

Plans and Ideas for VR for Science at UCLA

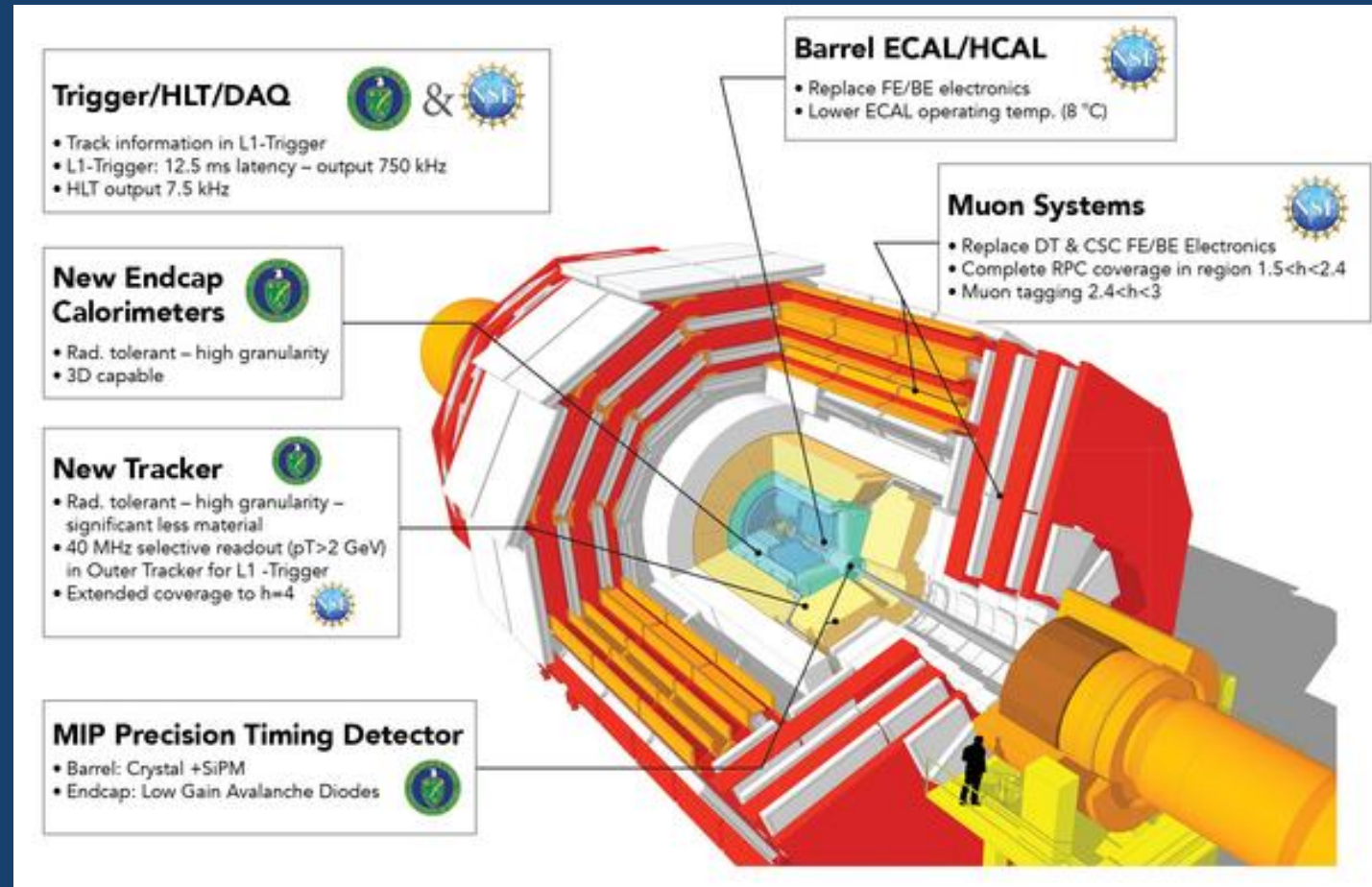
Jay Hauser

Categories:

- Development of existing apps
- Possible new apps
- Possible new directions
- If not indicated otherwise, nobody is yet working on these

Development of existing apps

- CMSVR and CEDVR for the massively upgraded detector being built right now, especially
 - Novel picosecond timing detector!
 - Novel endcap calorimeter with 3D energy plus timing

