

## *Civil and professional status*

**Family Name** : VIGOUROUX  
**First Name** : Laurent\_  
**Age, Civil status** : 35 years, Married  
**Birthday and birthplace** : 04/10/1978, Montélimar, France  
**Personal Address** : 801 route impériale 07000 Veyras  
phone number. : 06 11 44 06 63  
**Grade et section** : Assistant Professor, 74<sup>th</sup> section of the French research classification  
**Attachment Laboratory** : Institute of Movement Sciences : Etienne Jules Marey, UMR 7287 CNRS/Aix-Marseille University.  
**Attachment Faculty** : Sport Science Faculty, 163 avenue de Luminy, 13288 Marseille

## *Professional history*

2006-2013 **Assistant Professor** at the Institute of Movement Sciences of the Aix-Marseille University since 2006. Member of the team « Motor Performance and Modeling, P2M » of Professor E. Berton. Supervision of 3 PhD students. Manager of one component of research included in two industrial chair contracts.

2011-2012 Year-off for personal reasons. Approach to scientific openness towards biology (license enrolment) and to other scientific fields (readings of various scientific popularization literature), contacts for collaborations at the Museum of Natural History. Enrichment of my general scientific culture and staff.

2005-2006 **Assistant Professor for a one year contract** at the Faculty Sport Sciences, Marseille, France.

2002-2005 **PhD** done under the supervision of F.Quaine at the “Sport and Motor Performance” laboratory, E.A. 597, UFR-STAPS, Grenoble I. Title : *Modeling of underdetermined musculo-skeletal model. Static analysis of finger tendon tensions*. Defended the november 4<sup>th</sup> 2005. Ministerial Grants.

2001-2002: License, and Master degree “Sport and Performance”. Joseph Fourier University, Grenoble, France.

## *Scientific activities*

### **Reception of researchers :**

- Reception of a post-doctoral researcher, Chris **Hayot**, project of muscle modeling and tennis elbow problematic (April 2013-April 2014)
- Reception of Arif Mithat **Amca** (Ankara University) during his first year of PhD for an Erasmus exchange (2010-2011).

### **Students Supervision:**

- Benjamin **Goislard de Monsabert**, ENS (high school) Grants, expected defense in December 2014, Title: *Individualization of hand biomechanical models for the analysis of arthritis patho-mechanisms*

- Jérémy **Rossi**, CIFRE Grants (industrial), defended the November 30<sup>th</sup> 2012, Title: *Biomechanical analysis of hand-racket interfaces : applications to tennis elbow disease*
- Mathieu **Domalain**, MENRT grants (Ministerial), defense the February 19<sup>th</sup> 2010, Title: *Biomechanical modeling for the investigation if internal forces during index-thumb pinch grip. Honors of Aix-Marseille University.*
- 7 Master degrees 2<sup>nd</sup> year and 10 Master degrees 1st year for the « Research » path.
- 8 Master degree 2<sup>nd</sup> year for the « professional » path.

**Co-Manager of the Master degree IEMH** (human movement engineering).  
Managing of an experimental platform for movement analysis pedagogics.

### **Research Grants / Contracts**

2013-2015 : **Manager** of one axe (three axes in totality) of scientific research for an industrial chair contract with the Oxylane-Décathlon company. This axe included [1 Assistant professor, 1 post-doctoral researcher, 1 PhD, 1 research engineer] and 150 k€.

2008-2011 : **Manager** of one axe (three axes in totality) of scientific research for an industrial chair contract with the Oxylane-Décathlon company. This axe included [1 Professor, 1 Assistant professor, 2 PhD, 1 research engineer] and 102 k€

2011 : **Manager** of a Grants of the « Sport Santé et Développement Durable » foundation for an IRM measure campaign (20 k€)

2010 : **Manager** of an industrial contract with Décathlon / Quechua company for the ergonomics of a forearm socks. (10 k€)

2007-2009 : **Contribution** for a national Grants dedicated to the development of a walking robot « SHERPA » (114 k€ obtained by our laboratory)

2006 : **Contribution** to an industrial contract with Décathlon / Quechua company for the ergonomics of running shoes. (140 k€)

### **Reviewer Service:**

2010-2011-2013-2014 Jury member for the national recruitment of School teachers. Vichy, France.

