

PERSONALIA

PACS number: **01.60.+q**

Eugeniyus Levovich Ivchenko (on his 80th birthday)

DOI: https://doi.org/10.3367/UFNe.2026.02.040091

February 2, 2016 was the 80th birthday of academician of the Russian Academy of Sciences (RAS) Eugeniyus Levovich Ivchenko — an outstanding theoretical physicist, who has considerably contributed to the development of modern semiconductor physics and the formation of physics of semiconductor nanostructures.

E.L. Ivchenko was born on February 2, 1946 in Lithuania. In 1970, he graduated with honors from the Faculty of Radio Electronics (the Department of semiconductor and dielectric physics) of the Leningrad Polytechnic Institute. Further on, the whole scientific life of Eugeniyus Levovich has been related to the A.F. Ioffe Leningrad (now Saint Petersburg) Physico-Technical Institute (PTI) RAS, where he passed all the steps of scientific carrier from a graduate student, a junior, then senior researcher to head of the Sector of the theory of quantum coherent phenomena in a solid (1996–2014) and a head researcher at the present time.

In 1974, Eugeniyus Levovich defended his candidate thesis "Optical orientation and nonlinear light absorption in semiconductors," and in 1982, he defended his doctoral thesis "New optical phenomena in complex-band-structure semiconductors," and soon became professor.

In 2011, E.L. Ivchenko was elected a corresponding member of the Russian Academy of Sciences in the Division of Physical Sciences, and a full member of RAS in 2022.

The area of Eugeniyus Levovich's scientific interests covers the theory of solids, optical spectroscopy, the physics of excitons and photon crystals, spin physics, the theory of resonance excitations, control, and detection of spin coherence in nanostructures, nonlinear optical effects, photogalvanic effects, spin noise, and the physics of hetero-interfaces. Many results obtained by E.L. Ivchenko became classical and were included in textbooks and monographs; he is the author of three world-recognized monographs on semiconductor nanostructure physics. His close collaboration with experimenters from PTI and other Russian and international research centers made a substantial contribution to the development of optical spectroscopy of semiconductor systems.

A brief list of the main E.L. Ivchenko's works and scientific achievements is as follows:

— The importance of recording interference of multiple scattering processes in random inhomogeneous media is shown. This interference leads to amplification of complete backward scattering, which later underlay the weak localization theory (*Zh. Eksp. Teor. Fiz.* 1977) [1];

— A new field in nanophotonics was created — the study of resonance photon crystals and quasi-crystals, a giant exciton oscillator strength in a resonance Bragg structure with quantum wells was predicted (*Fiz. Tverd. Tela* 1994; *Phys. Rev. B* 2009) [2, 3];

Eugeniyus Levovich Ivchenko

— He is one of the founders of the physics of photogalvanic effects in media without center of inversion; predicted and investigated were the circular photogalvanic effect (*Pis'ma v Zh. Eksp. Teor. Fiz.* 1978, 1979) [4, 5], direct and inverse spin-galvanic effects in gyrotropic materials (*Zh. Eksp. Teor. Fiz.* 1990; *Nature* 2002) [6, 7] and Weyl semimetals (*Pis'ma v Zh. Eksp. Teor. Fiz.* 2017) [8], and valley orbit photocurrents (*Pis'ma v Zh. Eksp. Teor. Fiz.* 2005) [9]; the theory of shear photocurrent was constructed (*Zh. Eksp. Teor. Fiz.* 1982) [10];

— The theory of fine structure of zero-dimensional excitons localized in quantum wells, superlattices, and quantum dots was formulated (*Pis'ma v Zh. Eksp. Teor. Fiz.* 1992; *Zh. Eksp. Teor. Fiz.* 1998; *Internat. J. Nanoscience* 2007) [11–13];

— Effects were investigated caused by anisotropy of chemical bonds at interfaces, including heteroboundary between binary semiconductors without a common cation and anion (*Phys. Rev. Lett.* 1999) [14];

Uspekhi Fizicheskikh Nauk **196** (2) 217 – 218 (2026)
Translated by A.N. Tsaplin

E.L. Ivchenko in his study.

