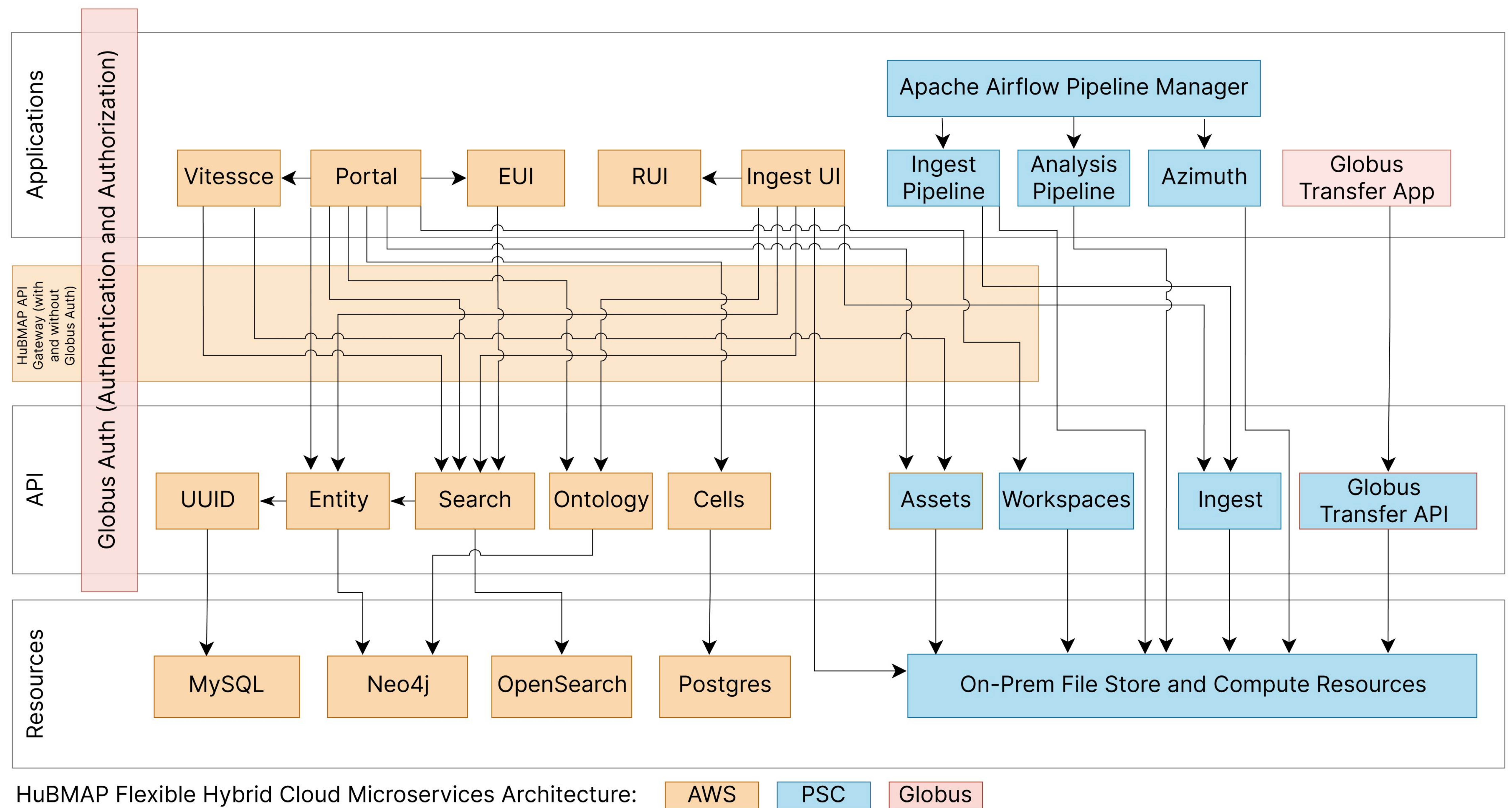


Human BioMolecular Atlas Program (HuBMAP): 3D Human Reference Atlas construction and usage

In the format provided by the
authors and unedited



Supplemental Figure 1. Hybrid Cloud Microservices System Architecture

Link to internship program, fellowship, associate memberships, and open working groups

Contact information, mailing list, policies, etc.

