

Science reform in Estonia - results and experience

Dr. Urmas Tartes

Chairman of the Estonian Association of Scientists

Director of the Institute of Zoology and Botany at Estonian Agricultural University

Profound political changes have led to changes in Estonian science. The main goals of the reform were:

- Reform of the legal basis of scientific research
- Reform of the principles of financing
- Reform of the institutional structure
- Merging of scientific research and university education

Starting an overview of the science reform in Estonia, one should look at some important events having great influence on the science reform in Estonia in the all above mentioned aspects.

1989 - founding of the Estonian Association of Scientists. The Estonian Association of Scientists had initially a great influence on the science reorganisation in the first years. The workgroup of the Estonian Association of Scientists took an initiative to compile the basic documents and draft laws regulating university education and research activity in newly independent Estonia.

1990 - establishment of three foundations:

Estonian Science Foundation - financing scientific research

Informatics Foundation - working out national informatics policy

Innovation Foundation - supporting technological advancement

The Estonian Science Council was established, acting as an advisory body to the Government on issues regarding science and science policy. The Chairman of the Estonian Science Council was the President of the Estonian Academy of Sciences. The members of Estonian Science Council were appointed by the Government for a three-year period (Minister of Education, rectors and vice-rectors of universities, some researchers, and representatives of the Estonian Science Foundation, Innovation Foundation and Information Foundation).

1991 - Estonian Science Foundation applied to the Royal Swedish Academy of Sciences and Swedish Research Councils with a request to carry out a thorough evaluation of Estonian science. Evaluation took place in 1991-1992 and was carried out in accordance with international standards.

1991 - Estonian Science Foundation started to introduce peer-reviewed grant system. More extensive funding of grants started in 1993 and funding increased gradually.

1993 - The Estonian Science Council was reorganised as the Estonian Research and Development Council. The Chairman of the newly formed council was ex officio the Prime Minister. The other governmental ex officio members were Minister of Education, Minister of Social Affairs, Minister of Finance and State Secretary.

1994 - 1994-1995, the Estonian Research and Development Council carried out a further, internal, evaluation of research institutions. The results correlated completely with the

results of Swedish evaluation.

1994 - In December "Organisation of Research Act" was approved by *Riigikogu* (Estonian Parliament).

A first the principal result was the wresting of control of research institutes from the Academy of Sciences. The Academy of Sciences was reorganised as a personal academy and academy institutes became independent state-owned research institutes. The Ministry of Education became responsible for organising scientific research in Estonia. Evaluation of science was to take place with a regular seven-year cycle.

State finances were divided into three parts: scientific research activities were financed by Estonian Science Foundation via grant and target financing. Infrastructural financing (maintenance of buildings and minimum administrative cost) had to be covered by the owner or the relevant ministry. In practice target and infrastructural financing remained as a basic budget until 1998.

1995 - In January the "University Act" was approved by *Riigikogu*. In February the "Tartu University Act" was approved by *Riigikogu*. Tartu University is the only university having its own act. Universities became public legal persons, i.e. bodies governed by public law.

In December the "Government of the Republic Act" was approved by *Riigikogu*. The Ministry of Education became responsible for science supervision in Estonia.

Soon it becomes evident, that most laws were at a variance with other legal acts and with themselves.

1997 - In April a new law, "Organisation of Research and Development Act" was approved by *Riigikogu*. Several important changes were introduced:

1) Estonian Science Foundation was reorganised as a private foundation with the objective to finance only grant applications.

2) Ministry of Education became fully responsible for target and infrastructural financing. Target financing was reorganised from the basic budget into project financing lasting up to five years. (Grants can last up to four years).

3) The law established a legal way to merge state research institutes with public legal universities or the Estonian Academy of Sciences. Earlier this was possible only via terminating the activity of research institutes. The law granted institutes a six-month period to make a decision.

In April the "Estonian Academy of Sciences Act" was approved by *Riigikogu*. The academy became a public legal person. According to the law the Academy is allowed to have its research institutes again.

Many state research institutes were joined to universities, while they maintained autonomy to the extent specified by law. For several reasons no institutes were joined the Academy, even those that were generally agreed to act under Academy's supervision. Many institutes remained affiliated to different ministries.