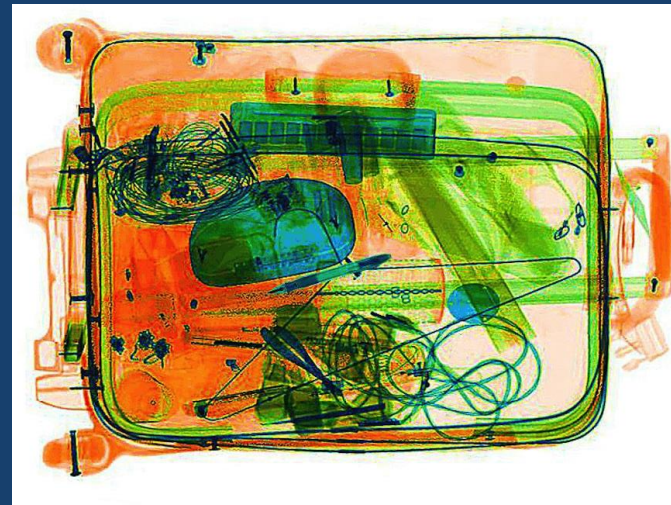
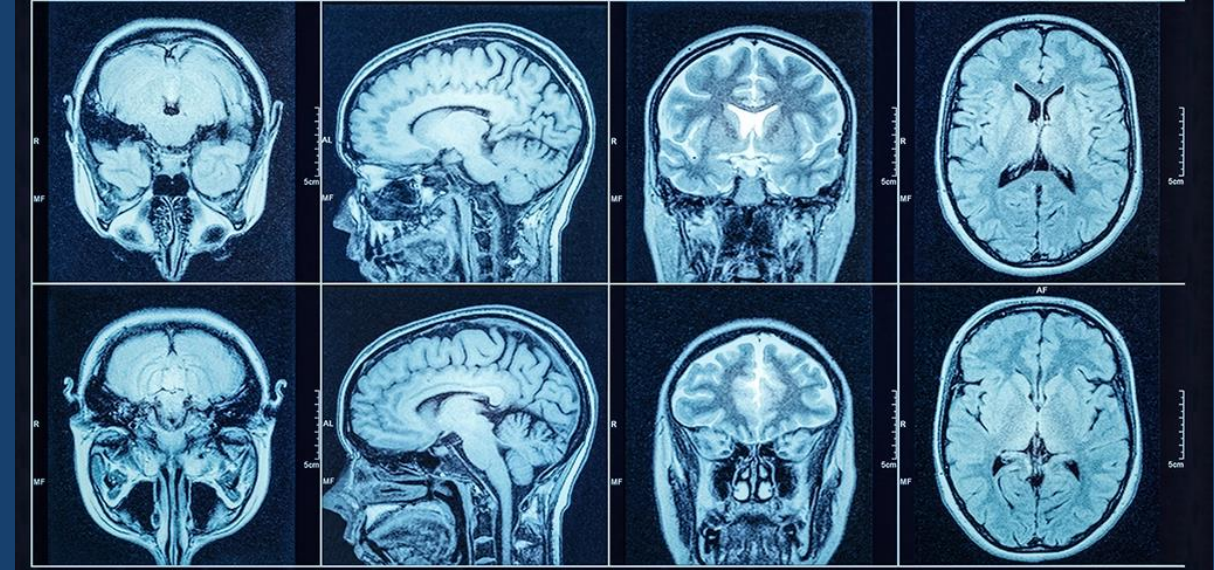


...Development of existing apps

- VRFields
 - Add ion and neutral atom traps used in AMO physics e.g. quantum computers
 - Penning, Paul, MOT traps (underway)
 - Make it an app accessible to a web browser in headset (underway)
 - Use it as a guinea pig for trying to develop VR apps with strong use of AI tools (underway)