Data, tools, HRA Portal, and other HuBMAP resources

Links to Image of the Week, publications, and news

Member login and directory

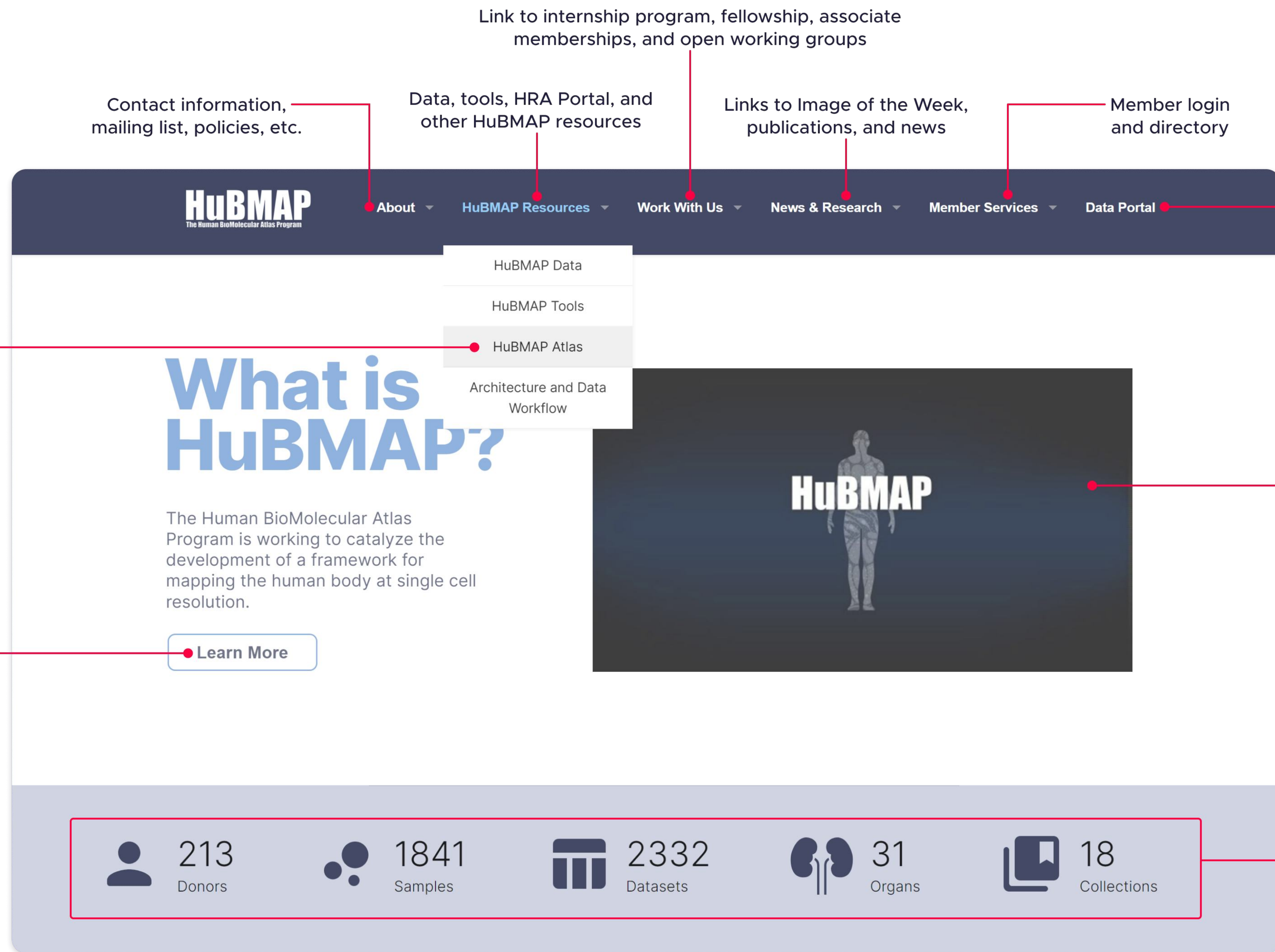
Link to HuBMAP Data Portal

Link to HRA Portal

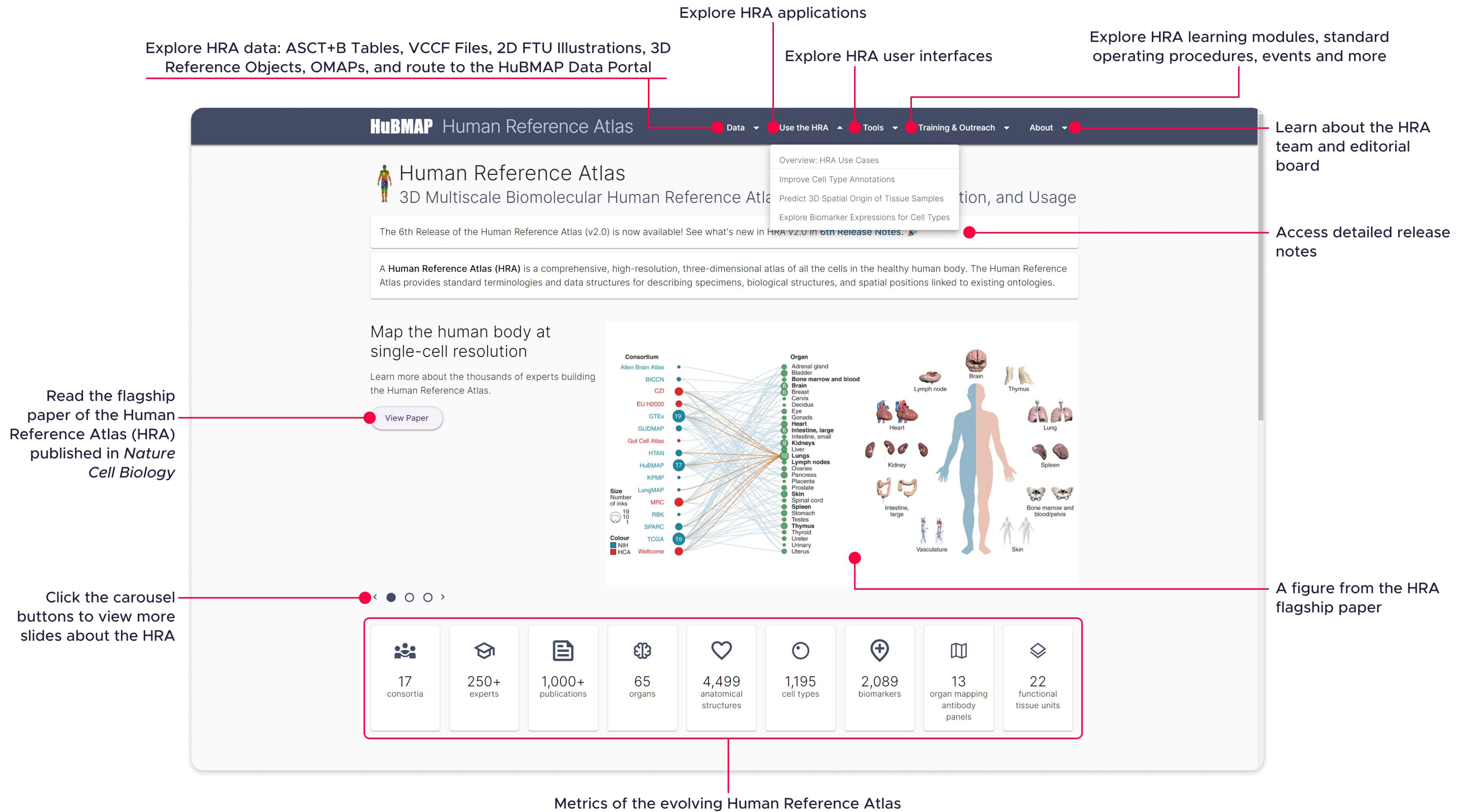
Featured carousel video content: HuBMAP Overview

