Have the Natural Sciences and Technology Forgotten Ethical Perspectives and Become Disciplines for Unaware Nerds?

by

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1. Nuclear Disarmament

In his welcome address in the conference programme the chair of the Organizing Committee, professor Ole D. Mjøs, pays a visit to the theme of this seminar by stating "..., while natural scientists let themselves be used to legitimise the supremacy of the white race as well as atomic bombs and star wars programmes."

Atomic bombs and star wars programmes is a central theme these days under the 2000 Non Proliferation Treaty (NPT) Review Conference taking part from 24 April – 19 May in New York. This is partly due to the very recent ratifications by the Russian Duma of the START II (Strategic Arms Reduction Talks) Treaty on 14 April and the CTBT (Comprehensive Test Ban Treaty) on 21 April. However, before the vote president Vladimir Putin demanded the United States adhere to the 1972 Anti-Ballistic Missile (ABM) Treaty. Russia opposes a U.S. desire to change the treaty to build a limited nuclear defence system NMD (National Missile Defence). "I want to stress that in this case, we will have the chance and we will withdraw not only from the START II Treaty, but from the whole system of treaties on limitation and control of strategic and conventional weapons", Putin told the Duma shortly before the vote.

A recent report by eleven physicists and engineers from the Union of Concerned Scientists and the MIT (Massachusetts Institute of Technology) Security Studies Programme
— among them senior defence consultants to the government and nuclear weapons laboratories — concludes that, even when fully deployed in 2010, the NMD system currently envisaged could be easily defeated and overwhelmed by countermeasures. It would be relatively cheap and easy for the “rogue states” North Korea, Iraq or Iran to overcome the planned system of ground radars, satellite-based sensors, and ground-based interceptors. The system could be confused with hundreds of bomblets of biological or chemical weapons or made impotent by decoy balloons in space that make the armed warheads too hard to find for a limited number of interceptors.

2. Ethical Challenges for the Natural Scientists

On the other hand, as happened when the SDI (Strategic Defense Initiative) programme was launched in the Reagan precidency, a series of researchers in the natural sciences and technology will line up in favour of the NMD. Most of them will know, or should know, that the programme is technologically unfeasible. Still they will line up due to the prospects of interesting research projects and flourishing economical fundings. Which side will win? When we know, that gives a partial answer to the question in the title of my talk: “Have the Natural Sciences and Technology Forgotten Ethical Perspectives and Become Disciplines for Unaware Nerds?”

This question is equally relevant when considering for instance gene technology which I expect will be covered in depth later in this seminar. In a conference contribution on “What is governing and what ought to govern research” I quote from Walløe (1998) (in my translation from Norwegian): “Some will react to the fact that I until now have not mentioned ethical considerations. This is not because I do not consider such considerations to be important, rather that in my opinion they of course enter in the type of considerations researchers go through before a research project is started up. The ethical problems are of course far more pressing in subjects that directly or indirectly have human beings as objects for their research (medicine, social sciences and the arts)”. I disagree wholeheartedly to what to me sounds like a naive confidence in fellow scientists and to the gross underestimation of potential negative consequences of research in the natural sciences.
3. Swing away from Science and Technology?

The Norwegian Research Council initiated a survey, which was carried through in 1999, on opinions in the Norwegian population on research, science and technology. Some main results are given in the report: “The Norwegian Research and Innovation System — Statistics and Indicators 1999”. Considering the expectations linked to different technologies in the next 20 years 24% thought gene technology will improve life, 16% thought it will make no difference whereas 60% thought it will make things worse. The corresponding figures for biotechnology were 63%, 20% and 17% whereas for data- and information technology the figures were 71%, 14% and 15%. When assessing the importance of different research disciplines for the society environmental research was ranked on top by 32%. The corresponding figure for medicine was 27%, for technology 15%, for social science 11%, and for the arts and the natural sciences both 5%.

On politics and science 51.4% completely agreed that values and attitudes should be at least as important as scientific knowledge as a basis for political decisions, whereas only 3.4% completely agreed that research gives the best basis for such decisions. On the precautionary principle 56.3% completely agreed that if it is doubt linked to the consequences of the use of new, unknown technologies for human beings and the environment, one should be restrictive in allowing them. Only 2.9% completely agreed that it was wrong to make strong restrictions on the use of new technology as long as it was not scientifically proven that it would lead to strong unfortunate consequences for human beings and the environment.

In the spring of 1997, the Nordic Council of Ministers commissioned the Norwegian Institute for Studies of Research and Education (NIFU) to carry through a study on young people’s interest in mathematics, the natural sciences and technology within higher education and research in the Nordic countries. This led to the report “Recruitment to Mathematics, Natural Sciences and Technology within Higher Education in the Nordic Countries. A Pilot Study by NIFU. 1998”. The reason for carrying through this study is the concern in many Western countries about the weakening interest in and recruitment to mathematics, the natural sciences and technology. In November 1996, Japan took the initiative to arrange an OECD symposium in Tokyo: “Public Understanding of Science and
Technology”. It is particularly interesting to note that such a high-tech country like Japan is also worried about what is now called “the swing away from science and technology”.

At the end of the report some tentative explanations to this phenomenon are given. The last of these states that the “spirit of times” and perhaps especially the youth culture may work against mathematics, the natural sciences and technology subjects and what they stand for or are thought to stand for. Furthermore, the strongly dominant position of these subjects in the post-war period has not led us to “the Promised Land”. There have been many disappointments and these are also directed towards the natural sciences and technology. Accordingly, the role these subjects play in social developments is often viewed more critically.

