Twenty years of the *Journal of Physical Studies*. An attempt at journalometric analysis

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A case study of the "journalometric" analysis, i.e. the quantitative analysis of the publication data in a scientific journal, is presented in this paper. Different kinds of data can be used to describe various aspects of editorial work as well as to characterize the publication set. We consider the so-called internal and external data: the first data set includes all bibliographic data and information about the timing of editorial processes, while as the second data set, we use the statistics of citations obtained from outside sources (Web of Science and Scopus in our case). The methods of complex network theory, descriptive statistics, and regression analysis are useful tools to process such data. Coauthorship connections on the level of separate authors, countries, cities, and scientific topics are presented in the form of networks — which is convenient for quantitative analysis and for visualization. The shape of citation distributions is discussed separately. All these results and findings are naturally framed by a short story about the history of the *Journal of Physical Studies*, an open access journal for the general field of physics published in Ukraine, which issued its 20th volume in 2016. The results of the case study presented here illustrate the combined approach to analyzing a scientific journal. It can be useful both for assessing the role of a journal as a whole, and for developing editorial policy for the future. A similar approach can be applied to analyze a group of journals, e.g. to describe the state of national scientific periodicals.

Key words: Journal of Physical Studies, scientometrics, journal metrics, complex networks.

PACS numbers: 01.30.−y, 89.75.−k, 02.10.Ox, 02.50.−r

This is an illustrative material from the paper submitted in Ukrainian to the* Journal of Physical Studies *(http://physics.lnu.edu.ua/jps/).

Table I: Main numerical characteristics of the co-authorship network of the *Journal of Physical Studies* build for different time periods N: number of nodes; L: number of links; $\langle k\rangle$, $k_{\max}$: the mean and maximal node degree, respectively; $\langle C\rangle$: the mean clustering coefficient; $\langle l\rangle$, $l_{\max}$: the mean and maximal shortest path length between the pair of nodes. $N_{\rm GCC}$: the number of nodes in the largest connected component; $N_{\rm i}$: the number of isolated nodes (%).

Time period	N	L	$k_{\max}$	$\langle k\rangle$	$\langle C\rangle$	$\langle l\rangle$	$l_{\max}$	$N_{\rm GCC}$	$N_{\rm i}$
1996–2001	536	693	16	2.6	0.90	1.57	4	23(4.3%)	55
1996–2006	892	1443	19	3.24	0.87	2.9	10	72(8.1%)	65
1996–2011	1167	1956	23	3.35	0.87	5.6	14	207(17.7%)	84
1996–2016	1344	2386	27	3.55	0.86	6.1	16	250(18.6%)	90(6.7%)

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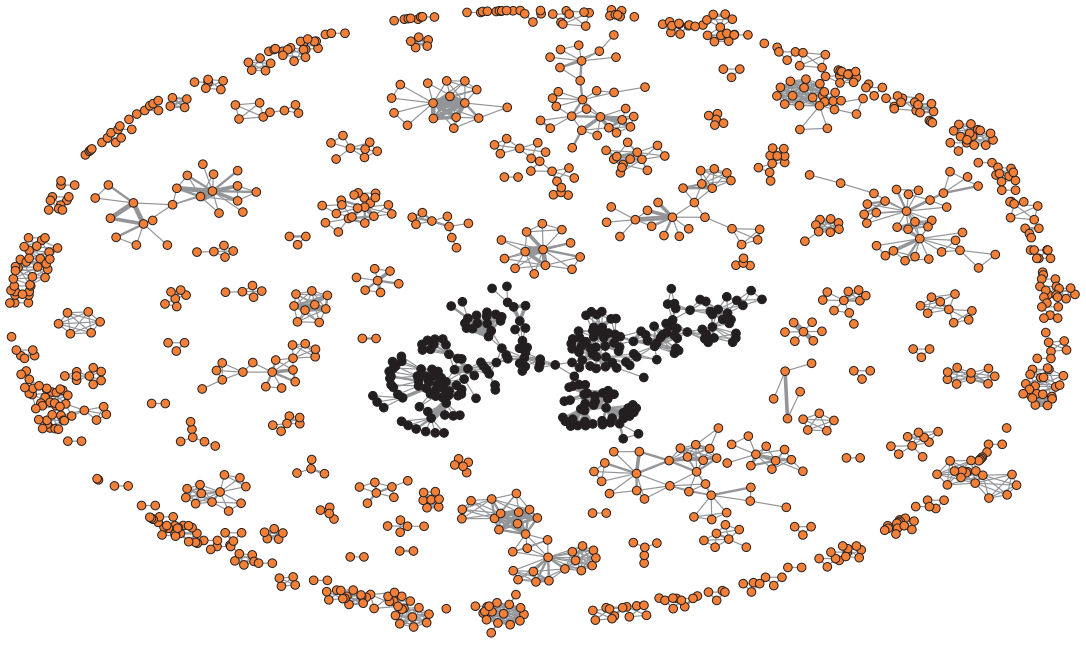

Fig. 1: The weighed co-authorship network of the *Journal of Physical Studies* based on the data for years 1996–2016. The link width is proportional to the number of common papers. The nodes which belong to the largest connected component are colored by black. This and further networks were generated using Pajek network visualization software [28].

