

Curriculum Vitae

Anna Ochab-Marcinek, Ph. D. (dr hab.)

Affiliation Dioscuri Centre for Physics and Chemistry of Bacteria
Institute of Physical Chemistry
Polish Academy of Sciences

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Programming

Currently working on software development for automated detection of bacteria in microscopic images using the machine learning and image analysis libraries.

Previously, programming projects for numerical modeling of stochastic systems in biophysics and biochemistry: Gene expression, cancer growth.

Also, web scraping and image recognition project for epidemiological data retrieval during COVID-19 pandemic.

Primary experience

- C++
- Python
- Machine Learning libraries (Tensorflow, PyTorch)
- Image Analysis
- Unix/Linux shell scripting

Also experience with

- C
- Fortran
- HTML
- CSS
- php
- JavaScript
- SQL

Exposure to

- R
- Arduino C++ programming

Programming tools

- Git
 - Jira
 - Jupyter
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Experience with scientific tools and software

- Symbolic algebra packages: Maple, Mathematica, Matlab
 - LaTeX
 - Scientific graphing and data analysis software: Origin, Gnuplot, Grace
 - Computer graphics software: Adobe Photoshop, Corel, Gimp etc.
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Employment and professional experience

Jan 2024 – present	Researcher (as <i>Specjalista</i>) at Dioscuri Centre for Physics and Chemistry of Bacteria, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
May 2018 – Dec 2023	Principal Investigator (<i>Kierownik Zespołu Tematycznego</i>) at the Biophysical Chemistry Group (as <i>Specjalista</i>), Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
08 Oct 2018	Habilitation in chemistry, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
Jan 2013 – Apr 2018	Principal Investigator (<i>Kierownik Zespołu Tematycznego</i>) at the Biophysical Chemistry Group (as <i>Adiunkt</i>), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
May 2009 – Dec 2012	Postdoc (as <i>Adiunkt</i>), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
Apr 2009	Postdoc (as <i>Specjalista</i>), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
Oct 2007 – Sep 2008	Postdoc (as <i>Wissenschaftliche Mitarbeiterin</i>), Lehrstuhl für Theoretische Physik I, Institut für Physik, Mathematisch-Naturwissenschaftlich-Technische Fakultät, Universität Augsburg, Augsburg, Germany
Oct 2006 – Sep 2009	<i>Asystent</i> , Department of Statistical Physics, M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland
30 Jun 2020 – 31 Dec 2022	Member of the Interdisciplinary COVID-19 Advisory Team affiliated with the President of the Polish Academy of Sciences
2008 - 2010	Head of a popular-science authors team writing blog and texts for <i>Tygodnik Powszechny</i> weekly (one of the most recognized and reputable social and cultural weekly magazines in Poland)

Research interests

- Software development for automated recognition of bacteria in microscopic images
 - Modeling of biological evolution
 - Stochastic modeling of gene expression
 - Diffusion in a crowded environment
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Publications

1. J. Jędrak, M. Rubin, A. Ochab-Marcinek, Generalization of Powell's results to population out of steady state, *Physical Review E* 108 (2), 024405 (2023)
2. J. Jędrak, A. Ochab-Marcinek, Contributions to the 'noise floor' in gene expression in a population of dividing cells, *Scientific Reports* 10, 13533 (2020)
3. A. Ochab-Marcinek, M. Kwiatkowski, J. Jędrak, Exactly solvable model of gene expression in proliferating bacterial cell population with stochastic protein bursts and protein partitioning, *Phys. Rev. E*, , 99 (2019) 042416
4. A. Ochab-Marcinek, J. Jędrak, M. Tabaka, Hill kinetics as a noise filter: The role of transcription factor autoregulation in gene cascades , *Phys. Chem. Chem. Phys.*, 2017, 19, 22580-22591
5. G. Angulo, J. Jedrak, A. Ochab-Marcinek, P. Pasitsuparoad, C. Radzewicz, P. Wnuk, A. Rosspeintner, How good is the generalized Langevin equation to describe the dynamics of photo-induced electron transfer in fluid solution? , *J. Chem. Phys.* 146 (2017) 244505
6. J. Jędrak, A. Ochab-Marcinek, Influence of gene copy number on self-regulated gene expression, *J. Theor. Biol.*, 2016, 408, 222-236
7. J. Jędrak, A. Ochab-Marcinek, Time-dependent solutions for a stochastic model of gene expression

