Development of Research in Russian Higher Education Institutes as a New Government Priority

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In the article the analysis of the modern status and place of science in Russian higher educational institutes is presented, as well as key government measures aimed at integration of research and education in universities. It is demonstrated that government initiatives to create a group of elite universities are not accompanied by introduction of additional stimulus that would encourage the development of science in these universities.

Keywords: Science, integration of education and research, research universities, research-educational centers, government science policy.

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Is the personal-member institution of the Ukrainian National Academy of Sciences justified in the light of scientometric indicators?

> For unto whomsoever much is given, of him shall be much required: and to whom men have committed much, of him they will ask the more.
>
> *Luke (12: 48)*

Existence of state-supported academies of science is a distinctive feature of the fundamental-science organization in Ukraine. Their research staff is divided into two groups: (i) personal members (academicians and corresponding members) and the rest of the researchers. First-group members have numerous economic and status privileges. It is officially purported that personal members are more

scientifically qualified than their colleagues. We analyzed this hypothesis on the basis of international indicators of the scientific activity (numbers of publications in the international peer-reviewed journals and citations in them). The indicators testify that there are no distinctions between representatives of both groups being of the same age and qualification. A conclusion is made that the lifelong privileges of the first group are ill-founded.

Keywords: Ukraine, organization of fundamental science, state academies, academicians, corresponding members, personal and 'no-named' researchers, lifelong privileges, scientometric indicators of research productivity.

Introduction

Pisgah sight of most theoretically minded scientists and humanitarians is to enjoy all necessary conditions and resources for professional activity; to be engaged in pure research without weighty teaching obligations, permanent time-consuming writing of their own research projects and reviews of other projects; to get rid of troubles connected with practical (industrial or social) implementation of their ideas; and to earn good wages for this hard, but pleasurable job. It seems to be a miracle, but such a dream has already been realized in Ukraine, the Republic of the former Soviet Union, now an independent state.

However, not all scholars are admitted to this ideal scientific world. Only personal members of seven state academies of science are inhabitants of this paradise. For instance, the Charter of the biggest and oldest Ukrainian academy — the National Academy of Sciences of Ukraine (NASU) — univocally states that only scientists, which "conduct research on the international level", and "made essential contribution" to sciences and humanities, could be elected as its personal members.

We are not going to deny that among personal members are scholars with a sound international reputation. However, such scholars can be met among ordinary scientists as well. In view of this, our task is to analyze the effectiveness of the whole institution of personal members using two criteria of scientific productivity: numbers of scientific publications and their citations in respectable international peer-reviewed journals. We, by no means, think that these criteria are sufficient for the full-fledged evaluation of any research results. Nevertheless, they are necessary to justify the assertion, proclaimed in the Charter, that personal members are world-famous scholars.

On Western and Soviet-like interpretations of the term 'academy' and its derivatives

Many countries have state-supported research institutes, centers and laboratories. Some of them are associated with universities; others are united into self-governed organizations (societies, academies), which coordinate and control their activities. French Centre National de la Recherche Scientifique (CNRS in brief, 2007), German Max Planck Gesellschaft (Annual Report of Max Planck Society, 2007) or Russian Academy of Sciences (2010) carry out most of national fundamental and applied scientific studies and are usually considered as prototypes for such research organizations. There are seven such organizations in Ukraine: the National Academy of Sciences of Ukraine (NASU), Academy of Medical Sciences, Academy of Arts, Academy of Pedagogical Sciences, Academy of Legal

Sciences, Academy of Ecological Sciences, and Ukrainian Academy of Agrarian Sciences. It is a crude fact that only NASU natural scientists and mathematicians regularly publish in international journals, which makes possible estimation (according to internationally recognized criteria) of their scientific results. That is why we shall exclude both NASU scholars of social sciences & humanities and members of six minor academies from consideration.

Under the Ukrainian legislation in force, "NASU is the highest Ukrainian state scientific organization, based on the state ownership and having self-administration rights. The latter mean the independent choice of research topics or its own structure, solution of all scientific, organizational, economic and staff issues and execution of international scientific links. The academy consolidates full, corresponding and foreign members, scientists of its institutions and carries out fundamental and applied studies of most important problems in the area of natural, technical, social sciences, arts and humanities" (About NASU, 2009).

CNRS and MPG characterize themselves in a similar way.

Besides, many countries have organizations of another kind (so-called, *public organizations*) related to science. Their titles traditionally contain the sacramental term 'academy' as well. In Ukraine one can find, e.g., Ukrainian academy of science, Academy of sciences for higher education of Ukraine, Ukrainian technological academy, Ukrainian academy of historical sciences, Ukrainian academy of political sciences, etc. Examples of similar Western organizations are the Bavarian academy of sciences and humanities (2010) and the National academy of sciences of USA (2010). Financial support of their activities comes mainly from membership fees and sponsors, sometimes including donations from the state budget.

Thus, the term 'academy' itself is ambiguous and its usage depends, in particular, on the country involved. In the Western world the term 'academy' is used predominantly to denote scientifically oriented *public organizations*. Membership in such academies is honorable and based entirely on the scientific achievements of the nominees, which should be original and substantially surpass the average level. Members or fellows of these organizations usually do not obtain regular salaries for their membership. Organizations of that sort hire auxiliary technical personnel to ensure activities of the members. In what follows, to avoid any ambiguity, we shall call public organizations of that kind as scientific (academic) *clubs*.

Different kinds of membership in NASU

Membership in the government-sponsored NASU differs fundamentally from fellowships in Western scientific clubs.

First, NASU members are mostly (but not always: see below) such scientists, for whom research in NASU is the main job.

Second, the NASU Charter singles out explicitly a privileged group of personal members (corresponding members and full members — academicians) among the NASU research personnel.

The majority of personal members, who are directly and permanently enrolled in NASU institutions, can be considered as NASU research fellows together with their ordinary colleagues. At the same time, a minority of personal members works in universities, other state Academies, ministries, and Ukrainian parliament or are businessmen. It means that it is possible to be a NASU personal member without any involvements into NASU research.

