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PROFESSIONAL PROFILE

Biomechanical engineer and licensed Professional Engineer with nearly 20 years of interdisciplinary experience spanning biomechanics, mechanical engineering, materials science, injury causation analysis, and automotive safety. Expertise includes occupant kinematics, injury biomechanics, human tolerance assessment, product performance evaluation, and biomechanical testing across transportation, consumer product, occupational, and recreational applications. Extensive experience designing and conducting experimental investigations involving full-scale automotive crash testing, sled testing, rollover testing, component- and system-level evaluations, head impact testing, helmet performance analysis, human subject testing, and anthropomorphic test device (ATD) testing. Skilled in integrating engineering analysis, medical literature, photogrammetry, testing, and injury biomechanics principles to evaluate injury mechanisms and human motion under real-world conditions. Experienced technical consultant and engineering communicator with a demonstrated history of leading multidisciplinary investigations, managing complex technical projects, publishing peer-reviewed research, presenting at national and international conferences, and communicating complex biomechanical concepts to technical and non-technical audiences including attorneys, juries, engineers, scientists, and industry professionals.

POSITIONS

Brillouin Consulting

Senior Managing Engineer

Philadelphia, PA

July 2026 - Present

Dr. Isaacs is a biomechanical engineer specializing in injury causation, occupant kinematics, product performance, and occupant protection systems. She has extensive experience evaluating motor vehicle collisions, transportation incidents, workplace accidents, consumer products, and recreational injuries using engineering analysis, experimental testing, and biomechanical principles. She applies biomechanical methods to assess whether claimed injuries are consistent with reported accident mechanisms, evaluate occupant motion and human tolerance, and examine the performance of safety systems and products across a wide range of matters.

Exponent

Senior Consultant

Philadelphia, PA

June 2015 - July 2026

Conduct biomechanical analyses involving injury causation, occupant kinematics, human tolerance assessment, and product performance across transportation, occupational, consumer product, and recreational scenarios. Evaluate injury mechanisms and loading conditions associated with motor vehicle collisions, transit bus incidents, rail events, falls, recreational activities, and product-related incidents. Analyze biomechanical consistency between claimed injuries and reported accident mechanisms using medical records, engineering analysis, testing, scientific literature, and human tolerance data. Perform evaluations involving occupant protection systems including seat belts, airbags, helmets, and other safety-related products. Communicate complex biomechanical, engineering, and anatomical concepts to technical and non-technical audiences including attorneys, juries, engineers, and industry professionals. Publish and present technical research related to biomechanics, automotive safety, occupant protection, sports injury biomechanics, and human motion analysis. Participate in public STEM outreach and science communication initiatives focused on biomechanics and injury mitigation.

Widener University**Chester, PA****Visiting Assistant Professor – Mechanical Engineering**

Aug 2013 - May 2015

Taught undergraduate mechanical engineering courses including Introduction to Engineering Techniques, Engineering Graphics and CAD, Statics, Mechanics of Deformable Bodies, Computational Methods in Engineering, Design and Prototype, Fundamentals of Engineering Materials and Design, and Mechanical Measurements. Coordinated and instructed the required first-year engineering design course serving approximately 190 students and 10 instructors. Advised student organizations including the Society of Automotive Engineers (SAE), Engineers Without Borders, and the Freshman Class. Served as a Kern Entrepreneurial Engineering Network (KEEN) Fellow and integrated entrepreneurial mindset principles into engineering curriculum and classroom experiences.

Tel Aviv University**Tel Aviv, Israel****Fulbright Postdoctoral Fellow – Mechanical Engineering**

Sept 2012 - June 2013

Developed and characterized fiber-reinforced biocomposite systems for medical applications. Assisted in development of computational finite element approaches for evaluation of vertebral bone effective properties. Conducted research related to computational biomechanical models for diagnosis and management of lumbar spine pathologies.

Drexel University**Philadelphia, PA****Research Assistant – Materials Science & Engineering**

Aug 2006 - May 2012

Conducted doctoral research focused on spine biomechanics and annulus fibrosus micromechanics. Developed fracture mechanics and fatigue testing techniques for annulus fibrosus tissue. Designed and fabricated micro-tensile testing equipment and customized biomechanical testing methodologies. Developed testing procedures for characterization of injectable nucleus pulposus replacement materials. Performed cadaver-based laboratory procedures and biomechanical evaluations.

