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How to Prepare and Write Candidate Dissertation

F. T. Aleskerov

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1. INTRODUCTION

Why I decided to write this paper? Somebody may say that I do not have enough rights to do so because the number of my graduate students is small. Yet this is possibly compensated by the fact that today some of my students are professors and very well known persons.

I had some graduates from this country and abroad, more than twenty of them defended their MPhil's, and now I have enough students. Since some things I have to tell to each of them, I decided to write down and publish what I have to repeat.

2. GENERAL PROBLEMS OF WRITING A DISSERTATION

The candidate dissertation is always a qualification test. You defend some work where you demonstrate your qualification. This needs not necessarily to be a breakthrough in science or practice. However, sometimes this notion of qualification test is somehow simplified; it is believed that if you have written several formulas or 150 pages of reasoning, then you have a ready qualification test and may go and defend it. It is not the case. In any case, the candidate dissertation at least must give new problem formulations, or throw light on some existing formulations, or present some new solutions.

Why people at all defend dissertations? There was a saying in the Soviet Union that one needs not to be a researcher, but must be a candidate. Why there was such great interest, such motivation to defend dissertation? As compared with the rest of this country, there was a relatively freer situation at the research institutions, and the candidates of science were paid better than the rest. True, with time this difference was smoothed.

Now we come to a very important component of writing a dissertation. Any dissertation is a problem, one, two or even more problems. The question is as follows:

Who and how has to pose problems? The graduates and masters cannot pose problems. It is a normal phenomenon. One needs not to be surprised or worried about this. Ability to formulate well the problems comes with experience. One has to work much to gain this experience. Therefore, we face here two problems: choice of the advisor and choice of the theme of dissertation.

Choice of the advisor. I had three self-sufficient students. If you are not self-sufficient, then never turn to an advisor who has no time to attend to you. Choose advisors who have time, possibility, and interest to concern themselves with you. Graduate or master who are left to take their course are in a very bad situation namely because they cannot pose a problem.

For the self-sufficient people there is another formula. Their advisor must be a super-professional, a person to learn from.

When after the Department of Mechanics and Mathematics of the Moscow State University I came to the Institute of Control Problems to my dear teacher, the outstanding researcher Mark

¹ Revised lecture read at the Higher School of Economics on April 10, 2008.

Aronovich Aizerman, training was such: they posed me a problem and left me alone. Now I understand what then was strange to me: they observed from aside how I “flounder about.” It was a severe school of life: if he “emerges” from the situation, then there is reason to concern with me. Later on they were concerned, and concerned much with me, and I am very thankful to my teachers M.A. Aizerman, L.I. Rozonoer, and many others with whom I had the luck to work with.

Now, about the problems. There are tasks, problems, and good intentions which must be clearly distinguished one from another. Karl Popper said wonderful words which I like very much that *There are no fields or even branches of science, there are unsolved problems and the demand to solve them.*

What is task in this situation? In the task one must clearly define what is given and what is intended to be obtained. Moreover, in the task the way of solution and the apparatus to be used are usually known, that is, the task is always concrete as the school curriculum. This may be exemplified, for instance, by data analysis with the use of linear regression. You have an apparatus, tackle the task, and obtain something.

Problem is somewhat different. It is known what is given, but it is far from being known what we will obtain. Moreover, the apparatus and technique of solution are often unknown. One has to invent them for the problem or modify some existing methods.

How problems arise and solved—this subject is covered in numerous books. There are remarkable books by Thomas Kuhn “Structure of Scientific Revolutions” [1] and great French mathematician Henri Poincaré [2].

I am going to give an example from my own experience which suggested me the concept of the interval utility model which strongly account for human behavior. Once in Paris I and my wife descended Mintmaster and at the corner of boulevard de Clichy we saw that somebody sells nuts. I asked how much are they. It turned out that a small cornet was for eight francs. My pockets were full of coins. I started to count, take coins from my wife, collect for four cornets, and give to the vendor thirty-two francs in smallest coins. And now he gives me the four cornets of nuts and throws the handful of coins on the pavement. Indeed, there were very small coins, but to throw it away... The thrown out thirty-two francs—about seven US dollars—all but shocked me.

