

PHYSICS STAGE

a joint programme by the
European Laboratory for
Particle Physics (CERN), the
European Space Agency
(ESA) and the European
Southern Observatory (ESO)
for the European Week for
Science and Technology
2000



PHYSICS ON STAGE

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Executive Summary

Physics on Stage is a Europe-wide programme in connection with the European Week for Science and Technology 2000. It is carried out by an international consortium headed by CERN, ESA and ESO and is currently being considered for partial funding by the European Commission, under the programme *Raising Public Awareness of Science and Technology*, as part of the 5th Framework Programme (Horizontal Programme: Improving Human Research Potential and Socio-economic Knowledge Base)

Physics on Stage comprises a series of high-profile physics-related activities that will inform the European public in general and European high school physics teachers and media representatives in particular about innovative ways to convey information about physics and the intimate connection of this natural science with our daily lives. This effort is undertaken on the background of a progressively deteriorating state of physics literacy among the European population at all levels.

During *Phase 1* (January-October 2000), national networks and associations will survey the situation in their respective countries and, with national media, will identify new and effective pedagogical approaches to physics education at different levels, e.g. demonstrations, interactive experiments, video, Web application, theatre performance etc., to serve as input to the next phase.

Phase 2 consists of a 5-day festival during the European Week for Science and Technology (November 6-11, 2000) that will expose about 400 delegates from most European countries to innovative teaching methods and include a deep discussion about how the present problem can be alleviated. Spectacular demonstrations of new educational tools and methods will be disseminated over TV networks and other media to the European public. Notably, up to ten special performances – selected and funded by Physics on Stage – will be shown at the festival.

In *Phase 3* (December 2000) a summary report about methods and means to improve physics literacy will be prepared and transmitted to political and educational authorities in European countries.

The overall goal of **Physics on Stage** is to call attention to, and to propose alleviating measures to the current state of widespread physics illiteracy among Europe's citizens, by means of a highly visible series of activities. The central event is a unique conference at CERN in Geneva during the European Science Week, bringing together representatives of European physics teaching bodies and the media to confront the diminishing attraction of physics to young people and to develop strategies for change. The objective in the short term is to infuse excitement and provide new educational materials. In the longer term it will generate new developments by enabling experts throughout Europe to meet, exchange and innovate. To generate maximum impact, in addition to science teachers, science communicators and publishers, top scientists, ministers, and Directors General of the organisations will attend. A strict pre-selection process at the national level will ensure that the most able people are brought together. Documentary coverage of the initiative will be proposed to ARTE and other TV companies.

1. Introduction

The present document provides an overview of the proposed **Physics On Stage** programme (status mid-October 1999). It has been prepared by the International Steering Committee (ISC) for this programme in order to inform all interested partners, in particular the participants at the national level, e.g. the National Steering Committees, about the scope and specific goals of this programme.

Physics On Stage has been proposed by CERN, ESA and ESO to the EC, as part of the European Week for Science and Technology 2000 that will be organised in November 2000.

Physics On Stage has been conceived on the background of deteriorating physics literacy. It aims at calling attention to this by means of a series of actions and events and also to propose useful and realistic countermeasures.

The programme will take place during three interlinked phases and with the active involvement of a large number of individuals and organisations in many European countries. The ultimate outcome will be a number of specific recommendations for a spectrum of appropriate measures that will contribute to alleviate the current situation. They will be widely disseminated in educational and political circles.

This description of **Physics On Stage** is based on the documents submitted to the EC by the initiators. It describes the background for the Programme (Section 2) and the General Workplan (Section 3) with the associated Management Structure (Section 4).

Physics On Stage will involve National Steering Committees in 22 European countries; some guidelines for their work are outlined in Section 5. Other information is available in the Appendices.

A contract between the EC and the participating organisations is being negotiated. It is expected that it will be concluded by December 1999, after which **Physics On Stage** may formally start in January 2000.

The European Science and Technology Week

A framework for promoting European Science

The objective of the European Science and Technology Week is to improve citizens' knowledge and understanding of science and technology - including the associated benefits for society. The Week focuses on the European dimension of research, such as pan-European scientific and technological co-operation.

The rationale for holding the Week has its roots in the importance of the role of science and technology in modern societies and the need, therefore, to ensure that the public recognises this importance.

The Week is a framework for special TV programmes, exhibitions, contests, conferences, electronic networking, and other science related activities to promote the public understanding of science and technology.

The Week was launched in 1993, on the initiative of the European Commission. Raising public awareness of science and technology is now the subject of a clearly defined action within the Human Potential Programme of the Fifth Framework Programme.

2. Background

Most European citizens have a very detached, not to say remote, relation to Physics. Judging from the way this word is applied in the media and among most levels of society, it seems to signify something which is difficult to comprehend, somewhat mysterious, if not outright dangerous.

Yet, there are an enormous number of examples how the daily lives of people are governed by physical principles. It is also a fact that the current, high level of life quality in highly developed countries like those in Europe to a very large extent is a direct result of the progressive mastering of our surroundings, thanks to deeper insight into the principles by which nature is governed.

During recent years, more and more European citizens have become increasingly dependent on complex technology; computers, transportation and telecommunication are just a few, well-known examples. Nevertheless, scientific literacy, in particular in core subjects like physics and related fields, is amazingly low, as demonstrated by a variety of surveys on this continent.

2.1 A long tradition of Physics in Europe

Physics is a major component of European cultural heritage. Through many generations, ingenious technicians and scientists have pursued applied and theoretical physics all over Europe. This has resulted in developments of great intellectual and practical impact.

Until last century, virtually all advances in this basic field of science took place within European nations who had early understood the importance of dedicated research for such purposes. Only in this century did other regions of the world, notably the United States and Japan, catch up with Europe. With great vigour and substantial funding, they have since overtaken Europe in a number of key fields. This in turn led to migration out of Europe to overseas centres of excellence and, not surprisingly, a resulting lagging behind in various important research fields.

