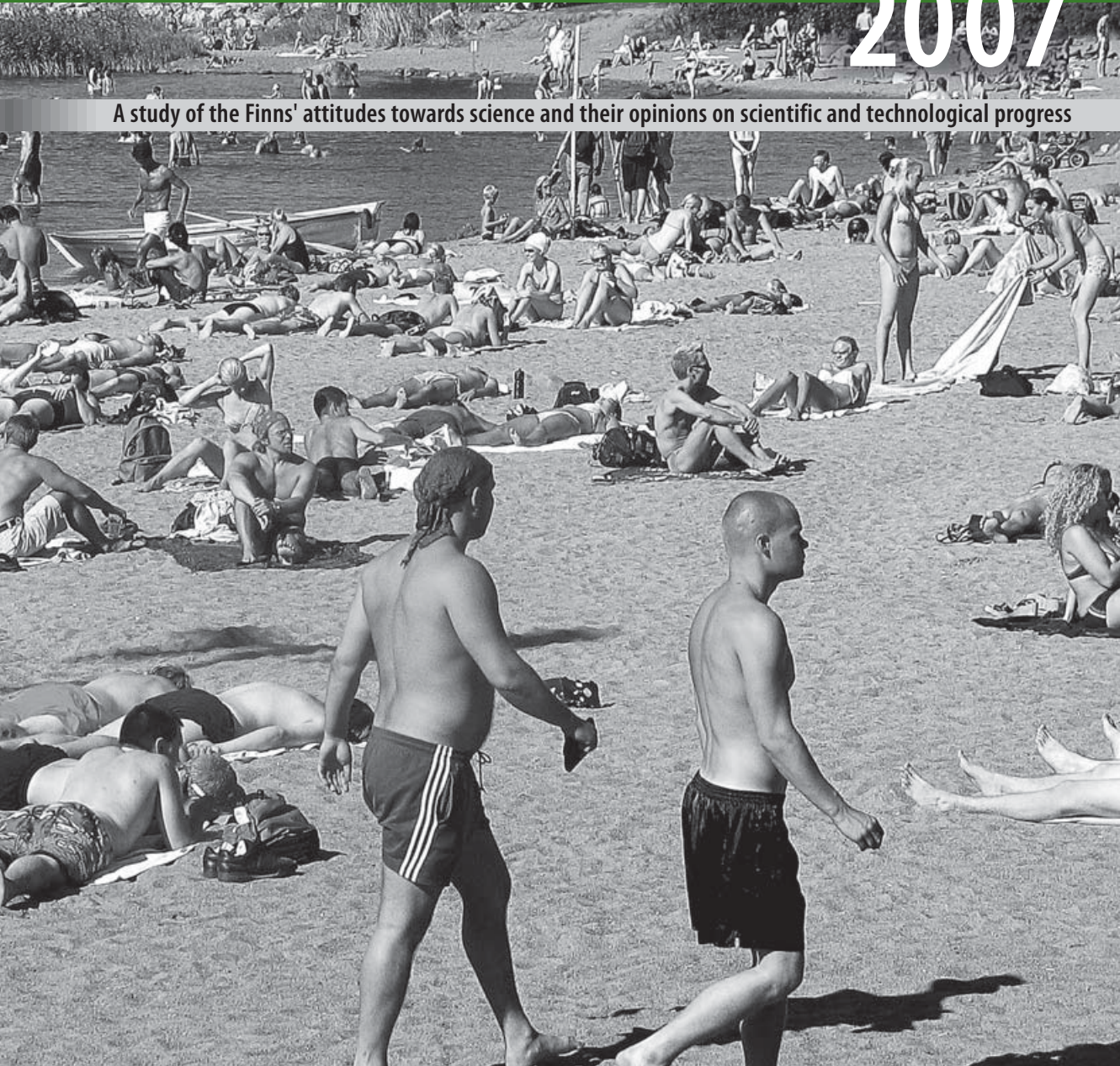


# FINNISH SCIENCE BAROMETER 2007

A study of the Finns' attitudes towards science and their opinions on scientific and technological progress



Finnish Society for Scientific Information

# FINNISH SCIENCE BAROMETER 2007

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### *Finland and Science*

Finland invested about 3.5% of GDP in research and development in 2007, making it one of the leading countries in this respect and placing it well above the EU average. Of the total of some 6 billion euros spent on R&D, about 70% was provided by private companies, and about a half of the almost 80,000 persons engaged in this work (out of the country's total population of 5.3 million) were employed by such companies. More than 1400 people obtained a doctorate from a Finnish university in the course of the year.

The principal elements in the Finnish research and innovation system are education, research and product development, together with a knowledge-intensive enterprise culture and an all-pervading interest in broad-based international cooperation. Finland has set out to develop its education, science and technology policies for the express purpose of strengthening this national innovation system in the long term.

The system consists of those responsible for producing new information and knowhow, those engaged in exploiting it and the multifarious interaction relations existing between the two. The producers include the universities, polytechnics, research institutes and numerous private companies, while the exploiters are mostly companies, public sector decision-makers, administrators and individual people. Research findings have steadily gained in importance as stimuli for development in society and in the economy, which has in turn increased the significance of networking.

Finland also has a large number of excellent popularizers of the achievements of science and research, including the organizations responsible for carrying out and financing the research and the media, most notably the magazine *Tiede* (Science).

Finland has consistently been pointed out in international comparisons as a model country in terms of the skills of reading and comprehension, and increasing emphasis has been placed on the need to develop people's scientific reading abilities, the responsibility for which is seen to lie with the scientific community, the school system and the whole of society. No actual research findings are available on the level of scientific knowledge among the Finnish population in general, but this report, which follows on from those published in 2001 and 2004, presents some results regarding the Finns' attitudes towards science.



# 1 PURPOSE AND NATURE OF THE SCIENCE BAROMETER

The extensive Science Barometer 2007 questionnaire survey was aimed at assessing the Finns' relations to science and their attitudes towards the production of various types of scientific information, the levels of this information and the necessity for it. Respondents were also asked to evaluate the benefits and risks associated with scientific and technological progress and also moral and philosophical aspects of science. Although the survey adopted primarily a national perspective, its results are examined within an international and global frame of reference.

In addition to the present state of people's attitudes, the research also set out to trace changes in attitude relative to two previously published reports which are comparable to the present one both methodologically and in terms of content (Science Barometers 2001 and 2004). As the survey comes to be repeated more often it is gradually emerging as a systematic means of monitoring national opinion and changes in this.

The material was gathered by means of a written questionnaire sent over the period 3.5.-6.7.2007 to 3000 persons selected at random from the national population register (an increase of 500 over the number in the previous surveys) to represent the population aged 18-70 years over the whole country with the exception of the self-governing province of the Åland Islands (pop. 22,600).

The survey yielded a total of 1078 questionnaire forms suitable for analysis, representing a response rate of 36%, a decline relative to the previous survey (42%) that was comparable in magnitude to the decline over the interval 2001-2004. The outcome can nevertheless be regarded as satisfactory bearing in mind the nature of the recipients (an unrestricted sample taken from the whole population with no regard for the possibilities of contacting the subjects or their ability to answer), the topic and extent of the questionnaire, the timing of the survey (partly in the summer) and the fact that it is difficult to contact people nowadays by any means of data acquisition. In any case, the number of replies received was slightly higher than on the previous occasion (1054) in spite of the decrease in the response rate.

The material is representative of the total population in its internal structure, conforming relatively well to the average distribution in terms of demographic, social and regional parameters.

The confidence interval, i.e. margin of error, for the results obtained from the total material is 2-3 percentage points in either direction depending on the form of the distribution (size of the percentage), but is naturally somewhat larger for results based on subgroups, depending on the size of these.

The survey was carried out by Yhdyskuntatutkimus Oy at the request of Finnish Society for Scientific Information, and the person responsible

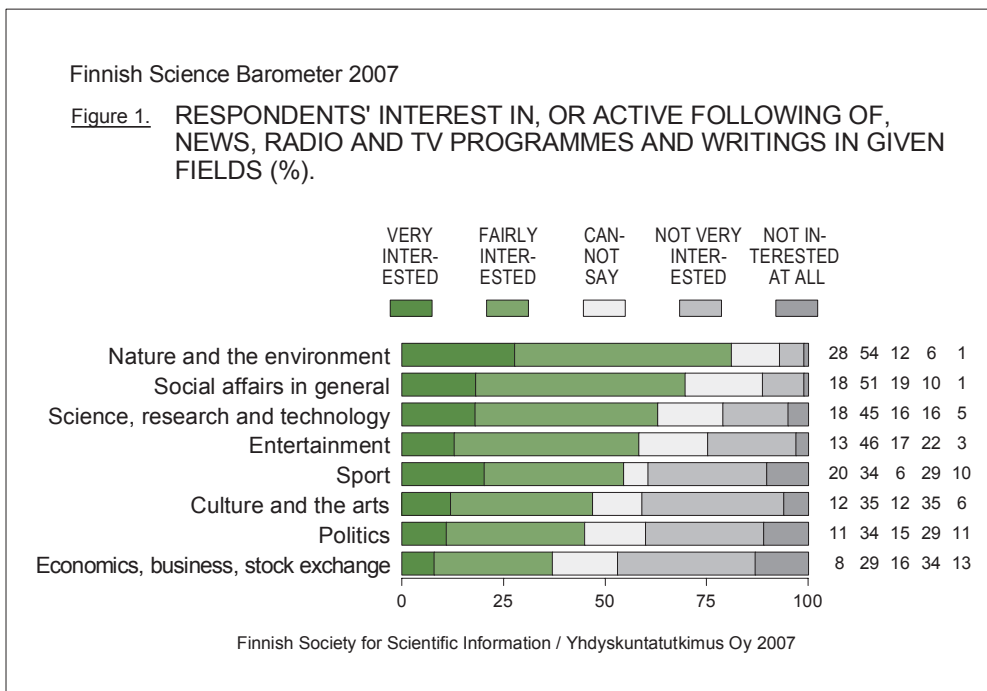
for the research and the writing of the report was Pentti Kiljunen. The material will be handed over to the Finnish Social Science Data Archive, from which it may be acquired for further research or teaching purposes.

Chapter 2 below will be concerned with people's relations to scientific information, principally their interest in science, evaluated quantitatively and qualitatively, and their sources of information on it, and Chapter 3 with their opinions and attitudes regarding it and the value they place on it.

## 2 INTEREST IN SCIENCE AND RELATED INFORMATION

### 2.1 Following developments in science

The survey set out to investigate the Finns' relations to science by assessing their interest in scientific matters. The respondents were asked to state how actively they followed news items, programmes and articles on certain subjects in the media. The most interesting of the topics proved to be nature and the environment, in which more than four-fifths showed an interest, with matters of general social interest in second place (Figure 1).





Here a certain paradoxical effect can be noted, however, in that although the respondents had a wide general interest in social affairs, the management of these affairs, i.e. politics, attracted far fewer people, while economics and related themes came still lower down the list. Assessments regarding culture and the arts similarly led to a fairly marked polarization, and sport and light entertainment had both their supporters, who were in the majority, and a clear group of detractors.

A clear majority indicated that they followed matters connected with science, research and technology with interest, and an interest in economics, social affairs, politics and culture tended to be prominently correlated with this, whereas sport and entertainment were inversely related to an interest in science. The general trend for the correlations between the various topics to be positive nevertheless points to the cumulative nature of these interests; if you are interested in one topic, you are also likely to be interested in others.

