

Summary of the Finnish Science Barometer 2013

A STUDY OF THE FINNS' ATTITUDES TOWARDS SCIENCE AND THEIR OPINIONS ON SCIENTIFIC
AND TECHNOLOGICAL PROGRESS



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Finland and science

Finland invests in knowledge-based competence and aims to increase the overall standard of education. Research is seen as the foundation of knowledge and know-how, in turn promoting sustainable economic growth and immaterial as well as material welfare. Finland invests about 3.7% of GDP in research and development, a total sum of approximately seven billion euros. Out of this, the private business sector accounts for approximately 70%, and higher education and the rest of the public sector for approximately 30%. Some 80,000 people work in research and development, more than a third of whom are women. Finland is among the top performers in this field in relative terms. According to the European Commission Innovation Union Scoreboard 2013, Finland is regarded as one of the European Union's innovation leaders.

The principal elements in the Finnish research and innovation system are education, research and product development, coupled 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.

Finland has consistently been pointed out in international comparisons as a model country in terms of reading and comprehension skills. Increasing emphasis has been placed on the need to develop scientific reading abilities, with responsibility seen to lie with the scientific community, the school system and the whole of society. This report presents representative results regarding the Finns' attitudes towards science.

For more information on Finnish science and innovation activities: www.research.fi

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1. INTRODUCTION

How does the public perceive science? Does the general public share the opinions, protestations and visions of the upper level of society? Is the scientific community effective in its research? Is it competent? Can researchers be trusted? Is scientific research worth investing in? Do science and research have any priority amongst the interests, valuations and attitudes of Finns?

The Finnish Science Barometer 2013 seeks answers to these questions, analysing the Finns' relationships and attitudes towards science on the basis of nationwide survey data. This is the fifth report of its kind; the Finnish Science Barometer survey was also implemented in 2001, 2004, 2007 and 2010. With repetition, the barometer has become a systematic method for studying how the public perception changes.

The approach is empiric and limited to the survey data, and does not offer any definitions of science. The concepts are adopted from public debate and standard media language.

The results presented in the report are based on written responses given by 971 individuals in a survey carried out during the summer of 2013. The survey target group, representative of the 18-70-year-old population of Finland (excluding the Åland Islands), was picked randomly from the Population Register.

The Finnish Science Barometer 2013 was commissioned by the Finnish Society for Scientific Information (Tieteentiedotus ry) from Yhdyskuntatutkimus Oy and produced by researcher Pentti Kiljunen.

This English-language summary comprises key results from the original report by Kiljunen, available for download in PDF format only in Finnish at www.tieteentiedotus.fi.

2. THE FINNS' INTEREST IN SCIENCE

Studying the Finns' relationship with science began with a closer examination of their level of interest in news, programmes and texts concerning a wide range of issues and fields. The winning category was environment and nature, with three out of four respondents interested in these fields. Social affairs in general came in second, with 72%, so it is paradoxical that the actual administration of society and politics interest people not nearly as much (47%). Economy-related themes were of interest to four out of ten respondents. The findings related to culture and art (48%) became polarised; although sport and entertainment are hugely popular, they also have their opponents.

For science, the results are quite flattering. Two out of three (65%) says they follow science, research and technology-related issues with great interest. Possibly influenced by the social acceptance factor, these numbers also need to be viewed in light of overlapping themes. Science is a board-based phenomenon; much like history, it basically covers all walks of life. Be that as it may, the level of interest towards science can be deemed remarkably high.

Comparing the interdependencies of targets of interest shows a correlation between various themes. Interest in science has a positive correlation with the interest to follow economic and environmental issues in particular, and also increases interest in politics, society and culture. With nature and other targets of interest, the correlation has to do with the overlapping of themes. However, the correlation of science with entertainment is inverse, repellent even. Zero correlation with sport indicates there is no direct link between the two activities. Dependencies can be considered to correspond with habitual perceptions. Mainly positive intercorrelation between themes is indicative of the cumulative nature of interest; active interest in one theme generally leads to having interest in others.

A comparison of this year's results with the findings from three years ago shows that, on the whole, not much has changed. The most significant single change concerns science. The percentage of respondents interested in science has increased by eight per cent from 2010. This may be a positive change, but in the end, science is merely returning to its old position, not making a new conquest. In 2010, the results were pushed down by the underlying general atmosphere in society overshadowed by the sudden decline of economic conditions and the ensuing air of disappointment and melancholy. That same year, the media exposure and debate regarding science was probably not as favourable as in previous years on account of controversy over issues such as vaccines and the climate.

2.1 Medicine attracts most interest

Compared to earlier Science Barometers, the respondents' level of interest in various fields of science has remained almost unchanged. Top of the list (Figure 1.) is general interest in scientific development, new research findings and inventions, which the majority of Finns (70%) report as having.

