

Paul Van Liedekerke, Phd.

Institut National de Recherche en Informatique et en Automatique (INRIA) - PARIS - www.inria.fr
Domaine de Voluceau-Rocquencourt, B.P. 105
8153 Le Chesnay Cedex
France
Phone: +33 (0)1 39 63 5036
Email: paul.van_liedekerke@inria.fr

Personal

Address:

Rue- Vandenbussche -straat 52
1030 BRUSSEL-BRUXELLES
Belgium

Day of birth: 17/07/1976
Nationality: Belgian
Marital status: unmarried
Phone: (+32) (0) 494 87 81 97
Email: Paul.VanLiedekerke@biw.kuleuven.be or
Paul.VanLiedekerke@gmail.com

Profile

- **'Ingénieur Expert'** position at INRIA Paris, team *MAMBA* (<http://www.inria.fr/en/teams/mamba>), for modeling the behavior of Soft Matter (fluids and solids) and Biological Systems (cells, tissues), using experimental models, physics based methods and numerical tools (direction: Prof. Dr. Habil. D. Drasdo).
- Visiting professor, K.U.Leuven.

Experience

- 01/12/2012- now:
 - Working on the mechanical aspects in *cell based* models for (multi-)cellular systems at different scales. Validation of those models with experimental biological data (collaboration with experimental group). Applications: mechanical stress distribution in spheroids and tissues, growth of avascular tumors, mechano-transduction in cells, tissue organization.
 - Co-developer of CellSys, a C++ open source software project for the modeling multi-cellular systems and tissue quantification (<http://www.msysbio.com/>).
 - (2012 - 2013) INRIA responsible for the European research initiative SEURAT (EU- FP7), to reduce animal testing for new drugs (<http://www.notox-sb.eu/>).

- 30/04/2011- 01/12/2012: **Senior Postdoc** at KULeuven: Modeling of the draining properties of complex viscoelastic fluids under free surface conditions. Optimization and product improvement. Bilateral project with Dutch company.
 - 2007-2011: **Postdoc** at KULeuven: Development of a multiscale modeling framework for the mechanics of cells and tissues. O.T. KULeuven project "Multi-scale Mechanics of Fruit Tissue".
 - 2006-2007: **Research Engineer** at KULeuven: Study for the improvement of granular flow spread by a new conceptual spinning disc fertilizer spreader. (Bilateral project with BASF, US patent 649967).
 - 2001-2006: **Research Engineer and Phd-student** at KULeuven: Model development, conducting simulations and experiments for granular matter flow. Modeling of multi-body dynamics and contact mechanics.
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Collaborations

- **01/07/2012- now:** experimental group of prof. Pierre Nassoy (past : Institut Curie Paris, now : CNRS Bordeaux) on the development of the novel "Cellular Capsule Technique", to analyze the mechanical behavior and fate of tumor cells under confinement using experimental and numerical techniques.
 - 30/04/2011- 01/12/2012: R&D of MOBA N.V., The Netherlands.
 - 2007-2011: Department of Computer Science, K.U.Leuven (Prof. D. Roose).
 - 2006-2007: R&D of BASF, Germany.
 - 2001-2006: R&D of AMAZONE WERKE, Germany; DELVANO N.V., Belgium.
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Education

- Phd in Applied Biological Sciences - modeling of granular flow (K.U.Leuven, 2007). Thesis title : "Study of the granular fertilizers and the centrifugal spreader using Discrete Element Method (DEM) simulations "
 - Post graduate in Environmental Sciences and Technologies (University of Ghent, 2001). Thesis title : "A statistical study to relate physical parameters and psychological effects in the experience of noise".
 - Master of Physics, option experimental physics (University of Ghent, 1999). Thesis title : "A study of the atmospheric dispersion model HYSPLIT for Kr-85".
 - Secondary education : Koninklijk Technisch Atheneum, "Industriële Wetenschappen", Herzele (1995).
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Teaching

- Visiting professorship at the KULeuven for the course "Modeling of Tissue Physiology" (Prof. H. Ramon and Prof H. Van Oosterwyck, KULeuven), 13 contact hours, academic year 2013-2014.
 - Teaching assistant for the course "Control engineering" - exercises (by Prof. H. Ramon, KULeuven), academic year 2008-2009.
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Interests

