

For debate in the Standing Committee — see Rule 15 of the Rules of Procedure

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Student disaffection for scientific studies

Report
Committee on Culture, Science and Education
Rapporteur: Mr Guy Lengagne, France, Socialist Group

Summary

The number of students in the science disciplines is declining significantly everywhere in Europe. The Parliamentary Assembly is concerned about the consequences of such a decline for the economy of the countries concerned as well as for the critical minds of their citizens and for the protection of human rights.

Measures to reverse the tendency should be taken urgently by the governments of Council of Europe member states, in particular on the level of teaching and this as of primary school. An upgrading of scientific careers and a particular effort to encourage girls could be included in such measures.

A. Draft resolution

1. Defending human rights, the Council of Europe's main task, cannot be restricted to protests or action to ensure respect for the law and democracy. What does the term "human rights" mean for someone dying of hunger or for one of the 100 million children who are "AIDS orphans"? Is it necessary to recall that a human being dies from AIDS every 15 seconds? What does "freedom" mean today for a nation which scientifically and technologically – and therefore as far as its development is concerned – is totally dependent on another country?

2. Developing science and technology does not automatically guarantee respect for human rights but it is an essential precondition. It is crucial in order to fight against injustice and mastering science is indispensable for a country if democracy is to survive. A country which is not at the cutting edge of nanosciences or nanotechnologies or which lags behind in the field of cell biology, to take just two examples, runs the risk of falling under the domination of another country.

3. The Parliamentary Assembly is concerned about the significant decline in the number of students in the science disciplines and believes that this ultimately poses a serious threat for freedom and the protection of human rights in the countries of Europe. Each year, China trains some 300,000 engineers and by 2009 it will be ahead of both the United States and all European countries in terms of research and development.

4. More than half of the big multinationals have relocated a significant part of their research and development to the "emerging" countries (China, India, Singapore) and this proportion is set to rise in the coming years.

5. There are many reasons for this declining interest but they all tie in with a number of key considerations:

5.1. the education pupils receive is too abstract, too far removed from their day-to-day experience and their own interests. Instead of taking advantage of their inquisitiveness and building on the very positive image of science and scientists they have developed at primary school level, the science teaching they are given has the effect of alienating them;

5.2. the image of scientists conveyed in the media is not very appealing to young people from around the age of 15 onwards and does not encourage them to consider the scientific professions as a career option;

5.3. science studies are, not without reason, perceived as being difficult and longer than those for other disciplines;

5.4. the social status of researchers, engineers and even doctors has declined considerably in many European countries;

5.5. salaries in the scientific professions too have fallen in comparison with other sectors. Following often longer and more difficult studies, salary increases are much slower.

6. If a substantial effort is not made in the coming years to counter this situation in which students are opting for other disciplines, there will be legitimate cause for concern about the future of European nations. Not all the countries of Europe are affected by this problem to the same extent but, overall, the decline in interest in the sciences is very worrying.

7. While the shortage of science students is worrying, the inadequate scientific training of economists and politicians can have serious consequences which are rarely mentioned. An American university professor recently said "Politicians do not understand science, and rarely seek the advice of scientists and engineers in addressing major issues. It is time to recognise that governments are ill-equipped to understand the sophisticated technological challenges and opportunities facing the world."

8. Such views should encourage the governments of Council of Europe member states to adopt practical measures, as a matter of urgency, to attract more students, both male and female, towards scientific and technical careers, and strengthen the science element in the training given to the economists and politicians of the future.

9. With this aim in mind, the Assembly invites the governments and other competent authorities of member states to consider the following principles:

9.1. science teaching, from primary school on, should draw on children's natural inquisitiveness in order to help them discover, as far as possible by themselves, the laws of nature. Accordingly, such teaching should not be excessively theoretical. It should be based on the child's day-to-day experience and should not, as is often the case today, be in the form of knowledge with little genuine relevance imposed from above. This presupposes sound theoretical training for the teacher and a new approach to teaching;

9.2. pupils must be informed as fully as possible on career prospects in science and technology as soon as they start secondary school. No attempt should be made to hide the fact that studies in these fields will be generally longer and more difficult than in other areas, but they should be made aware that the value of their future profession would be a just reward for the additional effort required;