Next day at the university I asked colleagues what does it mean. They just shrugged shoulders and said: “And what, forget it.” I thought it over and invented a model where the error in distinguishing between two alternatives depends on the individual attitude to benefit. If it has much money, the error grows. A billionaire rounds off up to hundreds thousands—it is one type of behavior. The more money, the longer the interval. Another behavior: the richer a person, the greedier, the interval shortens, the man “struggles” for each cent. These models were published.

As I already noticed, there are problems, tasks, and **good intentions** which have no solutions. For example, in the fields where I understand something such as the theory of aggregation it is impossible to pose to a graduate the task of developing the general theory of nonlocal aggregation operators. It is not a problem, but good intentions. The graduate may be given such a task and sent to work on it for forty years, after which he would come with empty hands.

Themes for the graduates must be clear-cut and solvable to the end with understanding how to solve. For example, the general theory of operation of the Russian economy is not a these for dissertation, it is rather a good intention having no solution. In my opinion, these are not scientific themes at all and we will not discuss them.

On the other hand, there is great danger that the graduate selects for seeming simplicity a narrow theme. I would like to warn here.

Any dissertation represents intellectual and physical efforts. Do not waste your time on “narrow” themes that are of no interest to anybody. It is impossible to waste time on a dissertation which

becomes obsolete before you have time to defend it; it is impossible to waste time on a dissertation which will be put on a shelf and forgotten in half-year. Always seek trade-off between importance and effort. Any dissertation is the efforts used.

Once an association of car vendors ordered to my colleague a study of car sales. He worked on this subject for some time, analyzed sales, constructed a regression model, and before delivering this work to the clients he told me about it. I answered that all is OK, but he disregarded the macro-factors that impact the economics as a whole. Therefore, if something takes a turn for the worse in economics, everything may change. He calmly answered that nothing would happen, but in less than a week the crisis came, and all his regression models turned into nothing. I want to warn you: do not consider models that may turn into nothing in the twinkling of an eye.

There must be a fundamental element in the work. Avoid doing simply technical works: substituted values and parameters, computed calculated, conclusions were drawn. There should be a new view of the problem, not necessarily a scientific breakthrough, but some novelty must be there. Fundamentality is reached very simply—required are new, be it simplistic, models opening new views. This concerns any area of learning, not just mathematics, economy, or political sciences.

Quite often the tasks to be solved follow from the needs of practice. I understand practice in a wide sense, it is not just a particular need of a particular consumer. Analysis of a practical task often may suggest very general models.

Model represents a description of a conventional situation. No model can claim to be a precise description of the real world, but any model may prove to be useful if gives a satisfactory approximate description. I can cite the Newton mechanics as a trite example. As long as the science dealt with objects having low speeds, it described well everything. When it became necessary to describe situations where the velocity was comparable with that of light, another mechanics was required, which gave rise to the special relativity theory.

Do not misunderstand me, I do not propose of invent mathematical models. Sometimes the graduates, not only they, abuse this, write huge formulas and believe that everything is done.

The model must describe a conventional situation and give new knowledge. There are sciences doing without formulas at all and, nevertheless, creating models. Philosophy, for example. Read the Aristotle's *Mechanics*. He tried to describe motion almost twenty-five centuries ago. He did not write formulas, but reasoned very interestingly trying to decompose motion into simple components.

Another example is provided by manipulation of voting which lies in that the voter can express untrue preferences and attain better results for itself. In the second century A.D. Gaius Pliny the Younger analyzed the situation at the Roman Senate tried to construct a verbal model of how the senators would manipulate. Currently we have a perfectly formal description of such task, and what Pliny wrote about can be obtained instantly as formulas, but this required a series of fundamental works (see, for example, a simple presentation in [3]).

3. PLANNING OF EFFORTS AND TIME

Execution of a task is always a loss of time. The graduates often cannot engage in science, they need free days. When negotiating with the employer, necessarily agree about the free days to have at least one day in a week plus Saturday and Sunday. You invest in yourselves. If you have no such days, engage in routine business and then try to write a dissertation, nothing good will come out of it.

One may say that no serious employer would agree to this—if he pays great money, he needs full return. In fact, it is possible to come to agreement with clever businessmen. Some of my students came to agreement in this way, and I personally solicited for some boys. What is important here is

that the employer must understand that by permitting the employee to do his post-graduate studies he soon would get a more qualified employee without paying for his training.