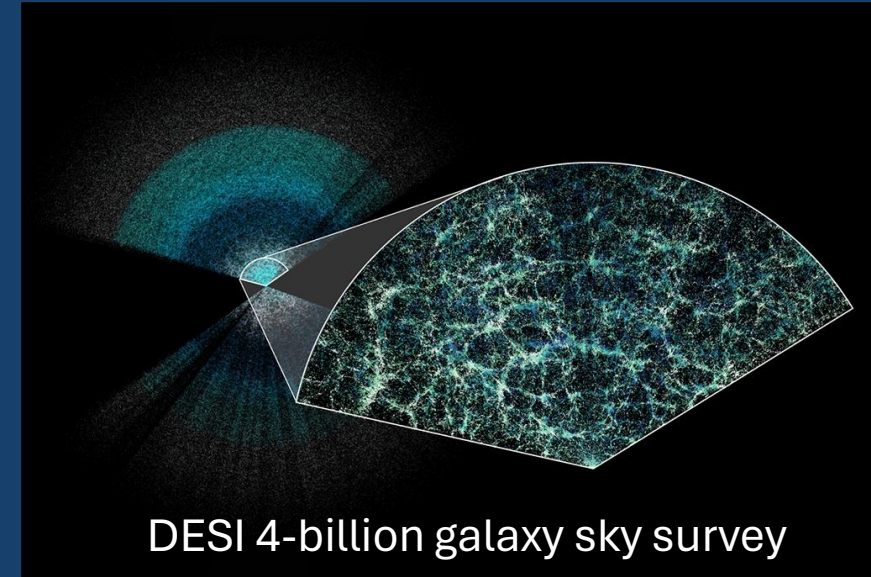
...Development of existing apps

- ROOTVR
 - Add new displays to take more advantage of VR capabilities, like contour plots/movies
 - transparency variations for immersion into CAT scans, TSA luggage scans, ...



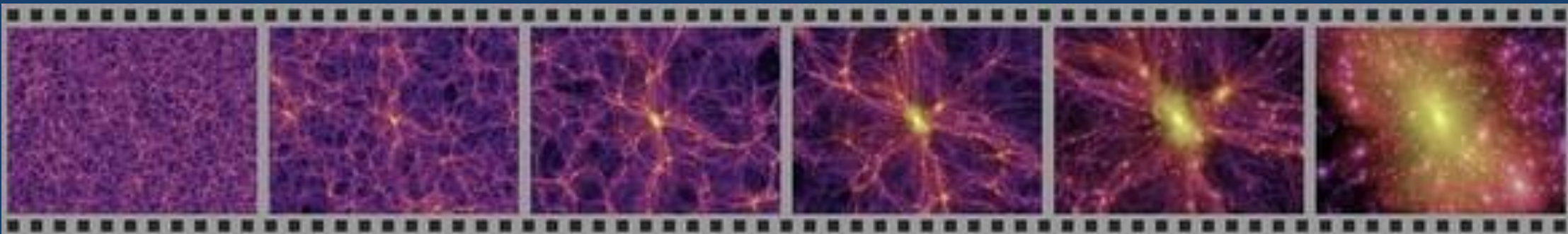
...Development of existing apps

- ROOTVR
 - Figure out how to display very large datasets (underway)
 - Figure out how to make 3D and 4D data displays completely immersive (like simulated development of the early universe)