While Europe has in the meantime regained much terrain and again begins to exert leadership in some research areas, it has become evident that an unhappy trend has been established – especially since the 1970's – towards a gradually diminishing interest in physics within the European population as a whole. This can be seen in all areas of society, e.g. in high schools in which the students when free to choose, often prefer less demanding subjects. Europe-wide, a decreasing number of students entering faculties of natural sciences at the universities are observed.

There is, moreover, an obvious lack of intimate knowledge about even simple physical principles in large parts of the European population, with casual links to the apparent re-flourishing of pseudo-sciences like astrology etc.

2.2 The need for physics literacy

At this moment when we are entering a new century in which science and technology will obviously play an even greater role in shaping our daily lives, it is of vital importance to ensure that Europe's citizens will have at least a minimum of literacy in the natural sciences. In the future, most of them will experience situations in which

choices will have to be made and for which a minimum of knowledge about basic physical principles is extremely desirable.

These may include the choice of equipment to support individual demands for telecommunication in all its modern aspects, well-founded judgement about equipment to be used in the household and, in particular, many areas that are connected to the impact of activities on the environment and its protection.

2.3 The Physics on Stage rationale

The present programme is aimed at alleviating the current situation, taking the opportunity of the widely publicised European Week on Science and Technology to enhance the visibility and impact during a European-wide effort.

The problems, as described above, are very similar in all regions of Europe, and an international programme with roots in many countries is clearly a most efficient mode of operation. It also brings some important benefits at the social level.

It is unrealistic to turn around the current situation and to take decisive steps to alleviate physics illiteracy at all social levels during a period that is restricted to the duration of one European Week for Science and Technology. Moreover, it is clearly not the goal to interfere with ongoing programmes in individual countries.

However, it is possible, within limited time and with the limited funds available, to achieve an important impact by structuring the effort in an optimum way. This is mainly done by the use of 'multiplication' and by achieving a high media profile so that the essence of the important message of this programme is widely noticed. It is on this background that the three major European science organisations that are closely connected to physical sciences, CERN, ESA and ESO, have come together to propose a series of activities that will address the above described problems directly. Together, they represent 22 European member countries and they are well known and respected in others.

Through direct interaction between practising scientists of the major European research organisations and participants from all over Europe, many of whom have been experimenting with innovative approaches to science communication in both formal and informal settings, a unique forum for interchange of ideas will be created, the repercussions of which will provide a strong stimulus at the national and regional level.

The combined expertise, contained in the European research organisations, in the fields of science and technology, together with their excellent relations to the media and educational circles in virtually all European countries, provide an outstanding basis for the successful implementation of this programme.

2.4 Main attributes of Physics on Stage

The main attributes of the **Physics on Stage** programme in terms of social objectives, are:

- drawing attention to a widespread problem, i.e. that of lack of scientific (in particular, physics) literacy among Europe's citizens

- demonstrating ways of overcoming this problem, by presenting innovative solutions that are ‘interesting’ and educative to wide sectors of the community
- underlining at the same time the international character of science (and the mentioned problem) and by bringing together citizens from different areas, contribute to establishment of Europe-wide contacts at different levels
- producing materials (texts, images, videos, etc.) of long-term value, that may be useful for various (educative) purposes, also after the Week

2.5 The target groups

A primary aim of this programme is to stimulate experiences that demonstrate – in many different ways and at different levels – the all-pervading influence of physics while at the same time do this in an interesting, enjoyable and intellectually challenging way. That this is possible can be seen by the great public appeal of several TV programmes that present physics in a simple and exciting way and also at the European science centres where young and old enjoy interactive experiments of great educational value.

For the present purpose, it seems particularly important to attempt to stimulate physics awareness of young people, the future citizens of Europe. They are open-minded and although they are already subject to a large amount of related information, e.g. via TV and computers, it is also obvious that most of this is in a haphazard and chaotic way. Most of the experiences are very short-lived, for the effect rather than for a deeper understanding.

In most European countries, teaching of physics in schools is lagging behind in terms of current relevance and induced excitement. By introducing new attitudes into physics education at the high school level and by showing to young people the relevance of physics by means of the most modern pedagogical tools, a first important step may be taken in the proper direction.

While it is therefore the intention to direct special attention to physics teachers, who will act as ‘multipliers’, towards their colleagues and, especially, towards their students in Europe’s more than 7000 secondary schools, the concept of the European Science Week also provides a very useful framework for embedding and aligning such a project with the initiation of parallel efforts directed towards the wider European public. The basic aim being the same and the educational means being easily adaptable to different audiences implies that positive experiences in one direction will be useful in the others.

2.6 Enhancing sensitivities

Physics on Stage will address the problem of physics literacy in a variety of innovative ways. Specifically, it will involve scientists, media representatives, teachers and their students, as well as the broad public in individual countries on this continent in a co-ordinated way. This will increase the impact and serve to increase the feeling of being part of a larger unity, as well as provide many opportunities for international contacts.

Furthermore, the impact will be greatly enhanced by a co-ordinated press strategy. Leading daily newspapers in each member country printing articles examining the crisis in physics education shortly before the event will give Europe wide awareness to the issue and create heightened interest in the event. Already at this early stage, some of the leading science journalists in Europe have been contacted and have agreed to give special coverage

to this initiative. The press offices of CERN, ESO and ESA have a unique relationship with the European scientific media and are confident of generating major publicity.

The immediate effects of this programme are very positive. It stimulates Europe-wide interaction among teachers; it attracts the interest of the media towards a fundamental problem, that of scientific literacy and calls attention to remedies; it forges connections between all involved, also at the national level and provides an easy-to-understand example of how the European Union contributes to the integration of all good forces in one particular field of general concern in the European society.