- with molecule production in the form of a compound Poisson process, *Phys. Rev. E*, 2016, 94, 032401
8. T. Kalwarczyk, K. Sozański, A. Ochab-Marcinek, J. Szymański, M. Tabaka, S. Hou, R. Hołyst, Motion of nanoprobe in complex liquids within the framework of the length-scale dependent viscosity model, *Advances in Colloid and Interface Science*, 2015, 223, 55-63
 9. A. Ochab-Marcinek, M. Tabaka, Transcriptional leakage versus noise: A simple mechanism of conversion between binary and graded response in autoregulated genes, *Phys. Rev. E*, 2015, 91(1), 012704
 10. K. Sozanski, A. Wisniewska, T. Piasecki, K. Waszczuk, A. Ochab-Marcinek, T. Gotszalk, R. Hołyst, Depletion Layer in Polymer Solutions at an Interface Oscillating at the Subnano-to Submicrometer Scale, *Soft Matter* 2014, 10, 7762-7768
 11. T.K. Piskorz, A. Ochab-Marcinek, A Universal Model of Restricted Diffusion for Fluorescence Correlation Spectroscopy, *J. Phys. Chem. B*, 2014, 118 (18), 4906–4912
 12. A. Lewandowska, A. Majcher, A. Ochab-Marcinek, M. Tabaka, R. Hołyst, Taylor Dispersion Analysis in Coiled Capillaries at High Flow Rates, *Analytical Chemistry* 2013, 85 (8), 4051–4056
 13. A. Ochab-Marcinek, S.A. Wieczorek, N. Ziębacz, R. Hołyst, The effect of depletion layer on diffusion of nanoparticles in solutions of flexible and polydisperse polymers, *Soft Matter* 2012, 8, 11173-11179
 14. A. Ochab-Marcinek, R. Hołyst, Scale-dependent diffusion of spheres in solutions of flexible and rigid polymers: mean square displacement and autocorrelation function for FCS and DLS measurements, *Soft Matter* 7 (2011) 7366-7374
 15. A. Ochab-Marcinek, M. Tabaka, Bimodal gene expression in noncooperative regulatory systems, *PNAS* 107(51) (2010) 22096-22101
 16. A. Ochab-Marcinek, Extrinsic noise passing through a Michaelis-Menten reaction: A universal response of a genetic switch, *J. Theor. Biol.*, 263(4) (2010) 510-520
 17. A. Ochab-Marcinek, E. Gudowska-Nowak, E. Nasonova, S. Ritter, Modelling radiation-induced cell cycle delays, *Rad. Env. Biophys.* 48(4) (2009) 361
 18. A. Ochab-Marcinek, G. Schmid, I. Goychuk, P. Hanggi, Noise-assisted spike propagation in myelinated neurons, *Phys. Rev. E* 79, 011904 (2009)
 19. A. Fiasconaro, A. Ochab-Marcinek, B. Spagnolo, E. Gudowska-Nowak, Monitoring noise-resonant effects in cancer growth influenced by external fluctuations and periodic treatment, *Eur. Phys. J. B* 65, 435-442 (2008)
 20. Anna Ochab-Marcinek, Predicting the asymmetric response of a genetic switch to noise, *J. Theor. Bio.* 254 (2008) 37-44
 21. B. Spagnolo, A.A. Dubkov, A.L. Pankratov, E.V. Pankratova, A. Fiasconaro, A. Ochab-Marcinek Lifetime of Metastable States and Suppression of Noise in Interdisciplinary Physical Models, *Acta Physica Polonica B* 38(5) 2007, 1925
 22. Anna Ochab-Marcinek, Alessandro Fiasconaro, Ewa Gudowska-Nowak, Bernardo Spagnolo, Coexistence of resonant activation and noise-enhanced stability in a model of tumor-host interaction: Statistics of extinction times, *Acta Physica Polonica B* 37(5) 2006, 1651
 23. Alessandro Fiasconaro, Bernardo Spagnolo, Anna Ochab-Marcinek, Ewa Gudowska-Nowak, Co-occurrence of resonant activation and noise-enhanced stability in a model of cancer growth in the presence of immune response, *Physical Review E* 74, 041904 (2006)
 24. Anna Ochab-Marcinek: Transient pattern formation in a stochastic model of cancer growth, *Fluctuation and Noise Letters* 5(2) (2005) L331
 25. Anna Ochab-Marcinek: Pattern formation in a stochastic model of cancer growth, *Acta Physica Polonica B* 36(6) (2005) 1963
 26. Anna Ochab-Marcinek, Ewa Gudowska-Nowak: Population growth and control in stochastic models of cancer development, *Physica A*, 343 (2004) 557-572