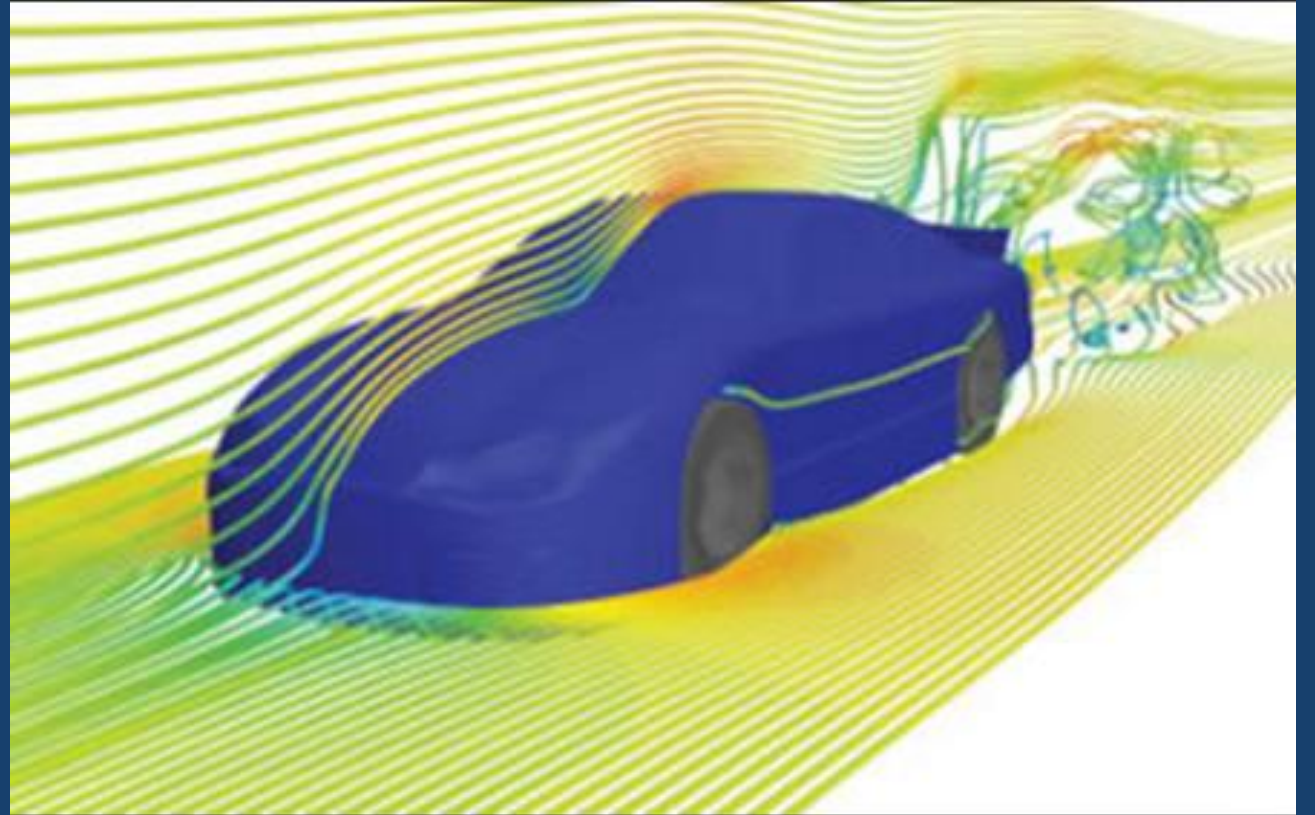
DESI 4-billion galaxy sky survey

The Millennium Simulation Project



...Development of existing apps

- ROOTVR
 - Look for cool science data samples to plot, such as fluid flow or plasma

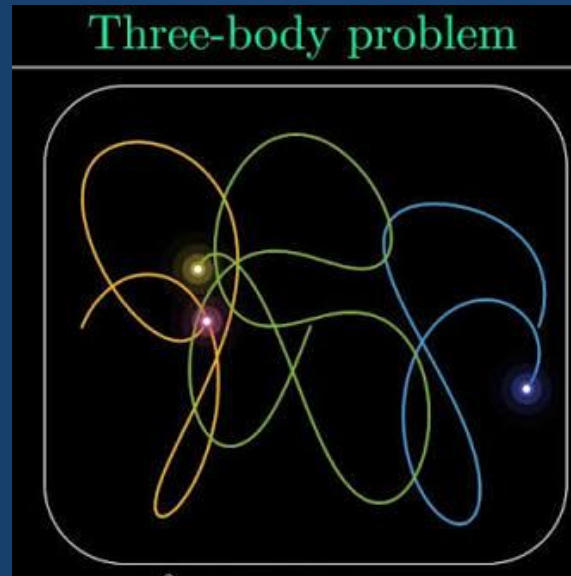


Development of existing apps...