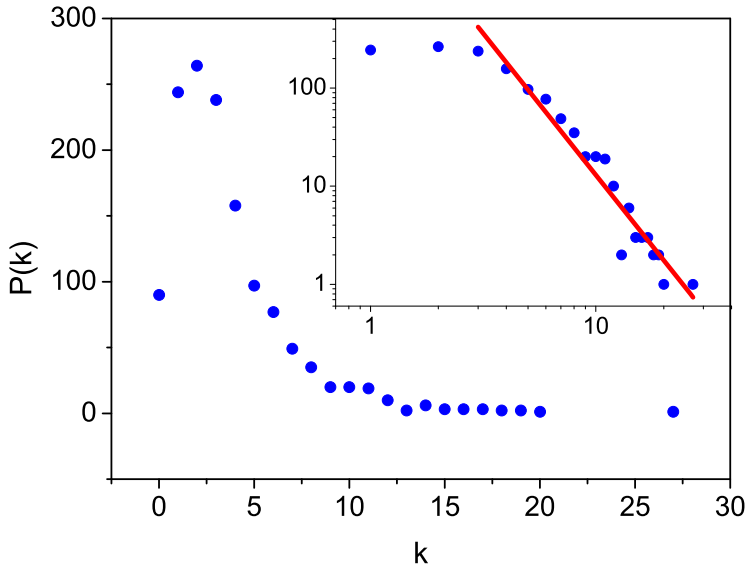

Fig. 2: The node degree distribution of the co-authorship network of the *Journal of Physical Studies* based on the data for years 1996–2016 . The inset contains the same plot in double logarithmic scale: the line denotes a variant of linear approximation of the distribution tale.

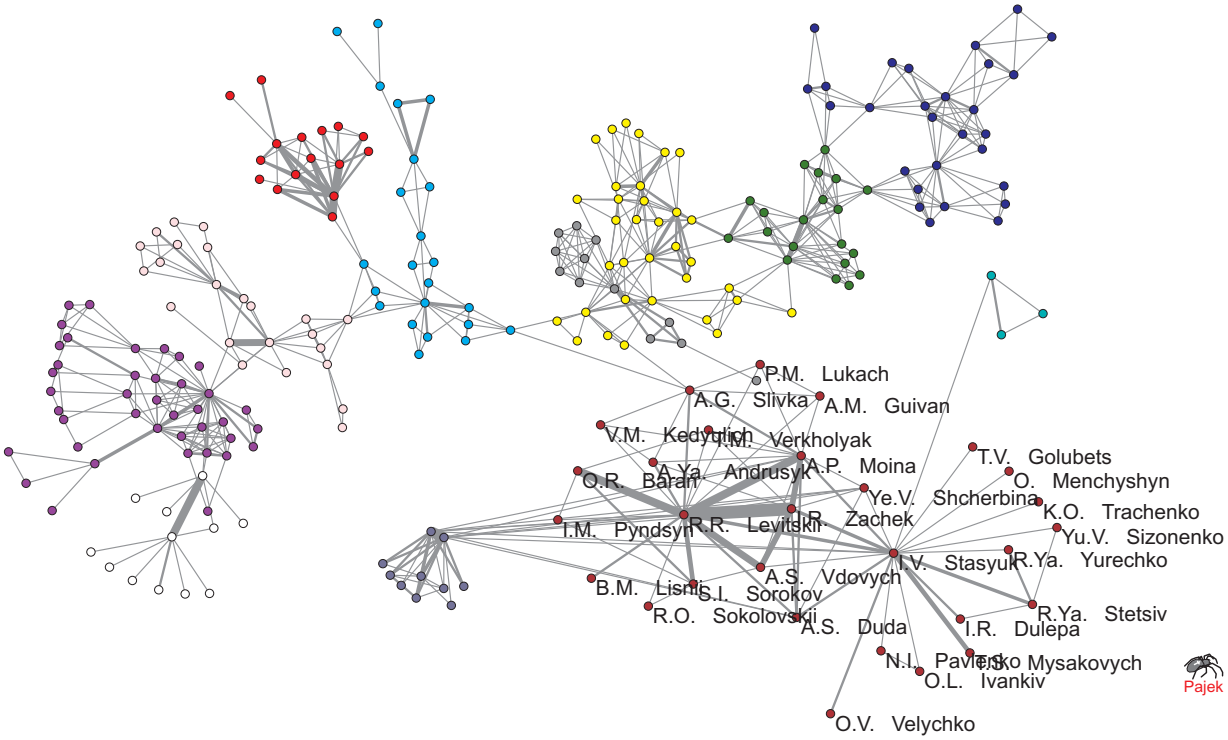

Fig. 3: (Color online) The largest connected component of the weighted co-authorship network of the *Journal of Physical Studies*. Different colors denote the nodes which belong to different communities detected by the Louvain method [29]. Text labels (authors names) are provided only for one randomly chosen community not to make the visual representation of the network too complicated.