Selected other publications (non peer-reviewed)

- J. Duszyński, A. Afelt, A. Ochab-Marcinek, R. Owczuk, K. Pyrc, M. Rosińska, A. Rychard, T. Smiatcz, Zrozumieć COVID-19, *ACADEMIA - magazyn Polskiej Akademii Nauk* 4 (64) 2020 pp. 1-80
- J. Duszyński, A. Afelt, A. Ochab-Marcinek, R. Owczuk, K. Pyrc, M. Rosińska, A. Rychard, T. Smiatcz,

Understanding COVID-19, ACADEMIA - The magazine of the Polish Academy of Sciences 4 (68) 2020 pp. 1-80

J. Duszyński, A. Afelt, M. Kossowska, A. Ochab-Marcinek, R. Owczuk, W. Paczos, A. Plater-Zyberk, K. Pyrc, M. Rosińska, A. Rychard, T. Smiatacz, Kroniki Pandemii: lata 2020-2021, ACADEMIA - magazyn Polskiej Akademii Nauk 4(68) 2021 pp. 1-118

J. Duszyński, A. Afelt, M. Kossowska, A. Ochab-Marcinek, R. Owczuk, W. Paczos, A. Plater-Zyberk, K. Pyrc, M. Rosińska, A. Rychard, T. Smiatacz, Chronicles of a Pandemic, ACADEMIA - The magazine of the Polish Academy of Sciences 4(72) 2021 pp. 1-120

Patents

A. Lewandowska, A. Majcher, M. Tabaka, A. Ochab-Marcinek, R. Hołyst *Sposób wyznaczania współczynnika dyfuzji D substancji chemicznej w buforze TRIS (Method for determining chemical diffusion coefficients in the rolled capillary at high flow speed)* patent no. 220250 (Polish Patent Office), application 10.8.2012, patent granted 4.12.2014.

Honours, awards, grants, scholarships

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| 15.5.2017-
14.5.2023 | Awarded the National Science Centre grant SONATA Bis 6 no. 2016/22/E/ST2/00558 (628,200 PLN) for the project: <i>Evolution of gene regulation as a stochastic process: Savageau's demand theory, cost of regulation and noise</i> |
| 2013 | Awarded the Polish Ministry of Science <i>Iuventus Plus</i> grant no. 0501/IP1/2013/72 (301,600 PLN) for the project: <i>Theoretical study of conditions for precise regulation of genes in a 2-gene cascade with autoregulation</i> |
| 2012 | Award in the „Young researchers IPC PAS” competition organized by the Institute of Physical Chemistry, Polish Academy of Sciences, for the publications in last 3 years |
| 12.2011-12.2014 | Awarded the National Science Centre grant SONATA no. 2011/01/D/ST3/00751 (800,000 PLN) for the project: <i>Transition from nano- to macroviscosity in diffusion of nano particles in a crowded environment: Theoretical and experimental study of the depletion layer effect</i> |
| 2011 | 1 st award in the competition for the best IPC PAS publication of the year 2010, for the paper: A. Ochab-Marcinek, M. Tabaka, <i>Bimodal gene expression in noncooperative regulatory systems</i> , PNAS 107(51) (2010) 22096-22101 |
| 8.11.2011-
31.10.2014 | Awarded the Polish Ministry of Science Scholarship for Outstanding Young Researchers (contract no. 30/E-64/STYP/6/2011) |
| 2011 | Award in the „Young researchers IPC PAS” competition organized by the Institute of Physical Chemistry, Polish Academy of Sciences, for the publications in last 3 years |
| 12.2010-12.2011 | Awarded the <i>Iuventus Plus</i> grant no. IP2010 028870 of Polish Ministry of Science (150,000 PLN) for the project: <i>Modeling the depletion layer effect in diffusion of nanoparticles in crowded environment</i> |
| 2009 - 2013 | Participation in Polish Science Foundation / European Union TEAM grant: <i>From nano to macroscale: motion of proteins, protein charge ladders and nanoparticles in complex liquids and diffusion limited reactions in crowded environment</i> |
| 2008 | Awarded a Highly Commended diploma in the „Popularyzator Nauki 2008” competition organized by Polish Press Agency and Polish Ministry of science, for popular-science articles and blog written for <i>Tygodnik Powszechny</i> weekly |
| 2008 | Participation in the Volkswagen Foundation grant no. I/80424: <i>New Conceptual Approaches to Modeling and Simulation of Complex Systems</i> |
| 2007-2008 | Participation in the German Research Foundation grant: <i>Nano- und Mikrofluidik: Von den molekularen Bewegung zur kontinuierlichen Strömung</i> |
| 2006 | PhD in physics with honours |
| 2005-2006 | Polish State Committee for Scientific Research grant no. 1P03B15929 (16 000 PLN) for |