2013 Reviewer for the ACAPS congress, Grenoble, October 28<sup>th</sup> to 31<sup>th</sup> 2013  
Member of the selection comity for the recruitment of one assistant professor, Henri Poincaré University, Nancy, France

2011 Reviewer for the mission of research of INSEP (National institute of Sport)  
Member of Selection comity for the recruitment of Assistant professor, Aix-Marseille University, and Poincaré University, Nancy, France

2010 Reviewer for the research national agency (ANR Blanc, SIMI9)  
Member of Selection comity for the recruitment of one assistant professor, Paul Sabatier University, Toulouse, France

2009 Reviewer for the congress « Progress in Motor Control » VII, The July 23-25<sup>th</sup> 2009, France

Reviewer of the Biomechanical Society workshop, Poitier, the May 14<sup>th</sup>-15<sup>th</sup> 2009, France

2006- to date: 24 reviews of articles for publication in « *Journal of Biomechanics* » (7), « *Clinical Biomechanics* » (5), « *Computer Methods in Biomechanics*

*and Biomechanical Engineering* » (1), « *Journal of Applied Biomechanics* » (3), « *Age* » (1), « *Mécanique et Industrie* » (2), « *Experimental Brain Research* » (1), « *Medical Engineering and Physics* » (1), « *European Journal of Applied Physiology* » (1), *Journal of Manipulative and Physiological Therapeutics* (1), *Annals of Biomedical Engineering* (1)

#### **Invited conference and seminar presentations**

2014 (forthcoming): Keynote lecture on finger/thumb/hand biomechanics related to climbing, *2nd International Rock Climbing Research Congress*, Switzerland, September 15-19<sup>th</sup>, 2014

2014(forthcoming): « Individualization of muscular parameters for hand modeling ». Seminary of PPrime Institute, the March 20<sup>th</sup> 2014, Poitiers, France

2008 « Estimation of muscle forces using a biomechanical model based on multiple experimental measures ». Invited presentation for the young researchers session of the GAMEA (French Society of Movement Analysis for Children and Adults). The January 18<sup>th</sup> 2008. Marseille, France

2007 Animator of the « Sport Biomechanics » session for the *XXXII<sup>th</sup> congress of the French society of Biomechanics* August 27<sup>th</sup> and 28<sup>th</sup> 2007, Lyon, France

2006 « Estimation of muscle forces using biomechanical modeling ». Seminary of Kinesiology Department of Montréal University, the February 21<sup>th</sup> 2006, Montréal, Québec

#### **Memberships :**

**SB :** French Society of Biomechanics

**SOFAMEA:** French Society of Movement Analysis for Children and Adults

**RFIS :** French Network of Sport Engineering

#### *Teaching experiences*

**1564 Hours** in Biomechanics, Statistics, Movement Analysis and Sport climbing

#### *Various experiences*

1998-2008 European level performances in outdoor rock-climbing. Photos and interviews in specialized magazines

2011 Coach of the Marseille University Team, 3rd team at the University French championship

2001-2005 Coach of the Grenoble University Team, 1st team at the University French championship from 2002-2005

2003 Diploma of **Trekking Monitor**

2001 Diploma of **Rock-climbing Monitor**

1997 **Young French Team Member**, 22th place of the world young championships of Sport-climbing in Imst (Austria)

1996 First place of the secondary school French Championship (UNSS)

#### **22 Peer Review articles published in international indexed journals**

##### **2009-2013**

Goislard de Monsabert B., **Vigouroux L.**, Bendahan D., Berton E., 2013. Quantification of finger joint loadings using musculoskeletal modelling clarifies

mechanical risk factors of hand osteoarthritis. *Medical Engineering & Physics*. in press.