The ultimate benefits of increased scientific literacy are obvious. To the individual citizen, considered choices in situations that demand technical insight are clearly advantageous. Improved education and skills enhance employment opportunities for young people.

3. Work plan

3.1 Introduction

Following the tradition of earlier European Weeks for Science and Technology, the overall goal of this programme is to call attention to a specific field of contemporary science – physics – that is of wide general interest and to present it, its social implications and the way it is currently carried out by European scientists, to the European public by means of a series of dedicated activities.

The **Physics on Stage** programme is comprised of 3 phases:

- i. National programmes (January-October 2000)
- ii. Main event at CERN (November 2000)
- iii. Evaluation and Recommendations (December 2000)

Following a series of preparatory actions/events at the national level in 22 countries, the central event is a unique conference/science fair at CERN in Geneva during the European Science Week. It will bring together representatives of European physics teaching bodies and the media to confront the diminishing attraction of physics to young people and to develop strategies for change. This 5 day meeting will expose about 400 delegates to innovative teaching methods and content, to stimulate modernisation of national curricula, building on the strengths of frontier European Research and exploiting new teaching and communication methods.

The novel idea of bringing Europe's three world class physics related research organisations, CERN, ESO, ESA, to highlight this, demonstrates the urgency. The objective in the short term is to infuse excitement and provide new educational materials. In the longer term it will generate new developments by enabling experts throughout Europe to meet, exchange and innovate.

To generate maximum impact, in addition to science teachers, science communicators and publishers, top scientists, ministers, and Directors General of the organisations will attend. A strict pre-selection process at the national level will ensure that the most able people are brought together. Documentary coverage of the initiative will be proposed to ARTE and other public service broadcasters.

3.2 Programme phases

3.2.1 Phase 1: The National Activities (January-October 2000)

The National Activities will take place simultaneously in 22 countries, i.e. in the member states of the participating organisations and the EU. A National Committee (NSC) of 5-6 persons will be established in each country with the charge to conduct these as proposed by the ISC, while taking into consideration national specifics. In planning the national programmes/events, it must be understood that they should be of a sufficient quality in content and execution to attract the best possible participation/contributions.

Each national programme must be seen as a self-contained event within a European-wide structure. Only a limited part of the participants will have the opportunity to go to the Main Event in Geneva. It is therefore important that all potential participants see the national programme as a good initiative in which participation or better, active involvement is worthwhile. It is equally important that the programme is accompanied by extensive media coverage, which will describe the programme itself and prepare the ground for a media debate on science and science education in Europe. The debate at the national level will be able to draw on the initiative by the main **Physics on Stage** partners in collaboration with key media representatives at the European level. In any case, it is important that the national components of **Physics on Stage** are perceived by the participants as being part of a larger (Europe-wide) effort. Inter-national links (by language, geographical situation) will be stimulated.

The national programme will begin with an invitation to science educators and other relevant persons to present novel ideas and projects for science (physics) education. If feasible, it may take the form of a national contest. These contributions can be of almost any conceivable type (demonstrations, lectures, educational material, performances, etc.) and may be presented at a national event (a 'mini' festival); the participants with the best contributions will then be invited to the international meeting in Geneva. The national events will most probably take place in September 2000 or, in countries in which the summer holidays are later in the year, in October 2000.

In addition, suggestions for especially spectacular, major 'performances' (up to 3 from each country) will be forwarded by the NSCs for consideration by the ISC and the Performance Evaluation Committee before May 2000.

The ISC may allocate funds for the realisation of about 10 performances, to be presented at the Geneva meeting.

As in previous 'Science Week' programmes, the national activities must however be funded primarily through national sponsorships that – in principle – are expected to match or exceed the allocation by the partner organisations.

3.2.2 Phase 2: The Main Event (November 2000)

The main event will be a unique 5-day meeting with about 400 participants, held on the premises of CERN in Geneva during the European Week of Science and Technology in the week of November 6, 2000. It will include formal sessions, discussions, demonstrations, visits to laboratories, as well as a variety of social functions, aimed at establishing an atmosphere of effective interaction among the many participants from all over Europe. The vision for the Geneva event is that it obtains the character of a 'festival' (science fair), rather than a 'conference'. Hence the programme is very varied. The participants will constitute a healthy mix of educators, media representatives and decision-makers from the educational sector.

Workshops will be held in smaller groups during which the participants are divided according to interests but also in such a way that there will be national representation, at least from the larger countries, on all working groups. Possible subjects include:

- Physics and technology
- Hands-on experiments
- Physics leads to jobs
- Exploiting the Web in teaching
- Review of existing resources
- Visits to research centres

- In-service teacher training
- Teaching and Communication: Same goals – different methods?

The teaching networks in member states are asked to provide additional subjects, also depending on the specific interests that will emerge in the course of the national activities during Phase 1. The final programme will become available in mid-October 2000, but a provisional plan foresees the following:

Sunday 5 November

Afternoon: Mounting of ('national') stalls at the fair area

Monday 6 November

Morning: Opening Ceremony with the Director Generals of the partner organisations, preferably also with the EC Commissioner, keynote lecture(s)

Afternoon: Keynote lecture(s), first special performance and welcome dinner

Tuesday 7 November

'National' presentations and special performances. Walk through of the fair area to provide the best possible opportunities for personal contacts; cocktail at the end of the day.

Wednesday 8 November

Morning: 'National' presentations and special performances. Walk through of the fair area.