The respondents find medicine the most interesting field of science. More than two-thirds (68%) state that they follow progress in medicine, such as the development of new drugs and treatments. This is quite natural since medicine can surely be viewed as the field of science which is closest to people's personal lives. Research findings related to the state of the environment are a close second (66%). This re-

sult also contains underlying primary concerns, because preserving the environment is the lifeline of our civilisation.

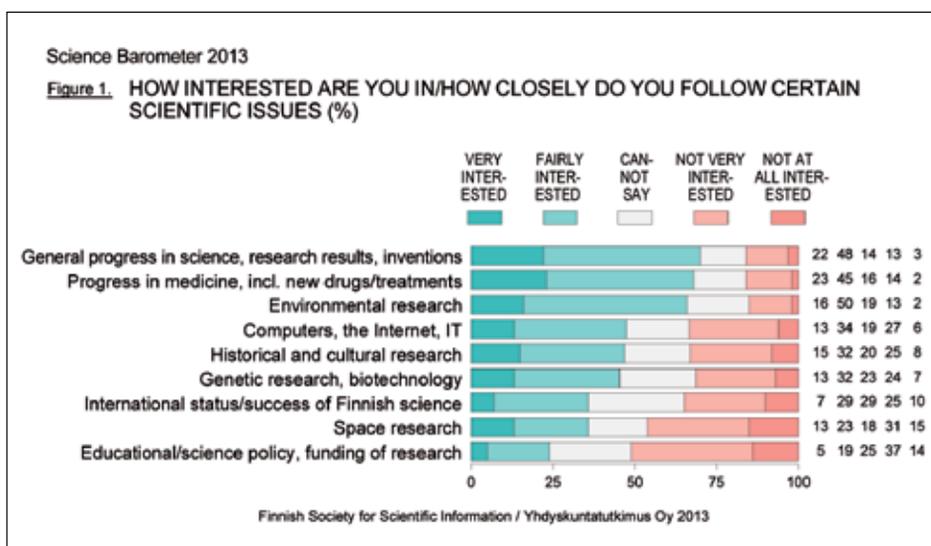
Slightly less interest is paid to historical and cultural research (47%), computers, IT and the Internet (47%), and genetic research and biotechnology (45%). Based on the responses, the least interesting field of science is space research (36%). Policies and funding issues related to science are deemed the least interesting category of all scientific themes (24%), because despite being of vital importance to the scientific community, the general public understandably has difficulty in forming an opinion on this abstract issue. The global competitiveness of Finnish science is deemed interesting by more than a third of the respondents (36%, Figure 1.)

Comparing the correlations between various fields of science only reveals positive interdependencies. Interest in one field of research does not reduce interest in others – if anything, quite the opposite.

Women have more interest in medicine and genetics than men, while men are clearly more interested in IT and space research than women. Interest in all kinds of new inventions and research findings also seems to be more characteristic of men than women. Progress in medicine is widely followed by all population groups. Unlike other fields of science, it even appeals to population groups that are otherwise not particularly keen on science.

Research data related to the state of the environment turns out to have a wide audience, with fairly equal interest levels in all population groups. IT-related research has more variation in the levels of interest, as interest increases in line with education levels and decreases with age.

Following genetic research is most common amongst women and people with higher education. Historical and cultural research is relatively more interesting to holders of a higher education degree in humanities. On average, space research is found more interesting by men, students and young people in general, and people with a degree in technology and/or science. Issues related to the policies and funding of science are mostly of interest only to academic people and those with other interests in science.



3. THE ROLE OF THE MEDIA

The respondents were asked to assess the importance of various information sources as providers of information regarding science and research. Mass media was a clear winner, while electronic media just barely beat printed media. Television and radio were deemed as slightly more significant sources of scientific information compared to newspapers (Figure 2.)

The Internet was not far behind traditional mass media. Nearly every other respondent named their work or education as a source of scientific information. Popular magazines were chosen by more than a third of the respondents, as was general non-fiction and professional literature. According to the responses, the least important sources of scientific information were public events, seminars and lectures. Other sources deemed less important included scientific journals and literature, as well as science centres, museums and exhibitions.

The percentages differ little from the previous science barometers. The order of information sources, for example, is exactly the same as three years ago. In light of long-term development, however, the changes send a clear message: shifting continues. The results show trend-like development in the interrelations amongst information sources.

The change in the role of the Internet is notable; the amount of respondents naming the Internet as a source of scientific information has risen by four percentage points from the last survey. The importance of this increase is emphasised by the corresponding lack of increase for other sources, with the exception of science centres. The Internet appears to have increased its importance at the expense of other information channels to varying degrees.

