

Dr Aljaz Godec

Emmy Noether group Mathematical bioPhysics, Max Planck Institute for Multidisciplinary Sciences

(formerly Max Planck Institute for Biophysical Chemistry)

9th May 2022

Personal data:

Family name, first name: Godec Aljaz

Date of birth: 22nd February 1984 (Maribor, Slovenia)

Nationality: Slovenia

Marital status: married, with three children

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Secretary: Ms. Eveline Heinemann & Ms. Stefanie Teichmann

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Education and Positions:

Diploma (2007) and Doctorate (2012), University of Ljubljana, Slovenia

2017 - present head of the Mathematical bioPhysics Group, Max Planck Institute for Multidisciplinary Sciences, Göttingen, Germany

(formerly Max Planck Institute for Biophysical Chemistry)

(hosted by Prof. Helmut Grubmüller)

2014 - 2017 Alexander von Humboldt postdoctoral fellow, Theoretical Physics at the Institute of Physics and Astronomy, University of Potsdam, Germany

(with Prof. Ralf Metzler)

2013 - 2017 research associate, Theory Department, National Institute of Chemistry (NIC), Ljubljana, Slovenia (on leave)

2012 - 2014 postdoctoral fellow, Theoretical Physics at the Institute of Physics and Astronomy, University of Potsdam, Germany (with Prof. Ralf Metzler)

2012 - 2013 research fellow, Theory Department, National Institute of Chemistry, Ljubljana, Slovenia (on leave)

2007 - 2012 young researcher, Theory Department, NIC Ljubljana, Slovenia

Other education and training:

- 2021 Training on “Unconscious bias & thought patterns” – workshop on gender-IQ
- 2009 Training on intellectual property, patent practice and academics entrepreneurship (workshop organized by the Slovenian research agency ARRS in Ljubljana)
- 2008 39th IFF Spring School on soft matter physics: Soft Matter – From Synthetic to Biological Materials, Research Centre Jülich (GER)

Languages:

Slovene (mother tongue), English (proficient), German (proficient); FORTRAN (proficient), Mathematica (proficient)

Publications and citations:

59 journal articles, 1 book chapter; Hirsch factor (H-index): Web of Science 21, Google Scholar 23; Citations: >1400 citations; >45 citations in 2014, >70 citations in 2015, >80 citations in 2016, >100 citations in 2017, >100 citations in 2018, >150 citations in 2019, >220 citations in 2020, >240 citations in 2021, >80 citations in 2022 (so far)

Awards, prizes and honors:

- 2020 Institute of Physics (IOP) trusted reviewer
- 2020 Outstanding Reviewer for Journal of Physics A: Math. Theor.
- 2017 Karl-Scheel Prize of the Berlin Physical Society (PGzB)
- 2017 Academy of Finland Fellow (declined)
- 2017 DFG Emmy Noether group
- 2016 Journal of Physics A Emerging talent
- 2016 PKS Distinguished Postdoctoral Fellow (declined)
- 2015 participant in the 65th Lindau Nobel laureate meeting
- 2015 Josef Stefan Golden Emblem Prize for PhD thesis with the highest impact
- 2014 Alexander von Humboldt fellowship for postdoctoral researchers
- 2012 Pregl award for exceptional PhD thesis
- 2007 Zois scholarship for gifted students

Recent Conferences and Seminars/Workshops (since 2020)

