



Vincent Hayward

Élu membre le 18 décembre 2019 dans Intersection *Applications des sciences*

Formation et carrière

1975–78 Diplôme d'Ingénieur, Ecole Centrale de Nantes (then ENSM), Nantes, France
1978–81 Thèse de Docteur Ingénieur, Université de Paris XI at Orsay, France
1981–83 *Visiting Scholar then Visiting Assistant Professor*, Purdue University, School of Electrical Engineering, Indiana, USA
1983–85 *Attaché puis Chargé de Recherche* au Centre National de la Recherche Scientifique
1989–06 *Assistant then Associate Professor* (tenured '94), Dept. of Elec. & Comp. Eng., McGill Univ., Montréal, Qc Canada
2001–04 *Director*, Center for Intelligent Machines, McGill Univ., Montréal, Qc Canada
2006–07 *Professeur Invité*, Université Pierre et Marie Curie
2006–10 *Professor*, Department of Electrical and Computer Engineering, McGill University, Montréal, Qc Canada
2008–11 *Professeur* (associé), Institut des Systèmes Intelligents et de Robotique, Université Pierre et Marie Curie (UPMC)
2011–16 *Professeur* (mis à disposition en 2017 et 18) Institut des Systèmes Intelligents et de Robotique, Sorbonne Université
2017–18 *Professor of Tactile Perception and Technologies*, School of Advanced Study, University of London (mi-temps)
2017– *Conseiller Scientifique*, Actronika SAS, Paris (mi-temps)
2019– *Professeur*, Institut des Systèmes Intelligents et de Robotique, Sorbonne Université (mi-temps)

Œuvre scientifique

Des années 1980 aux années 2000, Vincent Hayward poursuit des recherches en robotique sur la programmation des robots manipulateurs, leur conception mécanique, leur actionnement et leurs applications (robotique spatiale, maintenance des lignes haute-tension). Au début des années 1990, Vincent Hayward s'intéressa à l'accessibilité des personnes visuellement handicapées aux ordinateurs et met au point un mécanisme d'interaction à retour d'effort qui devient l'un des tous premiers dispositif de ce type. Vincent Hayward devint l'un des fondateurs du domaine de recherche des interfaces dits « haptiques » dont les applications se répandirent dans de nombreux autres domaines. Ces travaux le conduisirent à approfondir ses études sur la perception haptique chez l'humain qui, à partir de signaux provenant de la peau, des muscles, et des tendons, permettent aux personnes d'appréhender leur monde mécanique. Après que Sorbonne Université lui offrit une chaire en 2007, il posa les bases d'une théorie expliquant le fonctionnement du toucher basée sur une connaissance approfondie de la bio-mécanique, de la bio-tribologie et de l'architecture neuronale du système somato-sensoriel des mammifères.

Distinctions et Prix (liste partielle)