#### *Changes in interest and differences between population groups*

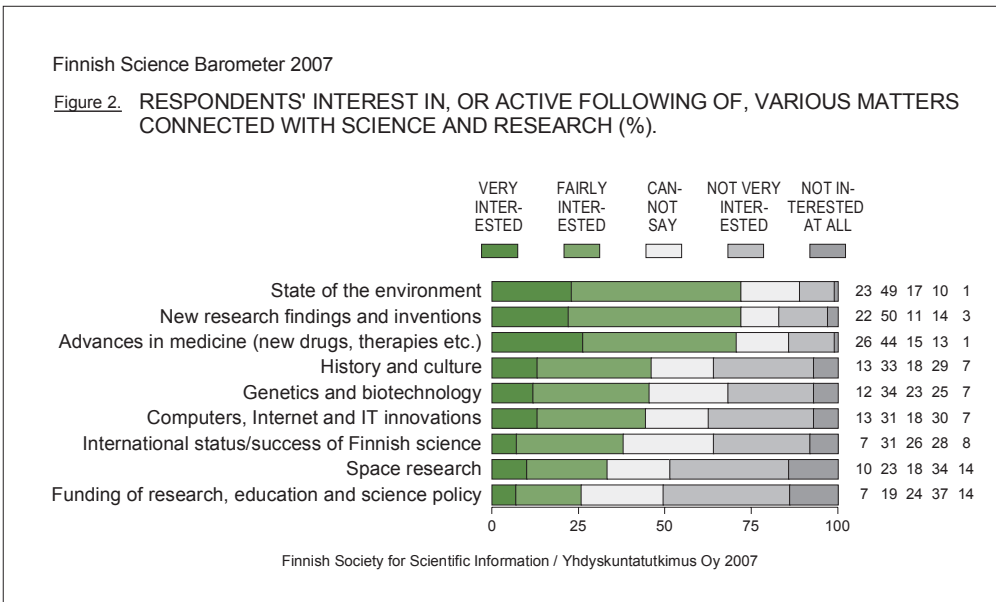
The changes in these results relative to the situation three years earlier are in general very minor ones, smaller than over the previous three-year interval.

Closer examination of the interest factors nevertheless reveals considerable differences between population groups. In the first place, interest in certain topics, most obviously culture and the arts, sport and economics, is clearly bound to gender, the first two being female preferences and the latter two male ones. Nature and the environment, on the other hand, would appear to be of interest to both sexes. Interest in science (i.e. science, research and technology) is somewhat greater among men than women, declines almost linearly with age, and is directly associated with the respondent's level of education.

## 2.2 Objects of scientific interest

The respondents' interest in science was also evaluated qualitatively, by asking them how actively they followed developments in different aspects of science and research. In addition to six specific areas selected as examples, various other more general indicators of an interest in science were examined.

The leading topics of interest were nevertheless so evenly balanced that the naming of a single favourite is very much a matter of interpretation (Figure 2).



Taking the two ends of the scale into account (interested vs. not interested), it is the state of the environment that just about wins out, but if the degree of interest is included (the proportion who were “highly interested”) the leading topic would be medicine, as seven out of every ten respondents reported following the development of new medicines and forms of medical treatment.

In practise, however, almost as many people were interested in scientific progress, new findings and innovations in general, and a large majority of the respondents reported an all-round interest in new knowledge. A somewhat lesser interest, although still considerable, was shown in historical and cultural research, genetics and biotechnology, and information technology. The least interest among the specific topics mentioned was shown in space research.

The most distant of all aspects was felt to be matters connected with science policy, for although these are questions of essential importance for the scientific community as a whole, they are understandably highly abstract for members of the general public who are asked to evaluate them. Somewhat more

attention was given to the international success enjoyed by Finnish science, however, as just under two-fifths of the respondents were interested in the global competition over knowhow.

### *Changes in the interest shown in certain fields and differences between population groups*

Comparison with earlier results again points to a stable situation. The interest shown in different branches of science has remained virtually unchanged.

The mean attitudes reported for the whole population nevertheless contain within them substantial variations between population groups. Again gender is of major significance, with medicine and genetics interesting the women more than the men, while the men were inspired more by information technology and space research. Similarly a general interest in innovations and new research findings was somewhat more common among the men.

Concerning the branches of science, it is clear that most sectors of the population follow developments in medicine, including those who are not especially oriented towards science in other respects, and that interest increases with age. Interest in the state of the environment is similarly both broad-based and fairly evenly distributed throughout the population.

The people are much more clearly divided when it comes to research into information technology, however, although interest increases distinctly with level of education and declines with age and is concentrated most obviously in those with an educational background in technology or the natural sciences.

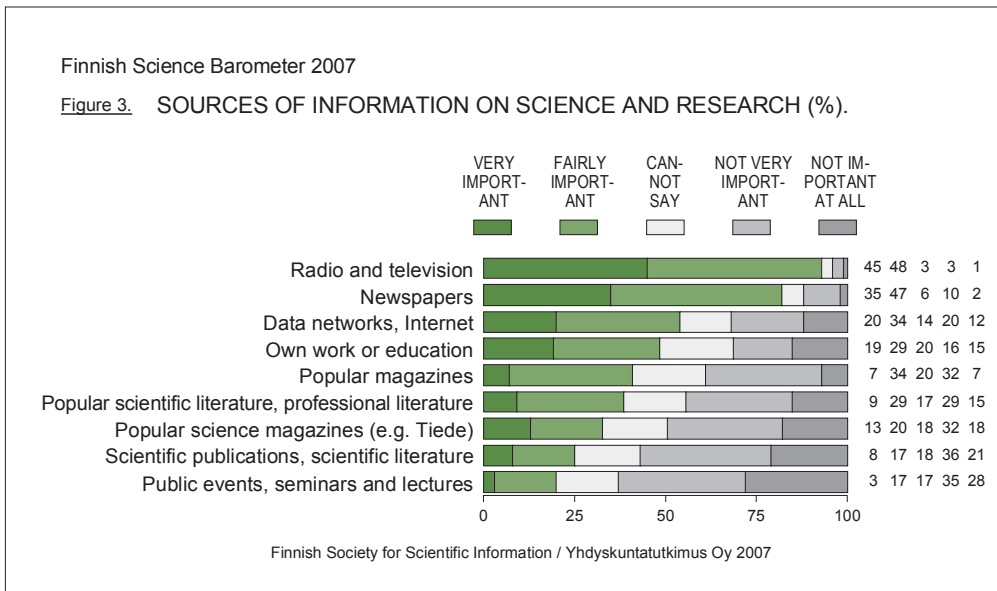
The following of developments in genetics is most common among women, the well-educated and people with a training in health care or the social services, while historical and cultural research particularly attracts those with a higher education, especially in the humanities. Space research appeals mostly to men, young people and those with an education in technology or the natural sciences, while science policy is almost entirely a matter for those with an academic background.

## **2.3 Sources of information on science**

The approach adopted when asking the respondents to say how important various sources of information on science and research were for them laid emphasis on the frequency of using these information channels rather than the amount of information gained from them or the profundity of that information. It should also be noted that the categories of sources are not necessarily very clearly defined.

The mass media stand out clearly as the most significant source, and as in most attempts to trace the general public's sources of information, the electronic

media narrowly win out over the printed media, i.e. television and radio are regarded as somewhat more significant sources than newspapers (Figure 3).



Immediately behind the traditional mass media come the World Wide Web and data networks in general, while almost every second respondent mentioned his or her own work or studies. General magazines and periodicals were cited by two-fifths of the respondents, and popular professional or non-fictional literature also achieved a prominent position. Of less significance were public events, seminars and lectures, scientific publications and scientific literature.

#### *Changes in sources of information and sources preferred by certain population groups*

The differences relative to the earlier results were relatively minor, the most significant being concerned with the role of the Web and other data networks, as the proportion of respondents mentioning these had increased by 10 percentage points over the last three years. Magazines of a general nature and magazines specializing in reporting on the achievements of science (such as Tiede) were also mentioned slightly more often than previously.

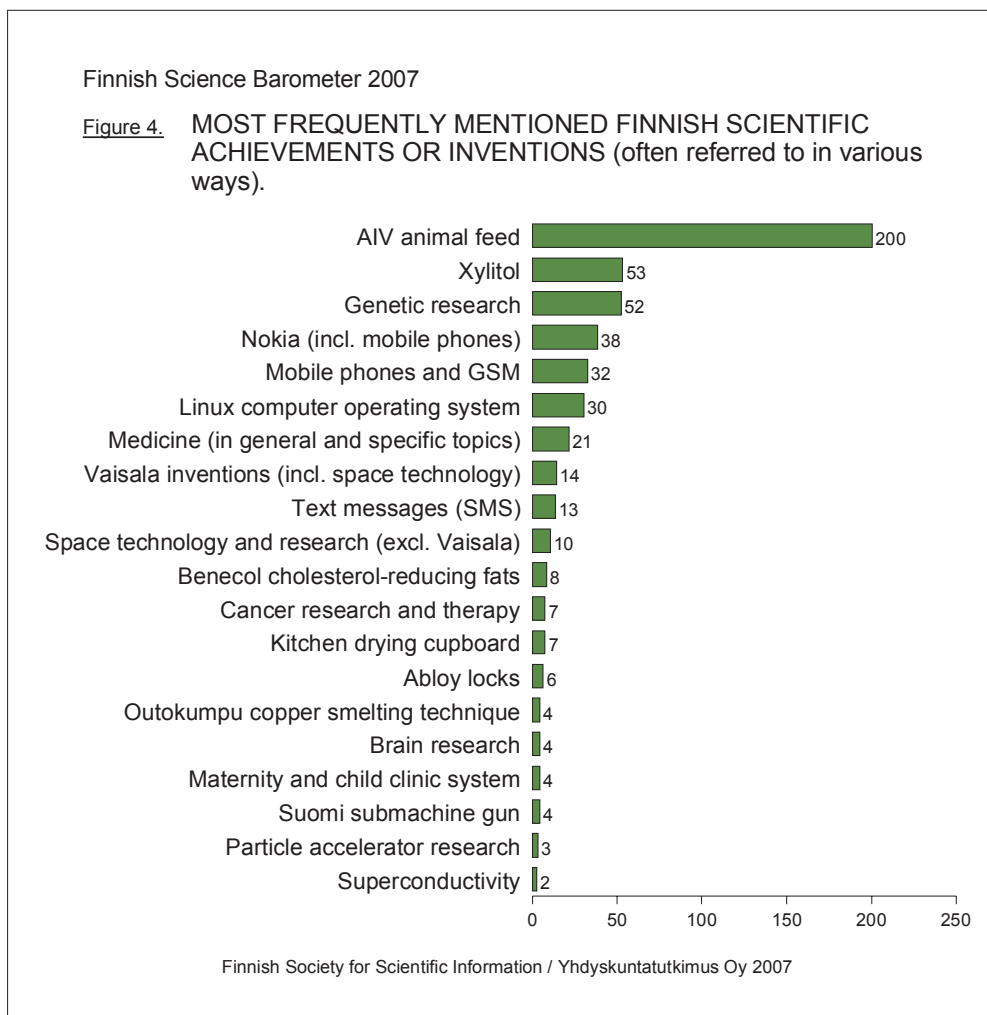
The use of particular sources of information was not closely bound to gender, but age was a prominent explanatory factor for the use of data networks, with young people marked out as users of the Web. The importance of one's own work and studies was also emphasized among the younger age groups (being largely attributable to its dependence on the age and education structure of the population). Level of education was in fact correlated with use of most of the sources of information.

## 2.4 Awareness of science

### *Ability to name Finland's scientific achievements*

The survey also set out to explore the public response to information on science, i.e. what had remained in people's minds as a result of following news on science. This was the first time that a survey had focused on Finland's scientific achievements. The respondents were asked what they would quote as an example of a Finnish scientific achievement or invention. No time restriction was placed on this, so that they could mention scientific accomplishments throughout the course of history. There are nevertheless other places in this report where information is given on the amount of scientific knowledge accumulated by individuals or comparable aspects.

