

The LSU logo is displayed in a bold, blue, sans-serif font with a yellow outline. It is positioned in the upper left corner of the slide, set against a background of a faded photograph of a large, curved building with 'LSU' and 'TIGER STADIUM' visible on its facade.

Department of
Physics & Astronomy

Research in the Space Radiation Transport & Applied Nuclear Physics Laboratory

SpaRTAN Physics Laboratory

Jeff Chancellor, Ph.D.
SpaRTAN Physics Lab
Louisiana State University

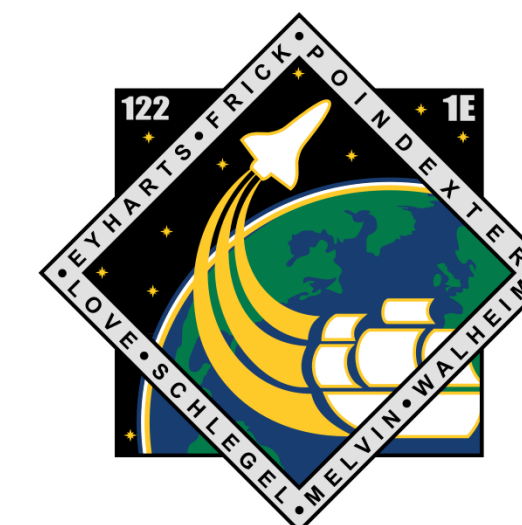
October 30, 2021



SPARTAN PHYSICS LAB

- **20+ years with or for the manned space flight program conducting nuclear physics research**
 - Space vehicle design, shielding analysis, flight hardware
 - Flight Controller in Mission Control
 - Mission Manager STS-118, STS-120, STS-122, and STS-125 (Hubble)
 - Nuclear physicist managing a \$30 MIL radiation biology research program??

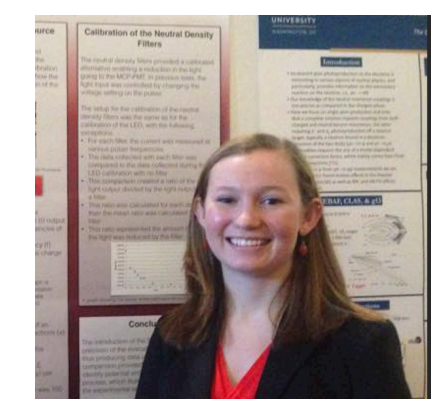
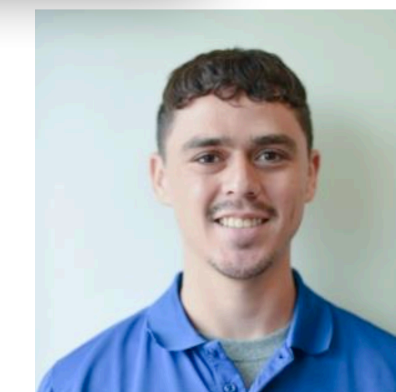
Recreational radiobiologist



SAARTAN

PHYSICS LAB

- **Multidisciplinary approach to solving real-world problems**
- **Both theoretical and experimental nuclear physics**
- **Computational modeling and utilization of supercomputers**
- **Understanding the interaction of heavy-charged nuclei with both soft and condensed matters**



Active Grants



- Principal Investigator
LaSPACE Graduate Research Fellowship
Computational Model of the Human Brain to Study Dose Topology on the Sub-micron Scale. 8/2021 – 07/2022, US \$16,000
- Principal Investigator
LaSPACE Undergraduate Research Assistantship (LURA)
Characterization of Radiation Environment During SpaceX Inspiration 4 Mission. 8/2021 – 07/2022, US \$4,700
- Principal Investigator
NASA Human Research Program HERO Appendix C: Topics in Human Health Countermeasures, Behavioral Performance, and Space Radiation
Integration of in-silico and in-vivo models for determining preclinical indicators and/or integrated biomarkers of radiation induced vascular dysfunction. 2/2021-1/2024, US \$1,799,901
- Principal Investigator
LSU College of Science and Office of Research & Development Funds
Tiger Eye 1 Mission To Lunar Surface. 1/2021-12/2021, US \$75,000
- Institutional Principal Investigator
NASA Space Biology Appendix D: Solicitation of Proposals for Flight and Ground Space Biology Research
Develop a novel single-cell biodosimetry for brain genomic instability and neurodegeneration to predict clinical health outcomes in human spaceflight crews. 11/2020 – 10/2023, US \$350,000
- Co-Investigator
TRISH Space Radiation Solicitation (TSRAD-2020)
Using human stem-cell derived vascular, neural and cardiac 3D tissues to determine countermeasures for radiation. 10/2020 – 09/2023, US \$68,612
- Principal Investigator
Texas Advanced Computing Center (TACC) Allocation
Emulation of the Heavy-Charged Particle Spectra Found in Microgravity 2021, Stampede2 cluster 3,250,000 CPUh (~\$4,875,000)
- Co-Investigator
NASA Space Biology Appendix D: Solicitation of Proposals for Flight and Ground Space Biology Research
Investigating Lunar Stress and Parkinson's Disease Using an Alpha-Synuclein Yeast Model (\$8,000)

Active Grants



- Principal Investigator

LaSPACE Graduate Research Fellowship

Computational Model of the Human Brain to Study Dose Topology on the Sub-micron Scale. 8/2021 – 07/2022, US \$16,000

- Principal Investigator

LaSPACE Undergraduate Research Assistantship (LURA)

Characterization of Radiation Environment During SpaceX Inspiration 4 Mission. 8/2021 – 07/2022, US \$4,700

- Principal Investigator

NASA Human Research Program HERO Appendix C: Topics in Human Health Countermeasures, Behavioral Performance, and Space Radiation

Integration of in-silico and in-vivo models for determining preclinical indicators and/or integrated biomarkers of radiation induced vascular dysfunction. 2/2021-1/2024, US \$1,799,901

- Principal Investigator

LSU College of Science and Office of Research & Development Funds

Tiger Eye 1 Mission To Lunar Surface. 1/2021-12/2021, US \$75,000

- Institutional Principal Investigator

NASA Space Biology Appendix D: Solicitation of Proposals for Flight and Ground Space Biology Research

Develop a novel single-cell biodosimetry for brain genomic instability and neurodegeneration to predict clinical health outcomes in human spaceflight crews. 11/2020 – 10/2023, US \$350,000

- Co-Investigator

TRISH Space Radiation Solicitation (TSRAD-2020)

Using human stem-cell derived vascular, neural and cardiac 3D tissues to determine countermeasures for radiation. 10/2020 – 09/2023, US \$68,612

- Principal Investigator

Texas Advanced Computing Center (TACC) Allocation

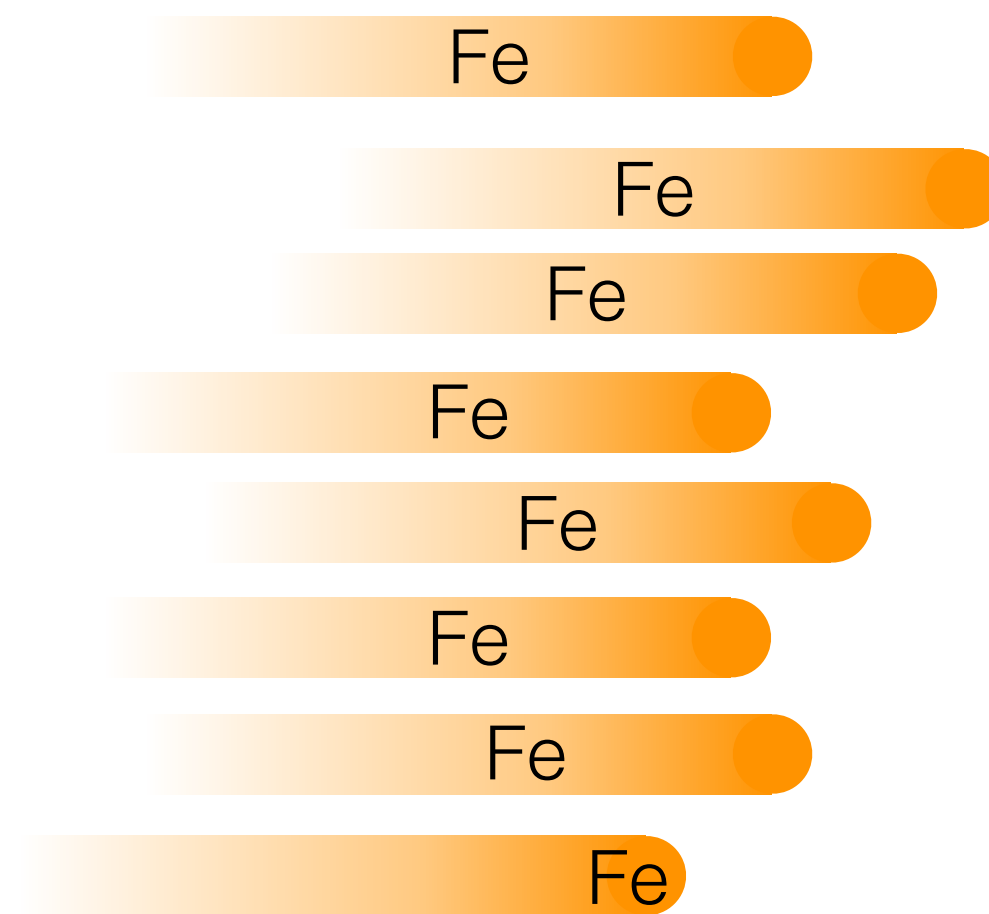
Emulation of the Heavy-Charged Particle Spectra Found in Microgravity 2021, Stampede2 cluster 3,250,000 CPUh (~\$4,875,000)

