John M. Drago

77 Massachusetts Ave, Cambridge, MA 02139
email: firstname [underscore] lastname [at] mit [dot] edu | web: john-drago.github.io

Education:

Massachusetts Institute of Technology (MIT), Cambridge, MA *Sept 2020 – Current*
Candidate for SM & PhD degrees in Electrical Engineering & Computer Science

Harvard Medical School, Boston, MA *July 2017 – Current*
Harvard/MIT MD-PhD Program
Candidate for MD degree

Massachusetts Institute of Technology, Cambridge, MA *Sept 2013 – June 2017*
S.B. Mechanical Engineering, Minor in Biomedical Engineering

Research Experience:

Magnetic Resonance Physics & Instrumentation Group, Boston, MA *Sept 2020 – Current*
Group at MGH Martinos Center focusing on the development and improvement of various imaging modalities

- Create system to perform multiphoton MR excitations using an additional z-directed low frequency field.
- Perform tSNR functional neuroimaging measurements for analysis of time-series MPI images to detect variations in image data that correspond to physiological changes.
- Optimized transmit filter design for MPI system to generate homogeneous 25 kHz magnetic drive field for nanoparticle excitation.

MGH Bioengineering Laboratory, Boston, MA *Nov 2017 – May 2020*
Research group focusing on in vivo mechanics and clinical outcomes of knee replacements

- Evaluated *in vivo* kinematics of novel knee replacement designs in patients undergoing a variety of functional tests to assess similarity to native knee biomechanics.
- Utilized machine learning/deep learning techniques for efficient 3D to 2D image registration of knee/hip replacements onto fluoroscopic image projections obtained during functional tests.

Grodzinsky Continuum Biomechanics Lab, Cambridge, MA *June 2014 – Aug 2017*
Research lab at MIT focusing on problems of musculoskeletal system and connective tissue

- Manipulated and evaluated biological pathways that contribute to onset of osteoarthritis through various lab techniques that track cell processes. Focused on potential therapeutics that reduce chondrocyte apoptosis and cartilage degradation.
- Designed experiments to culture murine supraspinatus tendons *in vitro* under constant tensile load.
- Designed and built a mechanical apparatus to hold tendons at precise strain levels for biomechanical compression testing.

Manuscripts:

1. C Klemt, **JM Drago**, V Tirumala, YM Kwon. "Asymmetrical Tibial Polyethylene Geometry-cruciate retaining total knee arthroplasty does not fully restore in-vivo articular contact kinematics during strenuous activities." *Knee Surg Sports Traumatol Arthrosc.* 2021. PMID: 33388940. DOI: 10.1007/s00167-020-06384-9.

2. C Klemt, **JM Drago**, R Oganesyan, I Yeo, YM Kwon. "Gait and Knee Flexion In-Vivo Kinematics of Asymmetric Tibial Polyethylene Geometry Cruciate Retaining Total Knee Arthroplasty." *J Knee Surg.* 2020. PMID: 33111271. DOI: 10.1055/s-0040-1718681.

Compiled: Nov 2021

Conference Papers and Abstracts:

1. C Klemt, V Tirumala, **J Drago**, W Boonyanuwat, W Chen, K Xiong, YM Kwon. "Two-Stage Reimplantation in Patients Requiring an Interim Spacer Exchange for Periprosthetic Joint Infection is Associated with Poorer Functional Outcomes." AAOS Annual Meeting. Orlando, FL. March 24-28, 2020.

2. BK Connizzo, **JM Drago**, EH Frank, AJ Grodzinsky. "Static Tensile Strain Does Not Alter Tendon Response To Joint Inflammation In A Murine Explant Model." BMES Annual Meeting 2019. Philadelphia, PA. October 16-19, 2019.

3. Klemt C, Arauz P, An S, **Drago J**, Wang A, Veith A, Limmahakhun S, Kwon YM. "In-Vivo Kinematics Of Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty During High Knee Flexion Activities." EFORT Congress. Lisbon, Portugal. June 5-7, 2019.

4. **J Drago**, P Arauz, C Klemt, S An, A Wang, A Veith, S Limmahakhun, YM Kwon. "*In Vivo* Contact Kinematic Comparison of Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty and the Native Knee During Gait." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

5. **J Drago**, P Arauz, C Klemt, S An, A Wang, A Veith, S Limmahakhun, YM Kwon. "*In Vivo* 6-DOF Assessment of Knee Kinematics During a High Flexion Lunge: A Comparison Between Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty and Contralateral Native Knee." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

6. P Arauz, C Klemt, S An, **J Drago**, A Wang, A Veith, S Limmahakhun, YM Kwon. "In-vivo Articular Contact Analysis during Step-Ups in Patients with Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

7. P Arauz, C Klemt, S An, **J Drago**, A Wang, A Veith, S Limmahakhun, YM Kwon. "In-vivo Kinematics during Gait in Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

8. C Klemt, P Arauz, S An, **J Drago**, A Wang, A Veith, S Limmahakhun, YM Kwon. "In-vivo Kinematics of Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty during High Knee Flexion Activities." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

9. P Arauz, C Klemt, S An, **J Drago**, A Wang, A Veith, S Limmahakhun, YM Kwon. "In-vivo Articular Contact Analysis during Functionally Strenuous Activities in Patients with Asymmetrical Bearing Geometry Cruciate Retaining Total Knee Arthroplasty." ORS Annual Meeting. Austin, TX. February 2-5, 2019.