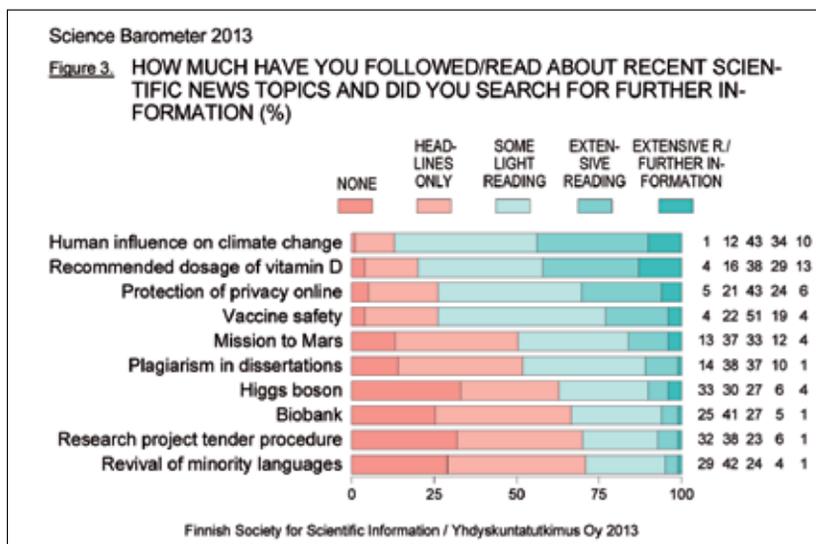
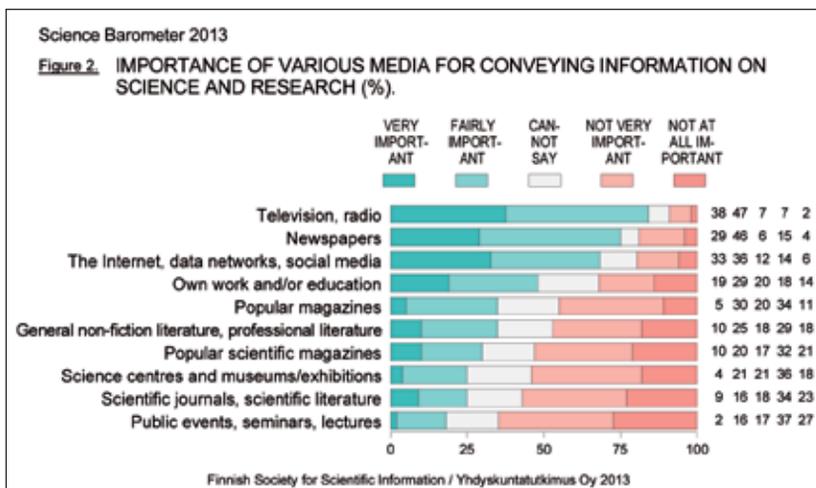
The main traditional channels of communication in particular, i.e. newspapers and television and radio, have experienced a decline in importance, and their long-term development seems to be on a downward trend. Based on the 2013 results, the earlier downward trend of scientific literature seems to have halted. Throughout the monitoring period, the most stable position has been held by popular scientific magazines. Public events and scientific literature have also managed to hold on to their position.

The significance of the Internet has increased amongst men and women, young and old, and other population groups with various levels of education. Presumably the responses reflect the situation in general, and not merely from the perspective of acquiring scientific information. The responses highlight the importance of seminars, lectures and other public events as sources of information for women, and the difference seems to be heading in the same direction with regard to television, radio and popular magazines. Men in turn base their knowledge relatively more on popular scientific magazines. Young people are clearly relying on the Internet. The importance of work and education is also emphasised more than average within younger age groups. Education level correlates positively with the use of nearly all sources of information.

3.1 Which scientific news and articles are remembered?

A new section of the Finnish Science Barometer investigated the public's responsiveness to the provision of scientific information, i.e. what do they remember about the scientific news and articles they have followed. The respondents were presented with a selection of fresh scientific news topics and asked to assess how much they had followed those news topics and how much further information they had acquired on them (Figure 3).

The news topics recognised by the greatest number of respondents, making



them also those most followed, were human influence on climate change and the recommended dosage of vitamin D. Two news topics nearly as widely recognised and followed were protection of privacy online and vaccine safety.

The global warming debate and controversy on vitamins and vaccines have a long history in Finland, with varying force and style, to the effect that scientific arguments have not always been represented to the fullest, at least not the most recent. As a result, some respondents may have broadened their response to cover all types of exposure of the topic in question.