One in six of the respondents were able and willing to name a Finnish scientific achievement (Figure 4),



the most responsive population groups being those with the highest level of education, managerial staff and – naturally – those interested in science. The younger adults fell below the average for the whole population on this score.

In terms of content, a very large number of diverging topics were mentioned, often expressed in highly original ways, and many respondents listed a number of innovations applying to quite different fields. No attempt was made to apply any far-reaching quantitative content analysis to these very variable statements in order to obtain classes and subclasses of topics, but instead the results were approached in a “softer” manner, as this in any case provided an adequate picture of how these things were perceived among the general public.

The AIV solution applied to fresh livestock feed to improve its preservation, as developed by the Nobel prize-winning chemist A. I. Virtanen, emerged as the most widely recognised Finnish scientific achievement, followed, albeit at a considerable distance, by the xylitol sweetener prepared industrially from the xylane contained in birch wood and, at virtually the same level numerically, the many references to genetic research and the study of the genome. The next two categories after that referred in different ways to the wireless communication company Nokia and/or cellular phones in general.

Considerable numbers of references were also made to the Linux computer operating system developed by Linus Torvalds and various medical topics, including cancer and brain research, and likewise space research.

### **3 IMPRESSIONS OF SCIENTIFIC ACTIVITY**

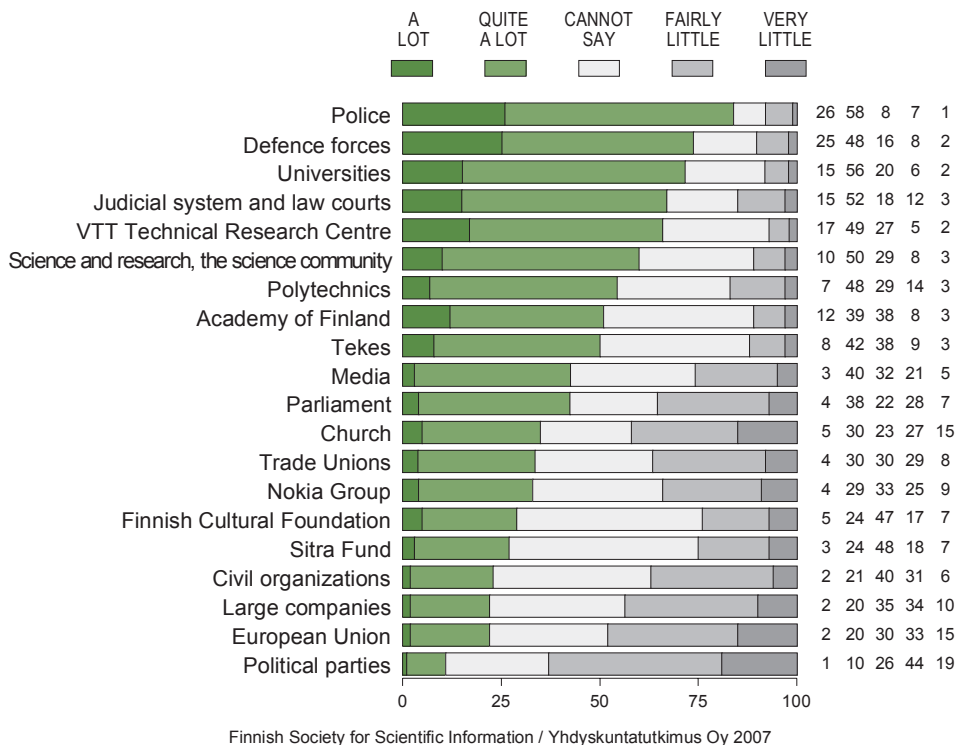
This latter part of the report will consider the Finns’ attitudes towards science from various viewpoints, chiefly the esteem in which science and scientists are held, people’s trust in scientific information and those who produce it, the standard of Finnish science and research, and the social repercussions, benefits and risks attached to developments in science.

#### **3.1 Trust in science and research**

When the respondents were asked how great a trust they felt in various social institutions and actors, in the form of a list of twenty organizations and bodies representing different sectors of activity within society, it was the organizations responsible for internal and external security, the police and defence forces, that proved to be especially trustworthy in the eye of the general public (Figure 5), but science, both as an institution and in the form of certain specifically named organizations, also merited a relatively high degree of trust. All the instances connected with science and research that were put forward for evaluation were to be found near the head of the list.

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Figure 5. DEGREES OF TRUST FELT FOR GIVEN INSTITUTIONS WITHIN SOCIETY (%).



The highest placed among the scientific organizations were the country's universities and polytechnics, which gained in practise (taking both ends of the scale into account) equally as great a trust as the defence forces. More than two-thirds of the respondents expressed considerable trust in the universities and less than a tenth very little trust, while the polytechnics, which were included in the list for the first time, fell short of this but still fared relatively well.

Of the scientific and research organizations mentioned by name, the highest place went to the Technical Research Centre of Finland (VTT), although the Academy of Finland and the Finnish Funding Agency for Technology and Innovation (TEKES) also achieved results that indicated a substantial degree of trust in spite of being less well-known to the general public (as seen in the high proportion of "Cannot say" answers).



The “scientific community” as a somewhat abstract cover term (“Science and research, the scientific community in general”), was also situated fairly high on the list of institutions in which the public had a firm trust, which in the light of the other indicators of a trust in science, points to a widespread esteem among ordinary citizens. The public image enjoyed by science and its relations to society at large can thus be regarded as being in good shape at the present time.

### *Changes in trust and differences between population groups*

Both a considerable degree of permanence and certain notable changes were to be perceived in the trust expressed for national institutions relative to the situation three years earlier, in addition to which there were also some steady trends that could be traced over the total period of six years. The outstanding characteristic of the trust shown in science and scientific organizations was nevertheless permanence. The most significant change relative to the previous survey concerned the political and administrative system, which inspired public confidence to a greater degree than earlier. There was also less scepticism expressed towards the EU.

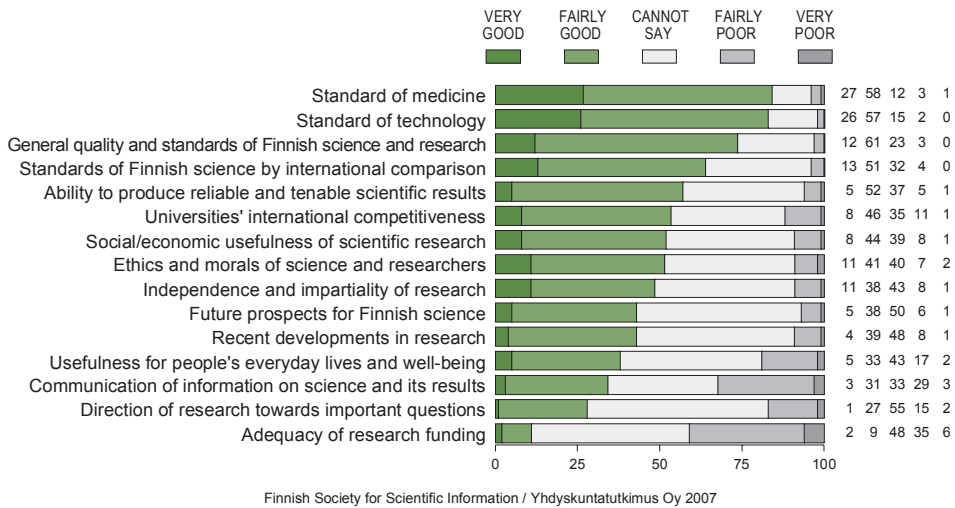
The variations in trust between population groups were not very pronounced, and the results with respect to many actors were relatively consistent throughout the whole population. This also applied in general terms to the measures of trust in science. Education was the one factor that caused evaluations to fluctuate, however, as trust in all the scientific organizations and actors indirectly connected with science increased according to the respondent’s level of education.

## **3.2 The state of science**

A somewhat more concrete and analytical picture of the position of science in public opinion can be gained from the series of items evaluating various aspects of the current state of science in Finland. The respondents were asked how well or poorly certain matters connected with science and research were being looked after in Finland nowadays.

The results in general were fairly positive (Figure 6). The overall evaluations of the quality and standards of science and research indicated a broad approval of the situation, the best evaluations being accorded to standards in medicine and technology, although recognition was given to the scientific community as a whole, so that it can be said that the standard of this country’s science and research is regarded as being generally good. Almost three-fourths of the respondents gave it a good grade and very few a poor one. The situation did not vary greatly even when a more external viewpoint was adopted, as two-thirds of the respondents also regarded Finnish science as being of a good standard internationally.

Figure 6. OPINIONS ON THE CURRENT STATE OF SCIENCE AND RESEARCH IN FINLAND (%).



Another factor closely connected with this, namely the international competitive potential of the country's universities, was also seen as unproblematic, with the majority regarding the situation as good and critical opinions remaining very much in the minority. This topic was included in the questionnaire for the first time in 2007.

A positive attitude is also reflected in opinions regarding the general development perspectives for Finnish science, in that evaluations of both recent developments and future prospects leaned towards the favourable end of the scale, reflecting both credit and optimism. More than two-fifths of the respondents were of the opinion that developments in research over recent years had been positive ones, and scarcely anyone was of the opposite opinion. Equally many people had high expectations regarding future prospects in Finnish science.

Positive rather than negative opinions also win out in the evaluations of scientific activity in terms of its achievements and general relevance. There is a general belief in the ability of science to produce reliable and tenable results, although the question as to whether these correct results concern the correct topics arouses somewhat greater uncertainty, so that only just over a fourth of the respondents subscribe to the opinion that research is directed towards matters of essential importance.

Replies regarding the usefulness of scientific research to society and the economy pointed consistently in one direction only, but a visibly greater degree of reservation was shown on the question of whether it was of benefit to citizens' everyday lives and welfare.

Views on the ethics and morality of science also proved positive, with substantially more people considering the state of affairs to be good than bad, and the same was also true in practise as far as the independence and impartiality of research was concerned.

Far more negative reactions were evident on the issue of the sufficiency of finance for research and the dissemination of scientific information and results to the general public.

### *Changes in perceptions of the state of science*

Comparison of the findings with those of the 2004 survey reveal both a persistent underlying structure and certain changes in attitude, the main direction in which is towards greater scepticism. This increase in reservations held regarding science and research is quite inescapable when comparing all three surveys.

Although the evaluations of the state of science are good in absolute figures, they are not as good as previously, the trend being visible more in a decline in explicitly positive opinions rather than in a rise in negative ones, i.e. there are more people nowadays who have doubts on the matter.

This is particularly true of the most pronounced changes of all. Although the proportion of respondents regarding the state of science in Finland as good had declined by 7 percentage points, the proportion regarding it as poor had risen by only 1 percentage point. It is also significant that the largest percentage change of all concerned prospects for the future rather than the performance of the scientific community up to now, i.e. there are fewer people who are optimistic about future developments in Finnish science (a drop of 8 percentage points).

Even so, the respondents were also less enthusiastic about past achievements as well, as seen from the decline of 7 percentage points in the proportion approving of research activities in recent years and of 5 percentage points in those rating the quality and standards of Finnish science and research as good. A symptomatic decline may also be seen in the case of specific branches of science, with slightly less people regarding standards in technology and medicine as good.

Evaluations of ethical and moral issues related to science, on the other hand, are somewhat higher than before, while assessments of the independence and impartiality of research remain at their previous level. Taken together, these results point towards an improvement in the public image of science.