ACADEMIC CREDENTIALS

Drexel University**Philadelphia, PA**

Ph.D., Mechanical Engineering and Mechanics

2012

Drexel University**Philadelphia, PA**

M.S., Mechanical Engineering and Mechanics

2009

Widener University**Chester, PA**

B.S., Mechanical Engineering

2006

LICENSURE & CERTIFICATIONS

- Professional Engineer (Mechanical), Delaware, License No. 21997
- Northwestern University Center for Public Safety – Traffic Crash Reconstruction for Engineers
- MTA NYC Transit Track Safety Certification

PUBLICATIONS

- Isaacs JL, George J, Campolettano E, Cutcliffe H, Miller B. "The role of three-point restraints for occupants in moderate severity frontal collisions." Society of Automotive Engineers (SAE) Technical Paper 2022-01-0845, 2022.
- Toney Bolger M, Isaacs JL, Rapp van Roden E, Croteau J, Dibb A. "Seat belt latch plate design and pretensioner deployment strategies have limited effect on in- and out-of-position occupants in high-severity rear-end collisions." SAE Technical Paper 2022-01-0849, 2022.
- Croteau J, Toney Bolger M, Isaacs JL, Shurtz B, Zolock J. "Seatback strength and its effect on in-position and out-of-position atd loading in high-speed rear impact sled tests." SAE Technical Paper 2022-01-0856, 2022.
- Isaacs JL, Campbell IC, Watson H, Toney Bolger ME. "Head and neck loading trends in IIHS side impact testing." Topic Key Note Presentation/Paper, Fédération Internationale des Sociétés d'Ingénieurs des Techniques de l'Automobile (FISITA) World Congress, Prague, Czech Republic (virtual), September 14-16, 2021. Outstanding Paper Award.

- Toney Bolger M, Sherman S, Isaacs JL, Garman C, Dibb A. "An evaluation of near- and far-side occupant responses to low- to moderate-speed side impacts." SAE Technical Paper 2020-01-1218, 2020.
- Davis MS, Isaacs JL, Graber MA, Fisher JL. "Thoracic spine extension injuries in occupants with pre-existing conditions during rear end collisions." SAE Technical Paper 2019-01-1222, 2019.
- Scanlon JM, Isaacs JL, Garman CMR. "Head and neck loading conditions over a decade of IIHS rear impact seat testing." SAE Technical Paper 2019-01-1227, 2019.
- Sharabi M, Benayahu D, Benayahu Y, Isaacs JL, Haj-Ali R. "Laminated collagen-fiber bio-composites for soft-tissue bio-mimetics." Composites Science and Technology, 2015; 117:268-276.
- Isaacs JL, Vresilovic E, Sarkar S, Marcolongo M. "Role of biomolecules on annulus fibrosus mechanics: Effect of enzymatic digestion on micromechanics." Journal of the Mechanical Behavior of Biomedical Materials, 2014; 40:75-84.
- Cannella M, Isaacs JL, Allen S, Orana A, Vresilovic E, Marcolongo M. Nucleus Implantation: "The biomechanics of augmentation versus replacement with varying degrees of nucleotomy." Journal of Biomechanical Engineering, 2014; 136(5).
- Isaacs JL. "Micromechanics of the annulus fibrosus: Role of biomolecules in mechanical function." Doctoral Dissertation, Drexel University, 2012.

INVITED TALKS

- "The Automated Vehicle User Experience." Panel Discussion, FISITA World Congress, Barcelona, Spain, June 5, 2025.
- "How my Career ended up in Failure." ASME FutureME Presentation, International Mechanical Engineering Congress & Exposition (IMECE), Pittsburgh, PA, November 11, 2018.

MEDIA APPEARANCES

- "Noggins, Nucleotides, and Nuclear Fusion," Mission Unstoppable with Miranda Cosgrove (Season 7, Episode 14), CBS, February 21, 2026.