Types of rewards for the scientific activity and its outcomes are different for ordinary and personal NASU employees. Only the latter obtain extra lifelong payments, in addition to regular salaries for their main jobs, irrespective of whether they are NASU employees or

not. Corresponding members can be regarded as a junior category, e.g., because they vote for or against new corresponding members only, whereas full ('senior') members elect both new corresponding and full members.

But the main legal and actual gap exists between personal members as a whole and ordinary scientific staff. Some 'ordinary' scientists point out that the difference between personal members and other researchers is bigger than the difference between University professors and their students (Viter, 2008).

Thus, there is the drastic difference between the meanings of memberships in Western club-like academies and in the NASU.

A total number of employees on direct NASU payroll constitutes 43439 at the beginning of 2008 (The National Academy of Sciences of Ukraine, 2008). Among them 39304 were employed in research institutes, laboratories or centers; 2733 worked in R&D organizations; and 1312 in service organizations. 19024 employees were officially considered as researchers. It comprised 43.8 % of the total personnel. Researchers include 8076 candidates of science and 2568 doctors of science, which amounts 42.5 % and 13.5 % of all *scientists*, respectively.

According to the Western interpretation of academicians as members of academic club, all 19 thousand researchers are academicians, since they are NASU members involved in research. However, in the Ukrainian sense only personal members are regarded as academicians. As of 2008 they contained 343 corresponding members and 182 academicians (1.80 % and 0.95 % of the scientific staff, respectively). The elections that took place in January 2009 added 104 new personal members (31 academicians and 73 corresponding members) to the NASU (Information on new elected personal members of NASU, 2009).

Personal members of NASU are a privileged group of its research staff

The existence of the (not numerous) privileged minority of personal members inside NASU, the scientific activity of whom is stimulated by peculiar stimuli, is one of the academy cornerstones.

In addition to the lifelong stipend, Ukrainian personal members of NASU enjoy other privileges and benefits, which are imperative according to the NASU Charter. It declares that personal "members of NASU have preference for conditions to carry out scientific research in NASU institutions" (The Charter of NASU, 2002).

They include: (i) particular conditions of hiring; (ii) obligatory membership in the institutional *senatus academicus*; (iii) absence of regular scientific attestation; (iv) exclusive right to elect new personal members; (v) lifelong sinecures after retirement (principal research associates, advisers of institute directors or academy Presidium); (vi) participation in international conferences at the expense of the NASU; (vii) auspicious conditions to obtain an apartment for themselves or their children free of charge; (viii) special medical and sanatorium services; (ix) special conditions of payment for University lecturing; (x) state-sponsored funerals; (xi) special posthumous support of widows and children.

The declared goal of all these benefits is "to enhance the role of NASU and other academies in public life, the motivation and prestige of the scientific work" (The decrees of President of Ukraine, 2003; 2005).

To estimate the fairness and expediency of the advertised goal, it is worthwhile to emphasize that all over the world a *salary* is considered as a payment for the *implemented job*. By contrast, the lifelong stipend is officially treated as a tool intended to motivate the *selected* scientists to work.

In particular, the official statement emphasized that "establishment of the lifelong payment to full and corresponding members of the indicated academies must be considered *not as a privilege but as a stimulus of the motivation and prestige* of the scientific activity" (italicized by AG and VK) (Shlapak, 2008).

This argumentation seems quite ambiguous. First, it is impossible to understand, why older, more well-to-do, people rather than young active researchers should be stimulated? Second, even if this logic were accepted for a while, an inability to work, which results in a cessation of the stimulated activity as a motivated process, would have meant an abolition of the lifelong stipend. However, as Ukrainian reality shows, the lifelong stipend is paid in all conceivable situations, in particular, in the cases when personal members become physically and mentally disabled and cannot carryout any scientific studies.

Whatever the legal basis of the lifelong stipend as well as other privileges and benefits (Semenova, in print), let us consider the true rather than declarative role of this stipend as a stimulus for scientific labor. To this end, it is worthwhile to analyze its place in the general structure of wages for scientific personnel in the NASU.

System of wages for NASU scientists

There are five scientific positions, which are accessible to ordinary research staff. We mean positions of junior research associate, research associate, senior research associate, leading research associate, and principal research associate. In addition, there are following scientific and organization positions: head of the department (laboratory), scientific secretary, and director of the institution, secretary-academician of the division (e.g., divisions of physics and astronomy; chemistry; nuclear physics and power engineering, etc.), vice-president, and president of the NASU.

Salaries of the research staff at the institute level can be found in Table 1. It would be interesting to compare these data with analogous ones for Russian Federation (*Arzhanykh, Andreyeva, Zubova*, 2010: 37).

Table 1. Wages of NASU scientific research staff (as of 1 April 2008)

Position	Salary in hrivnas
Director of the Institute	2552–2594
Scientific secretary	2278–2409
Head of the Department	2278–2409
Head of the Laboratory	2278–2338
Principal research associate	2326–2409
Leading research associate	2278–2326
Senior research associate	2070–2141
Research associate	1759–1909
Junior research associate	1562–1658

After 3, 10 and 20 years of scientific service, a researcher receives, respectively, additional 10 %, 20 % and 30 % to her official salary.

Salaries in the NASU substantially depend also on the scientific degrees of researchers. There are two scientific degrees in Ukraine: candidate and doctor of science. The former degree is usually defended after 3–4 years of studies, whereas the latter requires about 10 years of research. One sees that the conventional Western PhD, which is usually awarded after 5–6 years of studies, can be considered as an intermediate one. A candidate and a doctor receive extra 15 % and 25 % to the official salary, respectively.

Majority of junior research associates, research associates and senior research associates are candidates of science, whereas doctors of science are either senior research associates or leading research associates. Some doctors take up a post of a principal research associate. A transfer from lower to higher positions usually takes 3–5 years. Qualitative and quantitative personal achievements provide a formal basis of the promotion.