- 2022 Non-Markovian dynamics far from equilibrium, ICTP Trieste (ITA) - *Time-reversal symmetry and dissipation in dynamics with memory* (invited talk)
- 2022 DFG Research Unit FOR-5099 Colloquium, University of Freiburg (GER) - *Physics of shadows: thermodynamic implications of memory in coarse-grained dynamics* (invited talk *)
- 2022 Physics Colloquium, CUA Washington (USA) - *Physics of shadows: thermodynamic implications of memory in low-dimensional observables* (invited talk *)
- 2021 Venice meeting on Fluctuations in small complex systems V (ITA) - *Criticality in stochastic many-body systems: from cell adhesion to the Ising model (and back)* (invited talk)
- 2021 Physics Colloquium, Northwestern Polytechnical University (China) - *Observing Shadows: Mathematical Signatures of Memory and Their Physical Interpretation* (invited talk; virtual)
- 2021 Physics & Applied Mathematics Colloquium, University of Shanghai (virtual) - *Observing Shadows: Mathematical Signatures of Memory and Their Physical Interpretation* (invited talk)
- 2021 DPG Spring Meeting (virtual) - *Small diffusive systems warm up faster than they cool down* (invited talk / “Hauptvortrag”)
- 2021 APS March Meeting (virtual) - *Small systems warm up faster than they cool down*

(contributed talk)

2020 Physics colloquium, NORDITA Stockholm (SWE) - *Why small systems warm up faster than they cool down* (invited talk)

Research funding and supervision:

Funding: - Emmy Noether research group, German Research Foundation (DFG) (2017-2023; ~1.7 million EUR)
 - Academy of Finland Fellow (declined), Academy of Finland (2017-2022, ~440 K EUR)
 - Humboldt Fellowship for Postdoctoral Researchers, Alexander von Humboldt foundation (2014-2017; 125 K EUR)
 - Independent research project, Slovenian Research Agency ARRS (2016-2017, 50 K EUR)

pending:

- ERC consolidator grant 2022
 - Henriette Herz-Scouting-Programme (Alexander von Humboldt Foundation)

Supervision:

Completed: BSc Theses: Oliver Kindler (2014), Alex Berdin (2014), and Markus Dahlenburg (2015) [co-supervisor, University of Potsdam]
 Michelle Kemper (2019), Mathematics Dept. Univ. Göttingen, [co-supervision with Prof. Anja Sturm]
Diploma Thesis: Ivan Jamnik (2012) [co-supervisor, University of Ljubljana]
MSc Theses: Maria Schwarzl, (2014) [co-supervisor, University of Potsdam], Janik Schüttler (2021), Physics Dept. ETH Zürich [co-supervision with Prof. Matthias Krüger]
PhD Theses: Henning Krüsemann (2016) [co-supervisor, University of Potsdam] Alessio Lapolla (2021), Physics Dept. & GGNB-PBCS, Univ. Göttingen

Ongoing: BSc Theses:

Santiago Cabarrero Ibanez (since Mar. 2021), Mathematics Dept. Univ. Göttingen, [co-supervision with Prof. Anja Sturm]

MSc Theses:

Gerrit Wellecke (since Oct. 2021), Physics Dept. Univ. Göttingen

PhD Theses:

Kristian Blom (since Sep. 2018), Maximillian Vossel (since Sep. 2018)

Cai Dieball (since Oct. 2019), Rick Bebon (since Jan. 2022)

Refereeing

Referee for: Science Advances; PNAS; Physical Review Letters; Physical Review X; Physical Review Research; Physical Review E; New Journal of Physics; Journal of Statistical Mechanics; Journal of Chemical Physics; Scientific Reports; Soft Matter; Journal of Physics A: Mathematical and Theoretical; Biophysical Journal; Biophysical Reports; PlosONE; Proceedings of the Royal Society A; Chaos, Solitons & Fractals; Journal of Biological Physics; Biophysical Journal; Europhysics Letters; Langmuir; Physics Letters A; Applied Mathematics and Computation; Physica A; Physical Biology; Acta Biomaterialia

Editorial role

Associate editor for: Frontiers in Physics

Teaching experience

- i) Full faculty member of GGNB (Göttingen Graduate School for Neurosciences, Biophysics, and Molecular Biosciences) & GAUSS (Georg-August University School of Science)
- ii) Lecturing:
 - *Current Topics in Theoretical Physics*, Masters program in Physics (Univ. of Göttingen)