1998 - In October the "Institute of Chemical Physics and Biophysics Act" was approved by *Riigikogu*. This is a single former Academy institute, specified by a particular law, acting as a public legal person like universities and the Academy.

1999 - Estonia joined a EU science programme as a full member.

Science organisation in Estonia

The present science organisation structure is presented in Figure 1. The Cultural Affairs Committee of *Riigikogu* (11 members) is working on laws concerning science and education.

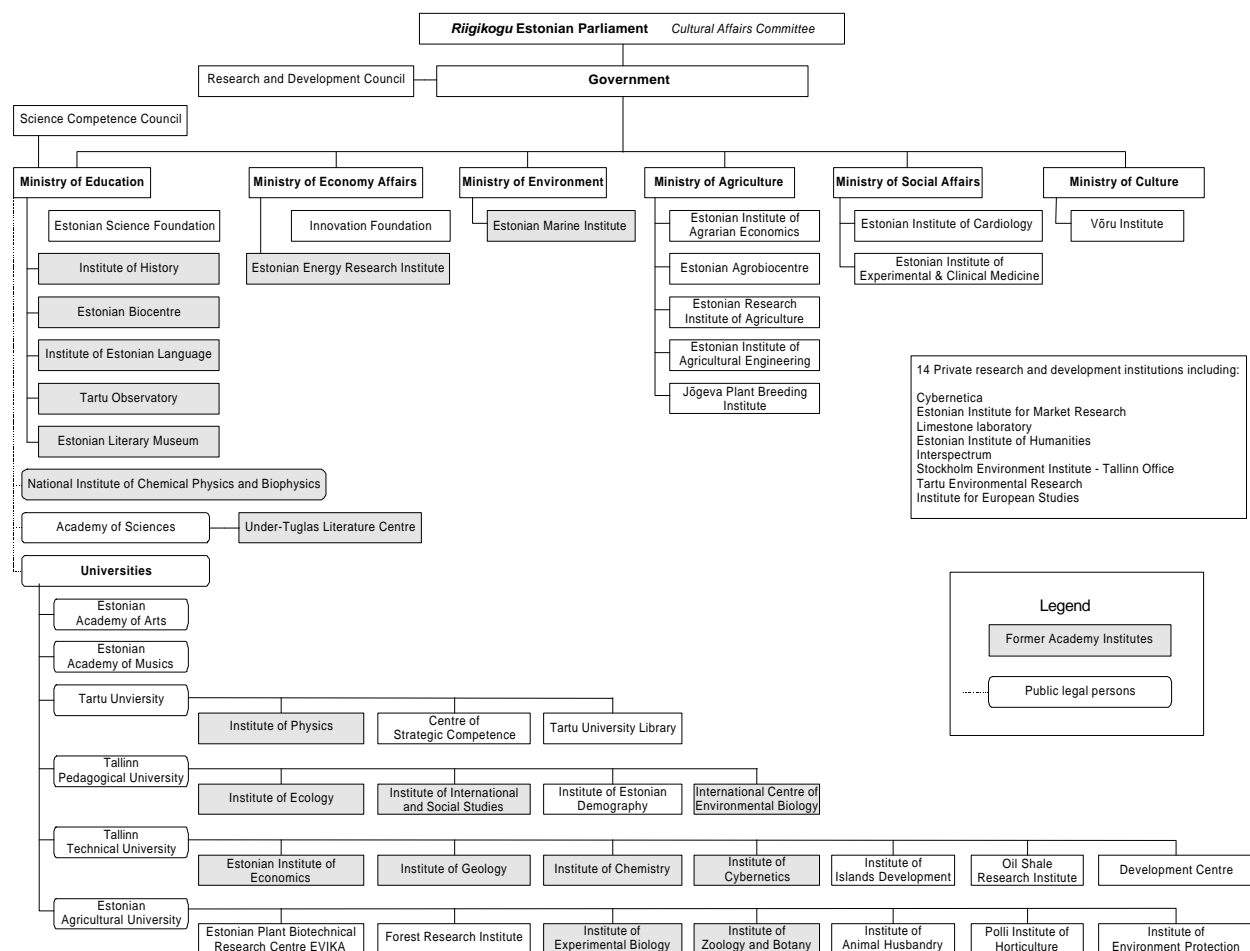


Figure 1. Organisation structure of Estonian Science and registered research and development institutions in October 1999.

