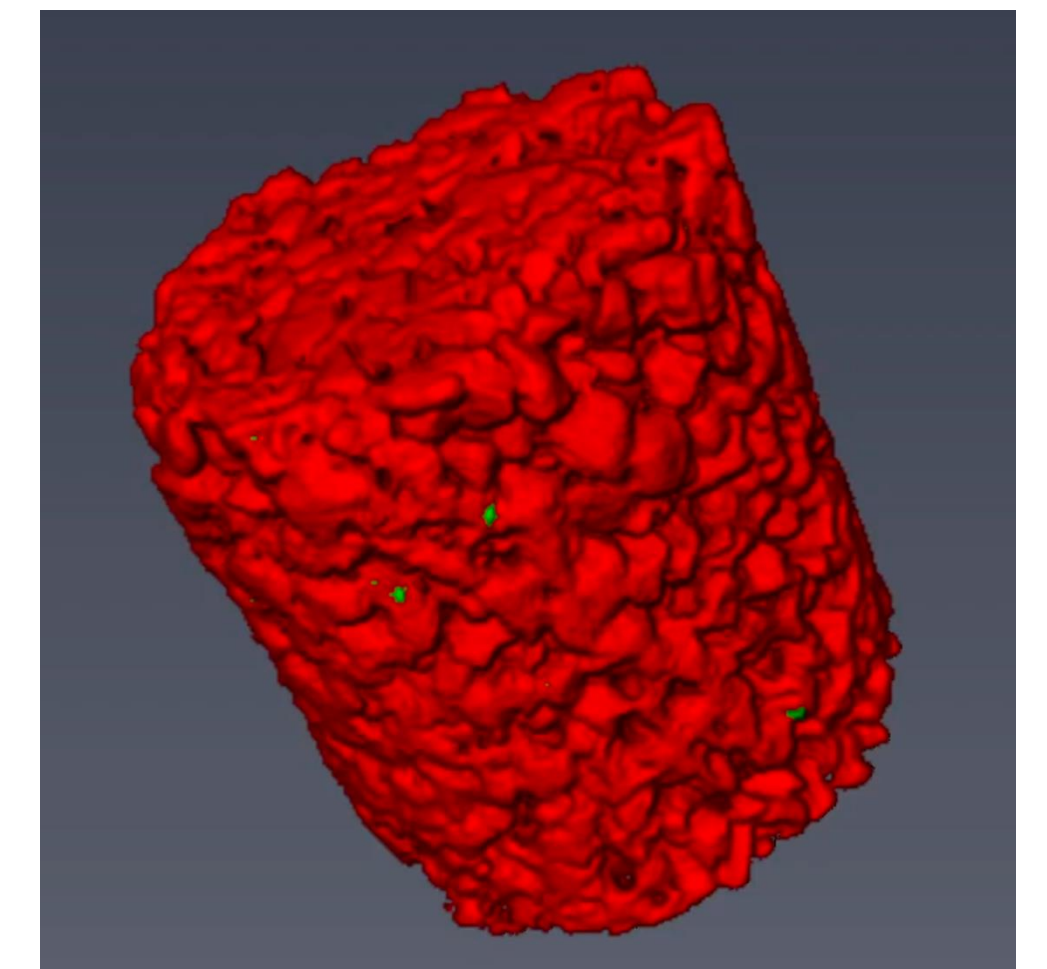
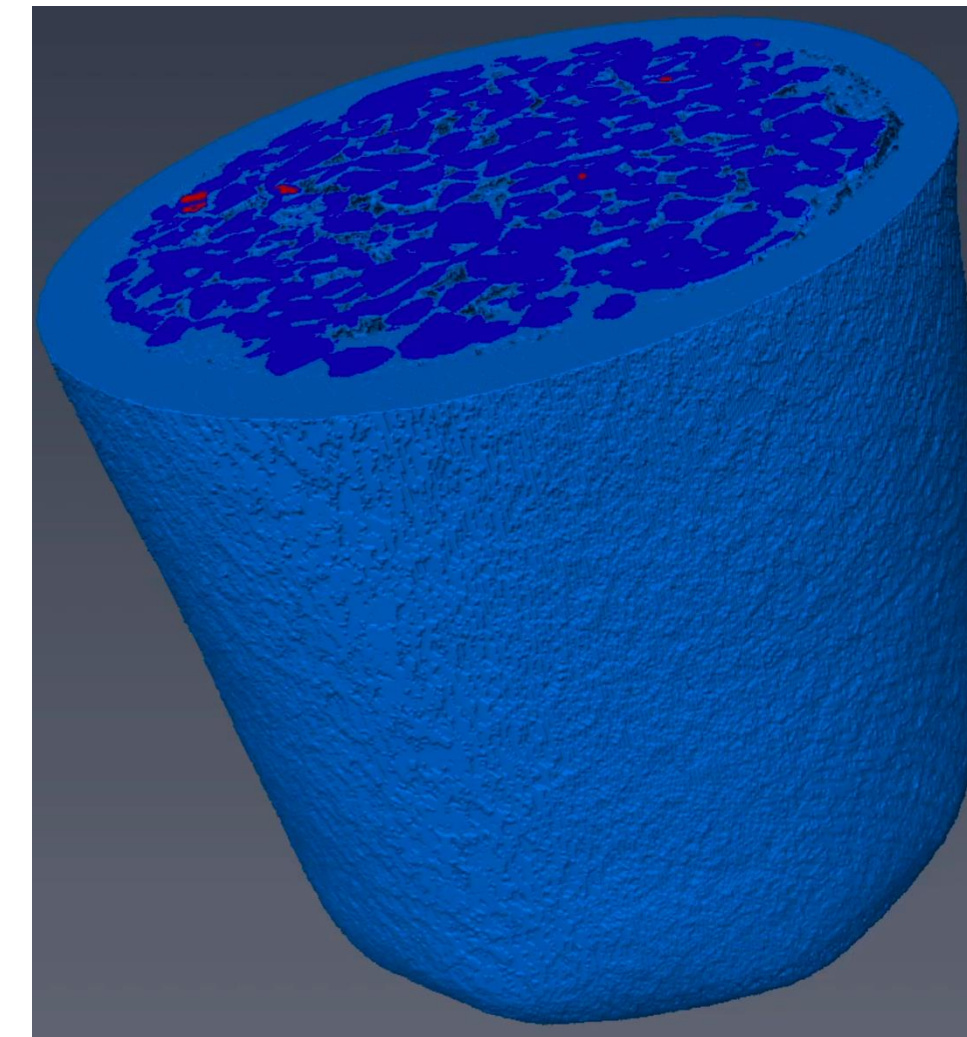
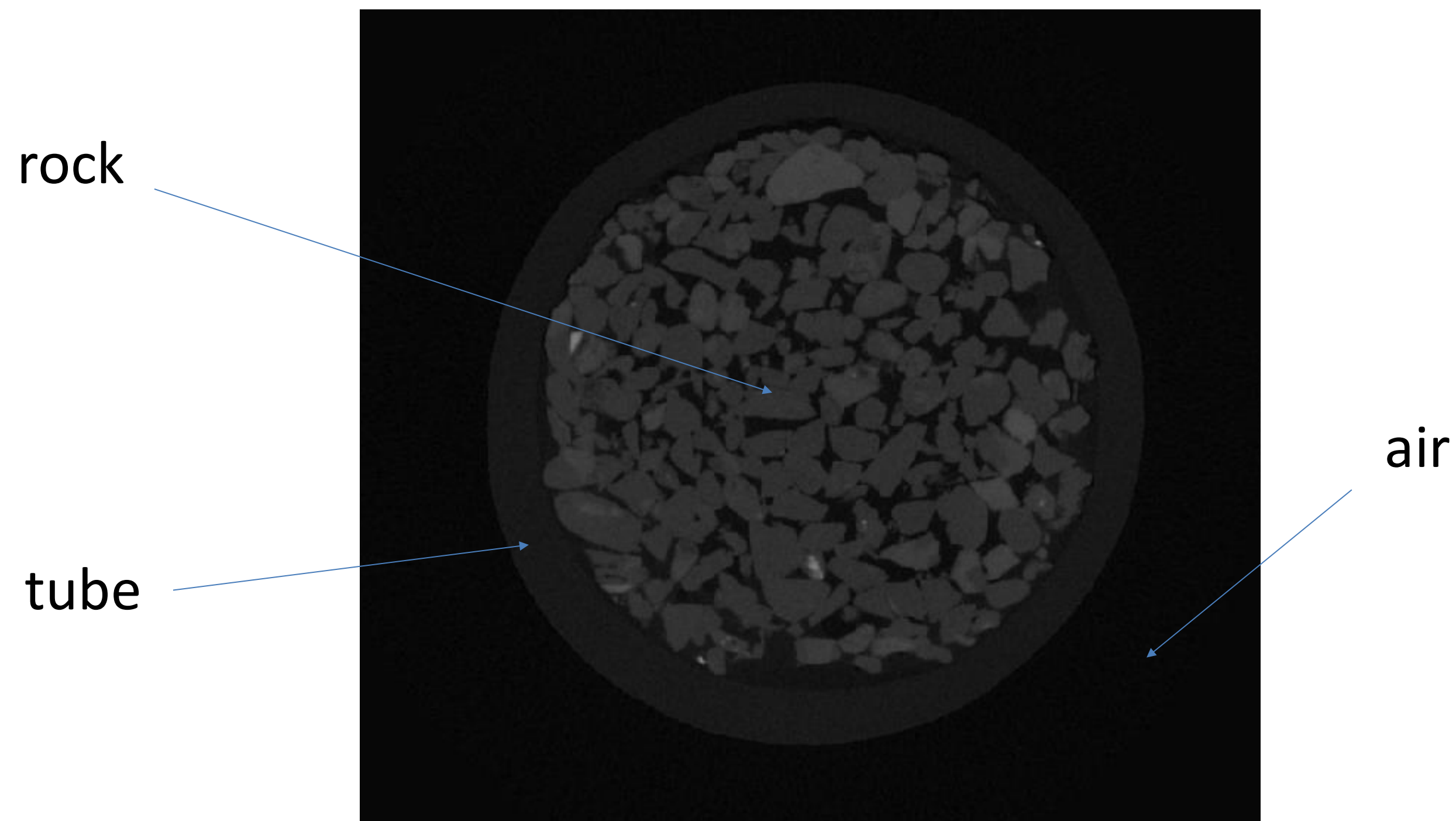
- Workshop Materials
 - Visualization Lab Wiki: <https://wiki.vis.kaust.edu.sa>
 - Training Page: <https://wiki.vis.kaust.edu.sa/training/overview>
 - Download data sets and slides:
<https://wiki.vis.kaust.edu.sa/training/scivis/2025/avizointro> |
Workshop Materials
- Recorded workshops available
 - KAUST Visualization Core Lab [youtube channel](#)

