Annals of Biomedical Engineering 2018 Year in Review

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The Annals of Biomedical Engineering (ABME) has grown substantially since the first issue was published in September of 1972 as the first official journal of the Biomedical Engineering Society. In the first few years of publication, the journal received around 50 submissions per year and published approximately half of them. In 2018, ABME received 1169 submissions, which is the most received in a single year to date (Fig. 1). As a result of increased submissions, the rejection rate has also increased to over 80%. The Annals accepted 212 papers in 2018, and published 182 in monthly issues. The number of international submissions has continued to grow as well, with submissions from 57 countries last year (Fig. 2). The US is still the largest contributor in terms of submissions, accounting for 26% of the total in 2018, followed by China (14%) and India (6%).

Impact factor is a metric used to summarize the importance of a journal by averaging the number of citations per published items. Journal impact factors are generated on a yearly basis, and consider the number of citations that year to items published in the journal in the previous 2 years. For example, the 2018 impact factor for ABME would be calculated by dividing the total number of citations in 2018 to ABME papers published in 2016 and 2017 by the number of papers published in ABME in 2016 and 2017. The 2018 impact factor for ABME was 3.474, which is the highest it has ever been, and ranks 20 out of 80 biomedical engineering journals.

ABME has a broad biomedical engineering readership, which is reflected by the variety of topics published in the journal. Certain topics tend to have more submissions and therefore more papers are published in those areas. The top classifications selected by authors are shown in Fig. 3. There is overlap between these topics as well, for example an author could select both biomechanics and cardiovascular system depending on the scope of the paper. The top 10 papers published in ABME in 2018 based on citations and downloads are summarized below, which cover these

most frequently published areas as well as other important topics in biomedical engineering.

The top papers in biomechanics had a broad range of focus including prosthetic design, biofluid mechanics, heart valve annular dynamics, and cell mechanics. Thesleff *et al.* reviewed different designs and challenges associated with percutaneous bone-anchored limb prostheses.⁹ These implants must be mechanically stable long term in spite of constant stresses placed on the system by the limb, and provide a barrier to infection from the external environment. Wiegmann *et al.* evaluated the effects of varying different design parameters in a centrifugal blood pump for a ventricular assist device (VAD) on hemodynamics and hydraulic performance.¹⁰ They found that certain design parameters were associated with potentially damaging shear stress conditions, and should be considered in VAD design to reduce adverse events. Rausch *et al.* used an ovine model to study the dynamics of a normal tricuspid annulus during the cardiac cycle.⁷ A better understanding of the relationship between valvular shape and function could help improve treatment of functional tricuspid regurgitation. Kalli *et al.* evaluated the effects of compressive forces on fibroblast proliferation and pancreatic cancer cell migration.⁵ These forces are generated in pancreatic tumors by excessive extracellular matrix production and cancer cell proliferation. Their results showed that compressive stress induces fibroblast activation and promotes cancer cell migration.

Studies involving therapeutic devices included a new thrombolytic protocol and a rehabilitation robot. Dixon *et al.* compared different microbubble formulations for use with sonothrombolysis protocols.⁴ These therapeutic protocols are used to enhance clot dissolution in patients. They found that microbubbles larger than those currently commercially available greatly increased thrombolysis rates and may further enhance current therapeutic approaches. Chang *et al.* developed a semi-passive rehabilitation robot for use in treatment of patients with neurologic or orthopedic

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 2018.

FIGURE 3. Top classifications selected by authors for papers published in ABME in 2018.

disorders.³ The robot showed potential as a low-cost therapeutic tool for upper-extremity rehabilitation.

Under the category of biomedical instrumentation, Ross *et al.* evaluated the feasibility of a closed-loop device for bladder control in a feline model.⁸ The device has a number of benefits for patients suffering from loss of bladder control compared with current open-loop stimulation devices by providing direct feedback on the bladder state. The closed-loop device showed promise in this study but requires additional feasibility studies over a longer period of time.

ABME had an increased number of submissions in biorobotics in 2018 because of a special issue published in October on the topic. Alambeigi *et al.* proposed a novel semi-autonomous technique for cryoablation of small kidney tumors.² In this technique, the clinician performs accurate needle insertion into the lesion, while the robotic system manipulates the tissue for accurate placement of the needle. The technique was evaluated with experiments on an *ex vivo* lamb kidney, which demonstrated the ability of the system to estimate real-time tissue deformation.

Tissue engineering continues to be a growing area of interest within biomedical engineering, making it another highly published category. Ahola *et al.* presented a new protocol for simultaneously measuring contraction and calcium transients in stem cell derived cardiomyocytes.¹ The protocol used a combination of video-based motion measurements and fluorescent dyes for calcium measurements. This technique could be used to improve the current understanding of electromechanical coupling of cardiomyocytes for elucidating disease mechanisms and developing new therapeutic approaches.

Biomaterials is another rapidly growing area in biomedical engineering that has gained a lot of recent interest. Although it was not one of the most frequently published topics in ABME in 2018, the papers that were published ranked highly in terms of citations and downloads. Manuchehrabadi *et al.* developed a new method for rewarming vitrified biomaterials.⁶ Materials to be used for tissue transplantation can be preserved in a vitrified state, but warming them for use while maintaining cell viability can be challenging. This new method uses inductive warming with commercially available metals, and was used to successfully rewarm a vitrified carotid artery while maintaining high viability.

As ABME continues to grow, more impactful papers are submitted and published. 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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BETHANY ROWSON

Department of Biomedical Engineering and Mechanics,
Virginia Tech, Blacksburg, USA
Electronic mail: browson@vt.edu

STEFAN M. DUMA

Department of Biomedical Engineering and Mechanics,
Virginia Tech, Blacksburg, USA

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