- Modeling and study of the behavior of (living) soft matter, granular matter, fluids.
 - Mechanics and adhesion of arbitrary shaped bodies and biological cells, mechanotransduction.
 - Validation and hypothesis testing of *in silico* models with experimental data.
 - Multi-scale models, coarse-graining techniques, reaction-diffusion equations.
 - Numerical methods: Finite Element Method, Smoothed Particle Hydrodynamics (PDEs), Discrete Element Method.
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Relevant skills

- **On computer**
 - Main programming: C/C++, Python, Git, Pascal.
 - Matlab, Scilab, Maple, ..
 - GNU/Linux, MS Windows and related programs (Office, Kile,...).
 - Deal.II, a C++ open source FE package (www.dealii.org)
 - Parallel computing: OpenMP, notices of MPI and GPU/Cuda implementations.
 - **Conduction of experiments**
 - Experimental design.
 - Design of small experimental equipment to validate models (during Phd and Postdoc).
 - Knowledge of small electronic devices, motors, cameras, fast-frame camera.
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Languages

- Dutch (mother tongue)
 - English (advanced)
 - French (good)
 - German (reasonable understanding, took a few classes)
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Grants

- FWO project : "A multilevel, integrative approach for the study of cellmatrix mechanics and mechanotransduction during cell adhesion". Started 20/12/2012 , runs over 4 years, (Funds : 550.000 EURO) (**Co-promotor**).
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Awards

- **Best Poster Award:** Odenthal, T.; Smeets, B.; Van Liedekerke, P.; Tijssens, E.; Oosterwyck, V. and Ramon, H. A DEFORMABLE CELL MODEL AND ITS APPLICATION TO INVESTIGATE INITIAL CELL SPREADING International Symposium on Computer Methods in Biomechanics and Biomedical Engineering., 2013.
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Supervising of PhD and master students

- Assessor of Tommy Heck (Department of Mechanical Engineering, K.U.Leuven). Title to be assigned, phd degree to be obtained in 2017.
 - Assessor of Yaidel Reyes Lopez (Department of Computer science, K.U.Leuven). "MPI Parallelization of particle based codes", phd degree to be obtained in 2014.
 - Supervisor of ir. Bart Smeedts (Department of Biosystems, K.U.Leuven). "Quantitative study on the influence of process design on the biophysical microenvironment in 3D cell cultures", phd degree to be obtained in 2014.
 - Co-promotor of Dr. Tim Odenthal (Department of Biosystems, K.U.Leuven). "Development of an individual cell based model of cell aggregates in bone tissue engineering", phd degree obtained in 2013.
 - Assessor of Dr. Jurgen Vangeyte (Department of Biosystems, K.U.Leuven), thesis title "Development and validation of a low cost technique to predict spread patterns of centrifugal fertilizer spreaders.", phd degree obtained in 2013.
 - Assessor of Dr. ir. Pieter Gyhysels (Department of Computer science, K.U.Leuven). "Multiscale modeling of viscoelastic plant tissue", obtained 28 November 2010.
 - supervisor of Ir. Fadil Alitinisik (Master in BIO-Engineering), Master thesis title "Determination of cell mechanical properties by micropipette aspiration", degree obtained in 2011.
 - supervisor of Ir. Bart smeets (Master in BIO-Engineering), Master thesis title "Individual-based models of yeast colonies: a discrete element approach", degree obtained in 2010.
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Scientific visits

- **EMI Fraunhofer Institute 01/03/2011 - 01/06/2011.** To study impact and damage caused by shock waves on cells and tissues. Freiburg, Germany.
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Organization of events

- Co-organizer of a minisymposium (cells and tissues modeling) in the 4th Particles conference in 2015, Barcelona, Spain.
- Active membership of SPHERic, the SPH European Research Interest Community.
- Co-organizer of 1st international symposium on centrifugal fertiliser spreading, 15-16 september 2005, Leuven, Belgium.

- Co-organizer of LMCC Workshop on "Fundamentals and applications of SPH in science and engineering", October 25-26, 2010, Leuven, Belgium.

Reviews for international journals

Physical Biology, Microfluidics and Nanofluidics, Journal of Rheology, Computer Physics Communications, Applied mathematical Modeling, Engineering Analysis with Boundary Elements, Medical Biological Engineering and Computing, Powder Technology, Biosystems Engineering.

Attended courses (past)

- Colmot10: International Workshop on Statistical Physics and Biology of Collective Motion, Max Planck Institute Dresden, Germany, 8-12 November, 2010 (Poster presentation)
- Course on Nano- and Micro-Mechanics of Living Cell Adhesion, CISM Udine, Italy, June 14-18 (2010).
- Short course on particle based methods, CIMNE, Barcelona, Spain, May 14-1 (2008).
- 39 th Spring school SOFT MATTER, Julich, Germany (2008).

