HRP Space Radiation Tissue Sharing Initiative

National Aeronautics and Space Administration

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2020 Human Research Program Investigators' Workshop

January 27, 2020

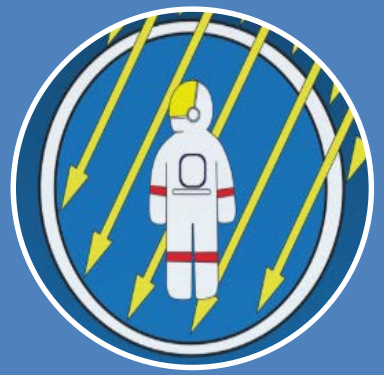
HRP Space Radiation Tissue Sharing Initiative

What is the problem?

What do we want to accomplish?

How do we implement?

Tissue Sharing Problem



HRP's Space Radiation Element is tasked with characterizing the risks of space radiation exposure on humans

- Many of the effects of these risks only present in a small subset of the population
- Need large sample sizes to fully characterize risk

Space Radiation Element funds rodent research to characterize and understand these risks

- These studies can result in excess tissues that are stored for later use
- Excess tissues could increase sample size if properly distributed

Tissue Sharing Goals

GOAL

- **Utilize existing archives of saved tissue samples to increase scientific progress with minimal additional cost**

GOAL

- **Encouraging researchers to collect and preserve “unwanted” tissues in future animal experiments to maximize secondary scientific output**

GOAL

- **Maximize scientific output from large, chronic, low-dose rate animal experiments**

GOAL

- **Ultimately, be good stewards of US Taxpayer Research Dollars and understand the risks of sending a human to Mars**

Increase n to improve power of study

- **The statistical power of a study is related to the sample size in question. For example:**

Situation	Sample Size to Estimate Confidence Interval	Sample Size to Conduct Test of Hypothesis
Continuous Outcome, One Sample: CI for μ, H_0: $\mu = \mu_0$	$n = \left(\frac{Z\sigma}{E}\right)^2$	$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES}\right)^2$ $ES = \frac{\lvert\mu_1 - \mu_2\rvert}{\sigma}$

- **In many research proposals, the PI calculates the desired sample size, n, based on cost, feasibility, and desired statistical power of the study**
- **With the tissue sharing initiative, NASA seeks opportunities to increase sample size through already available tissues**

Recall that for low dose rate studies, many effects may only exhibit in a small percentage of the population, so need a very large sample size for hypothesis testing

Tissue Sharing Implementation

- **Recall the goals:**
  - Utilize existing archives of saved tissue samples to increase scientific progress with minimal additional cost
  - Encourage researchers to collected “unwanted” tissues in future animal experiments to maximize secondary scientific output
  - Maximize scientific output from large, chronic, low-dose rate animal experiments
  - Understand the risks from sending Humans to Mars
- **Implementation**
  - Implement as a Phased approach — learning from different types of tissue sharing models and various levels of tissue sharing
  - All tissue samples are stored at home institute and animals are sacrificed at NSRL or home institute
    - Pilot storing tissues at tissue archives as PI’s retire
  - Engage research community and collect lessons learned

Phased Approach to Tissue Sharing

Type I: Increase Ad hoc Tissue Sharing (PI to PI) of Existing Samples

- SR will facilitate sharing
- Provide database of existing samples with access through our SR website
- Actual transfer and agreements to be negotiated between PI's

Type II: Solicited Research using Inventory of Existing Tissue Samples

- Element led; Voluntary by Primary PI
- Solicit research that specifically uses available samples shared between proposing PI and primary PI's
- Agreement to share is negotiated between proposing PI and primary PI

Type III: Promote Sharing of Tissues from On-going Animal Studies

- Ad hoc and solicited (Element led); Voluntary by primary PI
- Inventory possibilities and advertise; Agreements in place prior to sacrificing animals;
- Goal: Practice how to maximize secondary science without interfering with primary science, timing, and logistics

Type IV: Mandatory Tissue Sharing on Large PI-led animal studies

- For studies involving large number of animals, SR will consider making tissue sharing mandatory
- NRA will specifically request a tissue sharing plan from primary PI indicating samples easily available
- SR will determine which projects should be considered mandatory upon award of grant

Type V: Element-led Chronic Animal Study – Solicited Research Topics with Multiple PI Studies

- Element defines large animal study parameters and solicits research
- Study parameters vetted with Working Groups and PI community

