



**E**UROPEAN  
**S**CIENCE  
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SETTING SCIENCE AGENDAS FOR EUROPE

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**TECHBREAK**  
ESF FORWARD LOOK

# Discussions Day 1 (1)

- Already identified list of technologies on ESA's agenda (see, e.g. HiSPAC list), e.g. precision metrology  
→ how to/can we match these with KETs and other enabling technologies?
- Risks must be taken and managed. Who should bear the risks?  
→ short-term (industry) and long-term (academia, programmes)
- Space not part of the industries feeding into the KET areas  
→ how can we ensure that this is changed?
- ESA investment limited. Where to find the capital to invest into such TD? Do we have the institutions to select in which technologies to invest?
- How to deal with technologies developed for space without mass market relevance or immediate interest, in a context where policy support seems to diminish?
- 'Valley of Death': Europe is less good at the stage of product commercialisation

# Discussions Day 1 (2)

- Can a given KET be used as a test case to improve future coordination between ESA and EC?  
→ **Advanced Materials?**
- Various materials could perhaps be used for space  
→ **membranes, nanotubes, polymers (mirrors, plastic cables, photovoltaics)?**
- Public-Private Partnerships to be established  
→ **example of Eindhoven or IBM-ETH Zurich**
- Leading-edge science needs a leading edge infrastructure. Need for funding schemes for pre- competitive research (bridging the valley of death): not sufficiently covered by FPs
- IP is preventing industry from effectively work globally, and even locally (Universities became inflexible)
- Wild cards  
→ **biomimetics?**

# What to do today?

- Gaps and differences space vs. non-space at a detailed level → where to stop?
  - Which criteria to select and classify the fields?
  - Granularity level?
- Survey questionnaire
  - Questions
  - People (as precise as can be)

## Key and other Enabling Technologies

1. Nanotechnology
2. Micro and nanoelectronics
3. Photonics
4. Advanced materials
5. Biotechnology
6. Energy?
7. Propulsion?
8. Robotics?



# Way forward

- **Focussed workshops (one suggestion)**
  - Nanotechnology & microelectronics (manipulation of atoms)
  - Photonics, incl. energy
  - Biotechnologies (waste treatment, ISRU, LSS, etc)
  - Advanced materials
- **ICT, robotics as applications of KETS?**
- **Who participates?**



# What HiSPAC would like to achieve

- Agenda strongly driven by technologies on the agenda of various entities within the ESF programme (cf. list for distribution: most important developments that HiSPAC believes will take place + lasers in space)
- Views of this conference are needed about how these topics could develop over the next two decades
- Add other areas where conference participants believe important additional contributions to space science and technology may occur
- It could be helpful to ask the experts from the five discipline areas how they see these contributing to the types of technology which will be needed (considerations should span the complete range of ESA science and technology)
- HiSPAC is not interested in the institutional context within which these developments will take place (much expected to come from university scientists interacting with experts in ESA). The emphasis must be upon the technologies which are likely to be at the cutting edge in 20 years time. This is a difficult task, but it is one we need to address seriously

# Fostering Technological Breakthrough in Space through transfer from Non-Space domains

**Create a WIN-WIN situation to motivate both sides**

- **1. ESA-EU identify technological issues in space programs**
- **2. Publicize issues in FP8 calls to joint team S – NS**
- **3. Award contracts on the basis of TEB evaluation**
- **4. Among criteria: solution already implemented by NS**
- **5. 100% funding for NS, 70% for S-SME, 50% for S-LSI**
  
- **Possible domains: materials, structures, thermal, electronic, photonics, radiations, standards, services,...**
- **Award and Publicize an annual prize to the best NS-S transfer project on technical and economic criteria**

# Brainstorm on workshops

- Applications of KETS?
- Engineering processes?
- Concentrate on scientific breakthroughs
- Criteria to filter out / in topics
- Sub-topics (technology domains) or functionalities (existing material at ESA)?  
The former; then perhaps attempt to map into functionalities
- Recommendations / advice about « big bets »

# Workshop attendees

- **Researchers (bibliometrics study will be needed)**
- **‘High-tech’ companies (IBM model?)**
- **Based on sub-areas to include in our workshops**

## Nanotechnologies & microelectronics

- **Physics (better name?)**
- **Packaging**
- **New devices suited to radiation protection**
- **Processing**

# Photonics

- Lasers
- Frequency stabilised, tunable devices (clocks, lidars)
- Detectors
- Astrophotonics (band-gap optics)
- Power generation (quantum solar cells, anything new)
- Filters

# Biotechnologies

- Go through the whole area and see what they have!
- Membranes, biofilms, biocontamination, etc

# Advanced materials

- **Glues**
- **Active structures**
- **Plasma / surface treatment, optical coatings**
- **Applications of nanoparticles**



# Timeline

- Workshops +3-4 months
- Consensus conference +6 months
- Interviews, survey, feedback to you (+2-3 months)
  - Slides sent after conference
  - Draft report sent within 2 weeks
  - Need for names (+1 month)
  - Feedback on « tree structure » +2 months