Curriculum Vitae

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

Affiliation: Dioscuri Centre for Physics and Chemistry of Bacteria
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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. The project also includes non-standard methods of Point Spread Function deconvolution from the microscopic image.

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

Also, epidemiological data analysis project during COVID-19 pandemic. The project included web scraping,mage recognition, and calculation of the statistics.

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

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.

Employment and professional experience

Jan 2024 – present	Researcher (as *Specjalista*) 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 (*Kierownik Zespołu Tematycznego*) at the Biophysical Chemistry Group (as *Specjalista*), 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 (*Kierownik Zespołu Tematycznego*) at the Biophysical Chemistry Group (as *Adiunkt*), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
May 2009 – Dec 2012	Postdoc (as *Adiunkt*), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
Apr 2009	Postdoc (as *Specjalista*), Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland
Oct 2007 – Sep 2008	Postdoc (as *Wissenschaftliche Mitarbeiterin*), Lehrstuhl für Theoretische Physik I, Institut für Physik, Mathematisch-Naturwissenschaftlich-Technische Fakultät, Universität Augsburg, Augsburg, Germany
Oct 2006 – Sep 2009	*Asystent*, 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 *Tygodnik Powszechny* 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

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 nanoprobes 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. Holyst, 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. Lewandrowska, 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. Pyrć, M. Rosińska, A. Rychard, T. Smiatacz, Zrozumieć COVID-19, ACADEMIA - magazyn Polskiej Akademii Nauk 4 (64) 2020 pp. 1-80

J. Duszyński, A. Afelt, A. Ochab-Marcinek, R. Owczuk, K. Pyrć, M. Rosińska, A. Rychard, T. Smiatacz,

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. Pyrć, 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. Pyrć, 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. Lewandrowska, 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

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: *Evolution of gene regulation as a stochastic process: Savageau's demand theory, cost of regulation and noise*
2013	Awarded the Polish Ministry of Science *Iuventus Plus grant no. 0501/IP1/2013/72 (301,600 PLN) for the project: Theoretical study of conditions for precise regulation of genes in a 2-gene cascade with autoregulation*
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: *Transition from nano- to macroviscosity in diffusion of nano particles in a crowded environment: Theoretical and experimental study of the depletion layer effect*
2011	1st award in the competition for the best IPC PAS publication of the year 2010, for the paper: A. Ochab-Marcinek, M. Tabaka, *Bimodal gene expression in noncooperative regulatory systems,* 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 *Iuventus Plus* grant no. IP2010 028870 of Polish Ministry of Science (150,000 PLN) for the project: *Modeling the depletion layer effect in diffusion of nanoparticles in crowded environment*
2009 - 2013	Participation in Polish Science Foundation / European Union TEAM grant: *From nano to macroscale: motion of proteins, protein charge ladders and nanoparticles in complex liquids and diffusion limited reactions in crowded environment*
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 *Tygodnik Powszechny* weekly
2008	Participation in the Volkswagen Foundation grant no. I/80424: *New Conceptual Approaches to Modeling and Simulation of Complex Systems*
2007-2008	Participation in the German Research Foundation grant: *Nano- und Mikrofluidik: Von den molekularen Bewegung zur kontinuirlichen Strömung*
2006	PhD in physics with honours
2005-2006	Polish State Committee for Scientific Research grant no. 1P03B15929 (16 000 PLN) for

	the project *Fluctuations and delays in cell cycle models*
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): *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*)
23-25.9.2020	Dynamics of biological systems: from viruses to populations, virtual conference, Institute of Theoretical Physics, Jagiellonian University, Kraków, Poland Invited talk: *How cell growth, division, and stochastic gene expression contribute to the protein noise floor*
4-5.6.2018	Jędrzej Śniadecki BioMedical Workshop (3rd edition), Bydgoszcz, Poland, Invited talk: *Modeling of random fluctuations in gene expression and cell division*
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: *Bursty gene expression and cell division*
3-8.9.2017	30th Marian Smoluchowski Symposium on Statistical Physics, Kraków, Poland, Invited talk: *Stochastic gene expression in cells undergoing division*
8-9.12.2016	BIOFIZMAT 5 Workshop, Banach Center, Warsaw, Poland, Invited talk: *Modele stochastycznej ekspresji genów z losowymi burstami i deterministycznym rozpadem białek (Models of stochastic gene expression with random bursts and deterministic protein degradation)*
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 *Matematyczne modele regulacji genów i szlaków sygnalizacyjnych w komórkach (Mathematical models of gene regulation and signalling pathways in cells)* I was invited by the session organizer to co-organize it and to give the invited talk within that session**:** *Gene multiplication: A simple phenomenon that may cause non-intuitive effects*
14-17.9.2015	Conference: 28th Marian Smoluchowski Symposium on Statistical Physics, Kraków, Poland Invited talk: *Modeling stochastic gene expression: a few solutions by geometric construction*
7.9.2015	43rd Congress of Polish Physicists, Kielce, Poland Invited talk within the specialistic session *Fizyka Statystyczna (Statistical Physics)***:** *Modelowanie dyfuzji w zatłoczonym środowisku dla spektroskopii korelacji fluorescencji (Modeling of diffusion in a crowded environment for fluorescence correlation spectroscopy)*
11.5.2013	Conference: *Biological Complexity in Cracow*, Kraków, Poland Invited talk: *Gene regulation as a nonlinear noise filter*

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

- Symbolic algebra (Maple)
- Introductory physics
- Introductory mathematics
- Wave physics
- Physics laboratory

Languages

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