Phased Approach to Tissue Sharing

Phase I has been achieved

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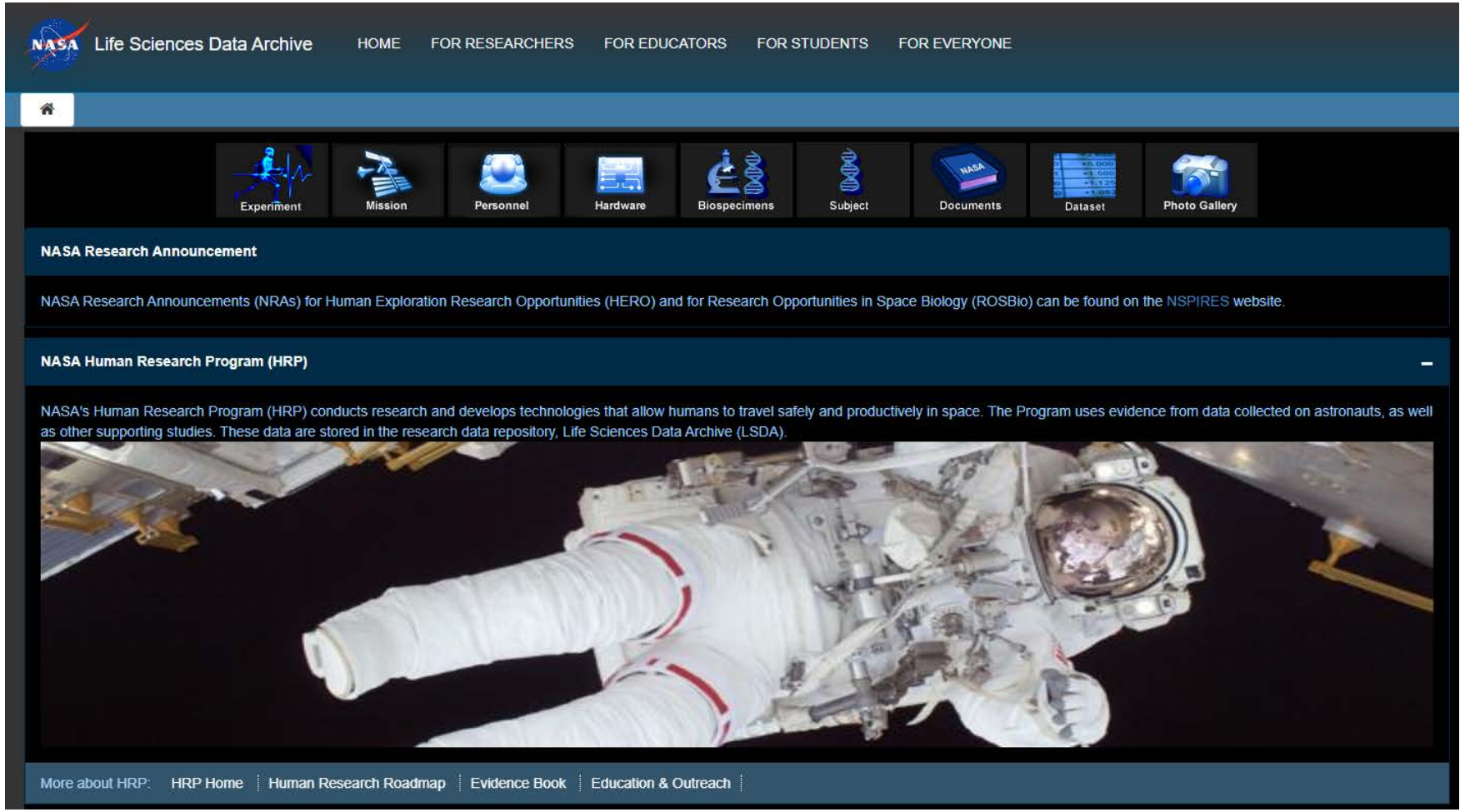
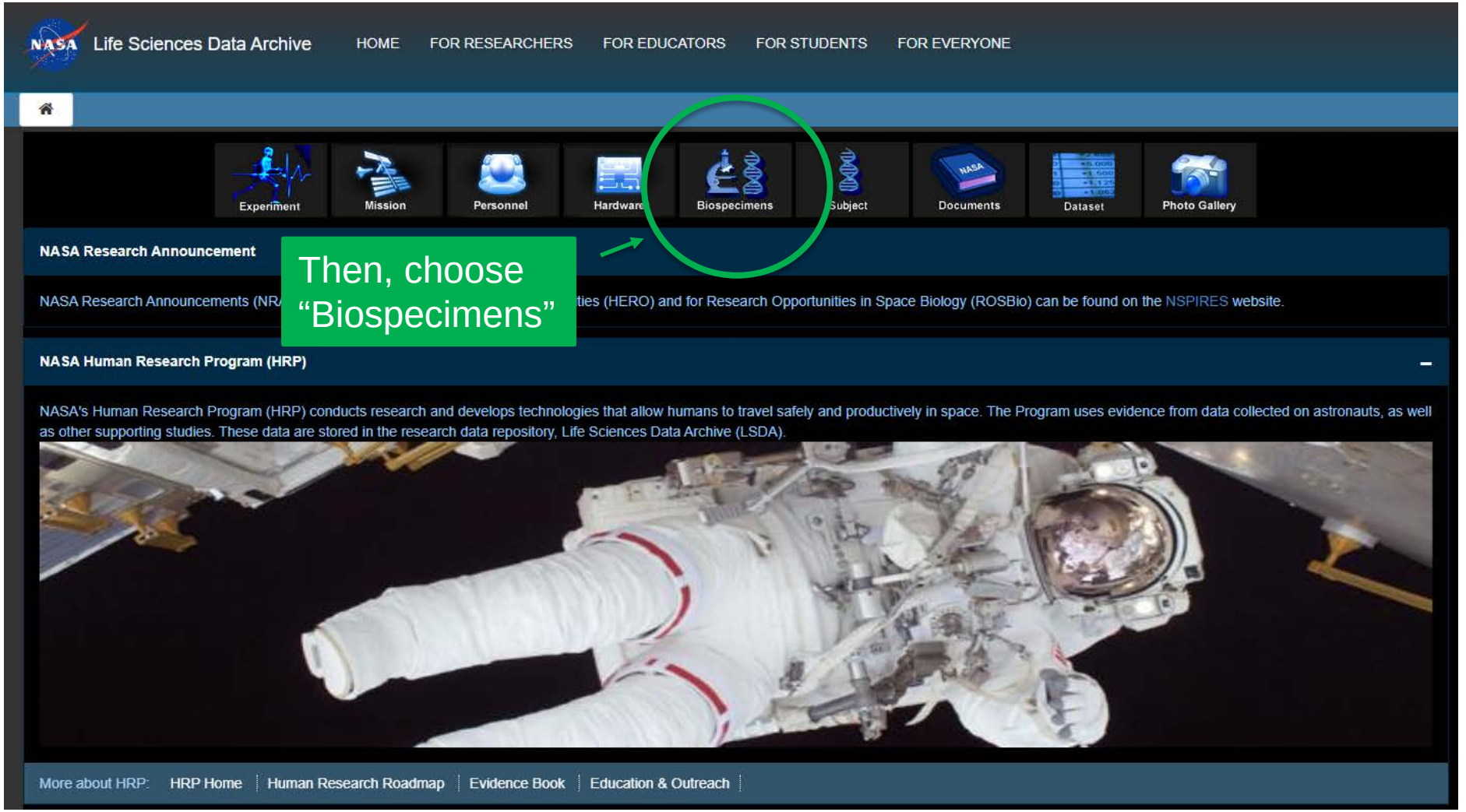
Life Sciences Data Archive

- **Space Radiation Tissues that are available for research can be found in the Life Science Data Archive**
- **https://lsda.jsc.nasa.gov/**



