

## Trust in Research and the Importance of Training

Dear Mr.Chairman,dear colleagues,ladies and gentlemen!

Allow me,please,to begin my talk on trust in research and the importance of training by a bit of history. In 1918,Czechoslovakia was proclaimed an independent state. The first president of the then Czechoslovakia was Tomáš Garrigue Masaryk,a professor of philosophy at the Charles University in Prague and a man of high moral standard. In 1938,a Czech writer Karel Čapek published a book entitled Talks with Tomáš Garrigue Masaryk. In the book,President Masaryk expressed his view on knowledge and science by the following words:”Pursuing knowledge is,indeed,an all encompassing endeavour,in fact,an exceedingly active life.If talking about science,you are speaking ,at the same time,about pains,patience,tenacity,perseverance,sacrifice,honesty-all these components of an active life,but of the moral life as well”.

Apparently, President Masaryk had a very high opinion on science and scientists.These words were pronounced more than seventy years ago. Now we have gathered to discuss research integrity. If we feel that it is necessary to discuss such issue,does it mean that science has changed? Or that the entire society and conditions of research have changed? Has the original trust in science been lost so that it is necessary to discuss research integrity,to give to scientists special rules for their behaviour,to provide them with various codes of ethics,charters for researchers,principles of good manners in science,etc.? I am not so sure about it.The scientific community is an autonomous world.It has the ability to verify itself published results. If anybody cheats in research,sooner or later the fraud is recognized.And the offender loses credit in his scientific community and has to quit science.

The scientific community is lucky to have its endogenous feedback which other communities are missing-the verification of results.What feedback do politicians have? They have to be watched by their voters and mass media. And mass media themselves? Do we also speak so much about codes of ethics for politicians,for journalists,for other professions? However,I understand that the contemporary society puts a lot of resources into research and wants to be sure about usefulness of the expended money and about reliability of obtained scientific results. While the outcome and interpretation of obtained research can be verified by the scientific community,it cannot be verified by public for which the new knowledge is intended. Therefore,if science is to remain trustworthy, researchers must observe basic moral principles. In fact,these principles should be part of their personalities. Hence, researchers must be people of moral integrity and honesty and must abide to basic principles of good conduct in science.No codes of ethics, which summarize the principles of good conduct, can ever exhaust all possibilities of misconduct.

As it was discussed in Track IIb this morning, in the session on educating for responsible research, the most important thing is to educate and train already research students and post docs in good conduct in science, to organize courses for them on ethics in science and to discuss with them openly all ethical problems appearing in the laboratory,department or institute.But this is not enough. The best training in good behaviour is always given by an example-based education. Such an example should be provided by the supervisor of students and postdocs or by the head of the research unit.

So how such a supervisor or head should ideally behave? Allow me now to cite from the Code of Ethics of the Academy of Sciences of the Czech Republic,as modified for this occasion.

First, the supervisor himself should abide by deep-seated human moral principles and should not conceal or defend conduct that contravenes the principles. The supervisor should also stand resolutely against the non-ethical and inappropriate use of scientific knowledge, defend the freedom of scientific thoughts, exchanges of opinions and information and refuse to use non-scientific approaches and expressions of racial, religious, nationalistic and political opinions in science. In other words, the supervisor should be independent of any state, party or religion ideology and pressure under all regimes.

This sounds simple, but it is not always as simple as it seems. I belong to a generation which was raised and worked most of the time under the communist regime. After the Second World War, genetics as science was forbidden in the then Soviet Union and in the fifties also in the Soviet satellites. Biologists had to teach ideas of the Russian academician Lysenko that properties acquired during the life can be inherited, and at the same time scientists should reject Mendel's laws of heredity of characteristics, in other words of genes, from parents. Those, who refused to do so, were ostracized and eventually put into jail or labor camps. This was also the case of an excellent Soviet geneticist and a former President of the Russian Agricultural Academy Sergei Vavilov. Due to harsh conditions in these camps, he died within two years after his imprisonment. Similar cases, though not so drastic, occurred also in other communist countries. For example, in the then Czechoslovakia, in the city of Brno, where Gregor Johann Mendel, the founder of genetics, once lived and worked, Professor Kříženecký was expelled from the Brno University and put into jail only because he taught genetics. Paradoxically, after his release in 1962, he was appointed the Director of a newly founded Mendel's Museum in Brno and became the main organizer of a symposium commemorating the one hundredth anniversary of the discovery of Mendel's laws. Unfortunately, before this symposium took place in 1965, Professor Kříženecký had died. Not all professors were so brave as he was. Some of them denied genetics as science and claimed that DNA cannot carry on heredity, as it is not a living matter. In the long run, the brave ones have not been forgotten and have served as the best example for their students and research collaborators.