Publications

International journals

1. B. Smeets, T. Odenthal, J. Keresztes, S. Vanmaercke, **Van Liedekerke P.**, E. Tijskens, W. Saeys, H. Ramon, H. Van Oosterwijck (2014) Modeling contact interactions between triangulated rounded bodies for the discrete element method. *Comp. Meth. Appl. Mech. Eng.* 275(10).
2. T. Odenthal, B. Smeets, **Van Liedekerke P.**, E. Tijskens, H. Ramon, H. Van Oosterwijck (2013) Contact mechanics of adhesive triangulated bodies and application to a deformable cell model. *Plos Comp. Biol* 9(10).
3. **Van Liedekerke P.**, T. Odenthal, B. Smeets, H. Ramon (2013) Solving microscopic flow problems using Stokes equations in SPH. *Computer Physics Communications* 184(7).
4. Bart M. Nicolai, Ashim K. Datta, Thijs Defraeye, Mulugeta A. Delele, Quang T. Ho, Linus Opara, Herman Ramon, Engelbert Tijskens, Ruud van der Sman, **Paul Van Liedekerke**, Pieter Verboven (2012). Multiscale Modeling in Food Engineering. *Journal of Food Engineering* 277.
5. Smeets, B., Odenthal, T., Tijskens, E., Roberts, S., Tam, W., **Van Liedekerke, P.**, Van Oosterwyck, H., Ramon, H. (2012). Influence of mechanics on microcarrier cell expansion: a computational study. *Journal of Tissue Engineering and Regenerative Medicine: vol. 6. TERMIS World Congress. Vienna, Austria, 5-8 September 2012, 391-392.*
6. **Van Liedekerke P.**, Ghysels P., Tijskens E., Samaey G., Roose D. and Ramon H. (2011) The bruising of soft cellular tissue: a particle base simulation approach. *Soft Matter* 7, DOI:10.1039/CoSM01261K.
7. **Van Liedekerke P.**, Ghysels P., Tijskens E., Samaey G., Roose D. and Ramon H. (2010) Particle based model to simulate the micromechanics of a spherical biological cell. *Phys. Rev. E* 81(1). **Selected for the Virtual Journal of Biological Physics Research.**

8. **Van Liedekerke P.**, Ghysels P., Tijskens E., Samaey G., Roose D. and Ramon H. (2010) A particle based model to simulate the micromechanics of single plant parenchyma cells and aggregates. *Phys. Biol.* 7 026006.
9. De Ketelaere B, Mertens K, **Van Liedekerke P.** and Baerdemaeker J Eggshell (2010) strength assessment using Hertz contact theory. Part II: Implementation and validation *Journal of food engineering* (under review).
10. De Ketelaere B, Mertens K, **Van Liedekerke P.** and Baerdemaeker J (2010) Eggshell strength assessment using Hertz contact theory. Part I: Theory and applicability. *Journal of food engineering* (under review).
11. Ghysels P, Samaey G., **Van Liedekerke P.**, Tijskens E., Ramon H. and Roose D. (2010) Coarse implicit time integration of a cellular scale particle model for plant tissue deformation". *Int. J. Multiscale Com. Eng.* 8(4).
12. Geris L., **Van Liedekerke P.**, Smeets B., Tijskens E., Ramon H. (2010) A cell based modeling framework for tissue engineering applications. *Journal of Biomechanics* 43, 887-892.
13. Ghysels P, Samaey G., **Van Liedekerke P.**, Tijskens E., Ramon H. and Roose D. (2010) Multi-scale modeling of viscoelastic plant tissue. *Int. J. Multiscale Com. Eng.* 8(4).
14. Ghysels P, Samaey G., Tijskens B., **Van Liedekerke P.**, Ramon H. and Roose D. (2009) Multi-scale simulation of plant tissue deformation using a model for individual cell mechanics. *Phys. Biol.* 6(3).
15. **Van Liedekerke P.**, Tijskens E. and Ramon H. (2009) Discrete Element Simulations of the influence of fertilizer properties on the spread pattern from spinning disc spreaders. *Biosystems Engineering* 102 (4), 392-405.
16. **Van Liedekerke P.**, Tijskens E., Dintwa E.,F. Rioual, J. Vangeyte and Ramon H. (2008) DEM simulations of the particle flow on a centrifugal fertilizer spreader. *Powder Technology* 190(3), 348-360.
17. **Van Liedekerke P.**, Piron E., Vangeyte J., Villette S., Ramon H. and Engelbert Tijskens (2008) Recent results of experimentation and DEM modeling of centrifugal fertilizer spreading. *Granular Matter*, 10(4),247-255.
18. **Van Liedekerke P.**, Tijskens E., Dintwa E., Anthonis J. and Ramon H. (2006) A discrete element model for simulation of a spinning disc fertilizer spreader. I: Single particle simulations *Powder Technology* 170(2), 71-85.
19. Dintwa E., **Van Liedekerke P.**, Tijskens E., Ramon H. (2004) Model for simulation of particle flow on a centrifugal fertilizer spreader. *Biosystems Engineering* 87(4), 407-415.
20. Van Zeebroeck M., Tijskens E., **Van Liedekerke P.**, Deli V., De Baerdemaeker J. and. Ramon H (2003) Determination of the dynamical behaviour of biological materials during impact using a pendulum device *Journal of Sound and Vibration* 266(3), 465-480.

