

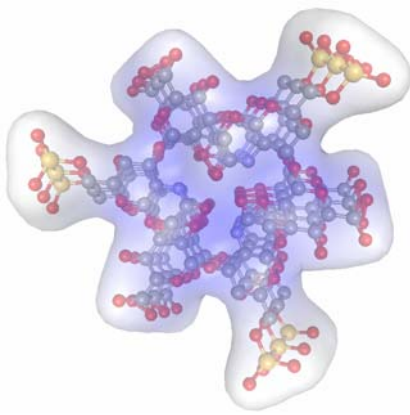
EST Marie-Curie Program on Biomimetic Systems

Politecnico di Milano (Technical University of Milan), Department of Bioengineering
Contact: Prof Alberto Redaelli, email: alberto.redaelli@polimi.it

Position (12 months)

A position is open at the Computational Biomechanics Laboratory for a period of 12 months. Depending on the interest of the candidate, two research activities are currently available, the first dealing with tendon micromechanics and the second one on molecular motors mechanics. Both works require a computational approach by using both molecular modelling and mesoscale modelling.

Tendon Micromechanics



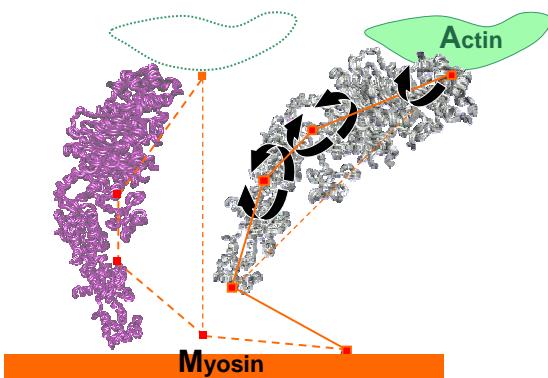
The objective of this work is the investigation of the stress transfer between contiguous fibrils constituting the tendon. In particular we are interested in studying the mechanical properties of the glycosaminoglycans who act as “bridges” between fibrils thus providing structural continuity to the tissue. For major details the candidate can relate to the following papers. Figure on the left represents a glycosaminoglycan chain composed by nine disaccharide units.

Redaelli A., Vesentini S., Soncini M., Vena P., Mantero S., Montevecchi F.M. **The possible role of decorin glycosaminoglycans in fibril to fibril force transfer in relative mature tendons – a computational study from molecular to microstructural level.** *J. Biomechanics* Elsevier Science, Oxford (UK), ISSN 0021-9290, 2003, 36:1555-1569.

Vesentini S, Redaelli A., Montevecchi FM. **Estimation of the binding force of the collagen molecule-decorin core protein complex in collagen fibril.** *Journal of Biomechanics*, Elsevier Science, Oxford (UK), ISSN 0021-9290, 2005; 38:433-443

Vesentini S, Fitiè CF, Montevecchi FM, Redaelli A. **Molecular assessment of the elastic properties of different collagen type I sequences.** *Biomechanics and Modelling in Mechanobiology*, Springer-Verlag, Berlin Heidelberg, (D) ISSN: 1617-7959 (printed), ISSN: 1617-7940 (online), online April 2005.

Molecular motors mechanics



The objective of this work is the investigation of the affinity between the myosin head and the actin filament as well as the myosin head and the ATP nucleotide. The energy of the two complexes will be evaluated through molecular dynamics and the data will be used to assess the mechanical performance of the single myosin head and to relate this finding to multiple myosin heads complexes. For major details the candidate can relate to the following papers

Redaelli A., Soncini M., Montevecchi F.M. **Myosin cross-bridge mechanics: geometrical determinants for continuous sliding.** *J. Biomechanics*. Elsevier Science, Oxford (UK), ISSN 0021-9290, 2001, 34:1607-1617.

Soncini M., Redaelli A., Montevecchi F.M. **Myosin head mechanical performance under different conformational change mechanisms.** *Journal of Biomechanics*, Elsevier Science, Oxford (UK), ISSN 0021-9290, 2005, 2004, 37:1031-1041.