Finally, if a researcher has a rank of a professor or an assistant professor (a rank of the senior research associate is equal to that of the assistant professor), additional 33 % and 25 % are paid, respectively. To be ranked in that way, a person must either teach in a university or be a supervisor of three successful candidates of science.

Hence, in 2009 maximal basic salary of a principal research associate, doctor of science and professor with the seniority of 20 years and over constitutes 2409 hrivnas plus 88 % extra charge, i. e. 4529 hrivnas in total. Of course, this income is taxed.

At the same time, in 2009 full academy members receive a lifelong stipend of untaxed 5112 hrivnas, while corresponding academy members have an extra untaxed income of 3400 hrivnas (The decree of the Cabinet of Ministers of Ukraine, 2007). It means that a total salary of a full or a corresponding member comprises 213 % (9631 hrivnas) and 175 % (7926 hrivnas) of the maximal available salary 4529 hrivnas for an ordinary scientist of the same seniority and qualification. As follows from these figures, the minimal ratio of top-level salary/entry-level salary for Ukrainian scientists is 6.2. For comparison, those ratios are 1.4, 1.7, 1.4, and 1.6 for Germany, UK, France, and USA, respectively (Rumbley *et al*, 2008).

Since rates of exchange for Ukrainian currency are not stable (in August 2010 1 euro = 10 hrivnas), we are not going to confront those figures with salaries of Western scientific colleagues (Berkhout *et al*, 2007) , the more so they differ from country to country and from institution to institution. Instead, let us compare salaries of scientists with average wages by type of industrial activities in Ukraine. The average figure for all economic spheres in December 2008 was 2001 hrivnas. The indices vary much from field to field. In particular, the average wages by type of industrial activities are (in hrivnas): 2057 for the industrial production, 1147 for agriculture, 1649 for trade, 2324 for transport and communications, 4094 for financial sphere, 3418 for public administration, 1692 for education, and 1441 for health care (Population income, 2009). One should consider those figures with some caution, because some part of economy is hidden in a shadow. Nevertheless, even the minimal income of an academy personal member is quite impressive against this background. Additional revenues take forms of additional salaries for administrative positions of directors, monthly and annual bonuses, extra payments for 'intensity of labor', management of scientific research projects, etc.

Requirements to the level of scientific research for ordinary and personal NASU members

Now let us look more closely at official reasons put forward to justify the lifelong state stipend for *chosen Ukrainian scientists* — personal members of NASU. According to the NASU Charter, its entire scientific staff must carry out the fundamental and applied research at

the international level. Namely, "primary goals of the NASU are (i) organization, realization and coordination of the scientific studies in the area of fundamental and applied problems for natural, technological, social and humanitarian sciences; (ii) carrying out fundamental and applied research in the priority directions at the international level and strengthening of the influence of corresponding results on the innovation development of economy, education, and culture in Ukraine" (Charter of NASU, 2002).

Therefore, the necessary but not sufficient condition for scientists from NASU, all of them working *by default* at the international level, to join the group of personal members, is a demand for challengers not only to produce results at the 'average' international level, but to achieve significant and even outstanding results. It is exactly, what is written in the Charter on NASU: "scientists that have made *outstanding* contributions to the development of the corresponding scientific branches are elected as full members of the NASU. Scientists, who have enriched science by *prominent* achievements, are elected as corresponding members of the NASU" (italicized by AG and VK). Thus, *prominent* and *outstanding* personal scientific results serve as *the only guide* to nominate and elect scientists as full or corresponding NASU members.

In practice, nominees become full and corresponding members after a fierce competition in double-stage elections rather than automatically. The first stage occurs formally among colleagues, working in the same scientific area; whereas at the second stage all previously elected personal members, whatever their specialty, finally confirm the election results. At this stage, decisions are often personally and politically motivated, since no professional estimates can be made by, say, physicists about linguists and *vice versa*. In any case, one vacancy is usually sought by over 10 rivals. Formally, it means that the institutional *senatus academicus* involved in the academic nomination consider all nominees as worthy candidates that have already made *prominent* and *outstanding* contributions. It means that, according to such speculations, Ukraine has not only 629 (as of 2009) personal members of NASU internally recognized as leading professionals but also about 1,000 excellent scientists, who are not yet academicians simply because the lack of vacancies.

Lifelong stipend as stimulus of the research

The lifelong stipend, given to NASU personal members and considered *by default as a stimulus* encouraging them to *further improve* their *outstanding* scientific activity, is, in essence, a prepayment for job not yet made. Hence, after the election each academician must produce brilliant scientific results and remain at the highest internationally recognized scientific level. In any case, notwithstanding high organizational burden of NASU members, scientific productivity of academicians should exceed that of ordinary scientists.

Note that the NASU charter makes no reference to the age of its personal members. Furthermore, paragraph 36 reads: "The main duty of full and corresponding NASU members is to enrich science by new achievements and discoveries on the basis of personal scientific studies, organization of collective elaboration of problems, and scientific supervision over investigations". Therefore, any mental or physical weakness can justify subsequent inefficiency of elected members. The very idea of a lifelong stipend as a *stimulus* to carry out scientific research means that this stimulus is active starting from the election moment until the end of the life.

To appraise the personal impact of the lifelong stipend on personal members, one should realize that during last decades the average age of newly elected personal members

exceeds 60 years, i. e. the regular age of the retirement of Ukrainian men. It seems not wise to *stimulate* people at the end of their career. At the same time, it is the proper age for distinguished scientists and scholars *to be recognized* by respective communities. Any financial reward has nothing to do with such recognition. This practice is appropriate to the Royal Society in Britain (2009) and National Academy of Sciences in the USA and is justified from the juridical and moral viewpoints.

In the absence of sociological data about the proclaimed enhancement of the NASU role in public life and social prestige of *all scientists*, let us draw the reader's attention to the comparison between NASU personal members, on the one hand, and other NASU employees, on the other hand, in the sphere of research in natural science and mathematics. It seems natural to put forward a hypothesis that in the case of the real influence of lifelong stipend and other privileges of NASU personal members on their scientific productivity there must be a strong correlation between their benefits and their scientific productivity.