The percentage of respondents who have acquired more information on certain news topics tends to reduce in line with how the news topics' level of specificity extends beyond the level of ordinary day-to-day conversations. At the same time, the percentage of respondents who have not even noticed the headlines on the news topic in question starts to increase. Such an intermediate group of less-recognised news topics includes the mission to Mars and plagiarism in dissertations. The remaining four news topics – the Higgs boson, biobank, research project tender procedure and revival of minority languages – failed to reach the awareness of the majority of the Finnish population.

4. THE CORNERSTONES OF TRUST FOR FINNS: THE POLICE, DEFENCE FORCES AND SCIENCE

The respondents were asked to assess their level of trust in various institutions and operators of Finnish society. The list of twenty operators comprised different types of organisations and communities from various sectors of society. The respondents have the highest level of trust in the two organisations responsible for the internal and external security of Finnish society: the police and the defence forces. Science, both as an institution and more specifically through certain organisations, is also fairly highly trusted (Figure 4).

Amongst scientific organisations, Finnish universities and other institutions of higher education are trusted nearly as much as the defence forces. More than seven out of ten respondents have great trust in these higher education institutions, while less than 10% report a lack of trust. Polytechnics or universities of applied science lag behind slightly, but still manage to inspire a great deal of trust.

VTT Technical Research Centre of Finland is the most trusted science and research organisation on the list. Also, the Finnish Funding Agency for Technology and Innovation Tekes and the Academy of Finland obtain high scores, showing their trustworthiness. The general category of scientific and research community almost reaches the same level of trust as VTT, which can be regarded as proof of citizens' wide-ranging appreciation of scientific activities in this country. According to the results, the public image of science and its relations to the community are in good shape,

but the same level of trust is not enjoyed in all sectors of society. Especially the responses concerning the country's political and administrative systems are awkward, perhaps even painful to read. Trust in political parties is virtually non-existent, and the Finnish Parliament also inspires more distrust than trust in people. The same goes for the European Union. These indications of the political alienation of Finns are not news, of course; the responses correspond to an almost standardised outcome of many studies.

For the remaining categories it can be stated that the responses concerning the media, trade unions and the Church are polarised. There is significantly more criticism towards the Church than expressions of trust. For major companies, the situation is clearly in the red, but NGOs are only slightly ahead of them on the list. Nokia is trusted less than other major Finnish companies as a general category.

The level of trust in science and scientific organisations has remained almost the same compared to the last science barometer (2010), which gave an indication of a shift in the stability of trust. In the end, this year's percentages of trust practically match the levels before 2010.

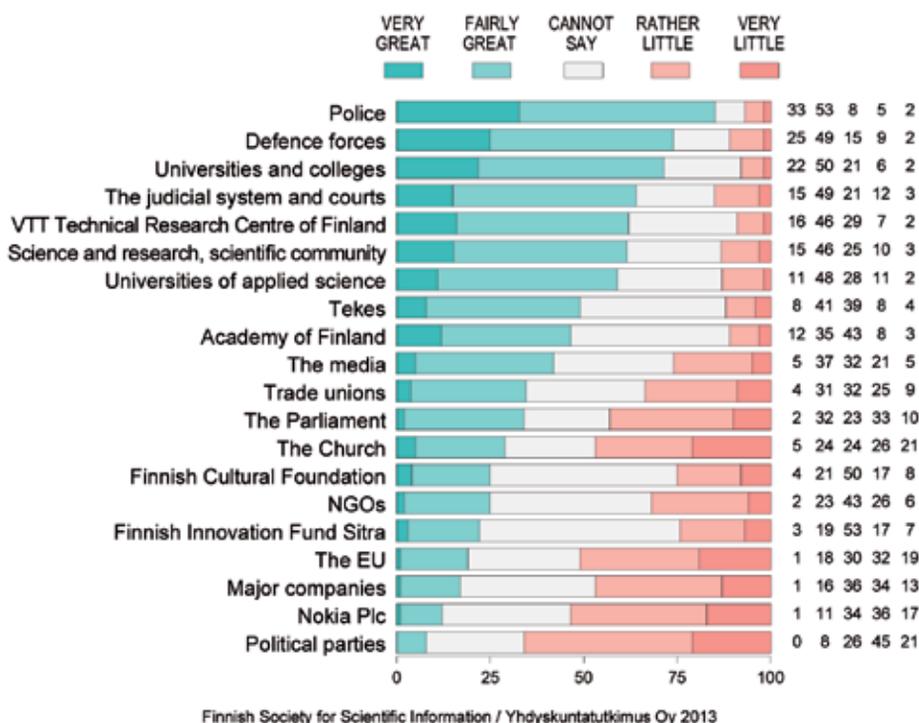
4.1 The state of science commended by Finns

The respondents were asked to assess the present state of various science and research-related issues in Finland. The key attributes of the quality and standard of science and research are very much appreciated. The highest scores go to medicine and technology (Figure 5).

