COST Action TD1002 AFM4NANOMED&BIO

Minutes from the 1st workshop on Education, Camogli (Genova, Italy), April 15-16, 2013

The 1st workshop on Education of COST Action TD1002 took place in Camogli, Italy, according to the following agenda:

MONDAY April 15th
9:30 - Starting COST meeting. Welcome and introduction (M. Vassalli)
9.45 **- Topic 1: Strategies for teaching AFM**
- Talk from a toxicologist interested in AFM: needs and expectations (Dr. Sanja Kezic, Academic Medical Center, Amsterdam, The Netherlands; 25')
- Talk from a physicist building tools for biologists (Dr. Tomaso Zambelli, ETH Zürich, SWITZERLAND; 25')
- Discussion, reporting experiences from participants.

11.20 **- Topic 2: AFM recipes.**
- Introduction (A. Podestà)
- Discussion (hot topics, a new shape for old things, connection to standardization activities)

14:30 **- Topic 3: Educational AFM kit**
- Introduction (Dr. Bruno Tiribilli, CNR - ISC, Firenze, Italy; time 20-30')
- Discussion

16.20 **- Topic 4: Virtual tools for teaching AFM**
- Reporting on NanoHUB experience and figuring out similar tools for understanding cell mechanics experiments

17.00 - **Conclusion of the workshop**. Towards the practical implementation of activities
- Short- and medium-term schedule, assign coordinators to each topic, define working sub-groups.

The most relevant points addressed, conclusions and future plans are shortly reported below. For sake of clarity and following the discussion developed during the workshop, we report on topics 1,3,4 together, and on topic 2 separately.

Strategies for teaching AFM, Edu AFM kit and virtual tools
Different attitudes versus use of AFM by people in the biological and medical fields were reported in contributed talks by S. Kezic (Academic Medical Center, Amsterdam) and T. Zambelli (ETHZ): one approach consists in relying on others' expertise in AFM rather than learning how to use it, as a consequence of an institutional policy aimed at not fragmenting individual skills and competences; another approach is to use instruments inspired to AFM designed and built by physicists and engineers for bio-med people, but aimed at performing specific, bio-oriented tasks. In the first case informing about what AFM can do in biology and establishing good cooperation links between AFM experts and colleagues from the bio-med community turn out to be more important than teaching how AFM works; in the second case the development of dedicated tools is a key aspects, because calibration/optimization issues and the overall complexity of the AFM technique represent a barrier for non AFM experts, who tend to consider the instrument as a tool to learn something about the biological system, rather than a research topic itself.

The feasibility of developing a kit for building an educational AFM from scratch has been addressed and discussed. To this purpose, an extended overview of existing low-cost AFMs has been presented by B. Tiribilli

(CNR-ISC Firenze). It has been recognized that even a very simplified instrument would have a cost comparable to that of other systems already on the market, in general higher than 20 k€.

A possible solution for a teaching/training strategy aimed at non AFM experts emerged from the discussion: to use a simplified demonstrator supported by suitable simulation tools to acquire the basic knowledge about the technique, getting acquainted with different imaging and force modes, as well testing the impact of different operational parameters; then, in those cases where a direct involvement in AFM measurements isrequired, the apprentice will move directly to commercial state-of-the-art instruments.

Concerning the demonstrators, B. Tiribilli introduced the LEGO-AFM, while M. Radmacher (Uni Bremen) introduced the Macroscope; both tools effectively demonstrate the working principles of AFM and have affordable costs, well below those of educational/low-cost commercial AFMs.
Operatively, the possibility of developing a kit for the realization of an AFM demonstrator, either based on the LEGO-AFM or on the Macroskope, or on both, will be pursued within the Action as part of the educational activities.

Concerning virtual tools, a good starting point is to look at the NanoHUB gate (www.http://nanohub.org/), where tools for simulation of dynamic AFM (http://nanohub.org/resources/veda) as well as others are present. A more in depth analysis is necessary to find suitable virtual tools to be coupled to AFM demonstrators.

AFM recipes
Action members will contribute to the preparation of an “AFM recipes” booklet. Each recipe will describe in a short yet clear and detailed way all the steps necessary for the accomplishment of specific AFM-related tasks (such as surface functionalization, preparation of specific samples, production of AFM probes, calibration samples, etc.).

The following members of the Action have expressed their willing to take part to the AFM recipes project (in addition, recipes will be also provided by standardization workgroups):

Lab / person	**TOPIC**
Missirlis Y	Sample preparation, tip calibration
Panajotovic Radmila	Cleaning Si, SiO2 and gold-coated substrates
Papi Massimiliano	Preparation of hydrophobic surfaces
Pellequer J-L	UV/Ozone box fabrication
Podestà A	Preparation of colloidal probes
Radmacher M	Cantilever calibration (force constant)
Svetlicic V	Sample preparation – marine samples
Tiribilli B	Preparation of a DVD sample for XY calibration
Standardization - DFS	Tip grafting, substrate grafting
Standardization - Mechanics	Tip calibration, sample calibration

Other members of the Action will be stimulated to contribute, the actual list of topic being preliminary.
A common template will be distributed to contributors.
A first draft of the recipe booklet will be presented and discussed in next MC meeting in Dubrovnik (September 2013).