Learn about HuBMAP

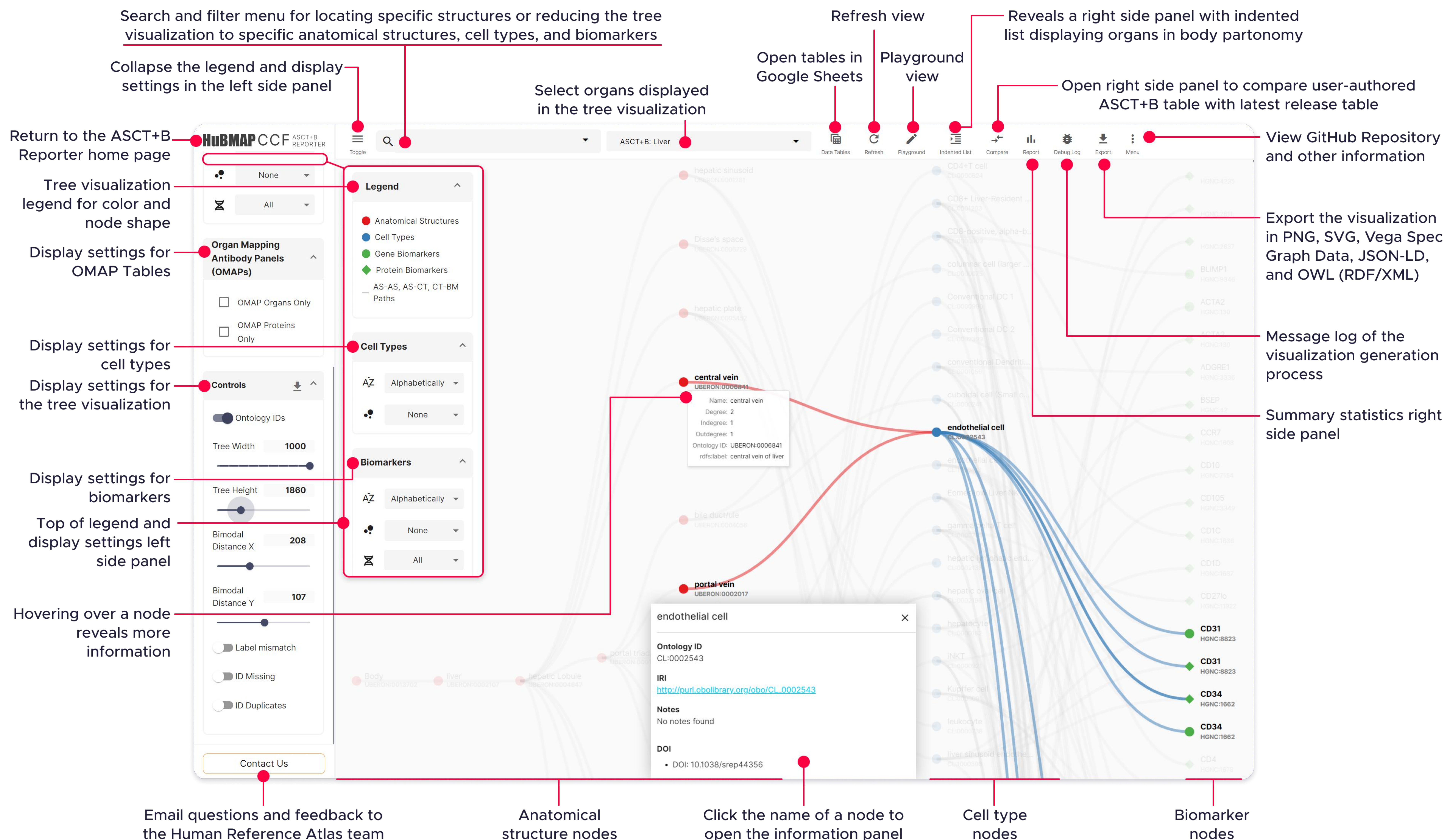
Metrics of the HuBMAP Data Portal



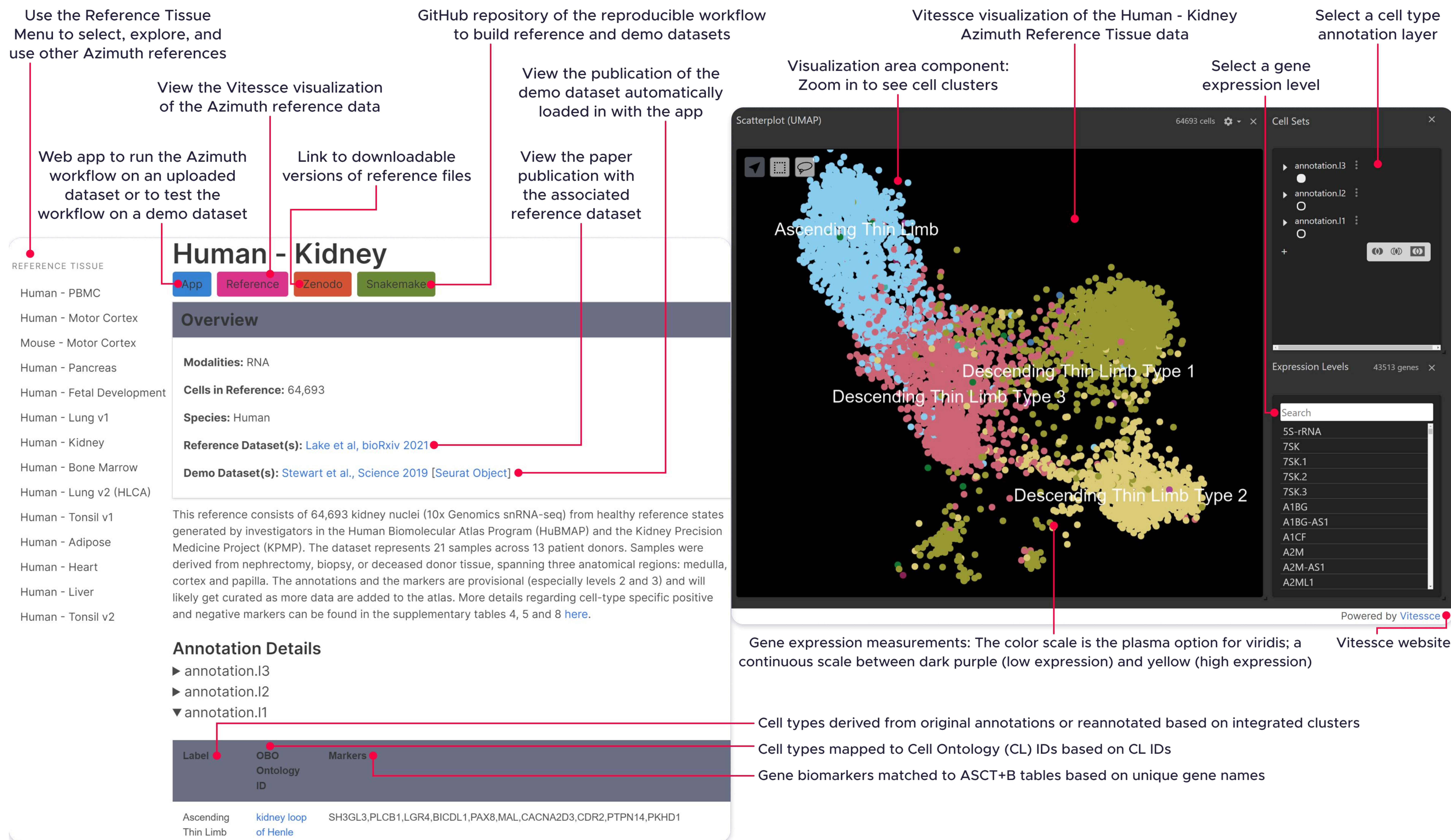
Supplemental Figure 2. HuBMAP Consortium Website



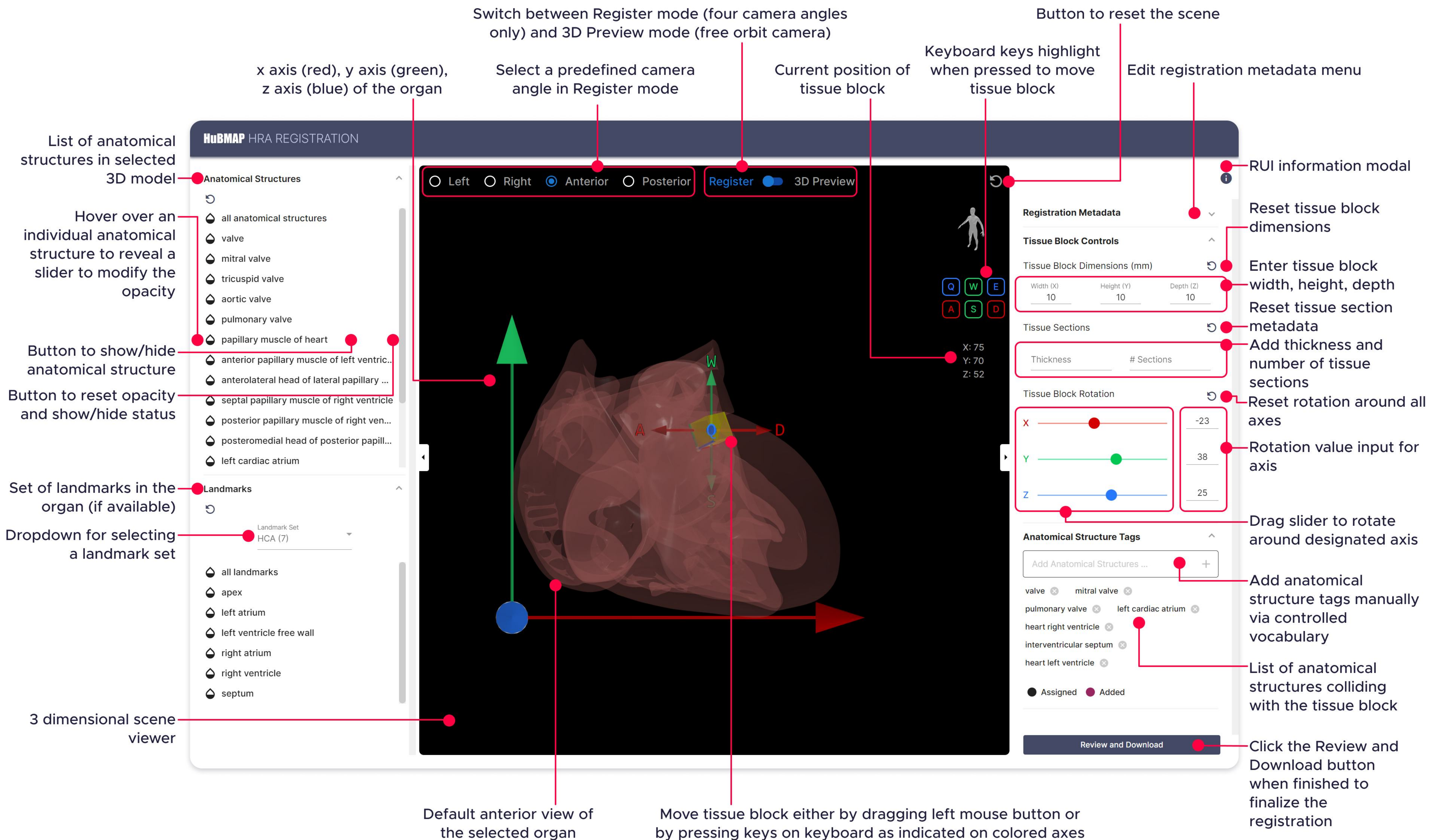
Supplemental Figure 3. Human Reference Atlas Portal



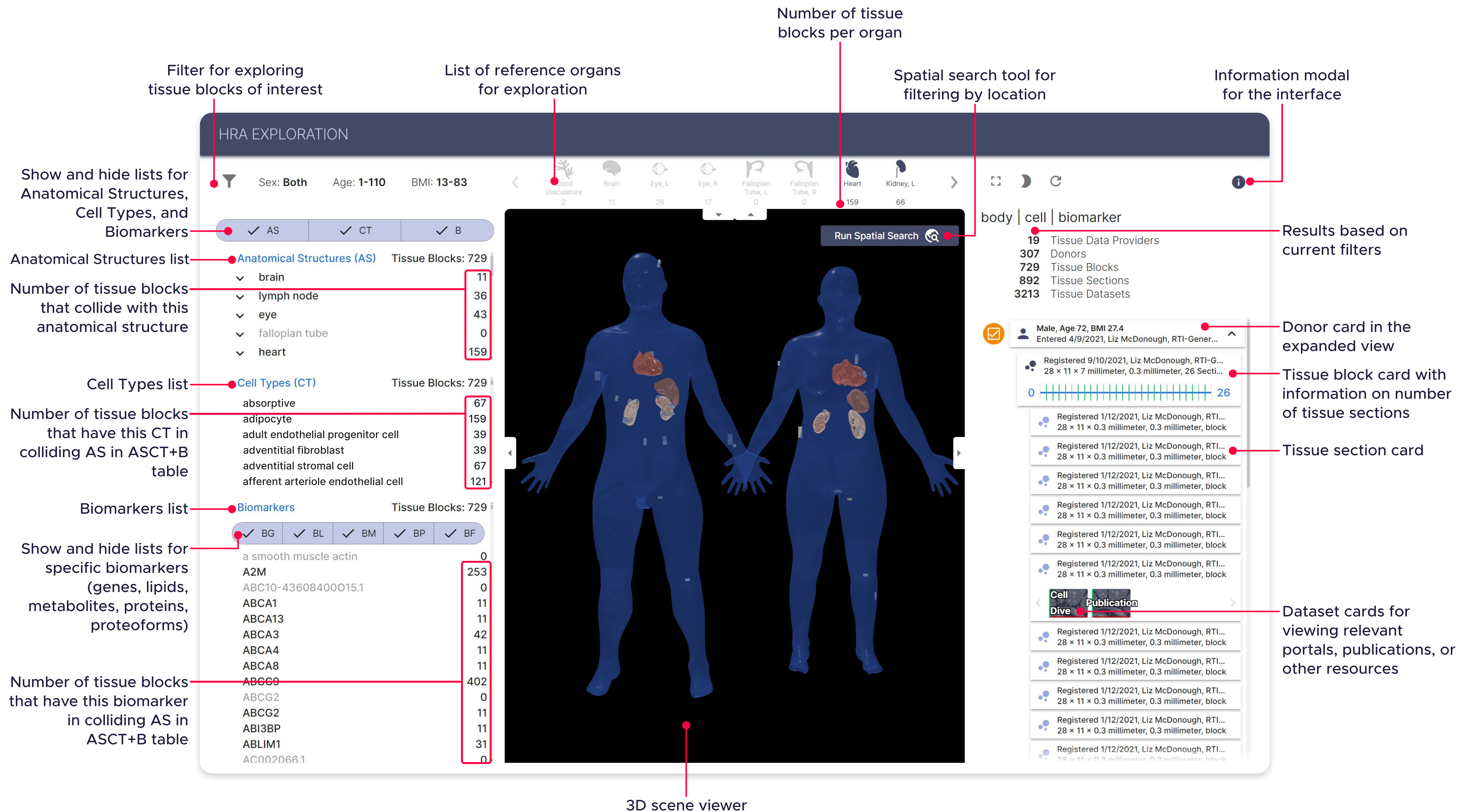
Supplemental Figure 4: ASCT+B Reporter User Interface