— The problem of the Seeman effect in low-dimensional structures with quantum wells (*Fiz. Tekh. Poluprovodn.* 1992) [15] and quantum dots (*Phys. Rev. B* 1998) [16] was solved;

— The effect of the magnetic field (*Fiz. Tverd. Tela* 1973) [17] and the electron-electron interaction (*Pis'ma v Zh. Eksp. Teor. Fiz.* 2002) [18] on the Dyakonov–Perel spin relaxation mechanism was investigated for the first time;

— The pioneering work on the electron spin noise in semiconductors was done (*Fiz. Tverd. Tela* 1973) [19];

— The theory of natural optical activity in semiconductors (*Fiz. Tverd. Tela* 1974) [20], resonance weak gyrotropy (*Solid State Commun.* 1978) [21], and magneto-induced dispersion of dielectric axes (*Pis'ma v Zh. Eksp. Teor. Fiz.* 1983) [22] was formulated.

— The theory of spin-dependent Shockley–Read–Hall recombination in semiconductors (*Pis'ma v Zh. Eksp. Teor. Fiz.* 2005) [23] was worked out and the superfine interaction of electron spin, captured to a deep center, with the spin of this center's nucleus was studied (*Phys. Rev. B* 2017) [24];

— The electron ratchet effects in systems with two-dimensional electron gas and an asymmetric metallic gate were investigated (*Phys. Rev. Lett.* 2017) [25].

At the present time E.L. Ivchenko is head of large-scale works on the study of optical and photogalvanic effects in new semiconductor materials, including semiconductor perovskites and dichalcogenides of transition metals of extreme two-dimensionality, as well as Weyl and Rarita–Schwinger–Weyl semimetals. He is often invited to give review talks and to deliver lectures at Russian and international conferences and scientific schools. E.L. Ivchenko has recently gave plenary talks at the 24th International school-conference ''Topical problems of magnetic resonance and its applications'' (Kazan' 2024) and at the International Conference on theoretical studies and new technologies (Cuba, 2025).

The scientific school founded by E.L. Ivchenko has been widely recognized. In 1989–2016, Eugeniyus Levovich was professor of the Physico-Technical Department of Saint Petersburg State Polytechnic University, and since 2012, professor of the Department of Condensed State Physics at Zh.I. Alferov Saint Petersburg Academic University RAS, and also professor of the Physics Faculty at Saint Petersburg State University (SPbSU).

His students have achieved international renown and became leading experts in condensed matter theory. Under his supervision, 12 candidate theses were defended, five candidates of sciences subsequently defended their doctoral theses, four were elected professors of RAS, two became corresponding members of RAS, and one served as head of a megagrant.

E.L. Ivchenko on the rostrum.

Currently, E.L. Ivchenko is the editor-in-chief of the journal *Fizika Tverdogo Tela* (*FTT*) (*Solid State Physics*), and for several years was editor of the international journals *Solid State Communications* and *Semiconductor Science and Technology*.

Since 2014, Eugeniyus Levovich has headed the Scientific Council of RAS for Semiconductor Physics and the Physical Science Section of the Joint Scientific Council for Natural Sciences of the St Petersburg branch of RAS; he is a member of the Academic Council of A.F. Ioffe Physical-Technical Institute of RAS and a member of the dissertation councils at the Physical-Technical Institute of RAS and Peter the Great St. Petersburg State Polytechnic University. He is also a member of the Advisory board of the 'Basis' foundation created to support fundamental physics and mathematics in Russia.

E.L. Ivchenko is a laureate of the A.F. Ioffe Prize in Physics and astronomy of the government of St. Petersburg for the development of the theory of optical and photogalvanic effects in low-dimensional systems and a multiple laureate of the PTI RAS Prize for superior work. He was invited professor within the framework of the 'Mercator' program of the German Science Foundation (2007–2009).

