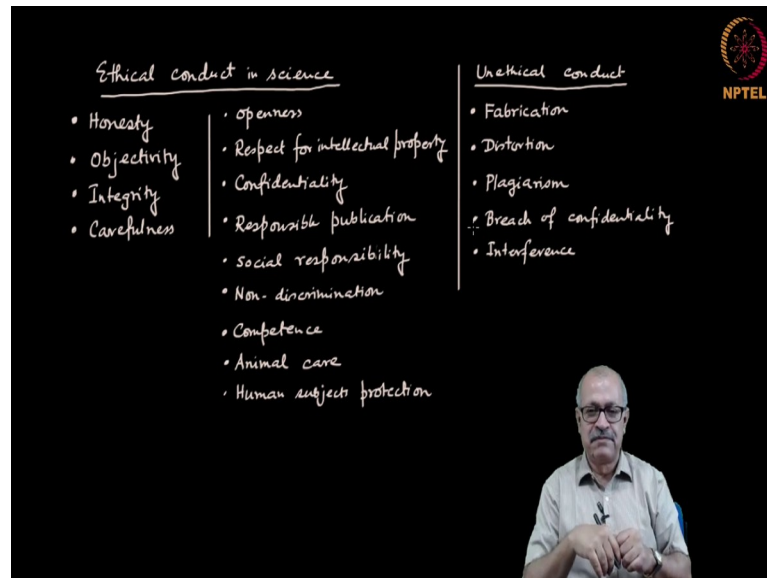


Research Methodology
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Lecture - 68
Ethical Conduct in Science: Research Misconduct

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Now, I have to talk also about unethical conduct. What would be called unethical, or maybe you can say research misconduct? Well, various things constitute research misconduct. I will again write these as bullet points.

The most important is *fabrication*. An experiment has given some data, but you want to say something else. And so, you fabricate your data. That is a clear case of fabrication. That is wilful making up of data, fabrication of data, results, recording and reporting. So, these are cases of fabrication.

Sometimes science scientists sometimes fall victim of such unethical practices, because they believe in something and maybe the result of the research is not pointing to that. Then, in order to protect their belief, they often fabricate their results and there has been enough instances of that happening. So, as I said, scientists should not start with a belief.

But the most extreme case of that is where your results are pointing otherwise, you still stick to the belief by fabricating the data, fabricating the results. Often people do that if you were

unsuccessful as a scientist, yet you want name, fame, promotions and things like that. Then people fabricate data; experiments that they have not conducted, they report results of that.

And let me tell you rather clearly that these always are detected sooner or later. That leads to disgrace of the scientist. Never do that. Never try to earn name and fame by means of fabrication of data.

The second is *distortion*. Distortion is not really the distortion of data. Maybe, again, the results of the experiment are not confirming to your belief. So you change things here and there, maybe do a little bit of change in the apparatus, the equipment, the consumables, so that the data confirm to your belief, the results that come conform to your belief. So, these are distortions.

The distortions are manipulating the research materials, equipment, reagents, processes and things like that, so that the data that are ultimately coming out, these conform to your belief. Omitting data, omitting outliers, which actually were obtained without showing any reason. These are distortion.

The next point I would make is very important: *plagiarism*. Plagiarism simply means copying, from somebody else's work. This happens when a scientist copies sentences, paragraphs, graphs, tables from somebody else's research paper without acknowledgement. I will come to details of how to avoid, because in a paper you have to cite others, you have to tell what others have done without actually plagiarizing from their writing.

So, how that is to be done, I will come to that a little bit detailed manner, a little later. But right now let me tell you that lifting somebody else's written material and putting that into your own writing is plagiarism. That has to be avoided at all costs. That is to be avoided both when writing a research paper as well as when writing your a master's or PhD thesis. You should not copy and paste from anybody into your thesis.

When I was talking about how to write PhD thesis, I mentioned this: that many students have the habit of copying. If you are writing about somebody else's work, then some students have the habit of simply lifting from the abstract of that paper. Do not do that, because that amounts to plagiarism.

If you have published something in your own paper, that also you cannot copy and paste into a next paper. You cannot do that; that amounts to self-plagiarism. So, if you have written a paper and now you are writing another paper, everything has to be written afresh. You should not copy and paste from the earlier paper. That applies also to writing other kinds of material.

The only exception that we make is, if we have published papers and finally we are writing a thesis, PhD thesis, then the papers' content will naturally go into the PhD thesis. I have said that you should not simply lift the paper and put in the thesis, that we should not do, you will have to put more material in it, you have to be more elaborate in the derivations and things like that. So, you have to add to things.

But the normal practice is that, you simply first copy and paste into the thesis file and then you go on changing here and there, adding stuff, adding steps in the derivations, and things like that. That is allowed. So, from your own paper, copying and pasting and then making the changes is allowable. That that is not considered to be plagiarism as such.

Publishing the same content in multiple papers is considered to be self-plagiarism because you have published it once you are publishing the same stuff again. Nowadays, there are plagiarism checking software, like Turnitin and other software are there, and so it is very easy to detect plagiarism. Whenever you submit a paper to a journal, they normally do that check. And so it is not possible to get away with plagiarism these days. So, do not even try that.

The next point is *breach of confidentiality*. If you have any confidentiality agreement with a concern, that could be the funding agency, that could be a company that has funded you, that could be even two groups are conducting research with some agreement of confidentiality, then you have to honour that confidentiality agreement and you cannot divulge that to others without informing the other party. So, this is another issue of unethical conduct.

Something that I have to mention, unfortunate, but it is true, sometimes happens, is *interference*. Interference is when one scientist, may be a scholar, may be a faculty member, whoever, interferes with somebody else's research work. There have been some instances of that in the past, that is why I am mentioning that.