9.3. steps should be taken to upgrade the image of researchers, engineers and scientists. It should be shown that a scientific career can be a very rewarding one, since a recent survey showed that when considering their future career 90% of young people are keen to opt for one that seems exciting. This will require a review of the often distorted way scientific progress, based on a purely factual event, is portrayed in the media. Science and technology evolve at a tremendous pace. It is therefore essential to place an emphasis on retraining and on exchanges between scientists in different countries;

9.4. it is not enough simply to upgrade the scientist's image. Scientific careers also need to be enhanced from the point of view of salaries and bonuses;

9.5. many companies attach greater weight to commercial aspects rather than creativity. While this might be profitable in the short term, it can prove counter-productive in the medium and long term. Several countries, such as the United States, have now taken this on board;

9.6. particular effort must be made to encourage girls into scientific careers since in many countries those opting for a career in this field are still fewer in number than boys. Surveys also show that in many countries "minorities" are seldom attracted by the scientific professions. They too must be the focus of a special effort;

9.7. television games are increasingly popular. They do not always require a particularly high intellectual level, indeed far from it, and are more a test of memory than intelligence, but their popularity with the viewers is undisputed. It is therefore suggested that competitions be run in all the scientific disciplines, along the lines of the inter-school challenges held in certain countries, in maths or physics, but in a way that is more popular and more attractive and not restricting participation exclusively to pupils or students.

10. Quite apart from the need for the countries of Europe not to allow themselves to be overtaken (if this has not already happened) by the emerging countries, it is also important for our citizens to maintain a sufficiently critical mind so as not to founder in excessive dogmatism or fall under the influence of exploitative charismatic leaders or sects. A scientist recently wrote: "the people of the 21st century who have lost their curiosity, competence and critical approach, who simply press buttons without thinking about everything that surrounds them, can be particularly susceptible to all sorts of beliefs peddled by would-be spiritual guides".

11. Science, today more than ever before, should be part and parcel of one's general culture as it enables one to maintain a sufficiently critical mind to remain impervious to the words of false prophets. Efforts to re-nurture the 18th century idea of the "honnête homme" are also a means of contributing to the defence of human rights which is the very role of the Council of Europe.

B. Explanatory memorandum
by Mr Lengagne, rapporteur

I. Introduction

1. During World War II, when the power of the Catholic Church was mentioned, Stalin inquired how many divisions the Pope had. An equivalent question today concerning a country's power, or even its ability to maintain its independence, might be how many scientists the country has.

2. There certainly is a close link between the number of scientists and the defence of democracy, for democracy cannot be built where there is poverty, and human rights have little meaning for people starving to death. What human rights can people have when they live in poverty or under material, and therefore also military, domination?

3. It is a prerequisite for any attempt to promote democracy for the country concerned to be sufficiently independent in material terms and to be able to deal with its population's economic difficulties. No nation can develop its law or economy if it starts from a position which is not strong enough in the technical, and therefore scientific, sphere. Although it may seem provocative to say so, discussions of human rights are just idle talk which can do no more than salve people's conscience, if no such starting position exists.

4. So the Council of Europe is well within its rights to put forward ways of stemming the decline in the number of students opting for scientific subjects and of helping the poorest countries to acquire sufficient numbers of scientists and technicians to find their place among the community of nations.

5. Is there any need to point out that some very large countries, including India and China, are investing heavily in science and technology? According to a recent report, there are on average in China's laboratories six times as many research scientists as in their European counterparts looking at specific subjects in certain areas of research.

6. Science and technology make it easier to combat poverty and disease, but they also offer nations means of defence, and hence of independence. What will Europe do, even the Europe of the 46 Council of Europe member states, if China, with its population of almost a billion and a half, achieves superiority over the Western world in scientific subjects? While this may be a disaster scenario, it is our responsibility to consider it.

7. Another aspect, rarely mentioned but increasingly worrying, is the lack of adequate scientific training received by managers in our countries, particularly those with political responsibilities. They are in practice increasingly expected to take decisions and commit either their own countries or Europe as a whole on scientific issues, although they lack sufficient basic knowledge to opt for the best of the proposals put to them by the experts on whom they are becoming dependent. Sadly, in this kind of context, law serves no useful purpose.

8. We must not fall into the 19th century mistake of believing that science would, by a natural process, make humankind happy. History has shown us that it does not bring democracy or a guarantee of human rights. But at this juncture, with mediaeval-style criticism of science resurfacing, we are duty-bound to point out that a denial of science as a whole is probably one of the worst threats hovering over human rights.