Dataset

provided by

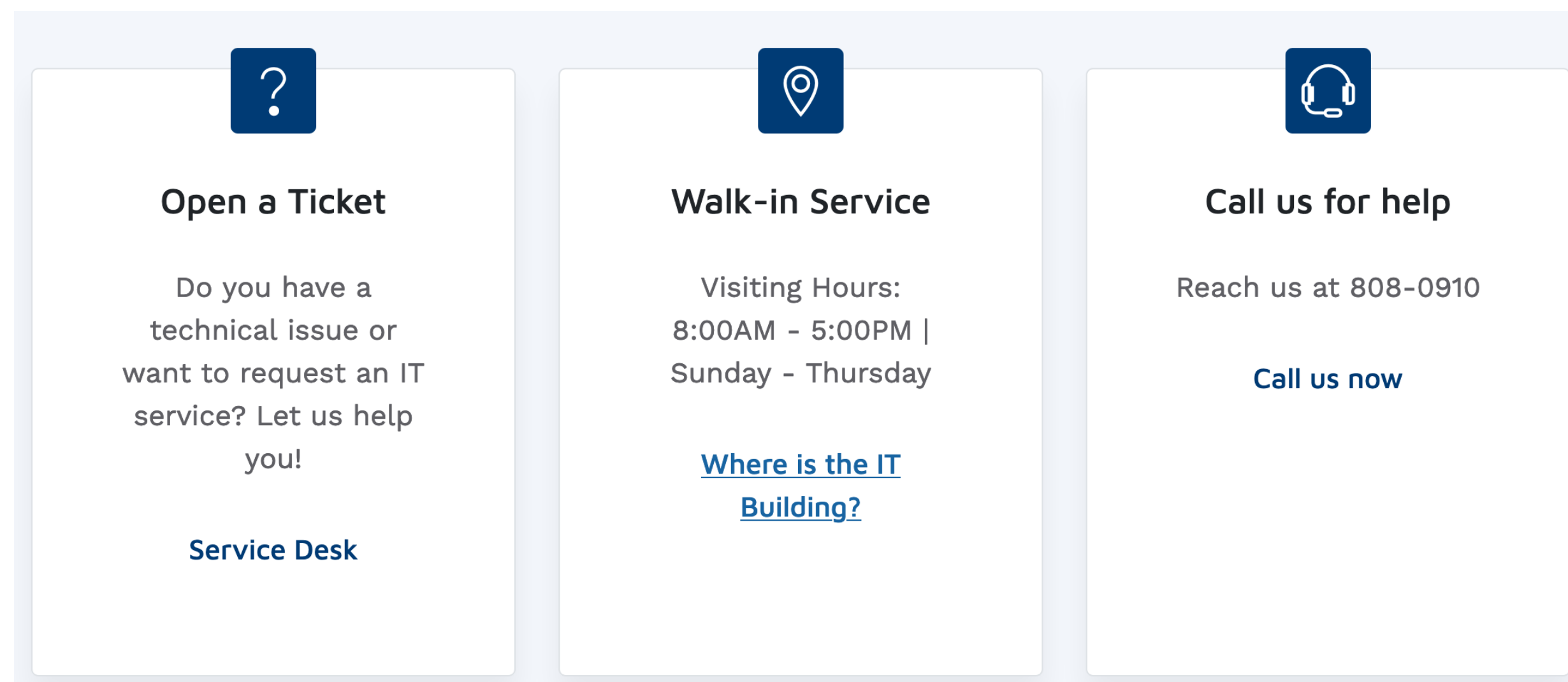
Jamal AlAamri, Ali I. Al-Naimi Petroleum Engineering Research Center (ANPERC)

