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**Wolfson Department of Chemical Engineering Seminar**

**Wednesday - March 3, 2021 at 13:30**

**Zoom Seminar ID:** [**https://technion.zoom.us/j/95965660387**](https://technion.zoom.us/j/95965660387)

**“Turbulent Bubbly Flow Modelling and Visualization”**

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Multiphase flows, particularly bubbly flows in the current context, are ubiquitous in nature and engineering applications. Examples in nature are air bubbles in the upper ocean and vapor bubbles in geysers. Examples in engineering applications are bubble column reactors in the chemical or pharmaceutical industry as well as food processing, and water vapor bubbles in nuclear reactor cooling systems or those created by cavitation in the wakes of ship propellers. Accurate knowledge and fundamental understanding of the complex physical phenomena underlying these turbulent bubbly flows is a necessity to aid design and optimization of chemical engineering applications.

For such systems with large separation of length scales, a multiscale modelling approach is a very useful tool. The principle of this approach is to use small scale fully resolved simulations to derive closures for description of the effective interactions in larger scale models. In the context of this multiscale approach, I will introduce and describe the Euler-Lagrange framework for bubbly flows, where each individual bubble is tracked. A particular focus will be paid on bubble coalescence and breakup models, which enable investigation of complex phenomena in turbulent bubbly flows.

Because a computer model has no value without experimental input and validation, I will also talk about some start-of-the-art non-invasive measurement techniques. High speed camera imaging has proven to be a valuable tool to visualize and extract bubble properties. However, imaging is limited due to the opaqueness and optical accessibility to the bulk of turbulent bubbly flows. Advanced experimental techniques such as ultrafast X-ray tomography, are therefore a better choice. Using this technique, plane measurements can be obtained to assemble a 3-dimensional matrix with two spatial and one temporal resolution. Using the reconstructed data, bubble dynamics can be characterized by volume fraction, size and velocity.

Finally, I will shed some light on one of the research topics of my proposed research theme “*flows laden with particles, droplets and bubbles*”. Following the topic of bubbly flows, I will discuss the bubbly flow encountered in electrochemical conversion of hydrogen. At the end of this talk, I will describe my teaching method and vision.