2. Quaine, F., Paclet, F., **Vigouroux, L.**, Moutet, F., 2013. Understanding of hand muscles involvement: towards a linkage between biomechanical modeling and motor control theories. *Movement and Sport Sciences*. DOI:10.1051/sm/2012039
3. Amca, A.M., **Vigouroux, L.**, Aritan, S., Berton, E., 2012. The effect of chalk on the finger-hold friction coefficient in rock climbing. *Sport Biomechanics*, (11) 473-479.
4. Goislard de Monsabert B., Rossi J., Berton E., **Vigouroux L.**, 2012. Quantification of hand and forearm muscle forces during a maximal power grip task. *Medicine and Sciences in Sport and Exercises* 44(10):1906-1916.
5. Amca, A.M., **Vigouroux, L.**, Aritan, S., Berton, L., 2012. Effect of hold depth and grip technique on maximal finger forces in rock climbing. *Journal of Sport Sciences*. 30(7):669-77.
6. Rossi, J., Berton, E., Grélot, L., Barla, C., **Vigouroux, L.**, 2012. Characterisation of forces exerted by the entire hand during the power grip: effect of the handle diameter. *Ergonomics*. 55(6):682-92.
7. **Vigouroux, L.**, Rossi, J., Foissac, M., Grélot, L., Berton, E., 2011. Finger force sharing during an adapted power grip task. *Journal of Neuroscience Letters*, 504, 290-294
8. Quaine, F., **Vigouroux, L.**, Paclet, F., Colloud, F. 2011. The Thumb during the crimp grip. *International Journal of Sport Medicine* 32: 49-53.
9. **Vigouroux, L.**, Domalain, M., Berton, E., 2011. Effect of object width on muscle and joint forces during thumb/index fingers grasping. *Journal of Applied Biomechanics*, 27, 173-180.
10. Domalain, M., **Vigouroux, L.**, Berton, E., 2010. Determination of passive moment – angle relationships at the trapeziometacarpal joint. *Journal of Biomechanical Engineering* 32, 071009
11. Rao, G., Berton, E., Amarantini, D., **Vigouroux, L.**, Buchanan, T., 2010. An EMG-driven biomechanical model that accounts for the decrease in moment generation capacity during a dynamic fatigued condition. *Journal of Biomechanical Engineering*. 32:071003
12. **Vigouroux, L.**, Domalain, M., Berton, E., 2009. Comparison of tendon tensions estimated from two biomechanical models of the thumb. *Journal of Biomechanics*. 2009 42 :1772-7.

## 2003-2008

13. Domalain, M., **Vigouroux, L.**, Danion, F., Sevrez, V., Berton, E., 2008. Effect of object width on precision grip force and finger posture. *Ergonomics*. 51:1441-1453.
14. **Vigouroux, L.**, Ferry, M., Colloud, F., Paclet, F., Cahouet, V., Quaine, F., 2008. Is the principle of minimization of secondary moment validated during various fingertip force production conditions? *Human Movement Science*. 27: 396-407.
15. **Vigouroux, L.**, Quaine, F., Colloud, F., Paclet, F., Moutet, F., 2008. Middle and ring fingers are more exposed to pulley rupture than index and little during sport-climbing : a biomechanical explanation. *Clinical Biomechanics*. 23 : 562-570.
16. **Vigouroux, L.**, Quaine, F., Labarre-Vila, A., Amarantini, D., Moutet, F., 2007. Using EMG data to constrain optimization procedure improves finger tendon tension estimations during static fingertip force production *Journal of Biomechanics*. 40: 2846-56.
17. **Vigouroux, L.**, Quaine, F., Labarre-Vila, A., Moutet, F., 2006. Estimation of finger muscle tendon tensions and pulley forces during specific sport climbing grip techniques. *Journal of Biomechanics* 39: 2583-92.

- ~~18~~—Rolloff, I., Schöffl, V.R., **Vigouroux, L.**, Quaine, F., 2005. Biomechanical model for the determination of the forces acting on the pulley system. *Journal of Biomechanics*, 39 : 915-23.
- ~~19~~—**Vigouroux, L.**, Quaine, L., 2006. Fingertip force and electromyography of finger flexor muscles during a prolonged intermittent exercise in elite climbers and sedentary individuals. *Journal of Sports Sciences*. 24: 181-6.
- ~~20~~—Quaine, F. **Vigouroux, L.**, 2004. Maximal resultant four fingertip force and fatigue of the extrinsic muscles of the hand in different sport climbing finger grips. *International Journal of Sport Medicine* 25, 634-7.
- ~~21~~—Quaine, F., **Vigouroux, L.**, Martin, L., 2003. Finger flexors fatigue in trained rock-climbers and untrained sedentary subjects. *International Journal of Sport Medicine* 24, 424-427.
- ~~22~~—Quaine, F., **Vigouroux, L.**, Martin, L., 2003. Effect of simulated rock climbing finger postures on force sharing among the fingers. *Clinical Biomechanics* 18, 78-84.

