

THERMAL SCIENCE JOURNAL* Foundation, History of Development, and Scientific Contribution

by

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<https://doi.org/10.2298/TSCI2405587O>

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Research and the Role of Scientific Journals

In the second half of the 20th century and especially at the beginning of the 21st century, it has become clear and undeniable that technological and general economic development directly depends on investments in education, research, and development. The example of large countries, such as Germany, China, and Japan (not to mention the USA), shows that clearly. However, the examples of small countries in the Far East (South Korea, Singapore, Thailand and other countries) and some European countries such as Denmark, Finland, Sweden and Norway (more similar to Serbia by many parameters), are much more representative. As a curiosity, it can be stated that the financing of research and development in Finland has been assigned as the task to the Ministry of Foreign Trade. Just for the purpose of general insight, we should look at the data on the percentage of funds for research and development (R&D) in the Gross National Product (GDP) of individual countries in 2018: OECD 2.4%, China 2.186% (0.983% in 2000), Korea 4.528%, Israel 4.961%, Finland 2.746%, Denmark 3.033%, Slovenia 1.950%, the Netherlands 2.164%, Japan 3.264% and Serbia 0.4%. [1]

For these considerations, data which, according to the study *Knowledge, Networks and Nations: Global Scientific Collaboration in the 21st Century* [2] specify prof. Jinyue Jan, Editor-in-Chief of the journal *Applied Energy* [3] can be very useful. In 2011, the SCOPUS database provided the following data: over 18000 journals were published, over 3 million papers were offered, over 300000 reviewers were hired, the number of readers exceeded 30 million, over 1.5 million papers were published, readers downloaded over 3 billion papers and over 30 million papers were cited. These data impose at least two conclusions: (1) Results of researches published in scientific journals are very interesting and certainly necessary and useful to readers - from active scientists to experts in industry, agriculture and other human activities important for the life of ordinary people and for the development of education, science and technology the economy as a whole and (2) Publication of journals is also a large market for scientific information that provides large profits to renowned publishing houses in the world.

The great interest in the publication of scientific results has also enabled the establishment of many small journals whose founders are interested only in profits and not in the quality of papers which they publish often without any criteria and reviews. Consequently, a decline in the quality of papers and journals can be noticed.

*This paper is published in the journal *Eko List*, Special Edition, pp. 29-41, 2021

In such a situation, some questions can also be asked: (1) Whether there is some place for new, small, quality scientific journals and (2) where their place is and what role they can and should have in the worlds' scientific community?

The publication of papers is a particularly important and inevitable link in the research chain. Desire of individuals for affirmation or collecting points for the advancement in their profession is not the main motivation for publish scientific papers. Presenting of the research results is important part of the research chain: at the beginning, for identifying problems that have to be investigated, and at the end for verifying and analyzing obtained results. The objective and strict review is the most important part of the process of the publication of papers and the most useful for authors.

The role of a journal and the importance of the publication of results in order to check them out, are very nicely described by prof. Jinyue Jan in her presentation [3]: *Writing or publishing scientific papers is not important for personal promotion but for spreading and exchanging information and for establishing mutual connections among researchers in order to achieve cooperation.*

With the aim to present the results of their scientific achievements to the worlds' scientific community, in small countries outside the English-speaking area, doctoral and master theses have long been written and published in English (the Netherlands, Denmark, Norway, Sweden, Finland and many other countries). Unfortunately, such proposals cannot be accepted in Serbia due to the misconception of the national pride and preservation of the Serbian language.

Faced with the constant challenge to coordinate researches with worlds' priorities in the science and modern technology development, as well as to make domestic science capable for solving current problems of domestic industry and economy, in the VINČA Institute and especially in the Laboratory for Thermal Engineering and Energy investigations are organized in a chain: basic research, oriented basic research, applied research, followed by experimental investigations using laboratory size and pilot plants, and finally, completed with testing of real size demonstration plants, under real operating conditions. Each research begins with a literature review (acknowledgement with *up-to-date* scientific knowledge). During the research, it is necessary to inform the scientific community in the world about obtained results and to get feedback and necessary criticism.

On the basis of experience from long lasting international cooperation and examples of well-organized countries and their strategic commitment to the importance of science for the progress of industry and economy, in the VINČA Institute and in the Laboratory for Thermal Engineering and Energy, it has been long discussed about the best way to present achieved scientific results. As early as in 1974, the journal TERMOTEHNIKA in the Serbian language was launched with Society of Thermal Engineers of Yugoslavia as founder and VINČA Institute of Nuclear Sciences as publisher. The journal was intended for engineers in industry and in electric power industry and mostly, papers presented at the Symposiums of the Society of Thermal Engineers of Yugoslavia were published.

Foundation

The main reason for the foundation of a domestic journal in English was the situation in which Yugoslavia as a whole, and particularly Serbia, was found during the last decade of the 20th century. In that period, international institutional, scientific, and technical cooperation of researchers stopped (with a few honorable exceptions, which were based on personal relationship of individuals). The papers of authors from Serbia were rejected in renowned journals in the world, either automatically or with unclear explanations, and the participation at

international symposia was prevented, often for political reasons, but also due to the lack of funds. Post offices of many European countries did not receive shipments of scientific journals and books sent to Serbia.