- *Advanced Mathematical Methods in Statistical Mechanics* (GGNB/GAUSS graduate course in the program 'Physics of Biological and Complex systems' – PBCS)
- *Advanced Computational Methods in Statistical Mechanics* (GGNB/GAUSS graduate course in the program 'Physics of Biological and Complex systems' – PBCS)
- *Current Topics in Biophysics* (GGNB/GAUSS program PBCS)
- *Theoretical Physics* and *Theory and applications of stochastic processes* and *Biophysics* (at Univ. of Potsdam, substituting for Prof. Ralf Metzler)

1 LIST OF PUBLICATIONS

A Manuscripts under review:

- A.1 C. Dieball & **A. Godec**, *Coarse Graining Empirical Densities and Currents in Continuous-Space Steady States*. Under review in Phys. Rev. Research, (2022). (arXiv:2204.06553)
- A.2 K. Blom, N. Ziethen, D. Zwicker, & **A. Godec**, *Intrinsic Roughening and Phase Condensation in Strongly Interacting Systems*. Under review in Phys. Rev. Lett., (2022). (arXiv:2204.02962)
- A.3 C. Dieball & **A. Godec**, *Mathematical, Thermodynamical, and Experimental Necessity for Coarse Graining Empirical Densities and Currents in Continuous Space*. Revised version under review in Phys. Rev. Lett., (2022). (arXiv:2105.10483)
- A.4 J. Li, J-F. Xie, **A. Godec**, K. R. Weninger, C. Liu, J. C. Smith, & L. Hong, *Non-ergodic internal dynamics of a globular protein observed over fourteen orders in time*. Under Review in Nature Commun. (2022).
- A.5 D. Hartich & **A. Godec**, *Comment on "Inferring broken detailed balance in the absence of observable currents"*. Under review in Nature Commun., (2021). (arXiv:2112.08978)
- A.6 D. Hartich & **A. Godec**, *Violation of local detailed balance despite a clear time-scale separation*. Revised version under review in Phys. Rev. Lett., (2021). (arXiv:2111.14734)
- A.7 A. Lapolla, J. C. Smith, & **A. Godec**, *Ubiquitous dynamical time asymmetry in biological and materials systems*. Under review in Phys. Rev. X, (2021). (arXiv:2102.01666)

B Journal articles:

- B.1 C. Zunke, J. Beverunge, F. Platten, S. Egelhaaf, & **A. Godec**, *First passage statistics of colloids on fractals: theory and experimental realization*. Science Advances **8**, eabk0627 (2022). [Covered in [ProPhysik magazine](#).]
- B.2 C. Dieball, D. Krapf, M. Weiss, & **A. Godec**, *Scattering fingerprints of two-state dynamics*. New J. Phys. **24**, 023004 (2022).
- B.3 D. Hartich & **A. Godec**, *Emergent memory and kinetic hysteresis in strongly driven networks*. Phys. Rev. X **11**, 041047 (2021).
- B.4 K. Blom & **A. Godec**, *Criticality in Cell Adhesion*. Phys. Rev. X **11**, 031067 (2021). [See accompanying [press release](#).]
- B.5 D. Hartich & **A. Godec**, *Thermodynamic Uncertainty Relation Bounds the Extent of Anomalous Diffusion*. Phys. Rev. Lett. **127**, 080601 (2021). [**Editors' Suggestion** & covered in a [Viewpoint in Physics](#)]
- B.6 A. Lapolla & **A. Godec**, *BetheSF V2: 3-point propagator and additional external potentials*. Comp. Phys. Commun. **269**, 108131 (2021).
- B.7 A. Lapolla, M. Vossel, & **A. Godec**, *Time- and ensemble-average statistical mechanics of the Gaussian Network Model*. J. Phys. A: Math. Theor. **54**, 355601 (2021).
- B.8 J. Li, X. Hu, T. Neusius, X. Cheng, M. D. Smith, **A. Godec**, L. Hong, R. Metzler, and J. C. Smith, *Reply to: Insufficient evidence for ageing in protein dynamics*. Nature Phys., **17**, 775 (2021).
- B.9 A. Lapolla & **A. Godec**, *A Toolbox for Quantifying Memory in Dynamics Along Reaction Coordinates*. Phys. Rev. Research **3**, L022018 (2021).
- B.10 A. Lapolla & **A. Godec**, *Single-file diffusion in a bi-stable potential: signatures of memory in the barrier-crossing of a tagged-particle*. J. Chem. Phys. **153**, 194104 (2020).

