

PETROS KOUMOUTSAKOS

Professorship for Computational Science
ETH Zürich
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Birthdate: 19 June 1963
Citizenship: Greece/Switzerland

EDUCATION

1993: *California Institute of Technology, Ph.D., Aeronautics and Applied Mathematics*
1988: *California Institute of Technology M.Sc., Aeronautics*
1987: *University of Michigan, Ann Arbor, M.Sc., Naval Architecture*
1986: *National Technical University of Athens, Greece, Diploma, Naval Architecture*

ACADEMIC APPOINTMENTS

2000- : *ETH Zürich, Professorship for Computational Science*
2016-2020: *Collegium Helveticum, Fellow*
1997-2000: *ETH Zürich, Assistant Professor of Computational Fluid Dynamics*
1996-2001: *NASA Ames, Research Associate*
1994-1996: *Stanford University, Center for Turbulence Research, Post-doc Fellow*
1993-1994: *California Institute of Technology, Center for Parallel Computing, Post-doc Fellow*

VISITING POSITIONS

2016-2017: *Radcliffe Institute of Advanced Study, Harvard University, Fellow*
2016-2017: *Massachusetts Institute of Technology, Visiting Professor*
2016, 2017, 2018: *California Institute of Technology, Moore Distinguished Scholar (6 months)*
2009-2015: *California Institute of Technology, Millikan Visiting Professor (18 months)*
2014: *UT Austin, Tinsley Oden Visiting Professor (2 months)*
2005: *University of Tokyo, Visiting Professor*

HONORS - AWARDS (selected)

Hall of Fame of the Digital Age, Zuse Institute Berlin, Germany, 2019
Foreign Member, National Academy of Engineering (NAE), USA, 2018
Moore Distinguished Scholar Award, California Institute of Technology, USA, 2016-2019
Distinguished Affiliated Professor, TU Munich, Germany, 2018
Einstein Fellow, Freie Universität Berlin, Germany, 2018
William and Flora Hewlett Foundation Fellow, Harvard University, USA, 2016-2017
Wallace Fellow, Massachusetts Institute of Technology, USA, 2016-2017
Fellow, Society of Industrial and Applied Mathematics (SIAM), 2015
Gordon Bell Award Winner (2013), Finalist (2015), Association of Computing Machinery (ACM)
Advanced Investigator Award, European Research Council (ERC), 2013
Fellow, American Physical Society (APS), 2012
Fellow, American Society of Mechanical Engineers (ASME), 2012
Fellow, University of Tokyo, Japan, 2007
Gallery of Fluid Motion Awards, American Physical Society (APS), 1995, 2000, 2007, 2012

ADMINISTRATION (selected)

Chair of the Access Committee (2016-2020), Chairman of the Scientific Steering Committee (2015-2016), Partnership for Advanced Computing in Europe (PRACE)
Founder and co-Director, Zurich Graduate School in Computational Science, 2014-2016
Advisory Board, Akademie Schloss Solitude, Germany, (2011-2015)
Comité Stratégique pour le Calcul Intensif, Ministry of Education, France, 2012-2014
Director, NVIDIA CUDA Research Center, 2011-
Founder and Director, ETH Zürich, Computational Laboratory (ETHZ CoLab), 2001-2007
Founder and Director, ETH Zürich, Institute of Computational Science (ICoS), 2000-2005

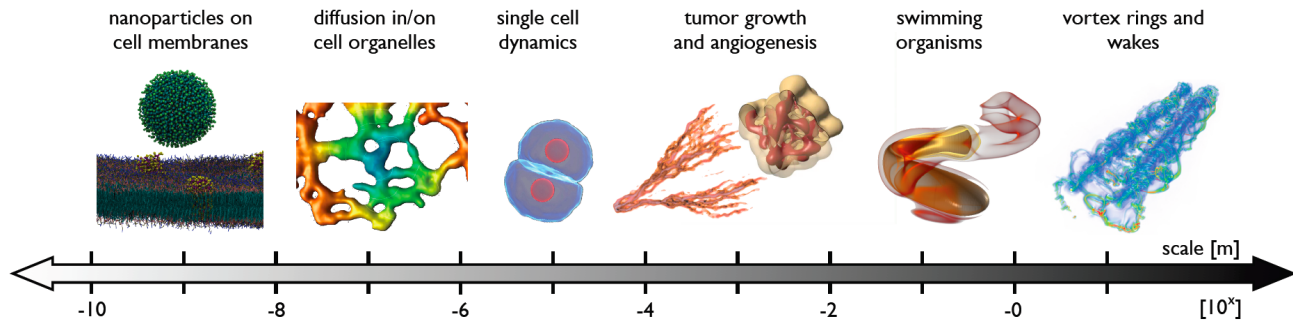
EDITORIAL BOARDS

Phys. Rev. Fluids (2018-), Comput. Phys. Commun. (2019-), J. Comput. Phys.(2010-2016), J.of Comp. and Theor. Nanoscience, Computational Particle Mechanics (2014-2017), J. Computational Science (2013-2017) Mathematics, Modeling and Simulation in Science, Engineering, Technology (Springer Book series).