The Research and Development Council (23 members) is an advisory body to the government regarding research and development policy. The members of the council are Prime Minister (chairman of the council), Minister of Education, Minister of Economy Affairs, three government members nominated by the Prime Minister, State Secretary, representatives of the Estonian Academy of Sciences, Tartu University, Tallinn Technical University, Tallinn Pedagogical University, Estonian Agricultural University, Estonian Science Foundation, Estonian Innovation Foundation and Estonian Bank; eight members are nominated by the government.

In the Government the Ministry of Education is responsible for organisation of science and education. The Department of Science and Higher Education (11 officials) of the Ministry is implementing education and science policy.

The Science Competence Council (9 members) is acting as an advisory body for the

Minister of Education concerning target and infrastructural financing. Members, who are expected to be prominent scientists within a particular field, are nominated by the Government.

The Council of Estonian Science Foundation (14 members) is a decision making body responsible for grant financing. The members of the Council are representatives of the Ministry of Education, Tartu University, Tallinn Technical University, Estonian Agricultural University, Academy of Sciences and Estonian Association of Scientists. Also, eight chairmen of Expert Boards (elected by scientists and university teachers) are members of the Council.

The Innovation Foundation implements state innovation policy by financing projects. The council has 11 members. There are representatives from the Ministries of Economy Affairs, Defence, Environment, Agriculture, Transport and Communications; Tallinn Technical University, Tartu University, Academy of Sciences and Estonian Chamber of Commerce and Industry.

Both the Estonian Science Foundation and the Innovation Foundation are financed from the state budget of corresponding ministries.

There are six public legal (former state) universities, a number of research institutes affiliated to universities and ministries. There are also several private universities and research and development structures.

Structure of Financing

Changes in the science budget during 1992-1999 (2000) are presented in Table 1. Initially all finances for science money were allocated by Estonian Science Foundation Funding. Gradually most of the control has been taken over by the Ministry of Education, and finances for science money have been split into different units. Target and infrastructural funds have been increased by the government more than grant funding. In 1998 postdoctoral programmes were launched within the target financing. Decisions have been increasingly based on merit, as determined by peer review. The result of these changes is that individuals or groups now have to apply for finances for their research directly from funding agencies, rather than through the basic budget of their institution, followed by internal distribution by the institution council and director.

Table 1. Science funds from state budget 1992-2000 ($\times 10^6$ EEK). 8 EEK = 1 DEM

Year	Basic budget	Target financing	Infrastructure	Grants	Other ⁵
1992	57.8			3.0	
1993	69.7			18.6	4.6
1994	92.3			30.8	5.1
1995	109.0			45.0	6.3
1996 ¹		93.8	34.0	58.4	3.0
1997		102.3 ²	39.5	68.4	x.x
1998		133.9 ³	48.0	72.9	18.5
1999		175.4	59.4	76.6	28.4
2000 ⁴		172.5	57.3	71.1	21.8

¹ financing system changes according to law; ² incl. centres of strategic excellence; ³ incl. centres of strategic excellence and doctoral projects; ⁴ project; ⁵ state science awards, reform expenses, state research programs; Infrastructure includes Academy of Sciences

Decision making body: Estonian Science Foundation

Decision making body: Ministry of Education

The amount of funds compared with the state budget and GDP is presented in Table 2. Comparison with other countries is presented in Figure 2. The main problem is the shortage of financial resources and low financing from the state budget. Research money from Estonian industry for applied research and innovation is negligible (not to say practically nonexistent).

