Ivane G. Murusidze
Professor of Physics

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Personal data:
Nationality: Georgian

Education:

Ph.D. (Theoretical & Mathematical Physics), Institute of Physics of the Georgian Acad. of Sciences / Tbilisi State University, 1986.
M.Sc. (Physics), Tbilisi State University, 1979.

Area of Expertise / Research Interests:

- Structural and electronic properties of nanostructures, low-dimensional systems and atomic clusters;
- Biophysics of bacteria and archaea interactions with metals;
- Microbial biosynthesis of noble metal nanoparticles;
- Laser-plasma interactions, laser-plasma accelerators;
- Relativistic optics of ultra-strong laser pulses in plasmas;
- Emergence and dynamics of coherent structures in nonlinear media;
- Computer modeling, algorithms and numerical methods.

Professional Experience:

2019 - to present – Professor, School of Technology, Ilia State University;
2011 - 2019 – Professor, Faculty of Natural Sciences & Engineering, Ilia State University;
2011 - to present – Head of the Institute of Applied Physics, Ilia State University;
2010 - 2011 – Professor, Institute of Applied Physics, Ilia State University;
2007 - 2009 – Dean, Faculty of Physics and Mathematics, Ilia State University;
2006 - 2007 – Acting Dean, Faculty of Physics and Mathematics, Ilia State University;
1992 - 2006 - Senior Research Scientist, E. Andronikashvili Institute of Physics, Tbilisi, Georgia;
1990 - 1991 - Research Scientist, Institute of Physics, Georgian Academy of Sciences, Tbilisi, Georgia;
1984 - 1990 - Junior Research Scientist, Institute of Physics, Georgian Academy of Sciences, Tbilisi, Georgia.

Editorial work:

2018 - to present - Editor for plasma physics, *Open Physics* / Central European Journal of Physics / peer-reviewed monthly journal - https://www.degruyter.com/view/journals/phys/phys-overview.xml.

Teaching Experience:

Doctoral Courses:
- Data Modeling and Computer Processing (2007 - to present);
- Numerical Methods in Nonlinear Dynamics (2021 – to present)
- Plasma Physics I, II (2007 - to present);
- Structure and States of Matter (2015 - to present).

Graduate Courses:
- Data Modeling and Computer Processing (2007 - to present);
- Computer Modelling (2014 - to present);
- Electrodynamics of Condensed Media (2007 – to present);
- Plasma Physics (2007 - to present);
- Space Plasma Physics (1998 - 2005);
- General Astrophysics (1998 - 2003);
- Plasma Astrophysics (2005 - 2006);
- Energy Sources and Their Physical Bases (1998 - 2001);

Undergraduate Courses:
- Introduction to Linear Algebra (2021 – to present)

Introduction to Computer Modeling (2008 - to present)
Probability Theory and Statistical Methods (2021 – to present)
Introduction to Ordinary Differential Equations (2021 – to present)
Modern Physics in Modern Technology (2007- to present);
Introduction to Nonlinear Dynamics and Chaos Theory (2015 - to present)
Intro to Data Modeling and Computer Processing (2015 - to present)
Electricity and Magnetism (2008 - 2013).
Origins of Molecular Genetics /E. Schrödinger, "What Is Life?"/ (2007-2013);

2008-2009 – Leading Expert of the Physics Subject Group, the joint European Tempus project "Application of the Tuning Approach in the Georgian Higher Education System".

Research Visits/Collaborations:

- Jülich Supercomputing Centre, Forschungszentrum Jülich (Jülich, Germany), Visiting Research Scientist – 2006, 2007.
- Istituto di Fisica del Plasma, C.N.R., Associazione EURATOM-ENEA-CNR (Milan, Italy). Research visits to IFP: Visiting Research Scientist under the NATO-CNR Senior Guest Fellowships Programme – 1999; Visiting Scientist – 2000, 2002.
- International Centre for Theoretical Physics, Trieste, Italy; Associate Member – 1995-2000.
- Lawrence Berkeley National Lab, Center for Environmental Biotechnology, Earth Sciences Division, (USA) 1998-2013.