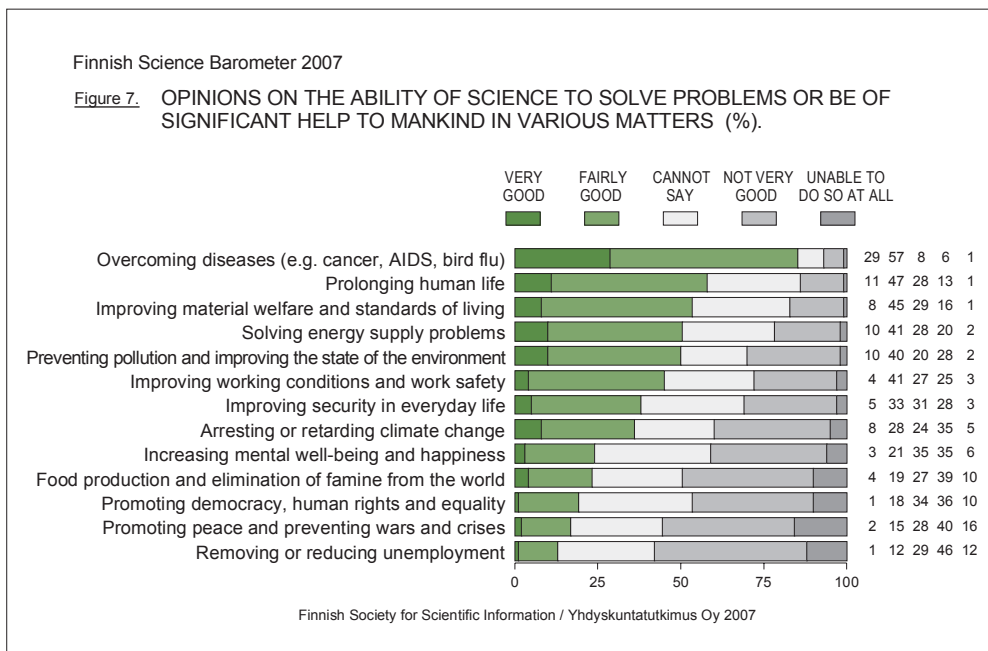
## Differences in evaluations between population groups

Gender-related differences in opinions on the state of science remained virtually non-existent, and age had very little effect. Education was a somewhat more divisive factor, however, with most evaluations emerging as more favourable among those with a higher level of education.

### 3.3 The ability of science to solve problems

Another aspect investigated in the survey was expectations regarding the impact of science. The respondents were asked what they thought of the ability of science to solve various problems, or at least to offer some help in this respect. The approach here was a global one, i.e. it was not a question only of Finnish science.

In general people were optimistic in their expectations, but although science was believed to be of help in many important matters, there was also a broad area in the profile of answers in which pessimism prevailed (Figure 7).



The greatest unanimity was noted on the subject of the ability of science to help the human species to overcome disease, with four-fifths regarding the possibilities as good and less than one in ten as poor. The second topic in order of probability was also connected with health, the ability to bestow longevity.

Significantly many people believed that science could improve our well-being, although this optimism concerned mostly material affluence and standards of

living, while it was regarded as more or less impotent in the field of mental well-being and personal happiness and opinions on its ability to improve security in our lives were somewhat uncertain, with pessimistic attitudes almost as common as optimistic ones.

Science was seen as offering good prospects in terms of safety at work and the improvement of working conditions in general, but little hope was perceived on the second topic related to working conditions, as science was regarded as powerless to eliminate or alleviate unemployment.

Expectations concerning the environment were markedly polarized, although there were significantly more respondents who believed that science could prevent pollution and even improve the state of the environment than those who did not believe that it was capable of doing so. Opinions became more doubtful, however, when the questions moved to the level of specific environmental hazards. Just over a third of the respondents believed that science could develop means for arresting or retarding climate change, but there were slightly more who did not believe it could do this.

Greater confidence was shown regarding the resolving of energy supply problems, where every second person assumed that science could offer significant help while the pessimists amounted to one fifth.

Apart from unemployment problems, the least hopeful sphere of life was the promotion of peace and prevention of wars and crises, while opinions on the impact of science on food production and the elimination of hunger in the world were almost as pessimistic. The same was true of the advancement of democracy, human rights and equality.

#### *Changes in expectations and differences between population groups*

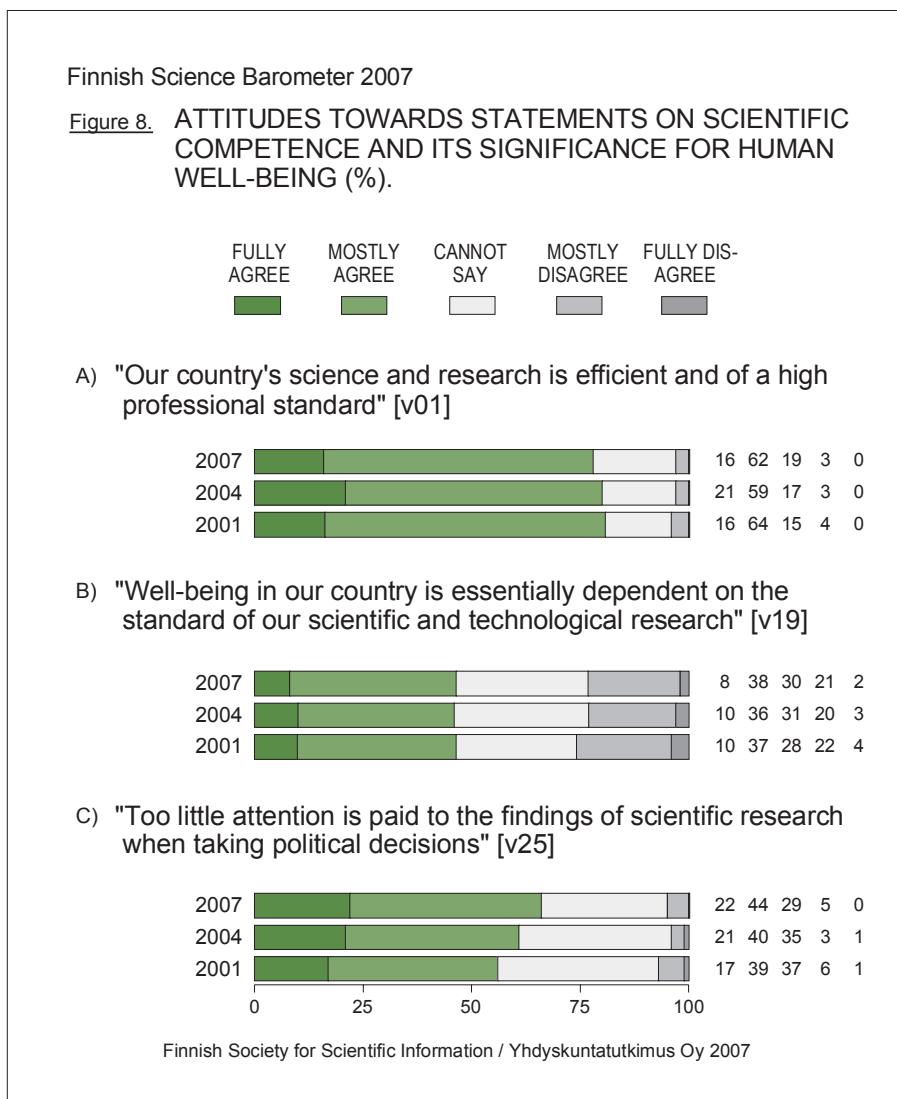
Comparison with the 2004 results does not demonstrate any great differences. The power and potential of science are appreciated in much the same way now as earlier, although opinions are systematically slightly more optimistic than in 2001. Similarly the general trend over the whole period is for an improvement rather than a decline in appreciation. The abilities of science to solve our problems were seen as being broadly similar in all population groups.

### **3.4 Other opinions on science – concretizations and additional viewpoints**

In addition to the above thematic items, the questionnaire also contained a section with 42 statements placed in random order to which the respondent was expected to react. It is important when interpreting the results to remember that the reactions were much more closely bound to the exact wording of the statements than in the case of the direct questions.

### 3.4.1 Esteem for science and its importance for people's well-being

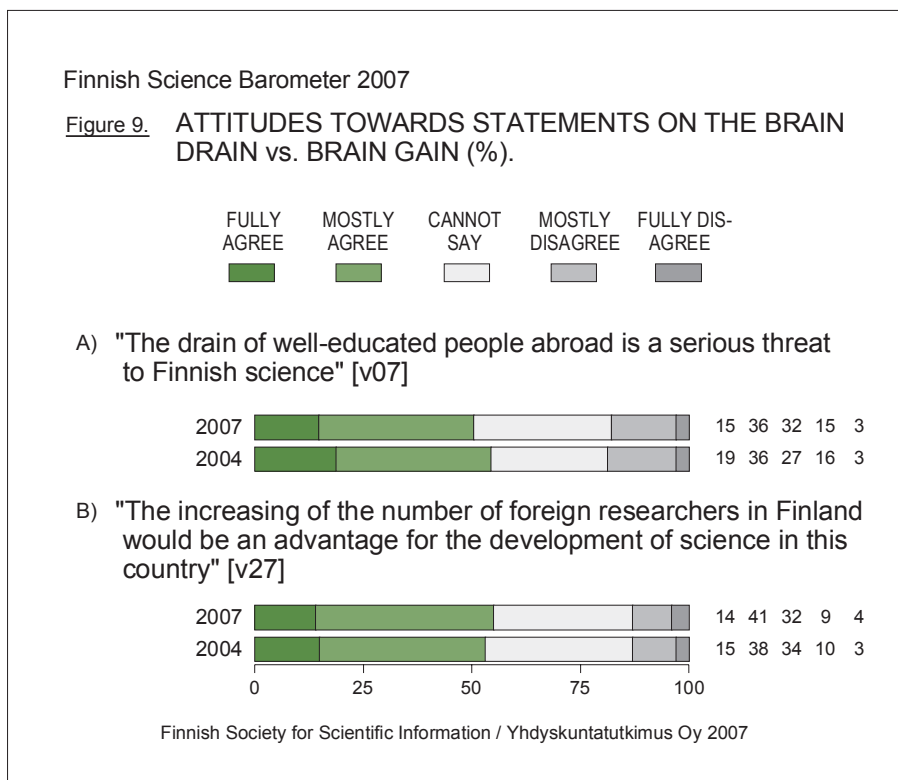
The responses to the statements support earlier findings that the public have a widespread trust in science and respect for the standard of this country's scientific research. Almost four-fifths of the respondents agreed with the statement that "Our country's science and research is efficient and of a high professional standard" (Figure 8). There was in practise no disagreement with this, nor was any significant change in opinion visible relative to the previous survey.



There were more differences of opinion regarding the general importance of science for people's well-being, in that while almost half of the respondents accepted that "Well-being in our country is essentially dependent on the standard of our scientific and technological research", one fourth rejected such a view. This result was also similar to those reached on previous occasions.

Two-thirds agreed that "Too little attention is paid to the findings of scientific research when taking political decisions", the remaining population having no opinion on the matter, so that practically no one disagreed with the statement outright. This view that scientific knowledge "is wasted" has become slightly more common since the previous survey (an increase of 5 percentage points), a trend similar to that noted between the first two surveys.