9. This report is based on the replies given to our questionnaire by Council of Europe member states' Education Ministries, or at least those which have responded.

10. It does not incorporate a study of the development of technology and its use for the benefit of peoples, nor does it consider the dramatic shortage of funding for scientific research or the eventual consequences of this for our democracies, which surely deserve their own in-depth study.

11. Any nation, however, needs sufficient numbers of science students if it is to master high technology and attain a good level of scientific research.

12. Parliamentary Assembly Recommendations 1379 and 1541, adopted in 1998 and 2001 respectively, have already emphasised the importance of scientific studies to the future of European

societies. The first was on basic education in science and technology, while the subject of the second was young scientists in Europe.

13. Students' disinterest in scientific studies is obviously looked at in different ways. Each country applies different criteria, and not all produce the regular statistics needed to gain an overview of the problem and any developments. Some, but not all, have embarked on reform and/or on information campaigns, and some seem to be overcoming, or already to have overcome, their difficulties, while others, such as France, are struggling to reverse the trend.

14. There are very few states, however, which consider themselves completely unaffected by the crisis in scientific education and, more generally, in fundamental research, two areas which in practice cannot be viewed separately.

15. As states face up to this same problem, they identify causes which tend to be identical: the difficulty of scientific subjects, the poor image of science, the low pay of scientists and a misapprehension of the social role of science.

16. Governments' reactions to, and proposed ways of solving, this worrying development are still inadequate, perhaps because there is as yet no public awareness of the scale of the problem. So people are not in favour of the budgetary adjustments which a true scientific revival would require. For as well as the issue of studies themselves, the question arises of scientific research, which requires funding at a level far higher than is currently allocated, and it would be necessary, in order to make scientific studies more attractive, significantly to improve the pay of both research scientists and scientific staff in general.

17. Several states are of course pursuing public policies to combat the falling off of interest in scientific studies, as this development causes them concern and makes them fear the technological, economic and social decline which will inevitably ensue in Europe. But the crisis goes on nevertheless.

18. The stakes are extremely high. In our knowledge society, where technological innovation is central to economic and social development, the backwardness of European students as compared to their American, Japanese and Indian counterparts, in particular, is one of the main threats facing Europe.

19. The findings drawn from the information supplied by member states generally give cause for pessimism. A far more vigorous response than hitherto is now needed.

II. Findings

1. Disinterest affects most states and needs to be combated

20. On 22 June 2005, Mr Legendre, Chair of the Committee, and myself sent a questionnaire on this subject to Council of Europe member states' Education Ministries. We received replies from Austria, Bulgaria, the Czech Republic, Finland, France, Georgia, Germany, Hungary, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Serbia and Montenegro and the United Kingdom.

2. Description of the situation in the different states

21. Not all member states replied to the questionnaire. Nor is the picture homogeneous, the replies received not all having contained the same level of detail. The information collected is nevertheless extremely interesting, making it very clear that the majority of Council of Europe member states face significant difficulties.

3. General synthesis

22. Not all countries examined the causes for disaffection, but the problems that certain countries detected are likely to be of general interest. They should be indicated.

23. Similarly the consequences of students' disinterest and the possible methods of remedying the situation concern the Council of Europe as a whole.