At the IX Symposium of the Yugoslav Society of Thermal Engineers in Belgrade in 1993 and at the suggestion of researchers from the Laboratory for Thermal Engineering and Energy of the VINČA Institute, the decision was made to launch an international journal in English - THERMAL SCIENCE. The first two issues were published in 1995 and 1996 as the fourth annual issue (No. 4) of the journal TERMOTEHNIKA and, in 1997, THERMAL SCIENCE became an independent journal.

That is how the journal THERMAL SCIENCE, founded by the Society of Thermal Engineers of Yugoslavia (later Society of Thermal Engineers of Serbia), began its life in 1997. Publisher was the VINČA Institute of Nuclear Sciences, which had experienced scientific and technical staff and the printing house. The National Editorial Board was formed by leading researchers from the Laboratory for Thermal Engineering and Energy and professors from the Faculty of Mechanical Engineering in Belgrade and Novi Sad.

Although THERMAL SCIENCE has been founded with a modest goal *to enable worlds' scientific community to be informed about the results of domestic researches*, the National Editorial Board has set much more ambitious goals when drafting the policy of the journal and when defining scientific fields covered by the journal - it has been created long term scientific policy. Long term and ambitious goals can be seen even in the chosen name of the journal. The name THERMAL SCIENCE has been accepted at the suggestion of the Editor-in-Chief and with the support of the Director of the Laboratory for Thermal Engineering and Energy, Ljubomir Jovanović. The choice of the name THERMAL SCIENCE is the result of the desire not to limit the area that the journal will *cherish*, because thermal processes are present, and most often crucial, in almost all natural processes and in many technological devices and systems (originally, the idea was to connect the name more with energy with which the Laboratory has been predominantly concerned). The development of science and new technologies will impose new and so far, unknown scientific problems that will have to be resolved by investigating thermal processes. In 20 years of the existence of the journal THERMAL SCIENCE, these views have been confirmed several times.

Along with the one of the main goals of the journal scientific policy – acquainting the worlds' scientific community with the results of our science and familiarizing our researchers with modern scientific achievements - the journal has to have three basic characteristics: general accessibility to all interested readers (OPEN ACCESS), general accessibility to all authors by low costs of *production* (the founder and the publisher are non-profit organizations) and the highest international level of reviews (peer reviews) by engaging only reviewers from highly developed countries (it has been concluded that our scientific community does not have sufficient “critical mass” for objective and high quality reviews).

Scientific and Editorial Policy

Starting from the perception that the development of new technologies requires cherishing basic and oriented basic investigations as the basis for applied research, the priorities of editorial policy have been defined and the priority has been given to basic and oriented basic investigation, theoretical and experimental, in areas: (a) fluid mechanics (primarily, turbulent flows), heat and mass transfer, combustion and chemical processes, (b) multiphase and multi-component flows, (c) high temperature flows with chemical reactions, (d) processes in fluidized systems, and (e) applied researches in areas that have priority in Serbia.

Very soon, it has become clear that the priorities in the world are not always the same as the priorities in the domestic economy and new areas are opened - RES, energy efficiency and sustainable development, thermal processes in previously unknown systems - cooling of electronic devices, flows and heat transfer in micro canals, flows and heat transfer of nanofluids, the production of micro and nanofibers, and processes in the atmosphere related to the climate change.

Mathematical, primarily numerical, modelling of processes in real conditions has had priority and in the first period, it has prevailed in offered papers. But, along with the expansion of interest for modern technology development, has shown that often neglected analytical procedures for solving equations describing thermal processes, again obtained former significance.

Now, the areas of interest of the journal *Thermal Science* are much wider than they used to be when it was founded.

In addition to the main goal - the exchange of information, research results and knowledge about conventional and new technologies, it has also been necessary to give an opportunity to re-establish connections between researchers and scientific institutions, which were broken by the division of Yugoslavia into six independent states. On the basis of previous scientific connections of the Laboratory for Thermal Engineering and Energy and the participation in international projects, after the meeting of several countries of the Southeast Europe in Thessaloniki in 2003, our proposal to accept journal *Thermal Science* as a regional journal was accepted and the Regional Editorial Board was formed with members from Bulgaria, Macedonia, Greece, Romania, Bosnia and Herzegovina and Serbia, in which members from Croatia, Slovenia, Montenegro and Turkey were later invited.

In 2005, the regular publication of selected papers of presently well-known international Conference on Sustainable Development of Energy, Water and Environmental Systems (SDEWES) began. This Conference has been organized in Dubrovnik every second year since 2001 and the Regional SDEWES Conference has been organized every second year alternately in the countries of the former Yugoslavia since 2015.

Knowing the situation in many countries and on the basis of papers received in the first few years, it has become clear that the journal *Thermal Science* cannot be oriented only to researchers from former Yugoslavia and neighboring countries of Southeast Europe and East Europe, but also to authors and readers from small developing countries of Asia and Africa, as well as from China, Russia and India, which have been developing rapidly in recent decades and which are investing huge amounts of money in research and development. According to the predictions given in the OECD Study [1], the number of published scientific papers from China by 2020 will reach, and even surpass the number of publications by authors from the USA, and the number of published papers from Japan, Brazil and India also will be constantly growing. Statistic data about the number of scientific papers from various countries published in journal *Thermal Science* confirm these predictions. In recent years, papers from developing countries account for over 50% of totally published papers.