The year before last I had a very intelligent girl doing her MA course. She was with a very well known Western company. We made a quite serious work, and she wanted to become my graduate student. The workload in this company was such that in the evening she would come so tired that I understood that she does not perceive anything said.

I cannot work with the graduates in such conditions. Moreover, your result at that will be null. The Scientific Council always discusses the question of low output of the graduates.

By defending the dissertation **you invest in yourselves**. Therefore, negotiate with the employer to have a free day in a week in order to go to library and study for sixteen hours, plus Saturday and Sunday. Then you have a chance. And if you come to lecture after working in a weekday and there is nothing in your eyes, then, believe me, is just waste of time.

Earn a little less, but have necessarily free days. It will pay in future.

Proportion your efforts and time. It is a very important point. I present one more example from my experience. In mathematics there exists the problem of partial order dimension dating to 1944. There are many publications devoted to this subject. I once spent a year of life on it, in half a year I understood that one may work over this problem all his life and get no results. It is one of the most difficult mathematical problems. I set myself the following task: I work on this problem for a year and either I do something or quit. A year of intensive work provided knowledge which I still use, although in the dissertation there was only one page of the results. This happened almost thirty years ago.

4. ANALYSIS OF PUBLICATIONS

To read much is most important for all graduates. If you do not read, then you cannot claim that you know something in your field. One needs to look through the main journals and, what is more important, books. This requires time which can be found in buses and subway. Without a good review, a qualified review, the dissertation is not a dissertation.

The scientific advisor can help by indicating what main journals must be read, what fundamental papers in this area of knowledge must be mastered. It is very important to create from the results of reading an image of the area. This image is not created by just listing the works read, you need to acquire a certain view.

One my colleague asserted that it is possible to compile a review and formulate a problem by reading a hundred of abstracts in the given area. It is not so. Dissertation is a view of the problem, the review in dissertation is not just listing of works. A review which simply retells others' works is of no interest to anybody. The well-known fact must be interpreted through your ideas and your results. The following analogy is to the point here. If the achievements in some area are compared with a building, then simple consecutive description of the publications may be compared with consecutive description of the bricks. A good review shows the entire building from some perspective. This perspective is defined by your model.

Another import component of a goof dissertation lies in good education of the author. Before starting any scientific work, one must acquire some basic knowledge. Do not expect that the "rule of thumb" you will succeed in getting a serious scientific result. Science exists over forty centuries, and everything that one was able to get without background was acquired thirty-nine centuries ago.

Newton once said that he saw further than others because he stood on shoulders of giants. Do not forget this, try to climb the giants shoulders. There you will see a wondrous landscape.

In my opinion it is very important to attend good scientific seminars. Seminar can give very much in the sense of problem formulations and mastering the scientific methods of study.

When I came to the Institute of Control Sciences, M.A. Aizerman told me that I am obliged to go to the general Moscow seminar headed by himself and L.I. Rozonoer. The first seminar was devoted to optimal control, the second considered some problems of stability. This I could understand somehow. The third seminar dealt with problems concerned with biological systems. I then asked Mark Aronovich whether he believes it was useful for me to attend such reports. The answer was "Necessary." Today I understand how much I got from this seminar. And not only myself, but other colleagues in this country who were lucky enough to visit its sittings.

Today many think that it is not necessary to make post-graduate studies and give the example of G. Perel'man. Indeed, it is possible to mention several great scientists who formally had no higher education. But great people are special case.

If somebody can write independently a dissertation without post-graduate course, then sure he/she can do without it. However, being the graduate student itself disciplines, there are some mutual obligations. In this sense, the advantage of the graduate course lies in that you commit yourself to graduate, we commit ourselves to guide you.

Three years of post-graduate studies is a too small time. At the Western universities the graduate course takes four years, but at good Western universities the graduates have no time to complete their dissertations in four years. In this country, the situation is twice bad because our graduate students are doing much "two-timing." Therefore, they have to lay the foundation of their candidate dissertation at the MA course.

5. DISSERTATION STRUCTURE

First of all, do not write an "autobiography," that is, do not describe how you arrived to this result. You must expound the theory, rather than to tell how you arrived to it.