- mini core plug isolated inside a shrink tube
- the rock represents a sandstone, a type of rock found in oil and gas reservoirs
- 466 png images of 742x742 resolution





- Installation and licenses maintained by KAUST IT
 - <https://it.kaust.edu.sa/software/avizo> (Windows/Linux)
 - Get help at <https://it.kaust.edu.sa/home>



- Expertise at KAUST Visualization Core Lab (KVL)
 - Email us at help@vis.kaust.edu.sa



Visualization Core Lab Overview – Facilities & Services



KAUST
VISUALIZATION
CORE LAB

The Team



Dr. Sohaib Ghani
(LEAD STAFF SCIENTIST)

- VISUAL ANALYTICS
- INFORMATION VIS
- STATISTICAL ANALYSIS



Thomas Theussl
SCIVIS

- SCIENTIFIC VISUALIZATION
- LARGE DATA ANALYSIS
- DISTRIBUTED VISUALIZATION



Dr. James Kress
HPC SCIVIS

- VISUALIZATION SOFTWARE
- HPC INSITU VISUALIZATION
- DISTRIBUTED VISUALIZATION



Dr. Ronell Sicut
VR/AR

- SCIENTIFIC VISUALIZATION
- VR DEVELOPMENT
- 3D RECONSTRUCTION



Dr. Didier Barradas
Data Scientist

- DATA SCIENCE
- MACHINE LEARNING
- DEEP LEARNING



Dr. Abdelghafour Halimi
Data Scientist

- Data Science
- Machine Learning
- Deep Learning



- 2D/3D Visualization Facilities
 - We provide a unique set of visualization facilities on campus
- Data Visualization and Data Science Workflows
 - We support KAUST users and collaborators with visualization workflows, VR workflows, and data science/machine learning
 - Contact us for additional information or to submit a request
- Training and Workshops
 - We have a wide variety of trainings available on our YouTube Channel, as well as select trainings performed in-person/live online each semester
 - <https://www.youtube.com/@kaustvislab>

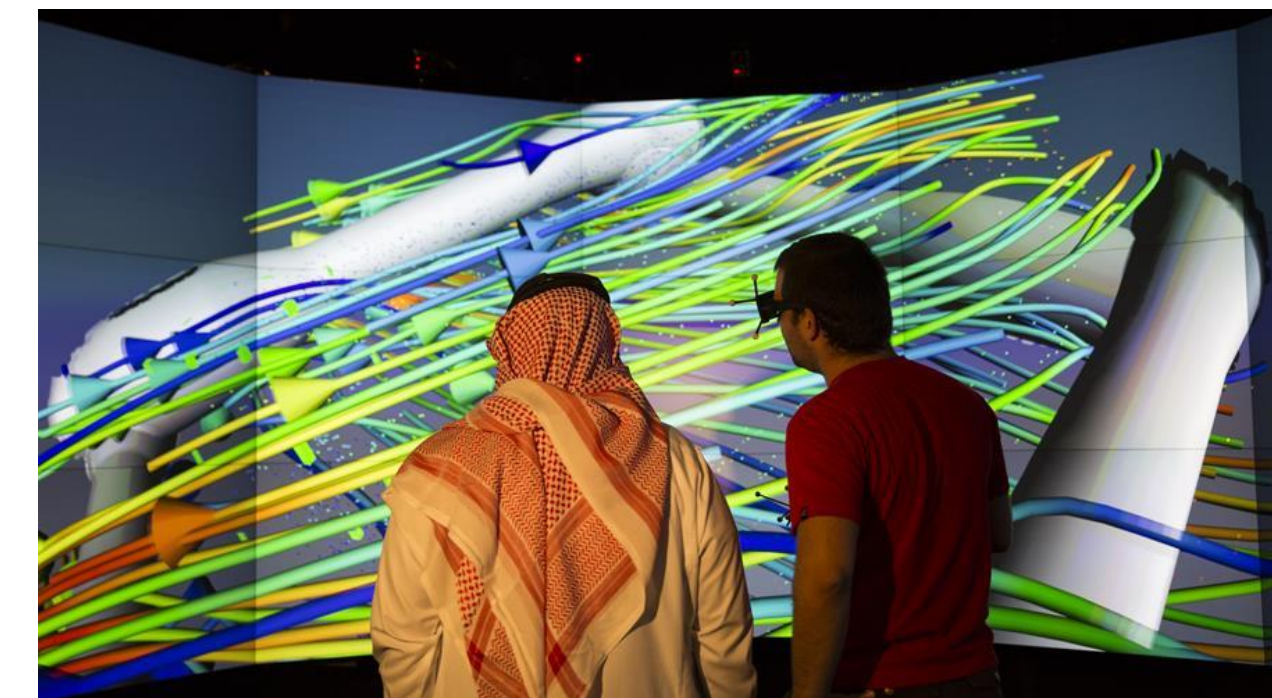
KVL Facilities



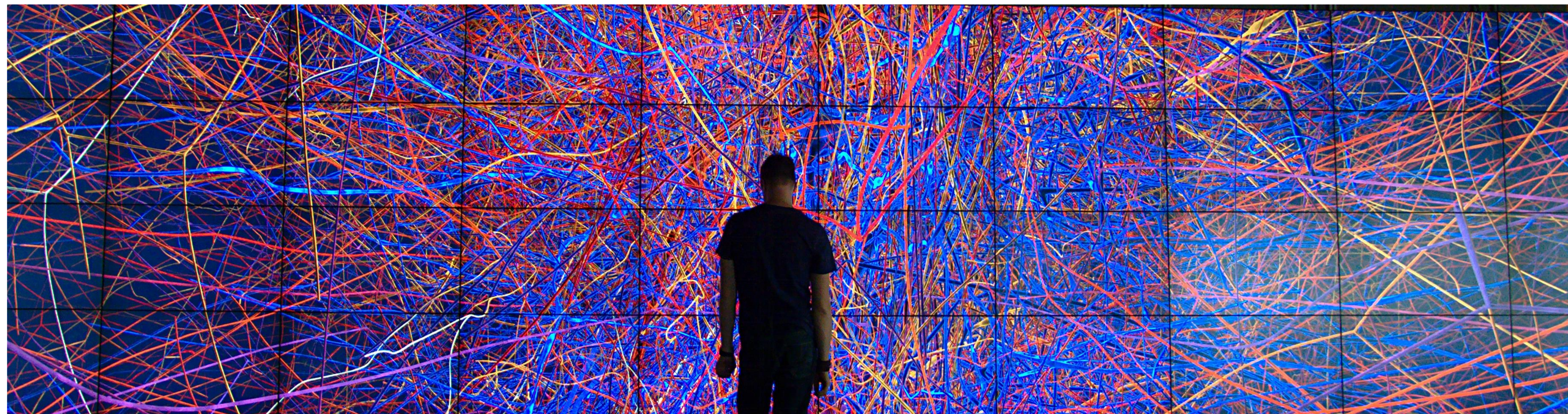
HMD's



Segmentation Tablets



CUBES VR



ZONE 1/2 DISPLAY WALLS



Accessing KVL Facilities

- Book here (requires Portal Credentials):
 - <https://wiki.vis.kaust.edu.sa/booking>
 - Email us for support: help@vis.kaust.edu.sa

Facility Booking Form



Once you click **Send Request** you can refresh this page to see your booking appear in the **bookings calendar**. All bookings are provisional until approved by KVL.