- B.11 A. Lapolla & **A. Godec**, *Faster uphill relaxation in thermodynamically equidistant temperature quenches*. Phys. Rev. Lett. **125**, 110602 (2020). [Editors' Suggestion & covered in a [Focus story in Physics](#) and a [commentary in PhysicsWorld](#).]
- B.12 A. Lapolla, D. Hartich, & **A. Godec**, *Spectral theory of fluctuations in time-average statistical mechanics of reversible and driven systems*. Phys. Rev. Research **2**, 043084 (2020).
- B.13 A. Lapolla & **A. Godec**, *BetheSF: Efficient computation of the exact tagged-particle propagator in single-file systems via the Bethe eigenspectrum*. Comp. Phys. Commun. **258**, 107569 (2021).
- B.14 T. Ukmar-Godec, P. Fang, A. Ibáñez de Opakua, F. Henneberg, **A. Godec**, M.-S. Cima-Omori, A. Chari, E. Mandelkow, H. Urlaub & M. Zweckstetter, *Proteasomal degradation of the intrinsically disordered protein tau at single-residue resolution*. Science Advances **6**, eaba3916 (2020).
- B.15 A. Lapolla and **A. Godec**, *Manifestations of projection-induced memory: general theory and the tilted single file.*, Front. Phys. **7**, 182 (2019).
- B.16 D. Hartich and **A. Godec**, *Extreme value statistics of ergodic Markov processes from first passage times in the large deviation limit*, J. Phys. A: Math. Theor. **52**, 244001 (2019). (Invited for a special issue 'New trends in first-passage methods and applications in the life sciences and engineering')
- B.17 D. Hartich and **A. Godec**, *Interlacing Relaxation and First-Passage Phenomena in Reversible Discrete and Continuous Space Markovian Dynamics*, J. Stat. Mech. **024002** (2019) (arxiv.org/abs/1802.10049).
- B.18 D. Hartich and **A. Godec**, *Duality between relaxation and first passage in reversible Markov dynamics: rugged energy landscapes disentangled*, New J. Phys. (Fast Track Communication), **20**, 112002 (2018).
- B.19 A. Lapolla and **A. Godec**, *Unfolding tagged Particle Histories in Single-File Diffusion: Exact Single- and Two-Tag Local Times Beyond Large Deviation Theory*, New J. Phys. **20**, 113021 (2018).
- B.20 M. Schwarzl, **A. Godec** and R. Metzler, *Quantifying non-ergodicity of anomalous diffusion with higher order moments*, Sci. Rep., **7**, 3878 (2017).
- B.21 T. Ukmar-Godec, L. Bertinetti, J. Dunlop, **A. Godec**, M. Grabiger, A. Masic, H. Nguyen, I. Zlotnikov, P. Zaslansky and D. Faivre, *Materials Nanoarchitecturing via Cation-Mediated Protein Assembly: Making Limpet Teeth without Mineral*, Adv. Mat., 1701171 (2017).
- B.22 **A. Godec** and R. Metzler, *First passage-time statistics for two-channel diffusion*, J. Phys. A: Math. Theor. **50**, 084001 (2017) (Invited for a special issue 'Emerging talents')
- B.23 **A. Godec** and R. Metzler, *Universal proximity effect in target search kinetics in the few-encounter limit*, Phys. Rev. X, **6**, 041037 (2016).
- B.24 **A. Godec** and R. Metzler, *Active transport improves the precision of linear long distance molecular signalling*, J. Phys. A: Math. Theor. **49**, 364001 (2016) [Invited for a special issue on Marian Smoluchowski's 1916 paper – a century of inspiration]
- B.25 M. Schwarzl, **A. Godec**, G. Oshanin and R. Metzler, *A single predator charging a herd of prey: effects of self volume and predator-prey decision-making*, J. Phys. A: Math. Theor. **49**, 225601 (2016). (see also accompanying press release: <http://phys.org/news/2016-04-theoretical-tiger-statistical-sheep-probe.html>)
- B.26 **A. Godec** and R. Metzler, *First passage time distribution in heterogeneity controlled kinetics: going beyond the mean first passage time*, Sci. Rep. **6**, 20349 (2016).
- B.27 **A. Godec** and R. Metzler, *Signal focusing through active transport*, Phys. Rev. E **92**, 010701(R) (2015).