#### 24 presentations in national and international congress

- ~~1~~—Goislard de Monsabert B., Rossi J., Berton E., **Vigouroux L.**, (2012). Comparison of muscle loadings between power and pinch grip tasks. Computer Methods in Biomechanics and Biomedical Engineering. Vol. 15, Iss. sup1. Congrès de la SB, Toulouse, 16-18 Octobre 2012.
- ~~2~~—Amca, A. M., **Vigouroux, L.** (2012). Climbers' hand capacities: a pathological case. XXXII WORLD CONGRESS OF SPORTS MEDICINE 20-27 September 2012, Rome, Italy
- ~~3~~—Jérémy, R., Grélot, L., Barla, C., Berton, E., **Vigouroux, L.** (2011). Etude de la répartition des forces à l'interface main - objet: Influence du diamètre, ACAPS, 24-26 Octobre, Rennes, France
- ~~4~~—Rossi, J., Goislard de Monsabert, B., Barla, C., Berton, E., Grelot, L., **Vigouroux, L.** (2011) Effect of handle size, handle inertia and fatigue on tendons affected by lateral Epicondylalgia: a simulation study. SIMBIO conference, June, 20-22, 2011. Marseille, France.
- ~~5~~—Rossi, J., Foissac, M., Baly, L., **Vigouroux, L.**, Grelot, L. (2010). Characterization of grip force during badminton strokes. 8<sup>th</sup> Conference of the International Sports Engineering Association, July 14<sup>th</sup> 2010
- ~~6~~—Domalain, M., **Vigouroux, L.**, Berton, E. (2010). A musculoskeletal model of the thumb and index finger pinch for ergonomic purpose. 7th Triennial International Hand and Wrist Biomechanics Symposium, June 20-23, 2010, in Cleveland OH.
- ~~7~~—Rossi, J., Foissac, M., **Vigouroux, L.**, Beeton, E., Baly, L. (2009). Influence de la taille du grip sur la force de préhension lors d'un match de tennis simulé. XXXVII ème congrès de la Société de Biomécanique, Toulon
- ~~8~~—Domalain, M., **Vigouroux, L.**, Berton, E. (2009). Influence of object size on finger muscle forces during grasping. *Progress in Motor Control*, July, 23-25. Communication affichée
- ~~9~~—Domalain, M., **Vigouroux, L.**, Berton, L. (2009). Identification of trapeziometacarpal joint stiffness for musculoskeletal modelling of the thumb. *International Society of Biomechanics XXI<sup>th</sup> Congress*, Cape Town, South Africa, July, 5-9. Communication affichée
- ~~10~~—Sevrez, V., Rao, G., **Vigouroux, L.**, Bootsma, R.J., Berton, E. (2008) An integrated approach toward testing sports equipment. 7<sup>th</sup> ISEA CONFERENCE, Biarritz, June 2-6. Communication orale.