- Co-Investigator

NASA Space Biology Appendix D: Solicitation of Proposals for Flight and Ground Space Biology Research

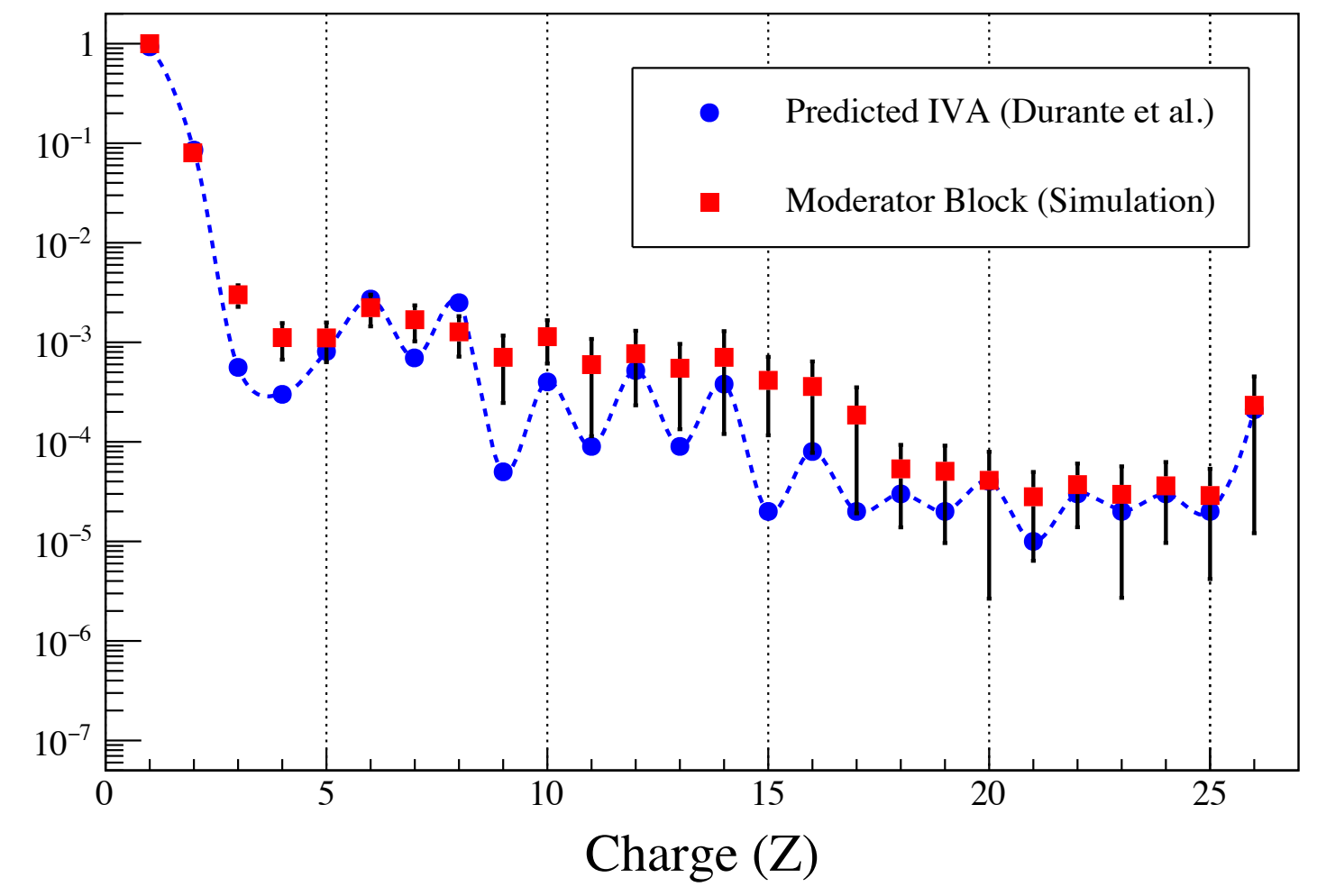
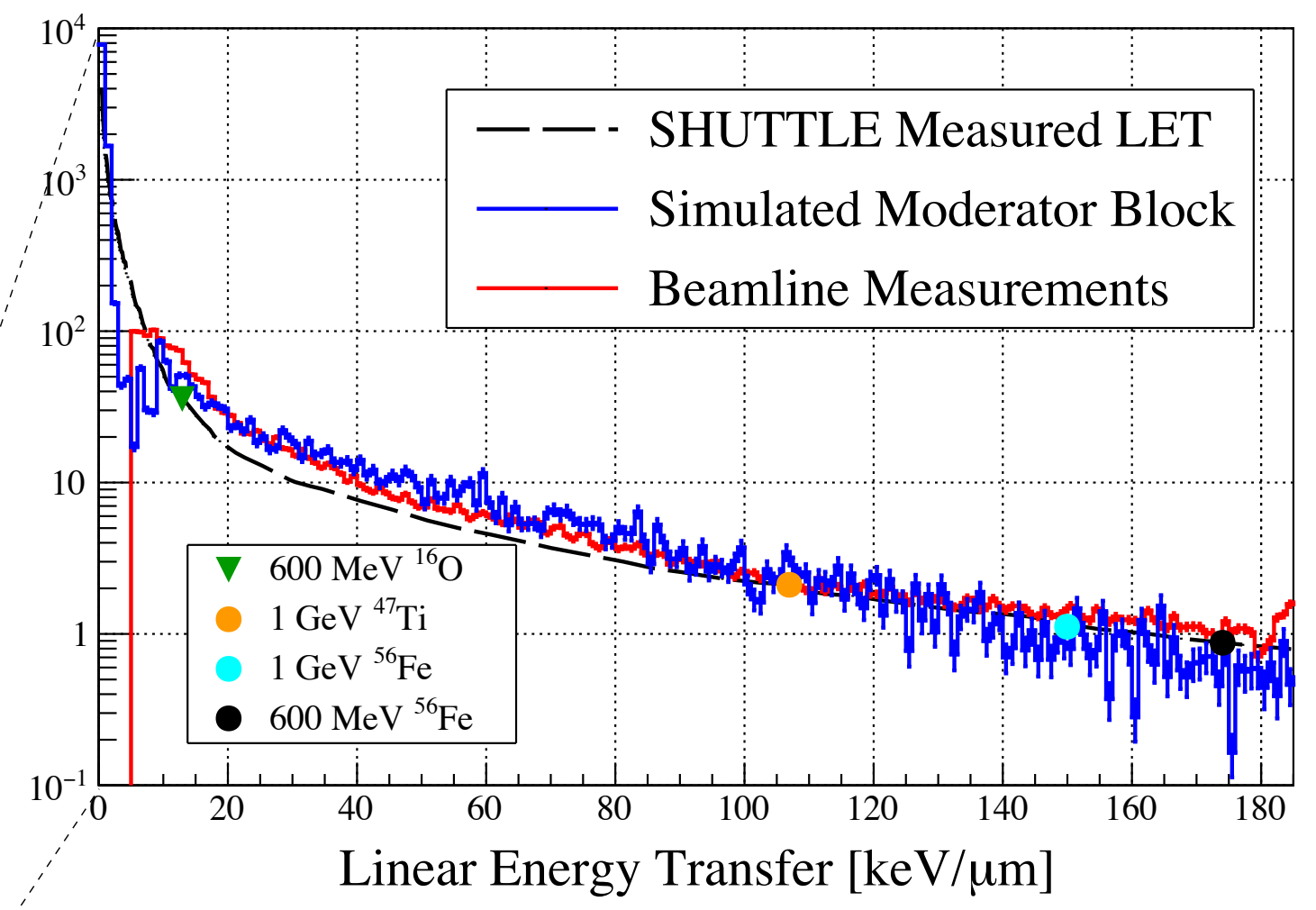
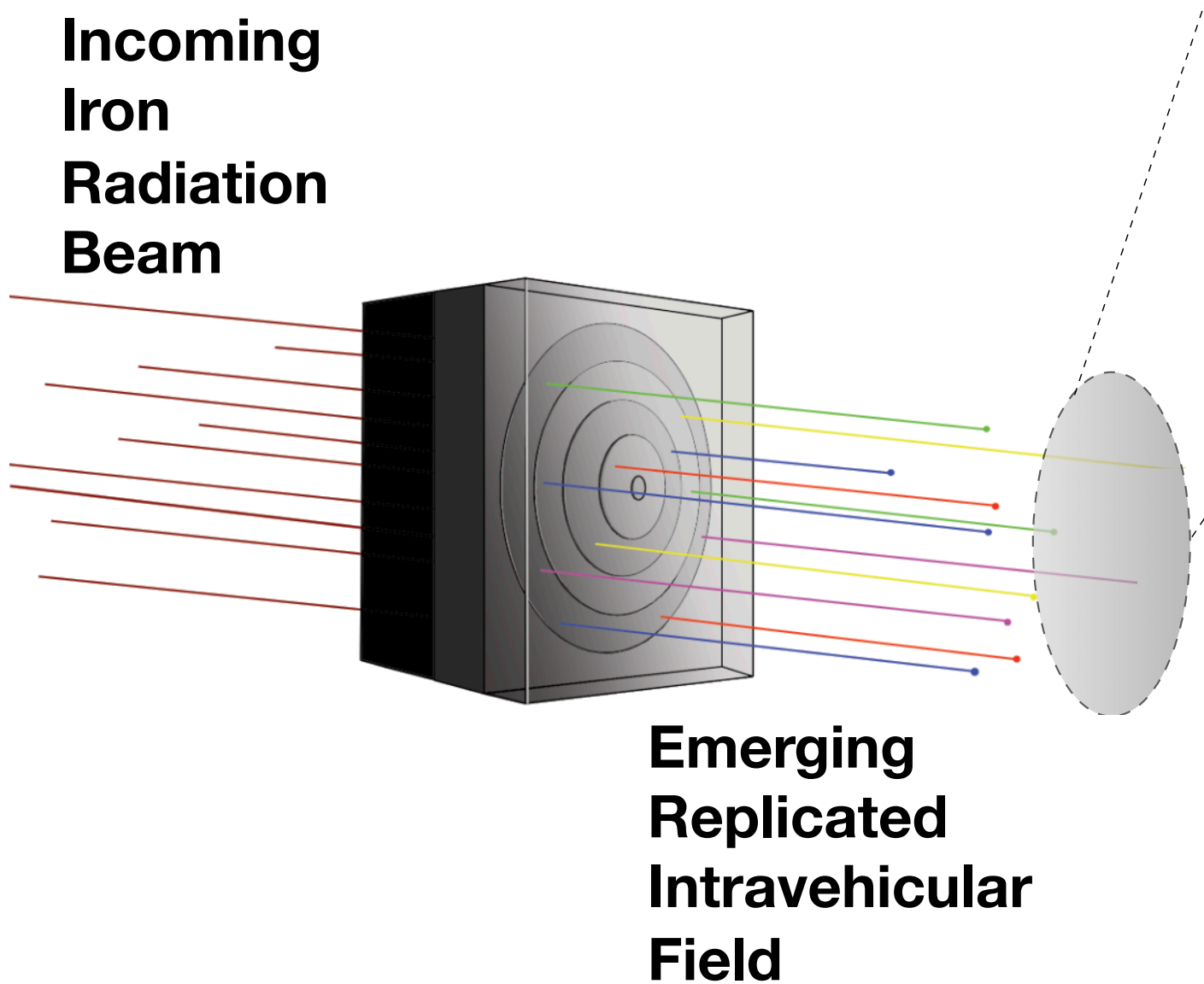
Investigating Lunar Stress and Parkinson's Disease Using an Alpha-Synuclein Yeast Model (\$8,000)