Before testing this hypothesis, we should from the outset reject a common idea that stimulation of personal members boosts ordinary scientists in a hope that in the future they will join the cohort of personal members. Some state officials believe that a vague possibility to obtain a livelong stipend plays a stimulating role for the majority of researchers. However, according to the sociological studies, the would-be lifelong stipend is not considered by persons involved as one of main motivations to become a scientist. Martynyuk and Soboleva (2006) make a conclusion that "motivation to carry out research is determined by a specific combination of the aspiration to self-expression and the desire to make a contribution into science and society development". Among motivations, they noted, prestige and the size of salary occupied the sixth and seventh place, respectively. The lifelong stipend was not mentioned at all as an extra motivation. Those sentiments of Ukrainian scientists conform to the behavior of their European and North American colleagues, who attained a great success in their job without any lifelong stipends for chosen members of scientific profession.

All the previously mentioned does not mean that very modest wages of Ukrainian scientists should not be enhanced. On the contrary, it would be of benefit to increase it, as well as to spend a considerable amount of money to modernize the obsolete equipment in the experimental research sector. Nevertheless, any regular or irregular financial support of the labor force must result in an increase of scientific productivity.

Inasmuch as in the NASU Charter there is a normative requirement to carry out research at the international level and annual report forms demand national scientific studies to be compared with this level, we are obliged to use exactly the same criteria of success, which are conventional in the international scientific community. As is well known, those criteria correspond to requirements established by top-level journal, included into the Institute of Science Information (ISI) list, and books issued by leading publishing houses.

Nevertheless, the forms of annual reports of NASU institutions contain information only about technical level of the accomplished projects as well as the scientific and engineering achievements, i. e. those documents are dealing with the *applied* research results. Therewith, such a level is classified as follows: (i) higher than the existing international analogues; (ii) at the same level as the existing international analogues; (iii) lower than the existing international analogues; (iv) not defined. As for fundamental researches, there is only one parameter, well applicable to them, namely, the number of publications in international journals. However, journals are not specified, so that, in practice, they include mainly

Russian-language sources of the former Soviet Union. It should be note, that even those journals, mostly of medium-rank quality, publish articles of Ukrainian scientists, working chiefly in mathematical and natural sciences.

Unfortunately, Ukrainian normative and legal documents dealing with science and the NASU Charter hold no criteria about the meaning of 'international level'. Therefore, the proclaimed necessity of comparison is senseless, the terms 'prominent' and 'outstanding' being completely subjective. Moreover, scarcity of information about NASU publications abroad in its annual reports and cessation in 2000 of monitoring the Ukrainian scientific publications abroad by the State Statistical Committee of Ukraine makes impossible to estimate, on the official basis, the place of Ukrainian science among its counterparts in other countries. On the contrary, information about ISI-covered publications of Western scientific organizations can be found, as a rule, on their websites.

That is why we used the Web of Science (ISI) database. To be more specific, we have analyzed the most internationally known category of Ukrainian scientists — physicists and mathematicians — working in the leading Institutes of the NASU. Namely, indices of the Institute of Physics and the Institute of Mathematics were determined and processed.

Do NASU personal members demonstrate higher scientific quality than ordinary researchers?

Necessity of age normalization

Before proceeding further, we should describe the applied method, inevitable to compare output for scientists of different age and experience. We note that in any case the comparison of achievements of people, who lived in different social environments, is not perfectly legitimate, since during Soviet epoch it was almost impossible for Ukrainian researchers to publish in leading international journals.

Let us assume, in accordance with the most probable situation, that a start of the publication activity of a Ukrainian researcher coincides with the third year of the post-graduate study when he/she is about 25. Hence, a period of creative activity equals to the biological age minus 25 years (in our case the years of monitoring were 2008 for physicists and 2007 for mathematicians). As comes about from our study, selected researchers from the chosen Institutes differ substantially in their biological age (for physicists and mathematicians it is in the ranges from 43 to 81 and from 33 to 90 years, respectively). It leads to a large scatter in their activity period (from 18 to 56 for physicists and from 8 to 65 years for mathematicians, respectively). Consequently, to compare impartially the publication activity numbers for various categories of scientific staff, one is forced to use figures divided by the research duration rather than absolute figures. For our purposes, in the case of personal members of NASU it is also important to take into account their age when elected and the period of office as academicians.

Four groups of researchers in each Institute will be separated and analyzed. Specifically, they include (i) personal members, i. e both academicians (full members) and corresponding members); (ii) academicians; (iii) corresponding members; (iv) 'top' doctors of science. For the first three groups we distinguish between annual publication activities: (i) during the whole creative life; (ii) before obtaining the personal status; (iii) after this obtaining. For ordinary researchers only average annual publication rate is calculated.

Justification of the Specific Institute Selection

We chose Ukrainian physicists and mathematicians from the Kiev Institutes of Physics (IP) (our data) and Mathematics (IM) (data of its scientific associates, doctors of sciences S. Kolyada, V. Lyubashenko and R. Cherniha (2008)) as a focus group for the following reasons.

First, each of those institutions employs large numbers of successful doctors of science, including personal members of NASU. In particular, 45 doctors, among them 7 corresponding members and 2 academicians, work in IP, whereas 68 doctors, among them 9 corresponding members and 7 academicians, work in IM. Data presented here comprise snapshots at the indicated moments. Therefore, subsequent changes, inevitable in functioning systems, are not taken into account. Up to December 2008 IP doctors of science published 3514 articles cited 26321 (using the search mode) and 21460 (using the cited reference search mode) times, whereas IM doctors published 411 articles in 1996–2007, cited 4248 times.

Specifically, using the *search mode* we first find all articles, belonging to a certain author and covered by ISI-list sources, and next count available *citations* of those articles. Using the *cited reference search mode*, we directly find *number of articles* citing any article, preprint or monograph of this author, published anywhere. Therefore, any of the results might be larger or smaller, depending on many conditions. In the case of scientists from the former Soviet Union, the cited reference search mode should be especially considered as a valuable parameter, because it makes allowance for citations of Russian-language publications not covered by Web of Science. In this connection, in our own analysis we have used both modes to characterize the international recognition of Ukrainian physicists.

