70 years’ anniversary of Professor Sergei B. Odinokov

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Abstract. This article briefly describes scientific, pedagogical and organizational achievements of Professor, Doctor of Technical Science Sergei Borisovich Odinokov.

1. Introduction
On the 25th of May, 2020 there are 70 years jubilee to Doctor of Technical Science, Professor of the “Laser and opto-electronic systems” Chair, Deputy Director on Academic work of Scientific Research Institute of Radioelectronics and Laser technics (SRI RL) of the Moscow State Technical University named after N. E. Bauman Sergei Borisovich Odinokov. The article briefly describes scientific, pedagogical and organizational accomplishments of Professor, Doctor of Technical Science Sergei B. Odinokov.

Figure 1. S.B. Odinokov.
2. Main Biographical Data

Date and Place of Birth: May 25th, 1950, Moscow

Education: 1967 -1973 Bauman Moscow Higher Technical College (BMHTC) specialty “Opto-electronic devices 1976-1979 - postgraduate studies of BMHTC and in 1980 defense of Ph.D. dissertation with specialty in “Optic-electronic devices and systems” in 2011 – defense of Doctorate dissertation on specialty “Optical and optic–electronic systems and complexes” at Bauman Moscow State Technical University (BMSTU); academic titles – senior research associate, associate Professor.

Career: 1973-1982 engineer, senior engineer, junior research associate at BMHTC. 1982-1990 – Head, sector of Central Design Bureau (CDB) “Spector”, Head, Sector of Central Scientific Research Institute “Kometa, since 1990 till now Associate professor, Professor of the Chair “Laser and optical electronic systems”, Deputy Director on Academic work of the Scientific Research Institute of Radioelectronics and laser technics (NIIRL) of the BMSTU.

Decorations and Awards: In 2004 r. Award of EMERCOM of the Russian Federation, also was decorated with medals of Optical Society of Russia – with Medal named after academician Yuri N. Denisuk (2015), with medal named after academician D.S. Rozhdestvensky (2017) and the medal named after academician Sergei I. Vavilov (2018).

He was also awarded with Honorary title “Labor Veteran of MGTU named after N.E. Bauman”, with title “Labor Veteran of the RF” as well as by honorary badge “Honoris causa of the University” (MGTU named after N.E. Bauman).

Membership in Professional societies: full Member of the International Academy of Informatization, Member of Optical Society named after D.S. Rozhdestvenski.

3. Holographic technologies in the MGTU named after N.E. Bauman

In 1973 Sergei Odinokov defended his diploma project on the topic “The recording of the relief – phased diffraction gratings by holographic method”, and in 1980 he defended Ph.D. dissertation on the topic of “Development of the method and optical electronic device for the recording of wave fronts of the moving objects” In 2011 he defended doctoral dissertation on the topic of “Methods and optical electronic systems for automized control of genuine nature protection security holograms” and in 1983-1990 he actively participated in the development of coherent optical electronic correlators with holographic filters for the recognition of the objects images. Therefore, all engineering and scientific activities of Sergei Odinokov related to the holographic technologies.

In 1995-2002 Sergei Odinokov participated in creation of the first Russian technological line for the recording and mass copying of the security holograms designed for the protection of documents and goods from counterfeit and fraudging. The customers of the work were the enterprises CJSC “Kripton” and JSC “Concern Russian security technologies”.

In 2002 with the active promotion of the Director of Scientific Research Institute RL MGTU named after N.E. Bauman professor V.I. Kozintz and there was created the laboratory named “Optical Holographic systems” and Sergei Odinokov became its Head and which successfully works at present. Since 2002 Sergei Odinokov actively engaged in research work in the area of optical holographic technologies and he was also the Chief of 10 RDs on the governmental order and contracts within the framework of Federal Central Enterprise (FCE) “Research and developments on the priority directions of the development of the scientific and technological complex of Russia” and also on economic agreements. Under the leadership of Sergei Odinokov there was developed optical and electronic system of the control of genuine nature of security holograms on the Russian citizens’ passports and on various governmental documents. There are 22 employees working in the laboratory who perform different scientific and research works and they are students, bachelors and masters of the RL-2 Chair. The results of the scientific research have been implemented in the industrial enterprises of optical holographic industry (JSC “NPO “KRIPTEN”, FGUP “NTC “ATLAS”, OICS “Holograte”).