Afternoon: Parallel Workshops, main evening event (possibly performance in the area of a CERN experiment)

Thursday 9 November

Morning: Parallel Workshops

Afternoon: Visit to CERN, Closing dinner

Friday 10 November

Reports from the Workshops, overall summary of meeting, round-table (possibly involving members of the Advisory Committee; EC participation); conclusions

3.2.3 Phase 3: Summary and Recommendations (December 2000)

The **Physics on Stage** Programme is a unique and intensive effort, aimed at increasing science literacy in Europe; nothing of a similar scope and content has ever been attempted. As such, it is in some sense a pilot project

for which certain results and benefits can be foreseen, but also with the potential, through synergy and new collaborations, to achieve effects much beyond those that may be safely predicted.

The result of this programme will happen at several levels. In Phase 1, individual national programmes will be established through active communication among the ISC and the 22 NSCs (e.g. via a dedicated mailing list), information about particularly promising new formats and initiatives that may surface in one particular place can be rapidly exchanged and the new ideas accordingly be exploited elsewhere.

During the Geneva meeting, a large body of important knowledge about physics education will come together for the first time. This will result in real-time cross-fertilisation at many levels, having important educational effects already during the meeting.

However, an even larger and longer-lasting effect will come from the planned, careful compilation of the activities and ideas exposed, and accompanied by well-considered conclusions. This valuable material will be made available in printed form or by other communication means some weeks after the meeting. The recipients should be the participants of the main as well as the national **Physics on Stage** events and, as far as possible, many other physics teachers and, not least, scientists and decision makers with educational functions.

Several international meetings which are fully or partly connected with science education will take place during the year 2000, i.e. the IAU General Assembly and the IAF education conference ("Bringing space into education") in Strasbourg (April 2000). Presentations about the **Physics on Stage** Programme will be made wherever feasible to stimulate the widest possible interest.

Because of its pilot nature, it is also possible that this unique programme will attract the attention of European educators in other subject fields. Expressions of interest for learning more about **Physics on Stage** and its outcome from outside parties may result in mutually useful, interdisciplinary discussions at different times and places.

4. Participants and Management

The main partners of the **Physics on Stage** consortium are *the European Laboratory for Particle Physics (CERN), The European Space Agency (ESA) and the European Southern Observatory (ESO)* (cf. Appendix A).

All partners have significant experience in bi-lateral and tri-lateral collaboration both in areas of scientific research, development of technology and public outreach activities. The consortium structure is based upon this experience and draws in secondary level partners that have performed similar functions in previous programmes, e.g. in 'Sea & Space' (European Week for Scientific and Technological Culture 1998).

Secondary partners include the *European Physical Society (EPS)* with its national branches, as well as the *European Association for Astronomy Education (EAAE)* with its national representatives. Various activities, under the delegated authority of National Steering Committees (NSCs) with a nucleus of persons from these organisations, will take place in about 22 countries. Additional partners are expected to join the consortium at a tertiary level.

The overall project responsibility will be in the hands of an *International Steering Committee (ISC)* with two representatives from each of the main partner organisations (ESA, CERN and ESO) and 1 representative from EAAE (cf. Appendix B). One or two additional members may be added, if desirable, as the programme develops. The task of the ISC is to supervise the programme preparation and execution and to approve the programme budget and the expenditures therein, as they occur.

The daily programme progress is coordinated and managed by an *Executive Co-ordinator* (located at the ESA Public Outreach Office) (cf. Appendix C). In this function he will interact with the appointed officers for the **Physics on Stage** Collaboration of the partner organisations. The Executive Co-ordinator is also the key contact person for the National Steering Committees. The Executive Co-ordinator reports to the International Steering Committee.

While ESO (as the official co-ordinator) will serve as the formal contact point with the EC, the ISC will be assisted by CERN that undertakes to carry out the daily financial management of **Physics on Stage** through a special programme-bound account. This account will act as a clearing account for the entire programme.

Furthermore, the ISC will be assisted by an *Advisory Committee (AC)* that is comprised of well-known scientists and professionals with interests and skills in science communication and science education. Committee members should cover, among others, the following areas that are particularly important for this programme: Science, industry, media, education, politics, engineering and students. Finally, a *Performance Evaluation Committee (PEC)* will be called upon to assess the 'performances' (or special presentations) that would be selected for the Geneva event.

At the national level, the programme will be initiated and managed by *National Steering Committees (NSCs)* which are responsible for the successful execution - in all its aspects - in their respective geographical areas. The NSCs will be hosted by a national body with a strong track record for efficient running of educational programmes in science, possibly the national branches of the European Physical Society or other bodies of similar stature. Also the expertise and a proven network of the EAAE and other organisations will be drawn upon.

For the purpose of management, Physics on Stage is divided into *Work Packages (WPs)*, which are described in detail in Appendix D.

5. Guidelines for National Steering Committees

The National Steering Committees (NSCs) are responsible for the successful execution of **Physics on Stage** in their respective countries, especially during Phase 1. The specific tasks are listed in the description of Work Package 2 (Appendix D).

The following guidelines are based on experience from previous educational projects carried out in the framework of earlier European Science Weeks.

5.1 Setting up the National Steering Committee

It is recommended that the NSCs be primarily comprised of scientists, science educators, media experts, government officials, representatives from Industry and others.

Preferably, the NSCs will be hosted by a national body with a strong track record for efficient running of educational programmes in science, possibly the national branches of the European Physical Society or other bodies of similar stature. Also the expertise and the proven network of the EAAE should be drawn upon with the understanding that the EAAE network would be 'embedded' in the supporting structure, as could for instance be provided by the physics society.

It is recommended that the NSCs maintain contact with the national delegates to the governing bodies (Councils) of the **Physics on Stage** partner organisations. They may also wish to contact the national representation of the European Commission in their respective countries.

Membership of the National Steering Committees is unpaid; however, within the national budget of the **Physics on Stage** programme, certain associated expenses such as travel may be covered.