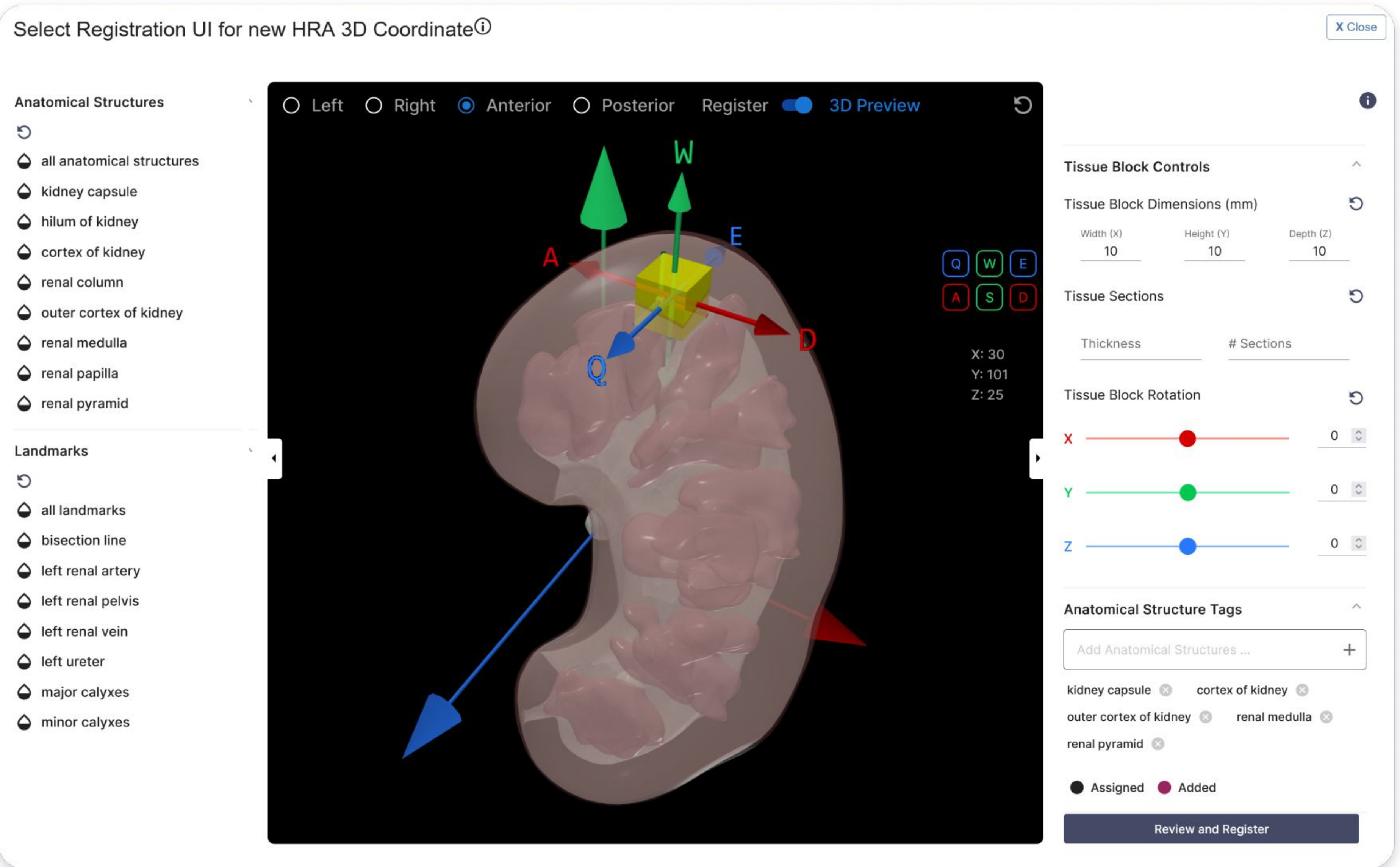
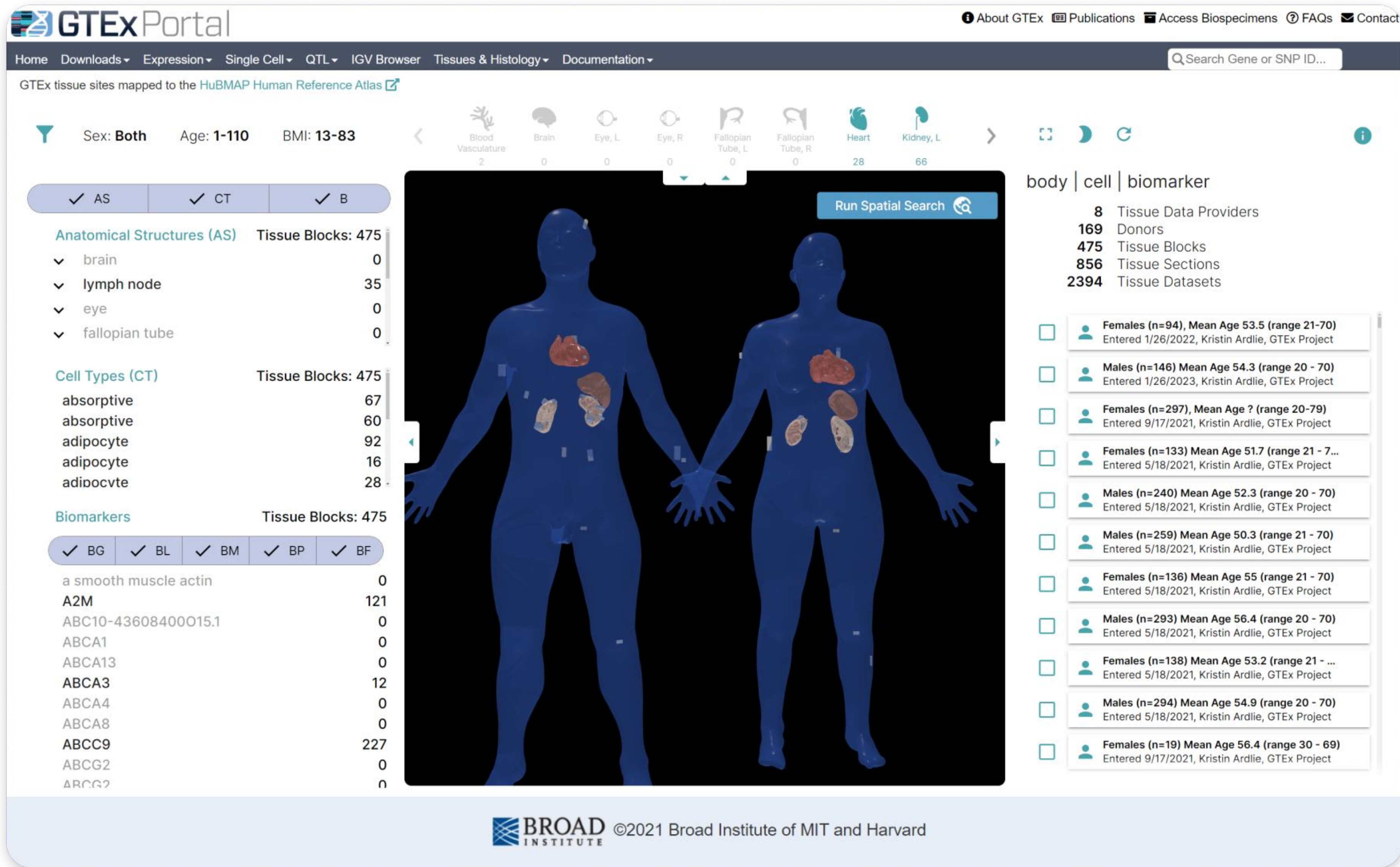
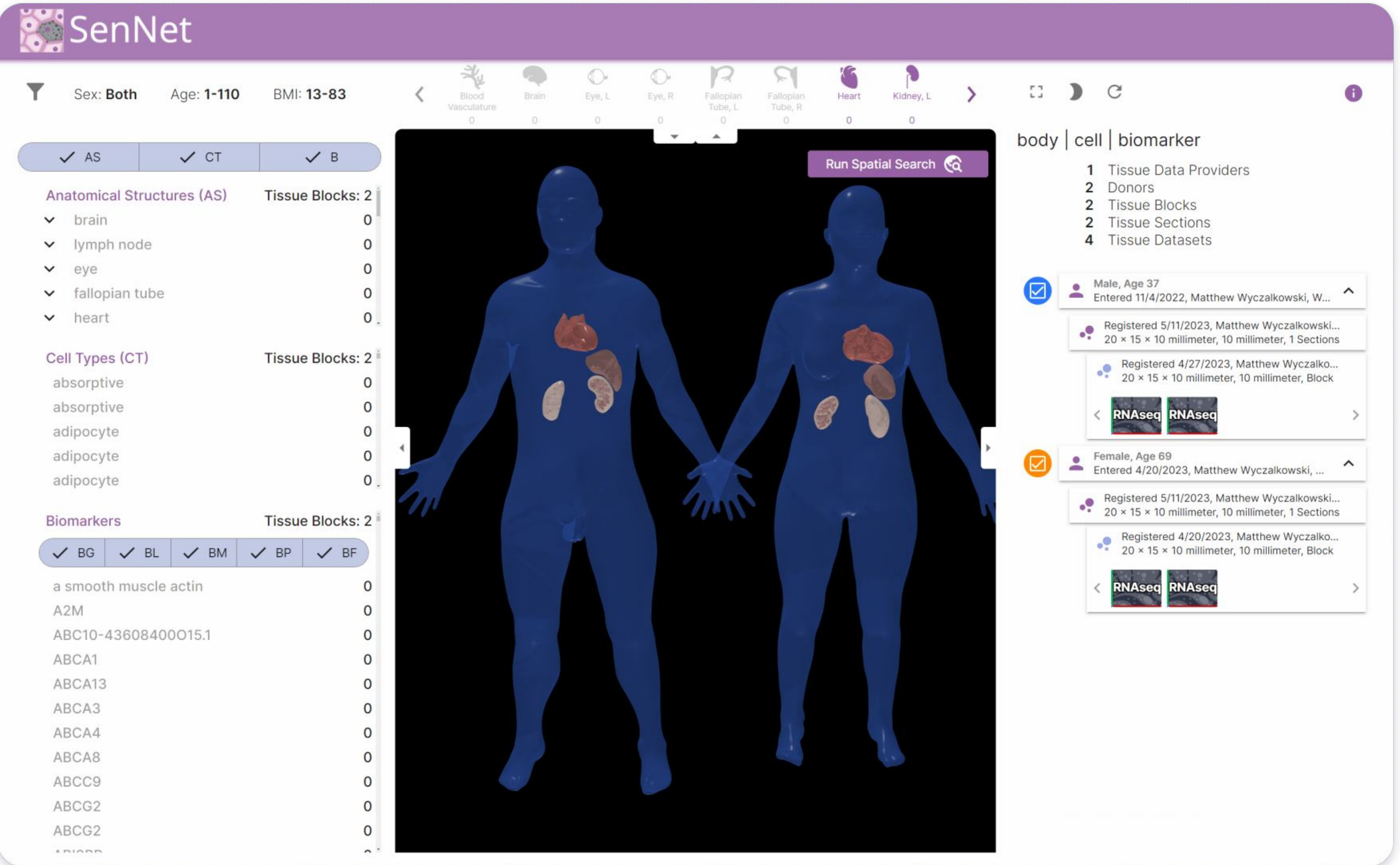
Supplemental Figure 5. Azimuth Portal and Reference Explorer User Interface



