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## EDITORIAL

# MEMS in biology and medicine

**Guest Editors**

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Stimulating—the first word that springs to mind regarding the emerging and expanding role of MEMS in biological inquiry. When invited to guest-edit this special issue on 'MEMS in biology and medicine' for JMM, we jumped at the opportunity. Partly owing to the breadth of the stimulating research in this nascent area and partly owing to the stimulating of biological function made possible with MEMS accessible length and time scales, we were eager to assemble manuscripts detailing some of the most cutting edge biological research being conducted around the globe.

In addition to cutting edge engineering, this special issue features challenging biological questions addressed with innovative MEMS technologies. Topics span from Yetisen and colleagues' inquiry into quantifying pollen tube behaviour in response to pistil tissues [1] to Morimoto and colleagues' engineering efforts to produce monodisperse droplets capable of encapsulating single cells (without surface modification) [2]. Questions are bold, including a means to achieve therapeutically-relevant scaling for enrichment of leukocytes from blood (Inglis *et al* [3]), assessing the dependence of *Escherichia coli* biofilm formation on bacterial signalling (Meyer *et al* [4]), and elucidation of adhesion dynamics of circulating tumour cells (Cheung *et al* [5]) among others. Technologies are diverse, including microfabricated magnetic actuators (Lee *et al* [6]), stimuli-responsive polymer nanocomposites (Hess *et al* [7]), and SU-8 electrothermal microgrippers (Chu *et al* [8]) to name but a few. Contributing authors do indeed span a large swathe of the globe, with contributions from Australia, Italy, China, Canada, Denmark, Japan, the USA and numerous other locations. Collaboration finds a home here—with researchers from macromolecular science and electrical engineering collaborating with the Veterans Affairs Medical Center or neurosurgery researchers working with biological and electrical engineers.

The questions posed by this generation of MEMS researchers encapsulate the mission of JMM to 'cover all aspects of microelectromechanical systems, devices and structures as well as micromechanics, microengineering and microfabrication' as the physics and chemical processes under study match the scales of the MEMS technologies now possible. As evidenced by the articles assembled in this issue, the combined maturation of both our biological model systems and our tools is driving a new paradigm in the formulation of biological hypotheses. The intersection of MEMS with cell biology is evidenced in reviews of both methods for applying microscale forces in biological environments by Zheng and Zhang [9] as well as the manipulation of biology through mechanical interactions by Rajagopalan and Saif [10]. Additionally, the potential for microfluidic platforms to miniaturize and improve for a diverse set of biological measurements and assays for medical diagnostics is further reviewed by Tentori and Herr [11]. We hope that you find, as we do, this special issue to be 'essential reading for all MEMS researchers' and perhaps even of technical interest to your life sciences colleagues.

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