5.2 Public Communication

The success of the **Physics on Stage** programme depends largely on the efficiency of the NSCs. Public communication thereby plays a crucial role, both in terms of raising interest and recruiting potential participants.

Key communication goals are:

- To inform a wide audience about the **Physics on Stage** initiative
- To stimulate the general interest in physics
- To demonstrate the European dimension of research and the related educational activities

The NSCs are called upon to use all communication channels available to them, including the setting up a national web page, issuing national press releases and holding press conferences, ensuring coverage also in the relevant professional journals, eg for teachers.

Furthermore, it is desirable to further a public debate on the need for improved public science literacy. While **Physics on Stage** partner organisations – through their press offices – will seek to stimulate this debate on a

Europe-wide scale, national initiatives organised in conjunction with the **Physics on Stage** programme are most welcome.

5.2.1 Programme Identity

The European Week for Science and Technology 2000 comprises a total of 7 different programmes. In communicating with the public (via the professional organisations, the media etc), it must be understood that the **Physics on Stage** programme is an integral part of the European Science Week. Certain common rules will therefore apply for the use of logos and predefined texts. To this effect, illustrations of the official logo of 'the Week' as well as a standard text which should be contained in all official communications will be provided to the NSCs.

5.2.2 Use of typefaces and graphical material

To maintain a graphical identity of the programme, certain standard typefaces will be selected for the programme. The programme title and all relevant logos will be downloadable from the central **Physics on Stage** Web site. Any official documentation (brochures, posters, web-pages) must use these standards.

5.3 Language

Whereas national activities may of course be conducted in the language(s) of the respective country, the language used in all communications from the ISC and also on the central Web page is English. Also, the working language during the main event in Geneva will be English.

5.4 Selecting participants for the Main Event

The central task of the national programme will be to identify and demonstrate novel ideas and projects for science education, proposed by science educators, science communicators and possibly others in their area. The **Physics on Stage** partner organisations recognise that novel ideas and innovative approaches are not bound to nations or geographical areas. Nevertheless, the programme is, in principle, aimed at countries that are members of either one of the partner organisations or of the European Union. To ensure a reasonable participation by all these countries in the Main Event in Geneva (maximum number approx. 400), a national quota of participants has been determined, based on criteria similar to those adopted by institutions of the European Union. The nominal number of participants per country is:

Austria	10
Belgium	12
Bulgaria	10
the Czech Republic	12

Denmark	8
Finland	8
France	40
Germany	45
Greece	12
Hungary	12
Ireland	7
Italy	40
Luxembourg	3
the Netherlands	14
Norway	7
Poland	28
Portugal	12
the Slovak Republic	8
Spain	30
Sweden	11
Switzerland	9
United Kingdom	40

The figures indicate the number of delegates, for whom travel (from the capital of their country) and accommodation will be paid by the **Physics on Stage** programme. A small number of additional places will be held in reserve by the ISC to enable possible special participation from outside of these countries.

Official representatives of government agencies/ministries are assumed to travel at the cost of their organisation.

5.5 Special Performances

In addition to the task of organising the national event in their respective countries, the NSCs are asked to solicit proposals for major performances. Such contributions may have many different formats. They may of course exist already (but be largely unknown outside of the country or professional discipline), but may also simply be ideas that have yet to be realised, and for which outside funding is required. In its mid-term report to the International Steering Committee, the NSCs are invited to forward proposals for such major performances (up to 3 from each country). Aided by the Performance Evaluation Committee, the ISC may allocate funds for up to 10 major performances for development and presentation at the Main Event in Geneva.

The proposals should contain sufficient information (eg as a document or a video-tape) about the suggested performance, including – where applicable – details about funding and requested financial support from the ISC. In general, financial support from the ISC to successful candidate projects will not exceed 10 000 € per performance.

5.6 Contact Point

The principal contact point for the National Steering Committees is with the Executive Coordinator.

5.7 Budget

An amount of approx. 5,000 € per country is foreseen as seed money for national activities. National committees are expected to raise at least the equivalent amount through local and national sponsorships. Sponsorships can be in-kind or cash support.

Appendix A – The Physics on Stage Partner Organisations

European Space Agency (ESA)

The European Space Agency was formed out of, and took over the rights and obligations of, the two earlier European Space Organisations: the European Space Research Organisation (ESRO) and the European Organisation for the Development and Construction of Space Vehicle Launchers (ELDO). The Member States are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Canada is a Co-operating State.

In the words of the Convention, the purpose of the Agency shall be to provide for and to promote for exclusively peaceful purposes, co-operation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems.

- (a) by elaborating and implementing a long-term European space policy, by recommending space objectives to the Member States, and by concerting the policies of the Member States with respect to other national and international organisations and institutions
- (b) by elaborating and implementing activities and programmes in the space field
- (c) by co-ordinating the European space programme and national programmes and by integrating the latter progressively and as completely as possible into the European space programme, in particular as regards the development of applications satellites
- (d) by elaborating and implementing the industrial policy appropriate to its programme and by recommending a coherent industrial policy to the Member States.

The Agency is directed by a Council composed of representatives of Member States. The Director General is the chief executive of the Agency and its legal Representative.

The ESA Headquarters are in Paris.

The major establishments of ESA are:

- The European Space Research And Technology Centre (ESTEC), Noordwijk, The Netherlands
- The European Space Operations Centre (ESOC), Darmstadt, Germany
- ESRIN, Frascati, Italy

European Laboratory for Particle Physics – A European laboratory for the world

CERN, the European Laboratory for Particle Physics, is one of the world's most prestigious research centres. Its business is fundamental physics – finding out what makes our universe work, where it came from, and where it

is going. At CERN, some of the world's biggest and most complex machines are used to study nature's tiniest building blocks. By colliding these minute particles of matter physicists unravel the basic laws of nature. CERN's machines are particle accelerators and detectors. The laboratory's accelerator complex is built around three principal inter-dependent accelerators. The oldest, the Proton Synchrotron (PS), was built in the 1950s and was briefly the world's highest energy accelerator. The Super Proton Synchrotron (SPS), built in the 1970s, was the scene of CERN's first Nobel Prize in the 1980s. The Large Electron-Positron collider (LEP) is the Laboratory's current flagship; it came on stream in 1989.