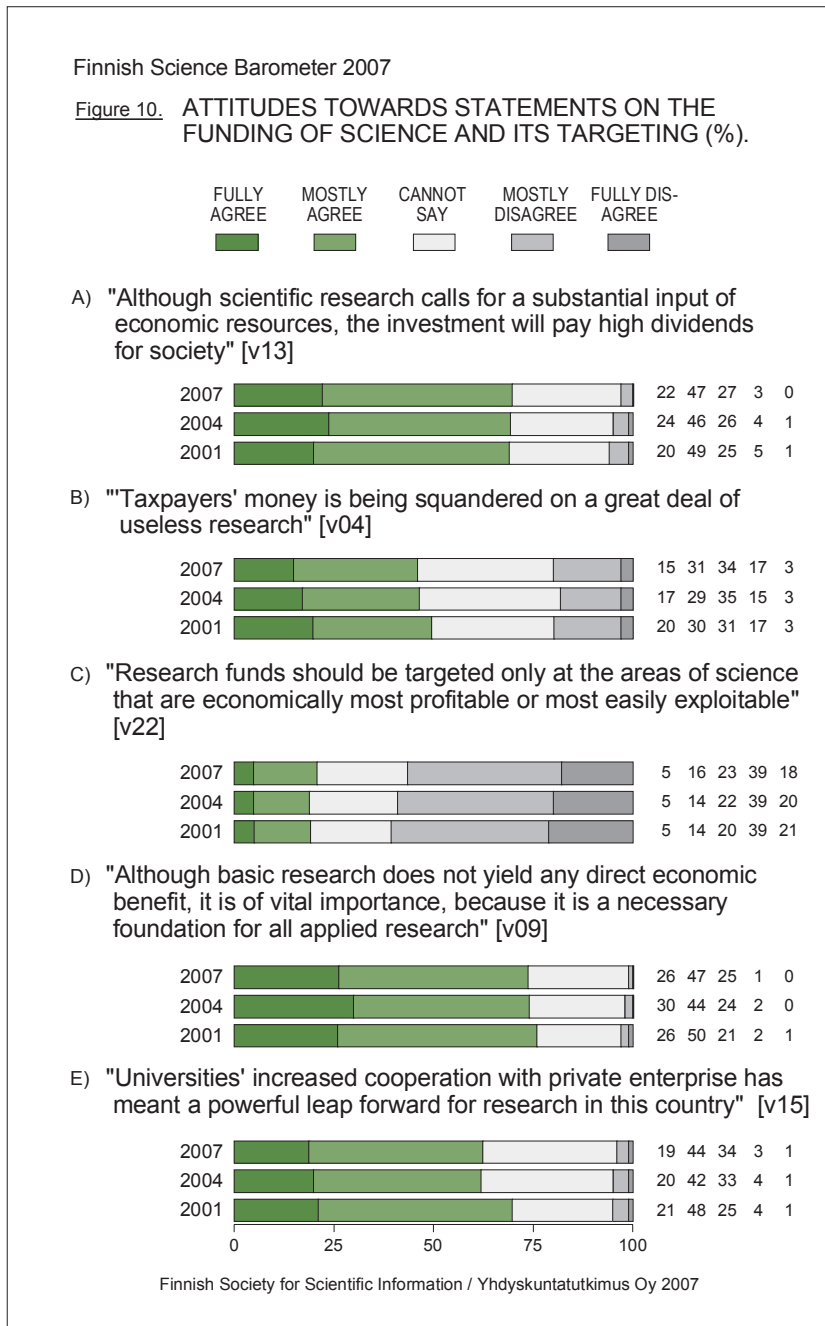
Where official evaluations of the state of science in Finland have perceived the relatively low proportion of foreign researchers in Finland as a potential source of problems and have also drawn attention to the drift of Finnish scientists abroad, i.e. the "brain drain" is regarded as a threat and imports of talent are considered necessary (Figure 9), the statement that "The drain of well-educated people abroad is a serious threat to Finnish science" gained agreement from half of the respondents, implying a weakening of such fears relative to the previous occasion. Correspondingly, a majority subscribed to the proposal that "The increasing of the number of foreign researchers in Finland would be an advantage for the development of science in this country". Although the distribution of reactions on this issue has not altered significantly, the result points to greater acceptance than rejection of this principle than in earlier times.





### 3.4.2 Funding of science, targeting of resources and competition

It is a clear majority view that “Although scientific research calls for a substantial input of economic resources, the investment will pay high dividends for society” (Figure 10).



There were scarcely any respondents who disagreed with this. Comparison with earlier results indicates that belief in the profitability of investing in research has not diminished, at least. On the other hand, there were distinctly more people who accepted the statement that “Taxpayers’ money is being squandered on a great deal of useless research” than there were those who disputed the fact. The number was similar to that recorded three years earlier but slightly less than six years earlier.

Although it is well understood that research needs adequate funding and people are ready to grant that funding, the question still remains as to what type of research the funding should be directed towards. The survey provides a surprisingly clear answer to this question, as considerable criticism is directed at short-term scientific endeavours that have an evident profit motive behind them. Likewise the statement that “Research funds should be targeted only at the areas of science that are economically most profitable or most easily exploitable” is rejected out of hand, although it must be said that while the distribution of responses does not differ significantly from that in previous surveys, the claim has gained rather than lost support. The more educated sectors of the population are unanimous in their opposition to it, of course, but it is notable that no population group has a majority in favour of it.

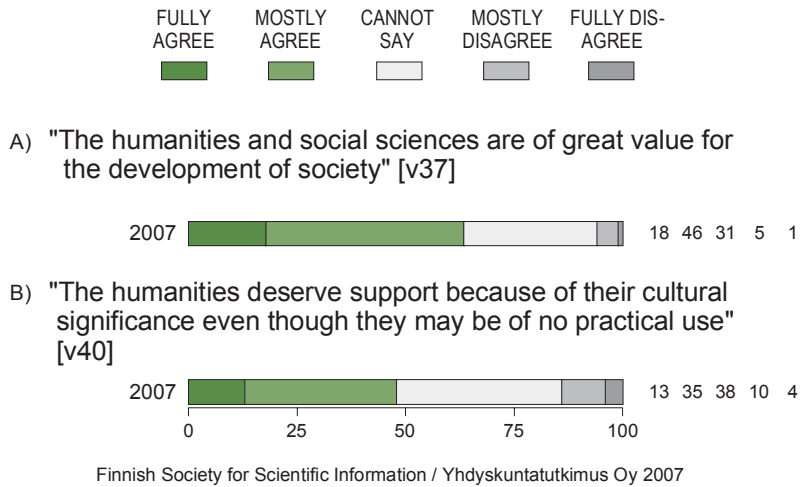
Similarly there is strong support for basic research, with three-fourths in agreement with the statement that “Although basic research does not yield any direct economic benefit, it is of vital importance, because it is a necessary foundation for all applied research.” Opposition to this is only marginal, and the distribution of reactions has for practical purposes remained unchanged.

Also connected with funding is the question of where the money comes from. In this respect the preference for basic research does not appear to carry with it any demand that science should function in isolation from the rest of society, since wide support is expressed for the claim that “Universities’ increased cooperation with private enterprise has meant a powerful leap forward for research in this country.” This is the same result as in 2004, whereas the previous three-year interval witnessed a marked increase in scepticism on this score.

Two of the new items included in this questionnaire concerned activities in the humanities (Figure 11). This branch of study also gained a considerable degree of acceptance, and the statement “The humanities and social sciences are of great value for the development of society” was accepted by almost two-thirds of the respondents. Only a small minority were of a different opinion. Although the humanities gained support from the social sciences in this instance, the distribution of responses was so clear that they cannot be regarded as being in any danger of condemnation as an unnecessary branch of academic study. A more controversial statement questioning their usefulness was “The humanities deserve support because of their cultural significance even though they may be of no practical use”, which was accepted by about a half of the respondents, whereas the number rejecting it was relatively small. This result is consistent with the findings of a general avoidance of the notion of economic benefit in connection with science reported above.

Finnish Science Barometer 2007

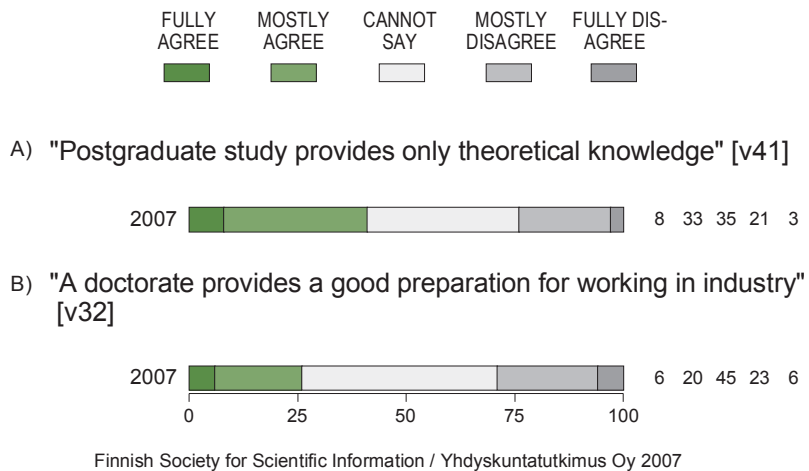
Figure 11. ATTITUDES TOWARDS STATEMENTS REGARDING STUDY OF THE HUMANITIES (%).



Two other new statements were intended to sound out opinions regarding doctorates and postgraduate research (Figure 12).

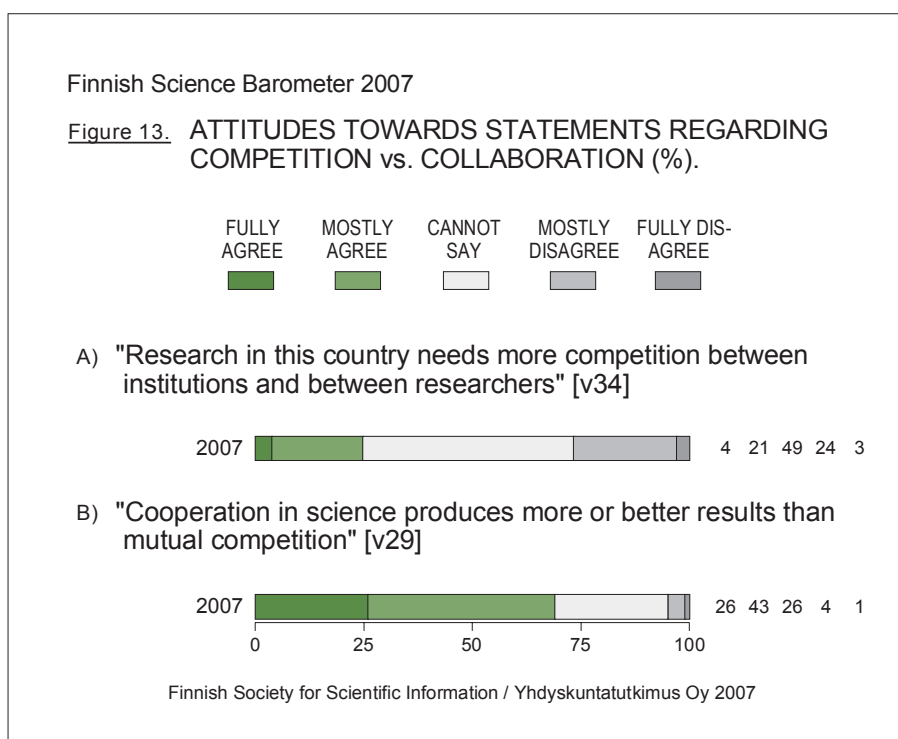
Finnish Science Barometer 2007

Figure 12. ATTITUDES TOWARDS STATEMENTS REGARDING DOCTORATES (%).



The claim that “Postgraduate study provides only theoretical knowledge” failed to elicit any clear signal, but the emphasis on acceptance suggests that the stereotypes regarding researchers who are too well-read to appreciate the niceties of practical life still live on in people’s minds. The differences between population groups were not significant in the case of this item, however. A still more indeterminate result emerged from the claim that “A doctorate provides a good preparation for working in industry”, which was accepted by about one fourth of the respondents and rejected by slightly more, while the remainder expressed no opinion at all.

