HuBMAP-SPARC *anatomical interoperation of resources* Collaboration (for the CFDE)

Jyl Boline & Bruce Herr

The Challenge

Work towards semantic and spatial “anatomical and cell type interoperability” via standardization of terminology and metadata used for anatomical structures and spatial mapping data formats, workflows, and user interfaces.

Goals of our CFDE-funded project

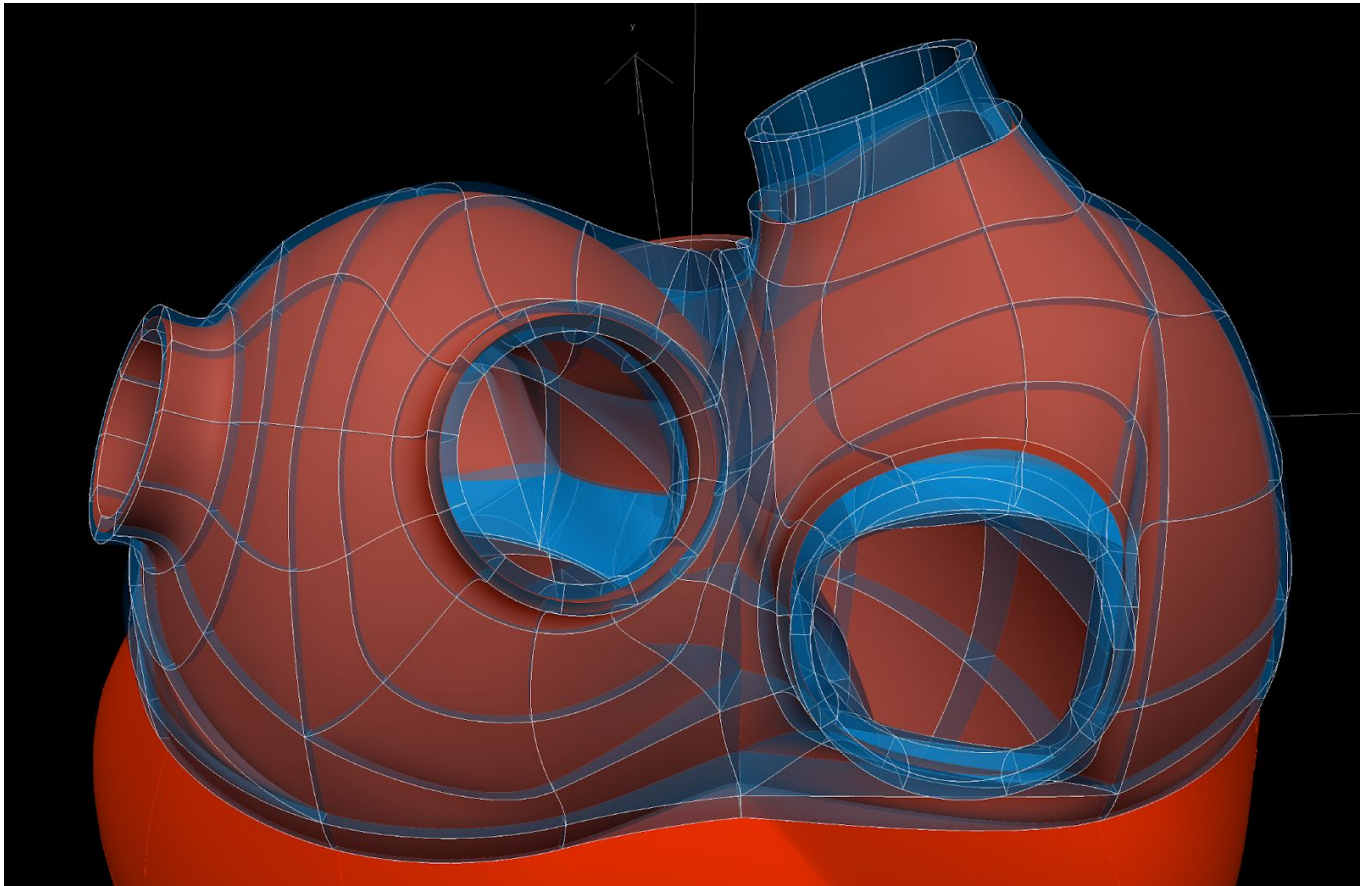
Ultimate goal is to create spatial interoperability between different coordinate systems. Allowing a system to pass spatially linked information to the other system (such as registered datasets) and to query across the two systems.