2020 Keynote speaker, International Multisensory Research Forum, Ulm, Germany
2019 Élu membre de l'Académie des Sciences
2019 Grand Prix Inria de L'Académie des Sciences, Paris (25,000 €)
2019 Keynote Speaker, International Conference on Virtual Rehabilitation, Tel Aviv, Israel
2018 Best Demonstration Award, EuroHaptics Conference, Pisa, Italy
2018 Keynote Speaker, Cross-Cutting Challenges, IEEE Haptics Symposium, San Francisco, CA, USA
2018 Best Paper Award for 2017, IEEE Transactions on Haptics
2018 Keynote Speaker, UK & Ireland IEEE Robotics and Automation Conference, London, UK
2017 Plenary Speaker, 43rd International Conference On Micro And Nano-engineering, Braga, Portugal
2017 Keynote Speaker, IEEE/RSJ International Conference on Intelligent Robots and Systems, Vancouver, BC, Canada
2017 Leverhulme Trust Visiting Professorship, University of London (£ 169,000)
2010 Lauréat du Conseil de la Recherche Européen, Advanced Grant « Computational Theory of Haptic Perception »
2014 Invited Speaker, AsiaHaptics 2014, Tsukuba, Japan
2014 Best Paper Award (honorable mention, oral presentation) Eurohaptics 2014, Versailles, France
2012 Plenary Speaker 2012 IEEE Int. Conf. on Multisensor Fusion and Information Integration, Hamburg, Germany
2012 Conférencier, Series 'Robotique, les fondations d'une discipline', Collège de France, Paris
2010 Keynote Speaker, Haptic Audio Interaction Design 2010, Copenhagen, Denmark
2010 Plenary Speaker, 32nd Annual Int. Conf. of the IEEE Engineering in Med. and Bio. Society, Buenos Aires, Argentina
2010 Best Paper Award, Eurohaptics, Amsterdam, the Netherlands
2008 Fellow of the IEEE for contributions to robot manipulator programming and the development of haptic interface technology
2007 Best Paper Award (applications), World Haptics 2007, Salt Lake City, Utah, USA
2006 Best Demonstration Award, Eurohaptics 2006, Paris
2006 Best Paper Award, ACM CHI'06 Conference, Montréal, Canada
2004 Keynote Speaker, Eurohaptics, Munich, Germany
2002 The E. (Ben) & Mary Hochhausen Award for Res. in Adaptive Tech. For Blind and Visually Impaired (\$ 10,000)
2000 Distinguished Lecture Series, Department of Computing Science, University of Alberta, Canada
1991 NASA Space Act Tech Brief Award (as a result of work on robot programming for the Jet Propulsion Laboratory)



Dix publications les plus représentatives

- o Robles de la Torre, G., Hayward, V. 2001. Force Can Overcome Object Geometry in the Perception of Shape Through Active Touch. *Nature*. 412 :445–448.
- o Hayward, V. and K. E. MacLean, V. 2007. Do it yourself haptics, Part-I. *IEEE Robotics and Automation Magazine*, 14(4) :88–104.
- o Konkle, T., Wang, Q., Hayward, V., and Moore, C. I. 2009. Motion After-Effects Transfer Between Touch and Vision, *Current Biology*, 19(9) :745–750.
- o Wiertlewski, M., Lozada, J., Hayward, V. 2011. The Spatial Spectrum Of Tangential Skin Displacement Can Encode Tactile Texture. *IEEE Transactions on Robotics*, 27(3) :461–472.
- o Jörntell, H., Bengtsson, F., Geborek, P., Spanne, A., Terekhov, A. V., Hayward, V. 2014. Segregation of Tactile Input Features in Neurons of the Cuneate Nucleus. *Neuron*. 83 :1444–1452.
- o Dupin, L., Hayward, V. Wexler, M. 2015. Direct Coupling of Haptic Signals Between Hands. *Proceedings of the National Academy of Sciences*, 112(2) :619–624.
- o Shao, Y., Hayward, V., Visell, Y. 2016. Spatial Patterns of Cutaneous Vibration During Whole-Hand Haptic Interactions, *Proceedings of the National Academy of Sciences*, 113(15) :4188–4193
- o Deroy, O., Fasiello, I., Hayward, V., Auvray, M. 2016. Differentiated Audio-Tactile Correspondences in Sighted and Blind Individuals. *Journal of Experimental Psychology : Human Perception and Performance*, 42(8) :1204–1214.
- o Dzidek, B., Bochereau, S., Johnson, S. A., Hayward, V., and Adams, M. J. 2017. Why Pens Have Rubbery Grips. *Proceedings of the National Academy of Sciences*, 114(41) :10864–10869.
- o Miller, L. E., Montroni, L., Koun, E., Salemme, R., Hayward, V., Farné, A. 2018. Sensing With Tools Extends Somatosensory Processing Beyond The Body. *Nature*, 561(7722) :239–242.