Table 2. Relative financing of research and development 1993 – 1998 ($\times 10^9$ EEK). 8 EEK = 1 DEM

YEAR	1993	1994	1995	1996	1997	1998
GDP	22	30	41	51	65	76
STATE BUDGET	41	71	89	10,2	12.5	15
RESEARCH	0.093	0.128	0.172	0.210	0.239	0.278
INNOVATION	0.025	0.013	0.013	0.009	0.02	0.03
% GDP	0.53	0.47	0.45	0.43	0.40	0.41
% STATE BUDGET	2.9	1.9	2.1	2.2	2.1	2.1

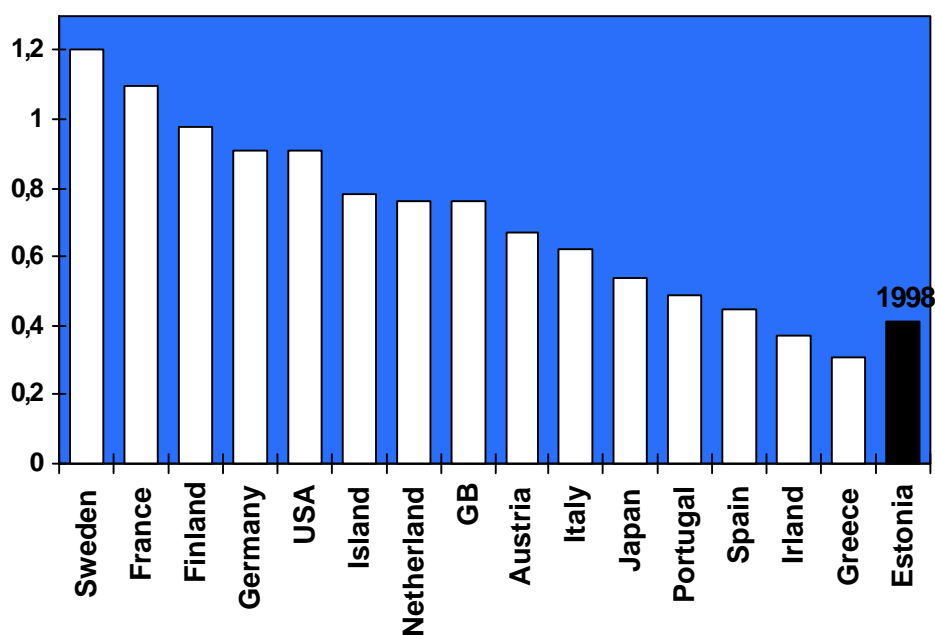


Figure 2. State budget expenses for research and development in 1996. % GDP

Integration of scientific institutes and universities.

At the beginning of the nineties (92-93) several joint professorships were established between academy institutes and universities (faculties). This cooperation had excellent results. Several new professorships were established, based on competence, both from academy institutes and universities. More scientists were involved in university teaching. The number of postgraduate and graduate students at universities increased. Teaching level improved essentially. On the other hand, financing of such cooperation was not taken into account by the Government. The

universities' education budget was increased to a greater extent than the research budget of institutes, and the interest of the universities in cooperation gradually declined. When academy institutes were converted to state institutes, their legal status also did not favour joint professorship agreements. Merging institutes with universities became legally possible only as late as 1997. By this time nearly all agreements on joint professorships did not function.

Of state-owned (including former academy institutes) research institutes the following mergings took place in 1997. One institute (Institute of Physics) joined Tartu University, four joined Tallinn Pedagogical University, seven joined Tallinn Technical University and finally six joined Estonian Agricultural University (Figure 1). The Institute of Animal Husbandry had joined the Agricultural University already in 1994.

It should be pointed out, that this integration is neither the result of active planning of national priorities nor of the corresponding resources needed to accomplish them. Rather it is the consequence of individual decisions that left institutes to face their future with those employees who were maybe not best suited for their current and future needs. Even if there was willingness to transfer institutes to universities, the institutes were often much too large to be fit into the universities and not all institute researchers had experience in teaching. In addition, geographic separation (even within one town) sometimes made integration difficult.

As a rule (with some exceptions) institutes did not merge with the corresponding universities with which they had earlier joint professorship agreements. There are several reasons for that. The merging model used by the Technical University, Agricultural University and Pedagogical University allowed institutes to retain considerable autonomy within the university.

The degree of participation of scientific institutes in teaching is different at different universities. Historically classical faculties are regarded as teaching units within the university and this idea is changing very slowly. Only occasionally do university institutes have direct access to the activity of developing their own study courses and act as faculties. Mostly participation of scientific institutes in teaching is indirect, going on as individual lecturing in different faculties, which was common practice already before the reform.

