

Cooperation of research, technology development and innovation in Baltic Region: problems and solutions.

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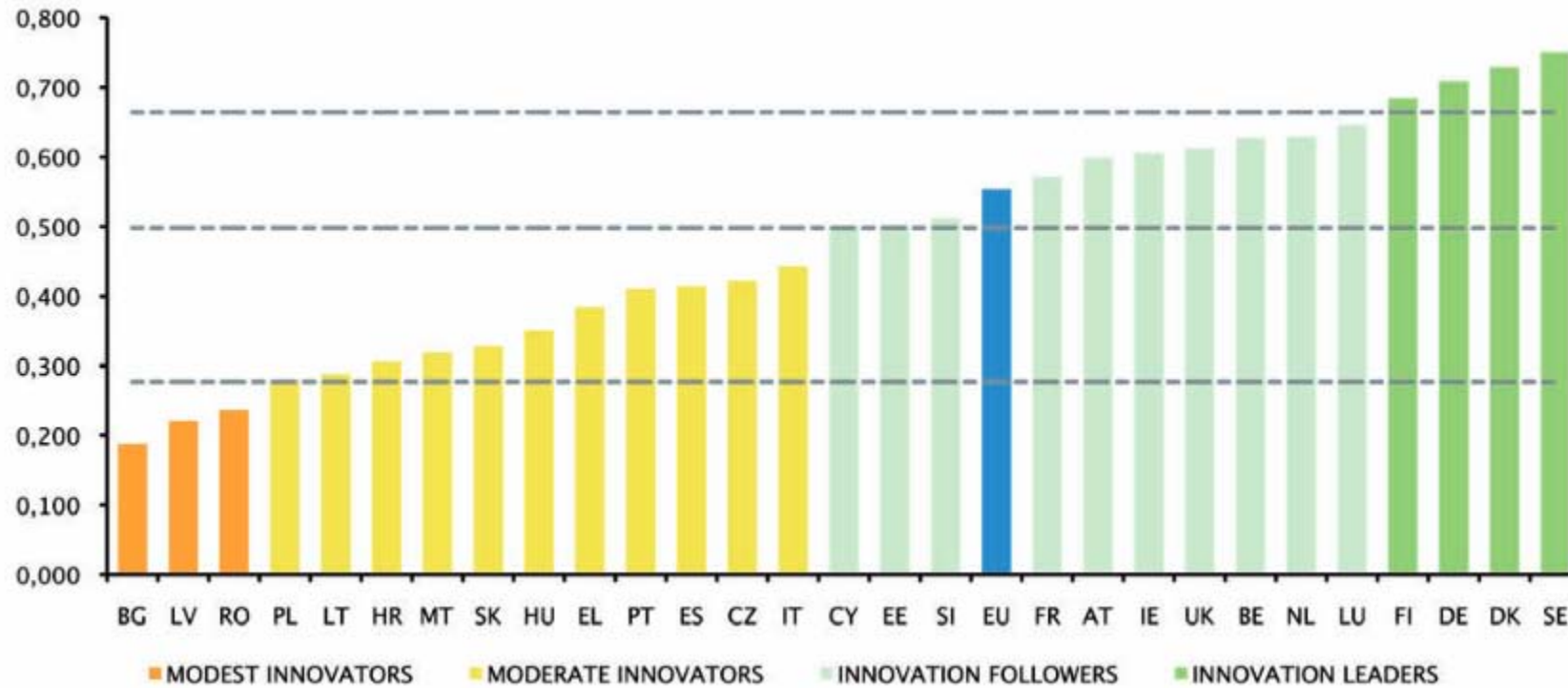
The 14th Baltic Conference on Intellectual Cooperation,
Riga, 20 April, 2015



Esko Aho

R&D spending is actually transforming money to knowledge and innovation is transforming knowledge to money, but not only money but well being and good human life as well

Figure 3: EU Member States' innovation performance



Overall, the EU is improving its innovation performance with Portugal, Estonia and Latvia being the innovation growth leaders

Challenges for Baltic States

- Economic development driven by low wage cost FDI, change to high value added, knowledge-intensive development
- **Unique Opportunity**: to promote and accelerate the economic growth, competitiveness of Baltic States by targeted investing in R&TD and innovation infrastructure both EU and national financial recourses (2014-2020)