For each researcher and research institution in which he/she is engaged, the choice of research areas is a difficult and always present problem starting from the personal decision to definition of the priorities in the state's strategy of basic and oriented basic research and in the strategies of economy development and the introduction of new technologies. During their work life, scientists are constantly reconsidering their decisions regarding a narrow (or a wider) scientific field they will deal with. When the state's strategies of scientific and economic development and technological priorities exists and when it is sufficiently clear and concrete, decisions at the personal level are easier. The good strategy of scientific and technological development

is based on constant monitoring of global directions and achievements of scientific and technological development and priorities and on reliable statistical data on energy potentials, reserves of raw materials and mineral resources, as well as on data on the quality of scientific and professional human resources and possibilities of scientific institutions and universities.

In order to make it easier for scientists and our readers to choose priorities, to make strategic decisions about their further work, as well as to evaluate the justification of social and state priorities in the strategies of scientific and technological development and to offer bases for strategic decision makers, recently we have included as areas of interest papers that consider: (a) energy potentials, especially renewable energy sources, (b) energy efficiency as a special type of energy potentials, (c) feasibility studies for the use of renewable energy sources, and (d) studies to increase the efficiency of energy production and consumption.

Development and Problems in the Development of the Journal Thermal Science

The journal *Thermal Science* has existed and has been developing for almost 25 years. In that long period of time, many revolutionary changes in science have taken place, many new technologies have been developed and scientific priorities have changed. In the same period the technique of the *production* of journals has also been changed drastically. Digital technologies have influenced not only the scientific profile of the journals, but also the way of communication with authors and reviewers, methods of *advertising* and distribution of journals, the preparation of texts and printing of issues. All these changes have influenced the scientific orientation and development of our journal.

The problems faced by the editors of journals, especially those of small and independent publishers, can be divided into three groups: financial problems, technical problems and most importantly, scientific problems. The proper scientific policy of the journal affects the quality of papers and the reputation of the journal, but also affects the reputation and visibility of the journal in the growing scientific community, and among the multitude of journals that exist in the world.

The specificity of printing journals is such that once it starts, it is not permitted for the *production* to stop and deadlines must be strictly respected. Technical processing has to be precise according to the style and standard, identical for each issue, and also aesthetically attractive and noticeable.

Journal *Thermal Science* was lucky because the VINČA Institute has had the printing and the publishing department with an experienced master of his craft as the head of the department, Vladimir Živković, who was dedicated to his profession and who has accepted to be a technical editor. Thus, from the first issue, journal *Thermal Science* has been printed in line with all rules of the printing trade, precisely, neatly and without any errors, under pre-set deadlines and at the same time, aesthetically appropriate.

The financial support of the Ministry of Science and Technological Development, with always present financial support of the Society of Thermal Engineers of Serbia and VINČA Institute of Nuclear Sciences and especially, the support of the Laboratory for Thermal Engineering and Energy (which has always been ready to help not only financially but also with human resources) were sufficient for the first few years when only 2 issues per year with the maximum of 20 papers in total were published. The members of the National Editorial Board did not receive compensation for their work, and they worked at home. Financial problems began when in 2012 the number of submitted papers per year (around 600) exceeded our technical, physical, and financial capabilities.

First, the National Editorial Board has been formed from associates of the Laboratory for Thermal Engineering and Energy and the Faculties of Mechanical Engineering in Belgrade and Novi Sad, prepared scientific and publishing policy. After that, International Advisory Board has been formed with the task to help in the final formulation of the scientific profile and policy of the journal and to take care about the quality of published papers and/or to control the peer reviewing process. It has been instantly decided that the journal should be OPEN ACCESS and thus available to every researcher in the world free of charge for reading and copying published papers.

Relying on up to that time very intensive scientific co-operation of the associates of the Laboratory with universities and institutes of many countries (universities in Aachen, Erlangen, London, Birmingham, Gothenburg, Tokyo, Russia, Belarus, Estonia and Latvia, Finland, Denmark, Austria and the Institutes in Novosibirsk and Minsk, Moscow, Tallinn, the Netherlands, *etc.*), the International Advisory Board has been formed of prominent researchers, professors and academics. Members of the International Advisory Board were invited to submit their papers, or the papers of their associates, to the new journal *Thermal Science*. The First International Scientific Committee had 26 members - 2 from Sweden, 1 from Denmark, 5 from Russia, 2 from Belarus, 2 from Estonia, 4 from Germany, 1 from England, 1 from Canada, 1 from the Netherlands, 1 from Macedonia, 4 from the USA, 1 from Japan and 1 from Italy [see *Appendix*].

At the beginning, we have obliged young associates of the Laboratory who completed their doctoral and master theses to prepare papers for journal *Thermal Science* based on their results. As it can be seen in the fig. 1, from 1997 to 2004, only 2 issues were published per year with totally 15-20 papers. This period can be called the **First Stage** of the development of the journal in which we have become familiarized with problems of publishing, conducting the process of paper reviewing, relationships and communications with authors and reviewers and primarily with all problems related to the survival and recognition in the majority of journals published all over the world.