Social status of scientists

The number of researchers has greatly diminished, in some institutes, which were active in the late 1980s, to half, or even less. In 1989 the total number of researchers was 7,100. By 1996 the number of researches has decreased to 1,570, i.e. 4.5 times. Clearly the number of researchers has reached a critical point. Further decreasing would result in interrupting research in many fields or even closing down of research institutions.

Permanent research positions do not exist in Estonia. Scientists can be elected to work as researcher (or a senior researcher) for a maximum of five years. The directors of scientific institutes can be elected for five years and not more than for two five-year periods (total of 10 years). It is not allowed to work as a regular professor or assistant professor at the university for persons older than 65 years.

Salaries for researchers or university teachers are not generally fixed. Salaries depend on the budget of institution. Trade Unions applied for 5000 EEK for researcher and 7000 EEK for senior researcher for year 1999, but is not possible to follow these suggestions in each university or institute. The highest salaries are at Tartu University: A professor receives 12,000 EEK and senior a researcher 9,000 thousand EEK per month. Generally researchers' salaries vary between 3,500 to 5,000 EEK and senior researchers' salaries from 5,000 up to 9,000 EEK per month. The mean salary in Estonia is about 4,500 EEK. All salaries are taxed (26% income tax).

Unless a scientist is an academy member or is awarded *professor emeritus* by the university, he/she does not get any extra pension for retired scientists.

Concluding remarks

1. Science is generally considered to be very conservative and difficult to reorganise. Nevertheless, changes in scientific work during reforms may be very rapid. As an example, I can present changes in the structure of publication at the Institute of Zoology and Botany. During Soviet occupation the main language of publications was Russian. Almost immediately after Swedish evaluation, carried out in 1991-1992 by international standards, the language structure changed and Russian was replaced by English (Figure 3).

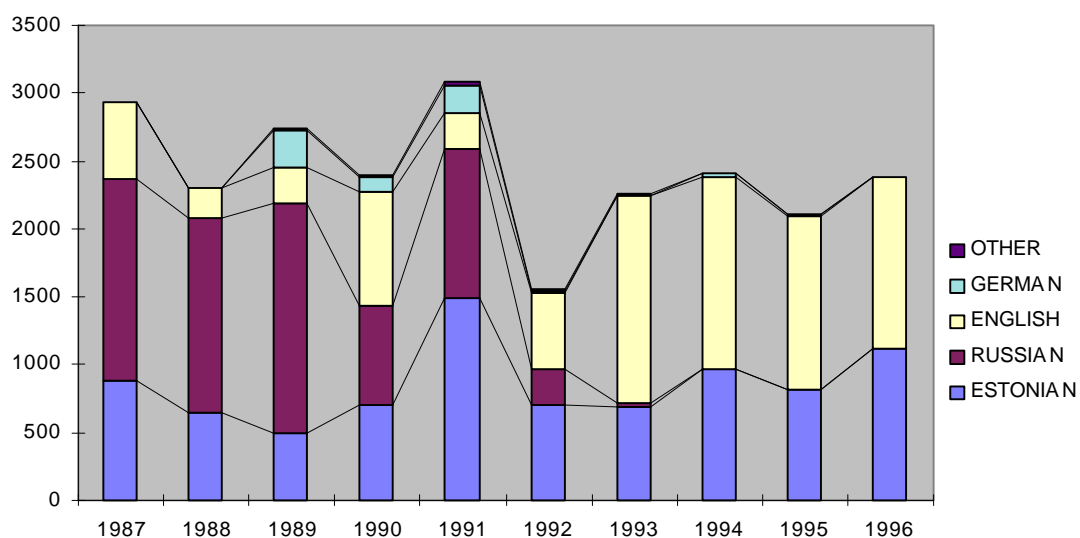


Figure 3. Language structure of publications of Institute of Zoology and Botany during science reformation (N of pages).

This has been a positive example. Sometimes, when reform changes are applied too quickly and without proper planning, they may lead to inadequate results.

2. During the transition period an initial point of the reform was to maintain the internal stability of research in the period of political and economic crisis, to guarantee the independence of a research organisation from political draught and alterations in the government. This aim was reached by establishing the Estonian Science Foundation.

