

## **Modelling the Micromechanics of Polycrystalline Materials Workshop**

Location: James Watt (South) Building, School of Engineering, University of Glasgow  
Dates: 7th-8th April 2016

### **Overview**

Finite element-based models form the core of a powerful set of tools for simulating the mechanical behaviors of polycrystalline solids. With these tools it is possible to study fundamental aspects of deformation mechanics at a microstructural scale and to better understand the roles of such factors as anisotropy, deformation heterogeneity, and grain interactions in determining the properties of polycrystalline solids. However, like many of the more intensive research tools, finite element-based tools are complex and require considerable investment of time and resources to fully exploit their potential. The goal of this workshop is to rapidly introduce researchers to one code, FEpX, and a number of auxiliary tools that constitute a complete capability for modeling polycrystalline solids.

The workshop is intended primarily for young researchers, such as graduate students and post-doctoral associates, who would like to incorporate finite element modeling in their own projects, whether as the main focus of the research or as a complement to experiments. Several lectures will summarize underpinnings of the tools, including the aspects of crystal plasticity, the finite element framework, and instantiation of virtual polycrystals. As the workshop takes very practical approach, however, much the time is devoted to a hands-on experience with the tools. We start by covering how to instantiate a virtual polycrystal with a finite element mesh using Neper and to specify the other input data required to define an application completely. Attendees will then execute FEpX on a computing cluster at the University of Glasgow for virtual polycrystals they instantiate during the workshop. We complete the introduction with instructions on how to post-process the results with commonly available visualization tools.

### **FEpX**

<http://arxiv.org/abs/1504.03296>

### **Neper**

<http://neper.sourceforge.net/>

### **Sponsored by**



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## **Workshop Schedule**

### **Workshop Day 1**

**Thursday 7<sup>th</sup> April 2016**

- 09:00        Registration
- 09:30        Workshop Introduction  
*Dr Euan Wielewski, University of Glasgow*
- 09:50        An introduction to the crystal plasticity finite element method using FEpX  
*Prof. Paul Dawson, Cornell University*
- 10:30        Tea / Coffee Break
- 11:00        Instantiating virtual polycrystals using Neper  
*Dr Romain Quey, Ecole des Mines de Saint-Etienne*
- 11:40        Using FEpX and Neper to study the micromechanics of Ti-6Al-4V  
*Prof. Paul Dawson, Cornell University*
- 12:30        Lunch
- 14:00        FEpX and Neper Simulation School  
*Matthew Kasemer, Cornell University*
- 17:00        End of Day 1
- 19:00        Workshop Dinner

### **Workshop Day 2**

**Friday 8<sup>th</sup> April 2016**

- 09:00        FEpX and Neper Simulation School  
*Matthew Kasemer, Cornell University*
- 10:30        Tea / Coffee Break
- 11:00        FEpX and Neper Simulation School  
*Matthew Kasemer, Cornell University*
- 12:30        Lunch
- 14:00        Calculations over orientation space using the MATLAB toolbox, ODFPF  
*Prof. Paul Dawson, Cornell University*
- 15:00        End of Workshop