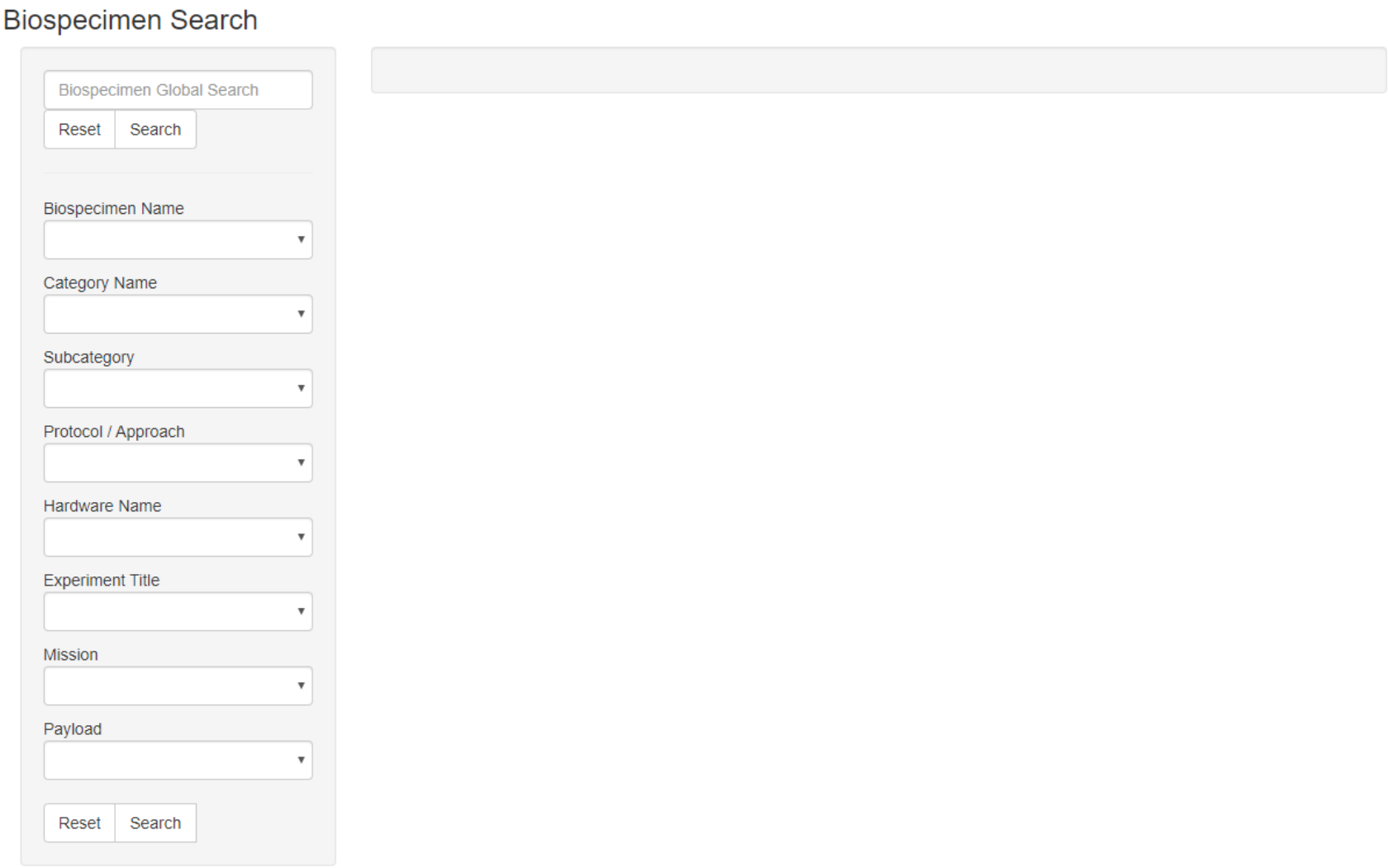
How to use the Life Sciences Data Archive

- **Start at https://lsda.jsc.nasa.gov/**



How to use the Life Sciences Data Archive

- **The result will be this search option:**



How to use the Life Sciences Data Archive

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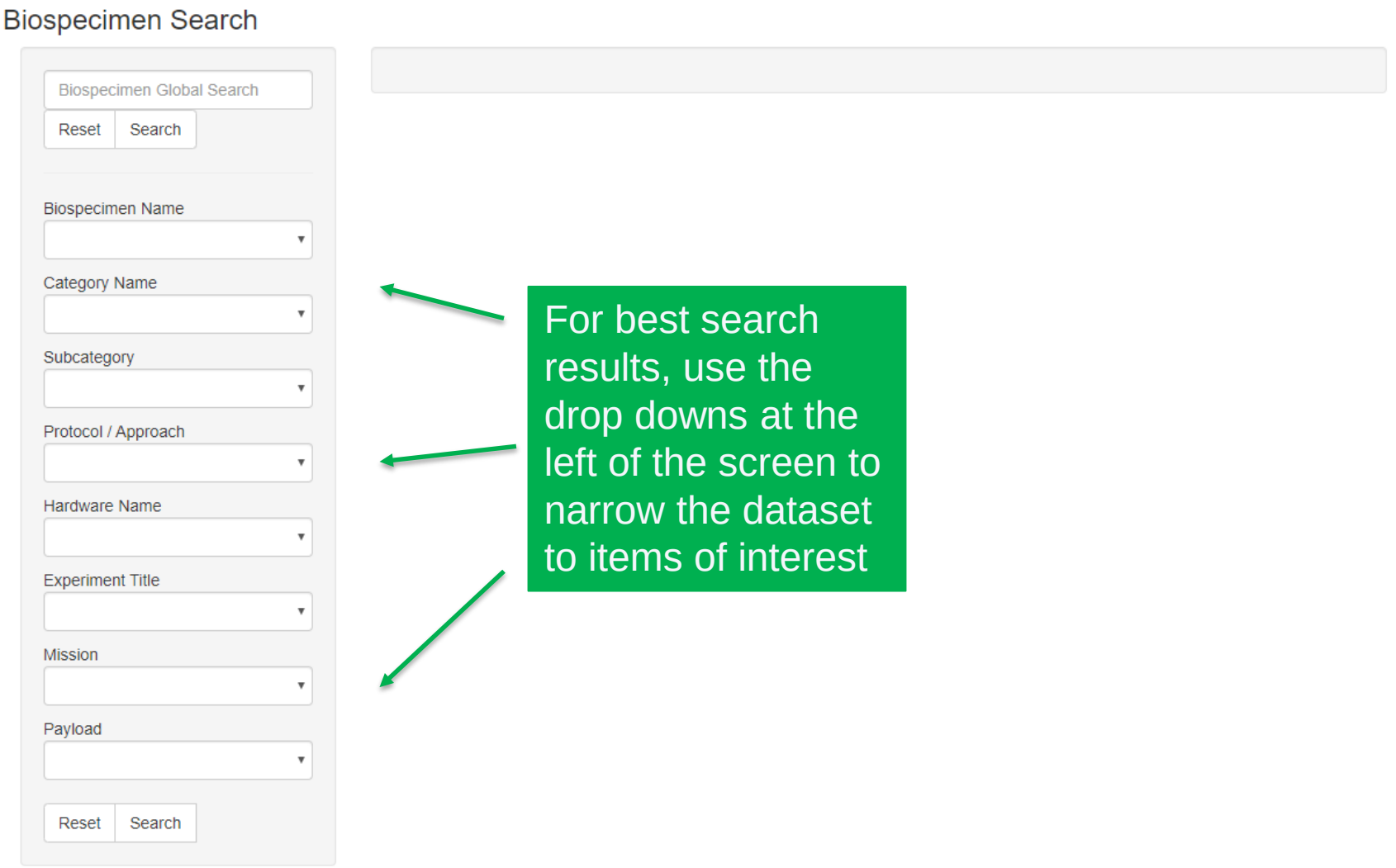

