Colloquium 566 Anisotropic Particles in Turbulence
(jointly with the final conference of COST Action FP1005 Fibre Suspension Flow Modelling – A key for innovation and competitiveness in the pulp & paper industry)

The 566th Euromech Colloquium on "*Anisotropic Particles in Turbulence*" was organized by Prof. H.I. Andersson (Norwegian University of Science and Technology - NTNU, Norway) and Prof. A. Soldati (University of Udine, Italy) and took place at NTNU in Trondheim 10 – 12 June 2015. The Colloquium was in many ways a follow-up of the earlier EUROMECH Colloquium no 513 on "*Dynamics of non-spherical particles in fluid turbulence*" held at CISM (The International Centre for Mechanical Sciences) in Udine in April 2011 and reflected in the special issue of Acta Mechanica devoted to "*Anisotropic Particles in Turbulence: Status and Outlook*" (issue no 10, vol. 224, pp. 2219-2449, 2013).
Dilute or dense suspensions of anisotropic (i.e. non-spherical) particles are encountered almost everywhere; e.g. aerosols in the atmosphere, microorganisms in the ocean, sediments in coastal areas and fiords, and wood fibers in the pulp and paper industry. The Colloquium included both studies and modelling of the behaviour of anistropic particles in turbulent flow fields.
The anisotropic particles were often plate-like (e.g. flakes) or rod-like (e.g. fibers) or particle agglomerates.
Altogether 33 persons took part in the Colloquium and 29 talks were given during the two and half days dealing with numerical simulations, theoretical modelling and experimental studies of non-spherical particles in fluid turbulence. The vast majority of the participants came from European institutions, but talks were also given by scientists from Israel, United States and South Korea. Five invited keynote lectures introduced some of the technical sessions (listed alphabetically):

- Eric Clément, Université Pierre et Marie Curie (Paris, FR): "*Bacteria in flow*"
- Fredrik Lundell, Royal Institute of Technology (Stockholm, SE): "*Fibres and fibrils in shear and extension: inertia vs diffusion*"
- Pier Luca Maffettone, University of Napoli "Federico II" (Naples, IT): "*Dynamics and rheology of a dilute viscoelastic*
- *suspension of spheroids in an unbounded shear flow"* Bernhard Mehlig, University of Gothenburg (Gothenburg, SE): "*Effect of weak fluid inertia upon Jeffery orbits*"
- Greg Voth, Wesleyan University (Middletown, USA): "*Measurements of rotation and alignment of fibers, spheres and disks in turbulent flow*"

The focus of the majority of the contributed talks was on generic aspects of particulate flows and particle dynamics, whereas others addressed particular practical aspects by means of laboratory or field measurements, mathematical modeling, or computer simulations.
In view of the challenge to measure the behaviour of anisotropic particles in fluid flow, different techniques exhibit different advantages and shortcomings. Optical techniques (PIV, PTV) are apparently the preferred choice for fundamental studies of dilute particle suspensions whereas others used magnetic resonance velocimetry or electrical tomography to categorize denser fiber suspensions.
Numerical simulations are primarily relying on the so-called pointparticle approach, which in combination with direct numerical simulations of the flow field of the carrier phase represents a reliable approach to investigations of sub-Kolmogorov particles of arbitrary shape. The pointparticle approach was employed to investigate the dispersion of fiber-like particles and rotation and orientation of disk-like and rod-like particles in channel flow turbulence. Simulations of finite-sized particles are relatively more demanding since the particles have to be resolved on the computational mesh. Approaches based on an immersed boundary method and a cut-cell method illustrated what one can achieve.
The point-particle approach uses analytically derived expressions for the force and torques on a single anisotropic particle and these expressions were challenged by CFD analysis of flow around single cylindrical particles and prolate spheroids. A strategy to handle irregularly shaped particles utilized data both from experiments and simulations. Some studies were concerned with the rotational dynamics of single spheroidal particles in simplified settings, like, for instance, a uniform shear flow.
Clustering of particles, agglomeration of particles, and break-up of aggregates are complex phenomena of practical importance, as are particle sedimentation, i.e deposition and re-suspension of solid particles. Particleladen and polymer-laden fluid suspensions may exhibit non-Newtonian rheological properties that

may impact on practical usage. Bio-polymers, for instance, were shown to exhibit a drag-reducing influence.

A booklet with abstracts of the invited lectures and contributed talks was given to the participants upon registration. In accordance with the traditions of EUROMECH Colloquia, no proceedings were published.