Research Methodology
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Lecture - 57
Scientific Writing: Journal Papers, Part 1

After you have done your research work, you have to communicate it. You have to disseminate the results of your research so that other people somewhere else in the world get to know what you have done.

When they do their research, your research results should be available to them so that they do not repeat it, or they build on the result that you have obtained. While doing so, they will cite your paper: that this result has been obtained in this paper. That way your paper makes its presence felt. It has impact.

Now, what is the way to make your research results known to the others? There are two avenues of doing that. One is publishing in a peer reviewed journal, and two, by presenting in a scientific conference. Out of these two, the former is the major channel and conferences are relatively of lesser importance except in a few fields like computer science, where conferences are the major channel. But otherwise, normally one publishes in a research journal.

Once you publish in a research journal, it becomes available for others to see, read, use, and build on that. That is what the purpose of the science is: that you do your own research, make it available to everybody, others build on that, and that is how science progresses. So, research journals play a very crucial role in this whole enterprise.

Now, the way it works is that you submit your paper to a journal, normally through its own website. There is a paper submission link and through that you submit your paper.

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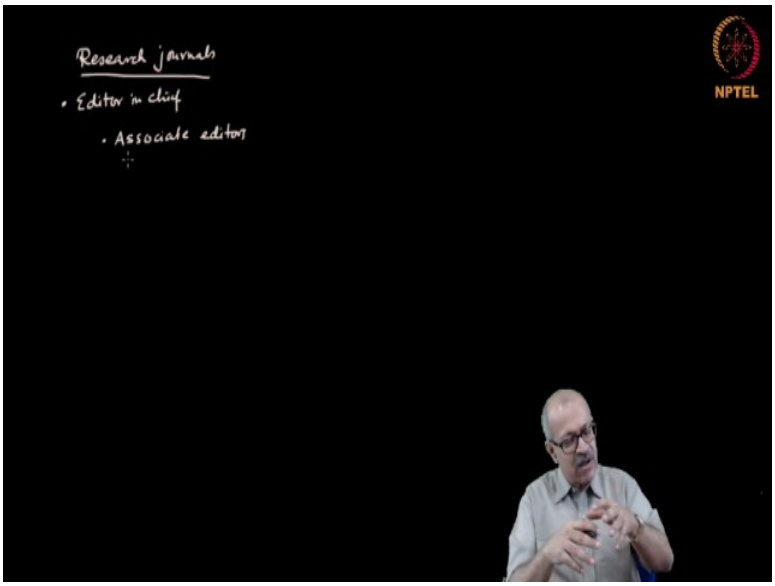

Let us talk about research journals. Every journal has an Editor in Chief. He is normally a very eminent person in the field and there is, for every journal, an Editorial Board. The editorial board comprises the Associate Editors: they are also important people in the field, but each associate editor will be in responsible for handling papers in a sub-field that is covered by the research journal.

Research journals normally come in a few different categories. There are some research journals which are general purpose, in which people from diverse disciplines submit papers and read papers. Nature, Science or in our country the Current Science, are such journals. These are general purpose journals.

In every field like physics, chemistry, biology there are also field specific journals. For example, in our field in physics, we have the Physical Review class of journals: Physical Review Letters, Physical Review A, B, C, D, E and journals published by the American Institute of Physics (AIP). There are also journals published by other publishers and also journals published by the academies of our country. So, there are a number of journals in the field of physics.

Within physics, there are certain sub-areas like statistical physics, gravitation and cosmology, particle physics, condensed matter physics, so on and so forth. These are sub-areas within physics.

Similarly, in chemistry you have inorganic chemistry, you have physical chemistry, you have organic chemistry, you have biochemistry. So, you have these kind of broad subdivisions within a field, and there are journals dedicated to each subdivision. Within its subdivision there are specific areas of research. Sometimes there are also very specialized research journals dedicated to a very specialized area.

So, there are various types of journals. Naturally when you submit a paper, you have to decide which journal you will submit to. Each journal will have an Editor-in-Chief and Associate Editors. When you submit the paper, it first goes to the Editor-in-Chief. He looks at the paper, broadly finds the area of the paper and accordingly he or she assigns some associate editor to handle that paper.

The Associate Editor: his or her job is to find appropriate reviewers and the reviewers are normally peers, that is why it is called ‘peer review process’. Why? Peers are those who are researchers in related areas, similar areas or maybe in the same area. They are people who will be able to comment on the scientificity of your paper, whether you have done the experiment satisfying the requirements of scientific research or not. If it is a theoretical work, whether you have done the derivation correctly or not. All these are checked and commented on by the reviewer.