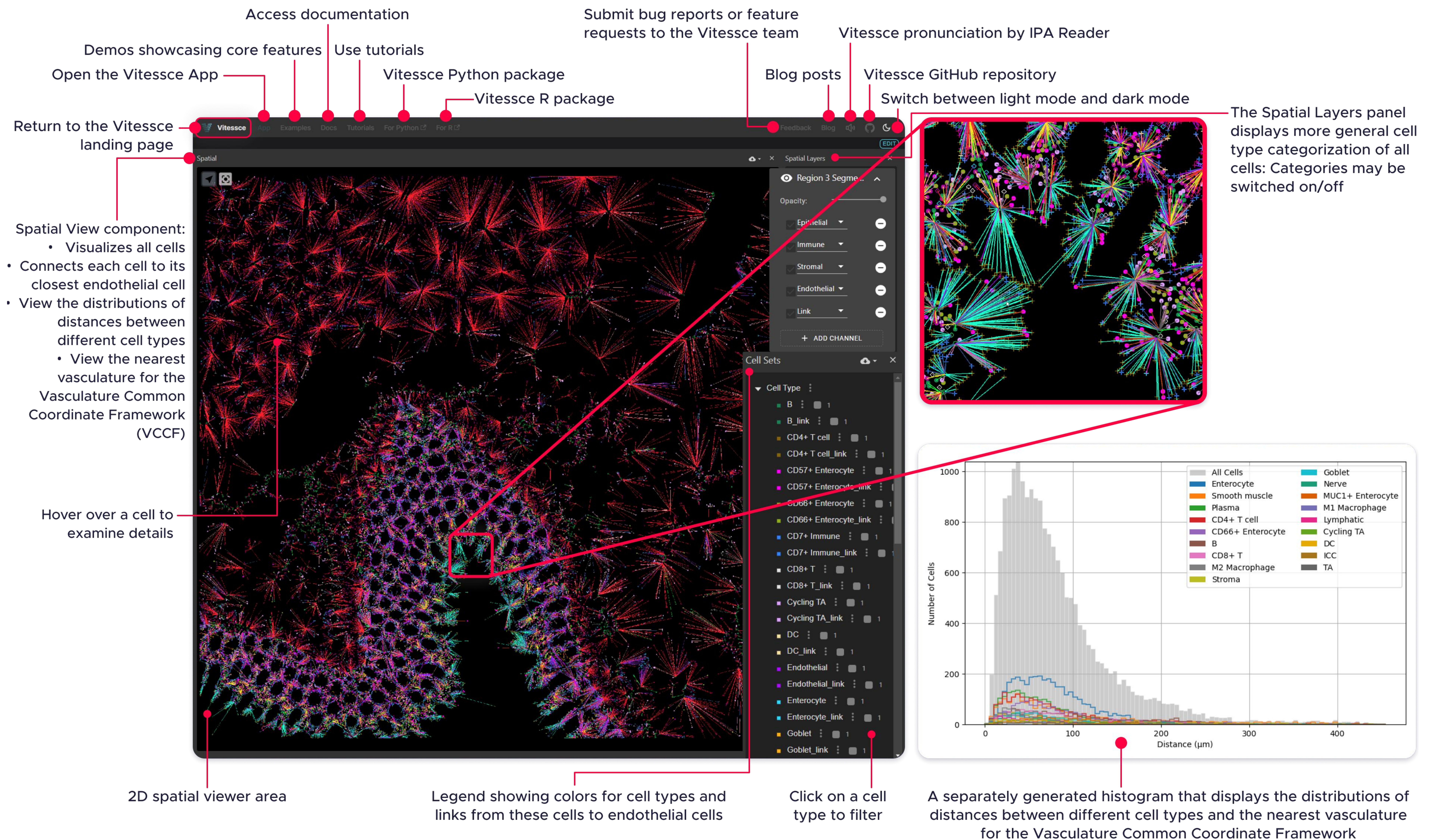
Supplemental Figure 6. Registration User Interface (RUI)



