Editorial

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The publication of the first issue of 2016 of *Engineering and Computational Mechanics (EACM)* provides me with an opportunity on behalf of the Editorial Panel not only to send New Year best wishes to our readership but also to look forward with anticipation to further growth of the journal. The increasing success of the journal is evident in many ways, not least by the sustained high quality of the articles that are being received and the recognition that has been gained by the best examples of the published papers. It is worth recalling that, in its short history (8 years), the journal has published papers that have twice won the ICE's annual Thomas Telford Gold medal for the best paper of the year; for Vardy (2008) and Giannakopoulos *et al.* (2013). The range and novelty of the papers in *EACM* continue to increase, reinforcing the underlying philosophy of the journal to publish new work from across a full range of mechanics problems relevant to civil engineering research and practice.

The primary aim of the journal remains to be to attract outstanding, novel and timely articles from academic researchers and engineering practitioners, particularly where both communities are represented in the authorship. To this end, as well as providing a home for high-quality new work in the fields of engineering and computational mechanics, the journal is promoting state-of-the-art overviews of key topics from established figures (see, for example, the overview of fluid-solid interaction by Kara *et al.* (2015)). In addition, an increasing emphasis will be placed on so-called 'themed issues' that bring together related articles within a novel, timely or developing area of research and/or practice, defined and curated by members of the Editorial Panel and senior experts in the field. Recent examples are the themed issues on *Tsunami Modelling* in 2014 and *Direct Methods* (Parts 1 and 2) in 2015; a practitioner-led, themed issue on *Offshore Wind* is scheduled for publication in late 2016. Readers are encouraged strongly to submit proposals for new themed issues to the Editorial Panel, for further consideration. In this regard, the journal is also very anxious to receive briefing papers – short contributions that are offered a rapid publication route to provide topical updates on recent work and/or to stimulate debate within the ICE community.

The present issue illustrates the extreme range of topics falling within the remit of the journal, with contributions from the fields of dynamical systems (in this case, flow in

thermosyphons) and mechanical vibrations in plates resting on elastic foundations. Both papers utilise advanced mathematical analysis to determine the dynamical behaviour of fluid systems and material composites respectively.

For practically all engineering problems nonlinear effects can seldom be neglected; for many cases they dominate and, indeed, control performance. This is true in either a solid or fluid mechanics context, and to analyse such problems a dynamical systems approach may be required. The classical text by Hayashi (1964) on nonlinear oscillations in physical systems outlines the basic principles involved in analysing generic systems in which (i) the dramatic consequences of nonlinear behaviour are described and (ii) the implications for natural systems of engineering relevance are outlined. The paper by Bahrami *et al.* (2016) illustrates well these principles. The focus of the study is the behaviour of thermosyphons – devices that are usually associated currently with renewable energy applications (solar collectors, heat pumps, etc.) but which have applications to geological systems and nuclear engineering. The authors are concerned with extending the analysis of Lundberg *et al.* (2009) for flow of water by thermosiphon action between two reservoirs held at different temperatures, operating over a temperature range centred at 4°C (the temperature at which water has its maximum density and around which the density has a parabolic dependence on temperature). The dynamical systems approach that was adopted reveals the existence of oscillatory behaviour, with such behaviour being described by solutions to the differential equations in phase plane space in terms of appropriate limit cycles. The extension to the theory described in Bahrami *et al.* (2016) is necessary in order to overcome the restrictions of the existing theory to very small vessel-volume ratio and is accomplished by invoking successfully a Mandelstam condition (see, for example, Maeda, 2004) that conserves the total heat content of the system during the rapid phases of the oscillation. The authors demonstrate that this approach leads to a solution that describes thermosiphon behaviour in heat exchange systems in which differences in vessel volumes are relatively small.

The paper by Pradhan and Chakraverty (2016) presents a detailed analysis of the free vibration eigenfrequencies of a thin Levy plate – a rectangular plate with two opposite edges hard-simply supported and the remaining two edges arbitrarily

supported – and the influence on these frequencies of (i) the aspect ratio of the plate, (ii) the compositional structure of the plate and (iii) the elastic properties of the foundations upon which the plate rests. The plate itself is composed of functionally graded materials that have constituents whose material properties vary continuously along the thickness direction and an energy method (Rayleigh–Ritz) suited to the calculation of natural frequencies and modal structures of continuous systems is used. The free vibration characteristics of the Levy plate are analysed for six different sets of boundary conditions and the individual roles of plate geometry and structure and elastic foundation properties are demonstrated.

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