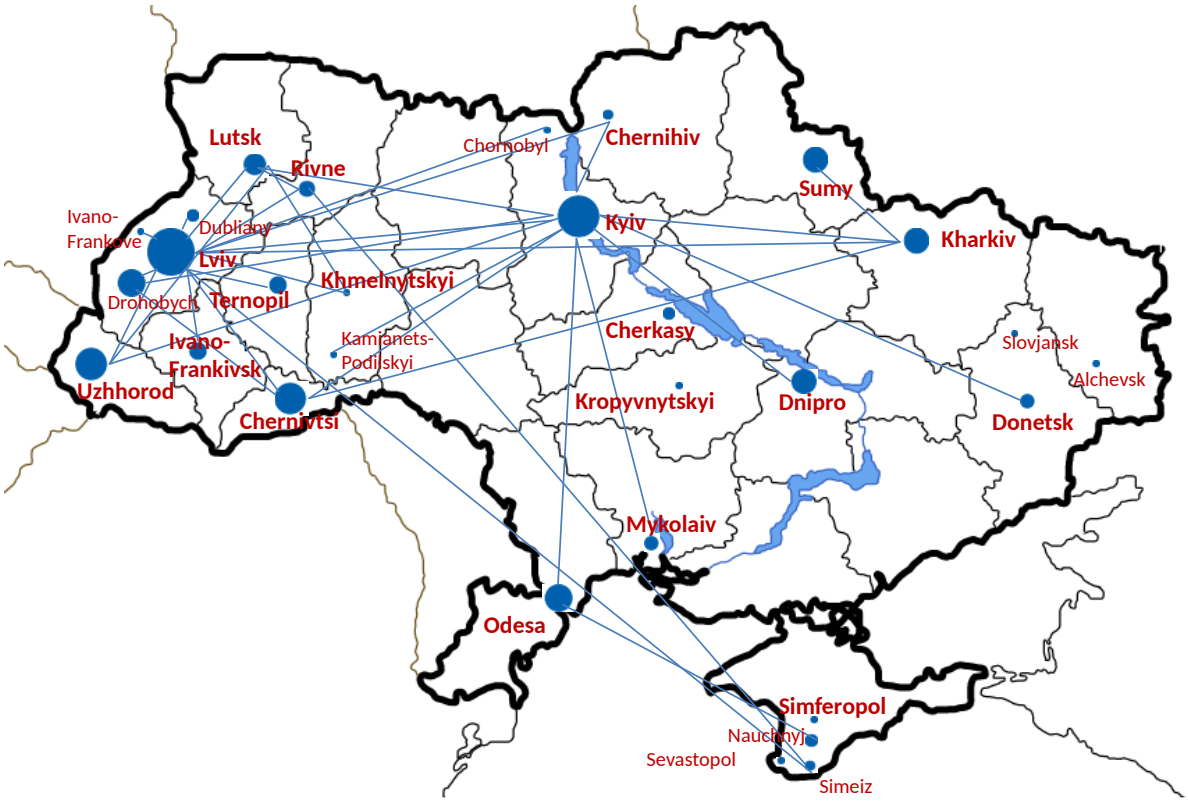

Fig. 4: (Color online) The authors' geography on the level of Ukrainian cities represented in a form of non-weighted co-authorship network. The node size as a function of number n of publications from each city is plotted as $\ln(n+1)$.

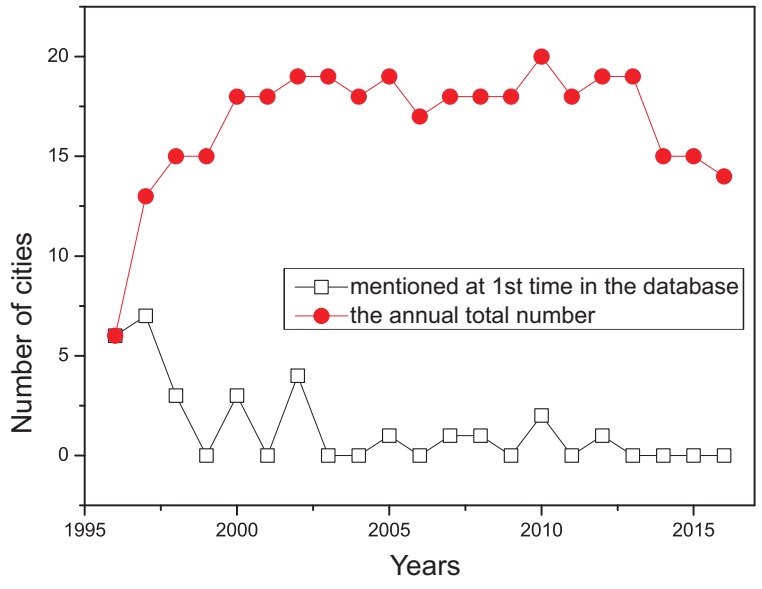

Fig. 5: (Color online) The annual total number of Ukrainian cities mentioned in authors' affiliations (circles) and the corresponding number of cities which were mentioned for the first time (rectangles).

