Editorial

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Not many engineering journals open with a paper by a historian. This issue of *Engineering and Computational Mechanics* does just that, with a fascinating paper by historian of science Allan Chapman on the work of Robert Hooke (Chapman, 2011). With a foreword by Alistair Borthwick, the paper is an insightful and authoritative account of Hooke's work in the seventeenth century, when Hooke and others were at the forefront of the new philosophy of promoting knowledge of the natural and physical world through observation and experiment. Put another way, at this time Hooke and his peers were at the origin of (engineering) science itself. Chapman gives a wonderful account of Hooke's engagement with the 'revolution in perception' afforded by the microscope, enabling Hooke to see mechanisms at work in nature that must have inspired his work in mechanics and mechanical invention. The paper provides an account of Hooke's work on the vacuum pump, barometer, weather clock and spring balance – all drawing their inspiration from his abiding concern with motion and elasticity – and of his civil engineering work with Wren following the Great Fire of London in 1666. Chapman does much more than merely catalogue some of Hooke's main inventions and achievements. He brings a history-of-science perspective, which captures the truly revolutionary nature of Hooke's work and conveys the vital connection between the fundamental, philosophical enquiry of the day and the associated scientific breakthroughs and inventions.

The other three papers in this issue all relate to fluid mechanics, an area of engineering science not immediately associated with Hooke (although Chapman suggests that Hooke's work on barometric pressure might be seen as initiating the scientific study of fluid mechanics). Laaneu *et al.* (2011) consider the interaction between fresh water river flow and saline marine water at the mouth of a river. Their particular interest lies in the bi-directional flow that occurs under certain conditions of river discharge and marine water level, whereby the dense saline marine water intrudes into the river mouth, flowing in the lower part of the water column against the direction of the less dense, fresh river water flowing in the upper water column. The authors use internal hydraulic theory, extended to include energy losses, to calculate the primary flow properties of the bi-directional flow, and they compare predictions based on the theory with archived measurements for the Parnu River entering Parnu Bay in the Baltic Sea. The authors show satisfactory agreement between measured and predicted stratified bi-directional fluxes and depth of interface between the different density waters, and conclude that the theory can be applied quite generally to the hydraulics of river-estuary interaction.

The detailed fluid mechanics of a river flow on its own, without interaction with marine waters, is the topic of the third paper in

this issue. Barrett *et al.* (2011) apply the commercially-available shallow water numerical modelling code Delft3D to simulate flow in a reach of the River Blackwater, UK. The reach comprises a curved, compound channel, giving rise to large-scale flow structures and secondary currents. The authors are primarily interested to investigate the merits or otherwise of a depth-averaged, three-dimensional (3D) model versus a fully 3D model, and of various options for turbulence closure. Predicted velocities and flow patterns are compared with detailed measurements from a previous hydraulic model study of the same river reach. The main conclusion is that the 3D model offers significant advantages over the 2D model for curved channels of this kind. Choice of turbulence closure is far less critical, and the 3D model appears to capture the complexity of flow in the curved channel reasonably well overall.

The fourth paper in this issue by Lipecki and Flaga (2011) considers the fluid–structure interaction problem of vortex-induced excitation of steel chimneys. The authors use a semi-empirical model for the vortex excitation, combined with the equations of motion for the structure, to determine the time-history of vortex-induced load and chimney displacement. Arguably, there is more of Hooke here than in the previous two papers, given the force–stiffness–displacement concepts inherent in calculating the chimney motion. A primary concern of the authors is the effect of corrosion on chimney response. For a range of steel chimneys with different height, diameter and (nominal) wall thickness, they show the potentially large increase in maximum chimney top displacement caused by corrosion of up to 4 mm thickness. Given this increase, the authors plea for better knowledge of corrosion in steel chimneys.

Engineering and Computational Mechanics reports work that is concerned with better understanding of mechanics; papers in this issue focus on the mechanics of river–sea interaction, river flow and steel chimney motions in wind. Understanding the mechanics is, however, not an end in itself, but is pre-requisite to the ultimate goal of better design of structures and systems for the benefit of society, or, to use the parlance of Hooke's time, better design for 'the Relief of Man's Estate'.

This issue of *Engineering and Computational Mechanics* also contains two book reviews, the first a review of *Ageing of Composites*, edited by R. Martin, the second a review of S. Tavoularis' *Measurement of Fluid Mechanics*.

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