The Associate Editor finds a few prospective reviewers and requests them to review. When the Associate Editor has to find a few prospective appropriate reviewers for a paper, how does he do that? Normally, there are two ways. One is that, from the paper he or she finds what is the area of the paper, what kind of issues the paper deals with. Accordingly he or she finds a few appropriate keywords, and then searches the net to find out who else have published papers in the same area, where the keywords match. Thereby the Associate Editor finds a few possible reviewers.

The other way is that, in your paper itself you have included a literature survey, you have talked about what is already known in that field, and you have also cited a few peoples’ work in that. It is reasonable to assume that those people know the background of this particular field. So, that is another pool from which the Associate Editor chooses.

So, either he or she directly searches the net to find out which papers are there that are related to your paper and request the authors of those papers, or does it by using your own citation list references. Then the reviewers receive the request. They either agree, or

maybe, if the reviewer feels that it is not really in my area of expertise, then he might say that please send it to somebody else. But in any case the Associate Editor finds at least three reviewers and then requests them to submit a report within say a month or 45 days or whatever.

Within that time, the reports are submitted and the Associate Editor then looks at the reports and then makes a decision as to whether to reject the paper outright, whether to accept the paper outright, or whether to request the author to make some changes: either major revisions or minor revisions.

Major revisions are those in which you have to make some major change in the presentation of the paper. The reviewers might also ask you to re-do some experiment or do some experiment additionally, all these are components of a major revision. Either your writing has to be changed in a major way or the result itself has to be improved in a major way. Minor revisions are those which are relatively minor as the word suggests, linguistic changes, cosmetic changes, and things like that.

So, if an author receives request for minor revision, it is more or less understood that the paper will be accepted if those minor revisions are made. But, if there is a request for a major revision, after you have made the major revision, then also it might not be accepted because the reviewers might not feel that you have done a good job at that.

So, finally, when you make the changes, then you resubmit it to the journal. The Associate Editor sends the report back to the reviewers. At that stage you, the author, have to include a separate file outlining how you have addressed each comment made by the reviewers. A comment, and this is how I have addressed it. Either I have made the appropriate suggested changes in the paper, or I have done an additional experiment.

Or maybe I have a different point to make. I contradict your point. That is also possible. You might feel that the comment by the reviewer is inappropriate and therefore, you defend your point. That is also possible. But whatever it is, you write it up, send it, the Associate Editor sends it back to the reviewer. If the reviewer is satisfied with the changes made or the comments that you have made, then the reviewer may say that now the paper is acceptable for publication. Then the Associate Editor accepts the paper.

In the earlier times, it took a reasonably long time from the acceptance to the publication. But nowadays printed publications are rather rare. All papers are available on the net and it takes a short time for a paper to be released online after it is accepted. So, this is more or less the process that goes on after you have submitted a paper.

When the paper is published, people all around the globe—whoever is working in a similar field or maybe a research student is starting to work in that field—they would like to know what is already known in that field and they would search and they would like to find your paper and read the paper. So, the writing of the paper has take that into account. I have to write in such a way, so that the prospective reviewer would find my paper and read my paper.

I will come to how to do that. This is the first thing, the process that goes in making a publication. Now, we come to the matter of writing the paper.

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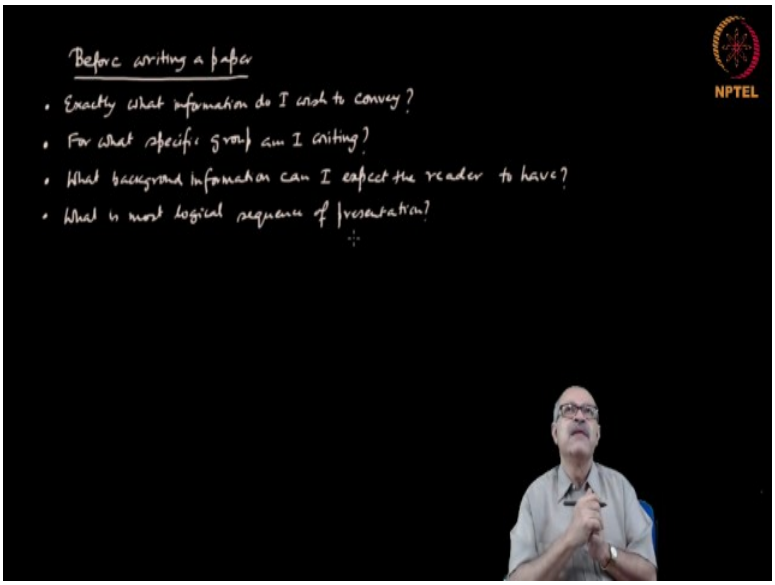

Before you start writing a paper, there are a few things to be done. I am assuming that you have done a piece of work and according to your own judgement, the work is mature enough to communicate a paper. So, at that stage you have to do a few things. You have to judge exactly what information do I wish to convey. This means that, every research work is actually the answer to a question. You had a question in mind, you have done some research in order to answer the question, and the results obtained through the research actually answer the question.

