



# SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS935

23 April 2018

A DCAMM seminar No. 724 will be presented by

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**Department of Continuum Mechanics and Structural Analysis**  
**University Carlos III of Madrid, Spain**

The title of the lecture is

**A general overview on multiple necking and fragmentation problems  
in ductile solids subjected to high strain rates**

**Abstract:**

Understanding the fragmentation of ductile solids and structures subjected to high velocity impacts or blast loadings has importance in aerospace industry, military applications, civil engineering and geophysical applications. Meteoric cratering, explosive behaviour of projectiles or orbital debris impact on spacecraft structures are examples of events subjected to strain rates within the range  $>10^4 \text{ s}^{-1}$ . From the early studies in this area – dating in the late 18<sup>th</sup> century – to the present time, an intense debate on the causes which reside behind the fragmentation of ductile solids has been carried out. In this seminar we will discuss canonical problems of rings (bars) and cylinders (plates) subjected to dynamic radial expansion. The principal advantage of the rapidly expanding ring and cylinder tests is that, due to the symmetry of the problems, the effects of wave propagation are nearly eliminated before flow localization occurs in the form of multiple necks which ultimately lead to the fragmentation of the sample.

Within this framework, we have developed a combined analytical / numerical methodology based on linear stability analyses and finite element calculations that provides new insights into the critical factors that control the processes of multiple necking and fragmentation. Our results suggest that the combination of inertia and stress multiaxiality effects inside a necked section lead to the promotion of a finite number of wavelengths that, at sufficiently high strain rates, determine/control, at least up to some extent, the neck spacing and fragments size. These results argue for the inclusion of a deterministic component within the fragmentation mechanisms and thus complement/enrich the statistical fragmentation theory developed by Mott in the 40s.

DATE:	<b>Thursday, 3 May 2018</b>
TIME:	<b>13:00 – 14:00 incl. questions</b>
PLACE:	<b>Room 025, Building 414</b> DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen

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