



## FOREWORD

### Prof. Valentin I. Vlad at his 70<sup>th</sup> anniversary

It is a pleasant duty for us to write, with high appreciation, about one of the most respectable Romanian laser physicists and about a friend, Valentin Ionel Vlad, at his 70th anniversary. He is recognized as a pioneer in the fields of holography, nonlinear optics, and information optics by both the Romanian scientific community and by the most prestigious foreign optical societies.

Valentin Ionel Vlad was born in Bucharest on September 22, 1943. His parents, Ioan Vlad and Lucretia Vlad (nee Timis), were distinguished Romanian intellectuals with deep roots in Transylvania and Maramures. He graduated the Polytechnic Institute of Bucharest, Department of Electronics, in 1966, and obtained the scientific title of Doctor in Electronic Engineering from the same Institute, in 1972, with a thesis on information processing in holography, supervised by Prof. G. Cartianu, member of Romanian Academy.

From 1966 until 1975, Valentin I. Vlad was a researcher at the Institute of Atomic Physics, Bucharest, the Laboratory of Optical Methods in Nuclear Physics, led by Prof. Ion Agarbiceanu, member of Romanian Academy. Here, he developed in 1966-68, in collaboration with his colleague, George Nemes, the first solid state laser in Romania [G. Nemes, V. I. Vlad, *Laser effect in neodymium glass*, Rev. Roum. Phys. **14** (4), 395 (1969)]. In the period 1969-1970, he also studied at the

University of Paris (with Prof. M. Françon) and visited CGE-Marcoussis. At CGE, he demonstrated and studied real time holograms recorded in saturable absorbers.

In 1975, Dr. V. I. Vlad started and became head of Holography Laboratory at the Department of Lasers, Institute of Atomic Physics, Bucharest. In the interval of 1977–1989, he was a senior researcher of the Central Institute of Physics, Bucharest. During that time, he was also a visiting scientist at the “A. F. Ioffe” Physical Institute in St. Petersburg, working in holography, ultra-fast optical phase conjugation, wave-mixing in photorefractive crystals, and picometer-amplitude vibration measurements (in collaboration with Prof. Yu. I. Ostrovski and Prof. M. P. Petrov). He also visited the Technical University Darmstadt (he was a recipient of a DAAD Fellowship for studies of wave mixing in photorefractive crystals with Prof. T. Tschudi). Until 1990, the main research fields of Dr. Vlad were holography, holographic interferometry, and optical processing of information. He published two books on these topics: V. I. Vlad, “*Introduction in holography*” (in Romanian), Publishing House of the Romanian Academy, Bucharest, 1973 and V. I. Vlad, R. Zaciu, J. Maurer, N. Miron, and D. Sporea, “*Optical processing of information*” (in Romanian), Publishing House of the Romanian Academy, Bucharest, 1976.

By the imperatives of that period, in addition to basic research in holography and information optics, he led the design and development of a good number of devices and systems for testing and measurement, which were based on holographic interferometry and other optical methods. A series of holographic interferometry systems have been designed and accomplished by him and his group for non-destructive testing of optical and mechanical components, for testing composite materials used in aviation industry, for calibration of high-precision measuring devices used in fine mechanics (Romanian patent no. 71070/1976 and US patent no. 4378160/1983, in collaboration with J. Maurer, N. Miron, D. Sporea et al.), and for precise measurement of homogeneity of optical glasses. He realized also a portable holo-camera in collaboration with D. Popa and N. Califaru (Romanian patent no. 4378160/1983), laser anemometers based on heterodyne optical detection (for measurement of flow speed in hydro- and wind-tunnels), optical filtering systems (Fourier and optical schlieren systems), optical correlators, optical coding of the relief and associative optical memory for robot vision, and Talbot-moiré deflectometry. Dr. V. I. Vlad designed and developed (collaborating with Dr. N. Ionescu-Pallas for solving difficult inverse problems in optics and with V. Capatina and Adriana Vlad for an innovative computer image processor) an optical tomographic method and an apparatus for the non-contact measurement of diameter and refractive index profile of optical fibers (Romanian patent no. 93121/1985) and developed the theoretical formalism and a system based on schlieren method for precise measurement of flow parameters in a tri-sonic wind tunnel for aviation research.

In 1989–1990, Dr. Vlad proposed the use of the selective amplification in the two-wave-mixing in GaAs:Cr and of a self-calibration method based on Bessel function properties in the measurement of the ultralow vibration amplitudes by holographic interferometry. Based on these methods, picometer-amplitude vibrations were measured in Prof. Vlad's laboratory, results published in a well-cited paper [S. I. Stepanov, I. A. Sokolov, G. S. Trofimov, V. I. Vlad, D. Popa, and I. Apostol, *Measuring vibration amplitudes in the picometer range using moving light gratings in photoconductive GaAs:Cr*, Opt. Lett. **15**, 1239 (1990), 88 citations on Google Scholar database, over the past 20 years].

Since 1990, he has been leading the Laboratory “Nonlinear and Information Optics” in the Lasers Department of the National Institute for Laser, Plasma and Radiation Physics, Bucharest-Magurele. As Professor at the Faculty of Physics of the University of Bucharest (since 1990), he held for about 12 years a course on Information Optics. At the Institute of Atomic Physics and University of Bucharest he supervised PhD students among which we mention A. Petris, V. Babin, Anca Mocofanescu, Mona Levai, I. Dancus, Tatiana Bazaru Rujoiu, S. Popescu, and Petronela Gheorghe. Currently, Prof. Vlad is giving also lectures in the Doctoral School of Condensed Matter at the Faculty of Physics, Bucharest.

Following an invitation from Prof. J. Tsujiuchi, he was a Visiting Professor at Chiba University, Japan in 1991, being a recipient of a JSPS Fellowship for a collaborative work in associative storage and processing in photorefractive crystals. In 1992, he was a Visiting Professor at Centro de Investigaciones en Optica, León, Mexico (Catedra de Excelencia) and had a scientific collaboration with Prof. D. Malacara in the area of direct spatial reconstruction of optical phase. As a result of this collaboration, a relevant paper was published in 1994 in the Elsevier book series “Progress in Optics”, edited by E. Wolf [V. I. Vlad and D. Malacara, *Direct spatial reconstruction of optical phase from phase-modulated images*, Progress in Optics, Vol. 33, pp. 261–317 (1994)].

Prof. Valentin I. Vlad established a long standing (more than 10 years) collaboration in adaptive interferometry and optical information processing with Prof. J.C. Dainty, Imperial College, Blackett Laboratory, in London, since 1991, through an exchange program between the Romanian Academy and Royal Society. In two research projects, in collaboration with Prof. J. C. Dainty and Prof. M. Damzen, he obtained significant results in stimulated Brillouin scattering (SBS). As a result of this collaboration a “first book to comprehensively describe SBS and its applications” was published [M.J. Damzen, V.I. Vlad, V. Babin, and A. Mocofanescu, *Stimulated Brillouin Scattering. Fundamentals and Applications*, IOP Publishing, Bristol, London & Philadelphia, 2003]. Furthermore, Prof. Vlad and his collaborators obtained and published in this collaborative work relevant results in wave-mixing, adaptive interferometry, and interconnection using photorefractive crystals [A. Petris, M. J. Damzen, and V. I. Vlad, Opt. Commun. **176**, 223 (2000), A. Petris, M. J. Damzen, and V. I. Vlad, Opt. Commun. **205**, 437 (2002)].

Since 1994, for more than seven years, Prof. Vlad was also an external collaborator of Prof. H. Walther, in the Max-Planck-Institute for Quantum Optics in Garching, where he proposed and made experiments on space charge distribution in photorefractive crystals with a highly sensitive atomic force microscopy for information storage with few photons [see *J. Opt. Soc. Am. B* **15**, 2185 (1998) and *Appl. Phys. A* **66**, 337 (1998)].

In 1995, Prof. Vlad became an associate researcher of the International Centre for Theoretical Physics (ICTP), Trieste, Italy and in 2003, an ICTP Senior associate. During that period, he studied the quantum gases in cavities with small adiabatic invariants and published relevant results, in co-operation with Dr. N. Ionescu-Pallas, see the papers: V. I. Vlad and N. Ionescu-Pallas, *The radiation of the double quantized cubic cavities*, *Fortschritte der Physik* **48**, 657 (2000); V. I. Vlad and N. Ionescu-Pallas, *Discrete Bose-Einstein systems in a box with low adiabatic invariant*, *Fortschritte der Physik* **51**, 510 (2003); V. I. Vlad and N. Ionescu-Pallas, *Exponential decrease of thermodynamic functions of photon gas in cubic and spherical cavities with low adiabatic invariants*, *Laser Physics* **17**, 1001 (2007), as well as other papers in Fourier optics and nonlinear optics.

In 1998–99, Prof. Valentin I. Vlad won two ICTP-TRIL grants for research at Università “La Sapienza” di Roma, Department of Energetics, led by Prof. M. Bertolotti. There, he proposed the generation of optical spatial solitons in sillenite photorefractive crystals, well-known nonlinear materials from his previous experience, cheap and relatively widespread, but with a strong optical activity. In a collaborative work with Prof. M. Bertolotti, Prof. E. Fazio, and Dr. V. Babin, he succeeded in showing the first evidence of spatial solitons in photorefractive crystals with optical activity [*Proc. Romanian Academy, Series A* **1**, 25 (2000)].

In the period 2001–2008, he was a project coordinator, jointly with Prof. E. Fazio, for studies of optical spatial solitons and soliton waveguides induced in photorefractive crystals, in the framework of the Inter-governmental Italian-Romanian Collaboration Agreement in R&D, at Università “La Sapienza” di Roma, Department of Energetics. He was also Visiting Professor at the same university, in 2001 and 2005. The original results of complex theoretical and experimental studies in the area of spatial solitons and soliton waveguides in photorefractive crystals have been published in a series of papers in high impact archival journals: *Phys. Rev. E* (2002, 2003), *Appl. Phys. Lett.* (2004), *Appl. Surf. Sci.* (2005), *J. Optics A: Pure Appl. Optics* (2003, 2006), *Phys. Rev. A* (2007), and in book chapters in prestigious publishing houses (Kluwer and Springer), in 2003 and 2009. We would like to point out that the seminal work [E. Fazio, F. Renzi, R. Rinaldi, M. Bertolotti, M. Chauvet, W. Ramadan, A. Petris, and V. I. Vlad, “*Screening-photovoltaic bright solitons in lithium niobate and associated single-mode waveguides*”, *Appl. Phys. Lett.* **85** (12), 2193–2195 (2004)], which was a result of this longtime collaboration, received more than 127 citations in Web of Science database and more than 175 citations on Google Scholar database.

It is worth mentioning that very recent works, performed by Prof. Vlad's group, deal with fast writing of soliton waveguides in lithium niobate using low-intensity blue light [S. T. Popescu, A. Petris, and V. I. Vlad, *Appl. Phys. B-Lasers and Optics* **108** (4), 799 (2012)] and writing of soliton waveguides in blue light assisted by the pyroelectric field [S. T. Popescu, A. Petris, and V. I. Vlad, *J. Appl. Phys.* **113** (4), 043101 (2013); *J. Appl. Phys.* **113** (21), 213110 (2013)].

He proposed and contributed essentially to the reflection I-scan method, and collaborating with A. Petris, to the reflection double Z-scan method with ultrafast pulsed lasers, as new techniques for characterization of the nonlinear optical properties of nanomaterials.

The list of scientific publications of Prof. Vlad includes more than 150 papers published in Romanian and international journals. He took part with communications in over 200 national and international scientific conferences (more than 15 invited and plenary lectures). He is author or co-author of five books and editor of seven Proceedings of SPIE-The International Society for Optics and Photonics. The International Conferences "Trends in Quantum Electronics", chaired by Prof. A. M. Prokhorov and Prof. I. Ursu and held in Bucharest in 1982, 1985, and 1988, were continued by Prof. V. I. Vlad with seven International Conferences on Optics "ROMOPTO", which were held in Romania every three years, in the period 1994-2012, with support of the most prestigious international organizations in Optics and Photonics (ICO, ICTP, OSA, SPIE, and EOS). Prof. Vlad was the chairman of these conferences.

After 1990, Prof. Vlad brought important services for the physics community: he was co-founder of the Romanian Physical Society and was the first president of the Division of Optics and Lasers. He obtained the recognition of this division as ICO Territorial Committee and EOS Affiliated Society. In 1991–1993, he was the Vice-president of SPIE-Romanian Chapter. In 1990, Prof. I. Iovitz-Popescu and Prof. Vlad established a new Physics journal, "Romanian Reports in Physics", in its current format, continuing the former journal "Studii și Cercetări de Fizică" (in Romanian). Since 2000, he has been the Editor-in-Chief of this journal, he started the electronic version of this journal on Internet, he organized it for Thomson Reuters - Web of Science indexing and ranking and introduced a good number of new features to turn it into a modern journal. At the same time, Prof. Vlad is also the Editor-in-Chief of the journal "Proceedings of the Romanian Academy, Series A". He was member of the editorial board of "Optics Letters" (1980–1990) and of "Journal of Optics A: Pure and Applied Optics" (1998–2006). Currently, he is a member of the editorial board of the "Journal of the European Optical Society - Rapid Publications", "SPIE Reviews", "Axioms", and "Optoelectronics and Advanced Materials - Rapid Communications".

Besides other services, we remark his important achievements as the President of Physics Commission of Romanian Consultative College for R&D (1991–2002), with important contribution to the Physics Strategic Plan "Horizon

2000”, project evaluation and funding, as the Vice-president of Grant Commission of the Romanian Academy (1994–2007), and as a co-director of the Romanian Center of Excellence in Photonics (ROCEP). He was also the national project coordinator of the EU Network of Excellence FP6-PHOREMOST-NoE IST-2-511616 “Nano-photonics to Realize Molecular Scale Technologies” (with relevant results in the area of optical nonlinearities of nano-structured materials, quantum dots, in nano-imaging, and in theory of thermodynamic functions of cavities with low adiabatic invariants). He was also the national project coordinator of three EU COST Actions on optical information storage and processing, on physics of photonic crystals, and on sub-wavelength photonic devices.

Prof. Valentin I. Vlad received different awards for his work, including “T. Vuia” Award of the Romanian Academy in 1978. He was elected “Fellow of the Optical Society of America” in 1978, “*in recognition of distinguished service in the advancement of optics*”, Member of the Romanian Academy (among 181 distinguished intellectuals of the country) in 1991, and “Fellow of the Institute of Physics and Chartered Physicist”, U.K, in 1999. In 2005, he was elected Member of Academia Europaea and he received the “Galileo Galilei” Award of the International Commission of Optics, “*for his outstanding contributions to the field of optics, non linear optics and photorefractive optics achieved under comparatively unfavorable circumstances*”. In 2006, he was elected Fellow of the International Society of Optical Engineering (SPIE) (for “*specific achievements in photorefractive crystals, holography, and interferometry*”, being “*one of the world’s leading researchers in dynamic holography, photorefractive crystals and nonlinear optics*”). Since 2011, Prof. Vlad is a member of the Board of Directors, member of the Executive Committee, and Chairman of the Advisory Committee of the European Optical Society (EOS).

In 2008, he was decorated by the Romanian Presidency with the Romanian National distinction “Knight of the Faithful Service Order”.

Since 2010, Prof. Valentin I. Vlad is acting as a vice-president of the Romanian Academy, the highest scientific forum in Romania. We remark his strong contributions in the building of the Doctoral School of the Romanian Academy, in the evaluation of the scientific output of different research institutions, and in many scientific and cultural activities.

Prof. Vlad is an excellent science communicator and an outstanding mentor and advisor to many undergraduate and graduate students. He is permanently trying to transmit to his students and young colleagues the passion for scientific research, the imagination and courage to explore new ideas, the perseverance and accuracy in experimental work, in interpretation and modeling of experimental results.

He is a fine diplomat and his deep knowledge of several foreign languages makes him an extremely enjoyable person, a human quality very much appreciated by colleagues all-around the world. Therefore, his peers very much appreciate his ability to speak with people from various countries with diverse cultural heritages,

in their mother tongue on many subjects starting from physics to philosophy, literature, music, and art.

At his seventieth anniversary, we are wishing Prof. Valentin I. Vlad good health, a long and successful scientific and cultural activity, and many happy years with his family.

This special issue of “Romanian Reports in Physics” has attempted to show the profound impact of his work in optics and photonics and the high appreciation of his lifelong colleagues and friends. Together with Professor Vlad, we thank all these colleagues and friends who generously contributed to this journal issue.

From the Editorial Board,

Dr. Dumitru Mihalache, Fellow of The Optical Society (OSA)

Dr. Adrian Petris