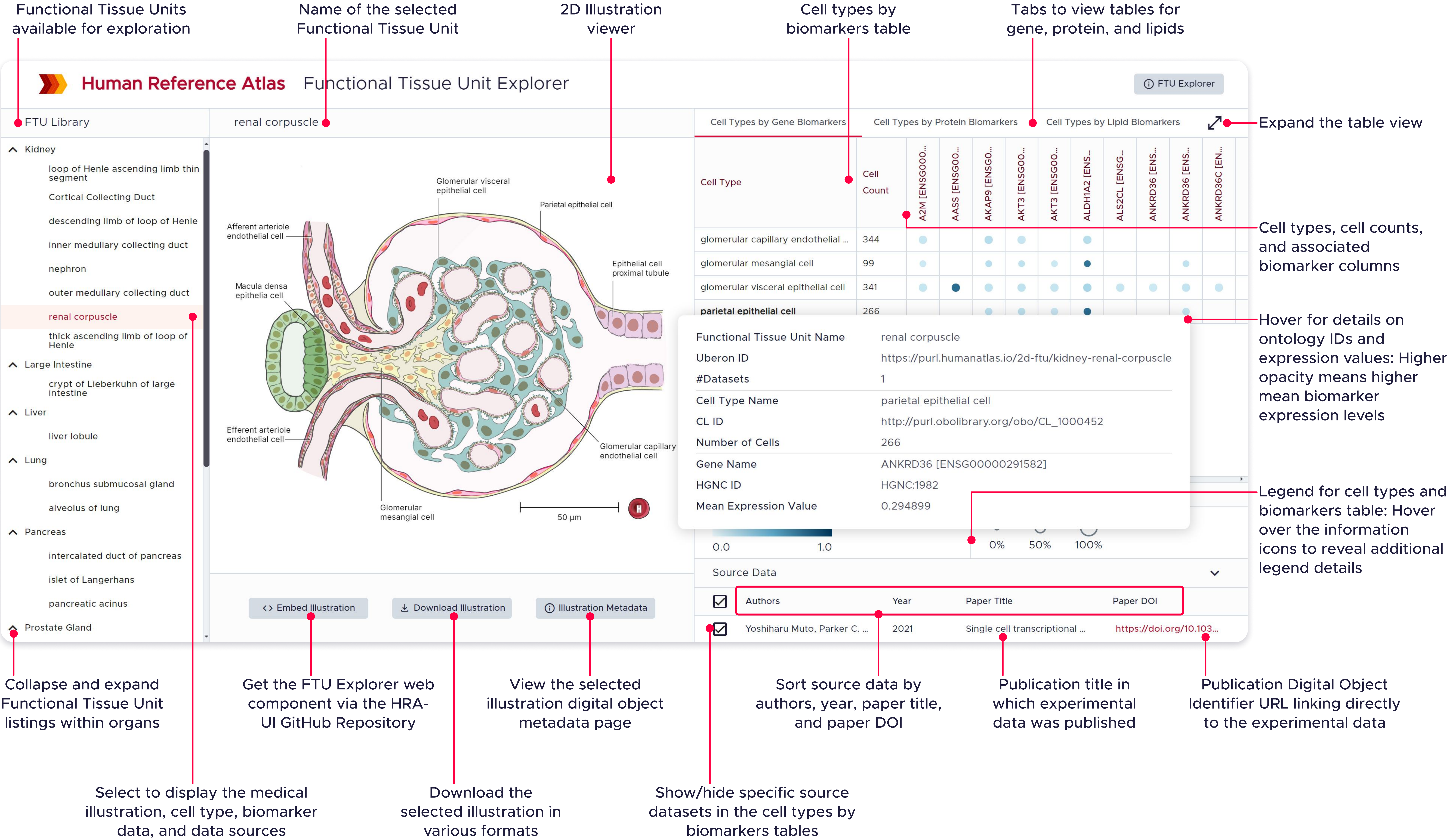
Supplemental Figure 7: Exploration User Interface (EUI)



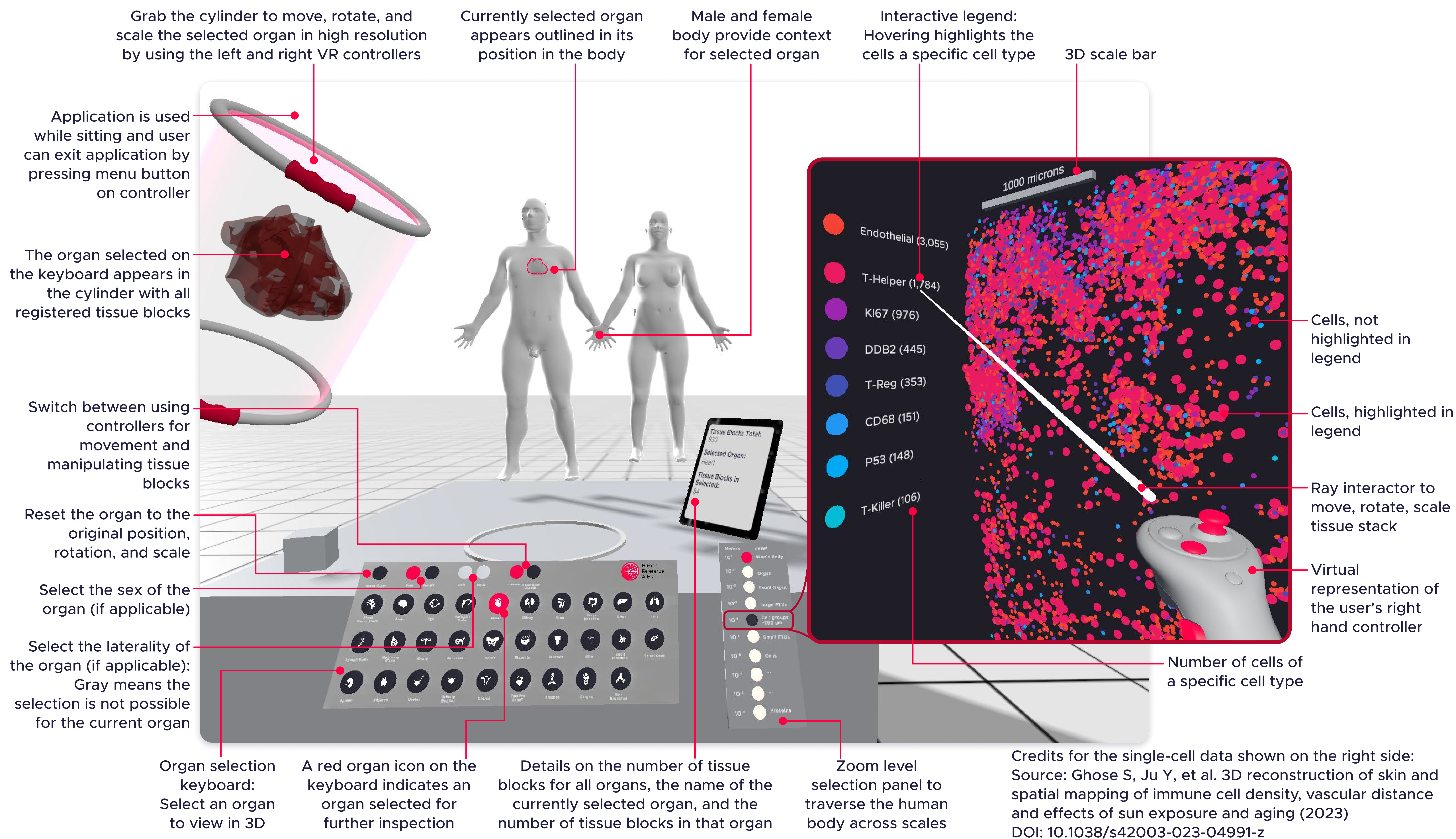
Supplemental Figure 8: Customized, Branded Deployment of EUI in HuBMAP, SenNet, GTEx, and RUI in GUDMAP



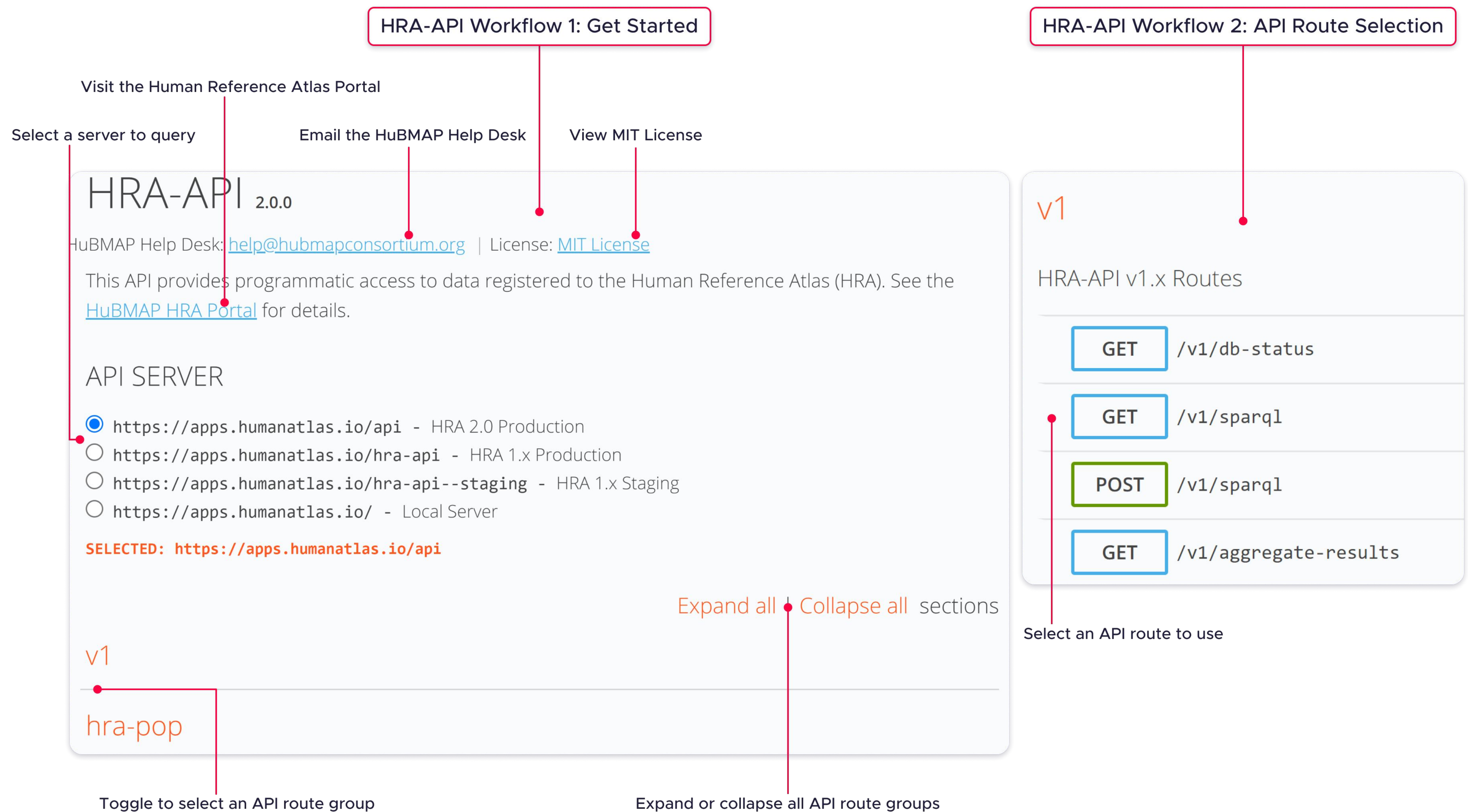
Supplemental Figure 9: Vasculature Common Coordinate Framework Distance Visualizations