Table II: Main numerical characteristics of the co-authorship network of the *Journal of Physical Studies* on the level of cities of Ukraine (the links to foreign cities or institutions are not taken into account here). Notation are the same as in Table. I is used here.

Parameter	N	L	$k_{\max}$	$\langle k \rangle$	$\langle C \rangle$	$\langle l \rangle$	$l_{\max}$	N_{GCC}	N_{i}
Value	29	68	16	4.69	0.6	2.25	4	23(79.3%)	6

Table III: The collaboration statistics of the *Journal of Physical Studies* on the level of cities of Ukraine.

ID(i)	City i	Number of publications, n_i	Degree, k_i	Link $i \leftrightarrow 30$	Year of appearance	Year of disappearance
1	Lviv	439	15	+	1996	2016
2	Uzhhorod	46	3	+	1996	2016
3	Dnipro	19	1	+	1996	2016
4	Drohobych	27	3	+	1996	2016
5	Kyiv	181	12	+	1996	2016
6	Odesa	25	2	+	1996	2016
7	Chornobyl	1	1	–	1997	1997
8	Donetsk	4	1	–	1997	2005
9	Rivne	5	3	–	1997	2016
10	Ternopil	8	1	–	1997	2013
11	Chernivtsi	48	4	+	1997	2016
12	Sumy	22	1	+	1997	2013
13	Kharkiv	22	4	+	1997	2015
14	Chernihiv	2	2	+	1998	2013
15	Lutsk	13	5	–	1998	2016
16	Ivano-Frankivsk	7	2	–	1998	2016
17	Khmelnytskyi	1	1	+	2000	2000
18	Sloviansk	1	0	–	2000	2000
19	Simferopol	1	0	–	2000	2000
20	Kamianets-Podilskyi	1	1	–	2002	2002
21	Alchevsk	1	0	–	2002	2002
22	Simeiz	2	2	+	2002	2002
23	Nauchnyj	3	1	+	2002	2013
24	Cherkasy	3	0	–	2005	2007
25	Kropyvnytskyi	1	0	–	2007	2007
26	Dubliany	3	1	–	2008	2016
27	Sevastopol	1	0	–	2010	2010
28	Ivano-Frankove	1	1	–	2010	2010
29	Mykolaiv	4	1	+	2012	2016
30	Foreign countries	204	14	+	1997	2016

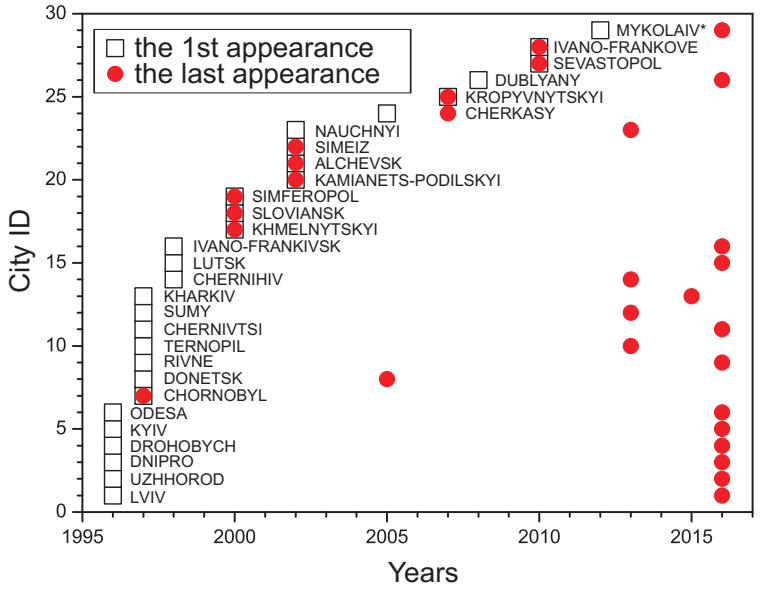

Fig. 6: (Color online) The years of the first (rectangles) and the last (circles) mentioning of each city (ID from 1 to 29) between 1996 and 2016. **regional center.*