In general, the quality and standard of science and research in Finland is deemed good; more than two-thirds of the respondents score it very or fairly good, while only a few deem it rather or very poor. Six out of ten also regard the standard of science in Finland as good by international comparison. The perception is that there are no problems regarding the international competitiveness of Finnish universities, based

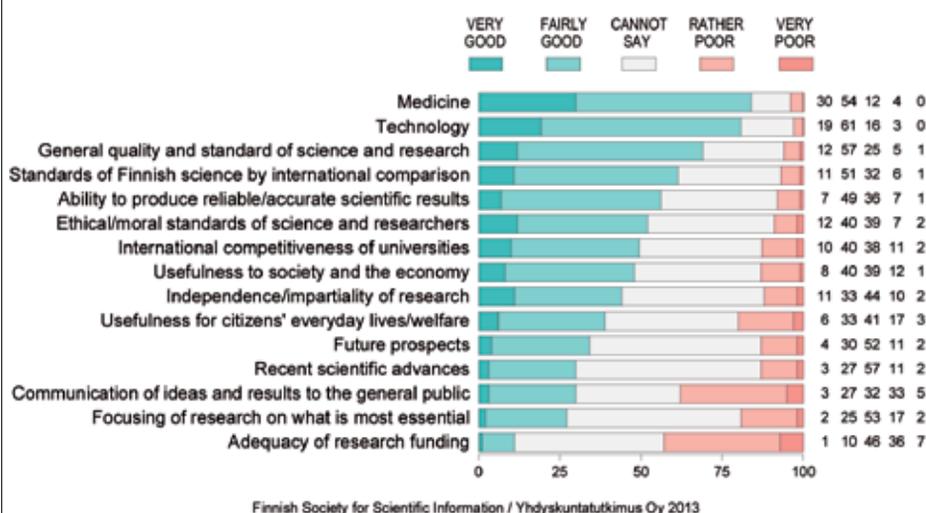
Science Barometer 2013

Figure 4. TRUST EXPRESSED BY FINNS IN CERTAIN INSTITUTIONS (%).



Science Barometer 2013

Figure 5. ASSESS THE CURRENT STATE OF SCIENCE AND RESEARCH IN FINLAND (%).



on the views of every other respondent. An issue that has raised public concern thus receives a pardon from the general public.

The recent developments in Finland's research activities are viewed as positive by one in three respondents. The future prospects of science in Finland are viewed as positive by more respondents compared to those who view it as negative.

The share of respondents who believe in the ability of science to produce reliable and accurate results is considerably high. The question is whether the results concern the right issues, and not nearly as many are convinced about that. Only approximately one in four believe that research is focused on what is most essential and important.

The opinions on the usefulness of scientific research to society and the economy seem to go only one way. Contrastingly, the respondents have slightly more reservations concerning its usefulness for citizens' everyday life and welfare.

The perception of researchers' ethical and moral standards is mainly positive, as a considerably larger share of the respondents rate it as good (52%) instead of poor (9%). The ratings for the independence and impartiality of research are fairly similar.

Science cannot be blamed directly for the categories with the lowest scores due to the nature of the issues involved. The assessments concerning the adequacy of research funding and the communication of ideas and results to the general public clearly contain the highest percentage of negative perceptions.

The proportional analysis of the results from 2013 and 2010 show the same basic structure, evidenced by the identical mutual order of the assessment categories in both science barometers. Any deviations are indicative of the increase in positive perceptions towards the state of science rather than a negative trend.

4.2 Finns believe in science's ability to solve problems

The respondents were asked about their perception of science's ability to solve problems or provide assistance in problem-solving in general. The issues to be solved were universal in nature, not everyday practical problems, and viewed from a global perspective without focusing on Finnish science.