Vis Lab

Home

Booking

Hosts **188**

Logged in as kressjm

Logged in as kressjm. ×

Request a booking

Purpose

Description of booking

Reservation

Maintenance

Cornea

MPR

Vis Cubes

Vive

Zone 1

Zone 2

Zone 5

Every

0

weeks

Full day

Start

2023-07-27 11:36



End

2023-07-27 11:36



Send Request



KVL Wiki: Facility Booking, FAQ, and More

Visualization Laboratory Wiki

Welcome to the KVL

Welcome to the KAUST Visualization Core Lab (KVL)

- Who We Are
- Core Services
- Mission
- Contact Us
- Location
- Recent Highlights
- Video Overview
- People

- Training Events
- Facilities
- Highlights

KVL Documentation

- Frequently Asked Questions
- Visualization Tools User Guides
- VR Tools User Guides
- Data Science Tools User Guides
- Facility User Guides

Docs » start

Welcome to the KAUST Visualization Core Lab (KVL)

Who We Are

The KAUST Visualization Core Laboratory is a state-of-the-art facility within the Core Labs that offers students, faculty, researchers, and university collaborators a unique opportunity to utilize one-of-a-kind visualization, interaction, and computational resources for the exploration and analysis of scientific data.

Core Services

Our mission is to support the data visualization and data science needs of KAUST researchers and In-Kingdom entities. To that end we have a varied range of expertise across the team. Contact us with your questions, project requests, or collaboration requests that fall within our service areas:

- **2D/3D Visualization Facilities**
 - We provide a unique set of [visualization and meeting facilities](#) on campus.
 - [Contact us](#) for inquiries or use your KAUST credentials to [create a booking](#).
- **Data Visualization and Data Science Workflows**
 - We support KAUST users with [visualization workflows](#), [VR workflows](#), and [data science/machine learning](#).
 - Contact us for [additional information](#), to [submit a general request](#), or [request a collaboration](#).
- **Training and Workshops**
 - We have a wide variety of trainings available on our [YouTube Channel](#) as well as select trainings performed [in-person each semester](#).

Mission

To support the needs of KAUST researchers and In-Kingdom entities by:

- Developing and maintaining an effective and efficient environment for data exploration and analysis
- Providing advanced visualization and data analysis services
- Providing training on state-of-the-art visualization hardware and software for scientific discovery
- Developing new capabilities to remain at the cutting edge of visualization and data science


Contact Us

- help@vis.kaust.edu.sa
- [KVL YouTube Channel](#)
- [KVL Twitter](#)
- [Core Labs Website](#)
- [KVL Core Labs Main Website](#)

Location

Our main showcase facility is located @:
Building 1 (seaside), Level 2, Showcase

Community Map



KAUST Visualization Core Lab

[Zoom to](#)
[Email Map](#)
[Direction](#)

<https://wiki.vis.kaust.edu.sa>

King Abdullah University of Science and Technology

10



KVL Training Events

<https://wiki.vis.kaust.edu.sa/training/overview>
<https://www.youtube.com/@kaustvislab>

- Scientific Visualization Workshop Series
 - ParaView, VisIt, Avizo/Amira
- Data Science Workshop Series
 - Shell, Conda, Python, Git, and more
- Hands-on AI Tools and Techniques Workshop Series
 - Intro to Machine Learning/Deep Learning, Visualization for Data Science



