

Eugen GHEORGHIU

International Centre of Biodynamics www.biodyn.ro
1B, Intrarea Portocalelor, 060101 Bucharest, Romania
egheorghiu@biodyn.ro

Nationality: Romanian; **Civil Status**: Married

Education: PhD in Theoretical Physics, 1994, Institute for Atomic Physics - Bucharest, Romania

Relevant Professional experience:

University of Kyoto JSPS fellow	1996- 1997	Visiting professor	Research in methods for monitoring and nonlinear analysis of cell cycle progression
National Institute of Biotechnology	1997-2000	Scientific Director	Supervising and research
IC Biodynamics www.biodyn.ro	since 2000	Director-founder	Managing, supervising, training and research
University of Bucharest	2003-present	Research Professor; ***since 2004*** ***PhD adviser***	Supervising PhD students and research; 2003- 2008 Teaching & Coordination of the Master Programme in Biodynamics

Research Interests include:

- Modelling & experimental aspects of electrically modulated optical assays (e.g., QPI, BFRL, SPR) allowing non-invasive analysis of dynamics of living cells (*per se* or exposed to drugs) and bio-interfaces.
- Derive robust transient measures from multimodal timeseries analysis of cells exposed to drugs
- Rapid detection of markers in blood (using portable, multichannel SPR systems)
- Fast Point-of-care: (A) sensitive identification & quantitation of microbes (bacteria, fungi & viruses) and (B) Phenotypic Antibacterial & Antifungal Susceptibility/Resistance Testing based on immune-magnetic capture, magnetophoresis and electro-optical fingerprinting

Professional Honors: "Stefan Procopiu" Award for Physics of the Romanian Academy, 1995

Teaching:

University of Bucharest,

(2004-2009) *Coordinator of the Master Program in Biodynamics;* Courses: Introduction in (non)linear data analysis; Electrochemical Impedance Spectroscopy to investigate bio-systems;

***2004– present*: PhD Adviser, University of Bucharest**

Polytechnic University of Bucharest

2019- present, Course on *Biodynamics* and related biomedical applications within the Master in modern technologies for Medical Engineering

Recent Seminars & invited Oral Presentations:

- November 7, 2025, Rapid phenotypic antimicrobial susceptibility testing by gauging cellular response at population level – via magnetophoretically assisted electrical impedance spectroscopy assay, in comparison to analysis of (single) cell dynamics using electrically modulated optical microscopy, 14th International Conference on Biomedical Engineering & Biotechnology, Matsue, Japan, https://www.icbeb.org/Speaker/Details?id=1409

- September 11, 2025, High-resolution impedance mapping of a (bio)sample using label-free electrically modulated optical microscopy, Carpathian Biophotonics Meeting 2025, Sinaia, https://carpathianbiophotonics.eu/invited-talks/
- 2nd February 2024- Seminar at Stanford Genome Technology Center, Stanford University, invited by Prof. Lars Steinmetz
- 9th February 2024: Seminar at Photonic Center, Boston University, https://www.bu.edu/photonics/distinguished-lecture-with-eugen-gheorghiu-phd/
- SPIE Photonics West, San Francisco, January- February 2024, "Label-free electro-optical imaging of nanopatterned surfaces and biological cells by electrically actuated quantitative phase microscopy"
- SPIE Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI, München, June 2023, *invited*. "Towards label-free fingerprinting of cellular dynamics by time-lapse single-cell, electrically modulated light microscopy"
- The 6th edition of International Conference on Analytical and Nanoanalytical Methods for Biomedical and Environmental Sciences, June 2022, Brasov, Romania, *invited,* "Towards a Point of Care System for Rapid, Phenotypic Antimicrobial Susceptibility Testing"

Recent & Ongoing International Projects:

- Coordinator: SmartMatter- Core integration of novel functional, adaptive materials into a smart, highly sensitive analytical system for point of need environmental applications, M-EraNet (2020-23);
- Co-Pi: MarkerSense (attract-eu.com): SPR for early detection of biomarker proteins in blood (2019-20)

Synergistic Activities

▪ Co-organizer of the International Symposium "Biodynamics - A Transdisciplinary Approach", with the participation of Prof Stefan Hell (Nobel laureate), Bucharest, May 2022 https://sites.google.com/view/biodynamics2022/home