Take a look at the question, write down the question that you had and then take a look at the results in the form of very concrete shape. Not the raw data, but filtered data in the form of graphs, charts, tables, and figure out how that answers the question that was initially asked. Or maybe derivations: whatever is your method of answering the question you take a look and try to formulate a wholesome story, because at the end of the day what you are trying to do is to tell a story. You had a question, you have done some work and it answers the question, and that completes a whole story line. You have to have the story clear in your head, before you start writing. So, that is the first step.

The second step is, as I said, journals come in various shapes and sizes and different orientations. Some are general some are very specialized. Naturally, depending on the journal, you have to figure out for what specific group am I writing? The next question, a related question, is what background can I expect, what information can I expect the reader to have? Accordingly, I have to write and I have to provide the necessary information.

So, these two related questions depend on the journal to which I am submitting. There would be some journals where the expected reader will be a specific group who know the background of my field. If it is a general purpose journal, then I have to provide the necessary information for a nonspecialized reader to understand this paper.

Fourthly, what is the most logical sequence of presentation? This means that, you may have developed a theory, the theory has some logical consequences or expectations. In order to test the theory, some experiment needs to be performed. You perform the experiment to validate the theory. I mean, if the experiment negates the theory, in that case you have to admit in the paper that the experiment negated the theory. But normally we do not write papers like that. If it is a theory we have developed, we try to find at least some support in the experiment.

In that case, the presentation should be the theory first and the experiment next. There are also situations where you performed an experiment, which has indicated some kind of a functional relationship between variables and then you have also developed a theory to explain that functional relationship. In that case the experiment first and the theory next.

If it is an entirely a theoretical paper, then also there are parts of the paper and you have to decide in which sequence I would present so that the reader can follow a particular development of thought. It is similar in experimental work also. You have to decide what logical sequence of presentation should we use in the paper.

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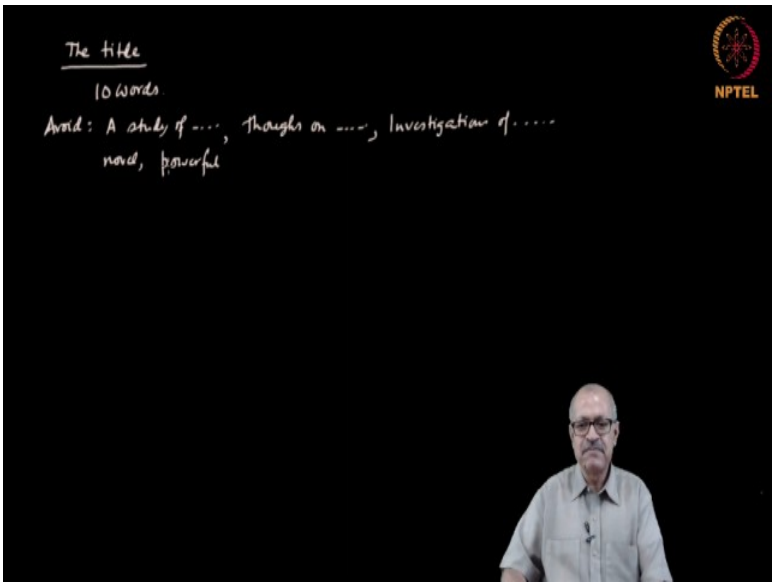

Once you have decided this, the most important thing is the title. So, let us go to the title. It is the most important part of the paper. The reason is that the title, in a span of about 10 words, has to convey what is there in the paper. If the title is incorrectly formulated, then most people will not even read the paper. From the title, one develops some expectation as to what comes in the paper. And then if he finds something else, he will be disheartened. It is a disaster. So, one has to formulate the title most appropriately representing the content of the paper, but in a span of about 10 words.

So, about 10 words. Even though it is only a few words, writing the title is actually the most difficult part because it has to represent the paper in such a short collection of words.