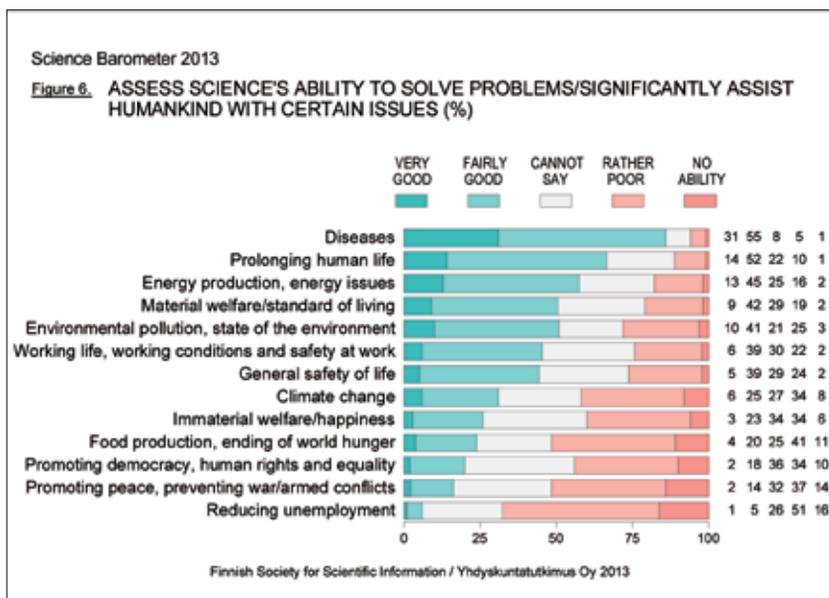
In general, the respondents' expectations were optimistic, but not overly hopeful. Pessimism also seems widespread, regardless of the trust in science's ability to assist in many important issues (Figure 6).

The respondents are most unanimous about science's ability to rid us of diseases, which more than four in five deem fairly or very good, and less than one in ten rate as poor. The second highest score is also related to health, i.e. prolonging human life.

Notably many of the respondents believe that science can be used to improve people's welfare. However, this optimism mainly applies to material welfare (affluence) and standard of living. In the respondents' view, science is more or less useless for improving immaterial welfare and increasing happiness. There is also no certainty of science's ability to boost the safety of life; optimism barely overrides pessimism.

Science's role in improving safety at work, alongside any other means of improving working conditions, is perceived in much the same way. The responses show that people do not believe that science can provide the tools for getting rid of or reducing unemployment.

The expectations concerning the state of the environment are rather polarised. Those that view science as capable of preventing environmental pollution or improving the state of the environment form a majority (51%) compared to those with the



opposite view. Roughly one in three (31%) believe that science has the ability to develop ways to stop or slow down climate change. The respondents put more faith in science's ability to solve energy problems, which are also closely related to environmental issues. More than half the respondents (58%) presume that science can provide significant assistance in energy production-related problem-solving, but about a fifth are pessimistic about this.

In addition to unemployment, people have the least optimistic view of science's abilities to promote peace and stop war or resolve armed conflicts – the sceptics take this one by a narrow margin. Science's ability regarding food production and ending of world hunger are viewed with equal scepticism alongside the promotion of democracy, human rights and equality – this exalted category of tasks is almost completely unreachable for science.

Overall, the results can be characterised as realistically optimistic. Despite some noteworthy advances in various fields of science, Finns have not fallen for airy idealism in their expectations for science. Instead, they hold on to a pragmatic, reserved attitude.

Comparing the results with the Science Barometer 2010 presents very little changes. Similarly to other sections, the categories and issues are in line with those from three years ago. Thus, the power and opportunities of science are perceived to be practically the same.

As a rule, the perception of science's ability to solve problems stays the same throughout the population groups, and it is impossible to identify groups that are clearly pessimistic or optimistic in their views on science. The differences between the expectations of men and women are mainly based on emphasis. Men have more faith in science's ability to solve energy problems and improve working conditions, whereas women have noticeably more optimistic views about its ability to rid us of diseases. Women are also less sceptical about science's ability to promote democracy and human rights and prevent wars than men. The responses do not appear to be age-specific. On the whole, young respondents tend to display stronger optimism than older age groups.

5. SCIENCE AND THE WORLD VIEW

The Finnish Science Barometer 2013 also took a look at the values and world view of Finns. One of the themes was the theory of evolution. To explain this choice, let us refresh our memories on the related public debate of autumn 2006, when Finns were alarmed by the authoritative evaluation made by Science magazine, calling us an unenlightened nation. According to the Science magazine's article based on the 2005 Eurobarometer, the percentage of Finns who believed in the theory of evolution was lower than the average in other reference countries.

The claim that *"humans have evolved over millions of years from other, earlier species of animal"* meets widespread, but not unanimous approval. Seven out of ten agree, but one in eight (12%) do not. The breakdown does not differ from the Finnish Science Barometer 2010. Differences in the responses according to population group are notable; the younger the respondent, the more convinced they are of the validity of the theory of evolution. The link to education is just as clear: the higher the education level, the stronger the belief that we share our origins with animals. The respondents who have the strongest trust in the Church are widely represented amongst those that deny the theory of evolution.

The ratio between those who recognise the conflict of world views and those who do not is practically the same as before, only the percentage of respondents without an opinion on the matter has slightly decreased from three years ago. The results also do not indicate any shift in emphasis one way or the other. Young age groups dismiss the claim – i.e. are able to recognise the conflict between science and religion – more often than older age groups.