Workshop: Goals and Agenda

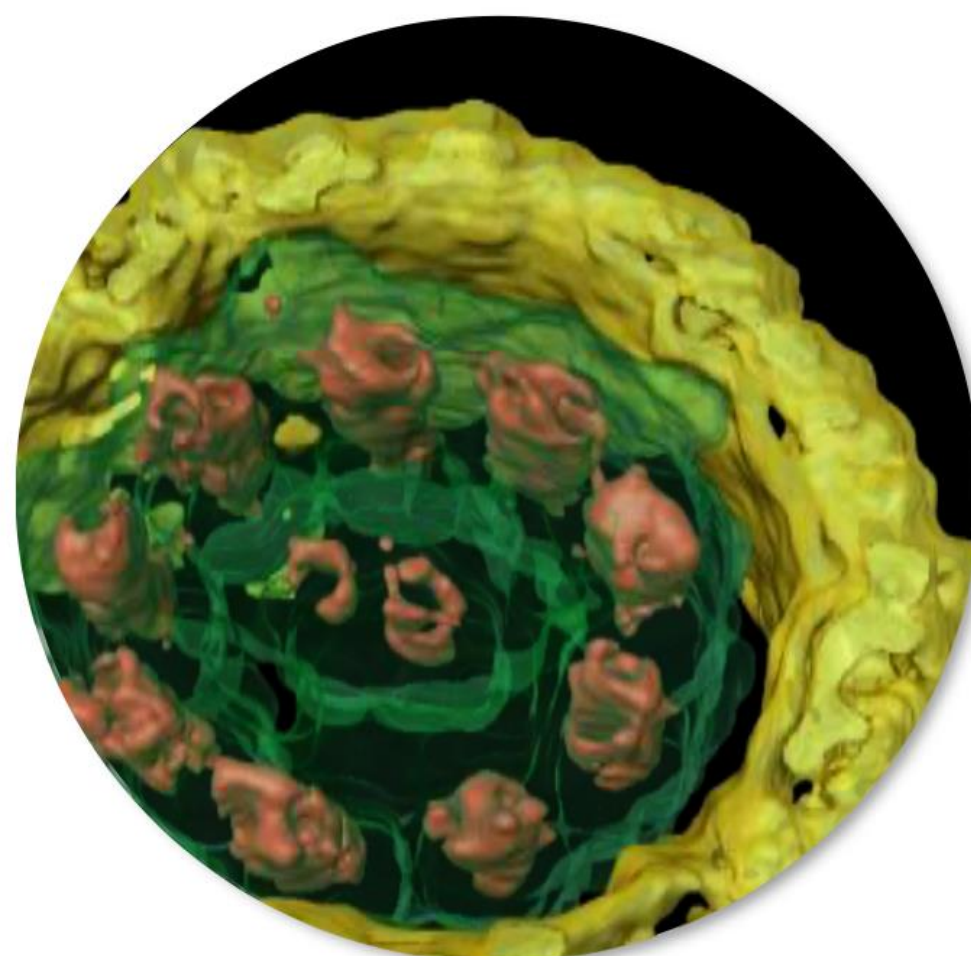


Workshop Goals

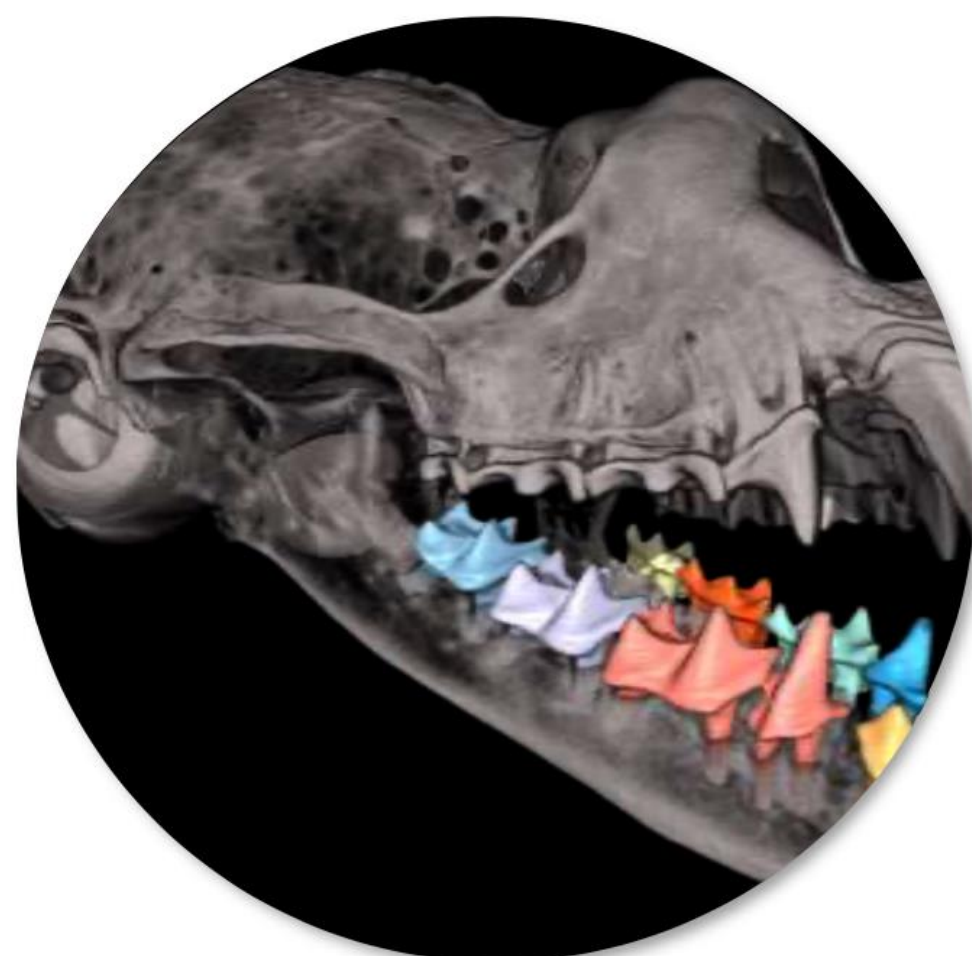
- Hands-on learning with *Avizo/Amira*
 - Introductory course
 - Interactive sessions
- What is *Avizo/Amira* (short history)?
 - Commercially supported software platform for 3D and 4D data visualization, processing, and analysis
 - Started as research project at the Zuse Institute Berlin (ZIB) named *Amira*
 - Visualization Sciences Group (VSG) in Bordeaux (France) continued the work on a complementary product named *Avizo*
 - In August 2012, FEI purchased VSG and brought the two software sisters *Amira* and *Avizo* back into one hand
 - In 2016 FEI has been bought by Thermo Fisher Scientific



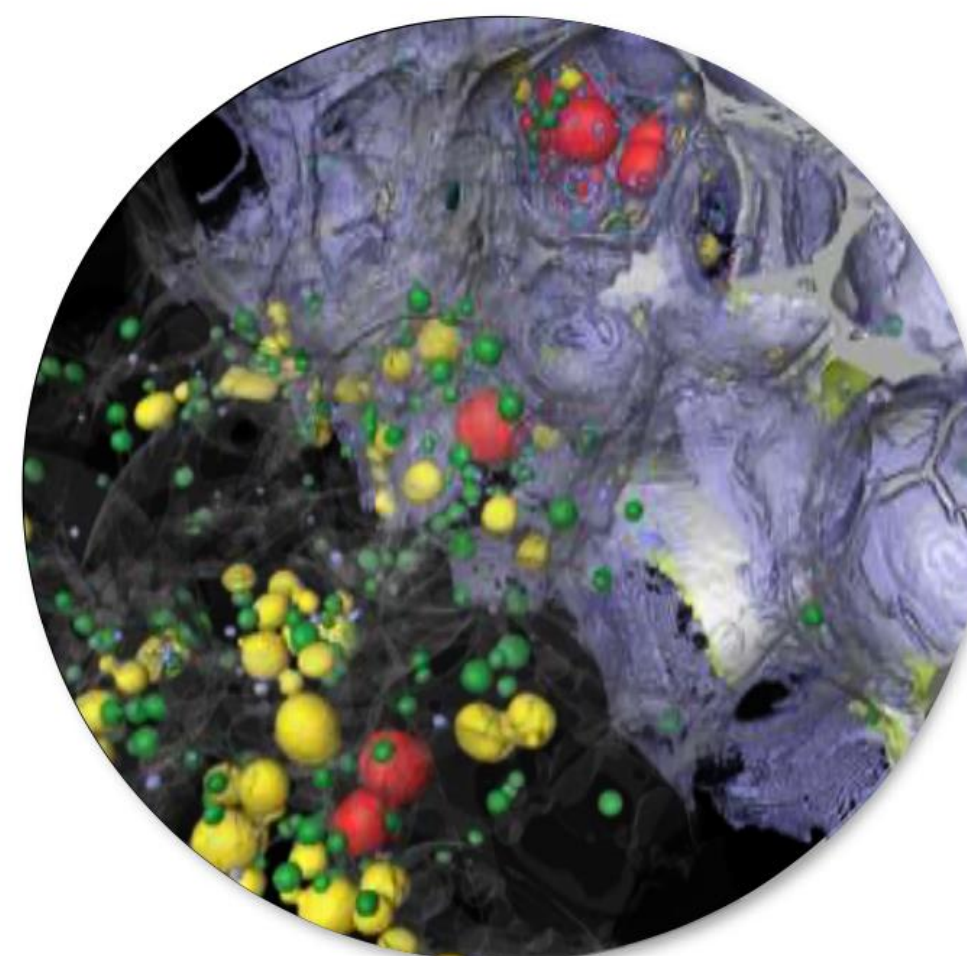
What is Avizo?