Second, any of the institutes' staff is in equal informational conditions and has equal possibilities to publish papers in international journals.

Third, Ukrainian physicists and mathematicians use available opportunities more vigorously than their colleagues from other branches of science and humanities.

Fourth, the majority of scientists concerned are working in the fundamental realm, carrying out unclassified research. Hence, they do not suffer much from still existing restrictions on the publication abroad, thus making possible to estimate their productivity on the basis of international publications in English.

Our choice can be confirmed by the data on publication and citation numbers of Ukrainian scientists, which can be easily extracted from Web of Science. Unfortunately, it is impossible to separate the NASU contribution from the overall international data. At the same time, as has already been mentioned, this 'major' state academy in its annual reports does not always indicate numbers of publications of its employees in international journals. Nevertheless, the Brief Annual NASU Report 2006 (2007) contains a statement that during that year NASU employees published 24000 papers, including 4500 in *leading* international journals. The compilers have not indicated impact-factors of those journals and whether they are included into the ISI list. It casts a certain doubt on the data, since, according to *Nature* (Schiermeier, 2006), ISI journals publish annually on average only 1500 articles of NASU employees. Recall that the practice of the NASU elections formally testifies that this Academy engaged not less than 1500 scientists of the world top level.

Our analysis of raw data (according to the Web of Science mirror) for all involved personalities from both Institutes shows that their productivities and recognition vary substantially. For instance, for selected IP personal members the maximal and minimal number of publications differ by a factor of 4.7 and citation numbers by a factor of 17.7 and 14.3 in the search and cited reference search mode, respectively.

For personal members from IM the factor for publication numbers is 20 even if one does not take into account three corresponding members, who did not publish anything in ISI journals during last 12 years. The factor for citations is as large as 54.3.

To smooth the apparent individualities and make the picture sociologically trustworthy, we shall operate with productivities and acknowledgments of the average academician, average corresponding member and average doctor working in the IP and IM.

Institute of Physics

Average publication activity of the IP personal members is demonstrated in Table 2. One should make several preliminary remarks in order to explain the real significance of the data presented there. Number of publications is approximately half as many as in the case of a standard European professor. The discrepancy can be easily understood, since until 1991 publications abroad were not encouraged by Soviet authorities. On the other hand, the activity after the election is not at all impressive that arouses suspicion that the academy membership is only a bureaucratic decoration, which does not actually imply any further scientific deeds.

Table 2. Publication productivity of personal NASU members, employed by the Institute of Physics (up to December 2008).

Category	Average number of publications	Average number of publications before election as a personal member	Average number of publications after election as a personal member	Average annual number of publications before the election as a personal member	Average annual number of publications after the election as a personal member	Average annual number of publications after the election as an academician
All personal members	143.3	80.2	46.1	2.9	3.6	
Corresponding members	134.6	89.1	44.0	2.8	2.7	
Academicians	174.0	49.0	76.5	3.3	5.7	4.1

Table 3 shows the age-specific characteristics of personal members and 9 'best' doctors of science. They strongly suggest that the membership is awarded too late to be a stimulus.

Table 3. Average age characteristics (in years) of personal NASU members and 9 most productive doctors of science, employed by the Institute of Physics (as of December 2008).

Category	Age	Period of the scientific activity (actual age minus 25 years)	Age of election as a personal member	Age of election as an academician	Duration of service as a personal member
All personal members	69.7	44.7	52.6		12.7
Corresponding members	68.3	43.3	54.0		10.8
Academicians	74.5	49.5	47.5	56.0	18.5
9 most productive doctors of science	67.2	42.2			

In Table 4 bibliometric data of personal members and 9 best non-elected doctors are collected for comparison. It includes averaged absolute and relative parameters for 4 categories of researchers, namely, for all 9 personal members (including academicians and corresponding members), academicians and corresponding members as separate groups, and 9 most productive doctors of science. We considered that it would be fair to compare 9 personal members with the equal number of top doctors. Indeed, the former as well as all their colleagues in other institutions of NASU are "prominent" and "outstanding" by definition, the latter explicitly implemented by the state Ukrainian establishment. Hence, they must be compared to the most productive non-elected doctors; the more so all persons involved are approximately of the same age and scientific experience.

Table 4 Comparison of the publication output and citation numbers of personal NASU members and doctors of science, employed by the Institute of Physics (up to December 2008).

Characteristics	Personal members	Corresponding members	Academicians	9 most productive doctors of science
Number of publications	143.3	134.6	174.0	126.3
Average annual number of publications	3.2	3.1	3.5	3.0
Number of citations (search mode)	1449.3	1503.6	1206.5	790.1
Number of citations (citation mode)	1162.1	1141.1	1278.0	653.9

The following circumstances, significant both for IP and IM, should be taken into account.

First, there is a large difference between IP and IM in all comparable figures for highest as well as averaged characteristics and for all groups involved. The dissimilarity reflects specific features of both branches of research as well as numbers of corresponding researchers all over the world.

Second, according to our own experience, data that are more precise can be collected if the responsible person is closely acquainted with the investigated activity. The problem consists in a large number of namesakes in interdisciplinary sciences and existence of many ways to transliterate Cyrillic names into English. Hence, it is not at all easy to attribute articles found by English-language databases to Ukrainian authors.

Third, data concerning IP (one of the authors is its long-term employee) are more differentiated and embrace larger temporal period (up to 2008) than those for IM (1996–2007). Moreover, data for mathematicians do not make allowance for two possible ways of citation counting. Although data for the IM are not as complete and differentiated as those for the IP, they are sufficient for our purposes — to check the validity, justification, and usefulness of the personal member privileges to boost their scientific production.