Mono-energetic, single ion beam

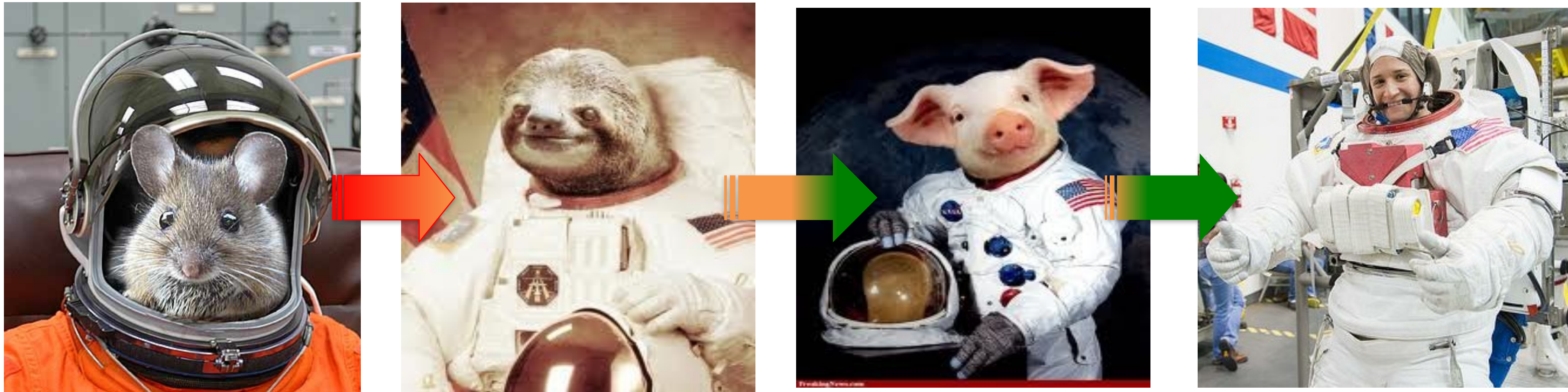


- **biological analog does NOT resemble the physiology of humans**
- **environmental analog does NOT mimic the multi-ion, multi-energy space radiation spectrum.**

SpaRTAN Lab Research Focus



Research Challenges: Disease Pathogenesis



Research Challenges: Disease Pathogenesis



Tiger Eye 1 Spaceflight Mission

- Tiger Eye 1 mission is a multi-disciplinary, university-industry collaboration between LSU Physics & Astronomy, Geocent Inc., Advacam, and Intuitive Machines to measure the cosmic ray spectrum on the lunar surface
- Student run, cross-campus collaboration project from five different LSU colleges: Science, Engineering, Honors, Humanities & Social Sciences, and Veterinary Medicine
- Tiger Eye 1 detector is manifested on the Intuitive Machine's Nova-C lunar lander that will be launched in 2021 from a SpaceX Falcon 9; operating on battery power for two weeks.
- Tiger Eye 1 detector will reside on the outer limb of the Nova-C lander and measure the cosmic ray energy spectrum – **the very first instance of these measurements performed on the lunar surface by a U.S. Intuition.**
- Data collected can be used to validate current space environment models, provide insight on shielding requirements for protecting human health and spaceflight hardware.
- A successful mission will help facilitate NASA's goal of using the lunar surface to demonstrate and test capabilities that will enable a continued human presence on the Moon, Mars, and beyond