There is another issue to it. Imagine that, after you have publish the paper, a reader sitting in another part of the globe—maybe in Brazil or in China or in Poland, working in similar areas—tries to find the background information in his or her field and he needs to know the content of your work. But if the title is incorrectly formulated, he or she will

not find it. He or she will not even come to know that this material is there. So, the title has to appropriately reflect the content.

But how does he actually try to find? The person who is at the other end, the reader, normally tries to find a paper by Google search, normally by scholar Google search and using certain keywords. He or she is interested in this; accordingly he or she formulates the keywords by which he or she will search, and whatever papers are found by Google, those are the ones they focus on.

So, the writer, the author, has to take this factor in consideration: that there will be people out there who will search my paper using some keywords. Therefore, he or she has to guess the keywords by which one might search and a normal way of writing the title is that, first guess the keywords, write the keywords and then ensure that these keywords appear in the title.

So, formulate a few alternative titles including those keywords, because if these keywords are included in the title, then it has a higher probability of appearing at the top of the search list. If these keywords appear somewhere in the body of the paper, then it will be found by Google, but it will be somewhere 34th or 35th in the search list and people will most probably not even look at that paper.

The way I normally do it is, I guess the keywords by which one might search, write them, formulate 3-4 alternative titles and then keep it like that. After having completed the rest of the paper I go back and choose the most appropriate of them, which reflects appropriately the content of the paper. The information that I try to convey, the title tells the reader that this information is contained in this paper. This is how the title has to be written.

Since it has to be very short, very precise, therefore, any imprecise words, any unnecessary words that do not really contribute to the substance of the title, they need to be avoided. For example, avoid ‘a study of’ something; this actually adds nothing to the substance of the title and therefore, drop it. Or maybe ‘thoughts on’ or maybe ‘investigations of’, you notice that they do not really mean much. So always avoid them.

Adjective words like ‘novel’, like ‘powerful’, like ‘excellent’, ‘a powerful technique to do the ...’. You do not say that it is powerful, let the reader say that. You do not say that

what you have done is novel, let the reader say that. So, avoid this kind of unnecessary words in the title. The title should have the least number of words that are necessary to express what is there in the paper.

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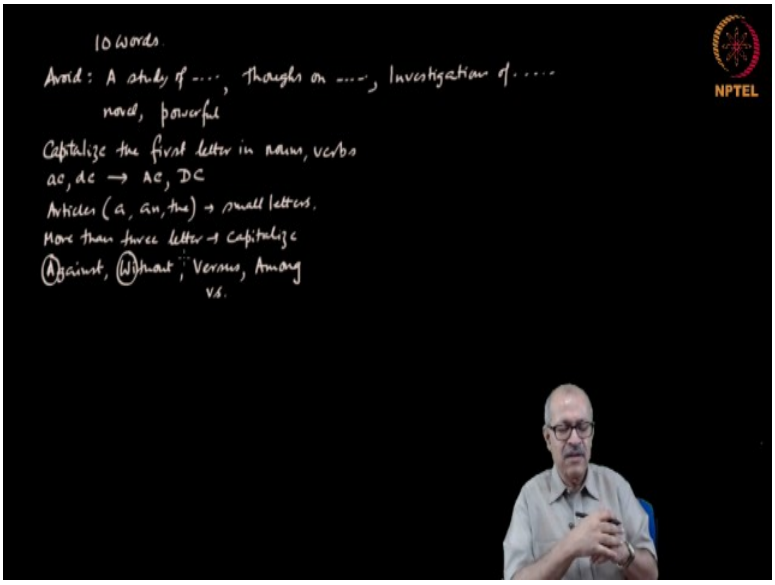

Now, there are some the conventions. You notice that if you read a paper, its title follows the convention that in all the words, the first letters are capitalized. The first letters would be capitalized. The first letters in nouns, verbs and similar words, first letter will be always capitalized. There are some letters which are normally written in lower case, for example, ac (alternative current), dc (direct current): these should be in the capital letter in the title.

The articles like a, an, the -- these are in small letters. The short prepositions also should be small letters, excepting the case where those appear in the first word or the last word of a title. These are to be in small letters. But if any such word has more than three letters, then it is capitalized. For example, ‘against’, ‘without’, ‘versus’, ‘among’, ‘under’, in these words the first letter has to be capitalized even though the grammatical character is like this, even though that is true.

Remember that we do not write vs in place of versus in the title. Write the full word ‘versus’ with a capital V. These are the usual conventions, not any instruction or anything like that. That is what is normally followed in writing the title. If you do not do that then the Editorial Board will have to do that. So, it is better to avoid that process.