How to use the Life Sciences Data Archive

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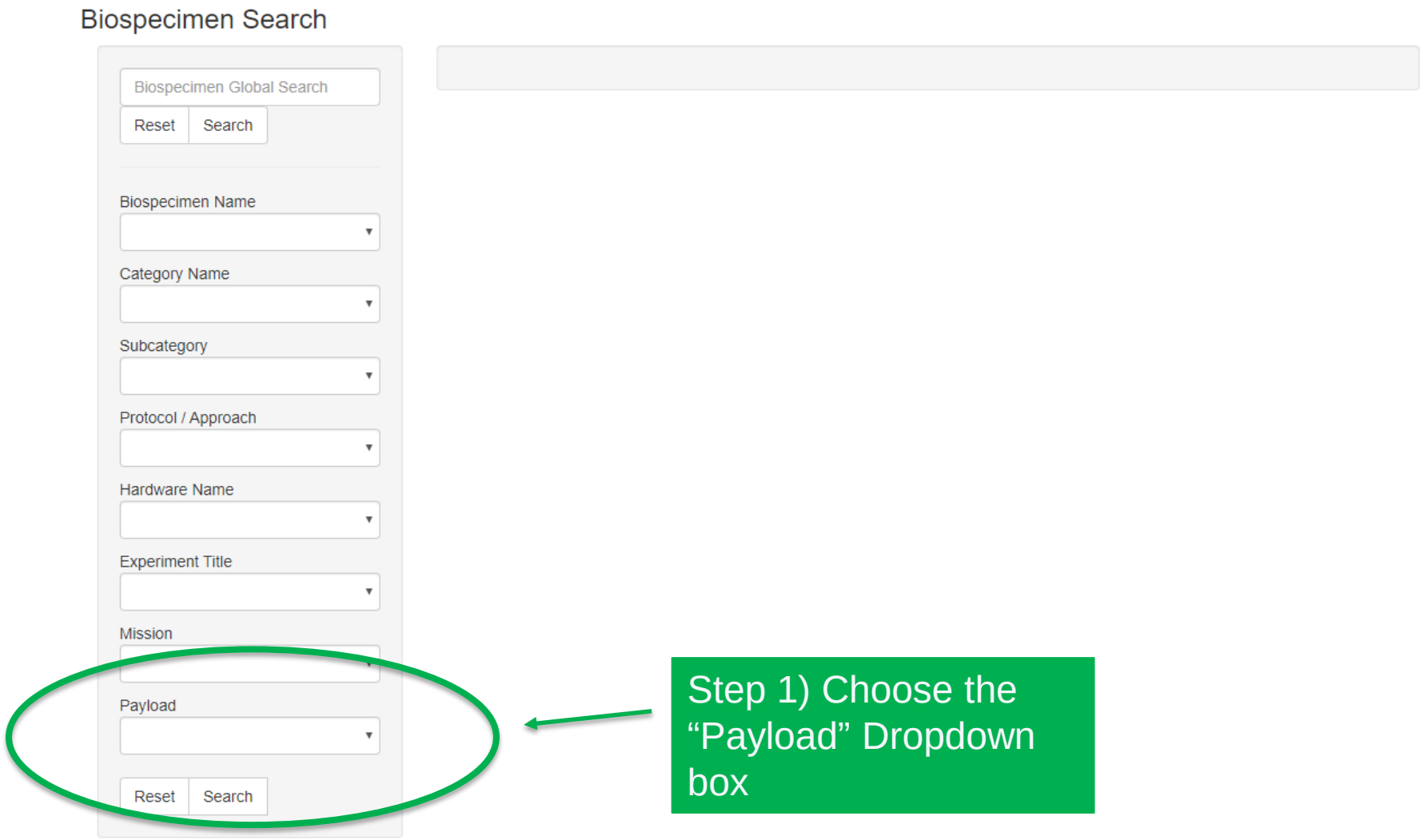
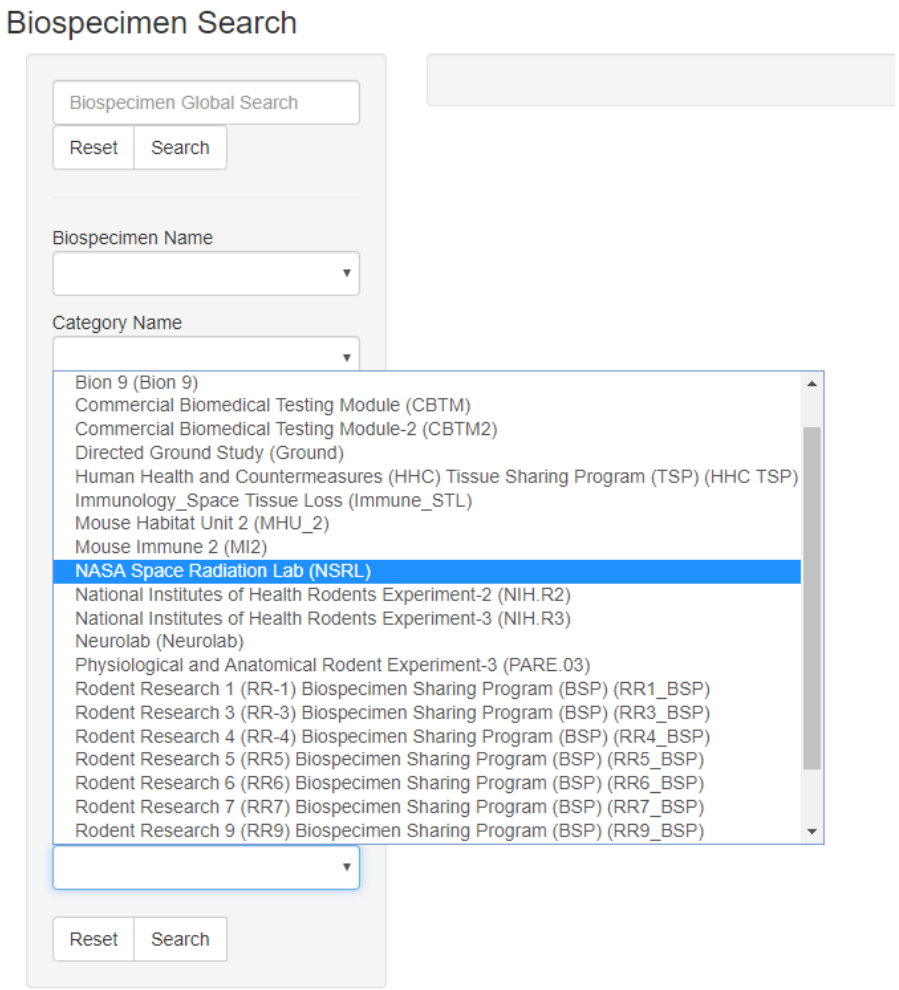
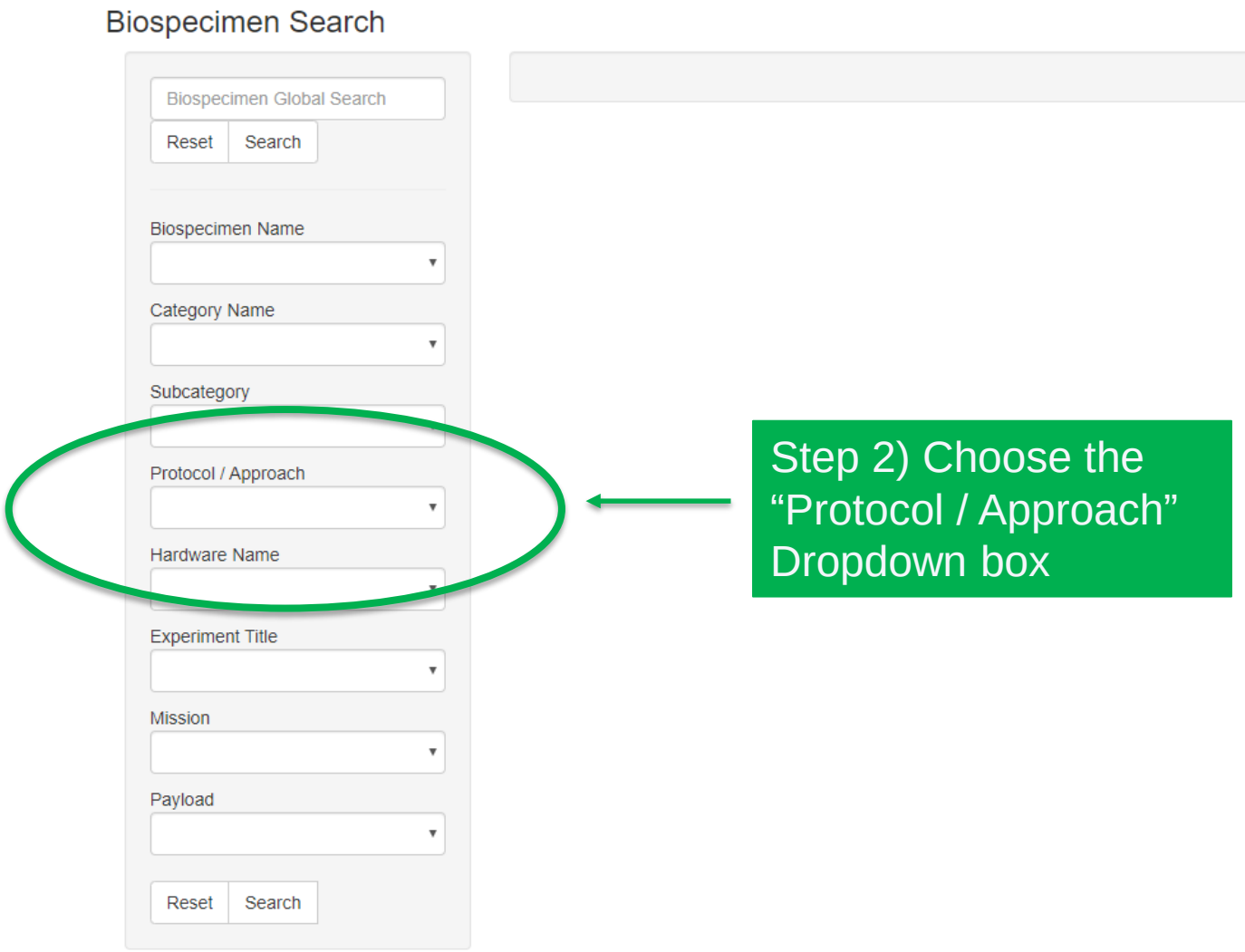


