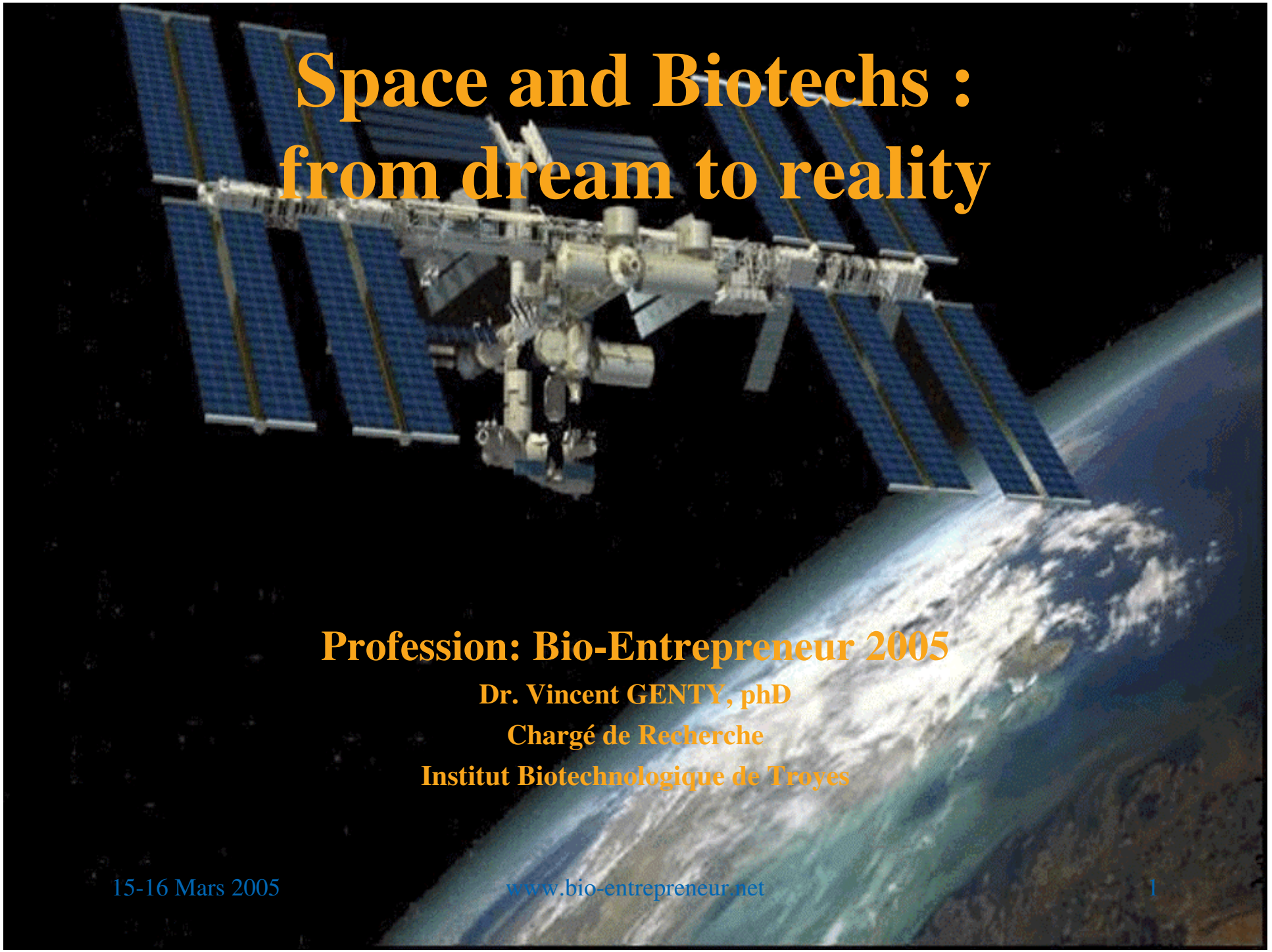

Space and Biotechs : from dream to reality

Profession: Bio-Entrepreneur 2005