MAJOR SCIENTIFIC CONTRIBUTIONS

Contributions in Computational Science, Fluid Mechanics, Nanotechnology, Biology and their Interfaces.

- ***Computational Science/Numerical Methods:*** multiscale particle methods, multiresolution adapted grids, coupling of atomistic and continuum descriptions, accelerated stochastic simulations.
- ***Computational Science/Computer Science:*** High Performance Computing (petascale simulations of two-phase flows (Gordon Bell award 2013),. Algorithms for Bio-inspired Optimization and its coupling with Machine Learning. Uncertainty Quantification for complex systems. Large scale Visualisations. Open source software in particle methods, optimisation, imaging and uncertainty quantification.
- ***Fluid Mechanics:*** Benchmark simulations of bluff body flows and high Re number vortex reconnection. Optimisation of swimmers demonstrated that fish escape patterns in nature are optimal.
- ***Nanotechnology:*** State of the art simulation of water interactions with graphene and carbon nanotubes. We devised validated interaction potentials that are considered the standard in the community. Large scale simulation of Nanofluidics, nanotube membrane interactions and nanoscale wetting.
- ***Biology:*** Pioneering simulations of diffusion in image reconstructed cell organelles, led to reevaluation of diffusion constants of several molecules in biology. Presented the first 3D simulations of angiogenesis inside an extracellular matrix. Extensive, open source, image and video analysis software for Biologists.



Examples from our state of the art, interdisciplinary simulations spanning a multitude of spatiotemporal scales.

INVITED CONFERENCE KEYNOTE PRESENTATIONS (2010-2018, selected)

- International Conference on Computational Science, Wuxi, China, 6/1-3, 2018
- Predictive Multi-scale Materials Modeling, Issac Newton Institute, Cambridge, 12/1-4, 2015
- International Conference on Computational Science, Reykjavik, Iceland, 6/1-3, 2015
- International Conference on Particle Based Methods, Barcelona, 28-30/9, 2015
- American Physical Society, Division of Fluid Dynamics Conference, San Francisco, 11/25-28, 2014
- SIAM Conference in Parallel Processing and Scientific Computing, Oregon, 2/18-22, 2014
- ACM Supercomputing 2013, Denver, USA, 11/20-23, 2013
- Von Neumann Colloquium of the American Mathematical Society, Snowbird, 2011
- International Conference in CFD, Saint Petersburg, 2010
- 8th European Fluid Mechanics Conference, Munich, 2010

ORGANIZATION OF CONFERENCES AND WORKSHOPS (selected)

- 2020: European Conference for Fluid Mechanics, Zurich, Switzerland
- 2017: International Conference on Computational Science (ICCS), Zurich, Switzerland
- 2016: PRACE Days, Prague, Czech Republic

- 2016: Fluid Mechanics and Collective Behavior, Monte Verita, Switzerland
 2015: 2nd Frontiers in Computational Physics Conference: Energy, Zurich, Switzerland
 2014, 2015: Partnership for Advanced Scientific Computing, Switzerland
 2005, 2008: School in Multiscale Modeling and Simulation, (Lugano, Zurich)
 2007: 6th International Congress on Industrial and Applied Mathematics, ICIAM07, Zurich,
 2000-present: Several conferences/summer schools for ERCOFTAC, ECCOMASS, EUROGEN

PUBLICATIONS

Links to: [ORCID](#), [ResearcherID:A-2846-2008](#), [Google Scholar](#)

MONOGRAPH

1. Cottet G. and Koumoutsakos P., *Vortex Methods: Theory and Practice*, Cambridge Univ. Press., 2000

EDITED VOLUMES (selected)

1. Koumoutsakos P. and Mezic I.(editors), Advances in Flow Control, *Lecture Notes in Control and Information Sciences*, © Springer Verlag, 2006
2. Hou T and Koumoutsakos P. (editors), Multiscale Modeling and Simulation in Materials and Life Sciences, *SIAM Multiscale Modeling and Simulation*, 2005
3. Attinger S. and Koumoutsakos P., (editors), *Advances in Multiscale Modeling and Simulation, Lecture Notes in Computational Science and Engineering*, © Springer Verlag, Berlin, 2004
4. Gyr A., Koumoutsakos P., Burr U.(editors), *Science and Art Symposium*, © Springer-Science+Business Media B.V., Dordrecht., 2000