How to use the Life Sciences Data Archive

- **Under the Payload drop down, choose “NASA Space Radiation Lab (NSRL)”**



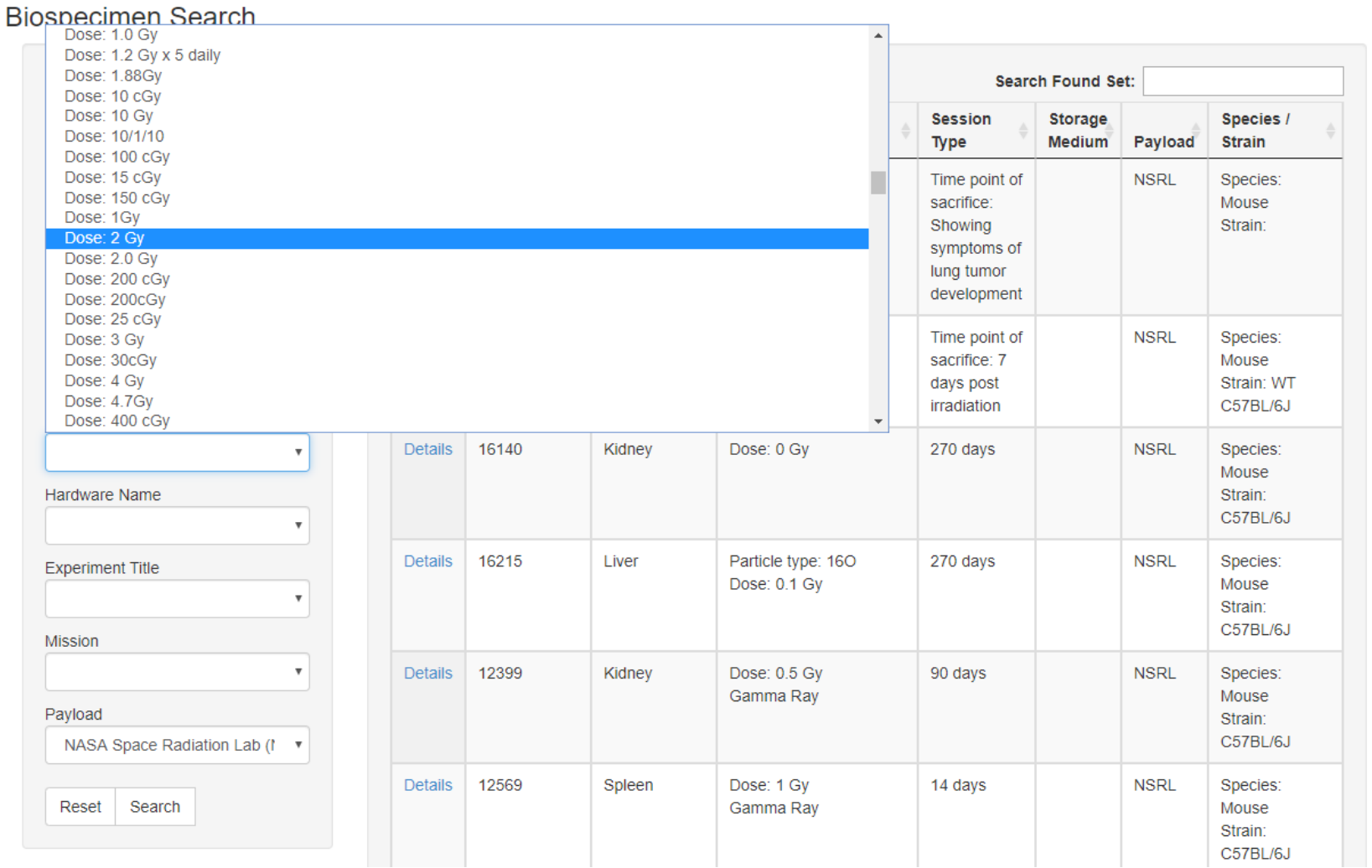
How to use the Life Sciences Data Archive



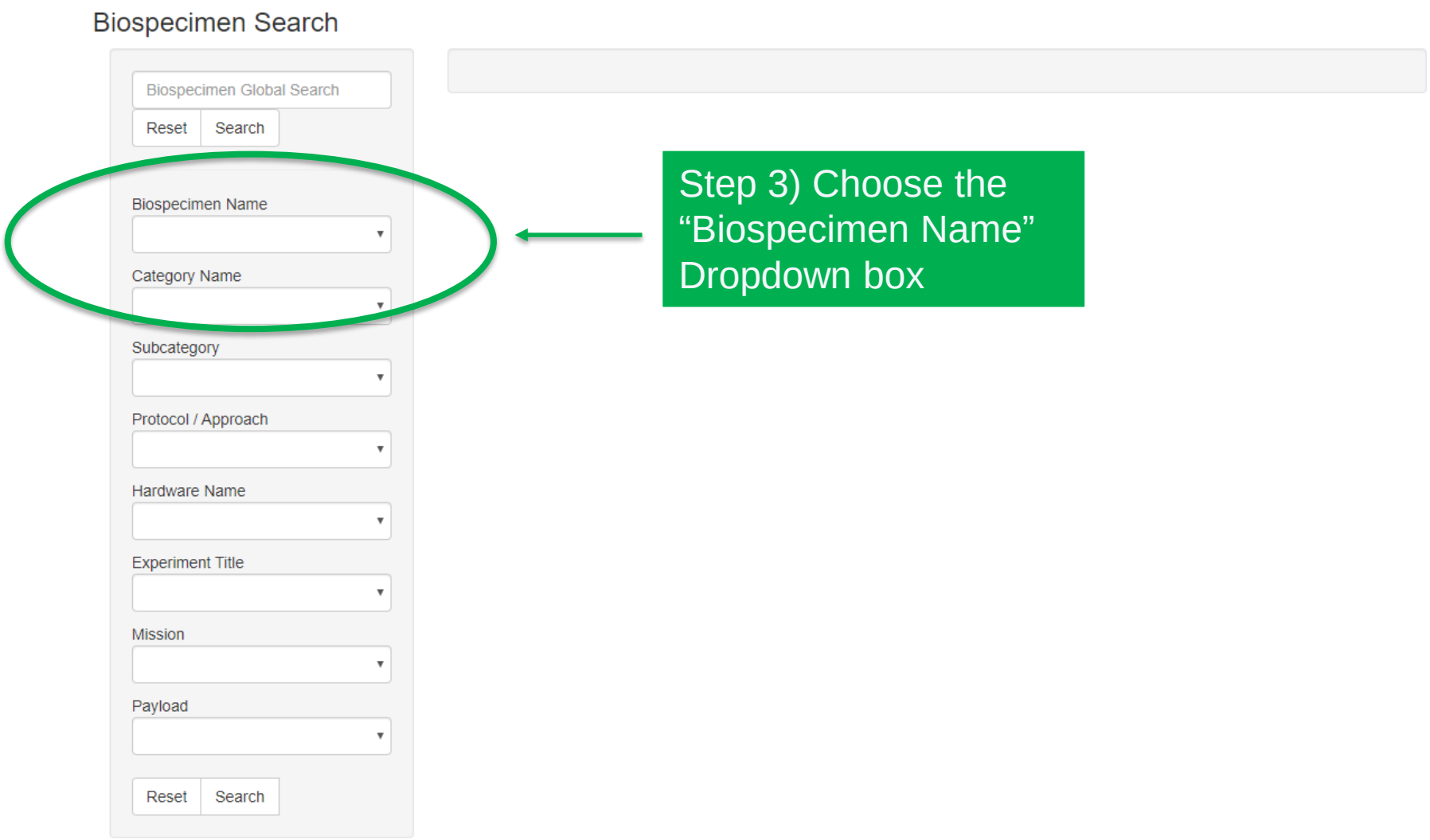
Step 2) Choose the "Protocol / Approach" Dropdown box