▪ Since 2019- Member of the International Consortium of the Tim Hunt Research Institute of Life Science and Biotechnology, Jiangyin, China

▪ Co-founder Euroscience and member of Euroscience Governing Board (elected for three mandates)

▪ Expert of the European Commission- Evaluator of Proposals on (nano)biosensing (1995-present), 2016-2020: H2020-FET OPEN & 2021-present H Europe- PathFinder

▪ Guest Editor, Special issue **2020-22:** Advanced Designs of Materials, Devices and Techniques for Biosensing-MDPI, (https://www.mdpi.com/journal/materials/special_issues/materials_devices techniques_biosensing)

▪ Member of Evaluation Commissions of PhD thesis of: University of New South Wales, Sydney & Swinburne University of Technology, Melbourne Australia, National University of Singapore, Université Catholique de Louvain, Belgium, Babes-Bolyai University, Cluj-Napoca and Polytechnic University of Bucharest.

US & Eu Patents

1. **US Patent 11,680,939/2023,** Systems and methods for detecting bioactive compounds using sensors with pre-stimulated cells, Authors: M. Gheorghiu, E. Gheorghiu

2. **US Patent 11,733,323/2023**, Systems and Methods for measuring cellular response to target analytes by controlled application of an oscillating stimulus, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu

3. **European Patent**: **EP2710359/2020**, Systems and Methods for Detection and Quantitation of Analytes Using Periodic Actuation, Authors: E. Gheorghiu, M.S. David, C. Polonschii, D. Bratu

4. **U.S. Patent 9,315,855/2016**: Systems and Methods for Detection and Quantitation of Analytes Using an Oscillating Stimulus, Authors: E. Gheorghiu, M. S. David, C. Polonschii, D. Bratu

Ro Patents and Patent Applications**:**

1. Ro Patent Application: A/00788/2022, Method for measuring the concentration of a target analyte without the use of a calibration curve, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu, C. Polonschii
2. Ro Patent Application: A/00772/2022, Method and Device for measuring the light intensity and the phase difference induced between two beams with linear, orthogonal polarizations, reflected by a sample illuminated at one, or simultaneously, at several angles of incidence, with a polarized light beam, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu, C. Polonschii
3. Ro Patent Application: A/00335/15.06.2022, Method and device for increasing the yield and online monitoring the capture of target analytes and assess their concentration, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu, D. Bratu
4. Ro Patent Application: A/00747/2021, Method to accurately derive the amplitude of a signal comprising repetitive rectangular pulses and of the temporal delays presented by a signal comprising distorted repetitive pulses versus a set of reference pulses, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu
5. Ro Patent Application: A/00693/2021, Method to increase the sensitivity of optical waveguides analysis", Authors: E. Gheorghiu, M. S. David, M. Gheorghiu, C. Polonschii
6. Ro Patent Application A/00577/2020 Method to collect, identify and quantitatively assess the concentration and the infectivity of pathogenic microorganisms with aerogenous spreading, Authors: E. Gheorghiu, M. Gheorghiu
7. Ro Patent Application A/00420/2018, Method and system for detection of bioactive compounds e.g. cytotoxic, using sensors with stimulated cells, Authors: M. Gheorghiu, E. Gheorghiu
8. Ro Patent Application A/00422/2018, Method for assessing the viability of biological cells and for testing their susceptibility when exposed to a compound (e.g. antibiotic), Authors: E. Gheorghiu, M. S. David, M. Gheorghiu
9. Ro Patent Application A/00423/2018, Method and system for high precision measurement of the periodic variations of the electrical impedance of a sample, Authors: E. Gheorghiu, M. S. David, D. Bratu, M. Gheorghiu, C. Polonschii
10. Ro Patent Application A0031/2018: Portable device to measure optical waveguides including their resonances, Authors: E. Gheorghiu, M. S. David, M. Gheorghiu, C. Polonschii
11. Ro Patent Application A00651/2017: Method for measuring the distributions of electric fields and of refractive indices with high spatial and temporal resolution, Authors: E. Gheorghiu, M. S. David, C. Polonschii, M. Gheorghiu