CERN is currently preparing to install a new accelerator inside the same tunnel as LEP. Called the Large Hadron Collider (LHC), this machine will start-up in 2005 giving the world's physicists a new tool to probe deeper than ever into the heart of matter. Each of CERN's accelerators plays host to a range of experiments run by collaborations of physicists from around the world. These physicists build particle detectors at their home institutes and bring them to CERN to record the results of particle collisions.

CERN was founded in 1954 as one of Europe's first joint ventures. Since then it has become a shining example of international collaboration. From the original 12 signatories of the CERN convention membership has grown to 19 Member States. The Laboratory sits astride the Franco-Swiss border west of Geneva at the foot of the Jura Mountains. Some 7000 scientists, over half the world's particle physicists, use CERN's facilities. They represent some 500 universities and over 80 nationalities.

CERN has long experience in organising conferences and has all the necessary facilities on site. CERN participated in 3 'European Weeks of Scientific and Technological Culture' In 1993 'The European Science /Media Conference' was the first time that journalists and scientists were brought together to discuss mutual problems. In 1994 The film 'Euro Big Bang' traced the contribution of Europe's scientific research organisations to the establishment of a united Europe. The film was awarded first Prize at the Lausanne International Science Film Festival in 1996. The project 'The World's biggest library on your desk' in 1995 introduced the enormous potential of the WEB as an educational tool to schools all over Europe.

European Southern Observatory – The European Astronomy Organisation

ESO, the European Southern Observatory, is a intergovernmental European organisation that was created in 1962 to... 'establish and operate an astronomical observatory in the southern hemisphere, equipped with powerful instruments, with the aim of furthering and organising collaboration in astronomy...'

ESO is supported by eight countries: Belgium, Denmark, France, Germany, Italy, the Netherlands, Sweden and Switzerland. Portugal is associated with ESO. It is expected that others will join during the next years.

ESO operates at several sites. It runs the La Silla observatory in the Atacama desert, 600 km north of Santiago de Chile, at 2,400 m altitude, where fourteen optical telescopes with diameters up to 3.6 m and a 15-m submillimetre radio telescope (SEST) are now in operation. In addition, ESO is in the process of building the Very Large Telescope Array (VLT) at the new Paranal Observatory. Located approximately 130 km south of Antofagasta, this 2,600 m high mountain is in the driest part of the Atacama desert. The VLT consists of four 8.2-meter and several 1.8-meter telescopes. These telescopes can also be used in combination as a unique, giant interferometer (VLTI). 'First Light' of the first 8.2-meter telescope (UT1) occurred in May 1998. UT1 became available on a regular basis for astronomical observations from April 1999 on. Over 1000 proposals are made each year for the use of the ESO telescopes.

The ESO Headquarters are located in Garching, near Munich, Germany. This is the scientific, technical and administrative centre of ESO where technical development programmes are carried out to provide the La Silla and Paranal observatories with the most advanced instruments. There are also extensive astronomical data facilities. In Europe ESO employs about 200 international Staff members, Fellows and Associates; in Chile about 50 and, in addition, about 130 local Staff members. The annual budget is of the order of 72 million € (140 million DEM).

ESO successfully participated in European Weeks in 1993 ('Future Astronomers of Europe'), 1994 ('Astronomy: Science, Technology and Culture'), 1995 ('Europe towards the Stars'), 1996 ('Astronomy On-Line'; with EAAE) and 1998 ('Sea and Space'; with ESA and EAAE).

Full information about ESO and its various projects is available on the web at URL: <http://www.eso.org/>

European Physical Society

The European Physical Society (EPS) provides an international forum for physicists as individuals and acts as a federation of national physical societies for the promotion of physics in Europe. Founded in 1968, the EPS now has over 3400 physicists from a variety of occupations as individual members, and brings together 36 national physical societies which represent 80000 physicists from the countries of Europe that have an active physics community.

The major fields of physics are represented through EPS Divisions and Inter-divisional groups. Other EPS groups address broader topics of importance to European Physicists, such as education and technology.

Among our many activities are:

- Conferences (organised directly by the EPS, or sponsored)
- Publications
- Student exchange and public understanding

European Association for Astronomy Education

In the context of the European Week for Scientific and Technological Culture, promoted by the European Union, the European Southern Observatory (ESO) organised in November 1994 in its Garching headquarters near Munich, Germany a seminar open to high school teachers from all over Europe. Various work and reflection groups focused on the role of astronomy in secondary school teaching, and drew up a final declaration which summarised these reflections, and underlined the urgent need for a European association of teachers interested in astronomy. A temporary executive committee prepared the General Constitutional Assembly, which took place in Athens in November 1995.

The purpose of the Association is to 'improve and promote astronomical education at all levels in all institutions involved in teaching astronomy in Europe'. The aims of the Association are in particular:

- To promote a greater interest in, and an awareness of, the role of astronomy education.

-
- To increase the effectiveness of European astronomy education at all levels through research and the exchange of information and experience.
 - To be a responsible body able to provide informed and authoritative advice on co-ordinated European astronomy education.
 - To encourage as deemed appropriate by its Members the development of resources for teaching of astronomy.

EAAE has approx. 500 members in 19 European countries. It is headed by an Executive Board and there are National Representatives in each country, responsible for the daily affairs at the national level and interacting with Executive Board. It has a number of specialised Working Groups. It has held numerous meetings at the national and international level, including several Summer Schools. The most recent General Assembly was in Stockholm (Sweden) in September 1998.