In Falkfjell (1999) the choice of natural science subjects in preuniversity education in Norway is considered along with the pupils’ longterm education plans. Among the pupils planning a college or university education 40.9% of the boys planned to study technology or the natural sciences. The corresponding figure among girls was 24.5%. Considering the pupils having both special courses in mathematics in their preuniversity education now as much as 52.5% of the boys planned to study technology or the natural sciences. The corresponding figure among girls was only 23.7%. The author stresses that it is reasonable to be worried about so few girls being interested in a career inside technology or the natural sciences. Women usually have a different scale of values and another background of experiences than men, and hence make their choices out of different priorities. For the society to be based on values to be considered important by everyone, a larger part of women should be recruited to education and jobs within mathematics, the natural sciences and technology.

If one is not convinced that at least the natural sciences are in deep trouble in Norway let me give a few more figures. In 1993 2779 students started studies in the natural sciences in Norway. The corresponding figure in 1999 was 2173. Finally, what is really worrying also for the future of technology studies in Norway is that only 22 out of 783 finishing a cand.scient. degree in Norway in 1999 were interested in a teacher job in the preuniversity education.
4. Declaration on Science and the Use of Scientific Knowledge

During the final session of the World Conference on Science in Budapest on 2 July 1999 a "Declaration on Science and the Use of Scientific Knowledge" was adopted, consisting of the following parts.

Preamble
1. Science for knowledge; knowledge for progress
2. Science for peace
3. Science for development
4. Science in society and science for society

I start by reproducing the following paragraph from the preamble:

20. that some applications of science can be detrimental to individuals and society, the environment and human health, possibly even threatening the continuing existence of the human species, and that the contribution of science is indispensable to the cause of peace and development, global safety and security,

Furthermore, the two paragraphs under "Science for Peace" are reproduced:

31. The essence of scientific thinking is the ability to examine problems from different perspectives and seek explanations of natural and social phenomena, constantly submitted to critical analysis. Science thus relies on critical and free thinking, which is essential in a democratic world. The scientific community, sharing a long-standing tradition that transcends nations, religion or ethnicity, should promote, as stated in the Constitution of UNESCO, the "intellectual and moral solidarity of mankind", which is the basis of a culture of peace. Worldwide cooperation among scientists is a valuable and constructive contribution to global security and to the development of peaceful interactions between different nations, societies and cultures, and could give encouragement to further steps in disarmament, including nuclear disarmament.
32. Governments and society at large should be aware of the need to use natural and social sciences and technology as tools to address the root causes and impacts of conflict. Investment in scientific research which addresses them should be increased.

Finally, I reproduce the following paragraph under “Science in society and science for society”:

41. All scientists should commit themselves to high ethical standards, and a code of ethics, based on relevant norms enshrined in international human rights instruments, should be established for scientific professions. The social responsibility of scientists requires that they maintain high standards of scientific integrity and quality control, share their knowledge, communicate with the public and educate the younger generation. Political authorities should respect such action by scientists. Science curricula should include science ethics, as well as training in history, philosophy and the cultural impact of science.

5. Exemplifications of How Peace Issues can be Included in Higher Education

This leads directly to the “Terms of reference” for this conference. Especially, I will consider the objective “to exemplify how peace issues are, or may be, included in different kinds of higher education”. All university students in Norway have to pass “Examen Philosophicum”, corresponding to a quarter of a year’s studies, covering history of philosophy, theory of science and logic. The intentions of this course are excellent, the experiences with it among at least a series of students and educators in the natural sciences are not that good. In my opinion the course is old fashioned and partly outdated. My proposal is that one of several ways to update this course is to include peace issues and ethical aspects of the natural sciences with detailed examples. In Norway a report suggesting reforms in higher education will be handed over to the government in a couple of days on 8 May by a commission headed by no other than professor Mjøs, the chair of the Organizing Committee of the present conference. If the commission has not already built in this proposal in their report, it should anyway be seriously discussed in the coming months.
In addition to the common ground suggested to be given in Examen Philosophicum mentioned above, ethical aspects and consequences for society should be included where suitable in any advanced course in the natural sciences, for instance in gene technology. In the course “ST 214 Introduction to Reliability” given at the Department of Mathematics, University of Oslo the students should know that the following problems arise when applying reliability theory to safety analyses of large technological systems:

(i) lack of knowledge on the functioning of the system and its components;
(ii) lack of relevant data;
(iii) lack of knowledge on the reliability of the human components;
(iv) lack of knowledge on the quality of computer software;
(v) lack of knowledge on dependences between the components.

This is then discussed in the light of the experiences from the Chernobyl catastrophe in 1986 and the incidents at the nuclear power plants LeBugey in 1984 and Barsebäck in 1992. For details see Natvig and Gåsemyr (1996). In this course also accidental nuclear war and the launch on warning strategy is discussed in depth, see Natvig (1989).

Finally, what is the answer to the question in the title of my talk: “Have the Natural Sciences and Technology Forgotten Ethical Perspectives and Become Disciplines for Unaware Nerds?”? If nothing is done now, the answer at least in the public opinion in a not too far future, may easily be YES. Hence, applying the precautionary principle we must react now before it is too late.

References


Walløe, L. (1998) What is Governing and what ought to Govern Research. In Ethics in the University Society. Editor Fredrik Engelstad. etikk@teologi.uio.no