Tiger Eye 1 mission logo designed by Katie Hostetler from the LSU School of Art+Design

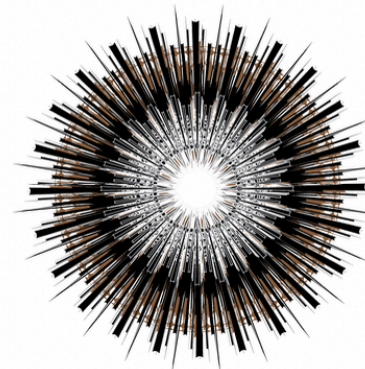
SpaRTAN Lab Research Focus



2021 LaSpace Undergraduate Research Assistantship *Characterization of Radiation Environment During SpaceX Inspiration 4 Mission.*



Artificial Neural Network framework and topology optimization for spacecraft shielding design



PHALANX

Cislunar Space Radiation Modeling and Shielding Design for Advanced Electronics

Topic Number: AF21B-TCSO1

Focus Areas: #14919 Cis-Lunar Domain Awareness; #14924 Persistent
Space-based ISR; #6465 Space Asset Resiliency

Proposal Number: FX21B-TCSO1-0238

CAGE: 8VNC7



ai.

ATLANTIS INDUSTRIES, INC.

An STTR Proposal in Partnership with Department of Physics & Astronomy,
Louisiana State University (Research Institution)

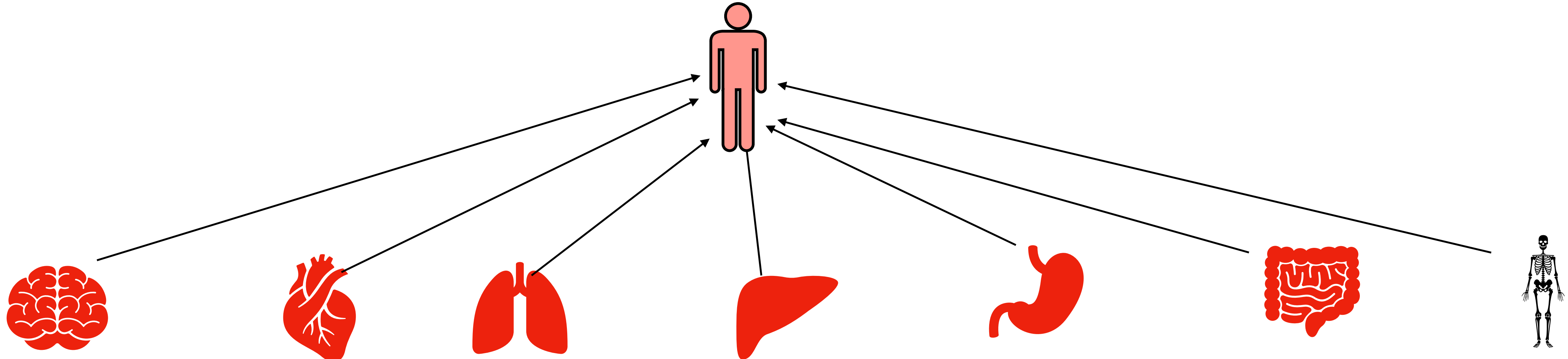
SpaRTAN Lab Research Focus

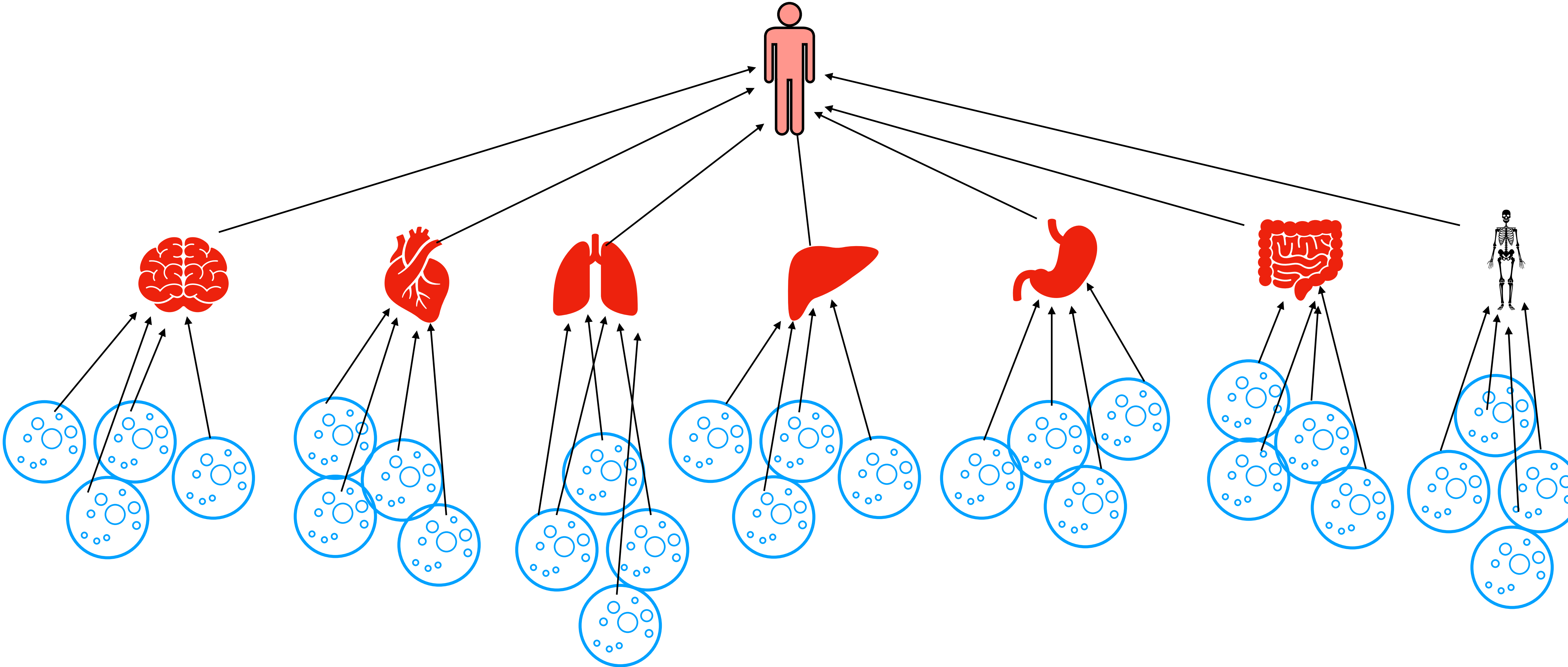


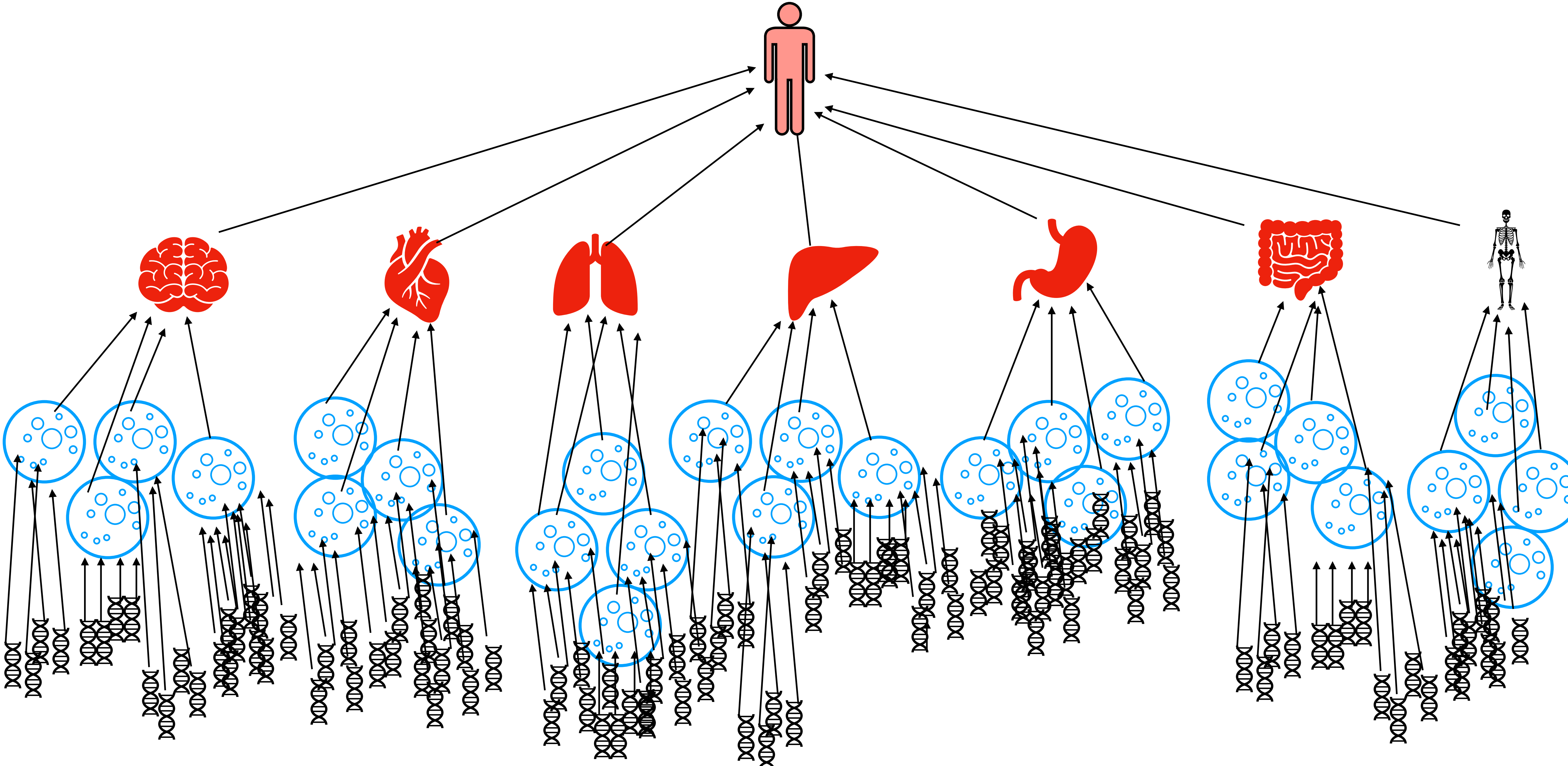
\$1,800,000 Grant from NASA Human Research Program to Determine Mechanisms of Space Radiation Induced Cardiovascular Disease