a. The extent of the loss of interest among students

24. The main revelations of this survey are the scale and persistence of the problem.
25. While some states (mainly former members of the Soviet bloc still in transition) have achieved an increase in strictly numerical terms in enrolments on scientific courses, most face very severe difficulties.
26. The number of students undergoing scientific training may be declining in either absolute or relative terms (in proportion to the total number of students), or it may quite simply be inadequate (whether or not there is a relative or absolute decrease).
27. Few states seem happy with their own situation where students' interest in scientific studies is concerned. Of those which replied to the questionnaire, only Bulgaria, Finland, Georgia, Hungary, Lithuania and Serbia and Montenegro make no express reference to a problem in this respect. Within this group, however, the teaching of science in general is not necessarily in a particularly good situation.
28. Bulgaria, for example, has for the past few years been experiencing a steep drop in the numbers of students in certain scientific subjects, such as maths and physics (although the total number of science students has been stable, with other disciplines expanding rapidly); Georgia's statistics reveal a not inconsiderable decline (6.1%) in its numbers of maths and physics students between 2002 and 2003; Serbia and Montenegro notes that literary studies are more attractive to its students than scientific subjects; in Hungary, while there is no apparent decline in the popularity of scientific studies, the proportion of holders of higher degrees in sciences fell by 4% between 1998 and 2002.
29. In other states, including some of those with the highest populations and/or GDPs, there is a very marked disinterest in scientific studies, causing serious concern to experts and governments. These countries include Austria, France, Germany, the Netherlands and the United Kingdom.
30. Thus some states with significant financial resources, and where fundamental research has, in the past, both given rise to huge scientific progress and made an extensive contribution to industrial and technological development, are seriously affected.
31. In the light of these shortcomings, successes within the EU in sectors such as aeronautics do not mean that the states of the Union are doing enough to prepare for international competition which is growing ever fiercer. A comparison with India, which is training 400,000 engineers a year, should surely be causing more concern than it is today among European leaders.
32. Is there any need to point out, finally, that an increasing proportion of the students trained in Europe is leaving for the United States, where material conditions for them are generally much better? Over 5,000 French researchers are estimated to have left France, most for the United States (and these are said to be among the best of all those educated in France). A loss of interest in scientific studies is thus combined with a lack of interest in European research centres, which have insufficient funds to offer satisfactory openings to young graduates (in France, for instance). A growing proportion of European-trained scientists will leave to strengthen research and development in other centres of economic power.

b. The dramatic consequences of the loss of interest in science

33. The present and future consequences of this situation are known, and they are particularly alarming.
34. Science and technology are the main drivers of innovation, itself the key to the economic development of modern societies. Thus the development of scientific research and the training of adequate numbers of scientists - researchers, teachers, specialist technicians, and so on - is vital to the future of Europe.
35. In this context, the result of current disinterest is a very worrying shortfall which already poses a threat to some states' ability to offer, in optimum conditions, even the most basic primary and lower secondary education in maths, physics and natural sciences. The fear has to be that a not insignificant proportion of young Europeans is not currently receiving an adequate level of education,

whether in terms of preparing them to work in the sciences or just of enabling them to familiarise themselves with the sciences and technologies on which their day-to-day environment is based.

36. Another two vital political problems also add to the economic and social difficulties stemming from the decline in interest in scientific studies. Firstly, the question arises of European citizens' ability to discuss the issues facing society where these have a scientific dimension, of which medical research and the development of genetically modified organisms are examples. Thus the development of scientific studies seems to have huge democratic implications for the 21st century. This issue was raised again at a colloquy held in Lille, France, on 28 and 29 November 2005 (*La crise mondiale des sciences/The worldwide science crisis*), where it was emphasised that policy-makers cannot just rely on experts, but need an adequate scientific culture of their own.

37. In this respect, it is a matter of great concern that the French institution which is one of the main channels for students hoping to obtain government service posts of administrative and political responsibility, the *Ecole Nationale d'Administration*, provides no scientific teaching, and sciences do not even have to be studied by those taking its entrance examination.

38. While this recruitment system is specific to France, a lack of adequate scientific training is a general feature in all European states, and could ultimately have extremely worrying consequences. In a society where virtually everything bears the hallmark of technology and science, it is absolutely absurd to leave decisions to people trained solely in the law or even economics.

39. Secondly, it seems legitimate to wonder whether disinterest in scientific studies might not, in the shorter or the longer term, lead to a reduction in rationality in the broad sense. Scientific studies in fact offer one of the strongest bastions against irrationality, perpetuating Cartesian thinking and, more generally, citizens' support for the scientific values which have enabled Europe to develop: reasoning, the challenging of dogma, experimentation, and so on. Now that certain American states have to cope with highly influential lobby groups which are attempting to question the way in which evolution is taught (defending creationist theories), the risks inherent in a possible decline in rationality must not be overlooked.

40. In conclusion, Europe lags well behind in fundamental research, and risks being outstripped not only by the United States, but also by China and India. Whereas competition from emerging states alone ought to have led European states to step up their research and training efforts, they find themselves severely handicapped by students' loss of interest in scientific subjects. Some states also face the problem of replacing the generation of scientists reaching retirement age.