10. A Veith, S Limmahakhun, P Arauz, C Klemt, S An, **J Drago**, A Wang, YM Kwon. "Does Posterior Tibial Slope Impact Anterior Cruciate Ligament Bundle Stress in Bi-Cruciate Retaining Total Knee Arthroplasty?" ORS Annual Meeting. Austin, TX. February 2-5, 2019.

11. BK Connizzo, HM Zlotnick, **JM Drago**, AJ Grodzinsky. "Development of an *In Vitro* Bone-Tendon-Muscle Explant Culture Model." BMES Annual Meeting 2017. Phoenix, AZ. October 11-14, 2017.

12. Y Wang, S Wan, **J Drago**, FM White, AJ Grodzinsky. "Phosphoproteomics analysis of signaling changes in human chondrocytes following treatment with IL-1, IGF-1 and dexamethasone." 2017 OARSI World Congress on Osteoarthritis. Las Vegas, NV. April 27-30, 2017.

Patents:

1. Varady NH, Khouri ER, **Drago JM**, Arnold CA. "Reloadable multi-fire suture passer." Patent Provisional. 2015. **(Provisional Patent, expired in 2016).**

Teaching:

HST.164: Principles of Biomedical Imaging, Teaching Assistant *IAP 2021*
Reviewed and updated course content. Led students in labs focused on physics of MRI acquisition. Developed course website. Course focused on mathematical understanding of various imaging modalities.

6.022: Quantitative Systems Physiology, Teaching Assistant *Spring 2017*
Assistant teaching instructor for MIT class, modeling fluid, electricity, and mass flow through various organ systems.

Service:

Harvard Medical Student Review, Associate Editor *Apr 2019 – Current*
Review technical content and scientific rigor of submitted articles for publication.

MGH Principal Clinical Experience, Education Rep *Oct 2018 – Sept 2019*
Served as representative to clerkship administration and faculty regarding educational curriculum at MGH.

HMS Financial Aid Committee, Member *Sept 2017 – Sept 2018*
Served as student representative on committee to advocate for financial well-being of students to members of HMS administration.

HMS Student Council, Member *Sept 2017 – Sept 2018*
Helped organize and run events and initiatives for student body.

MIT IFC Sexual Misconduct Committee, Inaugural Chair *Feb 2016 – June 2017*
- Worked with Interfraternity Council and Institute administrators to create programming changes for educating fraternity members about sexual assault.
- Created system to incentivize houses to seek sexual harassment training through Consent Awareness and Prevention (CAP) education program.

MIT Student and Affiliates Health Insurance Advisory Committee, Student Rep *Sept 2014 – June 2017*
- Served as sole undergraduate representative on committee that advised on pricing of insurance premiums for all students and affiliates.
- Analyzed data from past fiscal years, to recommend premium changes for subscribers in line with competitive institutions.
- Spoke to various undergraduate students to learn of concerns in current insurance programs at MIT. Coordinated with the Undergraduate Association leadership to communicate potential changes to student leaders.

MIT Committee on the Hobby Shop, Member *Sept 2016 – Aug 2017*
Undergraduate representative on committee designed to improve a maker space at MIT.

MIT Women's Technology Program in Mechanical Engineering, Mentor *July 2016, July 2017*
Mentored two program participants in creation of poster to be presented for Mechanical Engineering Department viewing.

MIT Athletic Trainer Search Committee, Member *June 2016 – Aug 2016*
Helped identify and select candidates to fulfill position opening. Collaborated with Institute administration, coaches, staff, and students to select best candidates for MIT community.

Boston Marathon, Volunteer *Apr 2016, Apr 2017*

Other Activities:

MIT Varsity Baseball *Aug 2013 – June 2017*
2014 & 2015 NEWMAC Champions. ECAC Champions 2016. NCAA Northeast Regional Tournament 2014 & 2015. CoSIDA Academic All-American, 2016 & 2017. NEWMAC All-Conference 2014 & 2016, and NEWMAC Rookie of the Year, 2014.

Honors and Awards:

- Tau Beta Pi Engineering Honor Society
- Pi Tau Sigma Mechanical Engineering Honor Society
- 2020 Thomas (1959) and Sarah Kailath Fellowship recipient, awarded by MIT EECS Department
- 2017 MIT Change Maker Award Recipient for work addressing sexual assault
- 2016, 2017 CoSIDA Academic All-American
- 2015, 2016, 2017 CoSIDA Academic All-District Baseball Team
- 2015, 2016, 2017 Academic All-NEWMAC Baseball Team
- 2017 Chi Phi Spaur Scholarship Recipient
- 2016 2nd Team All-NEWMAC
- 2015 Chi Phi Sparks Medal Recipient
- 2014 NEWMAC Rookie of the Year
- 2014 1st Team All-NEWMAC
- 2014 D3Baseball.com All-Region Team
- 2013 United States Marine Corps Distinguished Athlete Award
- 2013 National Football Federation, Arizona Scholar Athlete
- 2006 Fiesta Bowl Aerospace Challenge Winner