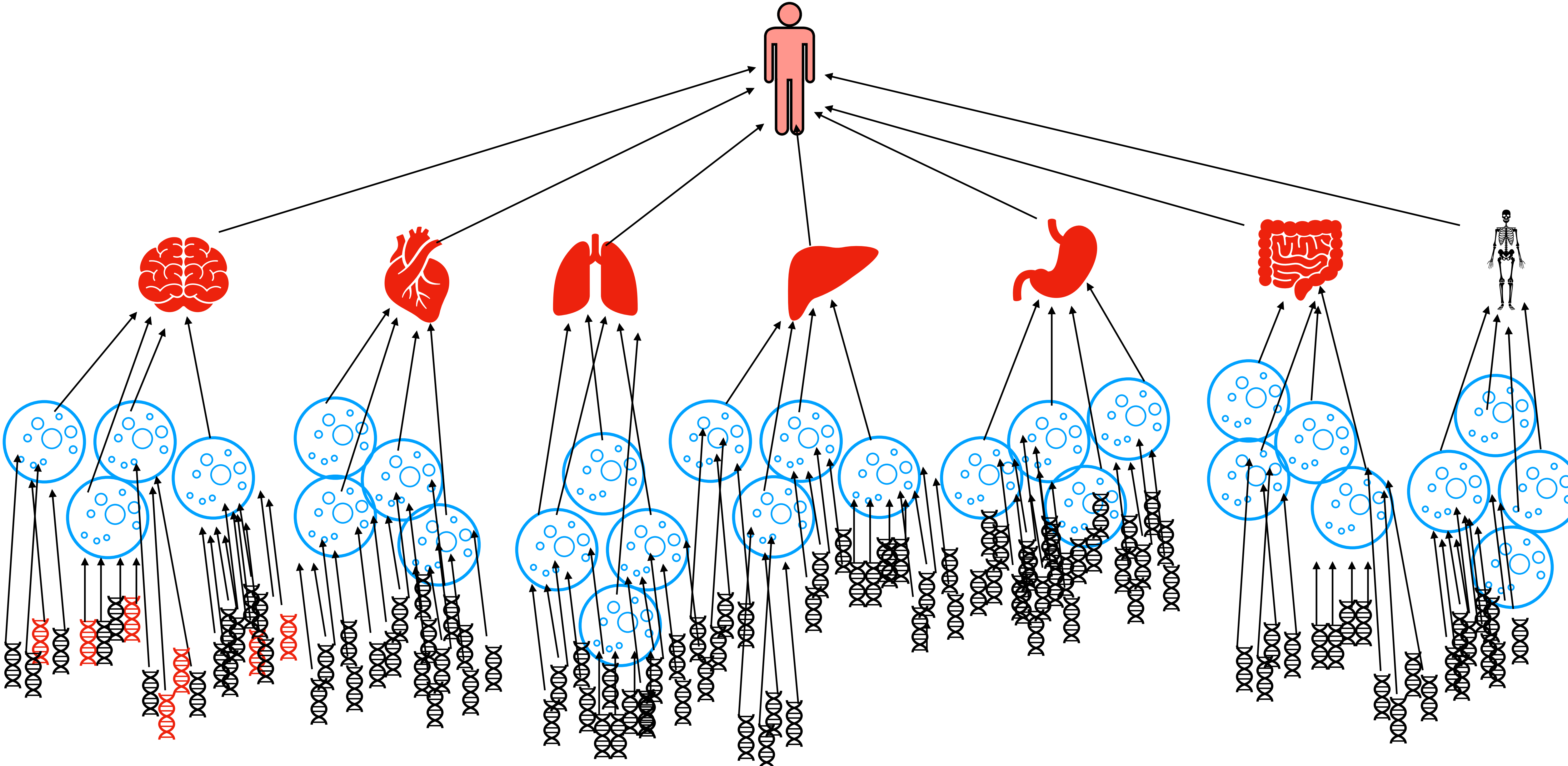


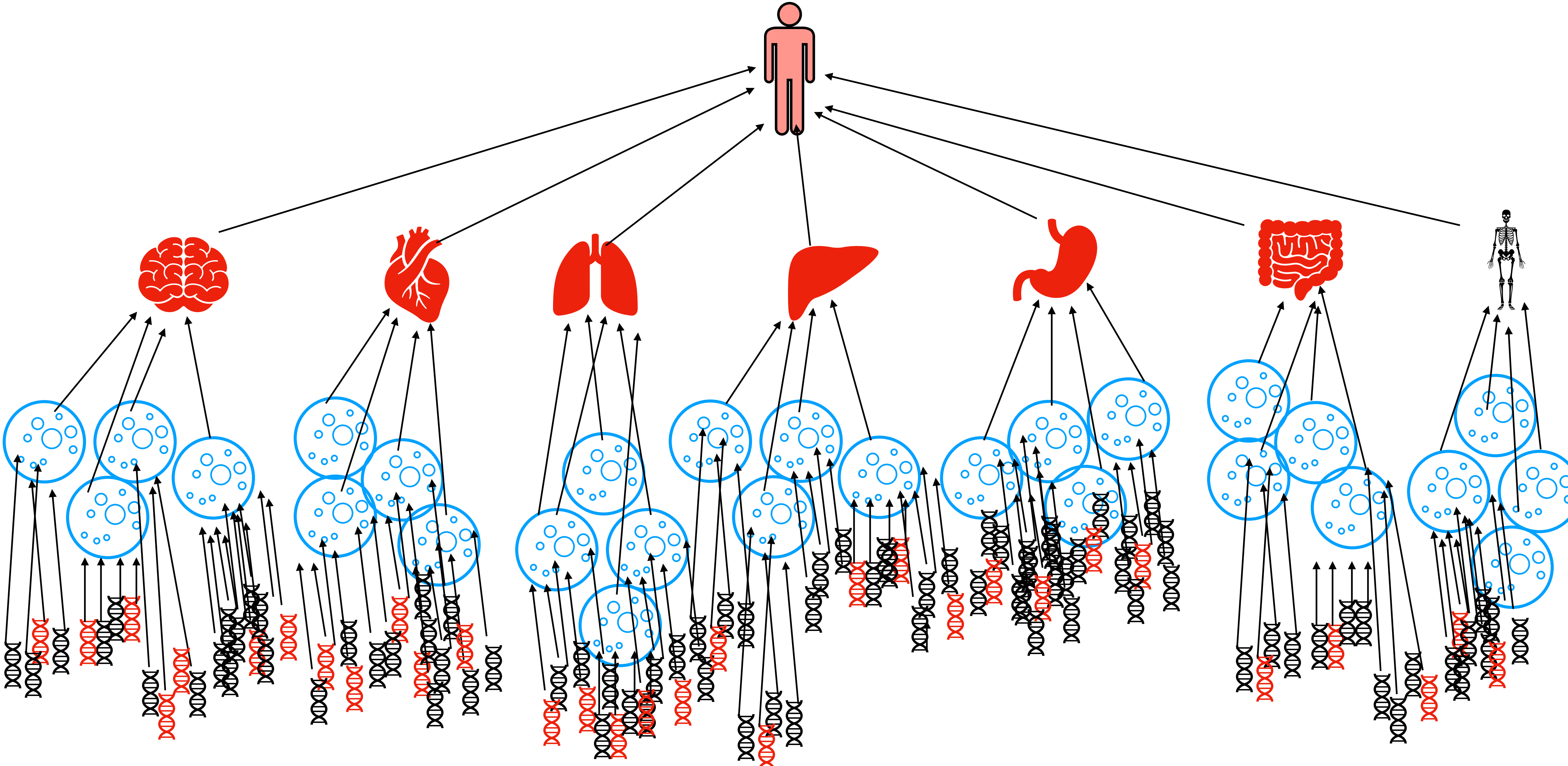
PHOENIX

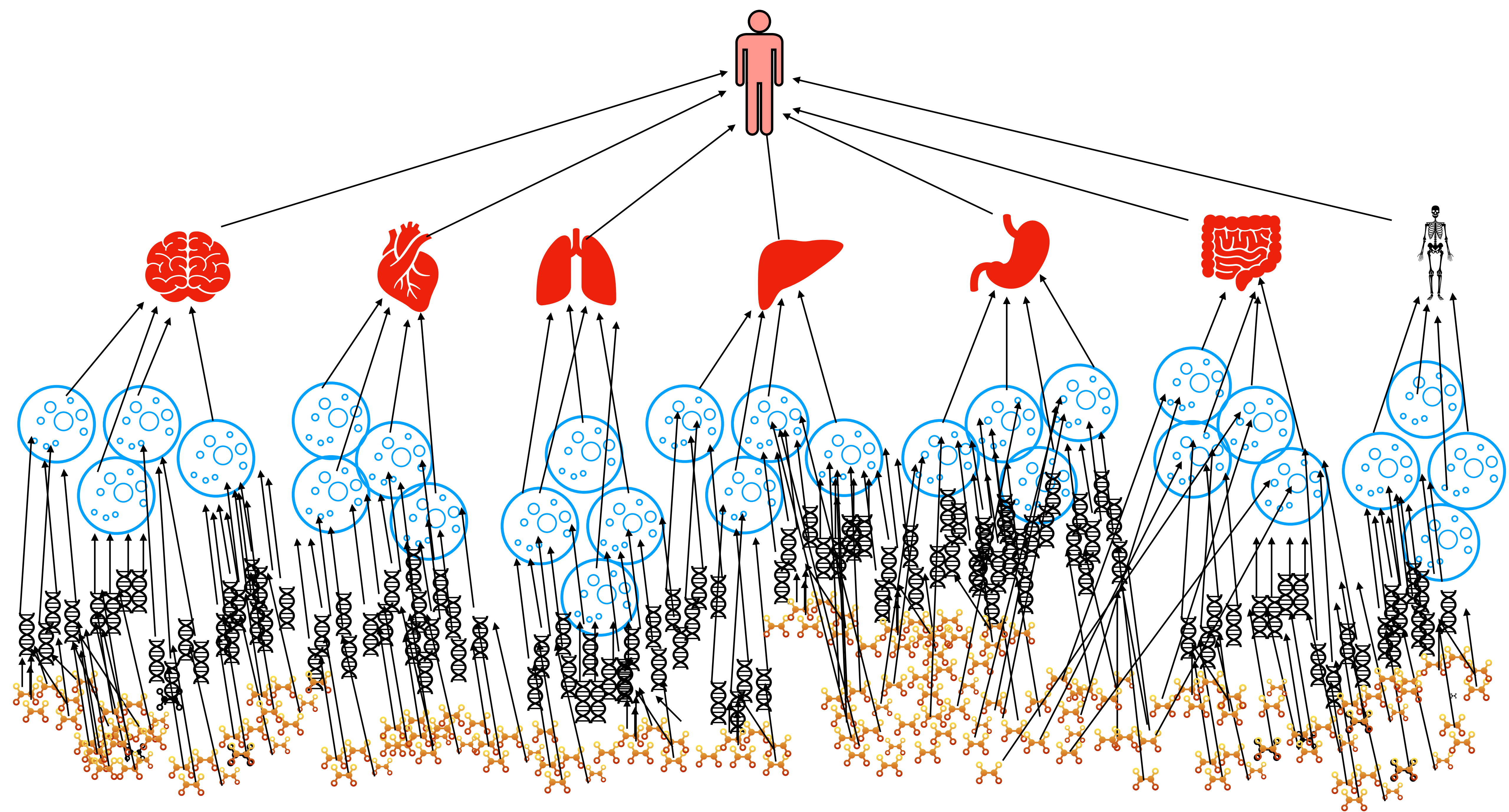












SpaRTAN Lab Research Focus

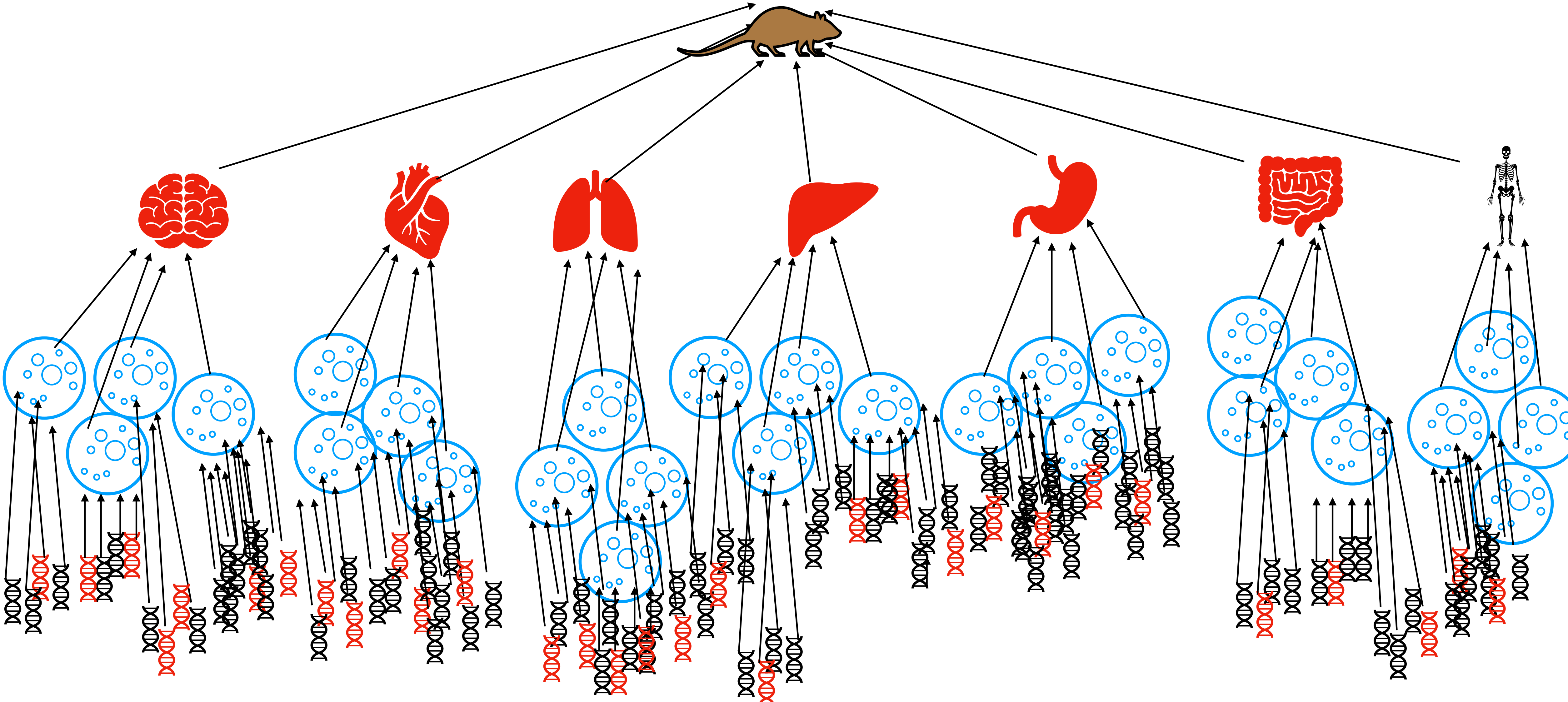


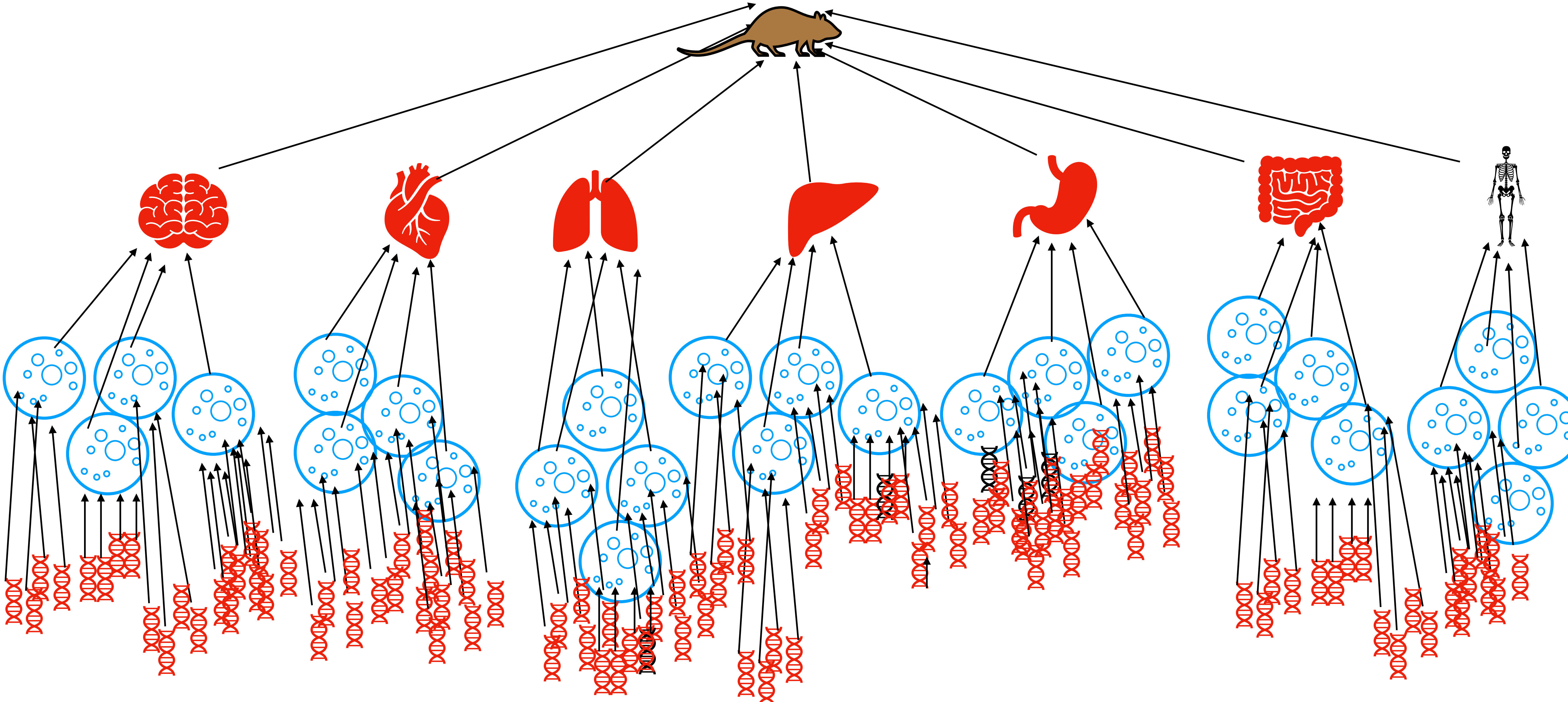
\$1,800,000 Grant from NASA Human Research Program