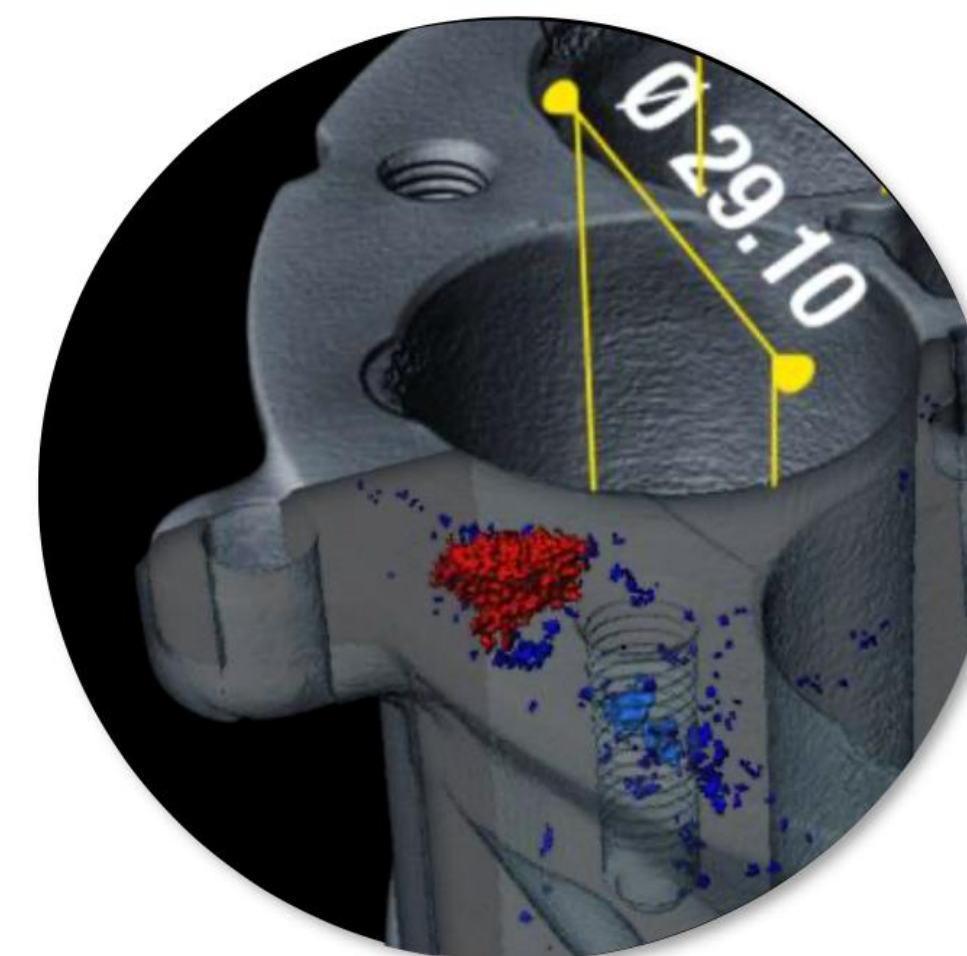
**Amira Software
for Life Sciences**



**Avizo Software
for Natural Sciences**



**Avizo Software
for Materials Research**



**Avizo Software
for Industrial Inspection**

Visualize

Analyze

Understand

Visualization & analysis software for scientific and industrial data

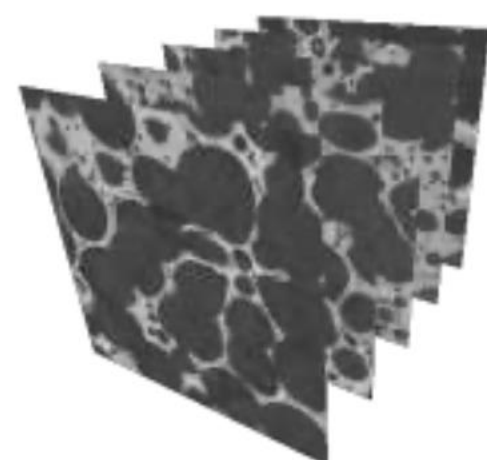


What is Avizo?