In this project, we moved towards this goal through the co-registration of HuBMAP and SPARC scaffold coordinate systems and the development of the ability to pass blocks of information registered to those systems between both projects.

HuBMAP Milestones

- Y2.701: Release of SPARC-HuBMAP cardiac scaffold (SPARC)
  - Y2.701.3 Modification of the SPARC human heart scaffold to incorporate fat pads around the atria and ventricles.
- Y2.702: Ensure interoperability between 3D SPARC scaffolds and HuBMAP reference organs, starting with heart and colon
- Y2.703: Ensure resource metadata interoperability, which is requisite to facilitate HuBMAP-SPARC cross platform querying
- Y2.704: Share spatially registered, biomolecular RNAseq data for sampling sites for the heart

SPARC scaffold incorporating fat pads around the atria and ventricles

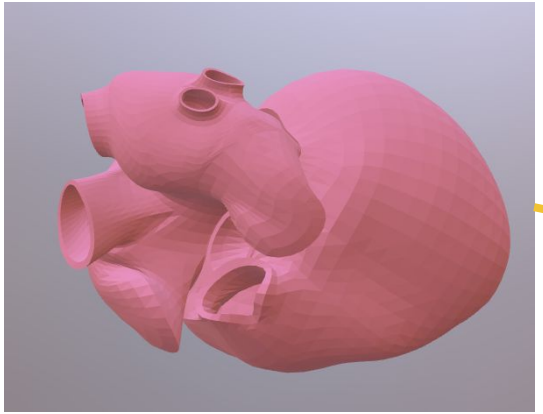


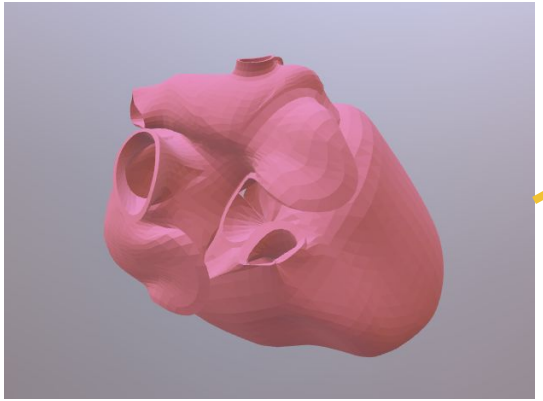
Diseased human hearts have significant peripheral fat pads containing intracardiac neurons. To enable the mapping of this data, the SPARC human heart scaffold was updated to include this adipose tissue.

