Annals of Biomedical Engineering 2019 Year in Review

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The Annals of Biomedical Engineering (ABME) went into publication in 1972 as the first official journal of the Biomedical Engineering Society. The journal has grown substantially since then, receiving 1207 submissions in 2019 (Fig. 1). In just the last 2 years, submissions have increased by nearly 30%. As a result of increased submissions, the rejection rate has also increased to around 80%. ABME accepted 228 papers in 2019, and published 185 in monthly issues. The monthly issues included two special issues on topics with growing interest in the biomedical engineering field. The number of international submissions has continued to grow as well, with submissions from 58 countries last year (Fig. 2). The US is still the largest contributor in terms of submissions, accounting for 24% of the total in 2019, followed by China (18%) and India (7%).

Review papers published in ABME represent areas of high interest in the field of biomedical engineering. Notable reviews from 2019 are summarized here. These reviews highlight the breadth of topics published in ABME, which include tissue engineering, medical devices and therapies, and medical robotics. Moore and West reviewed the roles of macrophages in vascularization of tissue engineered constructs.⁷ They explored different ways that the cells can be manipulated to promote neovascularization and support engineered tissues after they are implanted. Post *et al.* reviewed endothelial cell regulation of hemostasis, and how this regulation can be influenced by components of the underlying extracellular matrix.⁸ They then summarized how researchers have attempted to achieve thromboresistance in blood-contacting devices by mimicking extracellular matrix properties in device design. Aljghami *et al.* provided an overview of recently developed wound dressings that incorporate tissue engineering, new biomaterials, and stem cell biology to play a more active role in wound healing.¹ Andreozzi *et al.* summarized the development and

modification of bioheat models applied to hyperthermia treatments of cancer.² Heat transfer within tissues is complicated by a number of factors including tissue perfusion, heat generation from metabolism, and tissue properties, so accurate models are needed to predict temperature distributions during treatment protocols. Kulkarni *et al.* reviewed recently developed robotic needle guide systems.⁶ Most systems have some form of imaging guidance, and are used for percutaneous interventions such as biopsies or cancer treatments like radio frequency ablation or cryoablation.

Two special issues were published in ABME in 2019. The articles summarized here demonstrate the scope of each issue. The first issue was comprised of papers on computational models of traumatic brain injury. Giudice *et al.* reviewed and compared the different computational techniques used in 16 different finite element brain models.³ These models are often used to predict if brain injury will occur during a head impact, but there is not one universally accepted model that is used. The authors performed a parametric study varying the parameters used in different numerical methods, and found that different methods can lead to large differences in model outputs. Horstemeyer *et al.* used a mechanical brain damage framework to model abnormal tau accumulation seen in deceased football players with chronic traumatic encephalopathy.⁵ The framework is proposed as the foundation for a multi-scale brain injury model that combines biology and mechanics. Harris *et al.* reviewed studies on cerebral atrophy after traumatic brain injury to determine if any predictable patterns could be distinguished.⁴ While no pattern was seen with available data from mild traumatic brain injury cases, moderate to severe injury did follow a pattern that the authors were able to model and match with clinical observations.

The second 2019 special issue included research supported through the Grand Alliance Concussion Assessment, Research, and Education Consortium, which is funded by the National Collegiate Athletic Association and the Department of Defense. Stemper *et al.* evaluated the change in head impact exposure in

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FIGURE 1. Total number of articles submitted per year (left) and proportion of articles accepted and rejected per year (right). Not all papers submitted in 1 year receive a decision in the same year, so the total number of articles do not match exactly.

FIGURE 2. World map highlighting all countries that contributed submissions to ABME during 2019.

collegiate football players after two-a-day practices were eliminated from the preseason schedule.¹⁰ Although two-a-day practices were eliminated, the number of preseason contact days increased, resulting in an increased preseason head impact burden. The practice change was meant to decrease repetitive head impact exposure to reduce the risk of concussion for players, but instead increased exposure. This study highlights the importance of making data-driven decisions when considering ways to reduce concussion risk for athletes. Rich *et al.* developed an instrumented mouthpiece for measurement of head impact kinematics in athletes.⁹ The mouthpiece was validated in

the laboratory, showing strong correlations between the mouthpiece and laboratory-grade instrumentation in an impacted headform. The mouthpiece was then deployed in female youth soccer players to assess feasibility. The results of the study show promise for use of the custom mouthpiece in both helmeted and non-helmeted sports.

With the recent growth of ABME, more impactful papers were submitted and published in 2019. We thank our authors for submitting their important work, and our reviewers for volunteering their time and insight to refine the papers published. The journal

would not be possible without these valuable contributions.

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