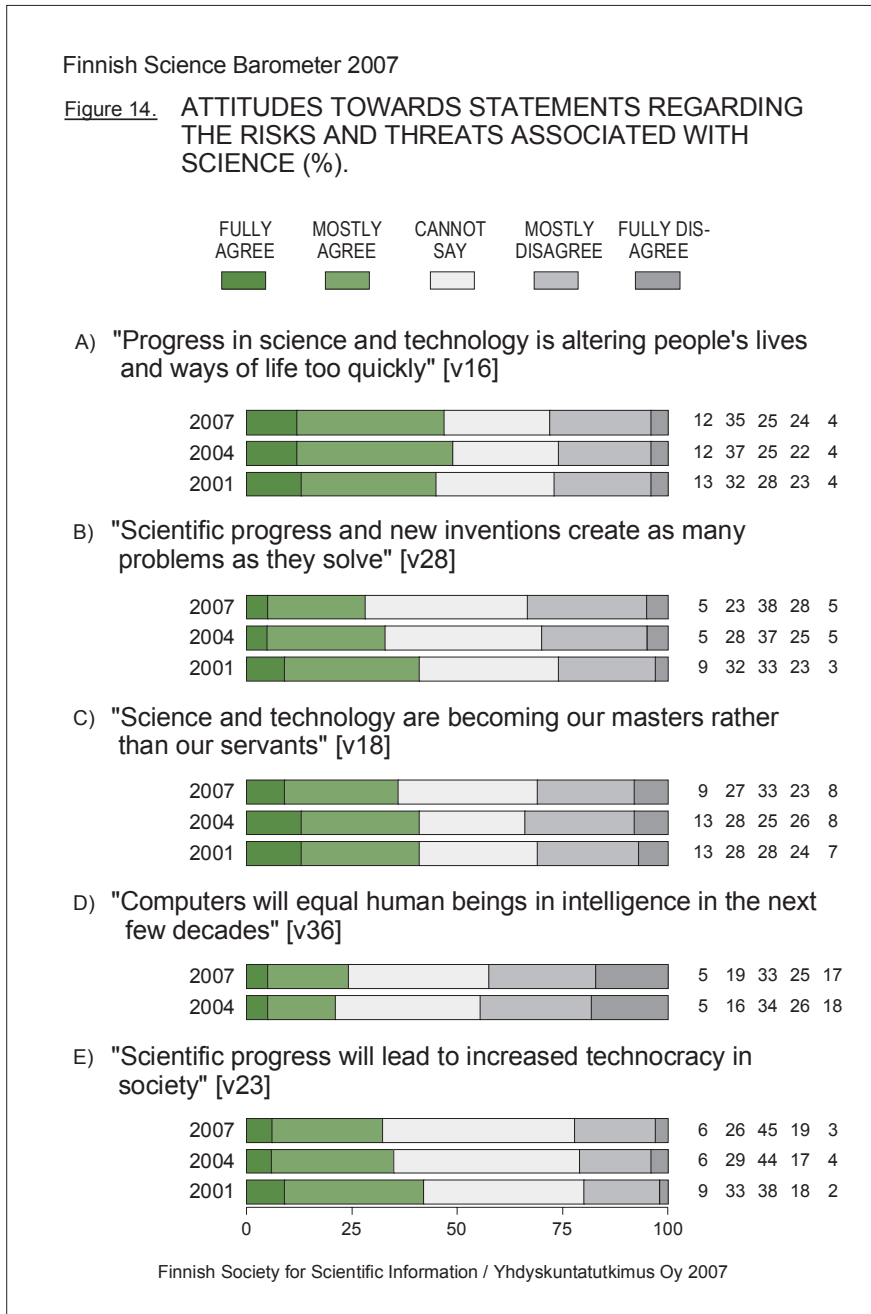
A third pair of new statements to be evaluated was concerned with the importance of competition in research (Figure 13). The suggestion that “Research in this country needs more competition between institutions and between researchers” was given a highly nondescript reception, in that half of the respondents could express no opinion on the subject and the remainder were of little help as they were fairly equally divided between those who accepted the statement and those who rejected it. The differences between population groups were also relatively minor ones, with those who were unable to formulate an opinion in the majority in all cases.



The second proposition concerned with competition and collaboration, that “Cooperation in science produces more or better results than mutual competition”, proved more acceptable. More than two-thirds of the subjects were in agreement, and only one twentieth rejected it. The differences between population groups were again very minor ones.

### 3.4.3 Risks and threats attached to science

Science is naturally not regarded universally as a good thing, and it is significant that the statement "Progress in science and technology is altering people's lives and ways of life too quickly" elicited more agreement than disagreement (Figure 14).



The extent of the agreement was admittedly slightly less than three years previously, but more or less the same as in 2001. Also, feelings varied greatly between population groups, fears being dispelled somewhat in the groups with a higher level of education and in the younger age-groups. A greater proportion of the women were anxious over the effects of science and technology on ways of life than of the men.

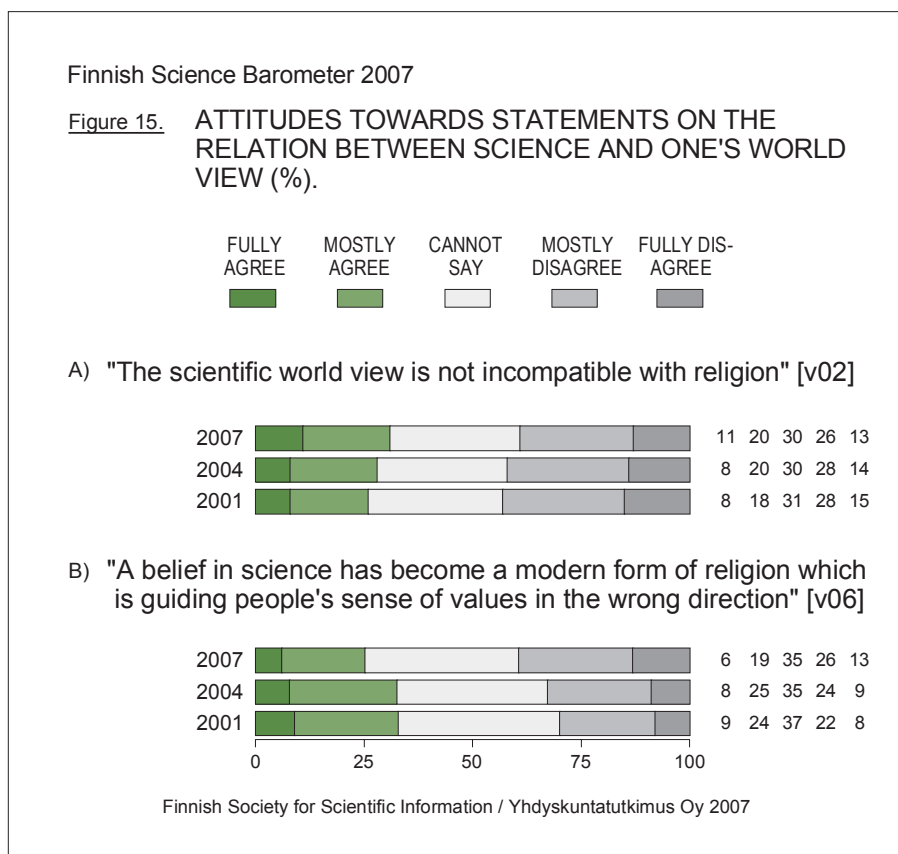
A second general statement of the same kind, that “Scientific progress and new inventions create as many problems as they solve” divided the respondents fairly equally, implying a significant decrease (of 5 percentage points) in those in agreement relative to the 2004 results. Since a similar difference had been noted on that occasion relative to 2001, the image of science may be said to be markedly “less harmful” than when these surveys first began. More people regarded the statement that “Science and technology are becoming our masters rather than our servants” as true than as false.

The statement that “Computers will equal human beings in intelligence in the next few decades” was connected with much the same theme, but was regarded as improbable rather than probable, although the number in agreement with it had increased slightly. Again the major factor dividing opinions within the population groups was education, as only a small minority of the academically inclined believed in this scenario.

A third of the respondents were in agreement with the statement that “Scientific progress will lead to increased technocracy in society” and a fifth disagreed with it. This represents a source of anxiety that has diminished in the course of these surveys, although it has also become more difficult for people to formulate a clear opinion on the matter.

### 3.4.4 Science and our world-view

About one respondent in three was of the opinion that “The scientific world view is not incompatible with religion” (Figure 15), while slightly more disagreed, about two in every five. Very little change had taken place relative to the previous survey, although slightly less people perceived an incompatibility.

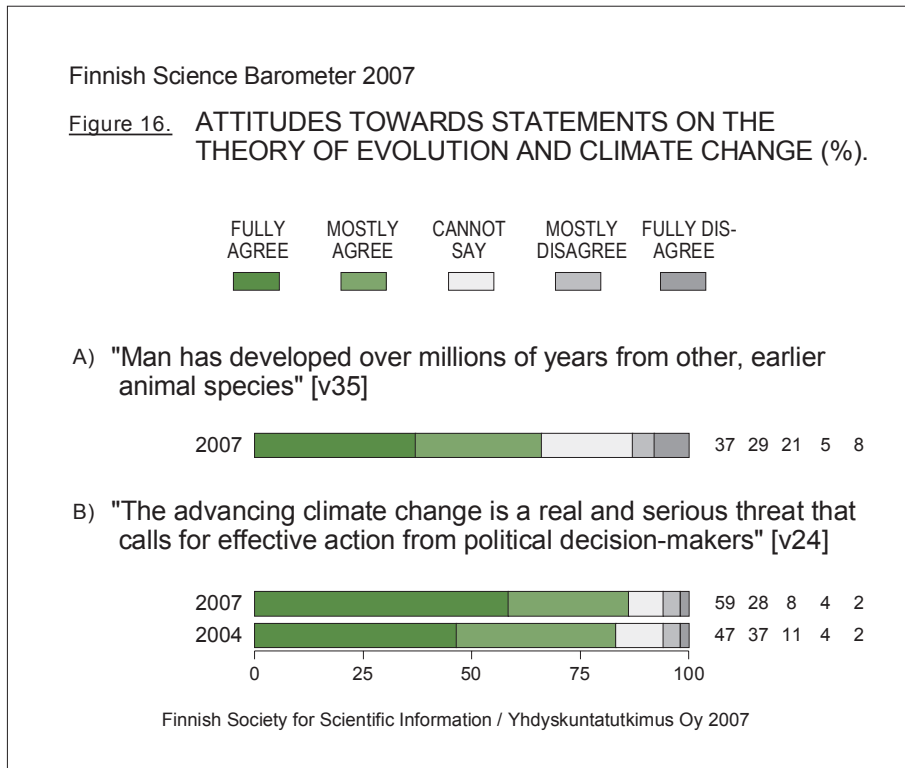


One fourth of the subjects agreed that “A belief in science has become a modern form of religion which is guiding people’s sense of values in the wrong direction”, while slightly more, two-fifths contested the argument. This represents an unusually great change compared with the previous questionnaire, in that the proportion holding the view that a belief in science imparted a warped sense of values had diminished considerably (by 8 percentage points). This is the second largest change in the results to be seen in the extensive statement section of the questionnaire.