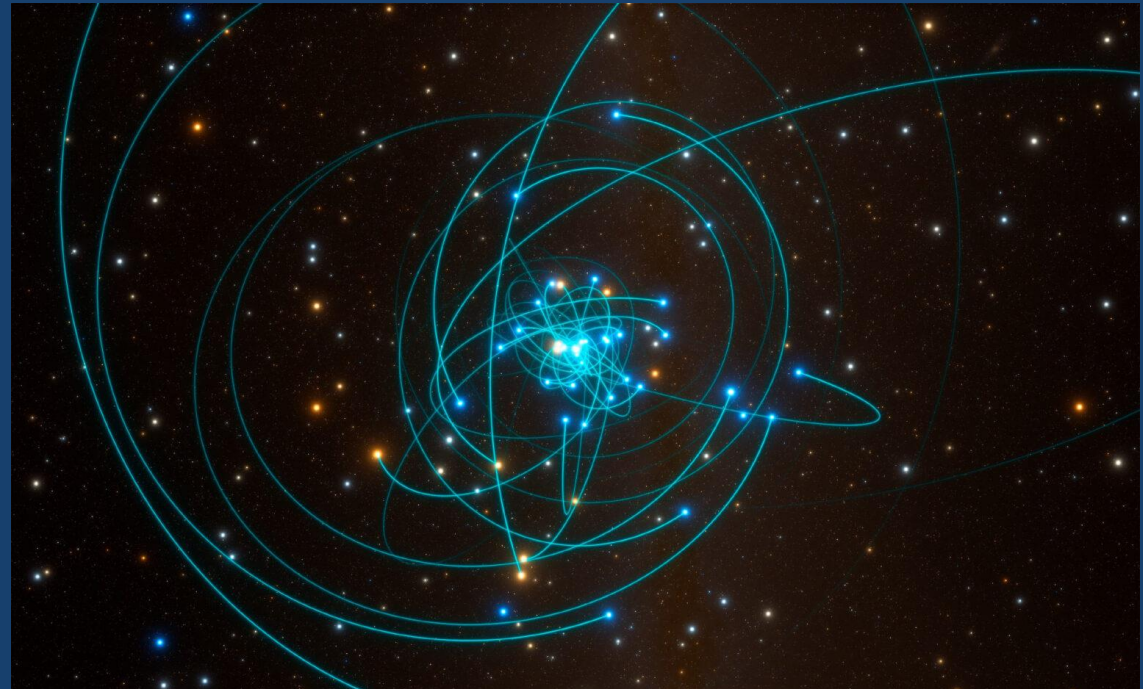
- “Publish” to Meta App Lab some of our additional apps that we will demo today:
 - Dark matter detection in liquid Xenon (Nicholas)
 - Proton decay in Super-K like detector (Trevor)
 - Atomic orbitals (Andrew D)
- Write up and submit articles for publication
 - 😊 G4VR submitted
 - CEDVR have a draft soon to submit
 - Nothing yet for ROOTVR (of great interest to CERN scientists)
 - Nothing yet for VR Fields (e.g. Physics Teacher)
 - Nothing written yet for Hypercubes (math teacher journal??)

Possible new apps

- Gravitational motion
 - 2-body $\rightarrow$ 3-body or more planetary system (underway)
 - Self-gravitating galaxy, globular clusters
 - The galactic center of the Milky Way and its massive black hole (Ghez 2020 Physics Nobel prize)

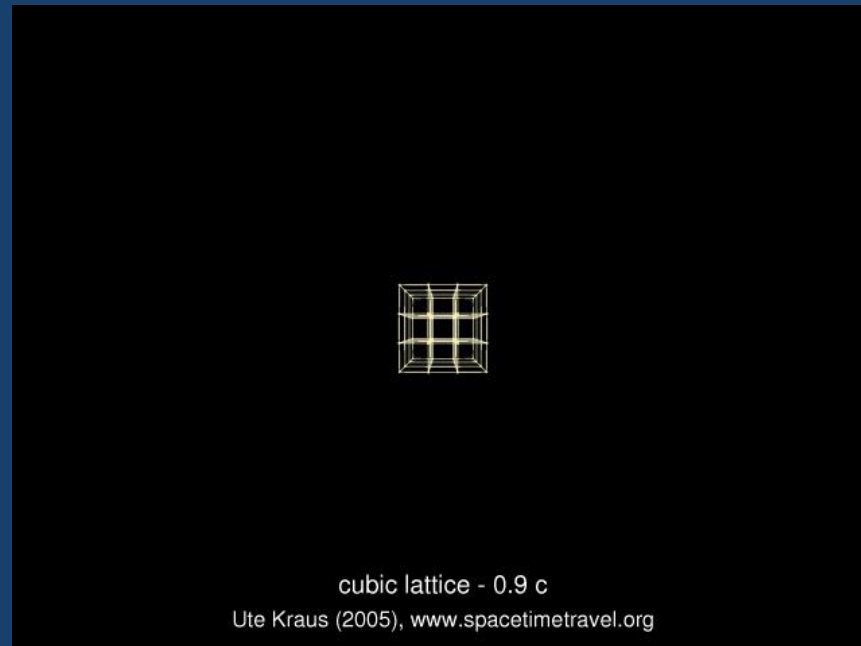


(very entertaining Netflix series)