JOURNAL PAPERS

1. Vlachas P. R., Pathak J., Hunt B. R., Sapsis T. P., Girvan M., Ott E. and Koumoutsakos P., Backpropagation algorithms and reservoir computing in recurrent neural networks for the forecasting of complex spatiotemporal dynamics, *Neural networks*, vol. 126, pp. 191-217, 2020.
2. Brunton S., Noack B. and Koumoutsakos P., Machine Learning for Fluid Mechanics, *Ann. Rev. Fluid Mech.* vol. 52, iss. 1, 477-508, 2020
3. Alexeev D., Amoudruz L., Litvinov S., Koumoutsakos P., Mirheo: high-performance mesoscale simulations for microfluidics, *Comp. Phys. Comm.*, p. 107298, 2020.
4. Bian X., Litvinov S. and Koumoutsakos P., Bending models of lipid bilayer membranes: spontaneous curvature and area-difference elasticity, *Comp. Meth. in App. Mech. Engin.*, vol. 359, p. 112758, 2020.
5. Karnakov P., Litvinov S. and Koumoutsakos P., A hybrid particle volume-of-fluid method for curvature estimation in multiphase flows, *Int.J. of Multiphase Flow*, vol. 125, p. 103209, 2020.
6. Weber P., Arampatzis G., Novati G., Verma S., Papadimitriou C. and Koumoutsakos P., Optimal flow sensing for schooling swimmers, *Biomimetics*, vol. 5, iss. 1, 2020.
7. Byeon W., Domínguez-Rodrigo M., Arampatzis G., Baquedano E., Yravedra J., Maté-González M. A. and Koumoutsakos P., Automated identification and deep classification of cut marks on bones and its paleoanthropological implications, *J. of Comp. Sci.*, vol. 32, pp. 36-43, 2019
8. Dietsche C., Mutlu B. R., Edd J. F., Koumoutsakos P. and Toner M., Dynamic particle ordering in oscillatory inertial microfluidics, *Microfluidics and Nanofluidics*, vol. 23, iss. 6, 2019.
9. Hashemi S. M. H., Karnakov P., Hadikhani P., Chinello E., Litvinov S., Moser C., Koumoutsakos P. and Psaltis D., A versatile and membrane-less electrochemical reactor for the electrolysis of water and brine, *Energy & Environmental Science*, 2019.
10. Larson K., Bowman C., Papadimitriou C., Koumoutsakos P. and Matzavinos A., Detection of arterial wall abnormalities via Bayesian model selection, *Royal. Soc. Open Sci.*, vol. 6, 182229, 2019.
11. Lipková J., Angelikopoulos P., Wu S., Alberts E., Wiestler B., Diehl C., Preibisch C., Pyka T., Combs S., Hadjidoukas P., Leemput K. V., Koumoutsakos P., Lowengrub J. and Menze B., Personalized radiotherapy design for glioblastoma: integrating mathematical tumor models, multimodal scans and bayesian inference, *IEEE Trans. on Medical Imaging*, p. 1-1, 2019.
12. Novati G., Mahadevan L. and Koumoutsakos P., Controlled gliding and perching through deep-reinforcement-learning, *Phys. Rev. Fluids*, vol. 4, iss. 9, 2019.
13. Papadopoulou E., Megaridis C. M., Walther J. H. and Koumoutsakos P., Ultrafast propulsion of water nanodroplets on patterned graphene, *ACS Nano*, 13,5, 5465-5472, 2019.

