UNIVERSITY OF ALBERTA

DEPARTMENT OF MECHANICAL ENGINEERING

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Research Assistant Positions Available – Dental Biomaterials and/or Orthodontic Biomechanics (towards a MSc or PhD degree)

How to Apply

Interested candidates may contact Dr. Dan Romanyk by email at **dromanyk@ualberta.ca** to discuss their qualifications and the project. To apply for this opportunity, please submit a complete application package including a cover letter detailing your specific interest in this project, resume, and transcripts as soon as possible.

The Opportunity

Dr. Romanyk of the Department of Mechanical Engineering at the University of Alberta invites applications and queries for a full-time Masters or Doctoral research assistant position in the area of *Dental Biomaterials* or *Orthodontic Biomechanics*. As a member of Dr. Romanyk's group, you will be exposed to an exciting interdisciplinary research environment focusing on the fundamental material response of an array of biomaterials and appliances. Experimental, analytical modeling, and numerical modeling approaches (e.g. FEA) are used to study materials such as cranial suture tissue, periodontal ligament tissue, dental ceramics (used for restorative crowns), and dental resin-based composite (used for cavity fillers) materials. Dr. Romanyk promotes a collaborative work environment with those in his group to foster innovative research that provides significant advancements to fundamental scientific and applied knowledge within his areas of focus.

Available Projects

Both biological and synthetic biomaterials, and their interactions, are of utmost importance in understanding the patient response to clinical interventions and performance of restorative materials. Oral appliances, namely orthodontic appliances, are of interest with respect to the loads they generate and how this alters patient response. Currently, Dr. Romanyk is primarily interested in the following areas of focus:

- Periodontal ligament is the soft tissue connecting a tooth to its surrounding bone structure and is integral in distributing applied loads within the oral environment. It also stimulates biological remodeling in response to load, as in orthodontic tooth movement. Research focuses on advanced experimental and modeling methods to understand ligament mechanics during tooth extraction and orthodontic treatment.
- Cranial sutures are soft tissue connecting bones in the skull, and are responsible for allowing growth and facilitating biological remodeling when exposed to applied loading. Research in this area is concerned with establishing the link between suture mechanical response to applied loading and the triggered biological response in surrounding bone.
- Dental restorative materials of interest are ceramics used for crowns in dental implants and and resin-based composite cavity fillers. Projects include understanding the performance of ceramic dental crowns manufactured through CAD-CAM methods and the polymerization behavior of composite filler materials.
- Orthodontic appliances apply loads directly to dental structures causing biological remodeling allowing for processes such as tooth movement. Dr. Romanyk's group utilizes world-leading laboratory equipment to measure mechanical loads applied through orthodontic appliances, namely braces and new aligner systems.

Specialized Training & Skills Development

Training of undergraduate and graduate research assistants is paramount. Depending on the project of choice, candidates will be exposed to a range of equipment training including use of an Instron E3000 electrodynamic load frame, micro-hardness tester, highly specialized orthodontic treatment simulation devices, and advanced imaging characterization methods through the nanoFAB institute. Due to the complex nature of required testing, trainees must often design and manufacture their own experimental jigs and manufacture their own samples. As a result, trainees gain valuable experience in design and manufacturing. Modeling methods often require use of tools to implement both analytical (e.g. Matlab) and numerical approaches (ANSYS, ABAQUS, etc.). Finally, the highly interdisciplinary nature of Dr. Romanyk's research exposes trainees to interactions with other engineers, biologists, and clinicians where they gain critical experience in communicating and working with a diverse team.

Required Qualifications

- Bachelors or Masters of Science (or Engineering) degree in Mechanical or Biomedical Engineering
- Willing to register in the University of Alberta's MSc or PhD Program
- Keen interest and/or experience (coursework, research, and/or industrial) in: tissue mechanics, biological tissue experimental methods, biomechanics, advanced modeling techniques, finite element analysis, and use of MATLAB are assets
- Minimum GPA of 3.3
- Proven ability to work independently
- Effective written and verbal communication skills; proficiency in English
- Open to Canadian citizens, permanent residents of Canada, and foreign students

Start Date: September 2019 (earlier start dates may be considered)