Supplemental Figure 10: Interactive FTU Explorer



Supplemental Figure 11: HRA Organ Gallery



Supplemental Figure 12: Human Reference Atlas Application Programming Interface: Get Started and API Route Selection

HRA-API Workflow 3: Run an API Query

Input parameters for running an API query:
Fill in parameter values for the route

The screenshot displays the HRA-API v1.x Routes interface, which is used for interacting with the database via SPARQL queries. The interface is divided into several sections:

- Header:** Shows the API version (v1) and the title "HRA-API v1.x Routes".
- Method and Path:** A dropdown menu is set to "GET" for the path "/v1/db-status". A description "Get current status of database" is provided.
- Method and Path:** A dropdown menu is set to "GET" for the path "/v1/sparql". A description "Run a SPARQL query" is provided.
- Request Section:**
 - QUERY-STRING PARAMETERS:**
 - query:** A text input field for the SPARQL query. A red dot indicates the "query" parameter. Below the field, it says "SPARQL query to use" and provides an example: "SELECT * WHERE { ?sub ?pred ?obj . } LIMIT 10".
 - token:** A text input field for the authentication token. Below the field, it says "Authentication token to use for authenticated searches".
 - format:** A dropdown menu for the response format. The "Allowed" formats are listed: application/json, application/ld+json, application/n-quads, application/n-triples, application/sparql-results+json, application/sparql-results+xml, application/trig, simple, stats, table, text/csv, text/n3, text/tab-separated-values, text/turtle, and tree. Below the dropdown, it says "Override SPARQL response format (Note that not all formats are supported for all SPARQL query types)".
 - API Server:** https://apps.humanatlas.io/api
 - Authentication:** Not Required
- Response Section:**
 - Response Codes:** Two buttons are shown: "200" (selected) and "404".
 - Response Description:** "Successful operation. SPARQL responses vary by format/content negotiation."
 - Response Tabs:** Two tabs are shown: "EXAMPLE" (selected) and "SCHEMA".
 - Response Content:** The "EXAMPLE" tab shows a JSON response: [{"sub": "HRA", "pred": "has", "obj": "HRA"}].
 - Response Format:** A dropdown menu is set to "application/json".
 - Copy Button:** A button labeled "Copy" is located at the bottom right of the response section.

Annotations on the left side of the image point to specific elements:

- "Select a response code to view example response and schema doc" points to the "200" and "404" buttons.
- "Example response tab" points to the "EXAMPLE" tab.
- "Schema documentation tab for the response" points to the "SCHEMA" tab.

Annotations on the right side of the image point to specific elements:

- "Run the API query" points to the "TRY" button.
- "Reset parameters" points to the "CLEAR" button.
- "Fill parameters with example options" points to the "FILL EXAMPLE" button.

Supplemental Figure 13: Human Reference Atlas Application Programming Interface: Run an API Query

HRA-API Workflow 4: View Query Response

GET /v1/sparql

Run a SPARQL query

Run a SPARQL query

REQUEST

QUERY-STRING PARAMETERS

* query string

SELECT * WHERE { ?sub ?pred ?obj . } LIMIT 10

SPARQL query to use

Examples: SELECT * WHERE { ?sub ?pred ?obj . } LIMIT 10

token string

Authentication token to use for authenticated searches

format enum

text/csv

Allowed: application/json | application/ld+json | application/n-quads | application/n-triples | application/sparql-results+json | application/sparql-results+xml | application/trig | simple | stats | table | text/csv | text/n3 | text/tab-separated-values | text/turtle | tree

Override SPARQL response format (Note that not all formats are supported for all SPARQL query types)

API Server https://apps.humanatlas.io/api

Authentication Not Required

FILL EXAMPLE

CLEAR

TRY

Response Status: 200

Took 173 milliseconds

RESPONSE

RESPONSE HEADERS

CURL

sub,pred,obj

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/1999/02/22-rdf-syntax-ns#type,http://www.w3.org/2002/07/owl#NamedIndi

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/1999/02/22-rdf-syntax-ns#type,http://www.w3.org/2004/02/skos/core#Cor

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/2000/01/rdf-schema#label,Laser ablation

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/2004/02/skos/core#broader,https://purl.humanatlas.io/vocab/hravs#HRAV

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/2004/02/skos/core#definition,"Removal, separation, detachment, extirp

http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C111241,http://www.w3.org/2004/02/skos/core#inScheme,https://purl.humanatlas.io/vocab/hravs