EAAE is legally registered in the Federal Republic of Germany as a non-profit association ('e.V.'). Full information about EAAE and its various projects is available on the web at URL: <http://www.algonet.se/~sirius/eaee/>

Appendix B – The International Steering Committee

Mr Neil Calder (CERN)

Neil Calder has been responsible for CERN's Press and Publication activities since 1989. This experience has allowed him to build up a deep knowledge and understanding of world scientific media. He has organised and presided several international conferences bringing the media and scientists together. He has produced several films and published articles in many leading media. Recently he has been collaborating with the French National Education Authority on presenting particle physics in schools. Neil Calder led the CERN projects for the European Week of Scientific and Technological Culture in 1993, 1994, 1995.

Prof. Frank Close (CERN)

Prof. Frank Close is a theoretical particle physicist and science communicator. He won the Institute of Physics (UK) Kelvin Medal in 1996 for his contributions to the public awareness of physics. He is head of theoretical physics at the Rutherford Appleton Laboratory in the UK, and is currently seconded to CERN as Head of the CERN Communication Group and as the leader of the European Particle Physics Outreach Network. He is a vice president of the British Association for the Advancement of Science. He presented the Royal Institution Christmas Lectures on British television in 1994, is a regular contributor on science for the BBC World Service and writes regularly for The Guardian and other news media. He has published over 200 research papers on physics, a major textbook and several popular books on modern physics.

Mr Claus Madsen (ESO)

ESO Public Relations Officer. In his career, he has pursued two strands – scientific imaging techniques and activities relating to the promotion of the public understanding of science. Joined ESO 1980 as a staff member of the Sky Atlas Laboratory, from 1986 – as a team member of the ESO Education and Public Relations Dept. – strongly involved in the science communication through exhibitions, films, public lectures and as international coordinator for the ESO educational activities within the European Science week ('Future Astronomers of Europe'), 1994 ('Astronomy: Science, Technology and Culture'), 1995 ('Europe towards the Stars'), 1996 ('Astronomy On-Line'; with EAAE) and 1998 ('Sea and Space'; with ESA and EAAE). (Co-author of the book 'Exploring the Southern Sky' (Springer Verlag 1987). Honorary member of the EAAE.

Prof. Wubbo Ockels (ESA)

Professor Ockels is an experimental Nuclear Physicist by education and an ex- scientist astronaut from the European Space Agency. DR. Ockels was selected in 1978 as one of the three first ESA astronauts. Dr. Ockels flew aboard the US space shuttle Challenger in 1985, for conducting experiments of a multitude of disciplines in the German organised Spacelab mission. **Presently Dr. Ockels is heading the ESA's new Office for Education Project Outreach activities and is part time professor at the Aerospace faculty of the Delft University of Technology.** He has initiated various space-related activities to involve youngsters. As such two times special parabolic flight campaigns for students were organised within the frame of the European week for Science and Technology (1994, 1995). In 1997 Ariane 502 launched Teamsat, a satellite build by young engineers. From 1997-1999 a large group of university students designed a new lunar satellite Lunarsat.

Dr Fernand Wagner (EAAE)

Vice President of the European Association for Astronomy Education. Physics studies in Paris (Université de Paris, Orsay), Physics teacher in Luxembourg Secondary School, Co-ordinator for Physics at the 'Département

ment de Formation Pédagogique du Centre Universitaire de Luxembourg', President of the 'Commission Nationale pour les programmes de la physique de l'enseignement secondaire au Luxembourg'

Dr Richard West (ESO)

Senior Astronomer and Head of EPR Dept. at ESO since 1986. Degree in astronomy and astrophysics and Assistant Professor at Copenhagen University Observatory (1964-1972), Assistant Astronomer to ESO Director General (1970-1972), Head ESO Sky Atlas Laboratory (1972 -1994), Assistant General Secretary (1979 -1982) and General Secretary of the International Astronomical Union (1982-1985), Chairman of various IAU Working Groups and President/Vice-President of IAU Commissions 6, 20, 38 (at various times from 1985 until now), Member of Executive Board of the International Council of Scientific Unions (ICSU) on behalf of Earth and Space Sciences (1982 - 1986), Research work, including co-ordination of various international research teams, mostly within solar system, About 150 scientific papers on double stars, galaxies, comets and asteroids; Many popular articles, talks, TV-appearances. Author of several books, Editor of ESO Messenger (1972-1982; 1986-1994).

Appendix C – Executive Coordinator

Mr Clovis De Matos

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*All correspondance to the **Physics on Stage** programme should be directed to the Executive Coordinator.*

Appendix D – Physics On Stage Work Packages

The programme will be based on four work packages* that pertain to the different phases. The corresponding timings are as follows:

WP 1	January – December 2000
WP 2	January – October 2000
WP 3	May – November 2000
WP 4	November 2000 – December 2000 (possibly January 2001)

Timetable for work packages

	1	2	3	4	5	6	7	8	9	10	11	12
WP 1	■	■	■	■	■	■	■	■	■	■	■	■
WP 2	■	■	■	■	■	■	■	■	■	■		
WP 3					■	■	■	■	■	■	■	■
WP 4											■	■

Activities

	WP Title	Lead Contractor	Person-months	Start month	End month	Deliverable
WP 1	MANAGEMENT	CERN	1.0	JANUARY 2000	DECEMBER 2000	1, 2, 3, 5, 10, 16
WP 2	NATIONAL ACTIVITIES	ESA	8.0	JANUARY 2000	OCTOBER 2000	4, 6, 7, 8, 9, 11, 12
WP 3	MAIN EVENT	CERN	7.2	MAY 2000	NOVEMBER 2000	13, 14, 15
WP 4	FOLLOW UP	ESO	1.5	NOVEMBER 2000	DECEMBER 2000	17

* This WP structure has been proposed but may be subject to change during the negotiations with the European Commission.