Research Projects:

1. **Institutional Development Project, Ilia State University**, "Circadian rhythm as a regulatory system for the homeostasis of a living organism from the perspective of nonlinear dynamics and chaos theory" (2019-2020).
2. **Shota Rustaveli National Science Foundation Project #AR/198/9-240/14**, "Investigation of atmospheric deposition of heavy metals in Georgia using moss biomonitoring and physical analytical techniques", (2015-2017).
3. **Science and Technology Center in Ukraine (STCU) Project #4744**: "Methods of nanoparticle production using extremophiles", Sub-manager of the Project, (2010-2013).
4. **Science and Technology Center in Ukraine (STCU) Project #5002**: "Biosynthesis and characterization of silver and gold nanoparticles", Expert in Computer Modeling and Simulation (2009-2011).
5. **Science and Technology Center in Ukraine / Georgian National Science Foundation (STCU/GNSF) Project # 4330**: "Detoxification of heavy metal ions by basalt-inhabiting bacteria", Expert in Computer Modeling and Simulation (2007-2009).
6. **International Science and Technology Center (ISTC) Project G-1366**: "Short Intense Laser Pulses in Optical and Composite Negative Phase Index Media", Leading expert – (2006 – 2009).
7. **Civilian Research and Development Foundation (CRDF) Project GE-B2-2597-TB-04**: "Mechanisms of Microbial Reduction and Detoxification of Heavy Metal Ions", Expert in computer modeling and simulation – (2004-2006).
8. **International Science and Technology Center (ISTC) Project G-408**: "Neutron Activation Analysis of Blue-Green Alga *Spirulina platensis*: Heavy and Toxic Elements Accumulation from Nutrient Medium in the Process of Cell Growth", Expert in computer modeling and simulation – (2001-2004).
9. **International Science and Technology Center (ISTC) Project G-348**: "Molecular Mechanisms of the Heavy Metal Transformation on Microbial-Mineral Surfaces: Their Roles in Detoxifying High-Oxidation State Cr and Other Heavy Metal Ions", Expert in computer modeling and simulation – (2000-2002).
10. **NATO-CNR Senior Guest Fellowships Programme Award, Ann. No. 219.31 (1998), Pos. 220364, Prot. 017920,** Individual grant (Research in laser-plasma interactions) – (1999).
11. **INTAS Project 94-0870**: "Non Linear Phenomena in Macrophysics of Collisionless Plasmas. Space and Laboratory Plasmas", Research group leader – (1996-1997).
12. **International Science Foundation (ISF) Grant # RVM000 Project**: "Self-focusing of Short Relativistically Intense Laser Pulses in Plasmas in the Presence of a Plasma Wake-Field and Magnetic Field Generation", Research scientist – (1996).

Selected publications:

1. L. Chkhartishvili **I. Murusidze** and R. Becker,
   "Electronic Structure of Boron Flat Holeless Sheet",
   Condensed Matter, **4**(1), 28 (2019).
2. L. Sartinska, L. Chkhartishvili,..., **I. Murusidze**, at al.,
   "Effect of concentrated light on morphology and vibrational properties of boron and tantalum mixtures"
   Heliyon **4**(3): e00585 (2018).
3. T. L. Kalabegishvili, **I. G. Murusidze**, D. A. Prangishvili at al.,
   "Silver Nanoparticles in *Sulfolobus islandicus* Biomass for Technological Applications",
   Advanced Science, Engineering and Medicine, **7**(9), 797-804 (2015).
4. R. Becker, L. Chkhartishvili, R. Avci, **I. Murusidze**, O. Tsagareishvili and N. Maisuradze,
   "'Metallic' Boron Nitride",
   European Chemical Bulletin, **4**(1-3), 8-23 (2015).
5. T. L. Kalabegishvili, **I. G. Murusidze**, E. I. Kirkesali, at al.,
   "Possibilities of Physical Methods in Development of Microbial Nanotechnology",
   European Chemical Bulletin, **4**(1-3), 43-49 (2015).
6. T. L. Kalabegishvili, **I. G. Murusidze**, D. A. Prangishvili, et al.,
   "Gold Nanoparticles in *Sulfolobus islandicus* Biomass for Technological Applications"
   Advanced Science, Engineering and Medicine, **6**(12), 1302-1308 (2014).
7. Levan Chkhartishvili, **Ivane Murusidze**,
   "Frequencies of Vibrations Localized on Interstitial Metal Impurities in Beta-Rhombohedral Boron Based Materials",
   American Journal of Materials Science, **4**(2), 103-110 (2014).
8. M. V. Frontasyeva, I. Zinicovscaia, S. S. Pavlov, A. Y. Dmitriev, T. Kalabegishvili, **I. Murusidze** and E. Kirkesali,
   "Redistribution of Elements in Microbial Biomass in the Process of Silver and Gold Nanoparticles Synthesis Studied by Neutron Activation Analysis",
   Journal of Bioremediation & Biodegradation, **S: 18** (2013).
9. T. L. Kalabegishvili1, **I. G. Murusidze**, E. I. Kirkesali1, A. N. Rcheulishvili1, E. N. Ginturi1, E. S. Gelagutashvili1, N. E. Kuchava1, N. V. Bagdavadze1, D. T. Pataraya, M. A. Gurielidze, Hoi-Ying Holman, M. V. Frontasyeva5, I. I. Zinicovscaia, S. S. Pavlov, V. T. Gritsyna,
   "Development of Biotechnology for Microbial Synthesis of Gold and Silver Nanoparticles",
   Journal of Life Sciences, **7**(2), 110-122 (2013).
10. L. Chkhartishvili, **I. Murusidze**, M. Darchiashvili, O. Tsagareishvili, D. Gabunia,
    "Metal impurities in crystallographic voids of beta-rhombohedral boron lattice: Binding energies and electron levels",
    Solid State Sciences**, 14**(11–12), 1673-1682 (2012).
11. Levan Chkhartishvili, **Ivane Murusidze**,
    "Relative stability of BN nanotubes".
    Solid State Sciences **, 14**(11–12), 1664–1668 (2012).
12. T. L. Kalabegishvili, E. I. Kirkesali, A. N. Rcheulishvili, E. N. Ginturi, **I. G. Murusidze**, D. T. Pataraya, M. A. Gurielidze, G. I. Tsertsvadze , V. N. Gabunia, L. G. Lomidze, D. N. Gvarjaladze, M. V. Frontasyeva, S. S. Pavlov, I. I. Zinicovscaia, M. J. Raven, N. M. F. Seaga and A. Faanhof,
    "Synthesis of Gold Nanoparticles by Some Strains of Arthrobacter Genera".
    Journal of Materials Science and Engineering A **2**(2), 164-173 (2012).
13. T. L. Kalabegishvili, E. I. Kirkesali, **I. G. Murusidze**, G. I. Tsertsvadze, M. V. Frontasyeva, I. Zinicovscaia, V. Y. Shklover, and N. V. Shvindina,
    "Characterization of Microbial Synthesis of Silver and Gold Nanoparticles with Electron Microscopy Techniques".
    Journal of Advanced Microscopy Research, **6**(4), 313-317 (2011).
14. L. Chkhartishvili, T. Berberashvili, **I. Murusidze**
    "Stability of Small Boron Nitride Nanotubes".
    Physics, Chemistry and Applications of Nanostructures, New Jersey, World Scientific, 2011, Eds.: V. E. Borisenko *at al*. Proceedings of the International Conference Nanomeeting 2011 (24-27 May), pp. 126-129 (2011).
15. L. Chkhartishvili, **I. Murusidze**,

"Molar Binding Energy of Zigzag and Armchair Single-Walled Boron Nitride Nanotubes".
Materials Sciences and Applications **1**(4), 223-246 (2010). DOI:10.4236/msa.2010.14035