View CURL command to reproduce query

View response headers

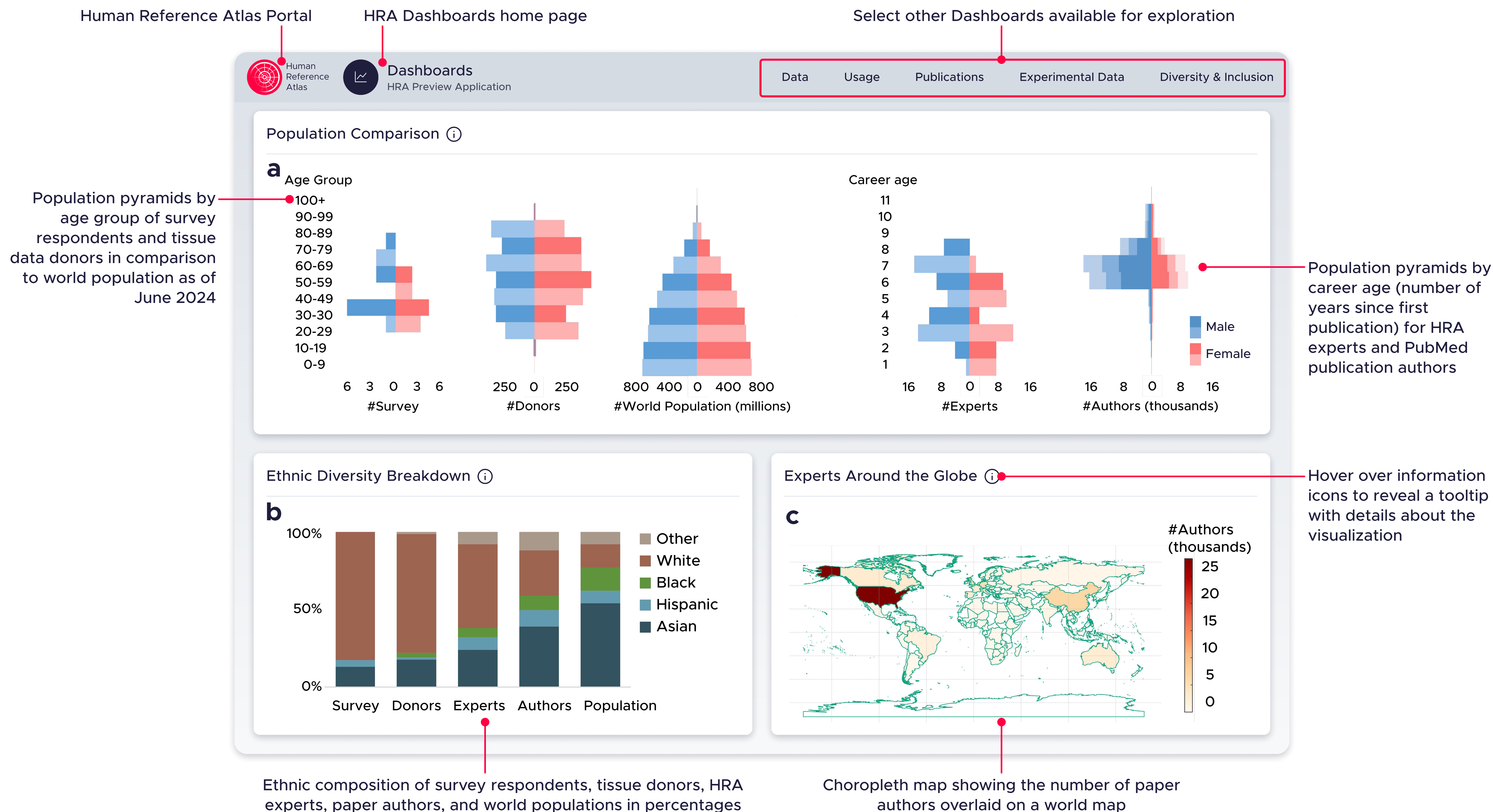
Copy

Reset the response

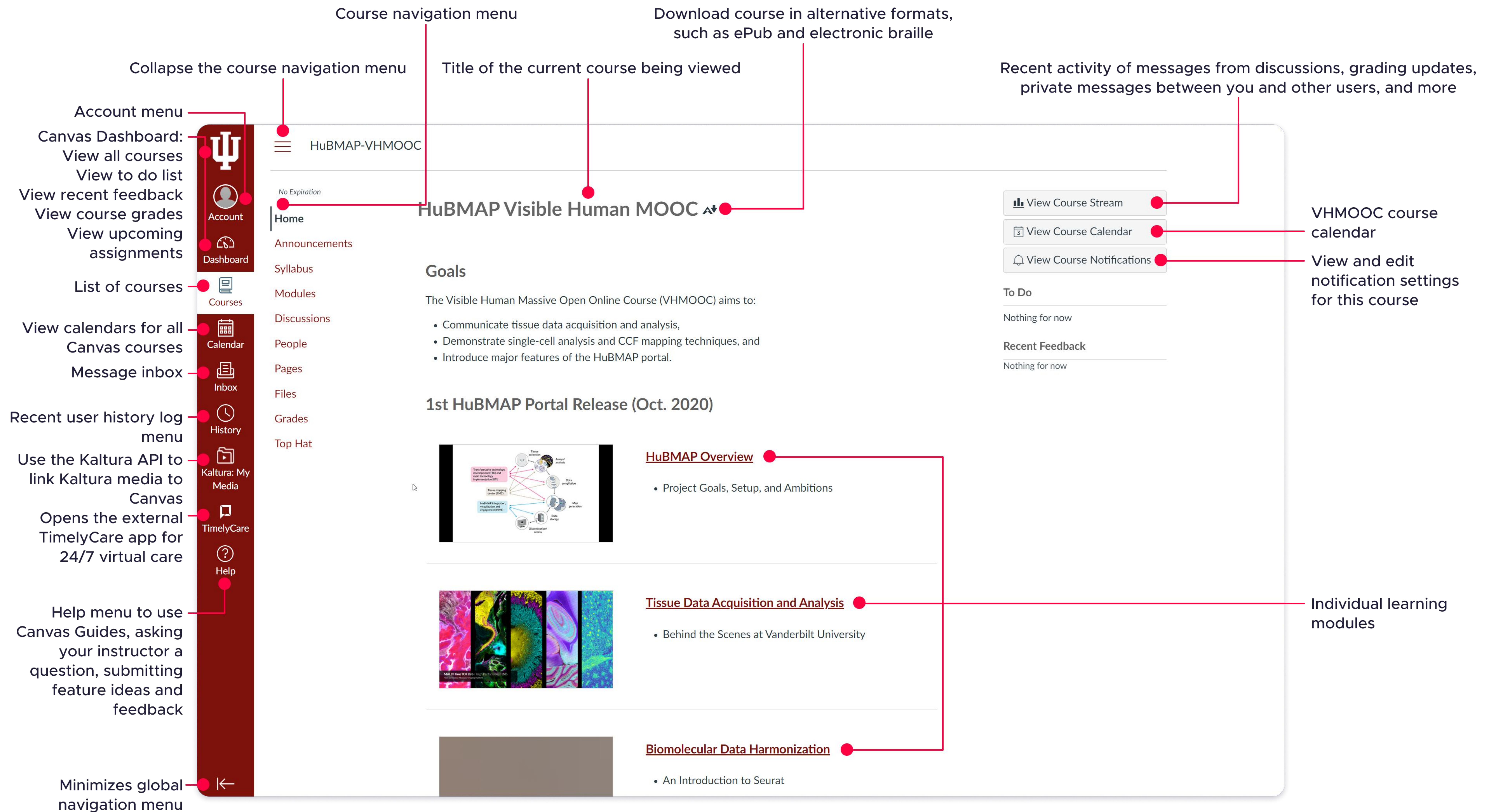
Copy the response

View real response from a query

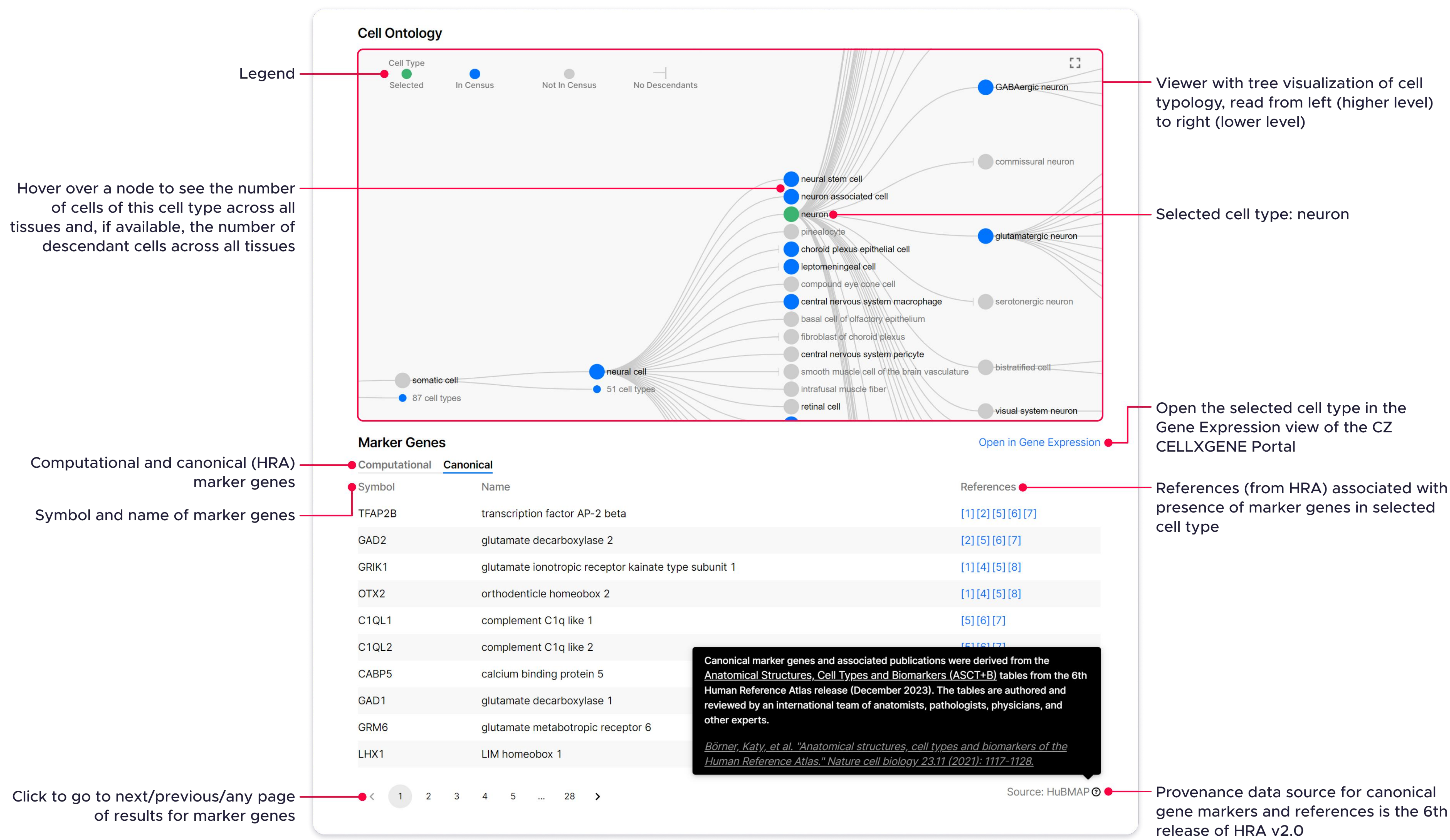
Supplemental Figure 14: Human Reference Atlas Application Programming Interface: View Query Response



Supplemental Figure 15. HRA Equity Dashboard



Supplemental Figure 16: Visible Human Massive Open Online Course (MOOC)



Supplemental Figure 17: CZ CellGuide Visualization With ‘Canonical’ Marker Genes And ‘References’ From The HRA