How to use the Life Sciences Data Archive

- **Under the Protocol / Approach Tab choose the desired Radiation Dose**



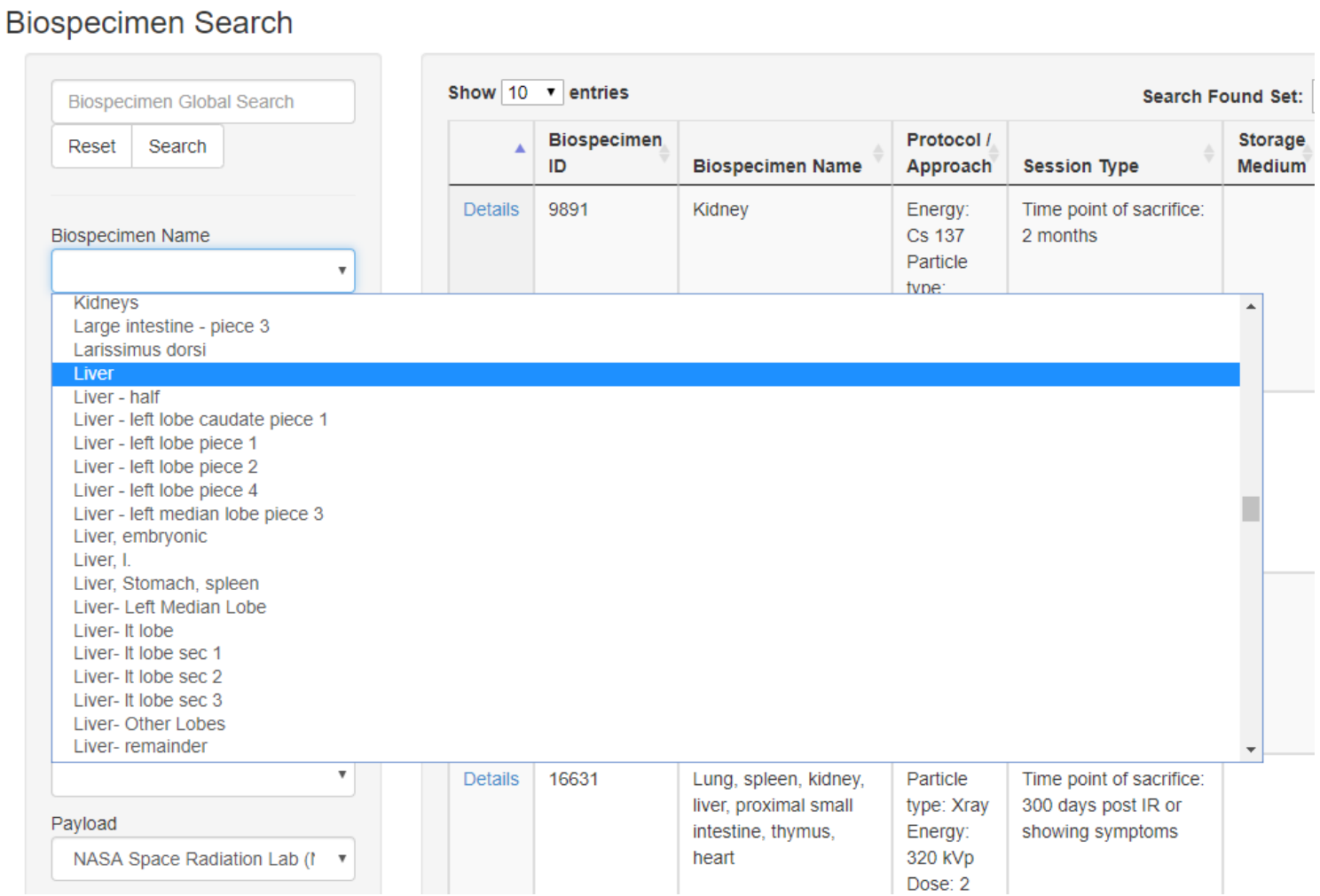
How to use the Life Sciences Data Archive



