Update on the Activities of the Joint MIT-CNRS-AMU Laboratory

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The joint, CNRS-MIT unit, **UMI < MSE>^{2}** (**Multi-Scale Materials Science for Energy and Environment**) was opened in Summer 2012. The CNRS-MIT UMI is hosted by MITEI and under the leadership of **Roland Pellenq** (CNRS Director of Research (DR1) and MIT-CEE Senior Research Scientist) and **Franz-Josef Ulm** (CEE-MIT full Professor), the UMI has emerged as an active research center fully integrated into the research and educational fabric of MIT. As of today, the UMI has **4 senior CNRS researchers**, around **10 postdocs and students** working with MIT faculty of various departments on exciting projects related to the fundamental physics of materials for energy and the environment ranging from cement sciences, shale gas, nuclear waste to urban physics.

On the 2012-2016 period, The UMI was supported through the Laboratory of Excellence ICoME2 grant as part of the French National Research Strategy. ICoME2 was directed by R. Pellenq. UMI senior researchers have Co-Pi status at MIT and can apply with MIT faculty for US funds through MIT. In return, MIT faculty can apply with UMI researchers for grants from ANR and Europe as Co-Pis through CNRS.

On Sept 6th 2016, the UMI contract was renewed for 2 years (with a tacit extension of 5 years) welcoming Aix-Marseille University (AMU) as a UMI co-sponsor along with CNRS. The CNRS-AMU CINaM laboratory (Centre Interdisciplinaire des Nanosciences de Marseille) is now the official mirror unit of the UMI in France. The privileged interactions between the UMI and CINaM are being strengthened through research programs such the MITEI/FASTER-Shale program sponsored by TOTAL.

Thanks to this first-of-a-kind institutional agreement between CNRS, AMU and MIT, **the UMI has become an integral part of the intellectual research and educational environment of MIT and beyond**. On the MIT campus, the UMI plays a critical role in MIT's ability to respond to the research challenges in the field of materials science and engineering for complex systems. On the educational side, the affiliation of UMI researchers as "Visiting Professors" allows the integration into the educational landscape of MIT. Furthermore, the UMI organizes, each January with AMU, the Marseille Winter School (MWS) on the science and engineering of multi-scale porous materials. MWS is now part of the MIT-IAP program and is set to evolve as a Master Program under the umbrella of MITEI education activities. The UMI also **leads a focused international research network of universities and research centers in the US and Europe**, dedicated to "Multiscale Materials Under the Nanoscope" (incl. Georgetown, NIST, Princeton, UC-Berkeley, UC-Irvine, UC-LA, Cambridge U., Newcastle, San Sebastian, Bilbao and 12 CNRS labs). On the resource development side, the UMI has become a privileged point of contact for large French industrial corporations (Total…); as well as a close partner for the MIT – France program.

In sum, **the UMI has been fully integrated at MIT as a highly productive research unit dealing with critical research issues** required for the sustainable development of key industrial sectors. By bringing CNRS and AMU researchers to the MIT community, and introducing them into the problem-/solution-driven engineering science context of MIT, new "out-of-the-box" approaches are emerging of high economic, societal and ecological value; relevant for both the United States and France. The UMI is as much a window for France to US academia, as it is for MIT to France and Europe. The UMI has now entered its "Phase II" with very promising and exiting outcomes.