For his achievements, E.L. Ivchenko received several high awards. He was awarded the Medals of the Order of Merit for the Fatherland, 1st and 2nd class, the Jubilee Medal

''300th Anniversary of the Russian Academy of Sciences,'' the Medal ''In memory of the 300th Anniversary of Saint Petersburg,'' and the ''Honorary Mentor'' badge of the RF Ministry of Science and Education.

Colleagues and friends heartily wish Eugeniyus Levovich sound health and prosperity, and further success in his scientific and pedagogical activity.

N.S. Averkiev, P.I. Arseev, M.M. Glazov, A.G. Zabrodskii, S.V. Ivanov, V.V. Kveder, Z.D. Kvon, V.M. Pudalov, M.V. Sadovskii, O.V. Rudenko, S.A. Tarasenko, D.R. Khokhlov

Selected publications by E.L. Ivchenko

1. Ivchenko E L, Pikus G E, Razbirin B S, Starukhin A N ''Optical orientation and alignment of free excitons in GaSe under resonant excitation. Theory'' *Sov. Phys. JETP* **45** (6) 1172–1180 (1977); *Zh. Eksp. Teor. Fiz.* **72** (6) 2230–2245 (1977)
2. Ivchenko E L, Nesvizhskii A I, Jorda S ''Bragg reflection of light from quantum-well structures'' *Phys. Solid State* **36** (7) 1156–1161 (1994); *Fiz. Tverd. Tela* **36** (7) 2118–2129 (1994)
3. Poddubny A N, Pilozzi L, Voronov M M, Ivchenko E L ''Exciton-polaritonic quasicrystalline and aperiodic structures'' *Phys. Rev. B* **80** 115314 (2009)
4. Ivchenko E L, Pikus G E ''New photogalvanic effect in gyrotropic crystals'' *JETP Lett.* **27** (11) 604–608 (1978); *Pis'ma Zh. Eksp. Teor. Fiz.* **27** (11) 640–643 (1978)
5. Vorob'ev L E, Ivchenko E L, Pikus G E, Farbshtein I I, Shalygin V A, Shturbin A V ''Optical activity in tellurium induced by a current'' *JETP Lett.* **29** (8) 441–445 (1979); *Pis'ma Zh. Eksp. Teor. Fiz.* **29** (8) 485–489 (1979)
6. Ivchenko E L, Lyanda-Geller Yu B, Pikus G E ''Current of thermalized spin-oriented photocarriers'' *Sov. Phys. JETP* **71** (3) 550–557 (1990); *Zh. Eksp. Teor. Fiz.* **98** 989–1002 (1990)
7. Ganichev S D, Ivchenko E L, Bel'kov V V, Tarasenko S A, Sollinger M, Weiss D, Wegscheider W, Prettl W ''Spin-galvanic effect'' *Nature* **417** 153–156 (2002)
8. Golub L E, Ivchenko E L, Spivak B Z ''Photocurrent in gyrotropic Weyl semimetals'' *JETP Lett.* **105** (12) 782–785 (2017); *Pis'ma Zh. Eksp. Teor. Fiz.* **105** (12) 744–747 (2017)
9. Tarasenko S A, Ivchenko E L ''Pure spin photocurrents in low-dimensional structures'' *JETP Lett.* **81** (5) 231–235 (2005); *Pis'ma Zh. Eksp. Teor. Fiz.* **81** (5) 292–296 (2005)
10. Belinicher V I, Ivchenko E L, Sturman B I ''Kinetic theory of the displacement photovoltaic effect in piezoelectrics'' *Sov. Phys. JETP* **56** (2) 359–366 (1982); *Zh. Eksp. Teor. Fiz.* **83** (2) 649–661 (1982)
11. Aleiner I L, Ivchenko E L ''Anisotropic exchange splitting in type-II GaAs/AlAs superlattices'' *JETP Lett.* **55** (11) 692–695 (1992); *Pis'ma Zh. Eksp. Teor. Fiz.* **55** (11) 662–664 (1992)
12. Gupalov S V, Ivchenko E L, Kavokin A V ''Fine structure of localized exciton levels in quantum wells''*J. Exp. Theor. Phys.* **86** (2) 388–394 (1998); *Zh. Eksp. Teor. Fiz.* **113** (2) 703–714 (1998)