Title begins any dissertation. I would like to give an interesting example. There was an outstanding mathematician Andrei Nikolaevich Krylov (for those who do not know I recall the Krylov–Galerkin method in the differential equations). He advance a theory of ship stability and suggested to balance a ship holed on one side by flooding its symmetrical part. Before him it was believed that water must be pumped out, and he proposed to flood. He was a great man. The entire theory of ships may be said to be developed by Euler and him. He also was a great educator and grew a pleiad of outstanding students. He wrote memories which I read some time ago in the edition of 1947. Now they can be found in Internet [4]. I advise to read them, it is like communication with extremely bright person.

In his book Andrei Nikolaevich discusses a paper of Academician Lazarev, an outstanding experimenting physicist which in one of his works considered a question that when people sing, their vocal cords exert, and this worsens their vision. The paper was published in *Doklady Akademii Nauk* (Reports of the Academy of Sciences) in 1934 under the title "On the Influence of Singing on Vision." What years, the 1930s! Immediately there appears a hysterical paper in the "Bol'shevik" journal questioning on what the scientists spend the people's money. And Krylov writes that the paper of Academician Lazarev mostly studies the effect of external physical factors or excitation of other organs of perception, say, hearing on eye sensitivity. Therefore, it would be better to name the paper "On Influence of Excitation of the Cerebral Center of Hearing on the Cerebral Center of Vision," rather than "On the Influence of Singing on Vision." "It is appropriate to recall Lord Kelvin,—writes Krylov,—who did not hesitate to name his papers not in three, but in fifty words, to ring it home what is discussed." Krylov's logic was as follows: man of sense will understand, and those who need not understand, won't; and it is to the best.

The title must reflect the content of the dissertation. Titles like "Study of Regularities of this or that Kind" are nonsensical. One should not begin with dissertation from the word "study," because any dissertation is a study.

Once they taught me that a paper must solve one problem, not half as much or two, but precisely one. This especially concerns publications in the West. If you send to a Western journal a paper where you simultaneously solve two problems, you must be at least a Nobelist. Only a very limited number of people can afford this. And by the way, they don't.

The paper must solve one problem. The dissertation, on the contrary, may solve more than one problem. In this country it is required that the dissertation be an integral work devoted to a single important problem. Another pole is represented by the dissertations at the prestigious American universities where the dissertation consists of four chapters devoted to different topics. This demonstrates qualification of the writer in different, though allied, areas.

The dissertation is a book, and book may consider more than one problem.

Introduction must substantiate in brief importance of your problem. It is what is called topicality. You know that there are standard requirements presented by the Higher Attesting Commission, and they require that the word "topicality" necessarily should be present.

Chapters may be written differently. I prefer the style where the first chapter formulates the problem. Often it may include also the review of literature. The review may be scattered between the chapters, but mostly the candidate dissertations contain the review in the first chapter. I prefer chapters consisting of introduction, conclusions, and review of literature. Yet this all is individual and depends on you and your advisor.

Conclusions usually list the results obtained. One must play big. If you have thirty small results, do not describe all of them, describe three, but write ponderably about what you managed to achieve. It is good style to finish be mentioning the yet unsolved problems, which demonstrates the author's culture.

References. There are several styles of references. The Harvard system lies in that you state in the text that the result was obtained by Mr./Ms. so-and-So (1997), and list the references in the alphabetical order. It is very convenient because allows one to add any new reference at any time.

There is a system where the numbers are bracketed. It is also convenient, the only disadvantage being that if at the last instant you decide to add one or more references, then you have to remake entirely their numbers.

If you refer to the works in Russian and English, then I would recommend to list first the Russian works in the alphabetical order, and then the English works.

In some journals and, in particular, in "Avtomatika i Telemekhanika," it is accepted to numerate the references by their first occurrence. It is a very serious journal published since 1936 and since 1956 translated into English. All paper undergo serious reviewing, but although the numeration system is inconvenient, we cannot change it because of the initial tradition which nobody dares to break.

Abstract of the dissertation repeats its structure in a concise form. There are important standard requirement that must be necessarily taken into account at writing the abstract.

6. SOME GENERAL REMARKS ON HOW TO WRITE TEXTS

A long time ago I read the Mark Twain's paper *Fenimore Cooper's Literary Offences* where he defined nineteen laws of artistic creativity. Laws 12–18 precisely concern text writing. I just list them [5]. The author is obliged to

12. Say what he is proposing to say, not merely come near it.
13. Use the right word, not its second cousin.
14. Eschew surplusage.
15. Not omit necessary details.