	the project <i>Fluctuations and delays in cell cycle models</i>
2005	ESF STOCHDYN grant no. 785 (895 EUR) for a visit at the Group of Interdisciplinary Physics in Palermo, Italy, 1-7 February 2006
2002-2006	Granted a PhD scholarship during all years of study
2002	Graduated with honours in theoretical physics
2000	Granted a TEMPUS Scholarship at Friedrich-Schiller-Universität, Jena, Germany
1998-2002	Granted a Jagiellonian University student scholarship for very good academic results (during all provided years of study: 2nd-5th year)

Invited talks (conferences)

26-29.10.2023	Conceptual workshop “Procesy i przemiany w układach złożonych” (“Processes and transformations in complex systems”) – Symposium of the Centre for Systemic Risk Research of the University of Warsaw and the Centre for Advanced Studies, Warsaw University of Technology; European Centre for Geological Education of the University of Warsaw, Korzecko in Chęciny. Invited talk (in Polish): <i>Zespół doradczy ds. COVID-19 przy Prezesie PAN, 30/06/2020 – 31/12/2022 (COVID-19 Advisory Panel to the President of the Polish Academy of Sciences, 30/06/2020 - 31/12/2022)</i>
23-25.9.2020	Dynamics of biological systems: from viruses to populations, virtual conference, Institute of Theoretical Physics, Jagiellonian University, Kraków, Poland Invited talk: <i>How cell growth, division, and stochastic gene expression contribute to the protein noise floor</i>
4-5.6.2018	Jędrzej Śniadecki BioMedical Workshop (3rd edition), Bydgoszcz, Poland, Invited talk: <i>Modeling of random fluctuations in gene expression and cell division</i>
6-9.3.2018	Information transmission in biological systems, Będlewo, Poland, I was invited by the conference organizer to co-organize it and to give the invited talk: <i>Bursty gene expression and cell division</i>
3-8.9.2017	30 th Marian Smoluchowski Symposium on Statistical Physics, Kraków, Poland, Invited talk: <i>Stochastic gene expression in cells undergoing division</i>
8-9.12.2016	BIOFIZMAT 5 Workshop, Banach Center, Warsaw, Poland, Invited talk: <i>Modele stochastycznej ekspresji genów z losowymi burstami i deterministycznym rozpadem białek (Models of stochastic gene expression with random bursts and deterministic protein degradation)</i>
15-17.9.2016	7. Forum Matematyków Polskich z Udziałem Matematyków Ukraińskich (7th Forum of Polish Mathematicians with Participation of Ukrainian Mathematicians), Olsztyn, Poland Co-organizer and chairperson of the thematic session <i>Matematyczne modele regulacji genów i szlaków sygnalizacyjnych w komórkach (Mathematical models of gene regulation and signalling pathways in cells)</i> I was invited by the session organizer to co-organize it and to give the invited talk within that session: <i>Gene multiplication: A simple phenomenon that may cause non-intuitive effects</i>
14-17.9.2015	Conference: 28 th Marian Smoluchowski Symposium on Statistical Physics, Kraków, Poland Invited talk: <i>Modeling stochastic gene expression: a few solutions by geometric construction</i>
7.9.2015	43 rd Congress of Polish Physicists, Kielce, Poland Invited talk within the specialistic session <i>Fizyka Statystyczna (Statistical Physics): Modelowanie dyfuzji w zatłoczonym środowisku dla spektroskopii korelacji fluorescencji (Modeling of diffusion in a crowded environment for fluorescence correlation spectroscopy)</i>
11.5.2013	Conference: <i>Biological Complexity in Cracow</i> , Kraków, Poland Invited talk: <i>Gene regulation as a nonlinear noise filter</i>