- B.28 H. Krüsemann, **A. Godec** and R. Metzler, *Ageing first passage time density in continuous time random walks and quenched energy landscapes*, J. Phys. A: Math. Theor. **48**, 285001 (2015). (selected by the editorial board as highlight for IOP-select)
- B.29 **A. Godec** and R. Metzler, *Optimization and universality of Brownian search in a basic model of quenched heterogeneous media*, Phys. Rev. E **91**, 052134 (2015).
- B.30 **A. Godec**, A. V. Chechkin, E. Barkai, H. Kantz and R. Metzler, *Localisation and universal fluctuations in ultraslow diffusion processes*, J. Phys. A: Math. Theor. (FTC) **47**, 492002 (2014). (selected as 2014 Highlight of J. Phys. A)
- B.31 M. Bauer, **A. Godec** and R. Metzler, *Diffusion of finite-size particles in two-dimensional channels with random wall configurations*, Phys. Chem. Chem. Phys. **16**, 6118 (2014).
- B.32 **A. Godec**, M. Bauer and R. Metzler, *Collective dynamics effect transient subdiffusion of inert tracers in flexible gel networks*, New. J. Phys. (FTC) **16**, 092002 (2014). (selected as New. J. Phys. Highlight 2014)
- B.33 H. Krüsemann, **A. Godec** and R. Metzler, *First-passage statistics for aging diffusion in systems with annealed and quenched disorder*, Phys. Rev. E **89**, 040101(R) (2014).
- B.34 **A. Godec**, J. C. Smith and F. Merzel, *Soft collective fluctuations governing hydrophobic association*, Phys. Rev. Lett. **111**, 127801 (2013).
- B.35 **A. Godec** and R. Metzler, *Linear response, fluctuation-dissipation relation, and finite-system-size effects in superdiffusion*, Phys. Rev. E **88**, 012116 (2013).
- B.36 **A. Godec** and R. Metzler, *Finite-Time Effects and Ultraweak Ergodicity Breaking in Superdiffusive Dynamics*, Phys. Rev. Lett. **110**, 020603 (2013).
- B.37 **A. Godec** and F. Merzel, *Physical origin underlying the entropy loss upon hydrophobic hydration* J. Am. Chem. Soc. **134**, 17574 (2012).
- B.38 T. Ukmar, U. Maver, O. Planinšek, A. Pintar, V. Kaučič, **A. Godec** and M. Gaberšček, *Guest-host van der Waals interactions decisively affect the molecular transport in mesoporous media*, J. Mater. Chem. **22**, 1112 (2012).
- B.39 **A. Godec**, J. C. Smith and F. Merzel, *Increase of both order and disorder in the first hydration shell with increasing solute polarity*, Phys. Rev. Lett. **107**, 267801 (2011).
- B.40 A. Žnidaršič, **A. Godec** and M. Gaberšček. *pH-based one pot synthesis of biocompatible olive shaped inorganic particles*, Mater. Res. Bull. **47**, 967 (2012).
- B.41 T. Ukmar, U. Maver, O. Planinšek, A. Pintar, V. Kaučič, M. Gaberšček and **A. Godec**, *Understanding controlled drug release from mesoporous silicates: Theory and Experiment*, J. Control. Rel. **155**, 409 (2011).
- B.42 T. Ukmar, M. Gaberšček, F. Merzel and **A. Godec**, *Modus operandi of controlled release from mesoporous matrices: a theoretical perspective*, Phys. Chem. Chem. Phys. **13**, 15311 (2011).
- B.43 T. Ukmar, **A. Godec**, O. Planinšek, V. Kaučič, G. Mali and M. Gaberšček, *Phase (trans)formation and physical state of a model drug in mesoscopic confinement* Phys. Chem. Chem. Phys. **13**, 16046 (2011).
- B.44 **A. Godec**, T. Ukmar, M. Gaberšček and F. Merzel, *Inversion of pore size dependence of solute transport kinetics from increasingly attractive ordered porous matrix*, Europhys. Lett. **92**, 60011 (2010).
- B.45 U. Maver, A. Žnidaršič, D. Saboti, S. Srčič, M. Gaberšček, **A. Godec** and O. Planinšek, *The relation between the interfacial contact and SiO₂ coating efficiency and properties in the case of two clarithromycin polymorphs*, Coll. Surf. A: Physicochem. Eng. Aspects **371**, 119 (2010).