16. Avoid slovenliness of form.
17. Use good grammar.
18. Employ a simple and straightforward style.

I am often asked from what chapter one has to start writing the dissertation. I immediately would like to emphasize that the dissertation is a by-product of scientific study which is carried out by developing models and solving problems.

I am trying to explain how this process is realized. The advisor poses a problem, you consider it, and then start to write. You must have some understanding of the subject which was worked out by your own results and understanding of how they fit the corresponding scientific domain. After that you may start writing the text beginning from the background and formulation of the problem. When you understand how your study is inscribed into the corresponding domain, writing is just the technical matter. You just “package” your results into chapters.

I will give you a figurative comparison. Science is like a territory. There are gardens, sanded paths, flowerbeds, but also untrodden paths, thickets, windbreaks. Even if you just step a little aside from a flowerbed you may encounter a small piece of virginal forest. And the piece that you studied you must describe in the dissertation. You must act like geographers describing the route from the well-attended paths into the thicket and the new paths or, possibly, avenues, that you made in it.

There is another comparison that I want to cite: “Today the majority of the fields of science resemble a lawn in full bloom trodden by a large herd. The grass is mostly eaten, the ‘richest’ pieces are eaten to the soil. Some parts were passed over repeatedly. Somewhere the grass is just made flat, but to eat it one has to apply such effort, and the result is so small that the larger animals for a long time seek new pastures...” [6].

7. OPPONENTS

Usually the advisor recommends the opponent. However, if in the course of writing the work you were sufficiently active and appeared at conferences, then you already known the experts in your field and can suggest to your advisor and discuss the would-be opponents. I recommend to select opponents who will read your work. Today often the applicants—do not turn away diffidently—write the opinion themselves. It is very bad. Seek opponent who will read the work, and, possibly, they would be able to suggest something useful.

8. DEFENCE

Usually the writer of a candidate dissertation is given twenty minutes for defence. It is good practice to keep within sixteen to seventy minutes. Therefore, you must say your text holding a watch. I spoke several hundred times, but even now if I have to make an important presentation I say aloud pieces of my report holding a watch in hand. Namely aloud, not to yourself. It helps me to structure the text and understand what I kept back. You must polish your speech at least five to seven times.

I was lucky to hear various persons of strong mind, I learnt from them. The author of several books on algebra, Aleksandr Gennad'evich Kurosh headed the Chair of Algebra at the Moscow State University and read perfectly brilliant lectures. A discipline such as the general algebra appeared as a theatrical performance to which one could listen for hours. Mark Aronovich Aizerman was a lector of the same kind. I did not attend his lectures because he lectured at the Moscow Physical and Technical Institute, but at the scientific seminars he enchanted his audience. Boris Pavlovich Demidovich whose problem book and other publications are known to many. was a somewhat different

lecturer. He talked on mathematical analysis. His lectures were very profound, maybe less theatrical, but they were intelligent lectures which kept the audience in suspense. But A.N. Kolmogorov, at that he was an outstanding mathematician, was a poor lecturer. No, maybe it should say that one had to understand his lectures.

It was an amazing spectacle, there was a feeling,—possibly, it was in actual fact—that some things that were known for 150 years he as if thought over again before saying them. With his poor diction, it was difficult to hear him, but difficult only in one case—if you did not know the lecture's subject. If you prepared in advance, then it was extremely interesting to hear, see how a great intellectual process generates before your eyes. These are three different styles of lecturing.

Text of the presentation must be based on the principle *Do without details!* In seventeen minutes you never, under no circumstances will be able to go into details. Let there be some results that are dear to you personally because you did something own, their detailed presentation is not for the Council. It is good for a seminar where you have an hour and a half to discuss it with your close colleagues who have an insight into the problem. Here you must present the main results preceded by detailed explanation. It often happens that the speaker tell something and uses notions that were not defined beforehand. It is enormous. Everything you speak about must be explained, but avoid general matters that are of common knowledge.

Answers to the questions. Often when the question is already understood, the candidate for a degree interrupts and starts to answer. Never do so, wait for the end of the question when the enquirer stops.