Second, the supervisor should permanently extend and deepen his scientific knowledge and pass it over to his students, postdocs and young colleagues. Also, the supervisor should use his knowledge and experience to set a task to a student which can be solved within 3-5 years. He should guide his students and young colleagues to observe principles of scientific work, to be responsible for the precision and objectivity of their research, for the completeness and verifiability of the results published and for their undistorted interpretation. This means that he should be himself present in the laboratory or in the institute for a significant part of his working time and serve himself as an example of such a good scientific conduct.

Third, the supervisor should pay heed to correctness and openness in the mutual communication with his students and young colleagues and avoid an unjustified leadership style. He should also assess students and colleagues according to the results achieved and treat them equitably, not requiring from them work which is his own responsibility, or that is beyond their capabilities. He should be devoted to teach his students and young colleagues and guide them to develop their independent, critical thinking, but at the same time he should respect their right to express freely their opinion about research. He should also support the enhancement of the qualification of students and young colleagues and their scientific and publication activities.

Fourth, the supervisor or head of a scientific unit should guide his students and young colleagues to expand the frontiers of scientific knowledge and to make every effort to ensure that their practically usable research results serve the society. This fourth and at the same time the last rule I have time to mention is very important, as young research students should have in mind that, whenever possible, their research results should be used for the benefit of the entire society, and the general public should be acquainted with them.

Ideal supervisors or heads of units exist only rarely, but a majority of good researchers may be close to that ideal. So why to worry too much about the future of science credibility, about integrity of scientists? Allow me, please, to mention also the role the today societies and governments play in research management and to consider also their contribution to the conduct in research, either in a positive or a negative sense.

First, contemporary societies and governments want almost immediately visible results for the money put into research. They call for speeding up research, for constant innovation, and seem not to understand, that sooner or later a good research will bring fruits anyway. The prevailing slogan of governments as well as of the entire European Union is competitiveness, i.e., the ability to compete in innovation and business with the whole world, especially via research and technological development. This puts high pressure on scientists, as they have to compete with other researchers, but at the same time they have to be open and collaborate with them. For example, a strong sense for competitiveness may lead to patenting of findings and discoveries, to which tens of researchers have contributed, but then one does a final step and patents everything.

Second, governments in their legitimate effort to allocate fundings only to a good and perspective research may try to evaluate themselves research outputs by mostly bureaucratic methods, e.g., by counting impacted publications or books. Such an approach may push researchers to partition acquired results into multiple journals and thus to increase scientific papers without producing more knowledge. Scientists themselves should persuade their governments to use mostly peer review system for evaluating scientific contributions instead of bureaucratic criteria.

Third, governments and states become more involved in national research as they put sometimes a lot of resources into it. An excellent research and discovery may become a national pride. But it is important to defend always the independence of scientific thinking of any state ideology. Also, science should never be nationalistic. Otherwise, there is a danger of fraud in the name of promoting a state or country excellence and glory.

At the end, allow me, please to return again to the subject of trust in research, in scientists and their results. I do not think that there is so much of scientific misconduct which would justify a serious concern about integrity in research. I do think that the scientific community is an autonomous community with feedback mechanisms and that governments and parliaments should trust it more than they sometimes do. The atmosphere of trust would allow simpler applications for fundings, fewer reports and documents, fewer audits, less of administration, and, consequently, a larger scientific output. Let me remind you of one of the books of Terry Pratchett, which our young colleagues like to read, namely *The Thief of Time*. In this book the writer predicts that at the end of the world there will be only auditors who will count everything, even paving stones, and will quarrel about their amount.

Finally, allow me, please, to say only a few remarks on the responsibility of scientists. Although people sometimes distrust science as they do not understand its results and are afraid of their misuse, at the same time they believe that science will solve all problems which mankind faces, as are the polluted environment, global warming, rising needs of energy, malnutrition, poverty, etc. Although science, without a change of the human attitude towards the Earth and without changes in our priorities and values cannot solve everything, it may, at least, help to solve the above mentioned problems partially. Science is a long-term runner: it is investment in the future. The ethics of the future is an ethics of the fragile and perishable. We must hand over to the future generations an inheritance that has not been damaged and polluted beyond all redress. And scientists should try to foresee in order to prevent and to build. At the same time, they should share their knowledge with the entire society in order to enlighten the public and help it to form its own judgement. But knowledge is not everything. Mr. Federico Mayor in collaboration with Jerome Bindé states in the book "The World Ahead: Our Future in the Making" published by UNESCO in 2001: "Risk-taking without knowledge is dangerous, but knowledge without risk-taking is worthless." And this should be the final message. Scientists should be trained not only to gain a trustworthy and necessary knowledge, but also to act on the basis of this knowledge to the benefit of future generations.