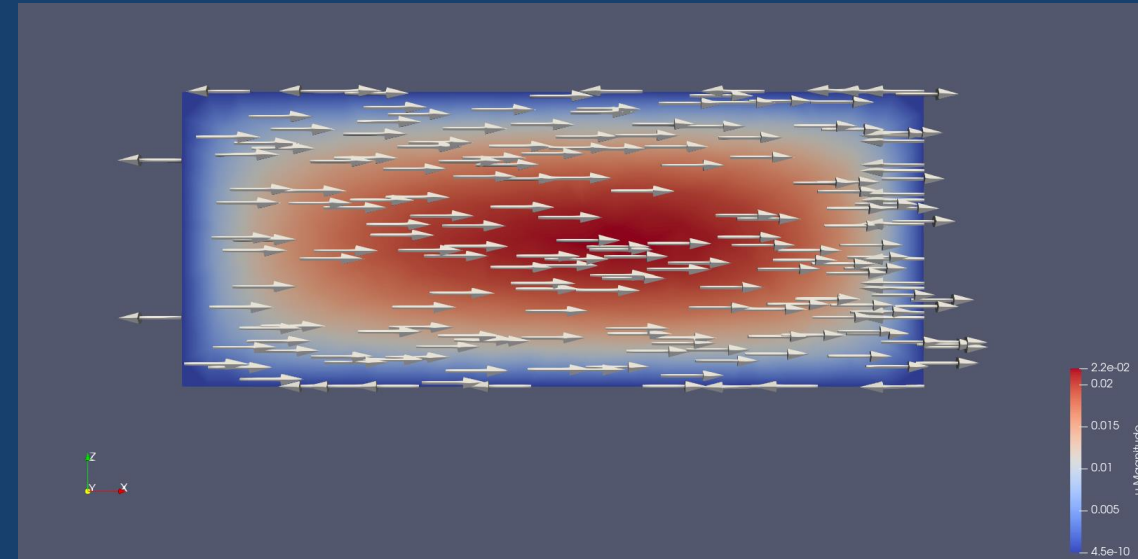
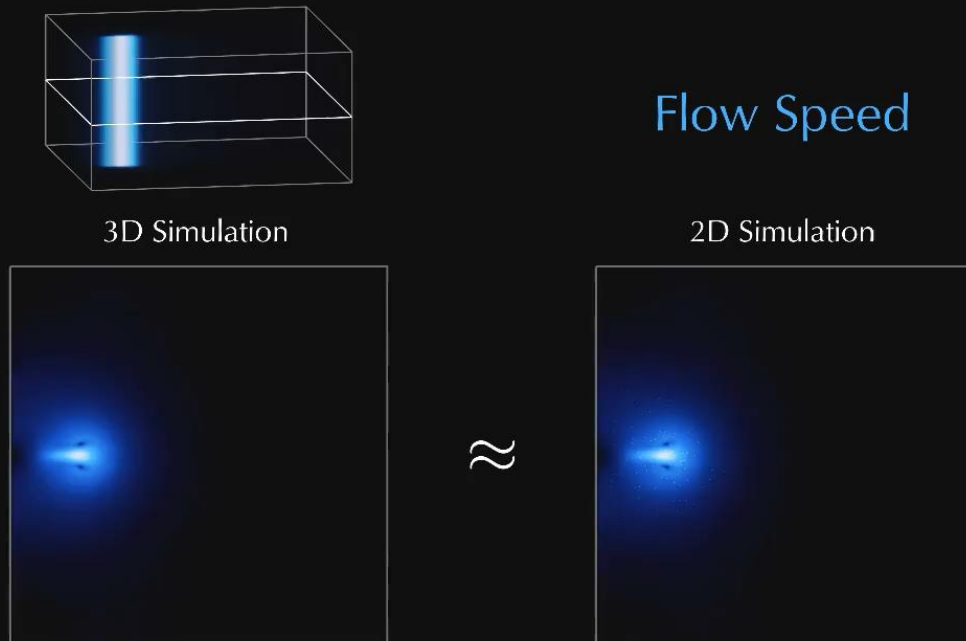
Possible new apps...

- “Star Trek” type display of star fields as user speed increases relativistically.
 - Not just blue shifts in front, red shifts in back, but distortions as well



Possible new apps...