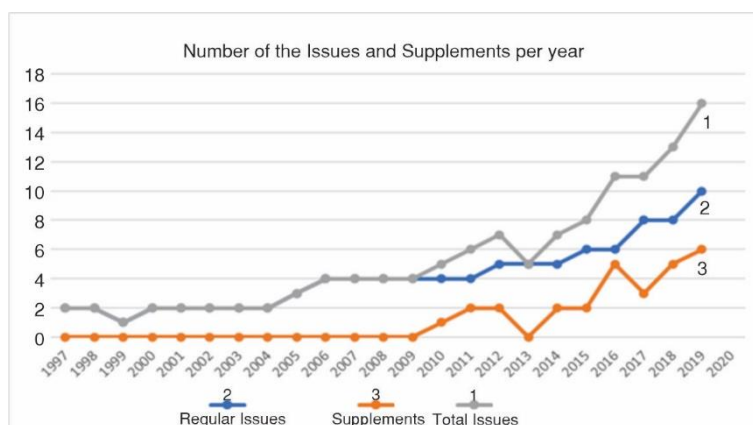


Figure 1. The number of regular issues and supplements per year

Despite efforts to inform many universities and scientific institutes in the world about the foundation of the new journal, the *visibility* of the journal was low. Over 500 letters were sent (in the 1990's there was neither Internet nor e-mail and the communication with authors and institutions was possible only by mail and telefax) to scientific institutions and individuals in Europe, Asia, Africa and America but, the response of authors was small.

In the period from 2001 to 2005, papers were published from only 5 countries, fig. 2 – Serbia 58%, Croatia 13%, Russia 13%, Italy 6%, and India 10%.

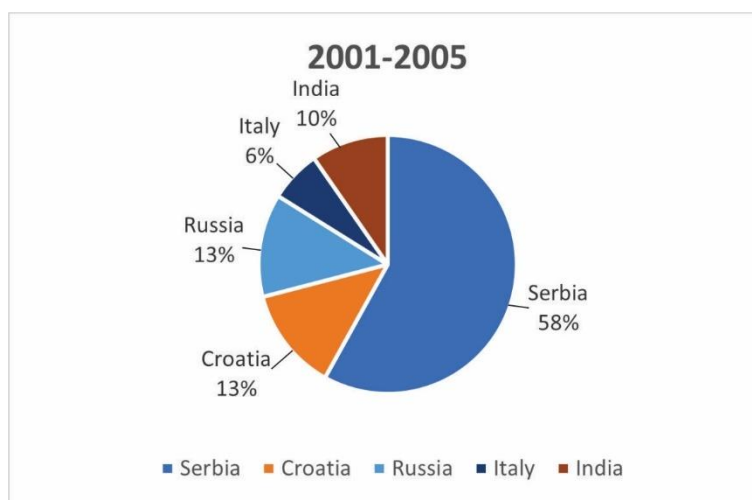


Figure 2. Share of papers from five countries in total number of papers published in the period 2001-2005

A significant change in the *visibility* and *popularity* of journal *Thermal Science* has been achieved because of the following three activities undertaken by the National Editorial Board. In 2003, journal *Thermal Science* turns out to be a regional journal and the Regional Editorial Board was established. At the end of 2004, the Website of the journal (<http://thermalscience.vinca.rs>) was established, which enabled the entire worlds' scientific community to be informed about the new journal through the Internet network. In 2006, the journal was included in the world information database DOAJ. Also, the first special issue [4] was published, whose editor was prof. Jordan Hristov from Bulgaria, who invited many reputed scientists in the world to publish papers dedicated to the *Constructal Theory* (The Theory of Constructing) formulated by prof. Adrian Bejan.

As the result of these actions of the National Editorial Board, in the next 5 years (2006-2010) the number of regular issues increased from 2 to 4 per year and the number of papers published per year increased from 25 to 100, fig. 1. In this period the number of countries from which papers arrived increased from 5 to 16, fig. 3. It is important to notice that papers started to come from Europe, Asia, and Africa (especially China, India, Iran, and Russia). This period of the development of the journal can be called the **Second Stage**.

The **Third Stage** in the development of the journal began in 2009 when journal *Thermal Science* (after two attempts) received from Thompson Scientific (now Clarivate) its first Impact Factor and was included in the world's database of scientific journals - Web of Science. Although the first Impact Factor (the ratio of number of cited papers during 2 years to the number of published papers) was modest - 0.407, it drastically affected the reputation of the journal and the number of submitted papers (Impact Factor is generally accepted as an indicator of the quality of published papers and/or the quality of the journal, in spite of many opposite opinions). Starting from 2009, when journal *Thermal Science* received its first Impact Factor and was included on the Web of Science, the authors' interest in publishing papers in the journal has been growing rapidly, tab. 1.