WP 1 (Programme Management)

Objectives

- To perform all relevant management services and functions to and by the International Steering Committee (ISC) and its associate bodies (The **Physics on Stage** Advisory Committee and the **Physics on Stage** Performance Evaluation Committee)
- Programme co-ordination and management
- Document preparation (e.g. guidelines to National Steering Committees (NSCs))
- Financial administration
- Internal reporting (also to the EC)
- Central public communication (brochure, web page, press release)

Deliverables

- Internal Programme Documentation, Database and Web page (electronically available to the partners) (January 2000)
- Establishment of National Steering Committees (January 2000)
- 'International' Web page (External) (start-up in January 2000; continuous updates)
- Brochure (February 2000)
- Financial report (November 2000)

Milestones and expected results

The milestones and expected results mentioned below are the general milestones of the entire **Physics on Stage** programme.

- Launch of national programmes (February 2000)
- The National Events (September 2000)
- The Main Event (November 2000)
- Follow up activities (may stretch into January 2001)

The expected overall results are:

- General management of **Physics on Stage**, with the following effects:
 - Calling attention on a Europe-wide scale to physics illiteracy
 - Involving a large number of participants in the search for suitable remedies
 - Compiling a list of results of these deliberations and disseminate it widely

WP specific milestones

- Formal establishment of NSCs and approval of national plans of action (January 2000)
- Selection of key performances for showing at the main event (May 2000)
- Financial reporting (December 2000)

WP 2 (National Programmes)

(22 individual countries, 1 WP for each country [WP 2/1, WP 2/2, etc.])

Objectives

- Management and execution of national activities, including national event(s)
- Public communication (brochure, national web-page, national press activities)

Deliverables

- National action plan endorsed by the ISC (January-February 2000)
- National Web pages (February-March 2000)
- Brochure (April 2000)
- Monthly progress reports (From February 2000)
- Mid-term report to the ISC (May-June 2000) with proposals for 'super performances'
- National Event (September-October 2000)

WP specific milestones

- National action plan endorsed by the ISC (January 2000)
- National Web pages (February 2000)
- National Brochure (April 2000)
- Selection of candidates for Special Performance support (presentation at main event) (May 2000)
- National Event (September-October 2000)
- Selection of participants to Main Event (September-October 2000)

WP 3 (Main Event)

Objectives

- Management and execution of main event (Geneva meeting), including planning and organisation of the event, travel and accommodation for all participants (November 2000)
- Public communication (Newspapers, TV, Web casting)

Deliverables

- Main event programme (November 2000; during Science Week), comprising
 - fair
 - presentations
 - performances
 - scientific talks
 - workshops on issues related to science teaching and public communication of science
 - general logistics
- Reports by workshops (November 2000)

- Recommendations to governments and organisations (November 2000)

WP 4 (Follow-up)

Objectives

- Preparation, publication and distribution of documentation of **Physics on Stage** activities and recommendations (e.g. CD-ROM)

Deliverables

- CD-ROM, possibly printed documentation (January 2001)

Deliverables List

Deliverable	Deliverable title	Delivery date	Remarks	Dissemination level
1	Internal Programme Documentation	END OF JANUARY	ESA provides server with FTP account all docs. are electronically available to the partners and is well structured in a database.	Partner organisations (ISC)
2	Appointment of National Steering Committees	END OF JANUARY	Established with the help of CERN and ESo networks, follow up by Executive Coordinator (ESA)	Partner organisations (ISC)
3	Web site (Internal and external)	END OF JANUARY	Executive Coordinator (ESA)	Internal: RESTRICTED external: PUBLIC
4	Formal establishment of NSCs	END OF JANUARY	International Steering Committee, based on report by Executive Coordinator (ESA)	Partner organisations (ISC)
5	Approval of national plans	END OF JANUARY	International Steering Committee, based on report by Executive Coordinator (ESA)	CONFIDENTIAL

6	Launch of national programmes	MID-FEBRUARY	Formal activity (i.e. national press conference ; possibly with international press conference at CERN, all partners present) prep. by CERN PR in collaboration with ESA and ESO PR.	PUBLIC
7	National Web pages	MID-FEBRUARY	National Steering Committees	PUBLIC
8	National Brochure	MID-MARCH	National Steering Committees with support from the Physics on Stage consortium/Executive Coordinator (ESA)	PUBLIC
9	Mid-term report to the ISC*	MAY	National Steering Committees	CONFIDENTIAL
10	Selection of key performances for showing at the main event	MAY	International Steering Committee in on advise from Advisory Committee	RESTRICTED
11	National Event	SEPTEMBER	National Steering Committees	PUBLIC
12	National Financial report to ISC	OCTOBER	National Steering Committees via Executive Coordinator to International Steering Committee	CONFIDENTIAL
13	Main event	NOVEMBER	CERN	PUBLIC
14	Reports by workshops	NOVEMBER	CERN	PUBLIC
15	Recommendations to governments and organisations	NOVEMBER	CERN	PUBLIC
16	Financial report	DECEMBER	CERN to International Steering Committee	CONFIDENTIAL
17	Programme documentation	DECEMBER	ESO	PUBLIC

Summary table of person-months

	1	2	3	4	5	6	7	8	9	10	11	12
CERN					1	1	1	0.2	1	2	2	
ESA	1	1	0.5		1	1	1	0.5	1	0.5	0.5	
ESO	0.2	0.2	0.2		0.1						0.3	0.5
PART. COUN- TRIES*	11	11	11	11	11	11	11		11			

* Cumulative for all national work packages