Research Aid Award

Dr. John Baker, *University at Buffalo*

My AAOF-funded project, titled Friction and Dimensional Integrity of in-House Fully Customizable 3D Printed Orthodontic Brackets, is a call back to my early hobby and competitive engineering experience. Since my early grade school years, I have been interested in expanding digital integration within my daily life. This led me to become one of the founders of Westhampton Beach FIRST Robotics Team 3171 in my freshman year of high school as the lead programmer and electrical engineer. Through hard work, and peer-based learning, the team has since grown into a northeast robotics powerhouse, going to the world championship three different years, including my senior year as captain. Following this, in my college years, I continued to mentor the team and develop my own projects with the likes of Arduino and other microcontrollers. My engineering foundation has shaped my world-view, and I am happy to bring my talents to orthodontics.

This project will determine the frictional properties and dimensional integrity of in-house fully-customizable 3-D printed brackets undergoing in-vitro sliding mechanics. The brackets will be 3D printed form Formlabs Permanent Crown Resin, a glass-filled hybrid resin printable in a typical orthodontic office with 3D printing capabilities. Although previous studies on resin materials have demonstrated their favorable frictional properties for orthodontic purposes, these materials lacked appropriate strength. To overcome this weakness of the resin materials, manufacturers have incorporated glass fillers to create hybrid resins. Overall, hybrid resins have increased the material strength but raise the question regarding the frictional properties of hybrid resins. Our research project will provide key scientific evidence to evaluate the use of hybrid resins for orthodontic purposes, such as a 3D printed bracket material by simulating the sliding orthodontic mechanics in-vitro. Should this project yield favorable results, the next step in orthodontic education would be to apply these brackets in-vivo and solidify a new era of clinician-controlled, affordable true in-house customizability while being accessible for a modern orthodontic office. I look forward to advancing digital orthodontic education through the production methods and materials knowledge gleaned from this project, inspiring clinicians toward in-house digital orthodontics.

This project would not be possible without the support of the AAO Foundation. Through the research aid award, the AAO Foundation is committed to helping champion a new generation of orthodontics, where ability to provide individualized orthodontic treatment and patient-centered care are considered paramount. My vision for orthodontics is to enable the clinician to have full control over digital design, manufacture, and utilization of their own appliances in-house for best possible clinical outcomes and experiences. The AAOF foundation's support has provided a foundation for me to carry out this vision.