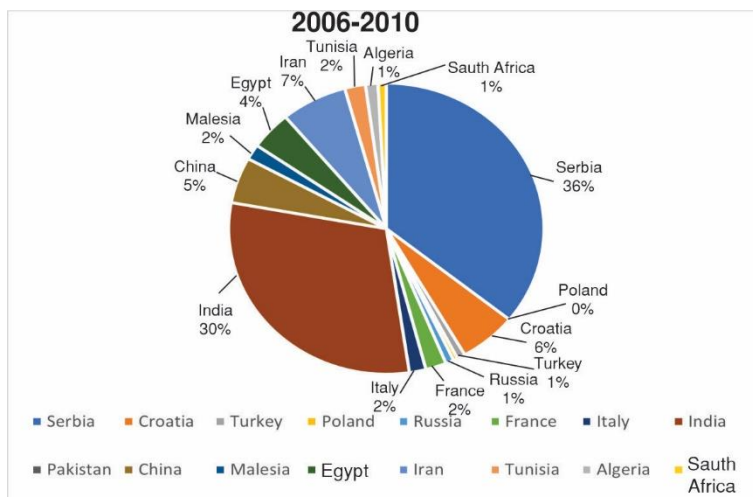


Figure 3. Share of papers from 16 countries in the period 2006-2010

Table 1. Impact Factor of the journal *Thermal Science*

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Impact Factor	0.407	0.706	0.779	0.838	0.962	1.222	0.939	1.093	1.431	1.541	1.574

Since 2009, the number of submitted papers and papers accepted for publishing has been constantly growing, so that in 2012 about 600 papers were submitted, which caused not only financial difficulties but also organizational and technical ones.

In 2012, the number of published regular issues grew to 5 per year, fig. 1, to reach 10 issues in 2019. Also, the total number of published papers has been constantly increasing. In 2012, there were already 165 and in 2019, there were 389 published papers in regular issues (with papers published in Supplements the total number of published papers in 2019 was 608). The average number of papers in one issue of the journal has been increased from 6 in 1997 to 38 in 2019.

Also, many scientific institutions and universities have shown interest in publishing special issues of the journal with papers dedicated to various, narrower scientific areas. The increased interest of many authors and institutions to publish the results of their researches in our journal has required solving financial problems and the changes in the editorial policy and in the organization of work. The changes that were introduced at the beginning of 2013, and this period can be called the **Fourth Stage** of the journal development:

- On March 6, 2013, a decision was made to introduce a so-called participation fee of EUR 150 per paper, which should be paid by authors whose paper was positively evaluated by reviewers and accepted for the publication in the journal. Authors of papers who did not pass the review did not have to pay anything.
- The result of this decision was seen in the same year, 2013. The number of submitted papers per year was reduced from 590 to 371 and only 311 papers were subjected to review process, instead of 486 in 2012.
- Smaller number of submitted and published papers, and additional income, enabled further publication of the journal, technical services were disburdened, and the process of reviewing was made easier.

- The number of members of the National Editorial Board has been increased with the election of mostly younger members.
- The title *Subject Editor* has been introduced for those members of the Editorial Board who are experts in narrower scientific fields and who are obliged to lead the process of reviewing of papers assigned to them by the Editor-in-Chief (until that time, the process of reviewing was the exclusive obligation of the Editor-in-Chief).
- It has also been decided to publish supplements (or special issues) at the request of individual scientific institutions or universities with papers selected by Guest Editors. For publishing special issues, contracts are signed with interested institutions thus providing additional funds for the publication of the journal.

The results of these changes have enabled further rapid development of the journal, which can be followed in the fig. 1 and in the tab 1. The number of regular issues increased from 4 in 2012 to 6 issues per year in 2017 but, due to the introduction of issues A and B, the number of regular issues in 2019 reached 10 volumes, fig. 1. The number of published supplements from 2 in 2012 increased to 6 in 2019.

Increase of the *production* is an obvious indicator of the growing interest of the scientific community in the world for publishing papers in the journal *Thermal Science*, and indirectly shows the scientific quality of papers and of the journal. More important fact is the increase in citing of papers that have been published, which can be seen in the tab. 1, as the increase of the Impact Factor from 0.838 in 2012 to 1.574 in 2019.

Expectations of the Editorial Board, and some of the basic goals of the scientific and publishing policy of the journal, which were set as early as on the occasion when the journal was founded, have been achieved during this **Fourth Stage** of development of the journal:

- Significant increase of the number of papers by authors from Serbia.
- Significant increase of the reputation of the journal in the region of Southeast and East Europe.
- It is generally accepted, and often expressed in many places and on many occasions, that: journal *Thermal Science* is the most distinguished journal published in our region in the fields to which it is devoted - energy, thermodynamics and thermal science, heat and mass transfer, renewable energy sources and energy efficiency. That is, in one word, in the fields of thermal processes present in all areas of engineering.
- The growth of the reputation of journal *Thermal Science* on a global scale. The number of countries from which authors send papers for publication to us has been significantly increased in this period. The interest of authors from some developed western countries (Italy, France) has also been increased.
- Great interest of authors from Asian countries (China, India, Iran) and countries from North Africa (Egypt, Tunisia, Morocco and Algeria) has also been intensified, which has confirmed anticipated orientation of the journal towards developing countries pre-set as one of the most important objectives when founding the journal *Thermal Science*. It is important to mention high investments in science and education in China, South Korea, and Southeast Asia (and probably also in Iran). Generally, countries of the Far East of Asia and of Southeast Asia have been investing above average amounts of money in science and education in recent decades, which can be seen not only in their technological and economic development but also in the number of papers in scientific journals, as well as in journal *Thermal Science*.
- The number of papers by authors from Russia, Poland, Hungary, and Turkey has been increased significantly.

