ΙΤΕ/ΙΕΧΜΗ

Κύκλος Σεμιναρίων

ΒΙΟΕΠΙΣΤΗΜΕΣ / ΒΙΟΤΕΧΝΟΛΟΓΙΑ

ΟΜΙΛΗΤΗΣ: **Άννα Μητράκη,** Αναπληρώτρια Καθηγήτρια
Τμήμα Επιστήμης & Τεχνολογίας Υλικών, Πανεπιστήμιο Κρήτης
& ΙΤΕ/ΙΗΔΛ

ΘΕΜΑ: **Οι φυσικές ινώδεις πρωτεΐνες σαν πηγή έμπνευσης για το σχεδιασμό καινοτόμων βιοϋλικών.**

Natural fibrous proteins as a source for inspiration for the design of novel nano-biomaterials.

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΙΕΧΜΗ

ΗΜΕΡΟΜΗΝΙΑ: **Τετάρτη, 11 Ιουλίου 2012**

ΩΡΑ: **12:00**

ΠΕΡΙΛΗΨΗ:

Natural fibrous proteins include families found in natural materials such as wool, silk, in tissue components such as collagen, elastin or in virus and bacteriophage adhesins [1]. They have long fascinated scientists and engineers due to their mechanical and elastic properties, and considerable efforts have been made in order to produce artificial materials inspired from these natural proteins. Repetitive sequences, or “building blocks” derived from these fibrous proteins can self-assemble into well-defined structures (wires, tubes etc.) under mild conditions and are relatively inexpensive and easy to manufacture [2]. Of particular interest is the possibility of using these peptide nanofibers and nanotubes as templates for the growth of inorganic materials, such as metals, semiconductors, silica, etc. We have been involved for a number of years in the rational design, synthesis and characterization of self-assembling proteins and peptides following identification of building blocks in viral fibers. This previous work resulted in the identification of a minimal,

octapeptide building block that self-assembles into fibrils, and these fibrils have been recently used as templates for the growth of inorganic materials [3]. We will describe how structural insight and basic biochemical studies, combined with practical integration approaches, can result in concrete materials applications ranging from the nano- to the macro-scale [4, 5].

[1] A. Mitraki. et al., (2006) Natural triple beta-stranded fibrous folds. Advances in Protein Chemistry 73: 97-124.

[2] A. Mitraki, (2010) Protein aggregation: from inclusion bodies to amyloid and biomaterials. Advances in Protein Chemistry 79: 89-125

[3] Kasotakis, E., et al., (2009) Design of metal-binding sites onto self-assembled peptide fibrils. Biopolymers –Peptide Science 92: 164-172

[4] V. Dinca et al., (2008) Directed three-dimensional patterning of self-assembled peptide fibrils. Nanoletters 8: 538-543

[5]. E. Kasotakis and A. Mitraki, (2012) Silica biotemplating by self-assembling peptides via serine residues activated by the peptide amino terminal group. Biopolymers –Peptide Science, in press, DOI: 10.1002/bip.22091

Anna Mitraki

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Short Curriculum Vitae

BS Chemistry, University of Thessaloniki, Greece, 1981. PhD Biochemistry, Université Paris-Sud, Orsay, France, 1986 (work on enzyme folding, assembly and aggregation with Professor Jeannine Yon-Kahn). Post-doctoral associate (1987-1991) and then Research Scientist (1991-1994) at the Massachusetts Institute of Technology, Cambridge, MA, U.S.A. (work on folding and assembly of fibrous phage proteins with Professor Jonathan King). Research scientist at the Institut de Biologie Structurale in Grenoble, France (French National Research Center) from 1995 to 2004. Habilitation, Université Joseph Fourier, Grenoble, France, in 2003, for work on structure, folding and assembly of beta-structured fibrous proteins and their self-assembling peptides. Since September 2004, Associate Professor, Department of Materials Science and Technology, University of Crete, Greece. Affiliated Research Scientist with the Institute for Electronic Structure and Laser, FORTH (http://www.iesl.forth.gr/research/activity.aspx?id=51). Academic Editor, PLoS ONE (since 2009, www.plosone.org).

Research Interests

The proteins as biomaterials; engineering and design of fibrous biomaterials; self-assembling peptides; protein folding and assembly; protein engineering and production.

Selected publications:

- Charalambidis, G., Kasotakis, E., Lazarides, Th., Mitraki, A., and Coutsolelos, A. G. (2011) Self-assembly into spheres of a hybrid diphenylalanine-porphyrin: increased fluorescence lifetime, conserved electronic properties. *Chemistry Eur. J.*, 17: 7213-7219
- Mitraki, A. (2010) Protein aggregation: from inclusion bodies to amyloid and biomaterials. *Advances in Protein Chemistry and Structural Biology*, 79: 89-125
- Kasotakis, E., Mossou, E., Adler-Abramovich, L. Forsyth, V.T., Mitchell, E.P., Gazit, E. and Mitraki, A. (2009) Design of metal-binding sites onto self-assembled peptide fibrils. *Biopolymers –Peptide Science* 92: 164-172
- Dinca V., Kasotakis E., Catherine, J. , Mourka, A., Ranella, A., Ovsianikov A, Chichkov, B., Farsari, M., Mitraki, A., and Fotakis, C. (2008) Directed three-dimensional patterning of self-assembled peptide fibrils. *Nanoletters*, 8: 538-543
- Papanikolopoulou, K., Schoehn, G., Forge, V., Forsyth, V. T., Riekel, C., Hernandez, J.-F., Ruigrok, R. W.H., and Mitraki, A. (2005) Amyloid fibril formation from sequences of a natural β-structured fibrous protein, the adenovirus fiber. *J. Biol. Chem.* 280: 2481-2490
- van Raaij, M.J., Mitraki, A., Lavigne, G. and Cusack, S. (1999). A triple beta-spiral in the adenovirus fibre shaft reveals a new structural motif for a fibrous protein. *Nature* 401: 935-938.
- Mitraki, A., Fane, B., Haase-Pettingell, C., Sturtevant, J. and King, J. (1991). Global suppression of protein folding defects and inclusion body formation. *Science*, 253: 54-58.