- ~~11~~ Sevrez, V., Rao, G., **Vigouroux, L.**, Berton, E., Bootsma, R.J. (2007). Which pattern of movement is chosen and how?. *12<sup>ème</sup> congrès de l'ACAPS*. Leuven, 31oct-2 nov. Communication affichée
- ~~12~~ Rao, G., Berton, E., Amarantini, D., **Vigouroux, L.** (2007) Biomechanical investigation of the muscular redundancy through internal and external perturbation. *12<sup>ème</sup> congrès de l'ACAPS*. Leuven, 31oct-2nov. Communication orale.
- ~~13~~ Domalain, M., **Vigouroux, L.**, Danion, F., Berton, E. (2007) Influence of object shape on musculoskeletal forces during grasping. *XXXIIème congrès de la Société de Biomécanique*, 28-29 Août, Lyon France. Communication orale.
- ~~14~~ Sevrez, V., **Vigouroux, L.**, Rao, G., Bootsma, R.J., Berton, E. (2007). Influence de la capacité de production de moment sur la réalisation d'un soleil. *XXXIIème congrès de la Société de Biomécanique*, 28-29 Août. Communication affichée.
- ~~15~~ Sevrez, V., Rao, G., **Vigouroux, L.**, Bootsma, R.J., Berton, E. (2006). Etude de l'organisation d'un système poly-articulé en rotation : l'exemple du soleil à la barre fixe. *3ème congrès du Réseau Français d'Ingénierie du Sport*. Bidart, 15-16 juin. Communication affichée.
- ~~16~~ Domalain M, **Vigouroux L.**, Danion F, Berton E. (2006). Influences des caractéristiques d'un objet sur les tensions des tendons des doigts lors d'une tâche de préhension. *3ème congrès du Réseau Français d'Ingénierie du Sport*. Bidart, 15-16 juin. Communication affichée.
- ~~17~~ Rao, G., Amarantini, D., **Vigouroux, L.**, Berton E. (2006). Influence of muscular fatigue on agonist and antagonist muscle groups moments during loaded squats *Journal of Biomechanics*, 39, S74-S75
- ~~18~~ **Vigouroux, L.**, Labarre-Vila, A., Moutet, F., Quaine, F. (2006). Utilisation de signaux EMG pour la modélisation biomécanique. *Neurophysiologie clinique* 36, 19-37. *XV<sup>e</sup> Journées Francophones de l'ENMG* (Grenoble- France) Communication affichée.
- ~~19~~ **Vigouroux, L.**, Labarre-Vila, A., Moutet, F., Quaine, F. (2004). Validation par électromyographie intramusculaire d'un modèle biomécanique de la main du grimpeur. *Neurophysiologie clinique* 34, 109-120. *XIV<sup>e</sup> Journées Francophones de l'ENMG* (Liège- Belgique) Communication affichée.
- ~~20~~ **Vigouroux, L.**, Amarantini, D., Dion, F., Quaine, F. (2004). Finger muscle recruitment by the min/max optimization procedure. *Archives of Physiology and Biochemistry* 112, 164. *Society of Biomechanics XXIX<sup>th</sup> congress* (Paris-France), Communication affichée.
- ~~21~~ Quaine, F., **Vigouroux, L.**, Termoz, N., Portero, P. (2003). Effect of the finger position on maximal fingertip force and fatigue of the extrinsic muscles of the hand during a simulated rock-climbing gripping exercise. *International Society of Biomechanics XIX<sup>th</sup> Congress* (Wellington-Nouvelle Zélande). Communication affichée.
- ~~22~~ Quaine, F., **Vigouroux, L.** (2002). Finger flexors fatigue during sub-maximal intermittent static contractions in trained rock climbers and untrained sedentary subject. *2nd International Conference on Science and Technology in Climbing and Mountaineering* (Leeds – Angleterre). Communication orale (Prix de la meilleure avancée scientifique).
- ~~23~~ **Vigouroux, L.**, Quaine, F., Martin, L. (2002). Comparison of finger muscles involvement in two finger postures. *Archives of Physiology and Biochemistry* 110, 112. *Society of Biomechanics XXVII<sup>th</sup> congress* (Valencienne-France), Communication affichée.

~~24~~ Quaine, F., **Vigouroux**, L., Noé, F. (2001). Fatigue des fléchisseurs des doigts lors d'un travail isométrique répétitif intense chez des grimpeurs experts et chez des sédentaires. *9<sup>ème</sup> congrès international de l'ACAPS* (Valence – France). Communication affichée.

### 3 articles for popularization of science

- a.i.1. **Vigouroux, L.** Améliorer la tenue de prise : alternatives à un entraînement pur et dur, *Revue GRIMPER*, n°144, dec-jan 2012-3
- a.i.2. **Vigouroux, L.** Philippe Ribière est-il dans le 7, le 8 ou le 9 ? *Revue GRIMPER*, n°135, oct-nov 2011
- a.i.3. Domalain, M., **Vigouroux**, L., Berton, E., (2008). Modélisation biomécanique de la main : influence des caractéristiques de l'objet sur la distribution des tensions des tendons lors d'une tâche de préhension (Prix Lyleire 2007). *Revue STAPS*. 81, 7-22.