- B.46 **A. Godec**, M. Gaberšček, J. Jamnik, D. Janežič and F. Merzel, *Ion-size effect within the aqueous solution interface at the Pt(111) surface : molecular dynamics studies*, Phys. Chem. Chem. Phys. **12**, 13566 (2010).
- B.47 O. Planinšek, J. Zadnik, M. Kunaver, S. Srčič and **A. Godec**, *Structural evolution of indomethacin particles upon milling: time-resolved quantification and localization of disordered structure studied by IGC and DSC*, J. Pharm. Sci. **99**, 1968 (2010).
- B.48 **A. Godec**, M. Gaberšček, J. Jamnik and F. Merzel, *14. Nonlinear diffusion in two-dimensional ordered porous media based on a free volume theory*, J. Chem. Phys. **131**, 234106 (2009).
- B.49 T. Ukmar, **A. Godec**, U. Maver, O. Planinšek, M. Bele, J. Jamnik and M. Gaberšček, *Suspensions of modified TiO₂ nanoparticles with supreme UV filtering ability*, J. Mater. Chem. **19**, 8176 (2009).
- B.50 **A. Godec**, M. Gaberšček and J. Jamnik, *Comment on the article "A new understanding of the relationship between solubility and particle size"*, J. Sol. Chem. **38**, 135 (2009).
- B.51 **A. Godec**, U. Maver, M. Bele, O. Planinšek, S. Srčič, M. Gaberšček and J. Jamnik, *Vitrification from solution in restricted space: formation and stabilization of amorphous nifedipine in a nanoporous silica xerogel carrier*, Int. J. Pharm. **343**, 131 (2007).
- B.52 U. Maver, **A. Godec**, M. Bele, O. Planinšek, S. Srčič, M. Gaberšček and J. Jamnik, *Novel hybrid silica xerogels for stabilization and controlled release of drug*, Int. J. Pharm. **330**, 164 (2007).

C Chapters in books

- C.1 D. Hartich & **A. Godec**, *Reaction kinetics in the few-encounter limit*. In *CHEMICAL KINETICS BEYOND THE TEXTBOOK*, Ed: K. Lindenberg, R. Metzler, & G. Oshanin. (World Scientific, 2019, in press) [<https://doi.org/10.1142/q0209>].