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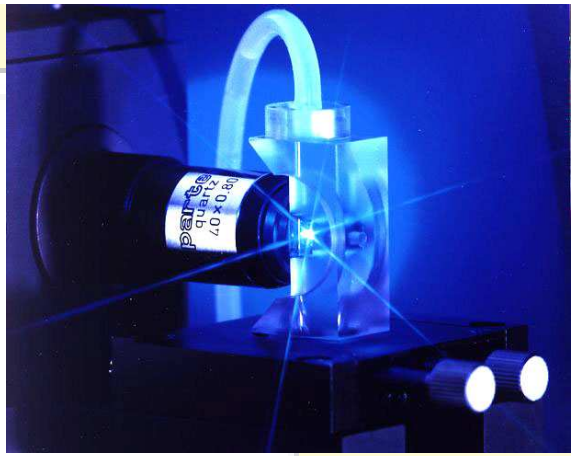
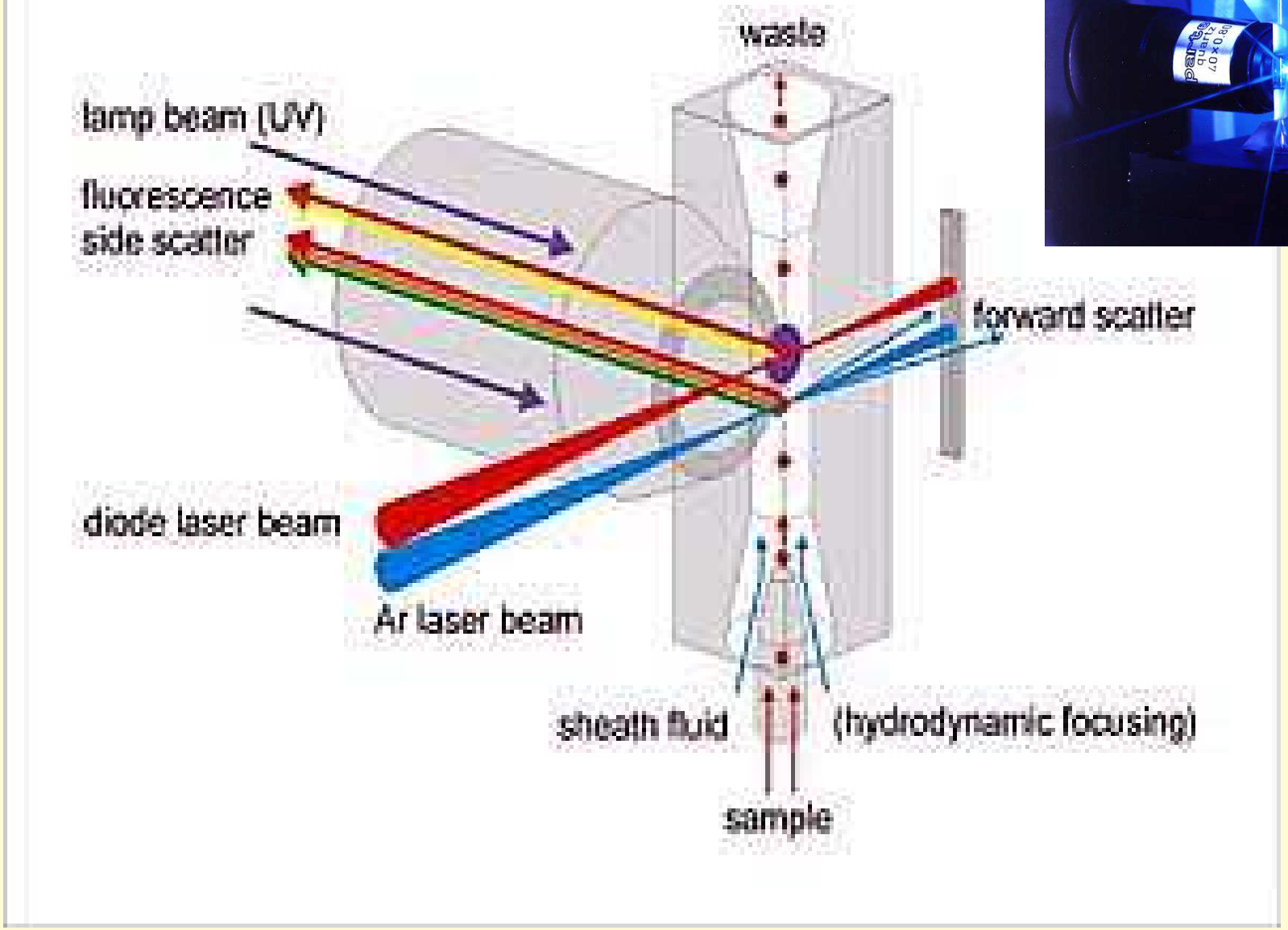
Project genesis