14. *Rasthofer U., Wermelinger F., Karnakov P., Šukys J. and Koumoutsakos P.*, Computational study of the collapse of a cloud with 12500 gas bubbles in a liquid, **Phys. Rev. Fluids**, vol. 4, p. 63602, 2019.
15. *Verma S., Papadimitriou C., Luethen N., Arampatzis G. and Koumoutsakos P.*, Optimal sensor placement for artificial swimmers, **J. of Fluid Mech.**, vol. 884, 2019.
16. *Zavadlav J., Arampatzis G. and Koumoutsakos P.*, Bayesian selection for coarse-grained models of liquid water, **Scientific Reports**, vol. 9, iss. 1, 2019.
17. *Arampatzis G., Wälchli D., Angelikopoulos P., Wu S., Hadjidoukas P. and Koumoutsakos P.*, Langevin diffusion for population based sampling with an application in bayesian inference for pharmacodynamics, **SIAM J. Sci. Comput.**, vol. 40, iss. 3, p. B788–B811, 2018.
18. *Lipková J., Arampatzis G., Chatelain P., Menze B. and Koumoutsakos P.*, S-leaping: an adaptive, accelerated stochastic simulation algorithm, bridging τ -leaping and r-leaping, **Bull. of Math. Biology**, vol.81, iss.8, pp. 3074-3096, 2018.
19. *Verma S., Novati G., Koumoutsakos P.*, Efficient collective swimming by harnessing vortices through deep reinforcement learning, **Proc. Nat. Acad. Sci**, 115 (23),pp. 5849-5854, 2018.
20. *Vlachas P. R., Byeon W., Zhong Y., Sapsis T. P. and Koumoutsakos P.*, Data-Driven Forecasting of High-Dimensional Chaotic Systems with Long-Short Term Memory Networks, **Proc. Royal Soc. A**, 474, 20170844, 2018.
21. *Wan Z. Y., Vlachas P. R., Koumoutsakos P. and Sapsis T. P.*, Data-assisted reduced-order modeling of extreme events in complex dynamical systems, **PLoS ONE**, vol. 13, iss. 5, pp. 1-22, 2018.
22. *Wermelinger F., Rasthofer U., Hadjidoukas P. E. and P. Koumoutsakos*, Petascale simulations of compressible flows with interfaces, **J. Comput. Sci**, Vol. 26, pp. 217-225, 2018.
23. *Wu S., Angelikopoulos P., Beck J., Koumoutsakos P.*, Hierarchical Stochastic Model in Bayesian Inference for Engineering Applications: Theoretical Implications and Efficient Approximation, **ACSE-ASME J. of Risk and Uncertainty in Engineering Systems**, Part B 5, iss. 1, 011006, 2018.
24. *Šukys J., Rasthofer U., Wermelinger, F., Hadjidoukas P. and Koumoutsakos P.*, “Multilevel control variates for uncertainty quantification in simulations of cloud cavitation,” **SIAM J. Sci. Comput.**, vol. 40, iss. 5, p. B1361–B1390, 2018.
25. *Cruz-Chú E.R., Papadopoulou E., Walther J.H., Popadić A, Li G., Praprotnik M, Koumoutsakos P*, On Phonons and Water Flow Enhancement in Carbon Nanotubes, **Nature Nano.**, Vol. 12, 12, pp.1106-1107, 2017.
26. *Karathanasopoulos N., Angelikopoulos P., Papadimitriou C., Koumoutsakos P.*, Bayesian identification of the tendon fascicle’s structural composition using finite element models for helical geometries, **Computer Methods in Applied Mechanics and Engineering**, vol. 313, pp. 744-758, 2017.
27. *Kulakova L., Arampatzis G., Angelikopoulos P., Hadjidoukas P., Papadimitriou C, Koumoutsakos P.*, Data driven inference for the repulsive exponent of the Lennard-Jones potential in Molecular Dynamics simulations, **Scientific Reports**, Vol.7, Art. No. 16576, 2017.
28. *Mosimann B., Arampatzis G., Amylidi-Mohr S., Bessire A., Spinelli M., Koumoutsakos P., Surbek D., Raio L.*, Reference Ranges for Fetal Atrioventricular and Ventriculoatrial Time Intervals and Their Ratios during Normal Pregnancy, DOI:10.1159/000481349, **Fetal Diagnosis and Therapy**, 2017.
29. *Novati G., Verma S., Alexeev D., Rossinelli D, van Rees W, , Koumoutsakos P.*, Synchronization through Learning for Two Self-Propelled Swimmers, **Bioinspiration and Biomimetics**, 12,3, pp. 744-758 , 2017.
30. *Oyarzua E., Walther J.H.P., Megaridis C.M, Koumoutsakos P., Zambrano H.*, Carbon Nanotubes as Thermally Induced Water Pumps, **ACS Nano**, 11(10), pp.9997-10002, 2017.
31. *Verma S., Abbati G., Novati G., Koumoutsakos P.*, Computing the force distribution on the surface of complex, deforming geometries using Vortex methods and Brinkman penalization, **Int. J. Num. Meth. Fluids**, 85, pp. 484–501, 2017.
32. *Wu S., Angelikopoulos P., Papadimitriou C., Koumoutsakos P.*, Bayesian Annealed Sequential Importance Sampling (BASIS): an unbiased version of Transitional Markov Chain Monte Carlo, **ACSE-ASME J. of Risk and Uncertainty in Engineering Systems**, Part B 4, iss. 1, 011008-1/13, 2017.
33. *Chen J., Walther J.H., Koumoutsakos P.*, Ultrafast cooling by covalently bonded graphene-carbon nanotube hybrid immersed in water, **Nanotechnology**, 27, 465705, pp. 1-8, 2016.
34. *Gazzola M., Tchieu A.A., Alexeev D., Brauer A. de, Koumoutsakos P.*, Learning to school in the presence of hydrodynamic interactions, **J. Fluid Mech.**, Vol. 789, pp. 726-749, 2016
35. *Wu S., Angelikopoulos P., Tauriello G., Papadimitriou C., Koumoutsakos P.*, Fusing Heterogeneous data for the calibration of molecular dynamics force fields using hierarchical Bayesian models, **J. Chem. Phys.** , 145(24), 2016.

