Nataliya D. Kundikova

Affiliation:
Laboratory of Nonlinear Optics (head), Electrophysics Institute of Ural Branch of Russian Academy of Science

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Personal

Born 19 March, Mogilyev, USSR (now Republic of Belarus).

Education and Academic degrees

- 1969 – Graduated from the "A.N.Kolmogorov Physics and Mathematics high school" of MoscowUniversity, Moscow, USSR.
- 1975 – Physicist (MS). Graduated from the Physics Department of Moscow University with honors degree.
- 1979 – Candidate of science (Ph. D.) from MoscowUniversity in solid-state physics. Thesis "Study of inharmonic effects in quartz by Raman scattering".
- 1996 – Doctor of science (2nd Doctor degree) from Moscow University in optics. Thesis "Manifestation of vector nature of light under it's interaction with matter".

Awards and Associations

- Galileo Galilei Award of International Commission for Optics (ICO) – 1997.
- Optical Society of America, member since 1999, senior member since may 2017 – present.
- Vice president of the International Commission for Optics (ICO), Chair of the Galileo Galilei Award Committee since 2017
- The member of the ICO Galileo Galilei Award Committee, 2015 – present.
- The member of the ICO Committee for the Regional Development of Optics (CREDO) 2011-2014.
- President of Presidium of Chelyabinsk Scientific Center of the Russian Academy of Sciences, Ural Division 2006 – 2009.
- The member of the Professors association council in Applied Physics and Mathematics (Russian Federation), 1999 – present.

Total number of years of professional experience – 39

Key professional achievements in the organization of education and science

- 1997 – The founder and head of the Department of Optics and Spectroscopy (Department of Optoinformation) in South Ural State University.
- 2003 – The organizer and dean of the School of Physics in South Ural State University.

Dissemination of scientific knowledge and educational technologies in optics among *school students, teachers, university students, scientists and professors*

- The member of the Editorial board of the educational journal for high school students and teachers “Potential” (Russian Federation), since 2009.

- The member of the Professors association council in Applied Physics and Mathematics (Russian Federation), 1999 – present.
- Lecturing at the All-Russian youth Samara competitions conferences of scientific works on optics and laser physics, since 2008, Samara, Russia and The international school of sciences for youth and teachers "Applied mathematics and physics: from basic researches to innovations", Dolgoprudny, the Moscow region, since 2010.
- Organization of the regional competition of fundamental research in the Chelyabinsk region, the deputy chairman of the regional expert council, 2001-2009.

Key professional achievements in science

For the first time, the influence of the light trajectory on its state of polarization (Rytov-Vladimirsky-Berry-Tomita-Chao-Wu polarization rotation) and the influence of the polarization of light on its trajectory (Fedorov-Imbert and Goos-Hänchen shifts) were considered as mutually inverse effects, and the term "spin-orbit interaction of the photon" was introduced. The Optical Magnus Effect, which is the speckle-pattern rotation of circularly polarized light transmitted through a multimode optical fiber under the circularity sign change, was interpreted as the manifestation of the spin-orbit interaction of a photon. The experimental observation of the Optical Magnus Effect and its interpretation opened up an avenue for the search and research of new effects of the manifestation of the spin-orbit interaction of a photon.

The transformation of the spin angular momentum into the intrinsic orbital angular momentum under light propagation through optical fibers was predicted and observed experimentally.

The influence of the spin angular momentum on the extrinsic orbital angular momentum was observed in an optically homogeneous medium as the transverse shift of the beam waist.

The convenient classification of the effects of spin-orbit interaction of a photon as the result of the paired interaction of the angular moments (AM) of light (spin angular momentum, intrinsic orbital angular momentum, extrinsic orbital angular momentum), and also as joint influences of two types of angular momentum on the third was proposed. It was shown that the known effects of the spin-orbit interactions of light could be divided into six types in the following way: the spin AM affects the extrinsic orbital AM; the extrinsic orbital AM affects the spin AM; the intrinsic orbital AM affects the extrinsic orbital AM; the extrinsic orbital AM affects the intrinsic orbital AM; the spin AM affects the intrinsic orbital AM; the intrinsic orbital AM affects the spin AM. The influence of two types of AM on the third suggests the existence of three new effects. The joint influence of the spin AM and the extrinsic orbital AM on the intrinsic orbital AM was observed experimentally under the propagation of circularly polarized light through an optical fiber coiled into a helix. Two new effects can be found according to the proposed classification.

It is well known that all known methods of polarization conversion cannot convert the state of light polarization at different wavelengths independently. Therefore, a method and device for independent and simultaneous control of the polarization state at two wavelengths have

been proposed. The possibility of maintaining the phase shift at the first wavelength unchanged while simultaneously and independently changing the phase shift at the second wavelength has been theoretically proved and demonstrated experimentally.

An exact ellipsometric method for the investigation of coherent light with small ellipticity has been proposed. The technique provides maximum measurement accuracy for the selected ellipticity range and avoids taking into account the interference of multiple internal reflections of coherent light.

My statement

I will do my best to promote the development and dissemination of scientific knowledge and educational technologies in optics and photonics through the more close international collaborating and work aimed at enhancing the role and understanding of the importance of our favorite branch of activity (optics and photonics) in modern fundamental and applied science.

As a Vice president of the International Commission for Optics and Chair of the Galileo Galilei Award Committee, I encourage scientists to nominate their colleagues who achieved brilliant scientific results under comparatively unfavorable circumstances for the Galileo Galilei Award.

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