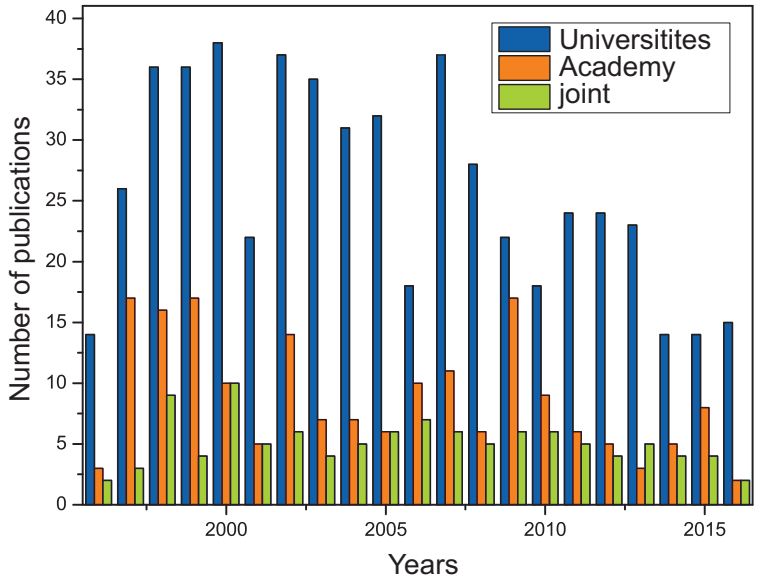

Fig. 7: (Color online) The number of papers published between 1996 and 2016 in the *Journal of Physical Studies* by authors affiliated in Universities and Institutions of the National Academy of Sciences of Ukraine — blue and orange columns of the diagram, correspondingly. The shares of joint publications are shown in green.

Fig. 8: The weighed co-authorship network on the country level based on the publication data of the *Journal of Physical Studies* between years 1996–2016. The node size is proportional to the number of publications which can be attributed to each country. The link width is proportional to the number of common papers.

Table IV: Main numerical characteristics of the co-authorship network of the *Journal of Physical Studies* on the country level. Notations are the same as in Table. I is used here.

Parameter	N	L	$k_{\max}$	$\langle k \rangle$	$\langle C \rangle$	$\langle l \rangle$	$l_{\max}$	N_{GCC}	N_{i}
Value	35	57	19	3.26	0.58	2	4	25(71.4%)	10

Table V: The distribution of the number of publications in the *Journal of Physical Studies* among topical sections.

The 1st digit of PACS number and the corresponding topical section	The number of papers in the section
0 General	233 (24.2%)
1 The Physics of Elementary Particles and Fields	15 (1.6%)
2 Nuclear Physics	30 (3.1%)
3 Atomic and Molecular Physics	27 (2.8%)
4 Electromagnetism, Optics, Acoustics, Heat Transfer, Classical Mechanics, and Fluid Dynamics	33 (3.4%)
5 Physics of Gases, Plasmas, and Electric Discharges	19 (2%)
6 Condensed Matter: Structural, Mechanical and Thermal Properties	151 (15.7%)
7 Condensed Matter: Electronic Structure, Electrical, Magnetic, and Optical Properties	305 (31.7%)
8 Interdisciplinary Physics and Related Areas of Science and Technology	33 (3.4%)
9 Geophysics, Astronomy, and Astrophysics	115 (12%)

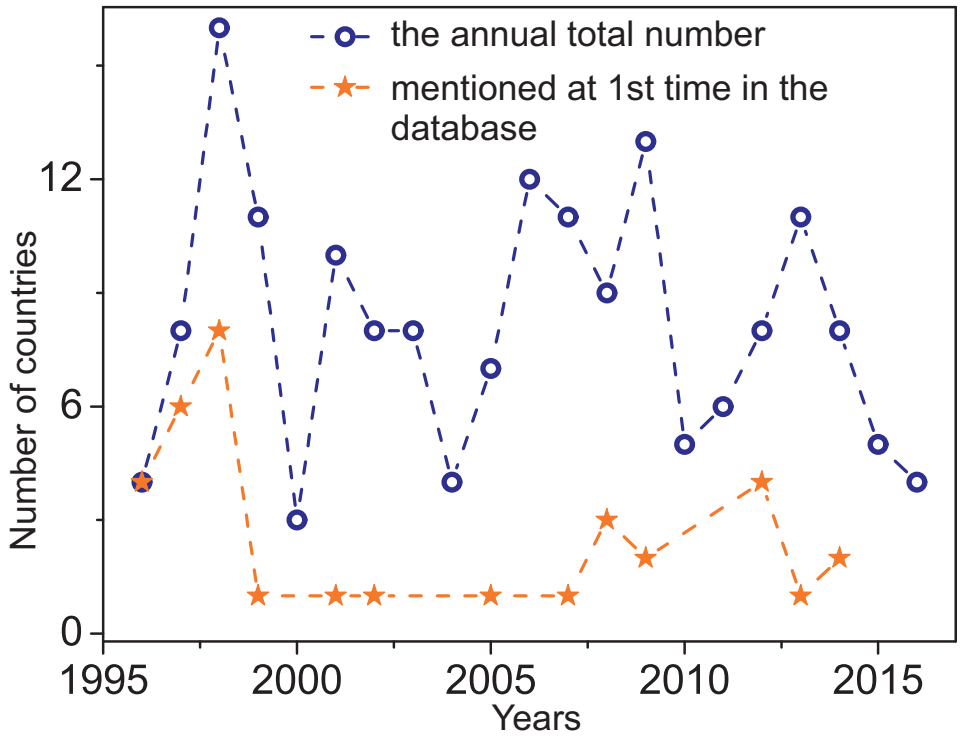

Fig. 9: The annual total number of countries participating in publications of the *Journal of Physical Studies* (circles) and the corresponding number of countries which were mentioned at first time (asterisks).