Popular science publications

For *Tygodnik Powszechny* weekly:

1. Anna Ochab-Marcinek, *Klucz do komórki*, Tygodnik Powszechny 2 (3209), 9.1.2011
2. Anna Ochab-Marcinek, *Geniusz z Wrocławia*, Tygodnik Powszechny 1-2 (3104-05), 4-11.1.2009
3. Anna Ochab-Marcinek, *Patent hochsztaplera*, Tygodnik Powszechny 50 (3101) 14.12.2008
4. Anna Ochab-Marcinek, *Doktorat z telepatii*, Tygodnik Powszechny 45 (3096) 9.11.2008
5. Anna Ochab-Marcinek, *Więcej niż mrówek*, Tygodnik Powszechny 37 (3088), 14.09.2008

2008-2010: *Świat: Jak to działa?* (World: how does it work?) <http://swiat-jaktodziala.blog.onet.pl>
Popular science blog commenting news in physics, for Tygodnik Powszechny. **10000 visits/month**

For Agora SA (the editor of *Gazeta Wyborcza* and gazeta.pl, the largest daily newspaper and news portal in Poland): Blog articles: 1. *Bez szumu nie ma rozumu?*, 2. *Drogi Watsonie, dlaczego ten izolator nadprzewodzi?*, 3. *O co naprawdę oskarżono Galileusza?* written to order for Agora SA and published on <http://jaktodziala.blox.pl>.

Selected other publications and interviews:

28.10.2021 **Interview for Polish Press Agency** [Polish]: *Dr hab. Ochab-Marcinek: trudno prognozować przebieg epidemii za pomocą symulacji komputerowych* (Dr. Ochab-Marcinek: it is difficult to predict the course of epidemics using computer simulations)
<https://naukawpolsce.pl/aktualnosci/news,89962,dr-hab-ochab-marcinek-trudno-prognozowac-przebieg-epidemii-za-pomoca>

Anna Ochab-Marcinek, *Porządek z przypadku*, Academia, magazine of the Polish Academy of Sciences, 4/11(28) 2011

9.7.2011 **Radio interview** [Polish]: *Dlaczego sklonowany kot wygląda inaczej niż oryginał?* (Why does a cloned cat look different from the original?) *Wieczór Odkrywców*, Polish Radio I

2.3.2011 **Radio interview** [Polish]: *Dlaczego sklonowany kot jest inny od oryginału?* (Why does a cloned cat is different from the original?) *Radiowa Akademia Nauk*, Radio TOK FM

2006 - 2014: Popular science blog, debunking pseudo-science: *Będąc młodym fizykiem* (Being a young physicist) <http://mlodyfizyk.blox.pl>.

Education

08 Oct 2018	Habilitation in chemistry, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
28 Sep 2006	Doctor of Philosophy in physics with honors
Ph.D. thesis:	"Spatio-temporal effect of noises on nonlinear dynamical systems" (Supervisor: prof. Ewa Gudowska-Nowak)
2002-2006	Ph.D. study M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland
2002	Master of Science in theoretical physics with honors
M.Sc. thesis:	"Stochastic models of population growth and control" (Supervisor: prof. Ewa Gudowska-Nowak)
1997-2002	M.Sc. study in physics M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland Specialization: theoretical physics

Teaching

- Numerical methods
 - Introductory theory of informatics
 - Self-organization in physics, chemistry and biology
 - C++ programming
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- Symbolic algebra (Maple)
 - Introductory physics
 - Introductory mathematics
 - Wave physics
 - Physics laboratory
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Languages

- Polish (native)
- English (Cambridge Certificate in Advanced English)
- German
- Russian