Step 3) Choose the "Biospecimen Name" Dropdown box

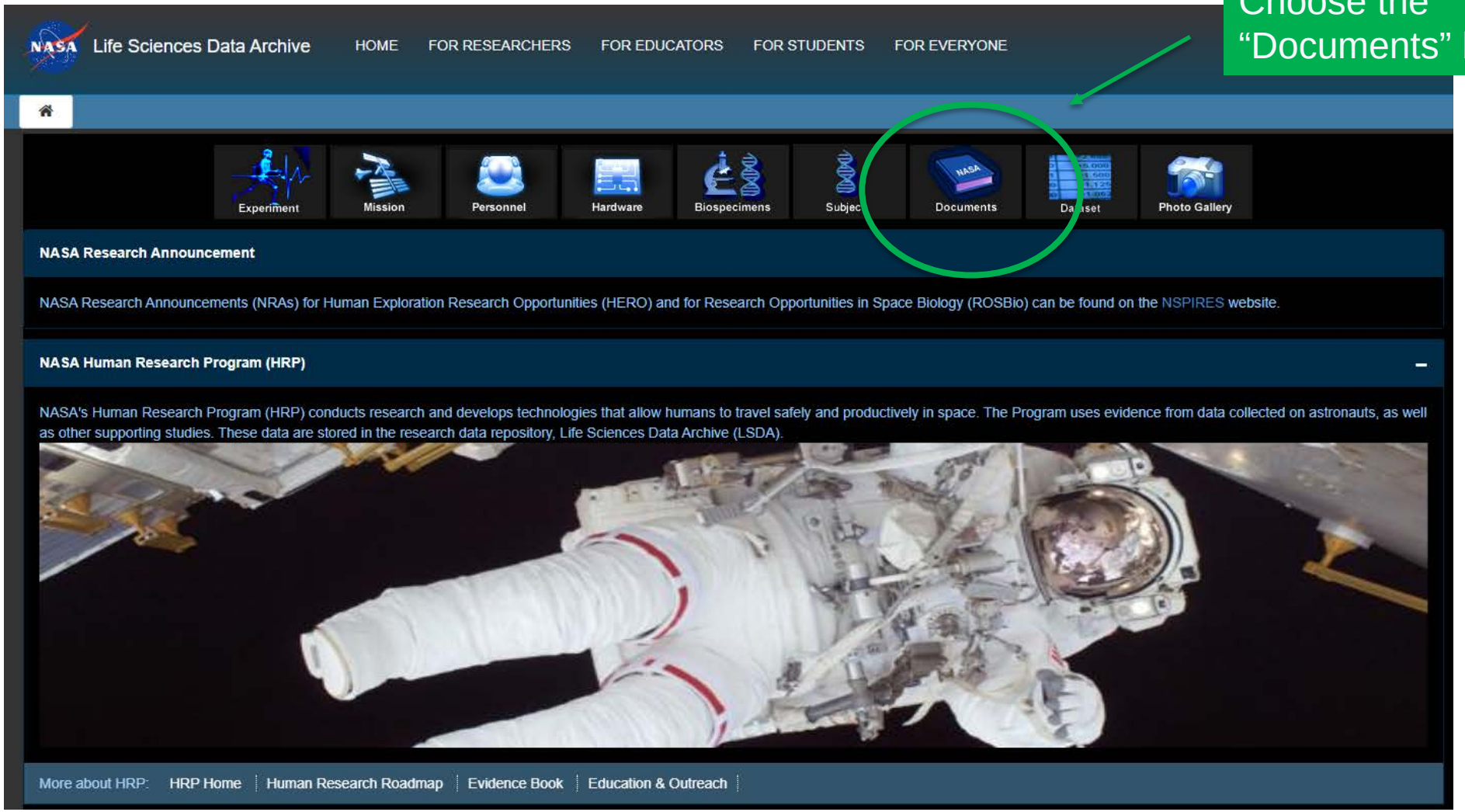
How to use the Life Sciences Data Archive

- **Under Biospecimen Name, choose the tissue type of interest**



How to use the Life Sciences Data Archive

- **Alternatively…..**



How to use the Life Sciences Data Archive

- **Under “Document Search”, search “NSRL”**

Document Search

NSRL

Reset | Search

Experiment

Space Flight Mission/Ground-Based Study

Payload

Document Type

Reset | Search

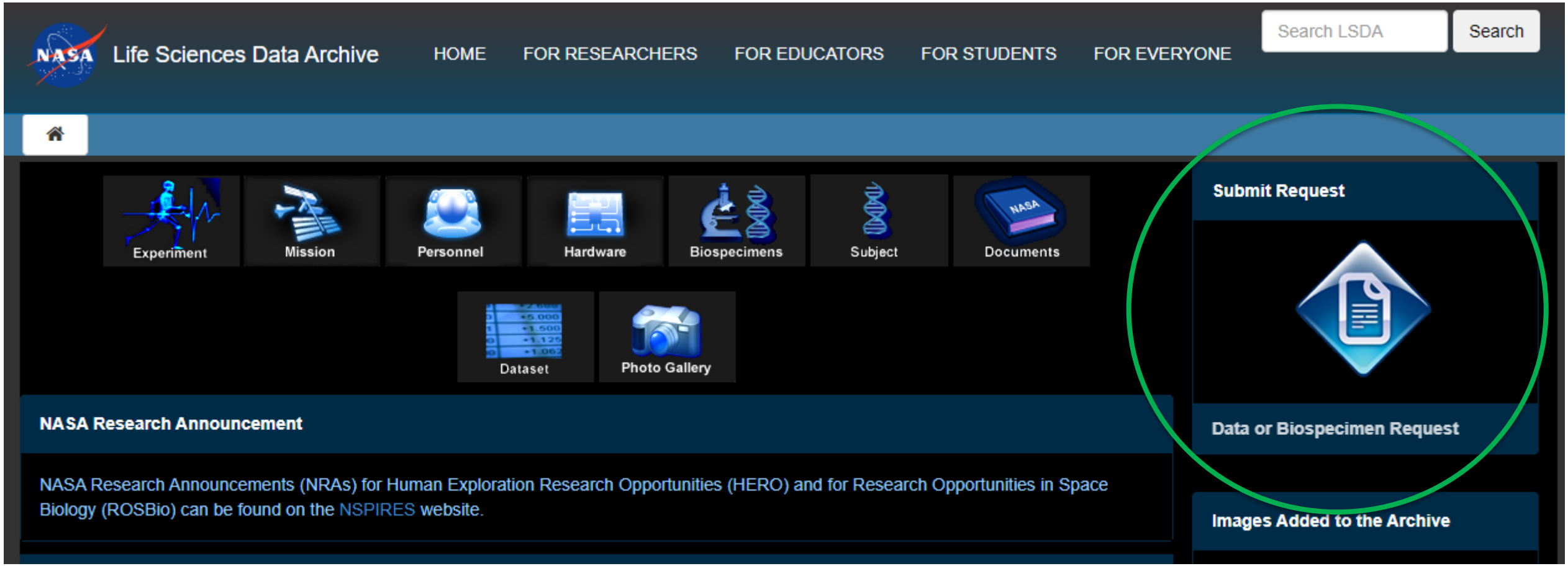
Show 10 entries Search:

	Document Number	Document Title	Document Type	Availability
Details	Doc13766	NASA Space Radiation Lab (NSRL) upcoming sacrifices	Project	Available online
Details	Doc13726	NASA Space Radiation Lab (NSRL) available biospecimens	Project	Available online

Showing 1 to 2 of 2 entries Previous 1 Next

Latest list of raw data that feeds the database

Sample Request Form



Tissue Sharing Storage Options

Currently, tissues are stored at individual PI Institutions

As PI's retire, ask to move tissue samples to JSC

SRE has identified space for tissue storage

Long term, SRE will establish a tissue storage archive

National Aeronautics and
Space Administration

Questions?