13. Glazov M M, Ivchenko E L, v. Baltz R, Tsitsishvili E G ''Fine structure of excited excitonic states in quantum disks'' *Int. J. Nanosci.* **6** (3–4) 265–268 (2007)
14. Platonov A V, Kochereshko V P, Ivchenko E L, Mikhailov G V, Yakovlev D R, Keim M, Ossau W, Waag A, Landwehr G ''Giant electro-optical anisotropy in type-II heterostructures'' *Phys. Rev. Lett.* **83** (17) 3546–3549 (1999)
15. Ivchenko E L, Kiselev A A ''Electron *g*-factor of quantum wells and superlattices'' *Sov. Phys. Semicond.* **26** (8) 827–831 (1992); *Fiz. Tekh. Poluprovodn.* **26** (8) 1471–1479 (1992)
16. Kiselev A A, Ivchenko E L, Rössler U ''Electron *g* factor in one- and zero-dimensional semiconductor nanostructures'' *Phys. Rev. B* **58** (24) 16353–16359 (1998)
17. Ivchenko E L ''Spin relaxation of free carriers in noncentrosymmetric semiconductors in a longitudinal magnetic field'' *Sov. Phys. Solid State* **15** (5) 1048–1052 (1973); *Fiz. Tverd. Tela* **15** (5) 1566–1572 (1973)
18. Glazov M M, Ivchenko E L ''Precession spin relaxation mechanism caused by frequent electron–electron collisions'' *JETP Lett.* **75** (8) 403–405 (2002); *Pis'ma Zh. Eksp. Teor. Fiz.* **75** (8) 476–478 (2002)
19. Ivchenko E L ''Fluctuations of spin polarization of free carriers in semiconductors'' *Sov. Phys. Semicond.* **7** (8) 998–1001 (1973); *Fiz. Tekh. Poluprovodn.* **7** (8) 1489 (1973)
20. Ivchenko E L, Pikus G E ''Natural optical activity of semiconductors (tellurium)'' *Sov. Phys. Solid State* **16** (7) 1261 (1975); *Fiz. Tverd. Tela* **16** (7) 1933–1940 (1974)
21. Ivchenko E L, Permogorov S A, Sel'kin A V ''Optical activity of CdS crystals in exciton spectral region'' *Solid State Commun.* **28** (4) 345–348 (1978)
22. Ivchenko E L, Kochereshko V P, Mikhailov G V, Ural'tsev I N ''Magnetically induced spatial dispersion of crystals in the exciton region of spectrum'' *JETP Lett.* **37** (3) 164–167 (1983); *Pis'ma Zh. Eksp. Teor. Fiz.* **37** (3) 137–139 (1983)
23. Kalevich V K, Ivchenko E L, Afanasiev M M, Shiryaev A Yu, Egorov A Yu, Ustinov V M, Pal B, Masumoto Y ''Spin-dependent recombination in GaAsN solid solutions'' *JETP Lett.* **82** (7) 455–458 (2005); *Pis'ma Zh. Eksp. Teor. Fiz.* **82** (7) 509–512 (2005)
24. Ibarra-Sierra V G, Sandoval-Santan J C, Azaizia S, Carrère H, Bakaleinikov L A, Kalevich V K, Ivchenko E L, Marie X, Amand T, Balocchi A, Kunold A ''Electron-nuclear spin dynamics of Ga^{2+} paramagnetic centers probed by spin-dependent recombination: A master equation approach'' *Phys. Rev. B* **95** 195204 (2017)
25. Faltermeier P, Budkin G V, Unverzagt J, Hubmann S, Pfaller A, Bel'kov V V, Golub L E, Ivchenko E L, Adamus Z, Karczewski G, Wojtowicz T, Popov V V, Fateev D V, Kozlov D A, Weiss D, Ganichev S D ''Magnetic quantum ratchet effect in (Cd,Mn)Te- and CdTe-based quantum well structures with a lateral asymmetric superlattice'' *Phys. Rev. B* **95** 155442 (2017)