12. Ro Patent Application A00502/2016: Method and system for illumination and reception for total internal reflection microscopy applications, Authors: E. Gheorghiu, R. Dabu, D. Ursu, M. Gheorghiu, M. S. David, C. Polonschii, D. Bratu
13. **Patent Ro 128065/2015**: Platform and method to monitor the quality of an aquatic environment based on analysis of the behavior of a fish population, Authors: E. Gheorghiu, C. Polonschii, D. Bratu
14. **Patent RO 127854/2014**- Method to assess the amount of target analytes by controlled periodic actuation, Author: E. Gheorghiu
15. **Patent RO127853/2014**- Device to assess the amount of target micro-organisms by controlled periodic actuation, Authors: E Gheorghiu, M. S David, C Polonschii and D Bratu
16. **Patent RO120867/14.03.2008**: Quantitative assessment of (bio)sensors by analysis of nonlinear frequency response, Authors: E. Gheorghiu, M. Gheorghiu, C. Balut, D. Bratu
17. **Patent RO120790/01.04.2003:** Method to detect analytes by analyzing the polarization impedance of the transducer/ sample interface, Authors: E. Gheorghiu, M. Gheorghiu, D. Bratu, A. Ursu
18. **Patent RO117877/30.08.2002**: Method for detecting target analytes in liquid media, Authors: E. Gheorghiu, M. Gheorghiu, C. Balut, D. Bratu
19. **Patent RO117986/29.11.2002**: Fast, high accurate method to measure AC impedances, Authors: E. Gheorghiu, D. Bratu, M. Gheorghiu, C. Balut

Selected peer reviewed publications

1. Vasilescu A., Gáspár S., Gheorghiu M., Polonschii C, Banciu R.M., David S., Gheorghiu E., Marty J-L, Promising Solutions to Address the Non-Specific Adsorption in Biosensors Based on Coupled Electrochemical-Surface Plasmon Resonance Detection, *Chemosensors*, (2025), 13(3), 92; https://doi.org/10.3390/chemosensors13030092
2. Polonschii C., Rosu-Hamzescu M., David S., Oloumi A., Ursu D., Szardenings M, Kern K., El Salhi A., E., Gheorghiu E., Point-of-care personalized rapid diagnosis of allergies using peptide epitopes and SPR multiplexed detection, *Sensors and Actuators B: Chemical*, (2024), 418:136359, https://doi.org/10.1016/j.snb.2024.136359
3. Polonschii C, Gheorghiu M., David S., Gheorghiu E., Label-free electro-optical imaging of nanopatterned surfaces and biological cells by electrically actuated quantitative phase microscopy, *Quantitative Phase Imaging X* (2024),12852,4-8, https://doi.org/10.1117/12.3002179
4. David S, Polonschii C, Gáspár S, Gheorghiu M, Gheorghiu E, Multiplexed sensing platform based on magneto-optical SPR for VOC detection, *Integrated Optics: Devices, Materials, and Technologies XXVIII* (2024), 12889, 104-107, https://doi.org/10.1117/12.3001614
5. Gheorghiu M, Polonschii C, Munteanu RE, Tudor D, David S, Electrically modulated microscopy assay for fast high content, label free assessment of live cell's dynamics, *Label-free Biomedical Imaging and Sensing* (2024) 12854, 81-85, https://doi.org/10.1117/12.3002193
6. Polonschii C, Ursu D, Rosu-Hamzescu M, David S, Gheorghiu E, Point-of-care multiplexed surface plasmon resonance system for rapid biomarker detection supporting rapid diagnostics and treatment monitoring, *Optical Diagnostics and Sensing XXIV: Toward Point-of-Care Diagnostics*, (2024) 12850, 62-64, https://doi.org/10.1117/12.3002319
7. David S., Cârtoc R.E., Petcu I-C, Polonschii C., Petran A., Turcu R., Bratu D., Gheorghiu M., Gheorghiu E., In situ detection and viability assessment of target microorganisms, *Biosensors Bioelectronics*, (2024), 245, 115821, https://doi.org/10.1016/j.bios.2023.115821