16. N. Tsibakhahsvili, L. Mosulishvili, E. Kirkesali**, I. Murusidze**, M. V. Frontasyeva, S. S. Pavlov, I.I. Zinicovscaia, P. Bode, and Th.G. van Meerten,
"NAA for studying detoxification of Cr and Hg by *Arthrobacter globiformis* 151 B",
Journal of Radioanalytical and Nuclear Chemistry, **286**(2), 533-537 (2010).
DOI: 10.1007/s10967-010-0815-y
17. N. Tsibakhashvili, T. Kalabegishvili, A. Rcheulishvili, **I. Murusidze**, S. Kerkenjia, O. Rcheulishvili, H.-Y. Holman,
"Decomposition of Cr(V)-diols to Cr(III) complexes by Arthrobacter oxydans".
Microbial Ecology, **57**(2), 360-365 (2009).
18. N. Tsibakhashvili, L. Mosulishvili, T. Kalabegishvili, E. Kirkesali, **I. Murusidze**, S. Kerkenjia, M. Frontasyeva, H.-Y. Holman,
"Biotechnology of Cr(VI) transformation into Cr(III) complexes".
Journal of Radioanalytical and Nuclear Chemistry, **278**(3), 565-569 (2008).
19. **Ivane G. Murusidze**, Maurizio Lontano,
"Self-Compression and Self-Focusing Instability of Femtosecond Multiterawatt Laser Pulses in Underdense Plasmas".
Superstrong Fields in Plasmas, New York: American Institute of Physics. Eds.: D. Batani, M. Lontano, AIP CP, V. 827(1), pp. 100-105 (2006).
20. Rachel Codd, Peter A. Lay, Nelly Ya. Tsibakhashvili, Tamaz L. Kalabegishvili, **Ivane G. Murusidze** and Hoi-Ying N. Holman,
"Chromium(V) complexes generated in *Arthrobacter oxydans* by simulation analysis of EPR spectra".
Journal of Inorganic Biochemistry, **100**(11), 1827-1833 (2006).
21. N. Y. Tsibakhashvili, M. V. Frontasyeva, E. I. Kirkesali, N. G. Aksenova, T. L. Kalabegishvili, **I. G. Murusidze**, L. M. Mosulishvili, Hoi-Ying N. Holman,
"Epithermal Neutron Activation Analysis of Cr(VI)-Reducer Basalt-Inhabiting Bacteria".
Analytical Chemistry, **78** (18), 6285 -6290 (2006).
22. T. Kalabegishvili, N. Tsibakhashvili**, I. Murusidze**, D. Pataraya, M. Gurielidze, H.-Y. Holman.
"Formation of Cr(V) and Cr)III) in Arthrobacter oxydans exposed to high concentrations of Cr(VI)".
Modern Multidisciplinary Applied Microbiology, Ed. by A. Mendez-Vilas, Wiley-VCH, Weinhem, pp. 516-520 (2006).
23. Maurizio Lontano and **Ivane G. Murusidze**,
"Dynamics of space-time self-focusing of a femtosecond relativistic laser pulse in an underdense plasma".
Optics Express, Vol. 11, No. 3, pp. 248-258 (2003).
24. **Ivane G. Murusidze**, Givi I. Suramlishvili, Maurizio Lontano,
"Spatiotemporal Self-Focusing and Splitting of a Femtosecond, Multiterawatt, Relativistic Laser Pulse in an Underdense Plasma".
Superstrong Fields in Plasmas, New York: American Institute of Physics. Eds.: M. Lontano, G. Mourou, O. Svelto, T. Tajima, AIP CP, V. 611(1), pp. 177- 184 (2002).
25. D. Farina, M. Lontano, **I. G. Murusidze**, S. V. Mikeladze,
"Hydrodynamic approach to the interaction of a relativistic ultrashort laser pulse with an underdense plasma".
Physical Review E, **63**(5), 056409 (2001).
26. **I. G. Murusidze**, N. L. Tsintsadze, D. D. Tskhakaya, P. K. Shukla,
"Radiation of Ion-Acoustic Waves by Supersonic Solitons".
Physica Scripta, Vol. 58, pp. 266-269 (1998).
27. D. P. Garuchava, **I. G. Murusidze**, G. I. Suramlishvili, D. D. Tskhakaya, N. L. Tsintsadze,
"Interaction of a non-symmetric powerful laser pulse with a plasma".
Journal of Plasma Physics v.59, part 1, pp.57-68 (1998).
28. V. I. Berezhiani, S. M. Mahajan, I. G. **Murusidze**,
"Photon accelerator: Large blueshifting of femtosecond pulses in semiconductors".
Physical Review A, **56**(6), 5147-5151 (1997).
29. D. P. Garuchava, **I. G. Murusidze**, G. I. Suramlishvili, D. D. Tskhakaya, N. L. Tsintsadze,
"Propagation of an asymmetric relativistic laser pulse in plasma".
Physical Review E, **56**(4), 4591-4595 (1997).