Dix contributions à des ouvrages

- o Hayward, V., Kurtz, R. 1991. Modeling of a Parallel Wrist Mechanism with Actuator Redundancy. In *Advances in Robot Kinematics*. S. Stifter and J. Lenarcic (Eds). Springer Verlag, pp. 444–456.
- o Hayward, V., Choksi, J., Lanvin, G., Ramstein, C. 1994. Design and Multi-Objective Optimization of a Linkage for a Haptic Interface. In *Advances in Robot Kinematics*. J. Lenarcic and B. Ravani (Eds.). Kluwer Academic. pp. 352–359.
- o Hayward, V., Astley, O. R. 1996. Performance Measures for Haptic Interfaces. In *Robotics Research : The 7th International Symposium*, Giralt, G., Hirzinger, G., (Eds.), Springer Verlag. pp. 195–207.
- o Hayward, V., Armstrong, B. 2000. A New Computational Model of Friction Applied to Haptic Rendering. In *Experimental Robotics VI*, Peter Corke and James Trevelyan (Eds), Lecture Notes in Control and Information Sciences, Vol. 250, Springer-Verlag, pp. 403–412.
- o Rovan, B., Hayward, V. 2000. Typology of Tactile Sounds and Their Synthesis in Gesture Driven Computer Music Performance. In *Trends in Gestural Control of Music*. Wanderley, M., Battier, M., (Eds). Editions IRCAM : Paris. pp. 297–320.
- o Hayward, V. 2008. Haptic Shape Cues, Invariants, Priors, and Interface Design. In *Human Haptic Perception - Basics and Applications*, M. Grunwald (Ed.), Birkhauser Verlag. pp. 381–392.
- o Mohand-Ousaid, A., Lu, T., Pacoret, C., Régnier, S., Hayward, V. 2016. Dual Stage Options for Interface Designs Suitable for Haptic Interaction at the Micro-Nano Scales, in *Experimental Robotics*, Springer, pp. 105–114.
- o Hayward, V. 2016. Tactile Illusions. In *Encyclopedia of Touch*, Prescott, T. J. and Ahissar, E. (Eds.), *Scholarpedia*, 10(3) :8245 also in *Scholarpedia of Touch*, Atlantis Press, pp. 327-342.
- o Hayward, V. 2018. A Brief Overview of the Human Somatosensory System. In *Musical Haptics*, Papetti, S. and Saitis, C. (Eds.), Springer, pp. 29-48.
- o Farkhatdinov I., Michalska H., Berthoz A., Hayward V. 2019. Review of Anthropomorphic Head Stabilisation and Verticality Estimation in Robots. In *Biomechanics of Anthropomorphic Systems*, Venture G., Laumond JP., Watier B. (eds), Springer Tracts in Advanced Robotics, vol 124, pp. 185–209.

Autres contributions

100+ articles de revue (*Nature* (2), *Current Biology* (4), *PNAS* (3), *Neuron* (1), *Royal Society Journals*, *Scientific Reports*, *Science Advances*, *Plos ONE*) 23 chapitres d'ouvrages, 160 articles de conférences, 30 brevets, 60+ séminaires invités depuis 10 ans ; Plus de trente mentions dans la presse, dont : *Wired Magazine* (2015), "Big Data : The Next Google" *Nature* Vol. 455 (2008), *The New Scientist* (trois fois), ou *The Economist* (2007).

Co-fondateur de jeunes pousses : Haptic Technologies Inc., Montréal, Canada, (1995)—Haptic Technologies Inc. fut acquise par Immersion Corp, March 2000 (US\$7MM) pour devenir Immersion Canada Inc. ; RealContact Inc. Montréal, Canada, (2002) ; co-fondateur and Honorary Director, Tactile Labs Inc., Montréal, Canada (2008) ; Actronika SAS (Paris, 2014) ;

Encadrement

UPMC/Sorbonne Université : 12 Postdocs ; 13 Thèses ; 11 Maitrises ; 7 Ingénieurs d'études

McGill University : 6 Postdocs ; 17 Thèses ; 18 Maitrises ; 7 Ingénieurs d'études