41. It should not be forgotten that virtually every state has emphasised the importance it attaches to training scientists to a level at which they can, particularly through the development of research and innovation, contribute to the vitality of the economy.

c. The reasons for waning interest

i. Reasons inherent to the sciences themselves and to the teaching methods used

42. The reasons for waning interest are the same in every country.

43. Firstly, scientific studies are considered too abstract, remote from the world's problems and cut off from reality. Students' reluctance to go in for sciences partly stems from a misplaced feeling that science and scientific subjects are in a world of their own.

44. Science studies are also - in this case correctly - regarded as difficult, or even very difficult. They are indeed very demanding and exacting, requiring steady hard work. The higher the level of study, the greater the efforts and sacrifices successful students have to make.

45. The problem of the method to use to teach sciences also arises in schools. The way in which they are taught in the early stages is one of the reasons for sciences being perceived as too theoretical. The states which have conducted surveys to find the reasons for the current loss of interest emphasised the need to promote experiment-based teaching.

46. Other reasons are inherent to the different education systems.

ii. Sociological reasons

47. The findings of the Dutch government's survey of the reasons for waning interest in scientific studies are extremely interesting. They show a paradox: there is a genuine interest in sciences as such, particularly among children, but young Dutch people shun the study of sciences.

48. France faces the same paradox. "We are lucky in that young people's loss of interest in certain scientific careers is unconnected with any 'anti-scientific' feeling or with rejection by public opinion. There is public interest, but people feel that they lack information. But there is certainly a connection between the current lack of interest and the view that scientific studies are difficult, and some of the best students are deterred by the unattractive pay levels of scientific careers and the real difficulties experienced in the early stages" (Report by Guy Ourisson, March 2000.)

49. Thus it seems that school leavers with an interest in science give it up because they opt for other subjects, preferring higher education courses which will lead to better pay, career prospects and working conditions.

50. The results of the French and Dutch surveys can be compared with the Bulgarian conclusions, which are that Bulgarian students base their choice of subjects on the career prospects open to them in the various sectors of activity. It is not necessarily their interest (or lack of interest) in maths, physics, chemistry, etc, that is decisive, but a rational weighing up of the economic and social consequences of their decision.

51. Another problem is the decline in the spirit of scientific inquiry. While young people do appreciate the fundamental role of sciences in improving living conditions and bringing about technological progress (especially in the field of new information and communication technologies), they are none too willing to adopt scientific methods or accept the doubts and constant uncertainties about human beings' place in the universe and the future of humankind that go with the spirit of scientific inquiry.

52. It has to be remembered in this context that scientific progress is increasingly denigrated by the media, and that science is often presented as a threat (global warming, the risks associated with GMOs, and so on). While France has given constitutional force to the famous "precautionary principle" included in its Environment Charter, it has not declared the need to develop sciences to be a similarly fundamental principle.

53. The impression that young people have of scientific careers also gives cause for concern. They attach little value to such careers, imagining that they offer little diversity, are cut off from everyday life, do not serve much of a social purpose, and so on.

54. A major reason for the decline in the popularity of scientific studies is the inaccurate perception of scientific careers, for students are conditioned by generally accepted ideas and by a desire to follow a model of socioprofessional success.

55. The lessons learned from these surveys are alarming, in that they can be considered to show that young people, infused with the values of consumer society (wealth, immediate material gratification, conformism, etc), even if they do have an interest in science, will increasingly tend to desist from scientific studies. It also has to be taken into account that, in general terms, the higher a state's level of economic and industrial development, the less attractive sciences are to its young people.

56. This is extremely worrying, for a country's economic prosperity depends primarily on its ability to innovate, develop new technologies and enjoy independence in the scientific sphere, so it must train enough scientists.

III. Proposals

Giving scientists a social status appropriate to the importance of sciences to the future of European societies

57. Various steps could be taken to achieve this general objective. Some were recommended several years ago, but the desired effects did not follow. In France, for instance, not enough attention

was given to the proposals made in Prof. Ourisson's report, many of which were not taken up despite being highly practical and easy to apply (among these were the idea of giving research scientists a role in schools and the provision at teacher training establishments of facilities, however rudimentary, for conducting experiments, where apparatus surplus to laboratories' requirements could have been used).