Some new topics were also included in the survey, including the statement that “Man has developed over millions of years from other, earlier animal species”, which gained wide, although not universal, acceptance (Figure 16), two-thirds of the respondents agreeing with it and one-eighth opposing it,

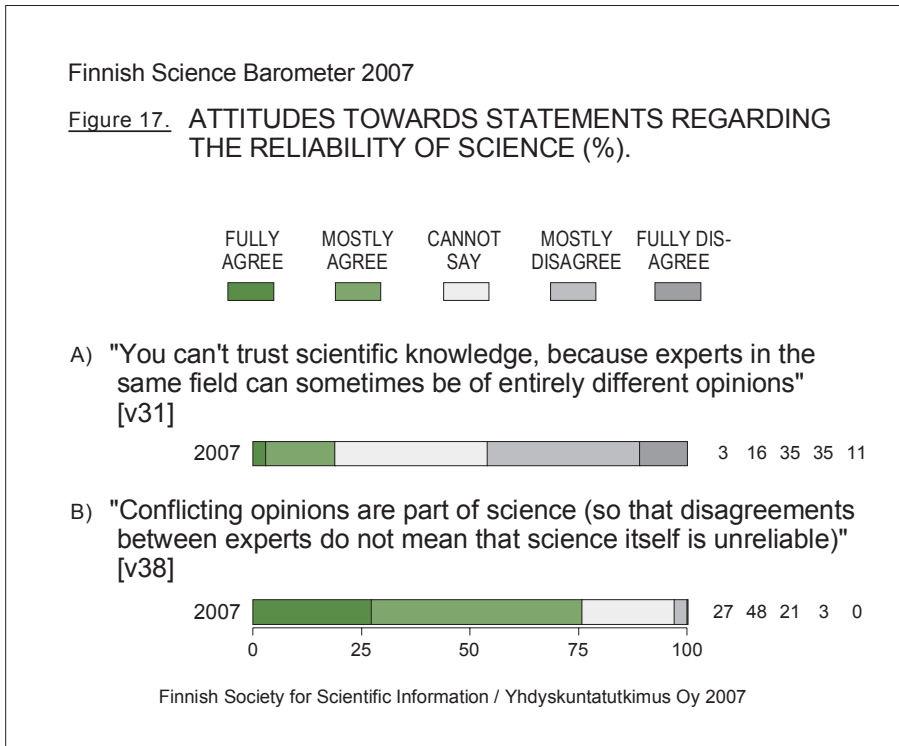


while about a fifth could not express any opinion. The responses showed a pronounced, almost linear variation with age, approval of the statement being most common in the younger age-groups, and in practise an equally clear correlation existed with education, the view of our origin as lying within the animal kingdom increasing as a function of education. Outstanding among the occupational and social groupings were students and managerial staff, while place of residence was significant in as far as the evolutionary view gained in strength from north to south within the country and from the small rural districts towards the large towns.



Practically the whole population was behind the argument that “The advancing climate change is a real and serious threat that calls for effective action from political decision-makers.” This was in fact the most unanimous response to be found anywhere in the whole questionnaire, representing a more positive result than in the previous survey and above all a strengthening of existing opinions.

Two supplementary statements had been included in this survey that were concerned with the credibility of science and those who practise it (Figure 17). The topic was the toleration of conflicting claims within science, and the results were indicative of a moderately good ability to “read” scientific results. A relatively small proportion of the population fell for the statement that “You can’t trust scientific knowledge, because experts in the same field can sometimes be of entirely different opinions”, whereas although the remainder were not unanimous in rejecting this view their distribution does speak of a generally more enlightened outlook.



The opposite contention, that “Conflicting opinions are part of science (so that disagreements between experts do not mean that science itself is unreliable)”, was subscribed to by three-fourths of the subjects, and practically no direct opposition to it was expressed. Thus it may be said that the Finns understand that science is constantly correcting itself and that no knowledge represents the final truth.

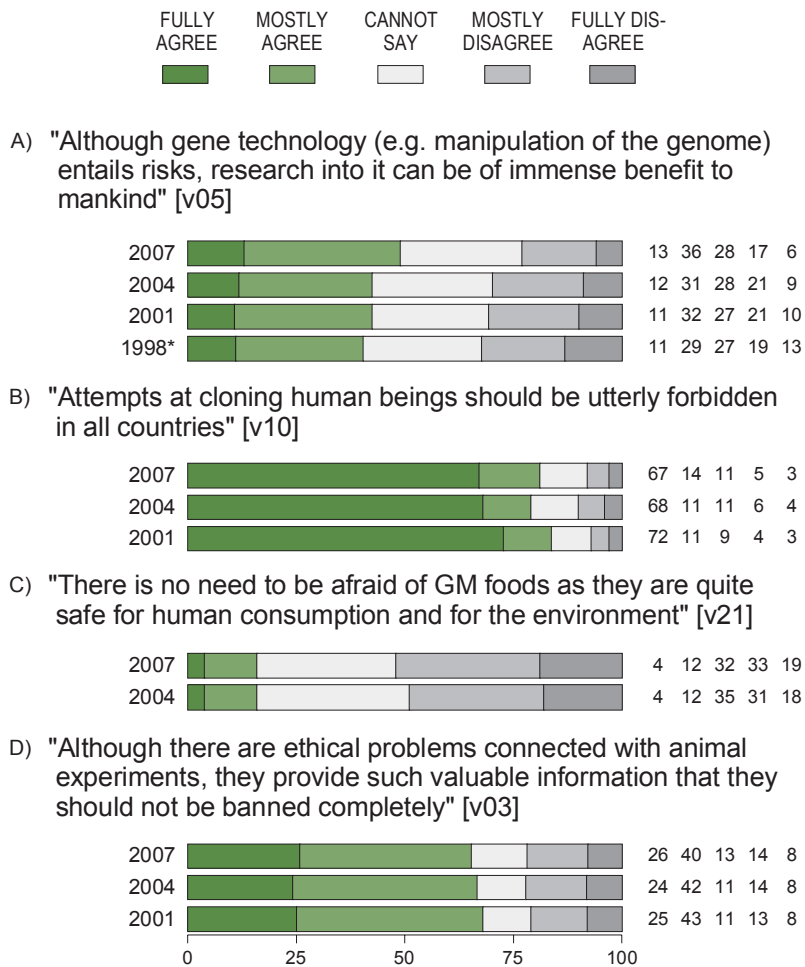
Among the population groups, tolerance of controversy in science increased with the level of basic and vocational education and could be taken for granted where people with an academic education and virtually all those claiming an interest in science were concerned. The influence of place of residence was also visible in this connection.

### 3.4.5 Ethical and moral aspects of science

It is possible to examine the ethical and moral questions related to science from a number of viewpoints, focusing on the topics or aims of scientific research, the methods used in it and the personal activities of the researchers. About a half of the respondents agreed with the statement that “Although gene technology (e.g. manipulation of the genome) entails risks, research into it can be of immense benefit to mankind” (Figure 18)

Finnish Science Barometer 2007

Figure 18. ATTITUDES TOWARDS STATEMENTS REGARDING ETHICAL AND MORAL ASPECTS OF SCIENCE: RESEARCH TOPICS AND METHODS (%).



Finnish Society for Scientific Information / Yhdyskuntatutkimus Oy 2007

and about one-fourth disagreed. This represents a higher level of acceptance than three years earlier, a significant change in view of the fact that opinions had previously remained relatively stable. The better educated subjects were more favourably disposed to gene technology than average, and the men somewhat more so than the women. Attitudes were distinctly more critical among the younger subjects.

The second item concerned with genetic research yielded a clear result, in that the vast majority of respondents were of the opinion that "Attempts at cloning human beings should be utterly forbidden in all countries". No relaxation in attitudes was to be seen relative to the previous survey, and unanimous opposition to the cloning of humans was found even among those who otherwise appreciated the value of genetic research. The women were still more firmly opposed to it than the men.

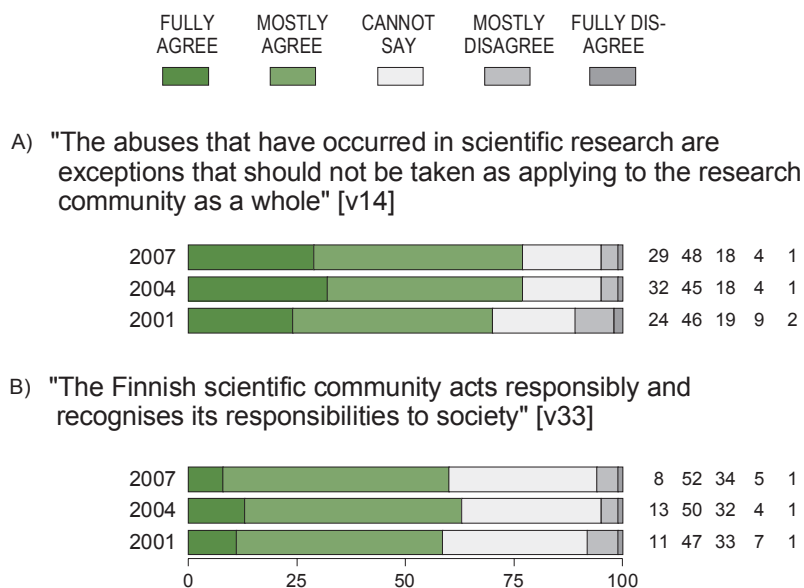
The third aspect of genetic research to be assessed was gene-manipulated foodstuffs. There were relatively few who were prepared to accept that "There is no need to be afraid of GM foods as they are quite safe for human consumption and for the environment", while more than half disagreed outright. Unlike the situation with the beneficial aspects of genetic research in general, acceptance has decreased rather than increased. Practically all sectors of the community are united in their suspicions with regard to GM foods, although women appear to have still greater reservations on the matter than men, and young people perceive them as a threat more often than older people. The trend relative to education is weaker than on most issues.

The opinion that "Although there are ethical problems connected with animal experiments, they provide such valuable information that they should not be banned completely" gained far more support, with as many as two-thirds of the subjects in agreement with it and just over a fifth disagreeing, in effect the same distribution as before.

The third category of issues under the ethical heading, concerned with the personal endeavours of researchers produced results that reflected widespread approval for the existing situation (Figure 19). More than three-fourths of the respondents agreed that "The abuses that have occurred in scientific research are exceptions that should not be taken as applying to the research community as a whole", and only one subject in twenty disputed this. The degree of acceptance was thus on a par with that recorded three years earlier. Variations between different sectors of the population on this issue were minimal.

Finnish Science Barometer 2007

Figure 19. ATTITUDES TOWARDS STATEMENTS REGARDING ETHICAL AND MORAL ASPECTS OF SCIENCE: RESEARCHERS' PERSONAL AND COLLECTIVE ACTIONS (%).



Finnish Society for Scientific Information / Yhdyskuntatutkimus Oy 2007

The view that “The Finnish scientific community acts responsibly and recognises its responsibilities to society” was subscribed to by three-fifths of the respondents, with practically no one objecting to it. This is a significant finding at a time when manifestations of social responsibility are being demanded of all actors within society. Although the distribution of responses does not depart markedly from that reported earlier, it does point to a slight increase in reservations on this issue. As above, fluctuations in attitudes between population groups remained relatively minor.

### 3.4.6 The status of quasi-scientific literature and research

A wide range of quasi-scientific doctrines and systems of knowledge and belief exist that compete for public attention with science and the information that it generates. The survey set out to assess the credibility in the public eye of six doctrines of this kind that are not recognised by the scientific community. The results indicate that they are indeed able to permeate the ranks of the general public to some extent (Figure 20).

Almost a half of the respondents agreed with the view that “Nature healers possess some knowledge and skills that are unknown to medical science” and one fourth disagreed, implying a slight decline in trust for alternative medicine relative to the previous survey.

The statement “Although homeopathy is not recognised by medical science, it can be effective in curing illnesses” aroused above all a sense of uncertainty in the minds of the respondents, and eventually rather more of them were inclined to accept than dispute it. In other words, although people do not really believe the statement they are not prepared to disassociate themselves from it entirely. The distribution of replies was for practical purposes the same as three years earlier.

Reaction to the claim that “Herbal medicines are in many cases better than those prescribed by a doctor and bought from a pharmacy” were a degree more critical. About a fourth of the subjects believed in the efficacy of herbal medicines and about a half did not. This represented a decline in belief relative to the previous survey and marked the largest change in opinion to be recorded for any of the statement items in the questionnaire.