- 3 main partners have developed convergent interest in flow cytometry applications and space
- Collaborative projects work already in progress between partners
- 1st attempt of technology development and transfer in 2002, but neglect by Intospace (former ESA commercial agency).
- Development of new concept by the industrial partners.
- Project reborn with proposal to EU FP7 and ESA

Cytometry ?

- Flow cytometry is an analytical method that allows the rapid measurement of light scattered and fluorescence emission produced by suitably illuminated cells. The cells, or particles, are suspended in liquid and produce signals when they pass individually through a beam of light. Since measurements of each particle or cell are made separately, the results represent cumulative individual cytometric characteristics. An important analytical feature of flow cytometers is their ability to measure multiple cellular parameters




waste
lamp beam (UV)
fluorescence
side scatter
forward scatter
diode laser beam
Ar laser beam
sheath fluid
(hydrodynamic focusing)
sample

Technical chalenge

- Several companies and organisations (like NASA: “In Flight Flow Cytometer”) have invested lots of efforts to finalize such a concept for more than 10 years . These plans had to be postponed because of the limits in conventional Flow Cytometry technology (too high demand in lab infrastructure, systems not mobile/portable, too high electrical power consumption, etc.). Now, a different situation is reached with the CyFlow technology developed by Partec Gbmh.

Interest for space life sciences

FCM is of essential importance in view of long duration space missions (cf. ESA HUMEX study)

- Health monitoring of the crew: control of blood formula & therapy, diagnosis of diseases, etc.
- Biological research: gravitational biology incl. plant research, biotechnology, radiobiology, etc.
- Medical research: testing of countermeasures (physical training, radioprotective substances, supplemented food, etc.), immunology, hematology, etc.
- Control of cell/tissue bioreactors
- Environmental monitoring: microbial contamination of air, water, food...

Space Microbiology

Flow cytometry is a useful technique for space microbiology that can allow discrimination among bacteria (community analysis), axenicity study, viability assessment, metabolism of micro-organisms. One of the goals of this project would be to attempt to optimise flow cytometrical protocols that could be used routinely in Space.

- The MELISSA Loop : Bacterial viability and metabolism assessment
- Discrimination among bacteria (community analysis)
- Environmental contamination by on board landing device

Space Immunology

- Stresses associated with space flight can impact astronaut health. It is likely to increase in proportion to mission duration. It results in changes in the immune response, such as
  - T-cell function
  - cytokine production
  - NK-cell function
  - cell mediated immunity
  - increased reactivation of latent viruses
- Understanding these effects is essential to ensure astronauts' health, safety & performances

Feasibility

- Adaptation of the Cyflow to ISS conditions will be useful for extending biomedical applications of flow cytometry in developing countries
- The use of a cytometer in resource poor-settings and developing countries was demonstrated for CD4/CD8 counting in HIV/Aids in Africa
- Cylab and Melissa loop development are the first life-size tests.


CyLab


Partec – Mobile CyFlow® Laboratory

Participants

- **Ecole Centrale de Paris (ECP),France**
- **Institut de Biotechnologies de Troyes (IBT), France**
- **SCK•CEN, Mol, Belgium**
- **University of Modena and Reggio Emilia, Italy**

Participants

- **University of Münster, Germany**
- **INSERM, Dijon, France**
- **CyTecs GmbH, Görlitz, Germany**
- **Partec GmbH, Münster, Germany**

Inserm

Institut national
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CyTecs

partec

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- http://perso.wanadoo.fr/ibt.ims/
- http://www.partec.de/partec/dec2002_2.html
- http://www.sckcen.be/

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