- Finally, perhaps the most important, is that the development of journal *Thermal Science* in recent years and the increase of its scientific quality and influence, has been reflected also in new scientific areas in which the number of papers is constantly growing and which have been opened in Supplements and Special Issues:
 - Nanofluids, processes in them and their use in new technologies.
 - Processes in the formation and production of nanofibers.
 - Physical models of flow and thermal processes by using fractal mathematics.
 - Fractal mathematics and application of fractal methods in solving equations that describe processes in fluid flows and in thermal processes.
 - Processes in the atmosphere and origins of the climate change.

In order to be able to follow changes in visibility and in interests of authors for the publication of papers in the journal *Thermal Science*, 70 countries from which papers have been published are divided into 14 world regions and 5 countries which are of special interest to us:

- **Former Yugoslav Republics – Former Yu Rep** (Croatia, Slovenia, Montenegro, North Macedonia, Bosnia and Herzegovina).
- **Countries of the Southeast Europe – Southeast EU** (Greece, Bulgaria, Romania).
- **Former Soviet Union Republics - Former USSR Republic** (Lithuania, Ukraine, Kazakhstan).
- **Countries of the East Europe - East EU** (Hungary, Poland, Czech Republic, Slovakia).
- **Countries of the West Europe - West EU** (Italy, France, Spain, Portugal, Austria, Germany, Netherlands, Belgium).
- **Countries of the North Europe - North EU** (Sweden, Finland, Great Britain, Ireland, Denmark).
- **Central Asia - Middle Asia** (India, Bangladesh, Pakistan).
- **Countries of the Far East- Far East Asia** (Japan, Malaysia, Korea, Singapore, Thailand, Brunei).
- **Countries of the South America - South America** (Brazil, Argentina, Mexico, Colombia).
- **Countries of the North Africa - North Africa** (Algeria, Tunisia and Morocco).
- **Countries of the Middle East - Middle East** (Oman, UAE, Egypt, Israel, Saudi Arabia, Jordan, Kuwait, Abu Dhabi).
- **Countries of Africa and South Africa – Africa and South Africa** (Madagascar, Nigeria, Ethiopia, Kenya, Cameroon, Sudan, South African Republic).
- **North America - North America** (USA and Canada).
- **Australia** (and New Zealand).
- individual countries - Serbia, Russia, Turkey, China (and Taiwan and Hong Kong), Iran (and Iraq).

The fig. 4 shows the share of aforementioned regions and countries in the five-year period from 2011 to 2015. In addition to the significant increase of the number of countries from which authors whose papers were published in regular issues, compared to the five-year periods 2001-2005, fig. 2, and 2006-2010, fig. 3, the following significant changes can be observed:

- The share of published papers from China has reached a remarkably high 36%, which will continue in the coming period of four years, fig. 5.
- Together with the countries of Central Asia, India and Pakistan have reached almost 50% of all published papers.
- Papers from Serbia make up 16% now.
- African countries and Iran have slightly increased their proportion to about 15%.

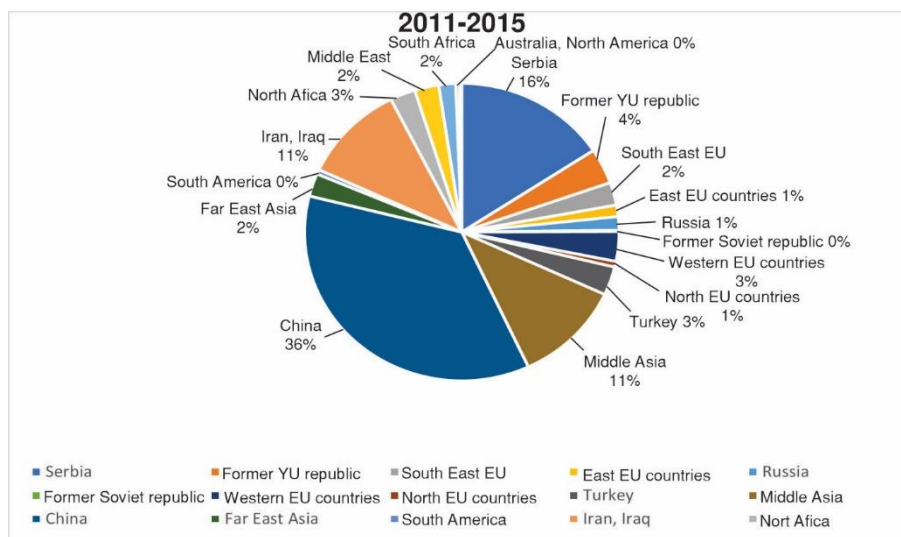


Figure 4. Share of the papers from some large countries and Regions in the World in the Period 2011-2015

When comparing the share of papers from individual countries in various five-year periods, it should be borne in mind that the number of published papers increased sharply after 2005 and especially after 2011. In the period from 2005 to 2010, the total of 318 papers was published in regular issues. In the period 2011-2015, 860 papers were published and in the period 2016-2019, in just 4 years, 1181 papers were published.

When analyzing the share of individual regions and countries in the four-year period from 2016 to 2019, fig. 5, we should keep in mind the fact that the total number of published papers in this period reached 1181, which is about 30% more than in the previous 5 years. During this period, Serbia and Iran reduced their proportion because authors from Turkey abruptly increased interest in publishing their scientific results in journal *Thermal Science*. Also, the interest of countries from East Europe, Russia, Former Yugoslav Republics and from Former Soviet Republics was increased, but their proportion ranged between 1 and 5% and authors from Western Europe appeared and accounted for 3%.