Science and scientific information have to compete for the public's attention against a wide range of doctrines, information systems and beliefs that resemble science. The survey investigated the credibility of such phenomena that are dismissed by the scientific community.

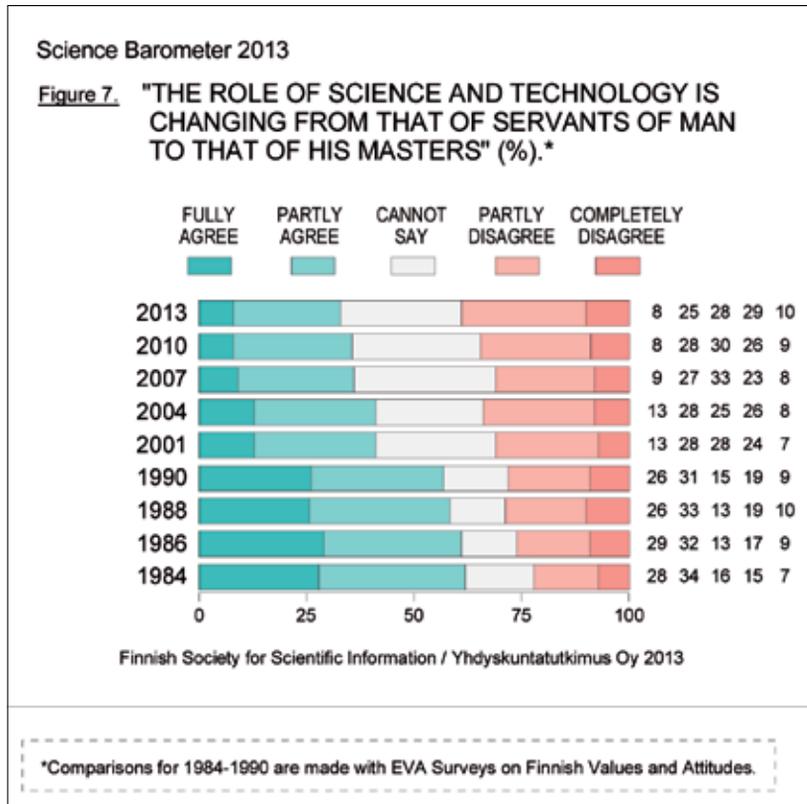
The results show that some of them do penetrate to the public. For example, 43% agree that *"so-called healers possess knowledge and skills that medicine lacks"*, while roughly 30% dismiss this claim. On average, women and older people tend to have more faith in healers' skills, and the peaks of dismissal are the highest in the responses of younger people, students and academics.

Homoeopathy raises the most uncertainty in the respondents, leaving 41% of them undecided. Its effectiveness receives more backing from women than men. Approximately one fifth of the respondents believe in the effectiveness of natural medicine, while every other (50%) does not. The size of the gender gap is not notable considering that the customer base for natural medicine products is predominantly female.

The statement *"magazine horoscopes are mainly for entertainment purposes, but reliable horoscopes based on in-depth astrological information also exist"* is supported by one in seven (15%), but fairly many are also undecided on the matter (20%).

The survey claim concerning UFOs also receives significantly more dismissals than approvals. One sixth agrees that *"although UFO sightings have not been proven by scientific means, it is obvious that the Earth has been visited by extra terrestrials"*, while every other respondent dismisses the idea and a third are hesitant.

The assessment target chosen from the field of parapsychology is telepathy. The survey claim *"telepathy is a genuine phenomena though it has not been scientifically proven"* receives a mixed review from the public. One fourth agrees, one third hesitates, and roughly two-fifths dismiss the claim.



5.1 The threat of the supremacy of science denied more than believed

It is quite natural that science is not viewed solely as a blessing. There has always been a general concern that humans and society cannot keep up with the progress, as demonstrated by the responses to the claim *"scientific and technological progress causes too rapid changes to people's lives and life styles"*. Slightly more respondents agree with the claim (43%) than oppose it (34%).

The result is practically the same as in 2010. It is also the most carefree response throughout the monitoring period. The issue does not raise as much concern as it did in the early stages of the monitoring period, probably on account of a certain level of adjustment and the related gradual increase in the courage to change. In any case, there is significant variation between population groups. The concern dissipates in line with the rise in education level. Those least worried about the rapid pace are younger age groups and students. The gender gap is fairly minimal; however, scientific and technological advances tend to worry women more than men.

Another common thesis, according to which *"scientific advances and the putting into practice of new inventions create as many problems as they solve"*, receives almost equal amounts of support and opposition (28%/36%).

