

# **Large Scale Particle Modelling of Industrial and Biophysical Applications**

**P.W. Cleary, S.M. Harrison, M.D. Sinnott, S.J. Cummins, G.W. Delaney, R. Cohen**

## **ABSTRACT**

Particle modelling and particle scale modelling provides advantages for prediction of flows involving particulates, splashing free surface flows, multiphase mixtures of fluid and particulates, complex material structures particularly undergoing phase changes, fracture or large scale deformation. Realistic industrial and biophysical applications require resolution of relatively small scales that are responsible for the emergent behavior of these systems at the engineering or human body scale. Biophysical systems involving humans interacting with solids and fluids also require coupling to advanced biomechanical models. This talk will use case studies in four application areas to showcase leading edge usage of these methods. The areas to be presented are

1. Comminution and screening
2. Additive manufacturing
3. Food breakdown and transport in the gastrointestinal tract including in-mouth
4. Elite human water based sports

Emerging trends in hybrid multi-method approaches and multiscale methods will also be discussed.