If we have in mind the fact that in this period 1181 papers were published in 4 years, it can be seen that these countries still published significant number of papers in journal *Thermal Science* although their percentage is small, fig. 6.

Thus, authors from Russia published 46 papers, authors from the countries of the former Yugoslavia 30, authors from Southeast Europe 20 and those from Western Europe 35.

In the period from 2010 to 2015, 2 Supplements were published each year, but in previous 4 years, in 2016, 2017, 2018 and 2019 - the number of Supplements increased to 5, 3, 5 and 6, respectively, so that the total number of published papers was significantly increased (both in regular issues and in supplements). In this four-year period, totally 1836 papers were published and out of that number, 655 papers were published in supplements.

The share of papers from individual regions and from large countries in the total number of papers in the period 2016-2019 (in regular issues and in supplements) did not change significantly. The proportion of papers from China decreased slightly (from 36% to 33%), as well as the proportion of papers from Iran (from 6% to 4%), and the proportion of papers from Serbia increased from 12% to 16%.

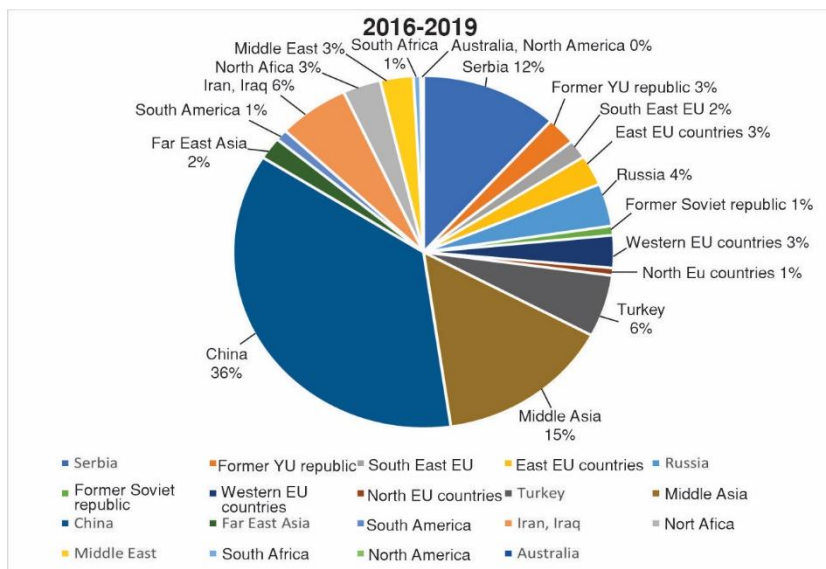


Figure 5. Share of the papers in regular issues from some large countries and Regions in the World in the period 2016-2019

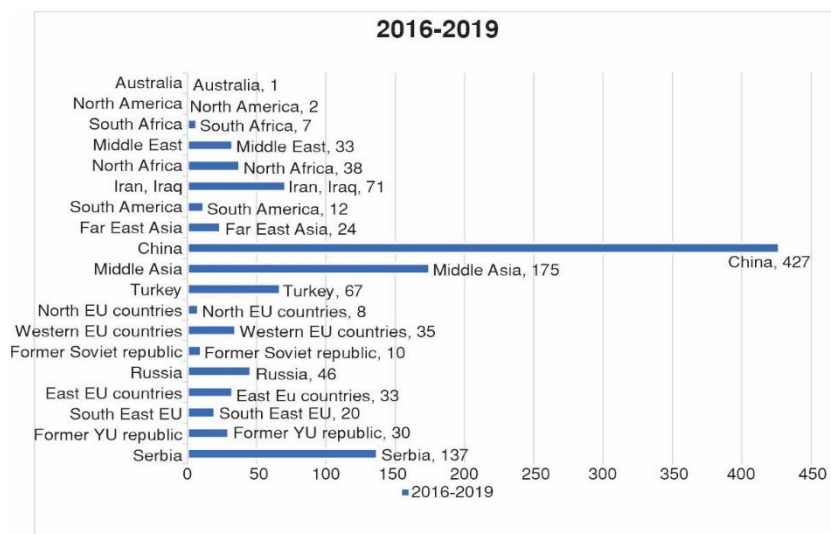


Figure 6. Number of published papers of some World Regions and large Countries in the period 2016-2019

It can be concluded that the initial assumption when founding the journal has been confirmed – the journal has gained international reputation by publishing results of researches by authors from developing countries, Serbia, Southeast Europe and countries in the region of the former Yugoslavia. The journal has become known for its quality all over the world. Authors from a large number of countries (except from Western Europe and North America) confirm, with their papers and with the number of cited papers, that journal *Thermal Science* has reached high international level that can be compared with the journals of famous publishing houses in the world.

The Role of Small Scientific Journals in the Science and in the Technology Development

The aforementioned specified data about the development and about the current situation with the journal *Thermal Science*, as well as the opinion of many renowned scientists and scientific institutions and researchers from 70 countries in the world to publish the results of their investigations IN THIS JOURNAL clearly show that the journal has reached a stable, respectable scientific level among numerous journals printed worldwide.