8. Dobre A., Sandoiu A. Morega A-M., Gheorghiu E., Magnetic field control in an analytic platform for assessment of pathogenic bacteria, *Revue Roumaine des Sciences Techniques, Série Électrotechnique et Énergétique*, (2023) 68(3):317-322, https://doi.org/10.59277/RRST-EE.2023.3.12
9. Polonschii C, Gheorghiu M., David S., Bratu D., Gheorghiu E., Towards label-free fingerprinting of cellular dynamics by time-lapse single-cell electrically modulated light microscopy, *Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI, SPIE* (2023) 12622,10-14, https://doi.org/10.1117/12.2670590
10. Gheorghiu E., A renewed challenge to electrical bioimpedance: rapid assessment of pathogenic bacteria, *J Electr Bioimp* (2023) 14, 1-2
11. David S., Munteanu R.-E., Țițoiu, A.M., Petcu, I C., Leancu C., Gheorghiu M., Gheorghiu E., Direct, Rapid Detection of Pathogens from Urine Samples *Materials* (2022), 15, 7640
12. David S., Gheorghiu M., Daakour S., Munteanu R.E., Polonschii C., Gáspár S., Barboiu M., Gheorghiu E., Real Time SPR Assessment of the Structural Changes of Adaptive Dynamic Constitutional Frameworks as a New Route for Sensing, *Materials* (2022) 15 (12), 483
13. Gheorghiu M., Polonschii C., Popescu O., Gheorghiu E., Advanced Optogenetic-Based Biosensing and Related Biomaterials, *Materials* (2021) 14 (15), 4151
14. Polonschii C., Gheorghiu M., David S., Gáspár S., Melinte S., Majeed H., Kandel M., Popescu G. and Gheorghiu E., High resolution impedance mapping using electrically-activated quantitative phase imaging, *Light: Science & Applications-Nature* (2021) 10:20
15. Gheorghiu E., Detection of pathogenic bacteria by magneto-immunoassays: a review, *The Journal of Biomedical Research* (2021), 1-7
16. Gheorghiu M., Stanica L., Ghinia Tegla M.G., Polonschii C., Bratu D., Popescu O., Badea T., Gheorghiu E., "Cellular sensing platform with enhanced sensitivity based on optogenetic modulation of cell homeostasis", *Biosensors Bioelectronics*, 2020, 154, 112003
17. Gheorghiu M., Stanica, L; Polonschii C., David S., Ruckenstein A., Popescu O., Badea T., Gheorghiu E., "Modulation of cellular reactivity for enhanced cell-based biosensing", *Analytical Chemistry*, 2020, 92, 1, 806-814
18. Gheorghiu E, Electrical impedance assays of blood cells, *Blood and Genomics,* 2020, 4(1): 1-8
19. Munteanu R.E., Ye R., Polonschii C., Ruff A, Gheorghiu M, Gheorghiu E, Boukherroub R, Schuhmann W, Melinte S, Gáspár S., "High spatial resolution electrochemical biosensing using reflected light microscopy", *Scientific Reports* (2019), 9:15196
20. Rosu-Hamzescu M., Polonschii C, Oprea S., Popescu D., David S., Bratu D., Gheorghiu E., "High speed CMOS acquisition system based on FPGA embedded image processing for electro-optical measurements", *Rev Sci Instr* (2018), 89, 065103-12;
21. Stanica L., Rosu-Hamzescu M., Gheorghiu M, Stan M., Antonescu L.,Polonschii C, Gheorghiu E., Electric Cell-Substrate Impedance Sensing of Cellular Effects under Hypoxic Conditions and Carbonic Anhydrase Inhibition, *Sensors* (2017)
22. Stanica L, Gheorghiu M, Stan M, Polonschii C, David S, Bratu D, Dinischiotu A, Supuran CT , Gheorghiu E, Quantitative assessment of specific carbonic anhydrase inhibitors effect on hypoxic cells using electrical impedance assays, *J Enzyme Inhib Med Chem*, (2017) 32:1,1079-90
23. David S., Polonschii C., Gheorghiu M., Bratu D., Gheorghiu E., Biosensing Based on Magneto-Optical Surface Plasmon Resonance, in MiMB series, Biosensors and Biodetection: Methods and Protocols, IInd Ed.,A. Rasooly&B. Prickril Eds., Springer, (2017) ISBN: 978-1-4939-6846-6.
24. Polonschii C., Gheorghiu E., A multitiered approach for monitoring water quality, *Energy Procedia*, (2017), 112: 510 – 518, doi.org/10.1016/j.egypro. 2017.03.1138