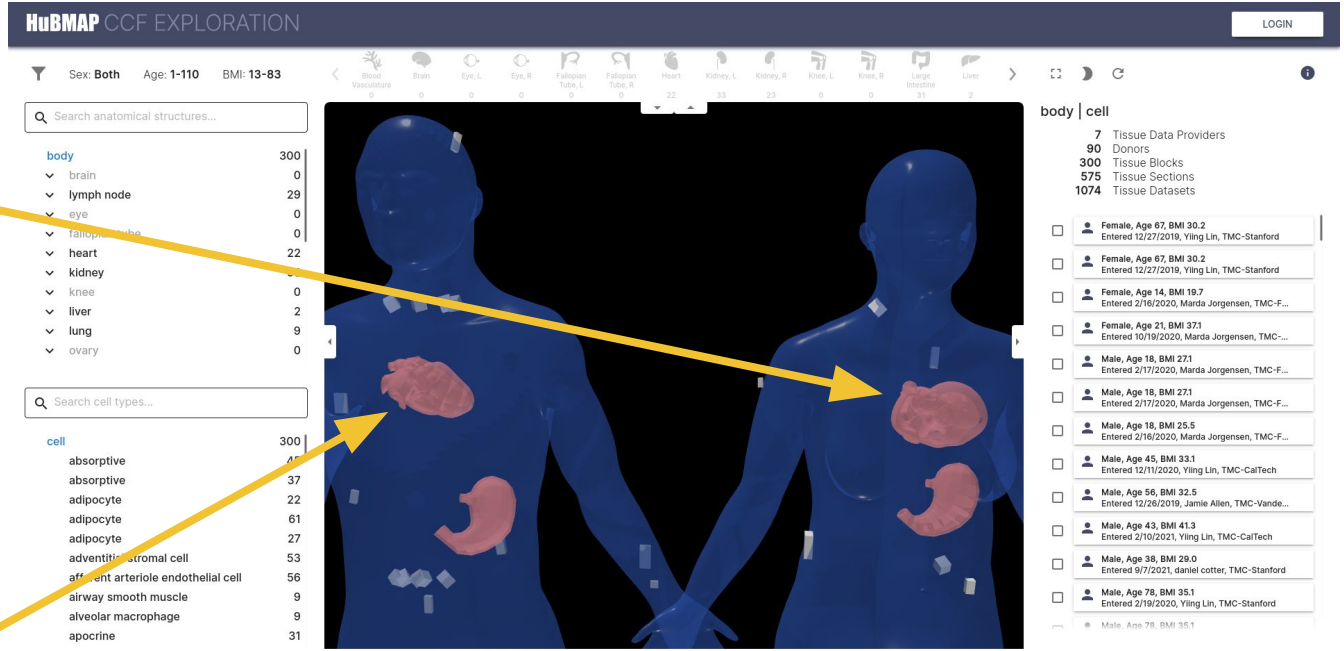
This shows how the fat pads sit on top of the epicardial surface (red/brown colour) and bridge across the gap between the left and right atria.

Example of cells registered to Rat heart in SPARC Scaffold viewer from dataset: https://doi.org/10.26275/gbxz-incd