This conclusion can also be confirmed by a few summarized statements and facts: (a) The name of the journal *Thermal Science* is recognizable and well-known in a large number of countries, (b) in the region of the Southeast Europe, journal *Thermal Science* is, in the opinion of many authors and scientific institutions, the best journal in its field (recently, the Ministry of Science of Poland, among many others, has included journal *Thermal Science* in the list of journals recognized for the promotion into scientific titles), (c) the Impact Factor of the journal *Thermal Science* is constantly growing and it is greater than 1.5, (d) according to the values of the Impact Factor, journal *Thermal Science* is in the top 50% journals in its field, (e) the most famous databases in the world announce data on papers published in journal *Thermal Science*, (f) the organizers of many conferences and symposia show interest in publishing selected papers in our journal (it is especially necessary to emphasize that the International Center for Sustainable Development of Energy, Water and Environment Systems (SDEWES), at its world conferences in Dubrovnik and at regional conferences specifies journal *Thermal Science* as a *journal partner*. Journal *Thermal Science* has published selected papers from the Conference in Dubrovnik every second year since 2005), (g) many publishing houses in the world (for example, Springer) offer co-operation or purchase of the journal *Thermal Science*, (h) universities and scientific institutions are very much interested in the preparation and publication of special issues of the journal *Thermal Science* with selected papers from modern scientific topics, (i) many renowned researches from various countries are interested in becoming members of the International Advisory Board so that this board has over 70 members now.

Journal *Thermal Science* has also confirmed its quality with strict and objective reviews, both of papers by foreign authors and of papers from Serbia without the influence of collegial connections or domestic scientific institutions. Taking into account the fact that the critical mass of researchers in narrower, especially modern, scientific fields is small (not only in Serbia but also in all countries of Southeast Europe as a whole), and insufficient for the objective assessment of scientific papers, the firm policy of the National Editorial Board is to select reviewers from developed countries for the evaluation of domestic papers. Out of the total number of submitted papers, over 30% is rejected immediately by the Editor-in-Chief before sending papers to reviewers. Number of accepted papers after peer review is less than 50%, which is similar as in large well-known journals.

Bearing in mind that publishing papers is an important link in the research chain, the Editorial Board of journal *Thermal Science* with its strict and objective publishing policy believes that it has made an important contribution to the education of young researchers and to raising the level of scientific research in Serbia. A critical attitude towards someone's own results is an important characteristic of a researcher and it is achieved, among other things, by a serious relationship between a researcher and a reviewer and by the possibility to enable discussions between an author and a reviewer.

The advantage of small journals in relation to large and renowned journals in the world is the possibility that authors and reviewers, and even editors of journals, feel as the part of the

process of getting to know a scientific truth. Collegial and personal relationship (without violating the anonymity of reviewers) is possible only in small journals. Large journals of well-known publishing houses, whose main objective is to make profits by the distribution of scientific information, are overly industrialized and depersonalized and the connection between authors and reviewers is discontinued.

The editors, authors and reviewers of small journals feel that they also participate in the joint venture of searching for the scientific truth.

If you look at the total *production* of large journals in the world, despite anonymous and objective reviews, the approach of authors from developing countries is obviously difficult. This can simply be seen from the statistical analysis of the regional distribution of authors. If we even do not take into account much greater possibility of researchers from large countries and large scientific institutes to access journals, authors from developing countries have at least three significant obstacles to break through to major journals of the English-speaking region: (a) national priorities in developing countries are often not at all identical with present scientific priorities in the world, (b) technical conditions and measuring instrumentation for experimental investigations often are not at high level as well as for numerical modelling, and (c) the skill of presenting results in the English language is often insufficient for the acceptance in large journals. For that reason, crucially important criticism of results by top reviewers is not available to many researchers in developing countries. Researchers in many countries do not get serious assessment of their results and without that, there is no significant influence on the education of scientific staff and on the increase of the quality of research work that will contribute to technological and economic development of developing countries.

Finally, small journals are as a rule OPEN ACCESS and enable researchers in the world to receive latest scientific information free of charge and authors to publish their papers only by compensating the cost of the *production* of the journal. The publishers of small journals are as a rule non-profit scientific organizations or scientific institutions and their objective is to achieve the easiest possible flow of scientific information and to enable scientific co-operation of researchers from many countries.

Journal *Thermal Science* has achieved all goals set from the beginning by the National Editorial Board:

- It has achieved a high scientific level in the world.
- It significantly contributes to the education of domestic young researchers and it has enabled informing the scientific community in the world about the results of researches carried out in Serbia, countries in the Southeast Europe and in many developing countries from the Far East to Europe.
- It informs researchers in Serbia, in the countries of the Southeast Europe and in many underdeveloped countries about the latest scientific achievements in the world.
- It has enabled getting to know researchers from many countries and the establishment of connections among them.
- It makes a significant contribution to raising the level of research in Serbia and in countries of the Southeast Europe.

The journal *Thermal Science* has become a significant link in the research chain of scientific, technological, and engineering fields in Serbia.

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Appendix

THERMAL SCIENCE, An International Journal, Vol. 1, No. 1, 1997 International Advisory Board of the Journal THERMAL SCIENCE

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