25. David S., Polonschii C., Luculescu C., Gheorghiu M., Gáspár S., Gheorghiu E., Magneto-plasmonic biosensor with enhanced analytical response and stability, *Biosensors and Bioelectronics* (2015) 63, 525–532
26. Bondarenko A. Cortes-Salazar F., Gheorghiu M. Gáspár S. Momotenko D. Stanica L. Lesch A., Gheorghiu E. Girault H. Electrochemical push-pull probe: from scanning electrochemical microscopy (SECM) to multimodal altering of cell microenvironment, *Anal. Chem*. (2015), 87, 4479−4486
27. Polonschii C., David S., Gáspár S., Gheorghiu M., Rosu-Hamzescu M., Gheorghiu E., Complementarity of EIS and SPR to Reveal Specific and Nonspecific Binding When Interrogating a Model Bioaffinity Sensor; Perspective Offered by Plasmonic Based EIS, *Anal. Chem* (2014), 86 (17), 8553–8562
28. Gheorghiu M., David S., Polonschii C., Olaru A., Gáspár S., Bajenaru O., Popescu O. B, Gheorghiu E., Label free sensing platform for amyloid fibrils effect on living cells, *Biosensors and Bioelectronics* (2014) 52, 89–97
29. Gheorghiu M., Enciu A.M., Popescu O. B, Gheorghiu E., Functional and molecular characterization of Aβ42 effect on an in vitro epithelial barrier model, *Journal of Alzheimer's Disease* (2014) 38,787–798
30. David S., Polonschii C., Gheorghiu M., Bratu D., Dobre A., Gheorghiu E., Assessment of pathogenic bacteria using periodic actuation, Front Cover- *Lab on a Chip* (2013), 13, 3192–3198;
31. Olaru A., Gheorghiu M., Polonschii C., David S. and Gheorghiu E., Quality assessment of SPR sensors chips; case study on L1 chips, *Biosensors and Bioelectronics* (2013) 45C, 77-81
32. Gáspár S., Marty J. L., Gheorghiu E.,Cytochrome c-Based Amperometric Sensors for Superoxide Detection: Where Their Signal Comes From?, *Electroanalysis* (2013) 25, No. 2, 448 – 452
33. Polonschii C., Bratu D., Gheorghiu E., Appraisal of fish behaviour based on time series of fish positions issued by a 3D array of ultrasound transducers, *Aquacultural Engineering* (2013), 55 37– 45
34. Gáspár S., David S., Polonschii C., Marcu I., Gheorghiu M., Gheorghiu E., Simultaneous impedimetric and amperometric interrogation of renal cells exposed to a calculus-forming salt, *Analytica Chimica Acta* (2012), 713,115-120
35. Gheorghiu M., David S., Olaru A., Polonschii C., E. Gheorghiu, Surface Plasmon Resonance Bioanalytical Platform to Appraise the Interaction Between Antimicrobial Peptides and Lipid Membranes in Optical Nano- and Microsystems for Bioanalytics, Springer Series on Chemical Sensors and Biosensors, Vol. 10, Fritzsche, Wolfgang; Popp, Jürgen (Eds.) (2012) ISBN 978-3-642-25497-0
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38. Sandu T., Vrinceanu D., Gheorghiu E., Linear dielectric response of clustered living cells, Phys. Rev E 81 (2010), 0219131-02191311
39. Gheorghiu M., Olaru A., Tar A., Polonschii C., Gheorghiu E., Sensing based on assessment of non-monotonous effect determined by target analyte: case study on pore forming compounds, *Biosensors and Bioelectronics* (2009), 24, 3517–3523
40. Olaru A., Gheorghiu M., David S., Wohland T., Gheorghiu E., Assessment of the multiphase interaction between a membrane disrupting protein and a lipid membrane, *J. Phys. Chem*. B, 113 (2009), 14369–14380

