



NASA EPSCoR
Research Performance Progress Report (RPPR)
Seed Award

I. Collaborating Organizations

A. Academic Collaborators (*do not include names of minors*)

Name	Academic Affiliation	RID Project Role	Nearest person month worked	Contribution to Project	Funding Support
Stephanie Cone	University of Delaware	PI	3	Experimental design, code development, data analysis, data interpretation	Startup, NIH, NASA EPSCoR

B. NASA Collaborators

Name	Title	NASA Center	Nature of the Collaboration

C. Industry Collaborators

Name	Title	Industry/Company Name	Nature of the Collaboration

D. New non-EPSCoR grants

Funding Entity	Award Name	Value of New Grant

E. Other Organizations Involved as Partners

Organization	Nature of the Partnership	Benefit of the Partnership

II. Products

- A. List Journal publications – Please only list papers that have been published. **Please do not remove the table; or alter columns, add additional rows as required.**

Date Published	Published Paper (APA format)

- B. List Conference Papers – Please only list papers that are included in conference proceeding. **Please do not remove the table; or alter columns, add additional rows as required.**

Conference Date	Conference Paper (APA format)

- C. List Conference Presentation – Please list conference presentation. **Please do not remove the table; or alter columns, add additional rows as required.**

Conference Date	Presentation Topic (APA format)

3/2025	OL Dyer, SG Cone. Morphometric and Functional Assessment of Anterior Cruciate Ligament Injury in a Rat Model. ASB East Coast Regional Meeting. State College, PA. March 2025.
7/2025	OL Dyer, SG Cone. Morphometric and Functional Analysis of Healthy and ACL Deficient Rat Knee Joints. XXX Congress of the International Society of Biomechanics. Stockholm, Sweden. July 2025.

- D. List Books and/or other Publications – Please include explanations, help us to learn about your accomplishments. **Please do not remove the table; or alter columns, add additional rows as required.**

Date	Explanations (APA format -Book, Newspaper Op-Ed, ...)

- E. List talk/presentation/event/outreach activity – Please include explanations, help us to learn about your accomplishments. **Please do not remove the table; or alter columns, add additional rows as required.**

Date	List talk/presentation/event/outreach activity (APA format if applicable)

- F. List of new or updated Website(s) or other Internet site(s). **Please do not remove the table; or alter columns, add additional rows as required.**

URL	Short description of purpose of site

- G. Technology/Technique – **Please do not remove the table; or alter columns, add additional rows as required.**

Technology/Technique	Short description of technologies or techniques
Rodent robotics	Multi-axial testing frame for rodent knee joints, developing ability to perform clinical exams ex vivo on cadaveric joints

H. List patent – Please include Patent Number/Patent Title/ Patent Abstract (or link to it). **Please do not remove the table; or alter columns, add additional rows as required.**

Date Patent Issued	Patent Number/Patent Title/ Patent Abstract (or link to it)

I. List Inventions – Please include Invention Title, List of Inventor(s) and Description. **Please do not remove the table; or alter columns, add additional rows as required.**

Invention Title	List Inventor(s)	Invention Description

J. List Licenses – Please include license issued, Invention Title, List of Inventor(s) and Description. **Please do not remove the table; or alter columns, add additional rows as required.**

Date License Issued	License Assignees	License Title

- K. List New/Revised Courses – Please include new/revised courses. **Please do not remove the table; or alter columns, add additional rows as required.**

Course Number	Course Name/Title	Offering Institution
BMEG465/665	Tissue Biomechanics & Modeling	University of Delaware

- L. Others: List Databases, Physical collections, Audio or video products, Software or NetWare, Models, Instruments or equipment, Data & Research Material (e.g., cell lines, DNA probes, animal models) related to your EPSCoR research. **Please do not remove the table; or alter columns, add additional rows as required.**

Accomplishments title	Short Description of accomplishments

III. Changes/Problems

- A. Actual or anticipated problems or delays and actions or plans to resolve them
- A faulty force sensor caused some delay on experimental progress, this has been addressed by returning the sensor to the manufacturer (ATI) and having repairs completed. No long-term impacts on overall project completion are anticipated. This issue was resolved in February 2025 and we were able to complete the proposed work within the grant period.
- B. Changes that have a significant impact on expenditures
- N/A

IV. Impact

Include article and photo w/caption (see instructions). Obtain permission to publish photo from any recognizable person via NASA Media Release Form. Do not include photos of minors.

Article:

Osteoarthritis, the most common joint disease globally, affects over 22 million Americans, often

leading to pain, dysfunction, and limited mobility. Post-traumatic osteoarthritis (PTOA) can result from injuries like anterior cruciate ligament (ACL) tears or meniscus damage - adding complexity to the recovery of patients after common orthopaedic injuries. Despite the prevalence of this disease, understanding the mechanisms of PTOA has been limited by technological deficits in preclinical research tools—until now.

Our team is pioneering biomechanical investigations for studying PTOA using a novel robotic system designed for testing small animal knee joints. This cutting-edge technology enables precise multi-axial mechanical testing, providing insights into the biomechanics of knee injuries and the effects of surgical interventions. With sub-millimeter positional accuracy and exceptional sensitivity, this robotic system sets a new standard for preclinical orthopaedics research.

Our research focuses on two common injuries: medial meniscus and anterior cruciate ligament (ACL) injury. By simulating these injuries in rodent knees, we can replicate clinically relevant scenarios and measure their immediate effects on joint stability and tissue function. Complementary medical imaging allows us to correlate these functional changes with tissue structural alterations, offering a comprehensive view of joint health.

The implications of this work extend far beyond the lab. By establishing baseline data for healthy and injured rodent knees, this research bridges a critical gap between preclinical models and clinical applications. The knowledge gained will enhance the development of targeted therapies, inform surgical techniques, and improve outcomes for millions of patients with osteoarthritis.

Website: <https://sites.udel.edu/conelab/>

Image:

