CONTRIBUTION OF SAMARA SCIENTISTS INTO *COMPUTER OPTICS* JOURNAL DEVELOPMENT

V.O. Sokolov

Samara Scientific Center of RAS, Samara, Russia

Abstract. The author analyzes the contribution of Samara scientists into development of *Computer Optics* scientific journal. He briefly describes the stage of publication of the *Computer Optics* collection in Moscow. Particular attention is paid to Samara stage of the journal development, its results, and to journal articles that have attracted special interest of the research community. The author tells about the current progress of the journal, discusses the prospects for its development.

Keywords: scientific journal, editorial board, optical information technology, image processing, computer vision, diffractive nanophotonics, micro- and nanotechnologies.

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Introduction

This year we celebrate 20 years since the publication of the Computer optics scientific journal moved from Moscow to Samara. This is a good occasion to look back at the history of the journal formation, noting its achievements and paying tribute to the Samara scientists and experts for their contribution to the development.

1 Moscow period

Fundamental research, jointly performed at the turn of 70-80-ies of the last century by scientific groups from Moscow and Kuibyshev (now Samara) under the guidance of academician A.M. Prokhorov, professor I. N. Sissakian, and professor V.A. Soifer, ensured creation of new classes of optical elements [1-9], allowing to solve problems that go beyond classical optics. New optical elements were called diffractive optical elements (DOE), and their sub-classes, intended for specific tasks, have received their own names: lazer light focusators [1-3, 8, 9], modans [4], Bessel-optics elements [5], compensators [6-7], and so on. Some of terms listed above, for example, the term focusator, proposed by academician A.M. Prokhorov, were adopted not only in Rus-

sia, but also at the international level [10-12]. It became clear that we were witnessing the emergence of a new field of research at the intersection of information technologies, laser physics, optics, and microelectronics, which has become known as diffraction computer optics. Thus there arose the demand for a scientific periodical for prompt publication of articles devoted to the new and rapidly developing area. In May, 1986 the decision was taken at the kickoff meeting on computer optics (the city of Zvenigorod) to start publication of a new journal, and it was approved by the Russian science leadership. In 1987 the first issue of the *Computer Optics* international scientific collection was published with a subtitle Physical Principles.

Among the co-founders of *Computer Optics* collection there were the International Center for scientific and technical information (ICSTI), Institute of general physics of the USSR Academy of Sciences, Institute of information transmission problems of the USSR Academy of Science, with the ICSTI acting also as a publisher. The publication was funded as part of information support of the complex program of scientific and technical progress of the Council for Mutual Economic Assistance (CMEA) member-states. In the initial years the *Computer Optics* collection was edited by academicians Ye.P. Velikhov and A.M. Prokhorov. The first issues were compiled by professor I.N. Sisakyan, professor V.A. Soifer, R.V. Matveeva, S.A. Orekhov, A.M. Kostin, and V.A. Danilov, with essential contribution made by scientists of Kuibyshev aviation Institute (presently, SSAU). Notably, the shock publication of the first issue was the article [13] by I.N. Sissakian and V.A. Soifer "Computer Optics. Achievements and Problems", which has determined the development direction of this field of science for decades. Leading scientists from Samara have also become authors of articles in the first edition: M.A. Golub, N.L. Kazanskiy, D.D. Klovsky, S.M. Shirokov [14-16].

The first issue of *Computer Optics* became internationally recognized, having attracted interest from Pergamon Press publishing house that published two volumes of the journal in the years 1989–1990 in English (Vol. 1, N 1, 1989; Vol. 2, N 1 & N 2, 1990) with world-wide distribution (cities like Oxford, New York, Beijing, Frankfurt, San Paolo, Sidney, Tokyo, Toronto were indicated at the journal cover). Volume 1 was compiled in English on the basis of the first Russian issue, and volume 2 included papers from Russian issues 3 and 4. Wherein in the second volume there were already 9 articles from Samara scientists [17-25].

Of particular note is the article [21], devoted to technological applications of focusators; it served as a start of the most important area of computer optics, which was actively developing all subsequent years [26-29]. In 1992, including for work in this area, a group of scientists of the Samara University (V.A. Soifer, V.P. Shorin, V.A. Barvinok, V.I. Mordasov, V.I. Bogdanovich, A.G. Tsidulko) together with I.N. Sissakian received the State prize of the Russian Federation for outstanding achievements in the field of science and technology.

2 Moving to Samara

Collapse of the CMEA and the Soviet Union in the early 1992 led to suspension of publication of the collection`s next editions, which was caused by termination of CMEA member countries comprehensive program of scientific and technical progress. Therefore, since 1992 V.A. Soifer`s research team had to take over financial support of the publication, and Samara University (at that time - SSAU) was added to the founders of the collection. 1992 saw the publication of a twin issue 10-11 and issue 12, with issue 13 published in 1993. Unfortunately, those years were marked by the growth of publication and distribution costs, which significantly exceeded financing of scientific research, therefore *Computer Optics* was not published in 1994.

However, in 1995, thanks to the assistance of academician N.A. Kuznetsov, rector of Institute of information transmission problems of the Russian Academy of Sciences (IITP RAS), and candidate of sciences N.S. Merzlyakov, head of digital optics sector at the IITP RAS, the financing was obtained, which enabled the publication in ICSTI of a two-part twin issue 14-15. The twin 14-15 issue became the last to be compiled and edited with participation of I.N. Sisakyan, who soon untimely deceased.

Starting from issue 16, commemorating I.N. Sisakyan, the collection started to be entirely published in Samara, with the ICSTI, SSAU, and IPSI RAS acting as cosponsors, and IPSI RAS also was its publisher.

3 Journal

Even though *Computer Optics* was no longer published in English, it acquired ever growing recognition in the scientific community. On October 17, 2001 the collection was included into the list of scientific periodicals recommended by RF higher certifying Commission of science and education Ministry for publication of research papers relating to basic scientific content of doctoral dissertations. The results published in Computer Optics later formed the basis of doctoral dissertations by A.V. Volkov, D.L. Golovashkin, O.V. Goryachkin, L.L. Doskolovich, A.I. Danilin, E.G. Ezhov, V.V. Ivakhnik, N.Y. Ilyasova, N.L. Kazanskiy, S.V. Karpeev, A.A.Kovalev, V.A. Kolpakov, V.P. Korolkov, A.V. Kupriyanov, I.V. Minin, O.V. Minin, S.P. Murzin, V.V. Myasnikov, A.V. Nikonorov, S.B .Odinokov, V.S. Pavelyev, A.G. Poleshchuk, S.B. Popov, V.V. Sergeev, R.V. Skidanov, S.A. Stepanov, V.A. Fursov, S. I. Haritonov, S.N. Khonina, A.G. Khramov et al.

Since 2007 the collection has become a quarterly scientific journal, jointly published by SSAU and IPSI RAS. The editorial board included three RAS academicians (Yu.I. Zhuravlev, V.Ya. Panchenko, and I.A. Scherbakov), three RAS corresponding members (S.Yu. Zheltov, B.V. Kryzhanovsky, and V.A. Soifer), six doctors of science (N.L. Kazanskiy, V.V. Korlyar, V.S. Pavelyev, V.V. Sergeev, S.N. Khonina, and V.M. Chernov), as well as scientists from Germany (professor Richard Kowarschik of Friedrich Shieller University, Jena), India (professor Kehar Singh), China (academician Jin Guofan of Tsinghua University, Beijing), and Finland (professor Jari Turunen

of Joensuu University). On 22 March, 2007 V.A. Soifer was appointed the chief editor of *Computer Optics* journal by Resolution N 2-8 of the RAS' information technologies and computing systems Department. V.A. Soifer outlines [30] the journal's strategic direction, the scope of research topics to be covered, and he also deals with staffing the editorial board. The process of reviewing the submitted articles on optical information technologies and diffractive nanophotonics is supervised by doctor of physics & math S.N. Khonina, the editorial board's secretary, on image processing and geo-information technologies – by V.M. Chernov, doctor of physics & math. Credit for big work on preparation of the journal for publication should be given to issue editor Ya.Ye. Takhtarov, to S.V. Smagin, M.A. Wakhe, Yu.N. Litvinova, D.V. Kudryashov, E.V. Semikolennykh, M.I. Kotlyar, S.S. Stafeev, and A.V. Kupriyanov. The journal is published with financial support of the Samara region government.

The scope of research topics covered by the journal has been extended during 10 years of its publication, now embracing new areas such as plasmonics and diffractive nanophotonics [31-43], geo-information technologies [44-47], systems of technical vision [48-52], interpretation and understanding of nanoscale objects images [53-56], intellectual analysis of video streams [57-58], optical computations [59-61], analysis of hyperspectral data [62-64], development of hyperspectrometers for Earth remote sensing [65-68], new types of laser beams with unique properties [69-71], sharp focusing [72-74], new types of lighting devices [75-76]. Further contributing to the development of the above-mentioned new topics, first published in *Computer Optics* journal, the authors have prepared a lot of well - cited articles in the leading international journals [77-106]. Promptly responding to emerging new areas in science and following cutting-edge scientific trends enables Computer Optics to be actively developing, winning the growing recognition in the research community. Online versions of the journal articles are in open access at www.computeroptics.smr.ru, and can also be found on the scientific e-library website at: elibrary.ru.

4 Intermediate results

The fact that since 2012 *Computer Optics* has been abstracted and indexed in international databases of scientific publications SCOPUS and Compendex can be considered a significant success of the journal, which is lacking the full-text English version. During this time it managed to include into these databases the articles published in the journal in 2009-2011. This greatly expanded the journal`s base for assessing its performance. In accordance with the objectives, set by the chief editor at the end of 2014 [30], from the second half of 2015 the journal switched to production of six issues per year. In 2015 and 2016 two issues of elected articles, translated into English, were prepared, published, and placed on the English language site of the journal.

This permitted a substantial improvement of the journal indicators calculated in the SCOPUS database (Figures 1-4). Key indicators of the journal by the 2015 results were as follows:

SJR (SCImago Journal Rank): 0.535;

IPP (Impact per Publication): 1.185;

SNIP (Source Normalized Impact per Paper): 1.284.

Here SJR, IPP and SNIP are the main indicators of journals, calculated in SCOPUS. SJR = SCImago Journal Rank estimates the prestige of a journal. Subject field, quality, and reputation of the journal have a direct effect on the value of citing (a citation). SJR also normalizes differences in citing behavior between subject fields.

IPP = Impact per Publication (IPP) measures the ratio of citations per article published in the journal.

SNIP = Source Normalized Impact per Paper measures contextual citing impact by weighting citations based on the total number of citations in a subject field.

Fig. 1 shows the entry of the *Computer Optics* journal in priority quartiles on three main areas of the journal: 1) physics, optics (atomic and molecular physics, and optics); 2) information technology (computer science applications); 3) electronics (electrical and electronic engineering). On Fig. 1 red color marks the fourth (lowest) quartile, beige - the third, yellow - the second quartile. Thus, according to the results of 2015 the *Computer Optics* journal entered the prestigious second SCOPUS quartile for all areas of the journal.

Fig. 2 shows a comparison of SJR of *Computer Optics* journal and a number of journals of similar category: *Optik* (Elsevier publishing house, impact factor in 2015 (Web of Sciences): 0.742); *Journal of Modern Optics* (Taylor & Francis publishing house, impact factor: 1.267); Russian translations: *Optics and Spectroscopy* (Pleiades Publishing, impact factor: 1.267); *Journal of Optical Technology* (OSA, Impact Factor: 0.505); *Optoelectronics, Instrumentation and Data Processing* (Allerton Press publishing house); and native English-language editions of *Pattern Recognition and Image Analysis* (Pleiades Publishing) and *Optical Memory & Neural Networks (Information Optics)* (Allerton Press). For this indicator *Computer Optics* journal (blue line) in 2014 and 2015 has made considerable progress, on indicators of 2015 *Computer Optics* approached the *Journal of Modern Optics* (beige line), ahead of all the other journals presented in the Figure.

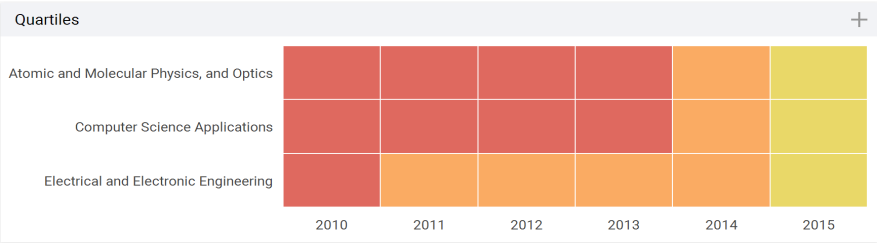

Fig. 1. Entering the quartiles in three main journal directions (red - the fourth quartile, beige - the third, yellow - the second)

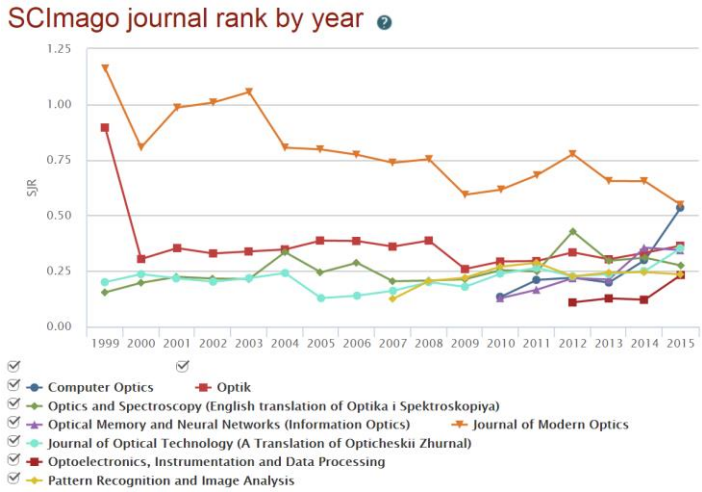

Fig. 2. SJR comparison of *Computer Optics* journal and a number of similar theme journals

Fig. 3 shows a comparison of IPP of *Computer Optics* and a number of similar category journals - the same as in Fig. 2. According to this index, *Computer Optics* (blue line) was ahead of all the journals presented in this Figure.

Fig. 4 shows a comparison of IPP of *Computer Optics* and a number of similar category journals - the same as in Figures 2 and 3. For this indicator *Computer Optics* (blue line) at the end of 2015 conceded only to *Optical Memory & Neural Networks (Information Optics)* (purple line), having lagged behind from it quite a bit.

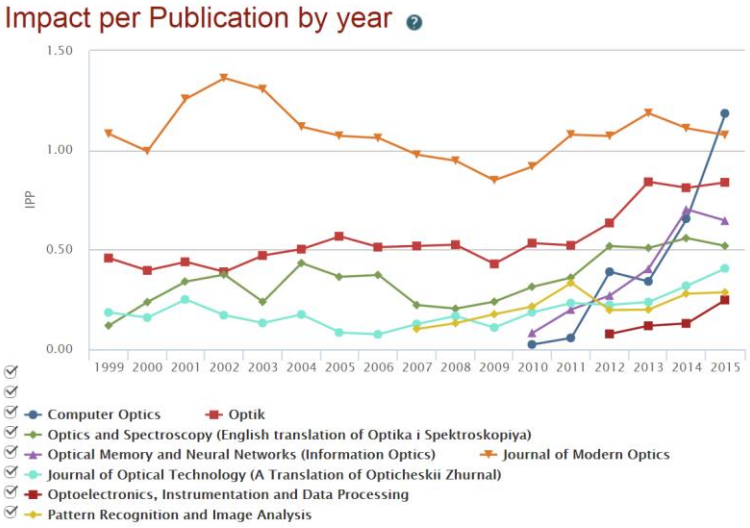

Fig. 3. IPP comparison of *Computer Optics* journal and a number of similar theme journals

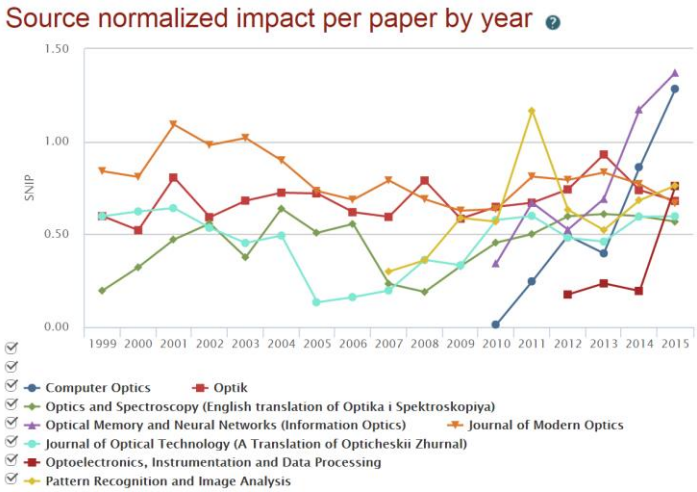

Fig. 4. Comparison of SNIP of *Computer Optics* and a number of similar theme journals

Because of its short history in SCOPUS(2009-2016 years) the journal yet is much inferior to close journals in such indicators as the Hirsch - for *Computer Optics* it is equal to 11. According to SCOPUS, the most cited articles (in 2009 [107, 34, 33, 48], in 2010 [108, 109, 27], in 2011 [54-55] in 2012 [49, 110] in 2013 [62, 111, 112], in 2014 [113-115, 65, 50, 66] and in 2015 [68, 39, 116, 117]) were published by Samara scientists.

As part of further development of the journal the editorial board announced its plans to form a full English-language journal issue (№ 5 of 2016) and to publish a number of reviews and articles prepared on the results of Sib-Optics 2016 international conference.

Conclusion

Synergetics of various scientific directions of the journal, which integrates achievements of computer optics, diffraction nanophotonics, and digital image processing, is extremely important for the progress of world science and serves as a basis for further development of the scientific edition. The goal of the current stage of the journal development is its inclusion into Web of Science Core Collection.

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