

European Space Sciences Committee

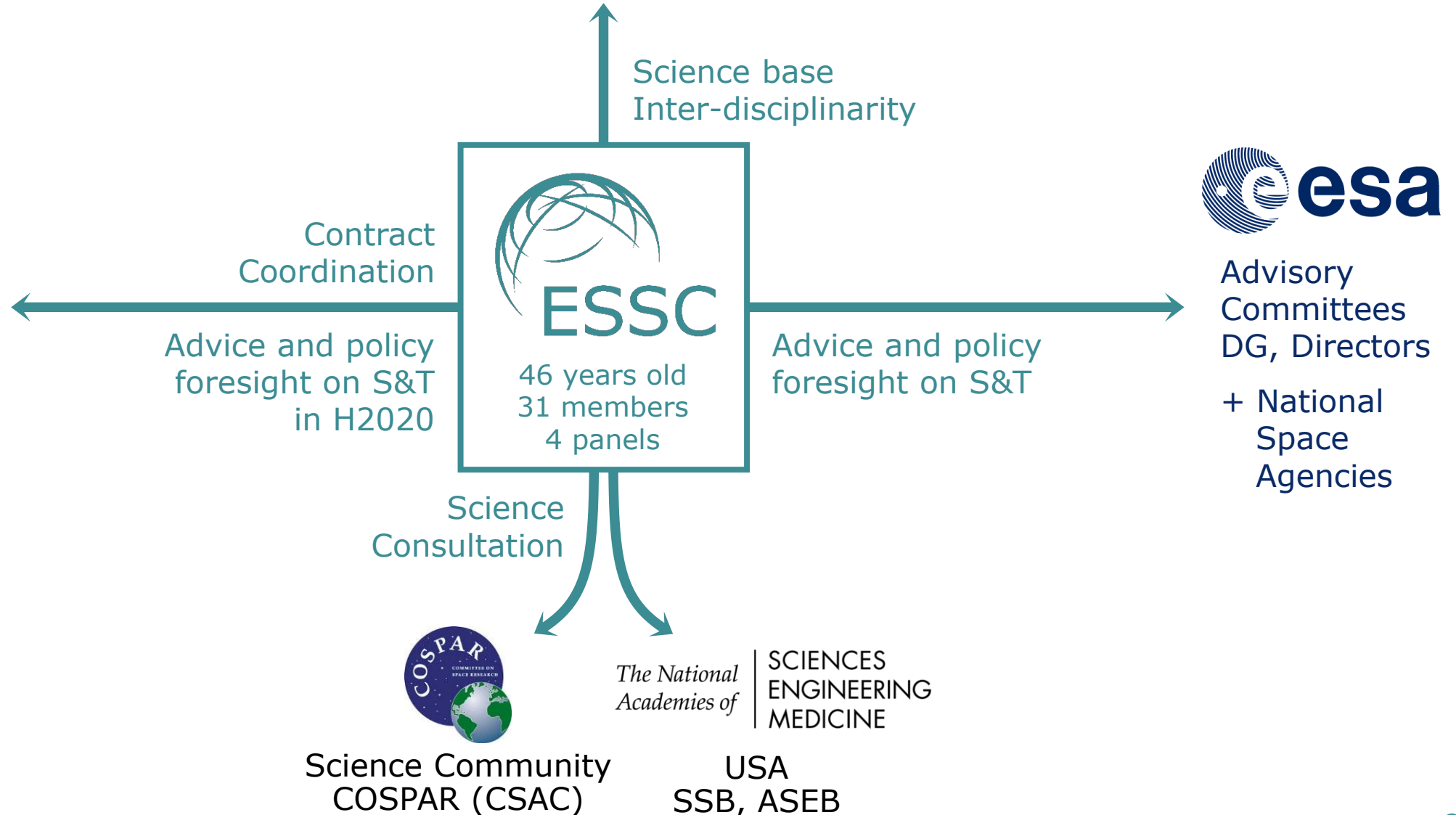
Recommendations on Fostering European Talents In Space Science And Education

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Solar System and Exploration Panel Chair

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SAG in H2020
DG-ENT,
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Academy



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Horizon Europe - the next research and innovation framework programme

How Horizon Europe is being designed, legal framework, factsheets, reports and timeline.



ESSC is a member of Copernicus Academy and an active contributor to the regular EC consultation on innovation, science and technology development.