Short letters

1. Van Liedekerke P, Odenthal T. Smeets B., Ramon H. Modeling of low Reynolds flow problems using Stokes equations in SPH. 17th Spheric Newsletter, December 2013.
2. Van Liedekerke P. A combined SPH DEM model to understand the dynamic behaviour of plant cells. 7th Newsletter, December 2008.

International conference proceedings and seminar presentations

1. Paul van liedekerke, Johannes Neitsch, Tim Odenthal, Bart Smeets, Herman Ramon, Hans Van Oosterwijck, Dirk Drasdo. Simulation of cell mechanics in a micropipette aspiration experiment using a highly detail model. 9th European Conference on Mathematical and Theoretical Biology (**invited talk** to minisymposium)
2. Van Liedekerke P. "Modeling of tissue at different scales using particle methods" 5th International Conference on Computational Bioengineering, ICCB2013, 11-13 September, Leuven, Belgium
3. Van Liedekerke P. "Solving Stokes equations using SPH". Third Conference on Particle-Based Methods PARTICLES 2013, 18-20 September, Stuttgart, Germany (**Invited session**).
4. Van Liedekerke P. "Particle methods for simulations in biomechanics and cell mechanics. "Multiscale mechanics group of Prof. Stefan Luding, 6 May 2013, University of Twente, The Netherlands (**Invited talk**).
5. Cardinaels, R., Van de Velde, J., Mathues, W., Van Liedekerke, P., Moldenaers, P. (2013). A rheological characterisation of liquid egg albumen. Inside Food Symposium. Leuven (Belgium), 9-12 april 2013 (pp. 1-6).
6. Van Liedekerke, Particle methods for simulations in biomechanics and cell mechanics. *University of Leipzig, IZBI, Germany, August 6, 2013. (Invited talk)*.
7. Van Liedekerke, Micromechanics in Biological Cells: a Multiscale Modeling Approach. *University of Freiburg, group Prof. Dr. Alexander Blumen, Theoretical Polymer Physics, Germany, May 4, 2011. (Invited talk)*.
8. Van Liedekerke, Micromechanics in Biological Cells: a Multiscale Modeling Approach. *2nd conference on Particle-Based Methods (PARTICLES 2011), Spain, October 26-28, 2011 (Invited session)*.
9. Abera, M., Fanta, S., Verboven, P., Van Liedekerke, P., Nicolai, B., Carmeliet, J. (2011). Virtual Fruit Tissue Generation Using Cell Growth Modelling. In Verstraeten, W. (Ed.), Coppin, P. (Ed.), Sase, S. (Ed.), Van Henten, E. (Ed.), De Melo Abreu, J. (Ed.), *Acta Horticulturae: Vol. 919. International horticultural congress. Lisboa, Portugal, August 22-27, 2010 (pp. 107-114). Lisbon, Portugal: International Society for Horticultural Science.*
10. Van Liedekerke, P. Multscale applications of SPH in tissue modeling. *Forschungszentrum Juelich (Gerhard Gompper group), Germany, December 1, 2010 (Talk)*.
11. Van Liedekerke, P. Multiscale modeling of cellular tissue with particle methods. *EMI Fraunhofer intitute Freiburg, Germany, September 16, 2010. (Invited talk)*.
12. Van Liedekerke P., Ghysels P., Tijskens E. Samaey G. Roose D. and Ramon H. An SPH-DEM model to simulate the micromechanics of cells and tissues. *ECCM 16-21 may 2010, Paris, France (Oral presentation)*.
13. "Particle based Simulation of agricultural and biological processes". 17-18 November 2009 , Divison of Mathematics, Prof. MAJ Chaplain, University of Dundee (**Invited talk**).
14. Van Liedekerke P., Ghysels P., Tijskens E. Samaey G. Roose D. and Ramon H. A 3D particle model to simulate the micromechanics of a spherical biological cell. *Conference Particle Based Methods, 25-27 November 2009, Barcelona, Spain. ISBN 978-84-96736-82-5 (Oral presentation)*.
15. Van Liedekerke P., Ghysels P., Tijskens E. Samaey G. Roose D. and Ramon H. A particle based model to simulate the dynamics of plant cells. *Proceedings of the 4th Spheric Conference on Smooth Particle Hydrodynamics, May 2009, Nantes, France (Oral presentation)*.
16. Van Liedekerke P., Tijskens E., Dintwa E., Vangeyte J., Ramon H., 2006. DEM for centrifugal spreaders. Multi particle simulations and validations. *2nd international symposium for fertilizer spreading, October 24-25, Montoldre, France (Oral presentation)*.