36. Alexeev D., Chen J., Walther J.H., Giapis K.P., Angelikopoulos P., Koumoutsakos P., Kapitza Resistance between Few-Layer Graphene and Water: Liquid Layering Effects, **Nano Letters**, 15(9), 5744-5749, 2015.
37. Angelikopoulos P., Papadimitriou C., Koumoutsakos P., X-TMCMC: Adaptive Kriging for Bayesian inverse modeling. **Comput. Methods Appl. Mech. Engrg.**, 289:409-428, 2015.
38. Baumann M.U., Marti M., Durrer L., Koumoutsakos P., Angelikopoulos P., Bolla D., Acharya G., Bichsel U., Surbek D.V., Raio L., Placental Plasticity in Monochorionic Twins: Impact on Birth Weight and Placental Weight. **Placenta**, 36(9), 1018-1023, 2015.
39. Chen J., Walther J.H., Koumoutsakos P., Covalently Bonded Graphene-Carbon Nanotube Hybrid for High-Performance Thermal Interfaces, **Advanced Functional Materials**, 25, 7539-7545, 2015.
40. Finley S., Angelikopoulos P., Koumoutsakos P., Popel A., Pharmacokinetics of anti-VEGF agent aflibercept in cancer predicted by data-driven, molecular-detailed model, **Pharmacometrics and Systems Pharmacology**, 4(11), 641-649, 2015.
41. Hadjidoukas P. E., Angelikopoulos P., Papadimitriou C., Koumoutsakos P., Π4U: A high performance computing framework for Bayesian uncertainty quantification of complex models, **J. Comput. Physics**, 284, 1-21, 2015.
42. Hejlesen M.M., Koumoutsakos P., Leonard A., Walther J.H., Iterative Brinkman penalization for remeshed vortex methods, **J. Comput. Physics**, 280, 547-562, 2015.
43. Huhn F., van Rees W.M., Gazzola M., Rossinelli D., Haller G., Koumoutsakos P., Quantitative flow analysis of swimming dynamics with coherent Lagrangian vortices, **Chaos**, 25, 087405, 2015.
44. Jones P.R., Hao X., Cruz-Chu E., Rykaczewski K., Nandy K., Schutzius T.M., Varanasi K.K., Megaridis C.M., Walther J.H., Koumoutsakos P., Espinosa D.H., Patankar N.A., Sustaining Dry Surfaces Under Water, **Scientific Reports**, 5, 12311, 2015.
45. Popadic A., Praprotnik M., Koumoutsakos P., Walther J.H., Continuum simulations of water flow past fullerene molecules, **Eur. Phys. J.**, 224, 2321-2330, 2015.
46. van Rees W.M., Novati G., Koumoutsakos P., Self-propulsion of a counter-rotating cylinder pair in a viscous fluid, **Phys. of Fluids**, 27, 2015.
47. van Rees W.M., Gazzola M., Koumoutsakos P., Optimal Morphokinetics for Undulatory Swimmers at Intermediate Reynolds Numbers, **J. of Fluid Mech**, Vol. 775, pp. 178-188, 2015.
48. Barbier de Reuille P., Routier-Kierzkowska A.L., Kierzkowski D., Bassel G.W., Schüpbach T., Tauriello G., Bajpai N., Strauss S., Weber A., Kiss A., Burian A., Hofhuis H., Sapala A., Lipowczan M., Heimlicher M.B., Robinson S., Bayer E.M., Basler K., Koumoutsakos P., Roeder A.H.K., Aegerter-Wilmsen T., Nakayama N., Tsiantis M., Hay A., Kwiatkowska D., Xenarios I., Kuhlemeier C., Smith R.S., MorphoGraphX: A platform for quantifying morphogenesis in 4D. **eLife**, 4:e05864, 2015.
49. Rossinelli D., Hejazialhosseini B., van Rees W.M., Gazzola M., Bergdorf M., Koumoutsakos P., MRAG-I2D: Multi-resolution adapted grids for remeshed vortex methods on multicore architectures. **J. Comput. Phys.**, 288:1-8, 2015.
50. Tauriello G., Koumoutsakos P., A comparative study of penalization and phase field methods for the solution of the diffusion equation in complex geometries, **J. Comput. Physics**, 283, 388-407, 2015.
51. Tauriello G., Meyer H.M., Smith R.S., Koumoutsakos P., Roeder A., Variability and constancy in cellular growth of Arabidopsis sepals, **Plant Physiology**, 169, 2342-2358, 2015.
52. Wu S., Angelikopoulos P., Papadimitriou C., Moser R., Koumoutsakos P., A hierarchical Bayesian framework for force field selection in molecular dynamics simulations, **Phil. Trans. Royal Soc. A**, 374(2060), 2015.
53. Chen J., Walther J.H., Koumoutsakos P., Strain Engineering of Kapitza Resistance in Few Layer Graphene, **Nano Letters**, 14, pp.819-825, 2014.
54. Cruz-Chu E., Malafeev A., Pajarskas T., Pivkin I., Koumoutsakos P., Structure and Response to Flow of the Glycocalyx Layer, **Biophysical J.**, 6(1), pp 232-243, 2014.
55. Gazzola M., Hejazialhosseini B., Koumoutsakos P., Reinforcement Learning and Wavelet Adapted Vortex Methods for Simulations of Self-propelled Swimmers, **SIAM J. Sci. Comput.**, 36(3):B622-B639, 2014.
56. Hadjidoukas P. E., Angelikopoulos P., Rossinelli D., Alexeev D., Papadimitriou C., Koumoutsakos P., Bayesian uncertainty quantification and propagation for discrete element simulations of granular materials. **Comput. Methods Appl. Mech. Engrg.**, 282, pp.218-238, 2014.
57. Milde F., Tauriello G., Haberkern H., Koumoutsakos P., SEM++: a particle model of cellular growth, signaling and migration, **Computational particle mechanics**, vol. 1, iss. 2, p. 211-227, 2014.