Returning to Table 4, we see that annual productivities among academicians and their 'junior' colleagues, corresponding members, does not differ conspicuously. In particular, it means that there is no substantial disparity in publication activity for those two categories, so that election criteria for distinguishing one group as full NASU members and the other

one as corresponding members seem vague and having nothing to do with real merits of candidates for high distinctions.

On the other hand, one can infer form Table 4 that an election as a personal member increases one's productivity by 25 %. We doubt, whether this amplification means a sudden growth of qualification or curiosity. It might simply reflect larger possibilities to engage more collaborators, undergraduates, etc. Nevertheless, we are not certain about the real cause.

Similar increases after elections as corresponding members and academicians constitute 3 % and 27 %, respectively. One sees that, contrary to what is claimed by the Ukrainian authorities, the change of status does not transform any scientist into a much more successful one. This is no surprise, since it would be ridiculous to expect any major boost of activity for persons older than 60 (see Table 3). We also want to emphasize that growing number of publications issued by personal members, head of the department or other officials in Ukraine as they make public career does not reflect only their personal contribution. They spend their time to carry out non-scientific activity or simply enjoy a well-paid rest, while their subordinates put their names into the authors' list. Unfortunately, those are symptoms of the international disease when top persons sign papers sometimes without reading them and notwithstanding possible grave consequences for science (Reich, 2009). This common disease is, however, more malicious in post-Soviet countries.

From Table 4 it also comes about that annual productivity of 9 personal members during all their creative years is only 7 % higher than that of their 9 most productive colleagues — ordinary doctors of science.

At the moment of the election the averaged personal member, corresponding member, and academician published 80.2, 89.1, and 97.5 articles in prestigious journals, respectively. In December 2008 those results were surpassed by 7, 6, and 6 ordinary doctors, respectively. It means that the existing NASU election system *discriminates* top doctors by deliberately awarding persons not more productive than their colleagues.

It should be noted that 13 non-elected doctors published more papers than two corresponding members with the worst productivity, while the publication list of the less productive academician is shorter than those of 6 doctors.

We note that all studied groups are inhomogeneous from the professional viewpoint. For instance, in the personal member group there are three persons with over 200 ISI publications. If we subtract their total output (620 articles), then it remains only 670 articles for other six personal members, so that the averaged productivity 2.7 of the latter becomes smaller than its counterpart for nine most productive doctors.

If one looks at the number of citations the results seem to unequivocally count in favor of personal members of the IP. However, this inequality is a consequence of a very large citation rate of the same two corresponding members mentioned above. Other representatives of the personal-member group are at the same level as the 9 doctors. Even if this circumstance is not taken into account, as we have done in our Table 4 to be totally consistent, it is impossible to talk about any scientific superiority of the IP personal members.

Institute of Mathematics

Various relevant characteristics describing the IM are presented in Table 5. This information is less detailed than our own results. In particular, necessary averaging has been carried out over smaller time interval 1996–2007.

Table 5. Comparison of the productivity of personal NASU members and doctors of science, employed by the Institute of Mathematics (1996–2007)

Characteristics	Personal members	Corresponding members	Academicians	The most productive doctors of science
Age in 2007	72.8	68.3	78.7	55.1
Period of the scientific activity (actual age minus 25 years)	47.8	43.3	53.7	30.1
Age of election as a personal member	59.6	61.4	57.1	
Duration of service as a personal member in 2007	13.4	7.0	21.6	
Average number of publications in 1996–2007	6.6	5.1	8.4	12.9
Average annual number of publications in 1996–2007	0.55	0.43	0.70	1.08
Number of citations in 1996–2007	136.7	49.8	248.4	71.2

Note, that the overall productivity of mathematicians is an order of magnitude smaller than that of physicists. For instance, the annual publication productivity of an average personal member is only 0.55. It seems that any scientific activity of those people ceased to exist long ago, which is no wonder for such elderly people. Nevertheless, their qualification and previous contributions into science can be rather correctly estimated from the citation numbers.

From Table 5 one can easily see that academicians are more or less recognized abroad, whereas corresponding members are not. Much younger 18 most productive doctors professionally excel corresponding members both in productivity and recognition. Three IM scientists have equal numbers of publications. That is why we take 18 doctors, but not 16 (the latter number 16 = 7 + 9 was dictated by the existence of 7 academicians and 9 corresponding members).

Let us remark, that at the time of the election, only two out of nine correspondent members were not administrators of whatever level. This is a *key factor* explaining the scientific failure of the personal member concept in the IM. The data on IM indicate even more, if ones try to differentiate personal members. Specifically, three academicians and six corresponding members published 5 or less papers each during last 12 years. Three corresponding members *haven't published any single work in ISI journals* during this period. Hence, annual productivity of the most productive doctors is 96 % higher than that of the personal members as a whole and 151 % higher than that of the corresponding members.

As can be readily seen from Table 5, IM doctors are notably younger than personal members, although still being over 50. Hence, there is an undoubted handicap to overcome for younger researchers while making any comparisons of achievements with older ones. Elderly people should have produced more by definition, because they have worked longer! Unfortunately, it is not the case. They were elected not for their high scientific record and stopped their activity after being elected. It is worth mentioning that worse bibliometric figures of mathematical personal members than those of their colleagues-physicists are due to specific character of their work. Specifically, it is a tiny Institute and there are not so many young people to supervise and collaborate.

Ukrainian scientific leaders according to the Hirsch index criterion

The parameters used by us in Tables 4 and 5 (number of publications and citation index) are traditional ones to estimate efficacy of natural sciences, although many researchers denounce them as indicators of success in social sciences and humanities. Indeed, for the latter books are often more important that articles and letters not to talk about reports at professional conferences. Nevertheless, if high-rank Ukrainian researchers in social sciences produce *no articles* in international journals, which is exactly the case (Gabovich, Kuznetsov, 2007), it seems to undermine their scientific reputation. Recent studies indicate the absence of the Ukrainian scientific publications (including personal member ones) together with Western colleagues in the realm of social sciences and humanities (Marshakova-Shaikevich, 2010: 58). Fortunately, in natural sciences and engineering Ukrainian personal academy members, as one may conclude, e. g., from Tables 4 and 5, are competitive with their low-rank colleagues, although undoubtedly not superior.