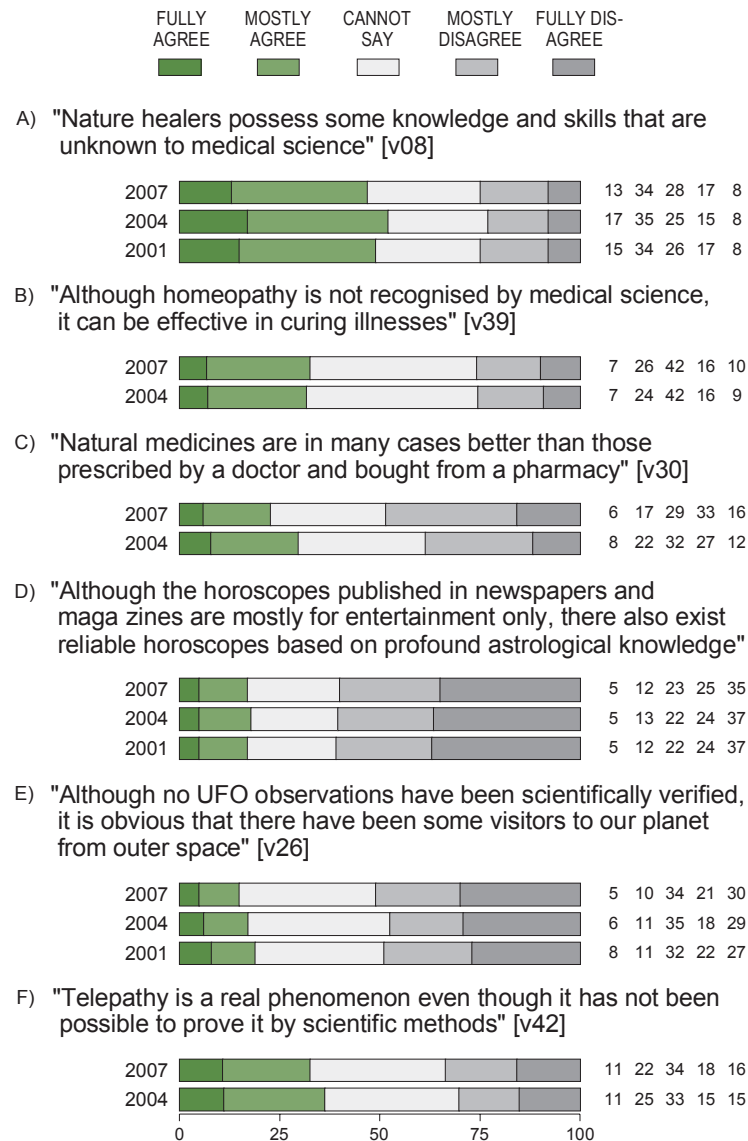
The respondents were not unanimous in denying that “Although the horoscopes published in newspapers and magazines are mostly for entertainment only, there also exist reliable horoscopes based on profound astrological knowledge.” A sixth of the respondents agreed with the statement and a large number were dubious. The remaining majority can be regarded as a large or small number according to how you interpret it. The result as such had not altered relative to the previous survey.

The statement regarding the existence of unidentified flying objects also elicited more denials than acceptances, with just under a sixth of the respondents agreeing that “Although no UFO observations have been scientifically verified, it is obvious that there have been some visitors to our planet from outer space.” A half rejected the claim entirely and a third remained doubtful. Comparison with earlier results pointed to a slightly more critical stance.

The claim that “Telepathy is a real phenomenon even though it has not been possible to prove it by scientific methods” divided the population fairly evenly into three large groups, a third accepting this, a third being doubtful and a third denying it. This represents a slight increase in the rejection of a belief in telepathy.

Finnish Science Barometer 2007

Figure 20. ATTITUDES TOWARDS STATEMENTS REGARDING QUASI-SCIENTIFIC DOCTRINES (%).

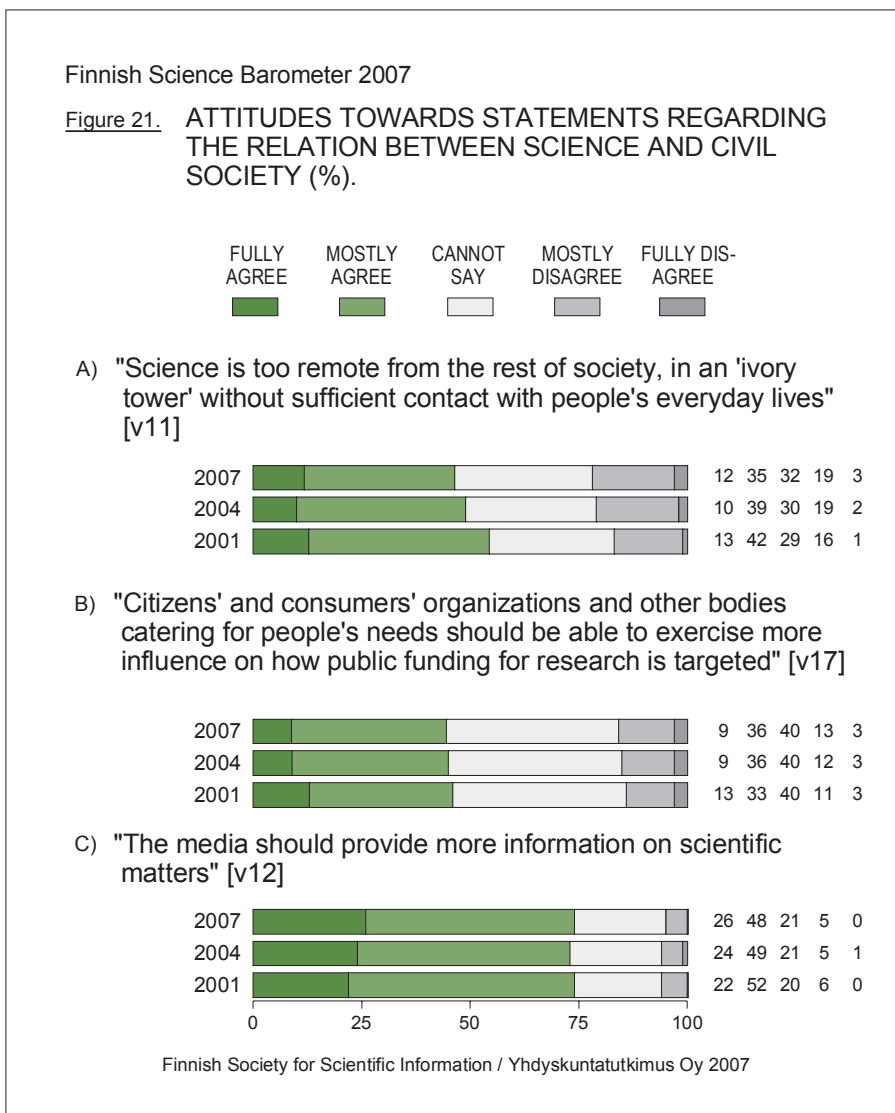


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### 3.4.7 Science, citizens and civil society

The statement items also included some views on interaction between science and the people on a more general level, assessed in terms of mutual distance, the exercising of influence and the role of the media (Figure 21). The view that “Science is too remote from the rest of society, in an ‘ivory tower’ without sufficient contact with people’s everyday lives” was accepted by a half of the respondents, while a fifth felt that it had sufficient contact with everyday life. It was not regarded as so remote as in earlier surveys.

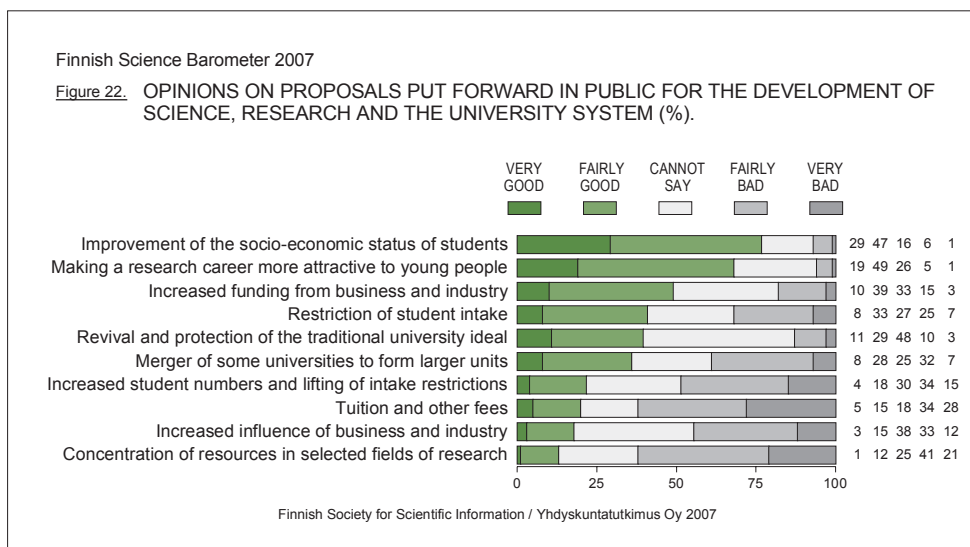


As far as the reactions aroused by the claim that “Citizens’ and consumers’ organizations and other bodies catering for people’s needs should be able to exercise more influence on how public funding for research is targeted” were concerned, less than a half subscribed to this rather clumsily phrased demand (which is an official objective of EU science policy), practically equally as many had no opinion on the matter and the remaining small proportion were openly against the idea. The result does not for practical purposes differ from that obtained in earlier surveys.

Three-fourths of the respondents were of the opinion that “The media should provide more information on scientific matters”, as high a proportion as in the earlier reports.

### 3.5 Attitudes towards proposals for the development of science policy

Finally, the questionnaire set out to investigate attitudes towards plans to reform scientific activity and the universities in Finland, assessing people’s opinions by means of a new set of questions in which the respondent was asked to assign weight to ten development proposals that have been raised in public in terms of how good or bad they deemed them to be. The resulting ranking of the proposals was a very clear one (Figure 22), with two matters of importance to young people at the head of the list: improvement of the socio-economic status of students and making a research career more attractive for young people. Third came increased funding from business and industry, although with the reservation that while private sector money was welcome, this should not imply any involvement in the decisions taken, since the proposal that business and industry should have more influence on scientific research aroused more objections than support.



Although the critics of private sector participation were worried that companies would only be interested in research information that was rapidly exploitable in a commercial sense, a related suggestion regarding the revival and preservation of the ideal of academic freedom engendered most of all a feeling of uncertainty. Even so, a very much larger proportion of the subjects accepted the notion than rejected it.

Opinions were clearly divided on the proposal that the numbers of university places should be restricted, although with rather more in favour than against it. Correspondingly, the opposite proposal, that the student intake should be increased and entry restrictions abolished, was regarded as a very much less desirable solution.

The concrete suggestion of an intervention in the structure of production with respect to science, i.e. the merger of some of the existing universities into larger units, resulted in a tie, with just as many for as against it.

The proposals that aroused the most objections of all were that registration and tutorial fees should be introduced for university studies and that resources should be concentrated in certain selected fields of research that are regarded as the most important. This latter finding confirms the results presented above that emphasis should be placed on the breadth of scientific activity.

Designed to measure people's relations to science and other influential factors in society, the Science Barometer once more confirms that the achievements of science are greatly appreciated. The main source of anxiety for the Finnish people was climate change.

**A study of the Finns' attitudes towards science and their opinions on scientific and technological progress**

The Science Barometer 2007 was commissioned by the Finnish Society for Scientific Information from the social research company Yhdyskuntatutkimus Oy and is the third survey in a series carried out at three-year intervals.