58. *Popadic A., Walther J.H., Koumoutsakos P., Praprotnik M.*, Continuum simulations of water flow in carbon nanotube membranes, **New J. Physics**, 16(8):082001, 2014.
59. *van Rees W. M., Rossinelli D., Hadjidoukas P., Koumoutsakos P.*, High performance CPU/GPU multiresolution poisson solver, **Parallel computing: accelerating computational science and engineering (CSE)**, vol. 1, iss. 1, p. 481–490, 2014.
60. *Angelikopoulos P., Papadimitriou C., Koumoutsakos P.*, Data driven, predictive molecular dynamics for nanoscale flow simulations under uncertainty. **J. of Phys. Chemistry B**, 117(47), pp.14808–14816, 2013.
61. *Franco D., Milde F., Klingauf M., Orsenigo F., Dejana E., Poulidakos D., Cecchini M., Koumoutsakos P., Ferrari A. and Kurtcuoglu V.*, Accelerated endothelial wound healing on microstructured substrates under flow, **Biomaterials**, 34(5):1488-1497, 2013.
62. *Hejazialhosseini B., Rossinelli D., Koumoutsakos P.*, 3d shock-bubble interaction, **Physics of fluids**, vol. 25, iss. 9, p. 91105, 2013.
63. *Hejazialhosseini B., Rossinelli D., Koumoutsakos P.*, Vortex dynamics in 3D shock-bubble interaction, **Physics of Fluids**, 25, 110816, 2013.
64. *Koumoutsakos, P., Pivkin, I., Milde F.*, The Fluid Mechanics of Cancer and its Therapy, **Annual Reviews of Fluid Mechanics**, 45:325-355, 2013.
65. *Koumoutsakos P., Feigelman J.*, Multiscale stochastic simulations of chemical reactions with regulated scale separation, **J. of Comp. Physics**, 244, pp.290-297, 2013.
66. *Milde F., Lauw S., Iruela-Arispe L., Koumoutsakos P.*, The mouse retina in 3D: quantification of vascular growth and remodeling. **Integrative Biology (cover)**, Vol. 5 No. 12, pp:1419-1510, 2013.
67. *van Rees W., Gazzola M., Koumoutsakos P.*, Optimal shapes for anguilliform swimmers at intermediate Reynolds numbers, **J. of Fluid Mech (cover)**, 722, 2013.
68. *Tauriello G. and Koumoutsakos P.*, Coupling Remeshed Particle and Phase Field Methods for the Simulation of Reaction-Diffusion on the Surface and the Interior of Deforming Geometries, **SIAM J. Sci. Comput.**, 35(6), B1285–B1303, 2013.
69. *Walther J.H., Ritos K., Cruz-Chu E., Megaridis C.M., Koumoutsakos P.*, Barriers to Superfast Water Transport for Carbon Nanotube Membranes, **Nano Letters**, 13 (5), pp:1910–1914, 2013.
70. *Angelikopoulos, P., Papadimitriou K., Koumoutsakos P.*, Bayesian uncertainty quantification and propagation in molecular dynamics simulations: A high performance computing framework, **J. Chem. Phys.**, 137, 144103, 2012.
71. *Conti C., Rossinelli D., Koumoutsakos P.*, GPU and APU Computations of Finite Time Lyapunov Exponent Fields, **J. of Comp. Physics**, 231(5):2229–2244, 2012.
72. *Gazzola M., van Rees W., Koumoutsakos P.*, C-start: Optimal Start of Larval Fish, **J. of Fluid Mech (cover)**, 698, 1-14, 2012.
73. *Gazzola, M., Mimeau C., Tchieu A.A., Koumoutsakos P.*, Flow mediated interactions between two cylinders at finite Re numbers, **Physics of Fluids**, 24(4):043103, 2012.
74. *Milde F, Franco D., Ferrari A, Kurtcuoglou V., Poulidakos D. and Koumoutsakos P.*, Cell Image Velocimetry (CIV): boosting the automated quantification of cell migration in wound healing assays, **Integrative Biology**, 4(11):1437-1447, 2012.
75. *Paolucci M., Kossman D., Conte R., Lukowicz P., Argyrakis P., Blandford A., Bonelli G., Anderson S., de Freitas S., Edmonds B., Gilbert N., Gross M., Kolhammer J., Koumoutsakos P. Krause A., Linner Bo., Slusallek P, Sorkne O., Sumner RW., Helbing D.*, Towards a Living Earth Simulator, **European Phys. J.**, Vol. 214, pp:77-108, 2012.
76. *van Rees W., Hussain F. and Koumoutsakos P.*, Vortex Reconnection at $Re=10^4$, **Physics of Fluids**, 24, 075105, 2012.
77. *Walther J.H., Praprotnik M., Kotsalis EM., Koumoutsakos P.*, Multiscale Simulation of Water Flow Past a C540 Fullerene, **J. of Comp. Physics**, 231(7):2677-2681, 2012.
78. *Bayati B., Chatelain P., Koumoutsakos P.*, Adaptive Mesh refinement for stochastic reaction-diffusion equations, **J. of Comp. Physics**, 230, 13-26, 2011.
79. *Gazzola M., Vasilyev O.V., Koumoutsakos P.*, Shape optimization for drag reduction in linked bodies using evolution strategies, **Comput. and Struct.**, 89, pp. 1224-1231, 2011.
80. *Gazzola M., Chatelain P., van Rees W., Koumoutsakos P.*, Simulations of Single and Multiple Anguilliform Swimmers with non-divergence free deforming geometries, **J. of Comp. Physics**, 230(19), 7093-7114, 2011.
81. *Koumoutsakos P., Bayati B., Milde F. and Tauriello G.*, Particle Simulations of Morphogenesis, **Math. Mod. Med. Appl. S.**, 21, pp. 955-1006, 2011.