to Determine Mechanisms of Space Radiation Induced Cardiovascular Disease



Megan Chesal awarded LaSpace Graduate Fellowship in both 2020 and 2021 for her thesis work on this project.

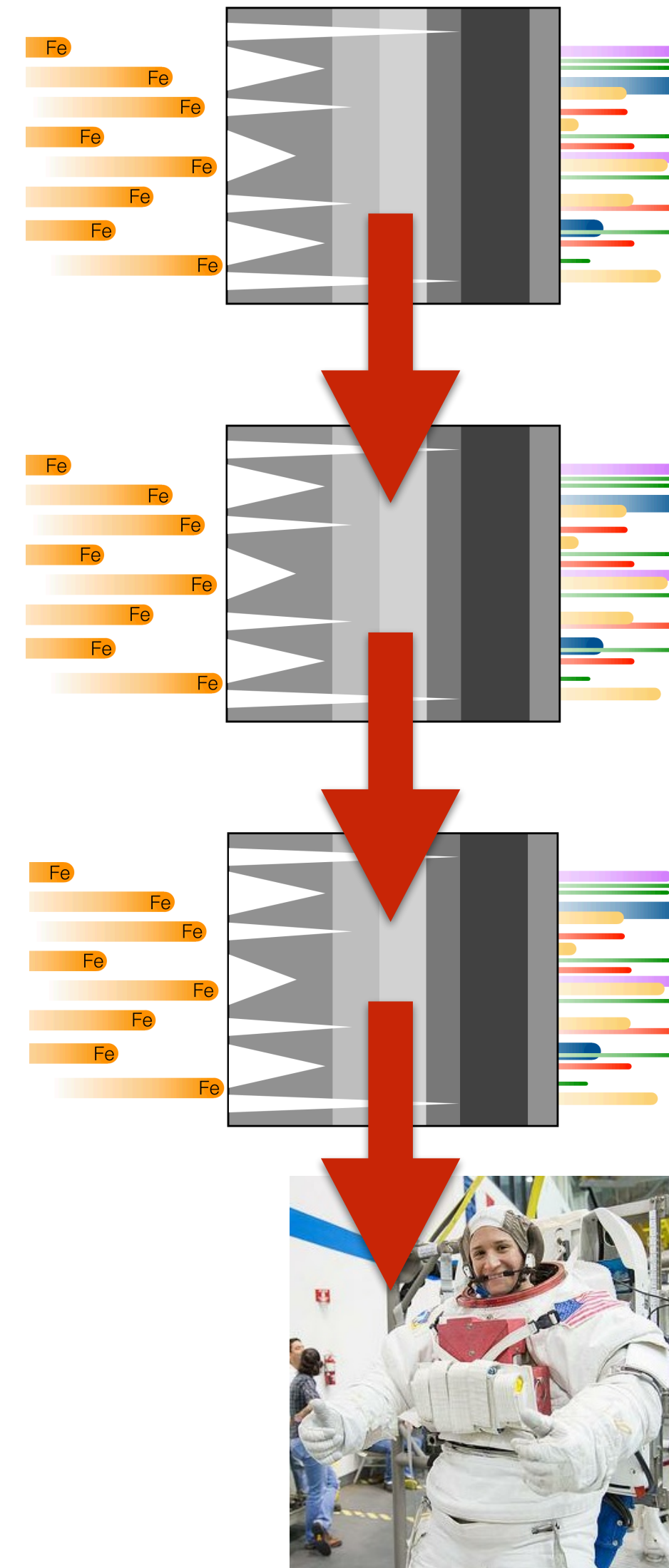
Provisional Patent Recently filed by LSU Technology and Commercialization