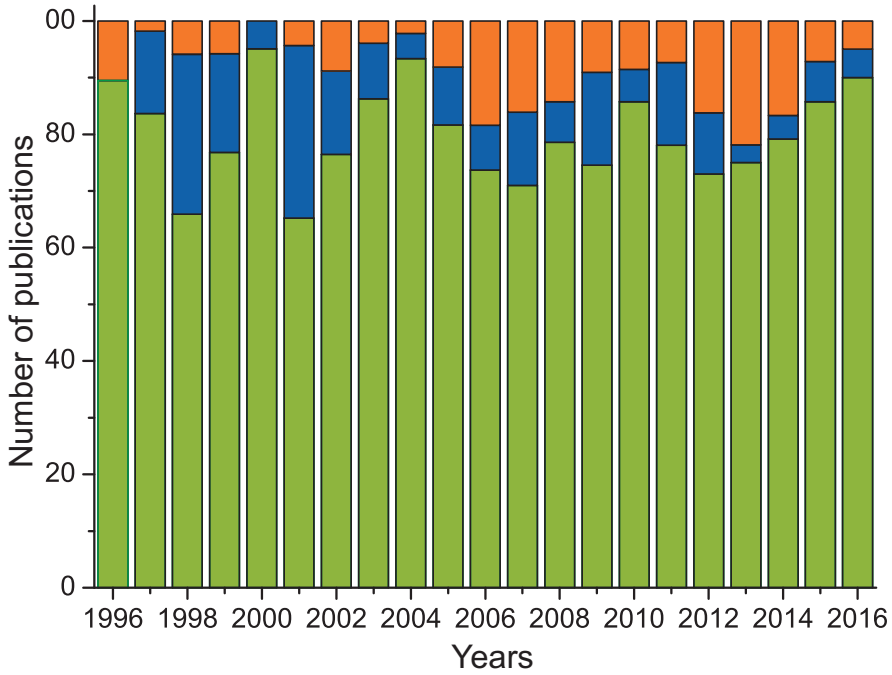

Fig. 10: (Color online) The annual shares of publication of the *Journal of Physical Studies* which belong to one of three categories: (i) only Ukraine is mentioned in authors' affiliations (bottom part of columns, in green); (ii) Ukraine is not mentioned in authors' affiliations (middle part of columns, in blue); (iii) Ukraine and at least one foreign country are mentioned in authors' affiliations (top of the columns, in orange.

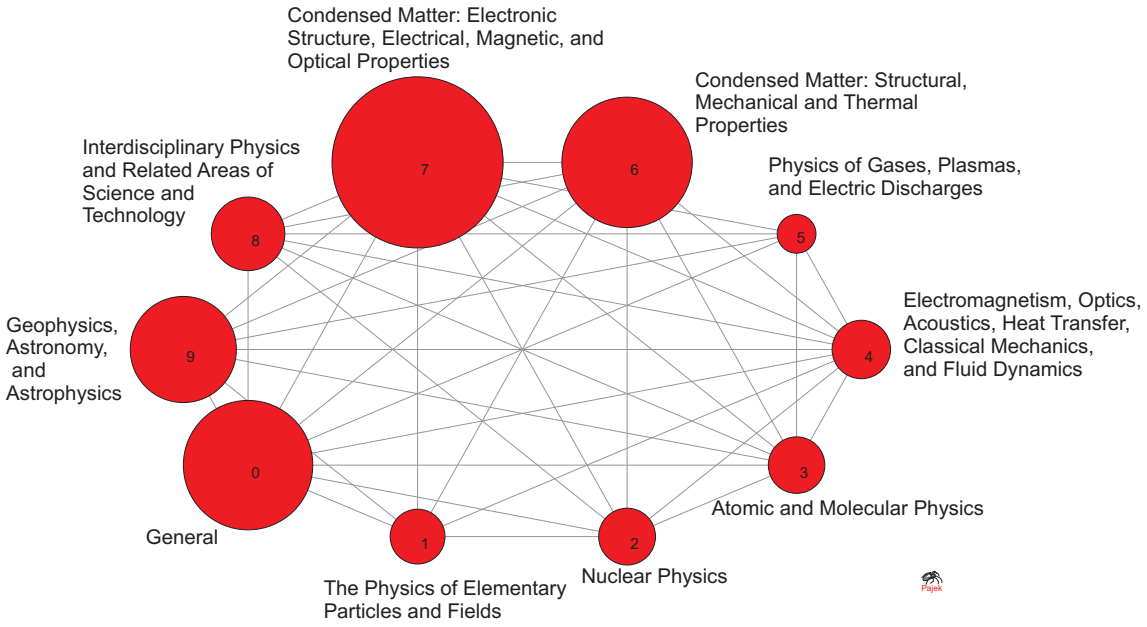

Fig. 11: The network of PACS number (only first digit is taken into account) co-used in the papers of the *Journal of Physical Studies* between years 1996 and 2016.