82. *van Rees W., Leonard A., Pullin D., Koumoutsakos P.*, A comparison of Vortex and Pseudo-Spectral Methods for the Simulation of Periodic Vortical Flows at High Reynolds Numbers, **J. of Comp. Physics**, 230(8), 2794-2805, 2011.
83. *Rossinelli D., Conti C., Petros Koumoutsakos P.*, Mesh-particle interpolations on GPUs and multicore CPUs, **Phil. Trans. R. Soc. A**, 369, pp. 2164-2175, 2011.
84. *Rossinelli D., Spampinato D., Hejazialhosseini B., Koumoutsakos P.*, Multi-core/multi-GPU accelerated simulations of multiphase compressible flows using wavelet adapted grids, **SIAM J. Sci. Comp.**, 33, 512-540, 2011.
85. *Schwank G., Tauriello G., Yagi R., Kranz E., Koumoutsakos P., Basler K.*, Antagonistic growth regulation by Dpp and Fat drives uniform cell proliferation, **Developmental Cell**, 20(1), 123-30, 2011.
86. *Bayati B., Owhadi H., Koumoutsakos P.*, A Cutoff Phenomenon in Accelerated Stochastic Simulation Algorithms Using Flow Averaging, **J. of Chem. Phys.**, 133, 2441171-2441176, 2010.
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SOFTWARE

Over the last 15 years we have developed a number of open source software packages in the areas of Biological Imaging, Stochastic Optimisation, Particle Methods and Uncertainty Quantification. Links to this software can be found in <http://cse-lab.ethz.ch/software/>

Software packages include:

- **TScratch** is a software tool to automatically analyze wound healing assays (scratch assays).
- **MorphoGraphX** is a free Linux application for the visualization and analysis of 3D biological datasets.
- **Particle Tracker** is a 2D and 3D feature point-tracking tool. It is embedded in IMAGEJ
- **Cell Image Velocimetry (CIV)** extracts and analyze detailed spatiotemporal information for cell migration, as studied by wound healing assays.
- **Parallel Particle Mesh Library (PPM)** is library for particle and particle-mesh simulations exploiting a unifying formulation for the simulations of discrete and continuous systems using particles
- **Cubism-MPCF** The 2013 Gordon Bell winning code on 3D Finite Volume Simulations for Multiphase Flows (*available on GitHub*)
- **uDeviceX**: The 2015 Gordon Bell finalist on DPD simulations for blood and cell flows in microfluidic devices - The in-silico Lab-on-a-Chip (*available on GitHub*).
- **CMA-ES**: The Covariance Matrix Adaptation Evolution Strategy (CMA-ES) for Noisy and Global Optimization is an evolutionary (search) algorithm for difficult optimization problems.
- **Pi4U** is an extensible framework for non-intrusive Bayesian Uncertainty Quantification and Propagation of complex and computationally demanding physical models, that can exploit massively parallel computer architectures.

TEACHING:

At ETHZ I have taught several courses in Engineering, Mathematics (Introductory and advanced Numerical Methods, Multiscale Modeling and Simulation) and Computer Science (Machine Learning, first ever class at ETHZ in 2000, High Performance Computing, as well as Introductory Courses for Computational Scientists and Engineers). During my sabbaticals at Caltech and MIT I have taught classes in Flow simulations using Particle Methods and Methods for Computational Science.

FORMER GROUP MEMBERS

PhD Students

1. *Dmitry Alexeev*, 2019, Present: NVIDIA Zurich
2. *Lina Kulakova*, 2017, Present: Google, Zurich
3. *Christian Conti*, 2016, Present: Post-doctoral fellow, Tokyo Tech Japan
4. *Wim van Rees*, 2014, Present: Assistant Professor, MIT, USA
5. *Gerardo Tauriello*, 2014, Present: Post-doctoral fellow, ETH Zurich in Basel, Switzerland
6. *Babak Hejazialhosseini*, 2013, Present: Apple, USA
7. *Mattia Gazzola*, 2012, Present: Assistant Professor UIUC, USA
8. *Florian Milde*, 2012, Present: Head Medical Development, Noser Engineering, Switzerland
9. *Basil Bayati*, 2011, Present: Intellectual Ventures, USA
10. *Diego Rossinelli*, 2011, ABB Award for best PhD thesis in IT in CH, Present: University of Zurich
11. *Evangelos Kotsalis*, 2009, Present: MacKinsey Consulting, Switzerland
12. *Michael Bergdorf*, 2007, ERCOFTAC Award, Present: DE Shaw, USA
13. *Stefan Kern*, 2007, Present: General Electric, Munich, Germany
14. *Urs Zimmerli*, 2006, Present: Plant Manager, Borregaard Schweiz AG, Switzerland
15. *Simone Hieber*, 2006, Present: Bern University Hospital, Switzerland
16. *Ivo F. Sbalzarini*, 2005, D. Chorafas award, Present: Professor TU Dresden, Germany
17. *Thomas Werder*, 2005, ETHZ medal for PhD thesis, ABB Award, Present: ABB, Switzerland
18. *Dirk Bueche*, 2004, ETHZ medal for PhD thesis, Present: MAN Turbo, Switzerland
19. *Sibylle Mueller*, 2002, ETHZ medal for PhD thesis, ECCOMASS Award, Present: BOSE Germany
20. *Michele Milano*, 2002 Present: Associate Professor, State University of New York, Buffalo, USA

Post-Doctoral Fellows (selected)

1. *Dr. Siddhartha Verma*, Assistant Professor, Florida Atlantic University, USA
2. *Dr. Stephen Wu*, Assistant Professor, Institute of Statistical Mathematics, Japan
3. *Dr. Wonmin Byeon*, NVIDIA Research, USA.
4. *Dr. Jie Chen*, Associate Professor, Jia Tong University, China
5. *Dr. Jens-Honore Walther*, Professor, Danish Technical University, Denmark
6. *Dr. Sabine Attinger*, Professor and Head of the Centre of Environmental Research Leipzig, Germany
7. *Dr. Anne Auger*, Permanent Researcher, INRIA, France
8. *Dr. Philippe Chatelain*, Present: Professor, UC Louvain, Belgium
9. *Dr. Panagiotis Angelikopoulos*, Present: DE Shaw, USA
10. *Dr. Thore Graepel*, Professor at UCL and Principal Researcher, Microsoft Research, UK
11. *Dr. Itsuo Hanasaki*, Professor, Kobe University, Japan
12. *Dr. Nikolaus Hansen*, Permanent Researcher, INRIA, France
13. *Dr. Shilpa Khatri*, Assistant Professor, UC Merced, USA
14. *Dr. Andrew Tchieu*, Aerodynamics Engineer, Space-X, USA

LANGUAGES: English, French, German, Greek