**What is needed to become smart
and sustainable?**

Large economies:

- are self-oriented (because big market volume)
- have high level of human and financial resources and therefore are multipotent (smart specialization is not crucial)
- have high level research potential in commercial sector and therefore public support for R&TD+I is not crucial

Small economies:

- have to be **export-oriented** even in R&D sector (because small home-land market volume),
- possesses limited level of human and financial resources and therefore **smart specialization and regional and international co-operation is necessary,**
- have low level research potential in commercial sector, because lack of big enterprises with own research Centers and therefore **public support for R&D is crucial**

Main problems of innovation in Latvian public sector (1.)

Public sector innovation supporting infrastructure of Latvia was destroyed in the nineties and does not exist more!

Latvia is missing:

- experimental workshops,
- constructor offices,
- testing laboratories,
- pilot production units

Main problems of innovation in Latvian public sector (2.)

Latvian R&D is not promoted to be pro-innovative, because:

- Latvian State via Latvian Council of Science support only academic research projects
- Evaluation of Latvian science and research is based mainly on number of scientific publication cited in data bases (Thomson etc.) and participation in 7-th Framework Program
- Pro-innovative research is supported only by EU projects, but there is shortage of co-financing from Latvian State or industry, blocking commercialization of results

3S Strategy for future development

Latvia as a small economy has to identified R&DT+I areas, where we have:

- scientific excellence,
- human and material resources,
- traditions and capacities for fast and extended growth
- an export market niche for these products and services

and then to perform targeted investments to create a regional complementary infrastructure for R&D&I in these sectors

What is the main precondition of sustainability of small countries?

Because shortage of human resources and limited markets - networking and clustering for cooperation with other countries of the region is needed to avoid unnecessary duplication and ineffective use of resources available.

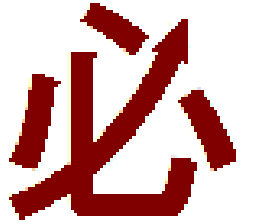
**What Latvian scientists and
innovative entrepreneurs
recommended to do?**