To independently check the results in more general sense it seems instructive to use the so-called Hirsch index (Hirsch, 2005), which is a number h equal to the largest number of articles published by a person concerned having at least h citations. Of course, the number h cannot exceed the total number of one's publications. Therefore, it is reasonable to use this estimation method only for mature scientists with many published works. That is why personal members are suitable objects to be studied in such a manner. Fresh raw data as of 1 December 2010 were taken from the Rating of 100 best Ukrainian scientists calculated by Vernadsky State Library in Kiev using the Scopus database (Rating, 2010).

The results are presented in Table 6. Necessary corrections were made in comparison with the data (Rating, 2010). Namely, we excluded deceased persons (3) and those affiliated abroad (1) as well as in all organizations except NASU (18). Hence, only 78 persons with $h \geqslant 12$ without self-citations representing 25 Institutions were left in the list. Since we are not interested in names we indicate only affiliations. Only citation data for the period 1996–2010 were taken into account. Since citations of *all articles and books* written by persons involved were accounted for, older scientists including personal members are *a priori* in a more advantageous position.

Table 6. Number of personal members in the best NASU institutes and the best NASU scientists arranged by Hirsch index h according to Scopus database (1 January 1996 — 1 December 2010)

	Number of academicians working in the Institute/Number of academicians represented in the list	Number of corresponding members working in the Institute/Number of corresponding members represented in the list	Number of non-personal members represented in the list	Total number of scientists represented in the list
Bogoliubov Institute of Theoretical Physics	2/1	2/1	9	11
Institute of Molecular Biology and Genetics	2/1	8/1	6	8
Institute of Physics	2/1	8/1	6	8
Central Astronomical Observatory	1/0	2/1	4	5
Institute of Magnetism	1/0	1/0	5	5

Bogomolets Institute of Physiology	1/1	1/0	3	4
National Scientific Centre "Kharkov Physical and Technical Institute"	4/0	5/0	4	4
Institute of Organic Chemistry	1/0	1/1	3	4
Verkin Physical and Technical Institute of Low Temperatures	8/1	6/0	3	4
Institute of Condensed System Physics	1/0	3/1	3	4
Kurdyumov Institute of Metal Physics	2/0	5/1	2	3
Frantsevich Institute of Materials Science	4/0	5/2	1	3
Palladin Institute of Biochemistry	1/0	3/0	2	2
Ovcharenko Institute of Biocolloidal Chemistry	0/0	0/0	2	2
Institute of Bioorganic Chemistry and Oil Chemistry	1/1	0/0	0	1
Lytvynenko Institute of Physical Organic Chemistry and Coal Chemistry	0/0	0/0	1	1
Scientific and Technological Complex "Institute of Single Crystals"	3/0	1/0	1	1
Tymoshenko Institute of Mechanics	4/1	3/0	0	1
Institute of Nuclear Studies	1/0	4/0	1	1
Institute of Mathematics	7/0	7/0	1	1
Kavetskii Institute of Experimental Patology, Onclology, and Radiobiology	1/0	0/0	1	1
Radio-Astronomical Institute	3/0	2/0	1	1
Chuiko Institute of Surface Chemistry	0/0	1/0	1	1
Institute of Cell Biology	0/0	2/1	0	1
Institute of Chemistry of High-Molecular compounds	1/0	1/0	1	1
In total	51/7	71/10	61	78

If one had taken seriously the assertion of the NASU Charter that any personal member is an outstanding scientist *by default*, the excerpts presented in Table 6 would have supported this viewpoint at least in principle. Here, all natural scientists compete on equal footing so that unlike the data of Tables 4 and 5 the results of Table 6 do not discriminate any branch of science. As for social sciences and humanities in Ukraine, their achievements are invisible in comparison to the more numerous ones of their colleagues working in natural sciences due to (i) the immanent differences in the financial support of various human activities all over the World; (ii) the specific weakness of Ukrainian economists, philosophers, legal experts, philologists etc. as a consequence of the previous communist policy.

Looking at Table 6 one can make several indisputable conclusions concerning the role of personal members in modern Ukrainian science. First, the alleged superiority of personal members over their "non-titled" colleagues turned out to be a myth since only 17 of academicians and corresponding members stand against 61 ordinary scientists (doctors and candidates) ranged by a parameter h, which is more favorable for older persons than the citation index. Indeed, a large high total citation can be achieved by only one recent "lucky strike" whereas a large h needs a longstanding systematic hard work. Hence, the presence of only 17 successors from more than 600 competitors in the 100-member list means a complete failure of the selection procedure in the NASU.

To be more specific, these 17 scientists should be compared with 122 personal members working in the Institutions presented in Table 6, which constitutes about 14 % of this number. Note, that the number 122 comprises 19.4 % of the total number of personal members in the NASU (Brief Annual Report of NASU-2009 2010).

Second, 61 ordinary NASU researchers have higher ranks in terms of the Hirsch index than about 600 personal members from their own and all other NASU institutions.

Third, the state of the art discovered in the Institutes of Physics and Mathematics (Tables 4 and 5, respectively) is not at all accidental. In those institutes as well as in other 23 institutions from Table 6 the number of ordinary researchers with the Hirsch index $h \geqslant 12$ exceeds the number of personal members with the similar h.

Fourth, notwithstanding large differences in publication numbers, citation and Hirsch indices among different branches of science, Table 6 associates researchers and institutions dealing with various natural and mathematical sciences. Hence, according to standard international criteria, institutions involved are true scientific leaders in the NASU. This was achieved by creative efforts of young and elderly scientists, whatever their relationship to the personal membership.

Finally, as has been clearly shown, notwithstanding their scientific age and affiliation in different institutions, personal members do not dominate in any of them. It means that for any selected internationally accepted relevant parameter academicians and corresponding members cannot be regarded as a community of outstanding personalities towering over their colleagues.