SELECTED PRESENTATIONS AND PUBLISHED ABSTRACTS

- Isaacs JL, Mortensen J, O'Brien K, Imler S. "Wearable Devices can Detect Differences in Alpine Ski Ability." Podium Presentation, International Society of Snowsports Safety (ISSS) / Société Internationale de Traumatologie et de Médecine des Sports d'Hiver (SITEMSH) Congress, Kranjska Gora, Slovenia, March 10-16, 2024.
- Isaacs JL, Toney Bolger ME, Campbell IC. "Cervical spine loading during asymmetrical non-injurious physical activities." Podium Presentation, XXVII Congress of the International Society of Biomechanics (ISB) /43rd Annual Meeting of the American Society of Biomechanics (ASB), Calgary, Canada, July 31 - August 4, 2019.
- Davis MS, Isaacs JL, Graber MA, Fisher JL. "Thoracic spine extension injuries in occupants with pre existing conditions during rear-end collisions." Podium Presentation, IMECE, Pittsburgh, PA, November 11-15, 2018.
- Isaacs JL, Bellezza A, Brown, V. "Sports concept design: An entrepreneurial co- and extra-curricular activity." Podium Presentation, Spring 2015 Mid-Atlantic American Society for Engineering Education (ASEE) Conference, Villanova, PA, April 2015.
- Isaacs JL, Binetti V, Lowman A, Marcolongo MS. "Testing methods for evaluation of injectable nucleus replacement." Podium Presentation, Philadelphia Spine Research Symposium, Philadelphia, PA, October 2014.
- Isaacs JL, Vresilovic E, Marcolongo MS. "Role of biomolecules on cross-ply mechanics of annulus fibrosus." Podium Presentation, Society for Biomaterials Meeting (SFB), Orlando FL, April 2011. STAR (Student Travel Award Recognition) Honorable Mention
- Isaacs JL, Vresilovic E, Marcolongo MS. "Micromechanical characterization of Annulus Fibrosus Lamellar." Poster Presentation, SFB, Orlando, FL, April 2011.

SELECTED POSTER PRESENTATIONS

- Mattucci M, Jendrus J, Angelucci M, Neidert J, Mauger J, Isaacs JL. "Posterior vertebral fixation: Screw-to-screw cross-connection concept investigation." Poster Presentation, Biomedical Engineering Society (BMES) 2015 Annual Meeting, Tampa, FL, October 7-10, 2015.
- Isaacs JL, Binetti V, Lowman A, Marcolongo MS. "Test methodology of characterizing the behavior of injectable hydrogels: An in vitro model." Poster Presentation, SFB, Charlotte, NC, April 2015.
- Isaacs JL, Vresilovic E, Marcolongo MS. "Role of macromolecules on micromechanics of the annulus fibrosus." Poster Presentation, Orthopedic Research Society Meeting (ORS), San Francisco, CA, February 2012.
- Isaacs JL, Vresilovic E, Marcolongo MS. "What role does macromolecules play in annular mechanics?" Poster Presentation, Philadelphia Spine Research Society International Meeting, Philadelphia, PA, December 2011. Best Poster Award: Biomechanics and Imaging.
- Isaacs JL, Vresilovic E, Marcolongo MS. "Role of biomolecules on circumferential mechanics of the annulus fibrosus." Poster and Podium Presentations, International Society for the Study of the Lumbar Spine Meeting (ISSLS), Gothenburg, Sweden, June 2011. Distinguished Poster Award.
- Isaacs JL, Vresilovic E, Marcolongo MS. "Enzymatic digestion effects on mechanics of radial annulus fibrosus samples." Poster Presentation, ORS, Long Beach, CA, January 2011.
- Isaacs JL, Bonfiglio D, Gidvani S, Vresilovic E, Marcolongo MS. "Effect of enzymatic digestion on mechanics of in-plane annulus fibrosus lamellae." Poster Presentation, ORS, New Orleans, LA, March 2010.
- Isaacs JL, Gidvani S, Sarkar S, Bonfiglio D, Vresilovic E, Doehring T, Marcolongo MS. "The role of macromolecular components in the micromechanics of the annulus fibrosus." Poster Presentation, SFB, San Antonio, TX, April 2009.
- Isaacs JL, Gidvani S, Sarkar S, Bonfiglio D, Vresilovic E, Doehring T, Marcolongo MS. "Toward a model of intervertebral disc herniation using normal and degenerative failure criteria based on annulus fibrosus laminar micromechanics." Poster Presentation, Philadelphia Spine Research Symposium, Philadelphia, PA, November 2008.