One of the main types of science-related concerns has its roots in the notion that the supremacy of science, and technology in particular, advances to the point that machines gain or take control over humans. This is backed by the fact that even the claim *"the role of science and technology is changing from that of servants of man to that of its masters"* is not very widely rejected (Figure 7). Almost as many respondents

agree with this (33%) as disagree (39%).

The results of this year's science barometer can almost be considered favourable to science in comparison with findings from 1990 and earlier. This most recent finding is historic in the sense that, for the first time, the number of respondents who believe in the threat of the supremacy of science is lower than the number of those who do not. The differences between population groups are in line with a familiar logic; the strongest antidotes to this notion include a high education level and young age.

5.2 Does the Finnish scientific community act responsibly?

The ethical and moral aspects of science can be studied from various viewpoints, for example, based on research topics or objectives, the research methods used, or the personal actions of researchers.

Gene technology has been a controversial topic in public debate for a long time. Both nationally and internationally, people have strong opinions on whether researchers have the right to "play god" or not, as well as on the ramifications of such behaviour. The tendency is towards approval. Every other respondent (50%) agrees that "despite the risks involved in gene technology (e.g. gene manipulation), genetic research provides great benefits to humankind", and roughly one in four disagree. More than two thirds believe that "attempts to clone humans should be forbidden in all countries". The persuasive statement "genetically modified food should not be feared, because it is safe for humans and the environment" is not widely accepted (14%).

Contrastingly, the eternal subject of ethical debate, the right to use animals in scientific experiments, receives considerably more support. Nearly two out of three (64 %) agree that "although animal testing raises some ethical problems, the results are of such importance that the tests should not be completely banned" and more than a fifth (22 %) of the respondents disagree.

The survey responses in the third category for science and ethics, the personal actions of researchers, show wide public support. Seven out of ten (71%) agree that "cases of scientific misconduct are exceptions and the whole research community should not be judged on that basis". People with a higher level of education and students have the most faith in the morality of researchers.

There is also another indication of a positive perception of the scientific community: "The Finnish scientific community acts responsibly and is aware of its social responsibility" is the view of more than half the respondents (58%), and not many disagree (7%). The result is noteworthy in a time when social responsibility is fiercely demanded from all actors in society. The issue-specific differences between population groups in the responses are minimal. All groups widely agree that cases of misconduct are exceptions, and inversely, no single group that has lost its trust can be identified.

5.3 More information needed on scientific research and its results

The survey used the viewpoints of closeness, influence and communication to assess the relationship between science and the public. The claim "*the scientific community is too isolated from society, in their ivory towers, and not enough in touch with peoples' everyday lives*" is accepted by nearly every other respondent (47%). Less than one in four believe that the scientific community is adequately in touch with the rest of so-

ciety. This perception is understandable for several reasons. The scientific community of experts is by nature inevitably somewhat distant, isolated from the public. Also, it is not characteristic for the scientific community to seek publicity or “display” itself or its achievements.

The assessment of the link between the public and science should be viewed in light of the results presented earlier in this report. Although the respondents believed that the scientific community fulfilled its function in society, the respondents were less convinced of the usefulness of scientific research for people’s everyday lives and well-being.

No increase or decrease can be detected in the perception of science being isolated from the rest of society in comparison to the previous survey. Distinguishing by population group shows some relatively clear differences in attitude; for example, the perception of isolation increases almost in direct proportion to age. The claim is denied most widely by young people, people with the highest level of education, high-level officials, and – naturally – people interested in science. These groups also perceive their connection to science to be close. Based on residence, the Uusimaa region and large cities – where the production of science is mainly localised – display a similar difference from the rest of the country’s average.

In its existing volume, the perception of isolation cannot be too extensively explained by the lack of opportunities to have influence on science. This can be deduced on the basis of the reactions to the demanding statement “*NGOs, consumer organisations and other advocates of citizens’ needs should be provided with more opportunities to influence the focus areas of publicly funded scientific research*”. More than two fifths (42%) agree with this lengthy thesis, while an equal amount cannot make up their mind (41%). The rest of the respondents (18%) openly object to the idea.

A closer inspection reveals that the division is similar in all population groups. Once again, the most notable relation is with education. As the level of education rises, the negative attitude towards the role of civic participation increases. This correlation can be seen to have a link to the general friction caused by the aspects of democracy and expertise in social decision-making.

Closing the gap between science and the public requires both sides to be active. In principle, a large percentage of Finns appear to have the capacity to take in scientific information, as is shown by the views of three-quarters (74%) of the respondents, who agree that “*the media should provide even more scientific news and articles*”. This has been the message in all previous surveys as well. It has remained strong and consistent throughout the monitoring period, and applies extensively in all social groups.