By now the Government has assumed great power in science regulation. In principle, the Minister of Education has complete control over target financing and infrastructural financing (about 70% of money, Table 1). Therefore, this system may become very vulnerable, when a responsible person(s) is(are) not understanding his/her responsibility.

All research money in Estonia is based on project financing. Scientific councils at scientific organisations are not decision making bodies any more. That way most scientists have been

excluded from making science policy and power has concentrated to a very small group of persons. During reforms this model will definitely work better, but in a longer perspective this system should be reconsidered to return a certain amount of power to research institutions and scientists.

3. There is pressure on science from the government for receiving applicable results from science in shorter time. The overall aim of the research is considered to enhance directly the countries' economic potential. New politicians with an experience only in economy and business often tend to underestimate the importance of fundamental research as a basis for innovation and education.

4. Although the reform has been called the reform of science and higher education, it has not involved both structures simultaneously and consistently. At the time when scientific institutes and their staff were faced with great pressure from the reform, universities were established as landmarks of integration practically without any pressure for changes and reforms in order to meet new requirements.

5. Clearly, the single most pressing problem for Estonian science is the inadequate amount of money available for science in its multiple aspects: to achieve a desirable level of large-scale basic and applied research; to replace out-of-date equipment; to upgrade the infrastructure (for example, to make laboratory buildings more energy-efficient and provide standards of safety); to be able to pay reasonable salaries and receive funds for library acquisitions and professional travel; or to retain the best and the brightest of the young. (Figure 4).

It is not clear which economic activities will succeed in the new climate and will, therefore, need corresponding research institutions. Only some of the small start-up companies and the beginnings of an infrastructure to transfer laboratory knowledge to practical ends have been developing.

Hopefully, participation in European science projects will provide possibilities to get resources for innovation and technology transfer, which is much more money consuming than fundamental research.

6. Estonia has undergone deep changes in science legal basis, structure of financing and integration of scientific research and higher education. Many reforms have been very successful (ESF grant system, peer-review evaluation standards). At the same time we cannot say that the science and higher education reform is completed. Active planning, will still be required to maximize the use of available limited resources. Estonia has to focus research on national goals - which have still not been defined by the parliament and government.

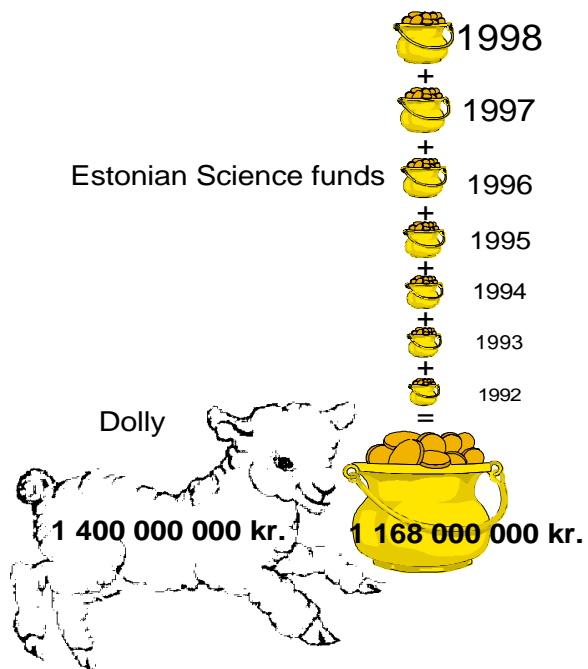


Figure 4. The cost of the Dolly project was more than Estonian science state budget from 1992 to 1998.

Internet links:

<http://www.tan.ee/> - Research and Development Council of Estonia

<http://www.etf.ee/> - Estonian Science Foundation

<http://web.mineco.ee/eif/> - Estonian Innovation Foundation

<http://www.akadeemia.ee/> . Estonian Academy of Sciences

<http://www.femirc.ee/English/teadusinfo.html.en> - Universities and Research Institutions in Estonia

Materials used to compile the overview:

“Estonian Science Foundation 1990-1996.” compiled by Helle Martinson.

“Teadmistekeskne Eesti. Teadus- ja arendustegevuse strateegia” (1998) compiled by Jüri Engelbrecht,
Tiit Laasberg, Galina Varlamova.

Internet (Ministry of Education, other homepages)