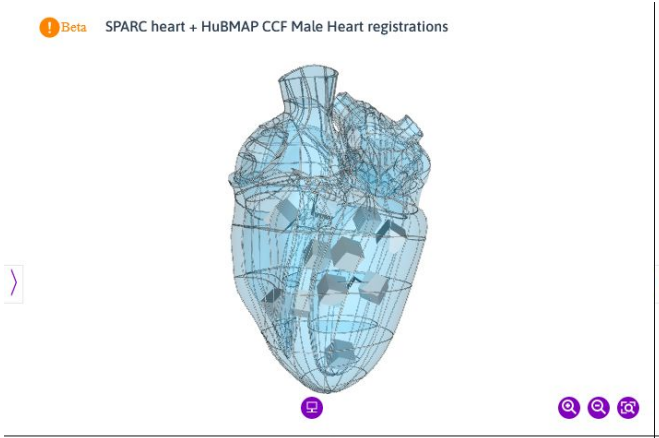
SPARC scaffolds placed in HuBMAP CCF

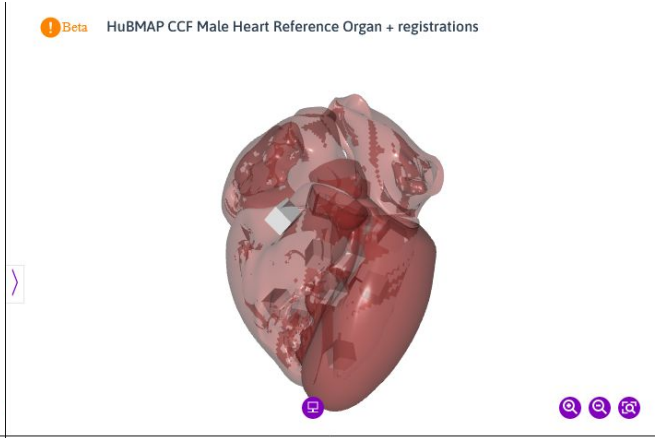


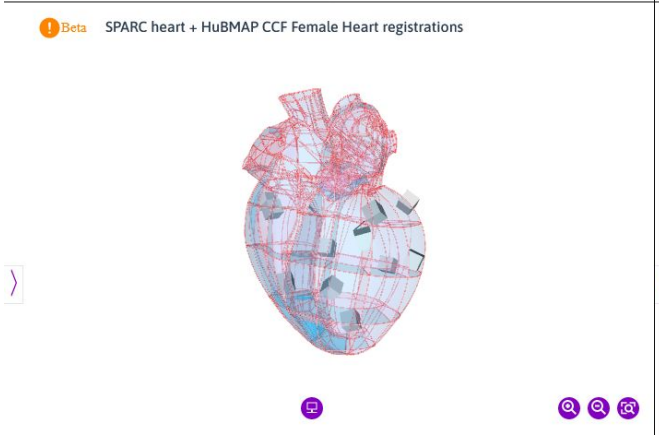


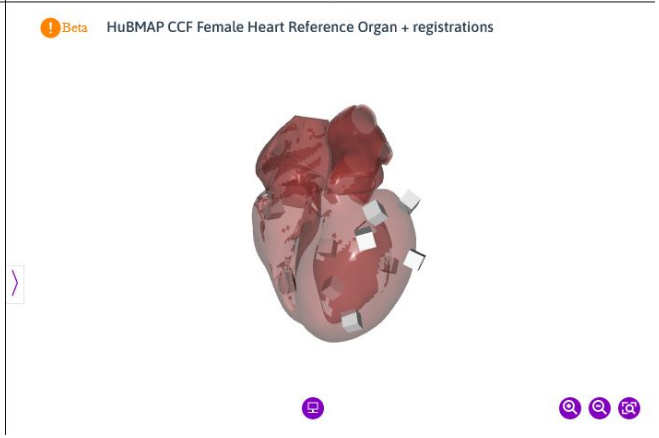


HuBMAP CCF registrations mapped to SPARC scaffolds

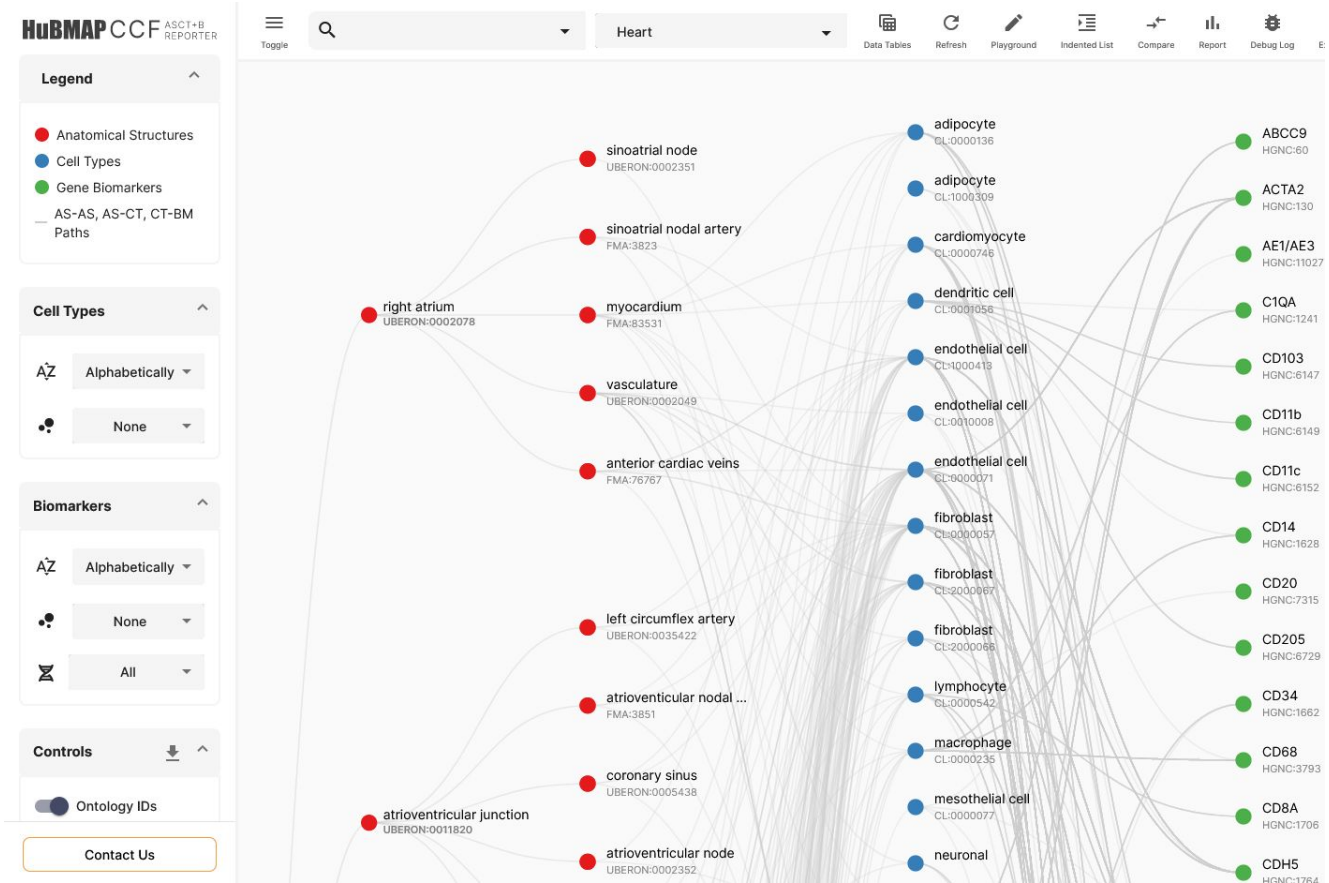








ASCT+B Heart Table Improvements



CCF-SPARC Pilot DEMO

CCF-SPARC Pilot

NIH Title: Anatomical Interoperation of Resources

Primary Deliverables

- SPARC heart scaffold fitted to HuBMAP CCF Heart reference organs
- HuBMAP CCF Tissue Block registrations mapped to SPARC scaffold registrations
- A bi-directional process for mapping HuBMAP CCF RUI registrations to SPARC scaffold registrations (code)
- Revised Heart ASCT+B Table: data demo
- Documentation: Overview (source), Scaffold Conversion, Registration Conversion

Deliverables by Milestone

DELIVERABLE OR MILESTONE	DUE DATE	STATUS	LINKS
Y2.701.1 First release of SPARC-HuBMAP cardiac scaffold	3/31/2022	Complete	docs demo data
Y2.702: Ensure interoperability between 3D SPARC scaffolds and HuBMAP reference organs, starting with heart ~~and colon~~	6/30/2022	Complete	code docs demo data
Y2.703: Ensure resource metadata interoperability, which is requisite to facilitate HuBMAP-SPARC cross platform querying	9/23/2022	Complete	ASCT+B data ASCT+B demo
Y2.704: Share spatially registered, biomolecular RNAseq data for sampling sites for the heart	9/23/2022	Complete	demo data (registrations) RNAseq data ASCT+B data

Potential Next Steps

- We now have a Proof of Concept for Heart scaffolds and CCF registrations
- Scale this up to all (shared) human organs and all CCF registrations
- Advertise all CCF registrations as SPARC scaffold registrations
- Advertise all SPARC scaffold-registered data as CCF registrations (no PoC yet for this)

Questions?

More to explore here:
https://hubmapconsortium.github.io/ccf-sparc-pilot/