Interference by contaminating a sample for example. Interference by deleting some data from the computer. Interference by making some equipment not available to another person when it could have been made available, it is not really engaged, but you do not make it available, is interference.

If an equipment is available and it is not being used, then it can be used by somebody else. It has to be made available to others. Supposing you do not allow others to use it by whatever pretext, even though you are at that time not using it, then that is also interference.

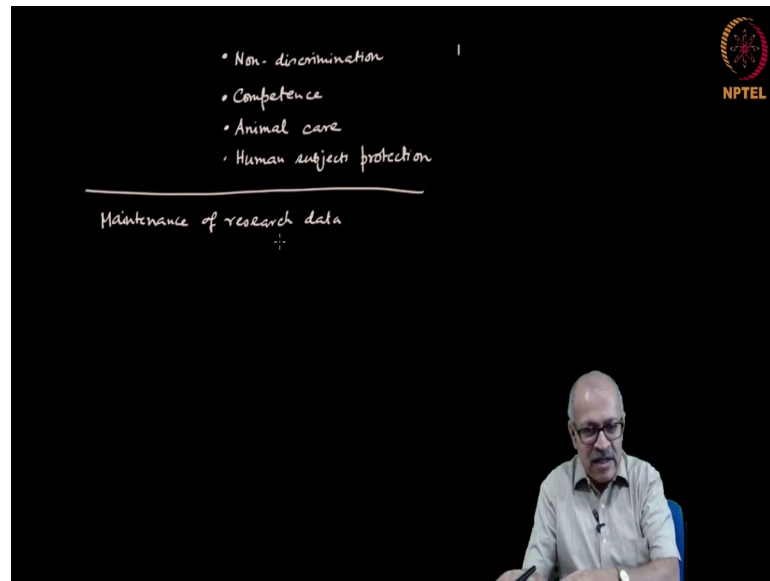
Concealing information that should be available to the others, concealing materials, processes, hardware or deleting data, text -- these are typical things that are often reported in various institutions. Somebody doing that to other people, maybe they are not in good terms with each other, so they do these things to each other. These are very bad practices and if caught, these are definitely punished. So, these are normally the points of unethical conduct or research misconduct.

What happens if there is a research misconduct? Normally somebody who detects a research misconduct will lodge a complaint. Now, that complaint can be lodged with the institute authorities; that complaint can be lodged at various levels. I mean somebody can complain to a journal editor, the journal who has published a paper. Somebody can complain that this the data reported in the paper is fabricated, because I have repeated the experiment, I did not get the same results. So, this can be an allegation.

Similarly, there can be allegations of all of these points that I have written here, to an institution authorities. What happens then? What happens then is that, at various levels there are ethics committees. At the institute level there would be an ethics committee, at various levels there are ethics committees, and at the national level also there is a scientific ethics committee.

So, depending on the gravity of the complaint, a committee will look into it and they will ask for the evidence that you actually got this result. For for that reason, you have to retain the raw data.

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So, you have to maintain the raw data. This is a different point, so I will write separately. Now, every research will produce data, either experiment will produce data or your simulation will produce data or your theoretical work will predict some data. Data are natural outcome of a scientific research and these need to be properly documented.

That means whenever you are conducting an experiment, you have to write down the data or if it is directly going into the computer, then you have to write down which file it is stored in. Today's result, at this time, has been stored in that file: you have to write somewhere.

So, every day should start with writing down the question that you have today, whose answer you are seeking, which experiment you are doing, and then what results you have got and what are the conclusions out of that. Some written material of that.

This is necessary because if there is an allegation, the committee will ask to show that data, the primary recording that you have done in that experiment. So, every research student must have a research record book and it does not depend whether you are doing an experimental work or a theoretical work or maybe mathematical work. That does not matter. Every research student should have a research record book.

What has been done in each day should be recorded there and periodically, maybe once a week, it has to be validated by the supervisor. The supervisor will sign with a date so that

it remains in record. If any dispute arises at a later time, then these are the fallback: yes, I have done that experiment and these were the results.

After a PhD student completes the PhD and passes out, he or she can retain the record, retain the raw data, the record of the research, and use that for future publications. It is possible. But at the same time the supervisor also participated in that work. The supervisor also has the right to publish in future on the basis of that data. So, the supervisor should also retain another set of record, maybe copies of the record. The supervisor, the PI, the principal investigator of that work, is primarily responsible for maintaining the data, so that, if in future, maybe 10 years later, a dispute arises (there have been instances where some scientific malpractice has been detected 10 years later), when that happens, you should be able to provide proof that these experiments were really done and these data were really obtained, the results were real results.

If you cannot show that, then the incrementing evidence is against you. And so, it is very important to maintain the research data. In a research project that is funded by an external funding agency, the PI is primarily responsible for maintaining the research data. In case of a PhD work, the student is primarily responsible for maintenance, but after he or she passes out the supervisor is supposed to maintain it. In some cases, the results may be confidential and then that confidentiality needs to be ensured.

Let me end today's lecture by saying that research misconduct mainly happens because of the greed of some scientists. If the scientist is incompetent, but is greedy, that is when the scientist is unable to obtain the results that he imagines himself capable of. And then he takes recourse to fabrication, distortion and things like that in order to earn name and fame.

The root of all this is that many scientists take a scientific career just as a career. It is not for the love of science, that they have come to science. It is just a career and they would do anything in order to further that career.

All the cases of scientific misconduct stem from that. That is why I will again say, do not take science as a career. If you are really passionate about science, if you are passionate about finding the mysteries of nature, then only take up science as your life's pursuit. Otherwise it is not going to yield fruit. I will end the class here with that note.