Sometimes the enquiring member of the Council tells about something for five minutes. Wait patiently, it is not your business to interrupt the member of the Dissertation Council, it is the duty of the Chairman. Then you say “Thank you” and do not abuse phrases like “what a nice question” or “I like it so,” begin to answer. By no means make it clear to the enquirer that he/she did not understand anything from your report. Even the members of the Council are not obliged to know what you do. Do not demand that everybody knows everything, understands everything, and admires your wonderful work. People sometimes do not think like you. Therefore, if the gist of the question is not clear to you, do not even think of saying that the colleague misunderstood everything that you presented. Even if you did not understand the question, say “If I understand you correctly,...” and then answer. Sometimes—extremely rarely and if you feel the situation—you may interrupt the enquirer to specify something, but under no circumstances transform the question-answer procedure into discussion. This infinitely irritates everybody. By the way, it is good practice to write down the questions from the audience.

I would like to dwell here on one frequent situation. Often the graduates are with some company and the theme of their dissertation is not related with their work. Stated differently, the field of scientific study does not coincide with what we do in practice. This may give rise to a feeling that the dissertation is alienated from the practical needs, and even at the defence some senior colleagues may express a severe opinion.

Unfortunately, there are practitioners looking down on science. It is especially manifest in social sciences and economics. Just ask such people to design an aircraft or nuclear reactor, and they immediately run to the experts in aeromechanics or physics because they know very well that their aircraft will not fly and the reactor either will fail or explode. But when the matter concerns social processes, they are Jacks of all trades. They are “Lysenko’s of our times” so to say.

In what concerns the answers, you must answer in such manner as to show that you master your field of knowledge, that is, you must demonstrate what you read in the literature and not what is done in practice. Therefore, I again repeat that you have to read much and to read good literature.

Practical value does not mean that tomorrow a factory will work using your models. A qualitative insight into a physical process is most “practical” in science.

9. HOW TO WRITE PAPER FOR WESTERN JOURNALS

Since I write about writing a dissertation, I afford to touch upon one more subject, although as I said before the paper should not discuss more than one problem. Some words about **writing papers for the western journals**. I published many such papers and would like to share experience. First, each journal has its own style, but there are some general things. People write to different journals, and it is impossible to know all styles in advance.

The first important thing is **knowledge of English**. Before the WW II French was the main mathematical language, Aleksandrov, Kolmogorov, and other mathematicians published their papers in French. German was the language of engineers. My mother told me that they read something in English, but dictionaries, manuals, papers, everything were in German. After the war everything changed, all publications appear in English. In my opinion, it is easy to learn it. I always recommend this to my students, although, of course, they do not always this advice. Just each evening learn by heart for twenty minutes a good text, not any but namely good. These are just five to ten lines, but you should do it every day. When you learn by heart and pronounce it aloud, in two months, believe me, your language will “explode.” You will jump to another level of understanding. It goes without saying that you must listen in order to train your aural perception.

When I do not go abroad for a long time, in the morning I listen to American or English stations in order to restore the speech recognition channel. In the sense of paper writing and knowledge of language, it is not necessary to listen to the radio, the speech recognition channel needs not to work, but the best method is to learn by heart. I repeat that one should do this regularly, twenty minutes before going to bed.

Another important consideration about knowledge of language: dictionaries do not give you knowledge of your narrow particular field. Any scientific speech is a slang, each science, especially mathematics, speaks slang. People invent words and symbols to reduce the time of communication. If everything written in the mathematical books was worded, then monsters of books should have been written in the middle of which one would drown. Formulas and language reduce the time of communication. To speak the same language as your Western colleagues, you need to know their slang.

If you open a dictionary in order to find a term, you will find more than one version of terms. Which to take? The dictionary never prompts you. There are, of course, specialized dictionaries, but this may be insufficient for learning how to use one or another word in your domain. In the 1970's and in the early 1980's papers in international journal underwent severe literary editing. Sometimes my reviewer would write with irritation that such-and-such paragraph or such-and-such page do not stand up to criticism from the language standpoint. Now you will not hear this. From the point of view language, the journal papers are reviewed extremely rarely and negligently. To master the necessary slang in your field, you have to read English books written by native speakers. Therefore, it is strange and yet true that book reading is the simplest way. In books you will find the necessary turns of speech, necessary words, necessary terms.

Now about **writing papers**. There exist some technologies. As I already said, topicality must be necessarily mentioned at least in one phrase.