30. **I. G. Murusidze** and L. N. Tsintsadze,
"Generation of large-amplitude plasma wakefields with low phase velocities by an intense short laser pulse".
Journal of Plasma Physics, v.**48**, part 3, pp.391-395 (1992).
31. V. I. Berezhiani and **I. G. Murusidze**. "Interaction of highly relativistic short laser pulses with plasmas and nonlinear wake field generation". Physica Scripta, Vol. **45**(2), pp. 87-90 (1992).
32. V. I. Berezhiani and **I. G. Murusidze**,
"Relativistic wake-field generation by an intense laser pulse in a plasma".
Physics Letters A, v.**148**, no.6, 7, pp.338-340 (1990).
33. **I. Murusidze**, D. D. Tskhakaya, S. Kuhn, M. Horhager,
"Radiation of ion-sound waves from a pulsating Langmuir soliton".
Physical Review A, **38**(3), 1427-1432 (1988).
34. **I. G. Murusidze**, N. L. Tsintsadze, and D. D. Tskhakaya. "Theory of Wave Radiation by Solitons in Plasma", Lecture notes, Spring College on Plasma Physics, H4.SMR/210-22 (30 pp.), International Centre for Theoretical Physics (ICTP), Trieste, Italy, (25 May-19 June 1987).
35. **И. Г. Мурусидзе**, Н. Л. Цинцадзе, Д. Д. Цхакая. "Теория излучения волн солитонами в плазме", в книге: *Проблемы теоретической физики*, сб. науч. тр. Редкол. В. Г. Барьяхтар (отв. ред.) и. др. – Киев: Наукова Думка, с.173-181 (1986).
36. **I. G. Murusidze**, N. L. Tsintsadze, and D. D. Tskhakaya." Excitation of Alfven waves by a Langmuir soliton". Sov. J. Plasma Phys., **11**(10), pp. 733-734 (1985).
37. **I. G. Murusidze**, N. L. Tsintsadze, D. D. Tskhakaya. "The theory of wave radiation by the Langmuir soliton." in Proc. of the 2nd Intern. Workshop on Nonlinear and Turbulent Processes in Physics (Kiev, October 10-24, 1983), *Nonlinear and Turbulent Processes in Physics*, Editor R. Z. Sagdeev, Gordon & Breach, Harwood Academic Publishers, New York, v. 1, pp. 451- 454 (1984).

Conferences / Workshops (Partial List):

- 9th International Conference & Exhibition on Advanced & Nano Materials (ICANM22), Canada, 24–26 October, 2022.
- The 6th International Conference "Nanotechnology", GTUnano20, Tbilisi, Georgia, 4–7 October, 2021.
- XI International Conference of the Georgian Mathematical Union, Batumi, Georgia, 23–28 August, 2021.
- The 20th International Symposium on Boron, Borides and Related Materials (ISBB 2019) Niigata, Japan, 22–27 September, 2019
- Nanoscience & Nanotechnology (n&n 2018), Frascati, Rome, Italy, 18-20 December, 2018.
- The 19th International Symposium on Boron, Borides and Related Materials (ISBB2017), Freiburg, Germany, 4-7 September 2017.
- The 18th International Symposium on Boron, Borides and Related Materials (ISBB 2014), Honolulu, Hawai'i, USA, August 31-September 5, 2014;
- ISTC International Scientific Seminar – Neuroplasticity: Nervous Substrate for Health and Disease, Tbilisi, Georgia, 25-27 September, 2012;
- ISTC International Scientific Workshop - Neuroplasticity: Nervous Substrate for Health and Disease, Tbilisi, Georgia, 17-19 October, 2010;
- Training Seminar II: Tuning approach and methodology at the University of Deusto, Bilbao, Spain, 1-3 December 2008;
- Training Seminar I: Tuning approach and methodology at the University of Groningen, Groningen, Netherlands, 27-30 October 2008;
- Tuning Dissemination Conference II (Competence-based learning: the approach for the future), Brussels, 11-13 June 2008;
- Tuning Dissemination Conference I (Student Workload and Learning Outcomes; Key Components for (Re) Designing Degree Programmes), Brussels, 21-22 April 2008;
- 3rd International Conference on SUPERSTRONG FIELDS IN PLASMAS, Villa Monastero, Varenna (Lc), Italy, 19-24 September 2005;
- 2nd International Conference on SUPERSTRONG FIELDS IN PLASMAS, Villa Monastero, Varenna (Lc), Italy, August 27 - September 1, 2001;
- One-day Workshop on Nonlinear Effects in Plasma", Istituto di Fisica del Plasma, C.N.R. Milan, Italy, 21 November 2000;

- International Topical Conference on Plasma Physics: New Perspectives of Collective Effects, International Centre for Theoretical Physics (ICTP), Trieste, Italy, 10-14 November 1997;
- Mesoscopic Phenomena in Complex Quantum Systems (A.R.C.), International Centre for Theoretical Physics (ICTP), Trieste, Italy, 11 – 14 June, 1996;
- School on Nonlinear Functional Analysis and Applications to Differential Equations, ICTP, Trieste, Italy, 15 April – 3 May 1996;
- Spring College on Plasma Physics, ICTP, Trieste, Italy, 17 May – 11 June 1993;
- U.S.-USSR Workshop on Optical and Plasma Physics, Los Angeles, Irvine, University of California, USA, 26-30 March 1990;
- Spring College on Plasma Physics, International Centre for Theoretical Physics (ICTP), Trieste, Italy, 25 May -19 June 1987;
- Joint Varenna–Abastumani International School & Workshop on Plasma Astrophysics, Sukhumi, USSR, 19-28 May 1986.