Horizon Europe Development ESSC Contribution



Consultation on Horizon Europe
October 2019

**European Space Sciences Committee
Contribution**

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The European Research Landscape

- Horizon Europe as a tool to strengthen space sciences and technology on the European scene
- Complementing national and European space programmes: upstream and downstream support
- Big data
- Reaching a clear view of horizon Europe support to space activities
- European talents
- The need for an empowered advisory body for space

The European Research Landscape ESSC Recommendations

- European Talents – 1
 - Horizon Europe should allow for the development of mechanisms to permit **maintaining knowledge, competencies and know-how** in areas where the European scientific community excels at the international level. These mechanisms could be implemented by and/or in concertation with Member States' institutions and should fully integrate the use European space assets, also including relevant ground-based facilities and infrastructures for space science and technology.
- Direction:
 - Both in science and technology European laboratories have demonstrated widely recognised excellence in space mission development and exploitation. **This needs to be transmitted to young researchers and must be included in specific courses at University level.**
 - Inspiring first-time achievements of ESA, like e.g. the Huygens probe landing on far-away Titan and the Philae probe landing on comet 67P, managed to engage a large EU community of different generations.

The European Research Landscape ESSC Recommendations

- European Talents – 2
 - Horizon Europe should acknowledge and utilise the high level of public interest stimulated by recent and ongoing space activities (also in the field of space exploration) and work towards turning this interest into improved recruitment into STEM high-school and graduate studies as well as improve general STEM literacy of the European citizens.
 - The creation of specific coordinated programmes and actions for children, pupils, and young researchers in the field of space research is highly recommended in view of high replacement demand for high-skilled professionals working in STEM-related occupations in the coming years (“Does the EU need more STEM graduates”, Directorate-General for Education and Culture, 2015) .
 - Furthermore, space sciences projects to be funded by the Horizon Europe programme need to dedicate a percentage of received grants to outreach and education activities.

The European Research Landscape ESSC Recommendations

- European Talents – 3
- Direction:
 - In comparison with the communication and Outreach activities in the US, Europe is undoubtedly lacking behind, both in training and early-learning, enabling scientists and engineers **to speak to the public, and in particular to schools and students**. This will need to be addressed e.g. by creating communication opportunities between communication specialists and space scientists (astronomers, astrophysicists, engineers,...) directly aimed at addressing and attracting young people.

The European Research Landscape ESSC Recommendations

- European Talents – 4
- Direction:
 - Universities play an important role in educating students at BSc and MSc level. The combination of research and teaching is an excellent way to motivate and train talented young people. Universities therefore need skilled tenure track (TT) personnel in space related subjects to perform this inspiring task. However, today's demands on TT personnel are high in terms of fund acquisition, publication, teaching and even administration. Horizon Europe should therefore allow to actively invest in this valuable human capital at Universities.

The European Research Landscape ESSC Recommendations



- Complementing national and European space programmes:
Upstream and Downstream Support
 - Horizon Europe presents a unique opportunity to strengthen the European efforts in space sciences by **complementing the investment already made by space agencies and member states on missions and instruments**:
 - either **upstream** – by supporting early development work for potential future science missions and instruments, **raising “Technology Readiness Levels” (TRLs)** towards new mission concepts provided or studied by space agencies,
 - or **downstream** – by supporting the **scientific exploitation of space missions and overarching space science data from combined assets on ground and in space**, even covering **interdisciplinary science goals**, which typically are difficult to fund by national agencies.

BepiColombo spacecraft (credit: ESA)



- Complementing national and European space programmes - 1: Education and Training
 - Professionals of the future need to be trained on new techniques, enabling more effective ways to analyse the huge amounts of space data that is gathered by scientific space missions in all research fields.
 - Space missions typically aim to answer important scientific questions which are of relevance for our society, e.g. on climate change, solar activity and impacts on our planet, planetary developments in our and other solar systems, various aspects of microgravity, etc...
 - Although data exploitation techniques like AI and machine learning will likely play a pivotal role in the future, links with traditional disciplines like physics, astronomy, chemistry, material science and geology should remain strong.