I review in a year about twenty papers for the Western journals. If you write to the West a work that “grew” out of nothing, that is, if you do not say from where it appeared, if you do not show its relation to other works in this area, believe me that 99% of reviewers will close it at the first page and even will not consider it. Everybody has much to do. Therefore, you have to demonstrate that you did something new which deserves publication in this journal.

When a Western journal rejects a paper, the reaction of our colleagues is approximately as follows:

1. Ours (Russian) people are not liked. Sometimes this may be true, but this happens very rarely. It is not the reason.

2. They do not understand what a great work we did. Believe me, if you did a great work, it will be appreciated. It must be presented correctly. After it was returned, you must consider the requirements of the journal. One has just to follow certain requirements on papers. One of them states that you have to show what new in the given science you did. Sometimes it is good to mention the feasible application areas. If you have done something new which may find use somewhere, write about this, the reviewers like it very much.

One more point. **Do not invent symbols that are not internationally accepted.** Our people are very fond of inventing notation of their own, terms of their own. For whom the paper is written? For the scientific community. If you use terms and symbols other than those used in the community, why do you expect that it will be ready to consider your work? Nobody will. This is a permanent error.

A simple example. In the problem of collective choice, the set of participants is usually denoted by N . Come an author and brings a text where T is used instead. I ask him whether it is essential or without any purpose. "No,—he answers,—just denoted so." Then why I or any other colleague working in this fields and used to N have to accept this notation? It would like to bring home to you that there are traditions in science, traditions of the society which you are anxious to join. These tradition are intended in part for facilitating communication. If everybody starts to invent its own notation of standard notions, nothing good will come. There was a good joke on this subject in the 1960's–1970's: "To confuse the reviewer, over seventeen pages use π , and in full honesty the reviewer will multiply everything by 3.14, and at the eighteenth page declare that π stands for pressure. But do not expect a good review.

Also, try to avoid notation which may be distorted by typographic errors.

Now a couple of words about writing a text, some technology. If you write your thirtieth paper, the process is debugged, but if it is your first paper, try to do as follows. If you want to formulate an idea, write down a sentence, look at it, try to rewrite the same idea as another sentence, do it in three or four ways. When to look through five ways of writing down the same idea, when you do this twenty times, then, believe me, on the twenty-first time you will write correctly.

Do the same with a paragraph. Sentences must logically follow one from another, each paragraph must contain an idea, not two or three of them.

I was taught so in the 1970's when I prepared my first paper. A similar method was proposed in the 1990's in [7].

Importantly, **the sentences must be short**, you cannot write sentences of six or seven lines, all the more so in English. In English there are wonderful text with long sentences. Norbert Wiener, the father of cybernetics wrote sometimes long sentences. But you cannot imagine the beauty of his language [8].

Two more recommendation for writing papers to Western journals.

First, write careful and concise abstracts. I was taught many times that at first it is the abstract that is read, then the introduction, then the conclusions, and only if this all was liked, people start reading the text. Therefore, the abstract and introduction must be extremely clear and well structured. There should be a clear and brief description of what you did and what place your problem occupies in its class. The person reading the text needs to understand where your paper fits in.

Second, do not misuse the footnotes; editors do not like them. The less footnotes, the better. Try to "pack" the ideas in the main text. There are few journals on humanities where large footnotes are justified. There are books where the footnotes occupy more space than the main text. But this

does not concern the main economic and, all the more so, mathematical texts. I was told that the editors dislike the footnotes because they hinder the makeup process.

I would like to draw your attention to what is absolutely inadmissible in the Western journals, although many of our writers are given to this. Our author willing to emphasize importance of his work writes to a Western journal that “It is frustrating that many papers still ignore the actual situation . . .”. This is absolutely inadvisable simply because nobody can know the bulk of the literature published internationally on one or another subject. “Springer” annually publishes several thousand books, to say nothing about the books. Although there are many papers, those of high quality are rare. Therefore, you estimate of the situation should be worded differently: “To the best of my knowledge, other researchers did not consider this problem” or “Attempts to consider this problem were made in such-and-such papers, but they did not consider this and that, and here is what we have done.”

I conclude this text by adding that one should treat papers as children. It is unlikely that you want that you want to have child dressed well, but have dirty face and hands. The same applies to papers: good result must be clothed well.

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