Table VI: TOP5 of the PACS numbers most frequently used in the papers.

Only first digit is taken into account
7 Condensed Matter: Electronic Structure, Electrical, Magnetic, and Optical Properties 6 Condensed Matter: Structural, Mechanical and Thermal Properties 0 General 9 Geophysics, Astronomy, and Astrophysics 8 Interdisciplinary Physics and Related Areas of Science and Technology
The part of PACS number until the first stop is taken into account
05 Statistical physics, thermodynamics, and nonlinear dynamical systems 78 Optical properties, condensed-matter spectroscopy and other interactions of radiation and particles with condensed matter 61 Structure of solids and liquids; crystallography 71 Electronic structure of bulk materials 03 Quantum mechanics, field theories, and special relativity
The part of PACS number until the second stop is taken into account
03.65 Quantum mechanics 64.60 General studies of phase transitions 05.70 Thermodynamics 78.20 Optical properties of bulk materials and thin films 78.55 Photoluminescence, properties and materials
The entire PACS number
05.70.Jk Critical point phenomena 05.70.Fh Phase transitions: general studies 77.80.Bh Phase transitions and Curie point 64.60.Cn Order-disorder transformations 03.65.Ge Solutions of wave equations: bound states

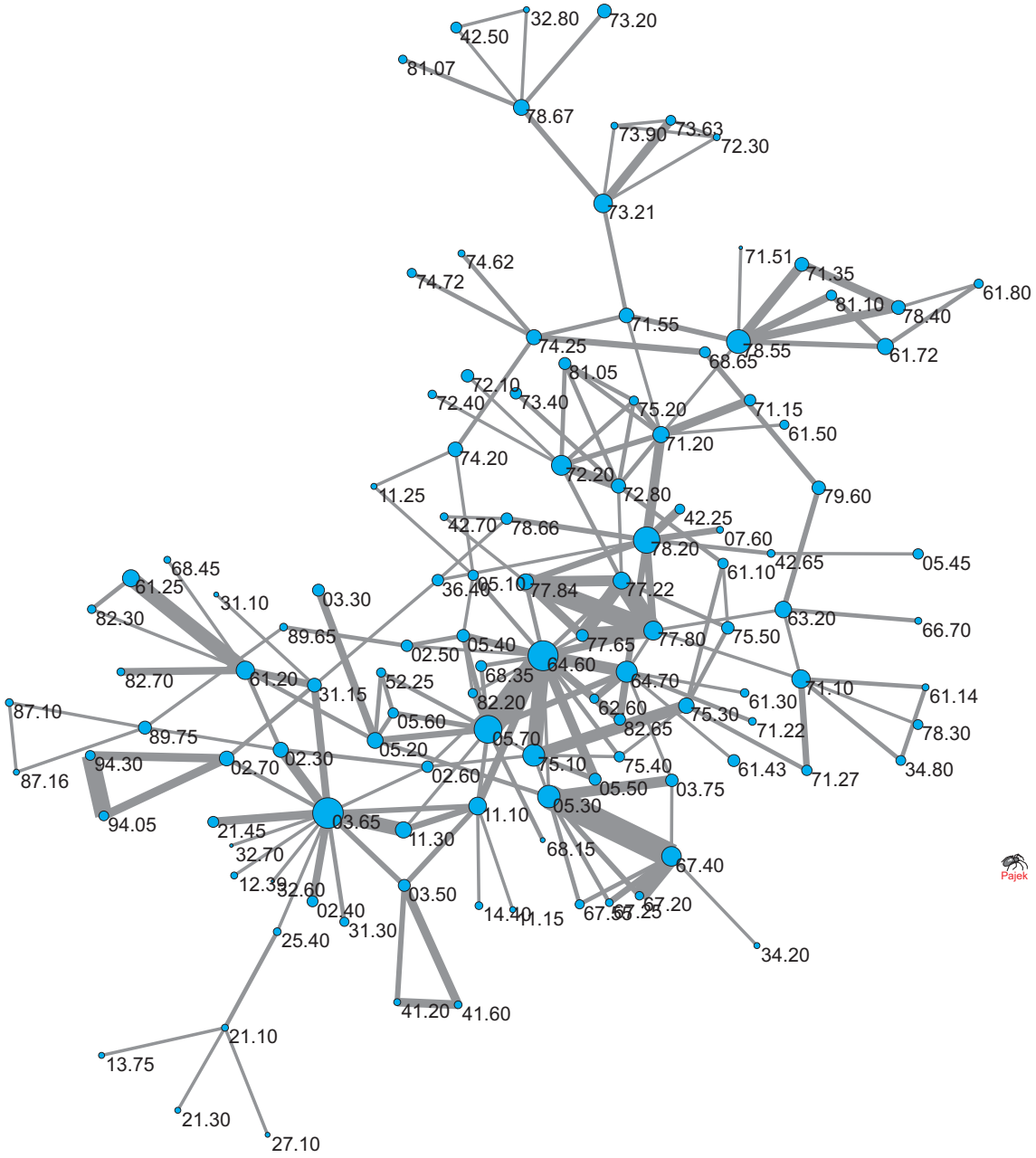

Fig. 12: The largest connected component of the weighted network of PACS numbers (the part of index before the second stop is taken into account) co-used in the *Journal of Physical Studies*. The links of weight less than 3 are neglected in this figure. The node size is proportional to the number of publications where the particular PACS number was used.

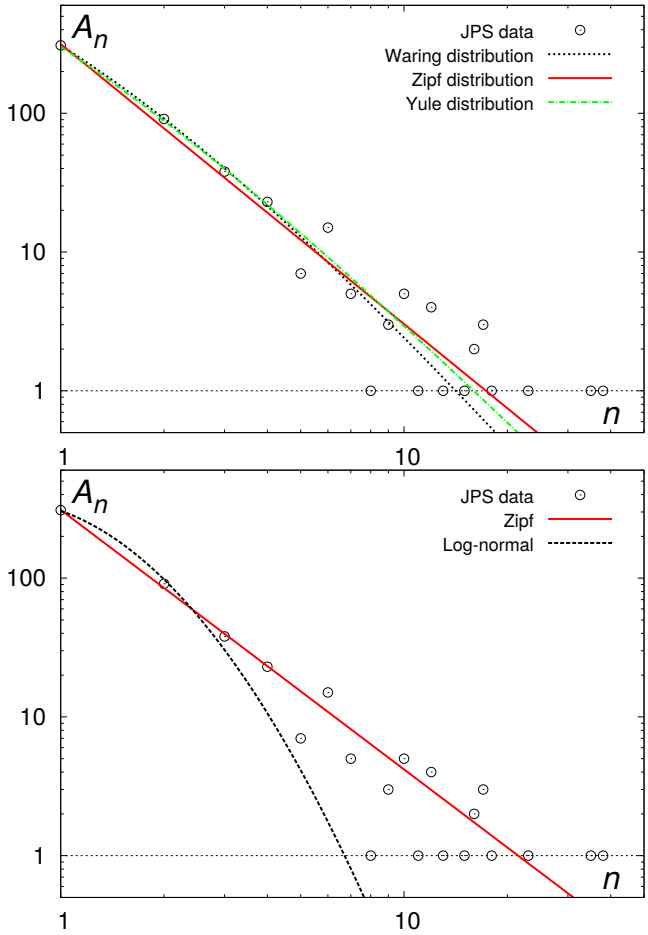

Fig. 13: The number of papers A_n published in the *Journal of Physical Studies* and cited n times according to the Web of Science database: the discrete distributions (above) and the uniform distributions (below) are presented. The data correspond to the results obtained via "Cited reference search" on May 19, 2017.

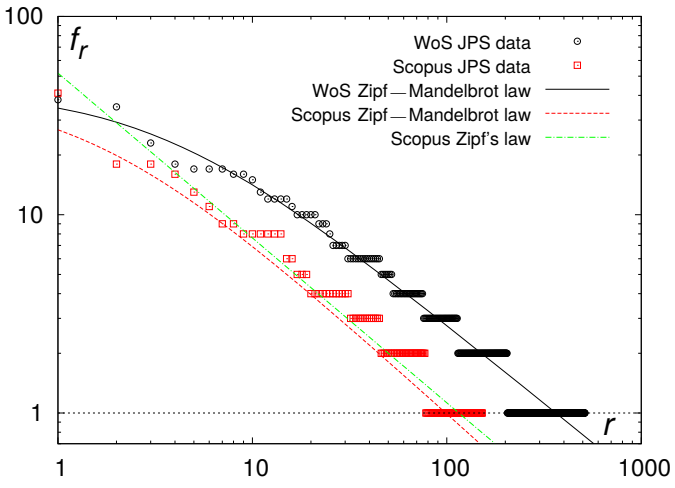

Fig. 14: The rank-frequency citation distributions for *Journal of Physical Studies* papers based on information from the Web of Science and Scopus databases. The numbers of citations correspond to the results obtained via "Cited reference search" on May 19, 2017. The Scopus data are collected on May 30, 2017.

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