Under the guidance of Sergei Odinokov in the laboratory there are conducted scientific research and research and development works on the following directions:
1) the development and research into new methods of encoding of information, recording of hidden encoded images in security holograms, creation of optical and electronic devices and gadgets for the control of authenticity of the security holograms and identification of the documents of strict reporting (special passes, banking promissory notes, customs and accounting documents, governmental documents of strict reporting etc.);

2) development, research and creation of testing samples of microoptical items, hologram and diffraction optical elements (GOE, DOE) including by methods of the direct laser recording with the assistance of femtosecond laser, by methods of forming computer-synthesized holograms (Fourier and Fresnel) with the aim of their use in the modern miniaturized optical and optical electronic systems;

3) development, research and creation of optical visual surveillance devices, including holographic hindsight with the set of signs, marks and scales with the changing of pattern for the small arms, supercompact helmet-mounted and devices of the added reality on the basis of lightguide plates with DOE;

4) development, research and creation of optical holographic systems of recording of the big volumes of digital information (up to 300Gb on a disc) and their superspeed readings on the basis of micro-nano opto-electronic element base.

The Laboratory “Optical–holographic systems” is equipped with modern scientific–research equipment, including:

- unique installation on the basis of femtosecond laser Antaus (Avesta company, Russia) for direct recording of GOE-DOE in different photo-sensitive materials including thermo-refraction glasses;
- modern complex for microscopy including scanning electronic microscope Zeiss EVO MA 10 and multifunctional optical microscope Zeiss Axio-1500;
- automatic device “Caroline 15 PE” for the reactive –ionic and plasma –chemical etching of quartz and standard glasses;
- complex comprising 4 optical tables, sets of gas, solid and semiconductor lasers working in the ultraviolet, visible and infrared bands of the irradiation wavelengths, devices for the control and measurement of the parameters of laser and optical irradiation.

4. International conferences on holography HOLOEXPO

According to the initiative of Sergei Odinokov in 2004 there was organized international scientific–practical conference “HOLOEXPO: holography, science and practice” which he has been presided in steering committee and in program committee till now and under his direct participation there were successfully conducted 16th conferences (2004-2019). The activities on conducting a series of HOLOEXPO conferences in 2004-2005 was actively supported by the founder of the domestic holography academician of the Russian Academy of Sciences (RAS) Yury N. Denisuk.

The conducting of annual International scientific and technical conferences “HOLOEXPO” is a very up-to-date and urgent scientific and technical event as well as it enables to assess the conditions of market of holographic production, latest scientific and technical developments in the area of holography and to determine its main directions of development. The conference is an event which seamlessly combining in itself the vivid demonstration of the production potential engineering and scientific ideas and entrepreneurial interests. The HOLOEXPO conferences are conducted with active sponsor participation of the series of such organizations as JSC “NPO “KRIPTEN” (Dubna, Russia) FGUP “Scientific and technical center “ATLAS” (Moscow, Russia) OJSC “HOLOGRATE” (St. Petersburg, Russia) CJSC “Holographic industry (Minsk, Republic of Belarus), JSC “Scientific and production amalgamation “State Institute of the Applied Optics”(Kazan, Russia), OJSC “Optical holographic devices” with the information support of the “Photonics” magazine.

The series of HOLOEXPO conferences are held with participation and scientific support from leading Universities and scientific institutes of Russia: Moscow State technical University named after N.E. Bauman (MGTU named after N.E. Bauman), St. Petersburg national research University of information technologies, mechanics and optics (ITMO University), Physical and technical institute named after A.F. Ioffe of RAS (The Ioffe Institute, Saint Petersburg), Saint Petersburg
Electrotechnical University "LETI", Samara National Research University named after academician Sergei P. Korolev, Image Processing Systems Institute of the of RAS (IPSI RAS – a branch of FSRC “Crystallography and Photonics” RAS, city of Samara, Russia), Institute of Automation and Electrometry of the Siberian Branch of RAS (IA&E SB RAS, city of Novosibirsk, Russia) and a number of others.

During the conducting of HOLOEXPO conferences the main scientific and technical questions were the following: 1) technologies in the area of recording and manufacturing security holograms; 2) forming of images and reflection of information with the assistance of hologram and diffraction optics as the elements of optical systems; 3) hologram and diffraction optical elements (GOE-DOE), methods of their computer synthesis and technologies of manufacturing with the use of photo-materials, metamaterials, plasma structures etc.; 4) three-dimension and decorative holography including new photosensitive materials for holography; 5) holographic interferometry, optical and holographic archive memory, optical holographic processing of information and signals.