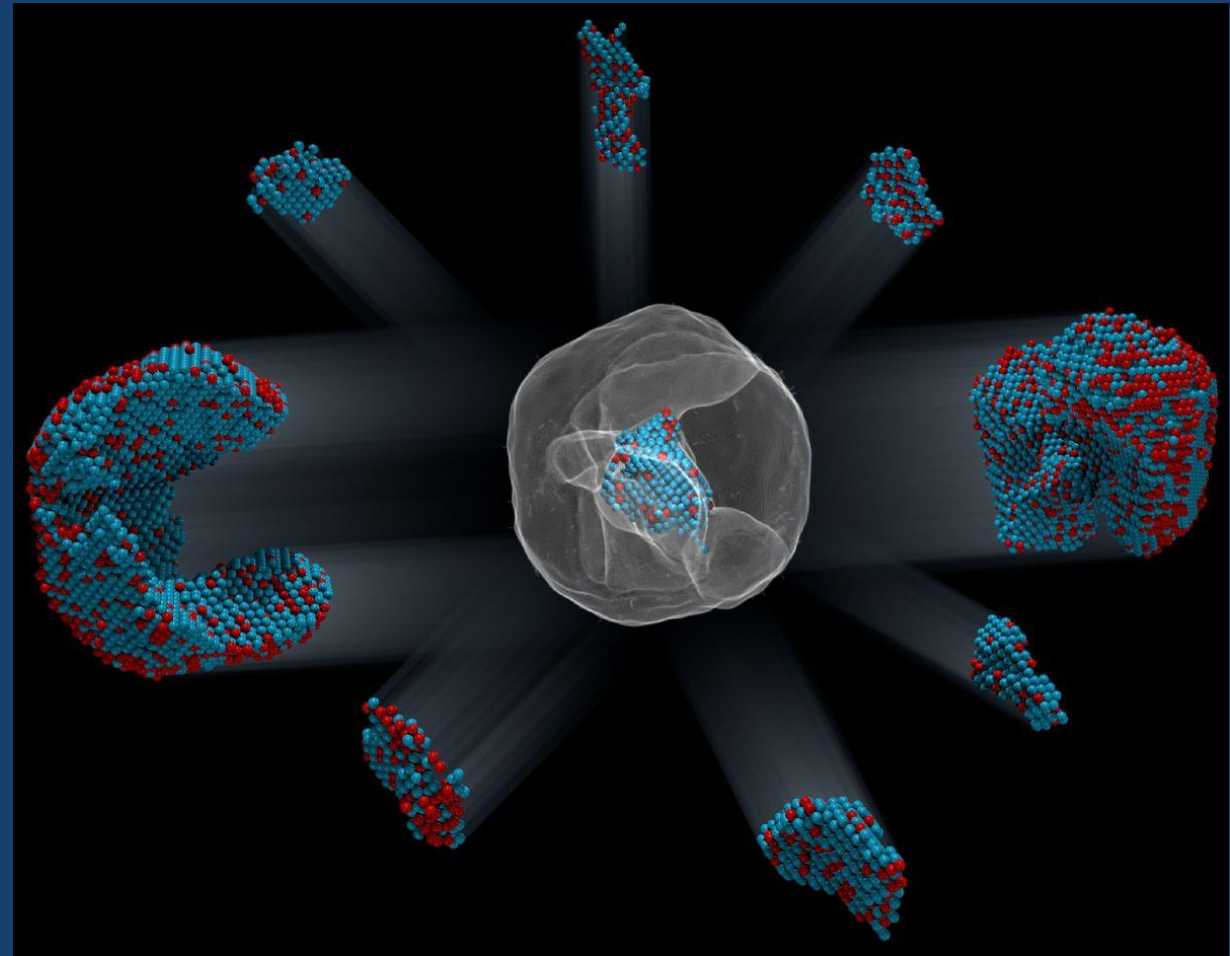
- VR add-on to fluid flow with the open-source Fenics package.



Possible new apps...

- UCLA Miao group imaging of atoms using advanced lenseless diffraction

“Identification of the 3-D coordinates of 6,569 iron and 16,627 platinum atoms in an iron-platinum nanoparticle to correlate 3-D atomic arrangements with material properties at the single-atom level.”



Other possible new directions

- Create VR add-ons to PyROOT (Python-based ROOT), matplotlib, or other data analysis packages
- Investigate higher-resolution, but expensive, headsets, such as Apple Vision Pro \$3500, Samsung Galaxy XR \$1800, or newer Augmented Reality (AR) headsets
- Investigate “foveated streaming” with best resolution only where you are looking, for faster performance

Your ideas?

Thanks for coming here today

Enjoy the rest of the demos!