EUROPEAN MECHANICS SOCIETY

Colloquium Final Report Form

Please send this report in electronic form to the Secretary General of EUROMECH, within one month after your Colloquium. As an example, please consult the Report of Colloquium 443 (available at www.euromech.org/colloquia/after.htm).

Title: DENSE FLOWS OF SOFT OBJECTS – Bringing together the cases of bubbles, droplets and cells
Colloquium No 544
Dates and location: Laboratory of Interdisciplinary Physics, Grenoble (France) May 13th-15th

Chairperson: Gwennou Coupier
Co-Chairperson: Philippe Marmottant and Ralf Seemann

Is there need of another Colloquium on the same or a related subject? Which year? There is clearly such a need (in 2015 ?), see in the report.

Full registration fee: 314 euros (including the Euromech affiliation fee)

What other funding was obtained?
IXXI : 2000 euros (http://www.ixxi.fr/?lang=en)
DYSCO : 1100 euros (a Grenoble-based research federation on complex systems)
MaiMoSine : 1100 euros (a local platform promoting interdisciplinary projects based on modelling and numerical simulations: http://www.maimosine.fr)
In addition, we could use the laboratory facilities for free.

What were the participants offered?
5 coffee breaks (local organic food), 3 lunches, 1 social dinner + access to the dinner location by cable car. Book of abstracts. Access to the booth of two exhibitors : Fluigent (http://www.fluigent.com) and Elveflow (http://www.elveflow.com).

Number of members of Euromech (reduced registration fee): 7.
Number of non-members of Euromech (full registration fee): 38
Other participants (no registration fee): the 3 chairpersons, 5 invited speakers, 4 exhibitors (2 for each company).
Number of participants from each country:

Austria	0	United Kingdom	1	Slovakia	0
Belgium	2	Greece	0	Slovenia	0
Bosnia	0	Hungary	0	Spain	0
Byelorussia	0	Ireland	0	Sweden	0
Bulgaria	0	Italy	2	Switzerland	2
Croatia	0	Latvia	0	Ukraine	0
Czech Republic	0	Lithuania	0	Serbia	0
Denmark	0	Netherlands	1	Montenegro	0
Estonia	0	Norway	0	Turkey	0
Finland	0	Poland	5	Others	9
France	26	Portugal	0	(Israel 4 USA 3 Canada 1 Singapore 1)	
Georgia	0	Romania	0		
Germany	9	Russia	0	**Total**	57

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EUROPEAN MECHANICS SOCIETY

Colloquium No 544 Scientific Report

The main goal of the colloquium was to make the people from two communities (namely bubbles and drops on one side and cells, vesicles and capsules on the other side) meet and share their recent achievements and the new problems they are facing in this common research area that is the flow of deformable objects under confinement and/or in interaction with each other.

It was expected to have a clearer idea on what all these deformable objects have in common (beyond their deformability) and how one could describe their flow, from microscopic scale to macroscopic scale, in particular in complex networks (blood capillary network, microfluidic chips...).

The received abstracts proved this wish was well understood by the communities, and covered all the evoked situations, in terms of considered objects, of degree of confinement or of particle density. In the program, we were then able to propose successively presentations dealing with the same problem but with different objects, or studying the same object but under different confinements or with different density of neighbours. There was also a good balance between theoretical/numerical works and experimental studies, that represented 48% of the presentations.

Another goal evoked in the announcement of the colloquium was to address the development of active manipulation of soft objects within microfluidic devices, for lab-on-chip applications. We have received few proposals based on this idea. However, had it been the case, the 5 half-days format would have turned out to be too short !

In total, there were 5 invited presentations (50'), 19 oral presentations (20', selected from the received abstracts), 16 posters (selected from the received abstracts). Because of the large number of high quality abstracts, we had to organise a poster sessions for limited time reasons. However, the participants having a poster were given the possibility to advertise for it during a short 3' presentation, and the poster session itself lasted 1h30 and was placed in the middle of the first day, so as to encourage people to go and look at them. It indeed worked well, and the poster presenters were happy to have this additional presenting time of 3'.

Two prizes were awarded during the colloquium:

- A poster prize, with a jury composed of the invited speakers, was awarded to Michael Levant, from Weizmann Institute in Israel, for his poster “Amplification of thermal noise by vesicle dynamics”.
- A best oral presentation prize was also awarded. The jury was only composed of PhD students (not giving an oral presentation). They indeed did their job very seriously, with a tough final debate. The prize was eventually awarded to Anne-Virginie Salsac, from UTC Compiègne, France, for her talk “Flow of a microcapsule suspension in a square microchannel: characterisation of the capsule mechanical properties”.

In addition, two companies (Fluigent and Elveflow) were present during the 3 days and had a booth in the coffee break room. Both sell equipments dedicated to microfluidics (pressure driven pumps, etc...).

We have received a lot of positive feedback during this colloquium, in particular due to the possibility we have offered to hear presentations from another community that were not that far from what the other one was doing.

It is probably too early to estimate the consequences of this meeting in terms of new ideas and collaborations.

During the colloquium, some scientific achievements were highlighted:

- Reliable 3D simulations with many deformable particles are now run in several research groups. Going beyond zoology and addressing the accurate question thanks to this powerful tool remains a critical task, though.
- On the other hand, there is still a need for accurate characterization of single particle properties, from their mechanical property to their behaviour under flow. Predicting the velocity of a confined object remains a complicated task.
- Several experiments with many (interacting) particles in microfluidics devices were presented. However, the numerical tools seem to be favoured by several groups.

The community now needs to better understand long range diffusion and transport phenomena, as well as non-local rheology. Phonon transport within suspensions also remains an unsolved problem.

A side observation was also made by several participants: it appeared to them that this colloquium mainly focused on fundamental issues regarding confined flows, an aspect that tends to disappear in most microfluidic dedicated conferences (such as European Conference on Microfluidics, whose third edition was held in Heidelberg in December 2012).

This may constitute another motivation for the organisation of a second edition of this colloquium, probably in another country so as to increase the contributions coming from other countries than France.

June 12th, 2013
Gwennou Coupier
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