In average the number of participants on an annual HOLOEXPO conference comprises 100 -130 persons and a number of presentations represented in the conferences usually comprises from 40 and to 60 reports. Thus after the conducting of 16 conferences the number of participants comprised more than 1000 persons and the number of presentations comprised more than 700 (one presentation equals to 10 pages of A4 size or approximately 7000 pages of A4size) which represents itself a solid volume of urgent scientific and technical information.

5. The main results of scientific activities
For forty seven years devoted to holography and optical science Sergei B. Odinokov made a significant contribution to the development of then theory, the principles of construction and methods of calculation of optical and holographic devices and the systems for surveillance and holographic memory.

Upon the results of his own developments, Sergei B. Odinokov published a monograph – “The Methods and optical electronic devices for the automatic control of the authenticity of the security holograms /S.B. Odinikov, Moscow: Technosfera eds, 2013, 175 pages which became the first book in Russia devoted to this topic.

In a composition of creative collective Sergei B. Odinokov published 2 books:
- Information optics / ed. by N. Evtihiev, Sergei B. Odinokov, O.A. Evtihieva and others, Moscow, MEI, 2000, 350 pages.
- Methods and devices of optical holographic systems of archived memory /ed. By S.B. Odinokov, Moscow, Technosfera, 2018, 236, which also became the first book for the last 20 years, published in Russia in the field of holographic memory.

Sergei B. Odinokov has more than 180 published scientific works of which for the last 5 years (2014-2020) till now there were published 65 scientific works in domestic and foreign magazines which are in the systems of SCOPUS and Web of Science. The Hirsh Index according to the publication in RINTZ is 13. The Hirsh index according to the publication in WoS is 8. The Hirsh Index according to the publication in Scopus is 9. He obtained 46 patents for the inventions and useful models from which 14 patents were received for the last 5 years.

The most significant works of Sergei B. Odinokov for the last years are referred below in the list of publications [1-31].

Sergei B. Odinokov is a member of editorial board of the two scientific and technical magazines (“Fotonics”, “The World of Cinema technics”) and a member of scientific and technical council of Laser Association of Russia as well as he is member of 2 dissertation councils in MGTU named after N.E. Bauman.

In the period of 2009 -2020 under the guidance of Sergei Odinokov there were developed and implemented into practice:
- According to the assignment of the Federal Security Service of the RF the optical and electronic complex “Diffraction-2” for the expert and criminalistics analysis of the security holograms used on
passess, IDs, tax and customs documents as well as optical and electronic systems “Dispatcher -1.2” for the identification and control of the authenticity of the security holograms on the citizens of RF passports which is used on the border passes of the Moscow region airports;
- According to the assignment of the Ministry of science and higher education of the RF there was developed the original system of archived optical and holographic memory on the basis of multi-gigabyte holographic discs and memory sticks (flash-cards) with the period of keeping the information up to 50 years;
- According to the assignment of the Ministry of education and science of RF for the latest generation of micro-photonic devices, miniature laser and optical and electronic devices there was developed the technology of obtaining hologram and diffraction optical relief–phased elements performed in micro-nano structured film materials by the methods of electronic beams and laser lithography in the optical glasses by the method of plasma chemical ionic etching.

6. Pedagogical activities
Under the guidance of Professor Sergei B. Odinokov there were defended 5 Ph.D. dissertations and currently he is an academic instructor of 2 post-graduate students. Sergei B. Odinokov performs all kinds of pedagogical work. He prepared and reads lectures on the disciplines “Applied holography”, “Designing Optical electronic Plates (OEP) of the location finding and homing action”, “OEP of environmental monitoring” conducts workshops and laboratory works, leading bachelor and master students, course and diploma papers projecting of the students of the Chair “Laser and optical electronic systems “ of BMSTU, has developed the topics of classes and the programs to read courses of lectures, topics of home assignments, course and diploma projects. There were published and edited as a co-author 6 study books.

7. Conclusion
In conclusion, we would like to wish Sergei Borisovich Odinokov good health and energy for the continuation of the scientific research and the implementation of their results.

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