From Sample to Knowledge



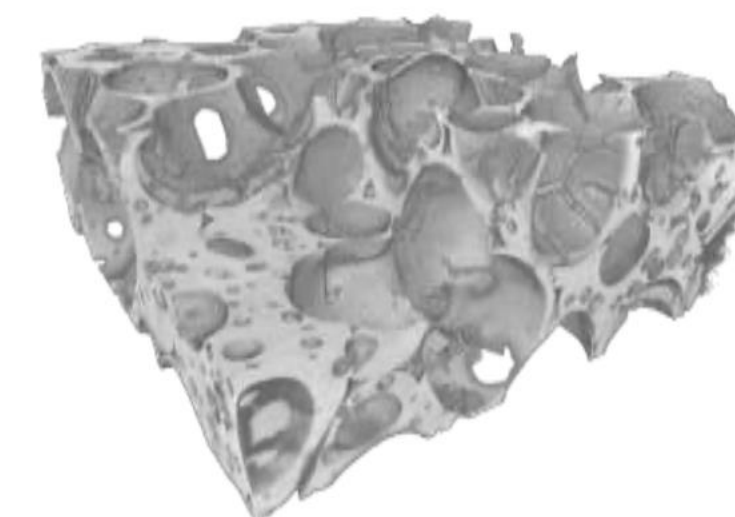
Data acquisition



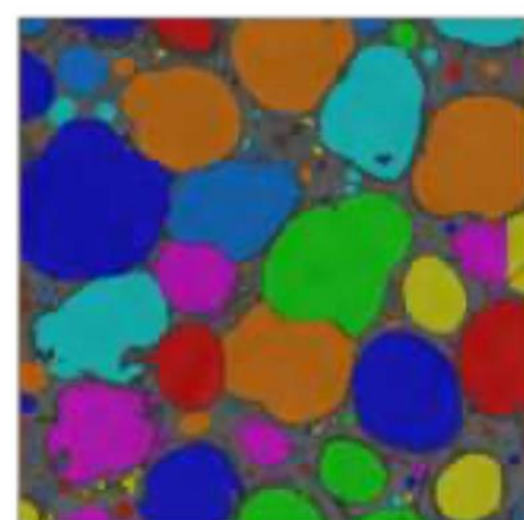
Import



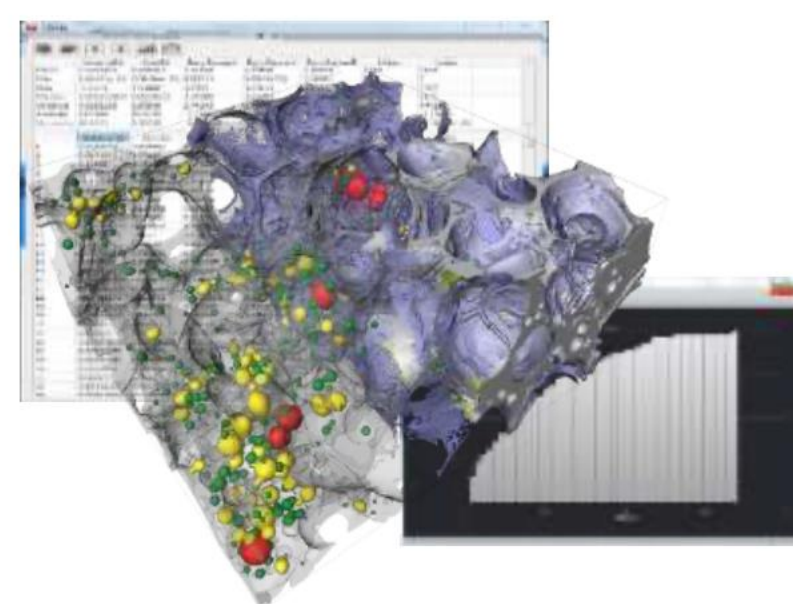
Filtering & pre-processing



Visualization



Segmentation



Measurements & analysis



Presentation

- + Large Data Management
- + Automation
- + Customization



Today's Agenda

Time	Topic	Speaker
~10 min	Introduction	Thomas Theußl
~30 min	Scientific Visualization: Scalar Fields	Thomas Theußl
5 - 10 min	— break —	-
~30 min	Scientific Visualization: Volume Segmentation	Thomas Theußl
5 - 10 min	— break —	-
20 min	The Avizo <u>GUI</u> and Features	Thomas Theußl
on demand	Q&A / Discussion	all