17. Van Liedekerke P., Tijskens E., Dintwa E., Vangeyte J., Ramon H., 2005. Discrete element simulations for centrifugal spreaders. Single particle simulations. 1st International symposium for fertilizer spreading, September 10-11, Leuven, Belgium (Oral presentation).
18. Tijskens E., Loodts J., Van Zeebroeck M., Van Liedekerke P., Dintwa E., Ramon H., 2005. Particle Based Simulations with DEMeter++, Acta Horticulturae No.674. Proceedings of Model-IT 2005. International symposium on applications of modelling as an innovative technology in the Agri-Food-Chain. May 29- June 2, Leuven, Belgium.
19. Van Liedekerke P., Tijskens E., Dintwa E., Vangeyte J., Ramon H., 2004. Discrete element simulations for centrifugal spreaders. Modelling single particle trajectories . AgEng 2004 proceedings, September 12-16, leuven, Belgium
20. Vangeyte J., Sonck B., Van Liedekerke P. and Ramon H., 2004 Comparison of two methods to measure outlet velocity of fertilizer grains from a rotary disc. AgEng 2004 proceedings, September 12-16, leuven, Belgium p336-337.
21. Tijskens E., Loodts J., Van Zeebroeck M., Van Liedekerke P., Dintwa E., Ramon H., 2004. Particle Based Simulations with DEMeter++, Proceedings of Partec2004, International Conference for Particle Technology, Nuremberg, Germany, p16-18.
22. Tijskens E., Van Zeebroeck M., Van linden M., Van Liedekerke P., Dintwa E., Ramon H., 2001. DEM Modelling of Agricultural processes: an overview of recent projects, IMACS/IFAC Fourth International Symposium on Mathematical Modelling and Simulation in Agricultural and Bio-Industries. June 12-14, Haifa, Israel.

Book contributions

- Van Liedekerke P., Vrindts E., Moshou D., Anthonis J., Bravo C., 2006. Fertilization, weed and pest control. Volume VI: Information technology. CIGR Handbook of agricultural engineering (ISBN 1-892769-54-9).
- E. Tijskens, P. Van Liedekerke, H. Ramon, "Modelling to Aid Assessment of Fertilizer Handling and Spreading Characteristics", 2005. Proceeding 553 for the International Fertilizer Society (ISBN 978-0-85310-189-5)

Contact Persons

Prof. Dr. Habil. D. Drasdo,
INRIA (Institut National de Recherche en Informatique et en Automatique)
Domaine de Voluceau-Rocquencourt, B.P. 105
8153 Le Chesnay Cedex
France
Tel. +33 1 39 63 5036 Email: dirk.drasdo@inria.fr

Prof. Dr. Ir. H. Ramon,
Afdeling Mechatronica, Biostatistiek en Sensoren
Kasteelpark Arenberg 30 - bus 2456
3001 Heverlee
Belgium
Email: Herman.Ramon@biw.kuleuven.be

Prof. Dr. Ir. H. Van Oosterwijck
Biomechanics Section
Celestijnenlaan 300c - box 2419
3001 Heverlee
Belgium
Email: Hans.Vanoosterwyck@mech.kuleuven.be

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