58. Action therefore needs to be taken against each of the reasons found for waning interest, which means, *inter alia*:

- running advertising campaigns to give science and scientific studies a new image;
- encouraging the teaching of sciences through experimentation, in order to increase school pupils' interest;
- working for equal representation in sciences, still all-too-often regarded as a male preserve, another demotivating factor.

59. Such a policy will be futile, however, unless the central issue of the careers to which scientific studies lead is addressed. In his report on the situation in France, published in March 2002, Prof. Ourisson pointed out that "unless their careers are improved, young people will not readily opt for a path which is more difficult than others!". French students with five years of post-baccalauréat study who are starting work on a thesis may consider themselves lucky if they receive a grant roughly equivalent to the statutory minimum wage, the same level as a worker who holds just the baccalauréat or has had just two years of higher education.

60. The pay issue proves to be vital, and lack of interest in scientific studies will be overcome only if the corresponding careers are made genuinely attractive.

Making scientific careers more attractive

61. Research scientists' pay must be improved, but the rigid nature of some states' administrative rules stand in the way. France does not have specific pay scales for scientists: research workers in the sciences or any other disciplines (such as history, law or human sciences) are in exactly the same situation in this respect. No account is taken of the particular features of scientific studies, economic needs or the general context in which some of the best students opt for disciplines less useful to society, but which will enable them to live more comfortably.

62. Increasing the number of science teachers and researchers goes some way to solving this problem, but additional measures may also have to be considered in order to make scientific careers not just intellectually, but also materially, motivating.

63. Furthermore, students will be readier to opt for difficult careers not offering particularly good rewards for their merits if substantial grants are made to them during their studies.

64. To quote just one example, one comment made in Prof. Ourisson's report can be applied to many countries: "It cannot be regarded as very attractive for those [who have been awarded their DEA following two years of post-baccalauréat study and] who are among the very best to know that they will have an income over a period of three years not much higher than the statutory minimum wage".

65. It is impossible to persuade the most able young people to study sciences without offering them both a far higher income during their studies and the possibility of starting their career on pay considerably higher than is available today.

66. In this context, not all states are in exactly the same situation, with some, such as France and the Netherlands, facing greater difficulties.

Improving the public image of science and scientific studies

67. Numerous ideas have been put forward, and action has already been taken in several states.

68. Advertising campaigns on TV can show young people how scientific studies can lead to exciting careers which are not necessarily extremely specialised. They can persuade them that science does have a role in everyday life and is not a purely theoretical discipline cut off from the world.

69. Similarly, it must be possible to alter the image of science, combating those prejudices according to which it serves no social purpose and is dangerous and cut off from the world. The development of the new information and communication technologies so beloved of young people provides an example of the decisive - and positive - influence science can have on lifestyles.

70. It is also important to use all the technical resources available to improve the image of science. One recommendation has been to create web portals exclusively for scientific culture and for the activities of science museums and clubs.

71. "Positive discrimination" programmes would be useful to encourage girls to take up scientific studies and careers, inter alia by introducing specific financial assistance.

72. Specific activities like science festivals could also make science more attractive. With more particular reference to young people's interest, science competitions between secondary schools are a "fun" way of enhancing scientific performance.

Changing teaching methods

73. Essentially, science teaching needs reforming at primary level, where it is still too far removed from experiment-based methods. If young people are familiarised at a sufficiently early age with scientific subjects, this may help to avoid any subsequent loss of interest.

74. Individualisation of training may also be useful, if it is used to increase the number of hours spent on scientific subjects.

75. In more general terms, there is sometimes a need for adaptation of the training available, inter alia through greater co-operation between the different science subjects.

76. Not all states have regularly updated statistics, so the need is great for improved channels of information about science teaching and new developments.

77. In conclusion, changes of methods all require an affirmed political will. Hitherto, European governments' responses have not been conclusive. Wrongly, states do not include among their main concerns the issues of science and the development of scientific studies. But it is up to states alone to anticipate long-term needs and offset the effects of that pure labour market law which leads students to prefer certain branches of learning with a view to easier integration into the world of work. Fundamental research requires long-term, even very long-term, investment, so political decisions have to be taken. Such a commitment by states is in any case by no means "unproductive" in the shorter term: there are many examples of fundamental research which has made it possible to develop new technologies (especially in the information and communication sector), with immediate and highly favourable economic effects.

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N.B. The names of those members present at the meeting are printed in bold

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