To find correlations between all these data using the modern Hirsch method with old good citation outputs of the scientists involved is not a straightforward procedure. Indeed, some scientists have stronger positions in the Hirsch ranging, whereas other ones have much larger overall citation records and smaller h (Rating, 2010). There is also a problem how to properly compare of citation indices between scientists of different generations, i. e. how to carry out an adequate time adjustment (Marx, 2010). We bear in mind that the amount of annual scientific product changes rapidly in time. Therefore, the adjustment would be of benefit even for young and old scientific compatriots.

Nevertheless, in our case it is not crucial because almost all persons from the Rating are either the middle-aged or old ones.

We are obliged to make an additional remark about the man after whom the main scientific library of Ukraine was called. Vladimir Vernadskii (Vernadsky) was a famous Ukrainian and Russian scientist, father-founder of the NASU. We have discovered 535 citations of his works in the ISI database during the period 1990–2003. This interval was chosen equal to that from the article (Marx 2004), where best physicists-authors of the pre-1930 papers were listed (Vernadskii, a person of encyclopedic learning. can not be considered as a representative of any individual science). If his record had been included into Table 2 of the essay (Marx, 2004) he would have shared the 20th position with a Nobel Prize winner Niels Bohr (532 citations). Unfortunately, subsequent generations of Ukrainian academicians did not augment Vernadskii's heritage.

Conclusions

Thus, our quantitative analysis has not revealed an unambiguous correlation between the academic rank and a higher productivity in comparison with the best (from the professional point of view) unranked doctors of science in physics and mathematics. The same was conclusively demonstrated for other sciences and institutions on the basis of the Hirsch index analysis.

It comes about that the lifelong academic stipend does not correlate with scientific results of its recipients. It does not play a purported role of a stimulus to further scientific achievements, which would have been an effective factor of the Ukrainian science development.

We by no means deny the existence of outstanding scientists among NASU personal members. Nevertheless, the *average personal member* ranks below many ordinary NASU research associates of the same age and qualification. In that sense, the academic lifelong extra salary is discriminative towards those colleagues and senseless from the pragmatic viewpoint.

The institution of personal members inside state academies has been declared as a kind of knighthood to support most talented and productive scientific researchers and create advantageous conditions for their creativity. However, both criteria of scientific assessment and transparent democratic procedures of academic elections were absent in the Soviet Union and are the more so absent in Ukraine. As a result, the institution studied here transformed into a mechanism of providing additional material support and absolute administrative power for top managers in state academies and universities. Unfortunately, this situation is not familiar to European, North American or Far Eastern officials and scientists. Their relations with Ukrainian colleagues are based on the tacit assumption that Ukrainian universities are institutions of the same style, moral weight and professional quality as, say, middle-level European universities. The same kind of assumption governs their attitude towards any Ukrainian state academy, which they (erroneously!) consider as an analogue of the Royal Society, National Academy of Sciences of the USA or French Academy.

The quasi-medieval system of privileges, where the whole community is divided into strata having nothing to do with true scientific capabilities and achievements, is one of the main reasons of Ukrainian science stagnation. This conclusion is very instructive in

a wider sense, since it shows how some archaic features of the remote past survived revolutions and wars of the twentieth century and still dominate scientific institutions in the twenty-first century. The demolition of this system is a necessary condition to carry out true indispensable reforms of Ukrainian science. The implementation of the worldwide criteria of evaluating outcomes of scientific research is only the first although obligatory step on this long and hard road (Shulga, 2009). At the end of this road, the country must have a meritocratic system to estimate its scientists and promote their research instead of the actual obsolete and fallacious structure with elections based on criteria far from being scientific.

As stems from the analysis carried out above, the personal-member institution of the NASU can be characterized in the same manner as has been done by Kugel concerning the quality of the RAN staff: «No doubt, there are distinguished scientists (Nobel prize-winner academician Zh. I. Alferov, academician D. A. Varshalovich, academician L. D. Faddeyev), but there are those who are unable to achieve real scientific results». (Kugel, 2010: 13). Hence, if one wants to conduct effective reforms of the Ukrainian academic science, taking into account the positive Soviet and exterior experience in the organization of science but trying to avoid generic drawbacks of the Soviet system, one must objectively analyze the real state of affairs, including the personal-member institution.

We would like to put the following non-conventional rhetoric question to both Referees and Readers of our paper. Imagine that you are a promising young scientist who successfully started your academic career with numerous sound scientific results and quite a number of already well-cited articles in international refereed journals. You observe the scientific community described above and become fully aware that it is inevitable to abandon science and choose an administrative career. Otherwise, you will be all your life across the track. Then: "Does it make any sense to stay in such a state academy and sponsor people of lower professional quality?"

The answer is self-evident. The only way to stay in science is to go abroad. It is no wonder that many young Ukrainian scientists made such a decision in the past or are going to make it soon.

To summarize, let us rephrase Shakespeare: "Something is rotten in the state academies of Ukraine". The existence of the *lifelong personal membership* comprises a significant reason of the social and professional failure of Ukrainian scientific community uncovered above.

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Оправдан ли с точки зрения наукометрических индикаторов институт персональных членов Национальной академии наук Украины?

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Существование государственных академий наук является характерной чертой организации фундаментальной науки в Украине. Их научный состав разделен на персональных членов (академиков и членов-корреспондентов) и остальных сотрудников. Представители первой группы обладают многочисленными материальными и статусными привилегиями. Официально считается, что они значительно превосходят в научном плане представителей второй группы. В статье эта гипотеза анализируется с точки зрения международных индикаторов научной деятельности (количество публикаций в международных реферируемых журналах и количество цитирований в них). Их использование показывает отсутствие принципиальных различий в научной продуктивности между одинаковыми по возрастным и квалификационным критериям представителями первой и второй группы. Делается вывод о необоснованности пожизненных привилегий членов первой группы.

Ключевые слова: Украина, организация фундаментальной науки, государственные академии наук, академики, члены-корреспонденты, персональные и рядовые исследователи, пожизненные привилегии, наукометрические показатели/индикаторы продуктивности научной деятельности.