41. Gheorghiu E, Gheorghiu M, David S, Polonschii C, Biodynsensing: sensing through dynamics of hybrid affinity / cellular platforms; towards appraisal of Environmental and Biological Risks of Nanobiotechnology in Silicon Versus Carbon Fundamental Nanoprocesses, Nano-biotechnology and Risks Assessment, *NATO Science for Peace and Security Series*, B: Physics and Biophysics (2009) Magarshak Y., Kozyrev S. Vaseashta A.K. (Eds.) ISBN: 978-90-481-2522-7
42. Balan C., Broboana D., Gheorghiu E., Vekas L., Rheological characterization of complex fluids in electro-magnetic fields, *Journal of Non-Newtonian Fluid Mechanics* (2008) 154, 22–30
43. Gheorghiu M., David S., Polonschii C., Gheorghiu E. Sensing at nanoscale via structured interfaces, *Eur Biophys J.* (2007) 36 S157
44. Balan C., Balut C., Gheorghe L., Gheorghiu E., Ursu G., Experimental determination of blood permittivity and conductivity in simple shear flow, *Clinical. Hemorheology and Microcirculation* (2004) 30 359-364;
45. Gheorghiu E., Andreescu D., Balut C., Ursu A., Impedance Spectroscopy in Biodynamics: Detection of Specific Cells (pathogens) using Immunocoated Electrodes, *Journal of Science and Technology* (2003), 24 791-797;
46. Sadik O.A., Gheorghiu E., Xu H., Andreescu D., Balut C., Gheorghiu M., Bratu D., Fast Dielectric Spectroscopy as a Dynamic Tool for In situ Monitoring of Bimolecular Reactions, *Anal. Chem* (2002), 74, 3142-3150;
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49. Bratu D., Gheorghiu E., A new fast, wide range, portable bio impedance spectrometer, *Med. Biol. Eng. Comput.* (1999) 37, 126-127;
50. Gheorghiu E., Balut C. M., Asami K., Monitoring cell cycle progression by impedance spectroscopy, *Med. Biol. Eng. Comput*. (1999) 37, 146-147;
51. Balut C. M., Gheorghiu E., On the errors in determining cell properties from impedance data: theoretical and experimental aspects, *Med. Biol. Eng. Comput*. (1999) 37,166;
52. Gheorghiu M., Gersing E., Gheorghiu E., Quantitative analysis of impedance spectra of organs during ischemia, *Annals of The New York Academy of Sciences* (1999) 873, 65-71;
53. Gheorghiu E., On the limits of Ellipsoidal Models when Analyzing Dielectric behavior of Living Cells: Emphasis on Red Blood Cells, *Annals of The New York Academy of Scie*nces (1999), 873, 262-268;
54. Gheorghiu E., Asami K., Monitoring Cell Cycle By Impedance Spectroscopy: Experimental and Theoretical Aspects, *Bioelectrochem. Bioenerg* (1998), 45, 139-143;
55. Gheorghiu E., Nonlinear Analysis of Synchronized Cell Suspensions: Experimental and Theoretical Aspects, in "*Experimental Chaos IV*", Eds. W. Ditto, M. Spano, L. Pecora, World Scientific Press (1998) 185-192;
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58. Gheorghiu E., Characterizing cellular systems by means of dielectric spectroscopy, *Bioelectromagnetics* (1996), 17, 475
59. Mihai C. M., Mehedintu M., Gheorghiu E., The derivation of cellular properties from dielectric spectroscopy data, *Bioelectrochem. Bioener* (1996), 40, 187

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61. Mehedintu M., Mihai C., Gheorghiu E., Fast, in flux, procedure to measure and preserve the growing medium of a biological cell suspension, *Bioelectrochem. Bioener* (1996), 40, 181
62. Gheorghiu E., Toward a new method to derive the invariant measures of (chaotic) dynamical systems. Application to living cell dynamics, *J. Tech. Physics* (1996), nr. 2
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64. Mihai C., Gheorghiu E., Using of truncated models to derive the invariant measure of living cell dynamics, *J. Tech. Physics*, (1996) nr. 2
65. Gheorghiu E., Dielectric behavior of spherical cell suspensions in relation to diffusion effects on nucleus presence, *Bioelectrochem. Bioener* (1995), 38, 123
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