Astronaut EVA Training (credit: ESA)

The European Research Landscape

ESSC Recommendations



GAIA spacecraft (credit: ESA)

- Complementing national and European space programmes -2 :
Mission Examples producing Big Data and Overarching Science
 - The star-finder mission **GAIA** is an excellent example of Big Data and the need for education in large data treatment and with AI.
 - The **COPERNICUS** Earth Observation Network produces an unprecedented dataset of our planet for many different applications
 - **SOHO** and **CLUSTER**, the **Proba-2** and **-3** missions, and soon **Solar Orbiter** help us to understand the sun and its impact on Earth
 - **Mars-Express**, **Venus-Ex**, **Cassini-Huygens** and **Rosetta** supply the basis for Comparative Planetology, preparing for **Bepi/Colombo** and **Juice**
 - **Cheops** will find new planetary worlds around other stars, preparing for **Plato** and **Ariel** to understand alternative solar systems.

Horizon Europe should encourage and mobilise assistance to research infrastructures supporting space activities that produce “Big Data”



■ Academia-Industry Relations – 1

- A fruitful collaboration between academia and industry can be the source of new ideas and new protocols, as well as leading to creative new approaches, which eventually will be highly beneficial for any kind of space activities at large.
- Unfortunately Graduate and Post-Graduate scientific training in Europe does not effectively accomplish a common understanding and communication between academic scientists and engineers.
- Graduate and Post-Graduate training programmes in Europe are often sharply polarised between technical and scientific domains.
- While Entrepreneurship and Fundamental Science mostly live in two separate worlds, even speaking different languages, they could in fact profit very much from each other.
- The development of space instruments and missions, including “Space spin-off products” offer an excellent opportunity to foster European talents, capable to live and work in both worlds.

BepiColombo in the cleanroom (credit: ESA)

The European Research Landscape

ESSC Recommendations



- Academia-Industry Relations – 2
- “Challenges” may be a way to trigger and stimulate cooperation and interdisciplinary research between industry and academia.
 - Such “Challenges” should typically set a **goal with measurable objectives**, e.g. in the realm of space instrumentation or data analysis
 - “Challenges” should result in a prize for the team, that manages to solve the challenge
 - Any team should consist of a **mixture of space scientists and engineers**, which learn to solve problems and develop technical solutions for scientific questions together.
 - In the USA, NASA (as well as other national agencies) regularly issues such challenges.

BepiColombo lift off (credit: ESA)

The European Research Landscape ESSC Recommendations



- Horizon Europe as a tool to strengthen space sciences and technology on the European scene -1
 - The scientific community should be involved in the definition of Horizon Europe's space-related work programmes as early as possible in order to maximise its scientific return, and to adapt to current needs.
- Direction:
 - Scientists and engineers within recognised entities like committees, Academies, international research organisations and coordinating initiatives should be consulted and involved in the preparation of specific Horizon Europe calls.
 - ESSC has already responded to and participated in different stakeholder consultations concerning the space-related parts of the Horizon Europe programme, and we can easily be involved in a more efficient preparation of future calls, through already established interactions with DEFIS representatives.

ESSC contributions to EC Framework Programmes



Space Clusters Consultation



Horizon Europe Consultation



Consultation on Space Work Programme

2016

2018

2014

2017-2018

2019

Space Strategy for Europe Consultation



FP9 Consultation

The European Research Landscape ESSC Recommendations



Europe from Space (credit: ESA)

- Horizon Europe as a tool to strengthen space sciences and technology on the European scene - 2
 - Horizon Europe should give **strong consideration to Member States research organisations, national agencies and the European Space Agency**, always aiming at the most appropriate way to optimise interactions and coordination. The space element of Horizon Europe should be **developed in agreement with the key European stakeholders** in order to accomplish the most efficient implementation of aspects of common interest in space research and technology.
- Direction:
 - National space agencies, industry and other stakeholders who contribute to the development and exploitation of space missions and ground-based data appreciate further guidance from experts directly involved in these efforts. Progress is a matter of enabling the stakeholders on the basis of a better understanding, and appreciation of international space efforts, **and improved funding allocation...**

The European Research Landscape ESSC Recommendations



- Horizon Europe as a tool to strengthen space sciences and technology on the European scene - 3
 - Beyond Europe, Horizon Europe should also allow to prepare for a **more robust European position in the context of international cooperation**, with the aim to promote common development and partnerships at international levels outside Europe, for areas of common interest and in particular for scientific programmes.
- Direction:
 - Scientists and engineers are always working in collaboration with their international colleagues, exchanging ideas and know-how. This could be of increased benefit to both sides via a formalised framework, like e.g. a Horizon Europe structure with adequate support.
 - In particular, **Horizon Europe could encourage European collaboration and partnerships with both leading and emerging space faring nations in Asia and Africa.**

END