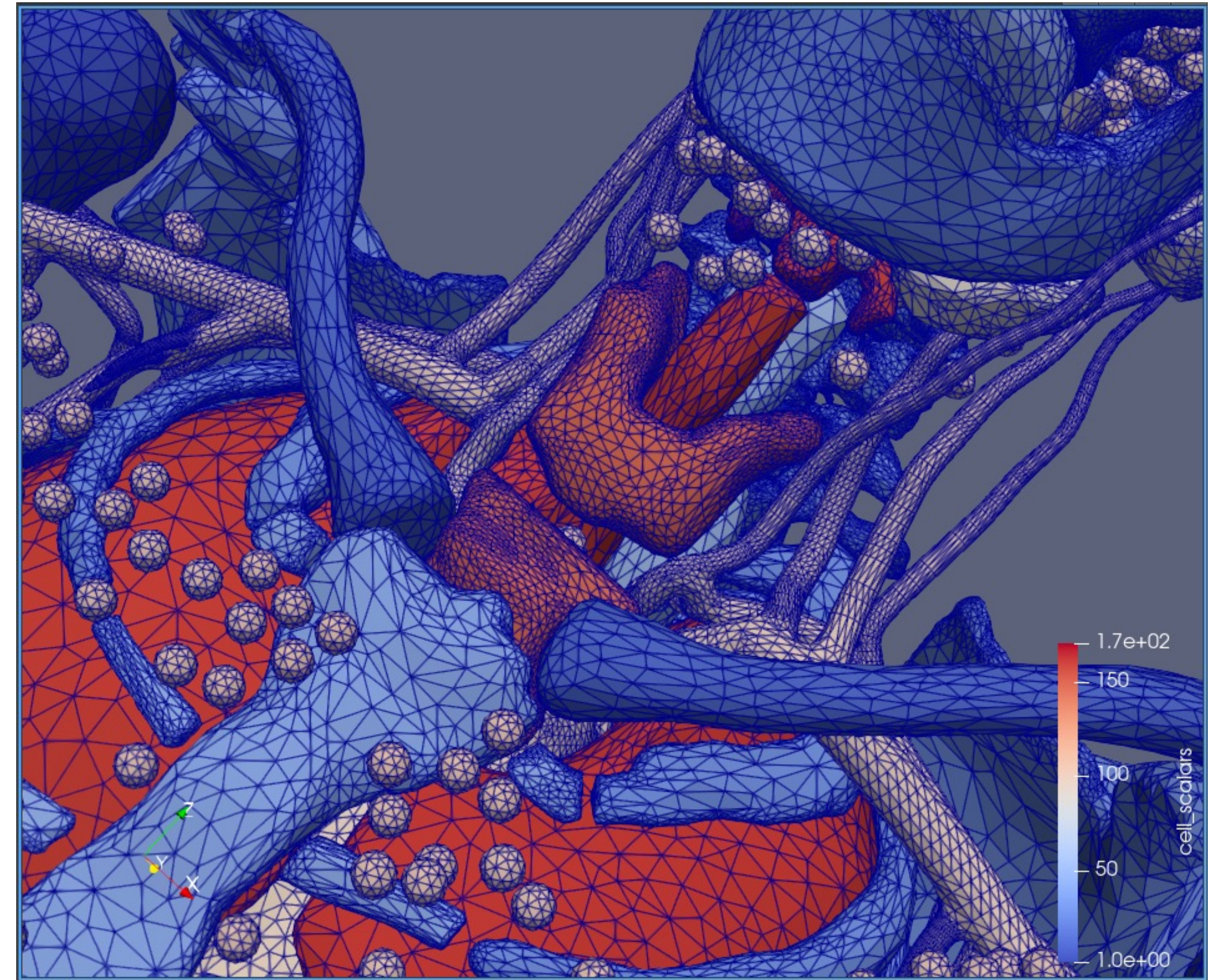
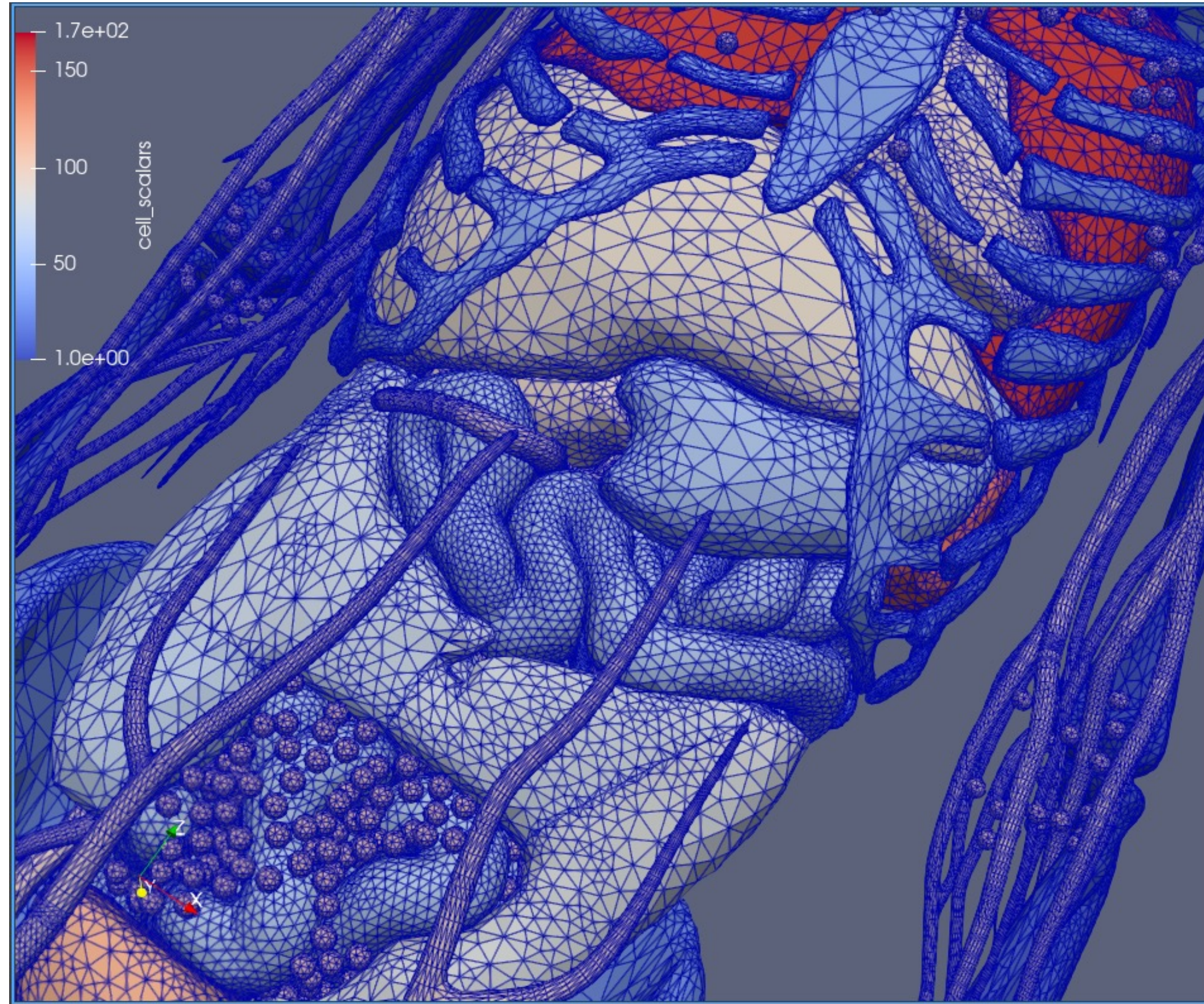


SpaRTAN Lab Research Focus

A physiological scalable analog that can simulate the non-homogenous space radiation environment in a laboratory setting.



SpaRTAN Lab Research Focus



Questions?



jeff@spartanphysics.com

www.spartanphysics.com