Introduction to Scientific Visualization with Avizo

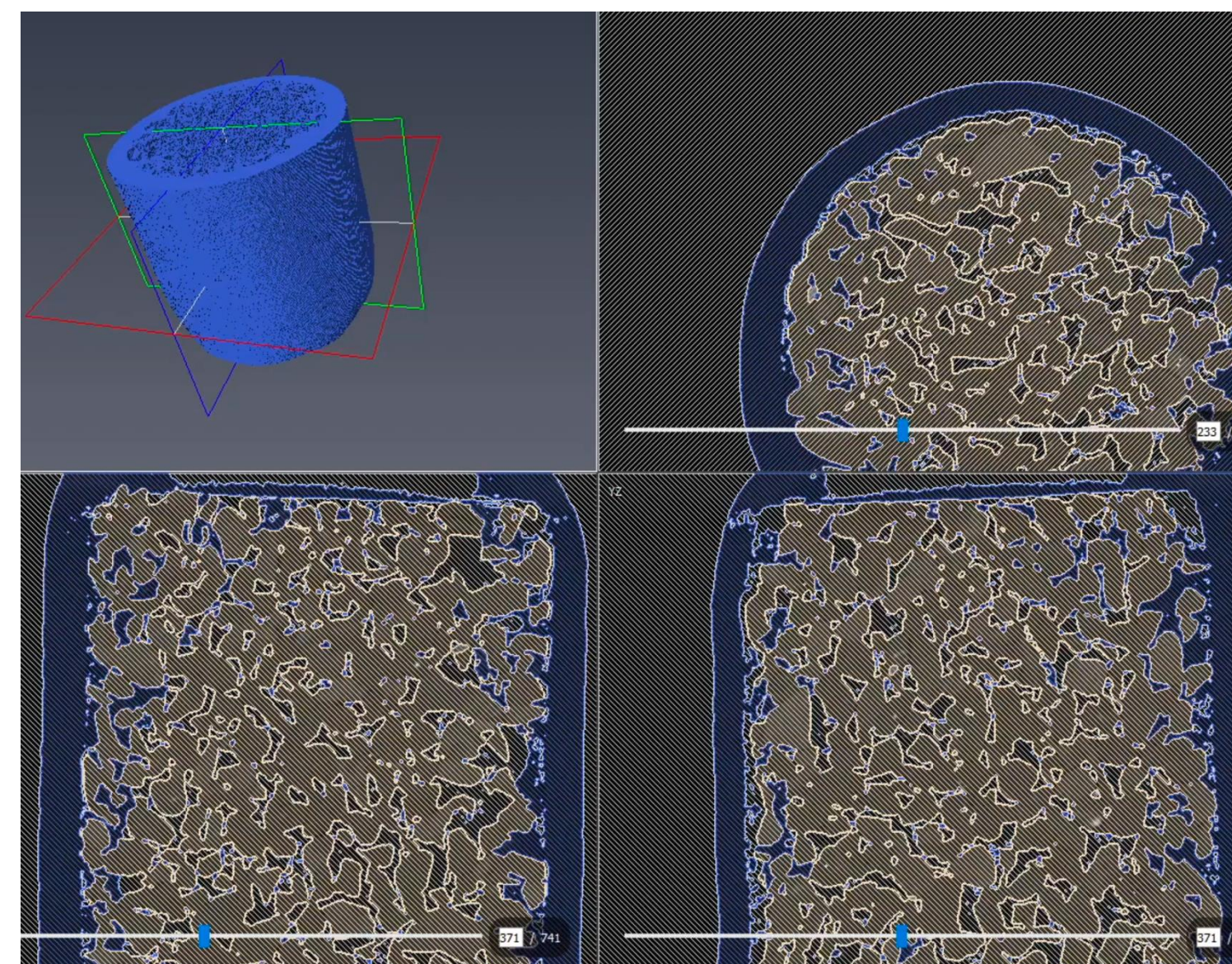
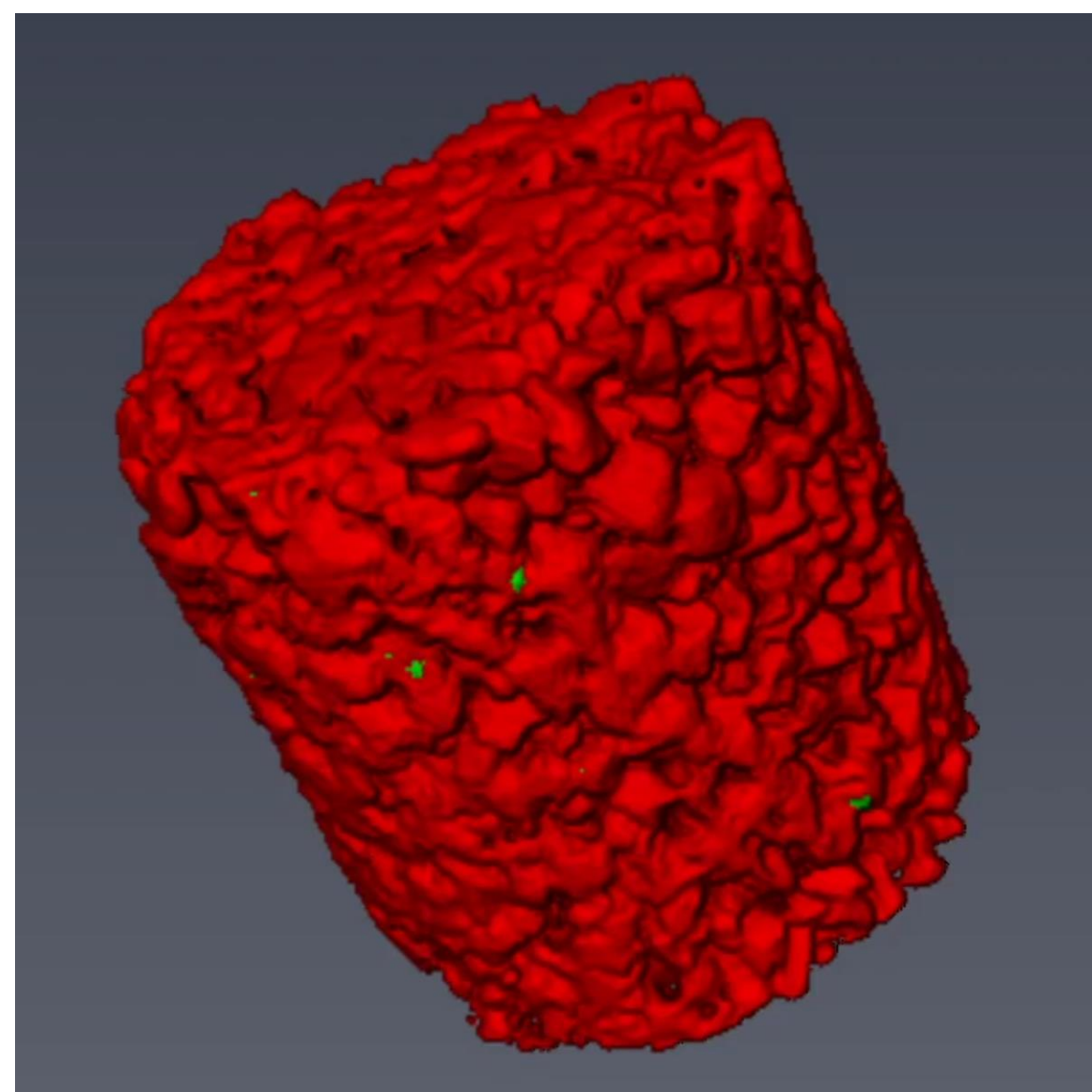
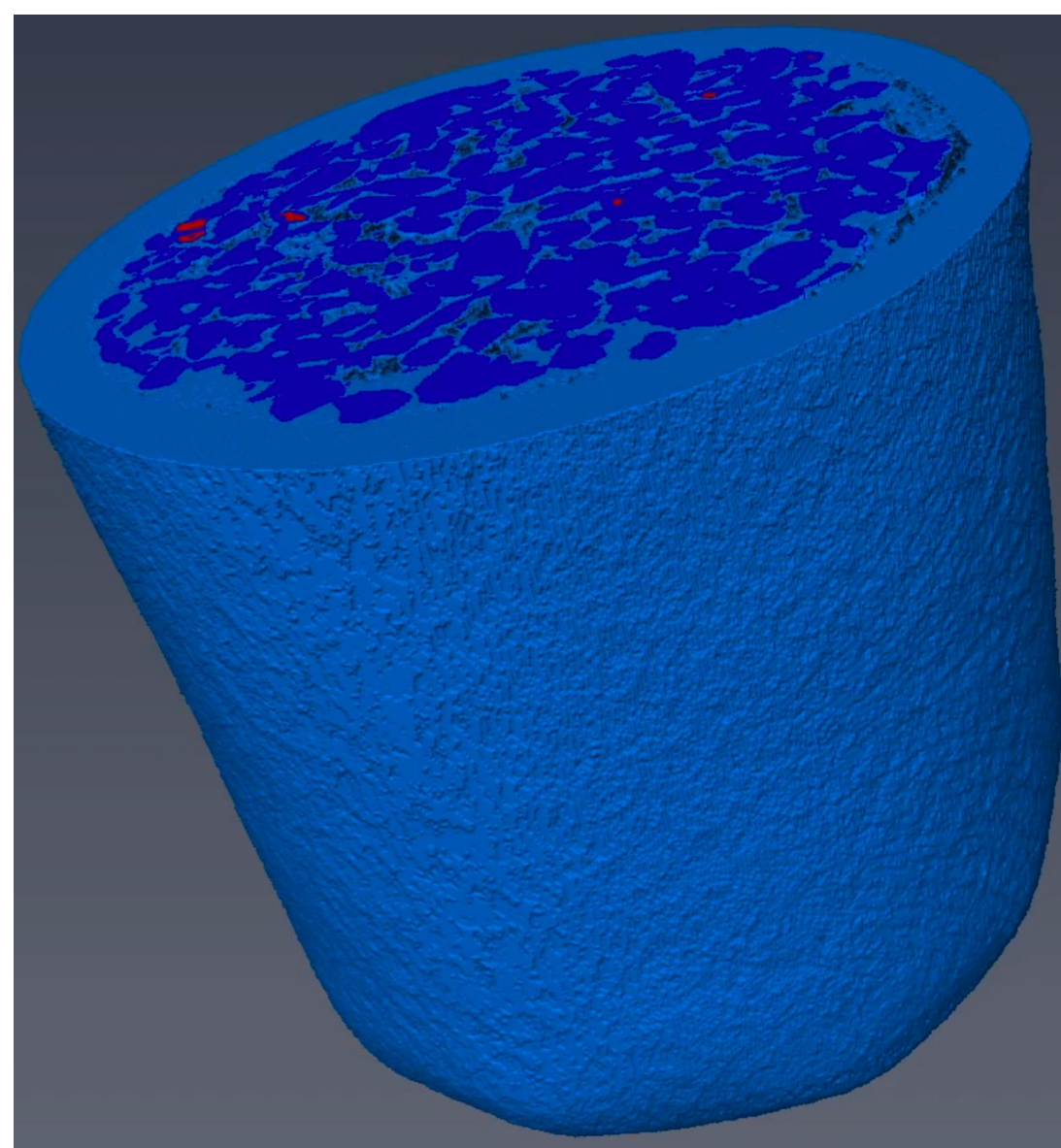
Hands on exercises in Avizo using some basic visualization techniques

- Scalar field visualization:

- Slicing
- Isosurfacing
- Raycasting

- Volume segmentation:

- Thresholding
- Watershed
- (Segmentation Editor)





Scalar Field Visualization

- Loading data
- Slicing
- Volume rendering



Image Segmentation

- Thresholding
- Watershed



Avizo/Amira GUI and Features

- Saving projects
- GUI and help



What's next?

- Advanced workshop on volume segmentation:
 - https://www.youtube.com/watch?v=63k0fM_w_R8
- Check out our upcoming workshops:
 - https://wiki.vis.kaust.edu.sa/training/overview#training_events