Project proposal

**Baltic excellence platform for the
development of competitive technologies**

**“Baltic Innovative Research and
Technology Infrastructure project”
(BIRTI)**

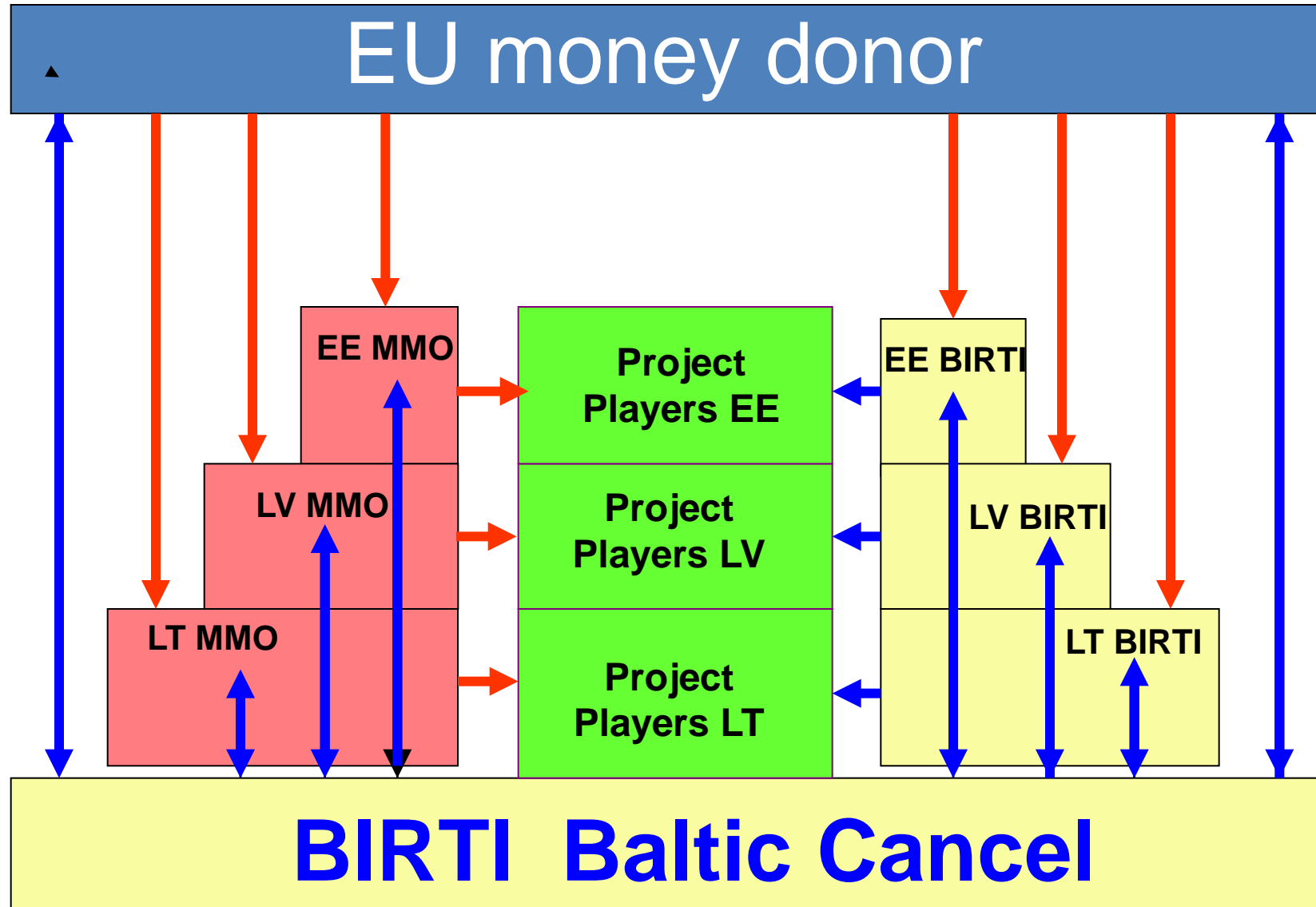




BIRTI means open access Regional R&DT&I Infrastructure in public sector, which is:

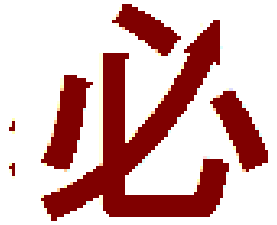
- innovation targeted,
- top level,
- complementary in Baltic see region,
- supporting high tech and high added value production

Regional BIRTI Project Management proposed



MTO = money managment organisation (governmental institution)

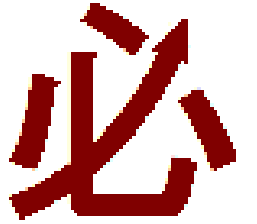
The aims of the BIRTI project



Goals to achieve:

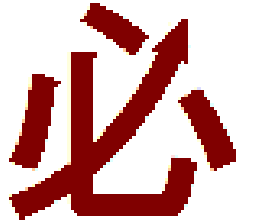
- Contribution towards EU2020 R&D intensity target of 3% in Baltic states in coordinated and complimentary way (**smart investments**);
- Increase of scientific excellence in Baltic countries and Baltic Sea region by attracting additional human resources (**smart growth**);
- Creation of regional infrastructure of science, technology development and innovation as a basis for high-tech industry and innovation (**smart development**);
- Regional **smart specialization** in R&D&I (according to scientific excellence);

The aims of the BIRTI project



- **Goals to achieve:**
- Contribution towards EU2020 R&D intensity target of 3% in Baltic states in coordinated and complimentary way (smart investments);
- Increase of scientific excellence in Baltic countries and Baltic Sea region by attracting additional human resources (smart growth);
- Creation of science regional infrastructure as a basis for high-tech industry and innovation (smart development);
- Regional smart specialization in R&TD&I (according to scientific excellence);
- Development of contract research market

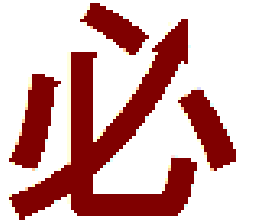
The aims of the BIRTI project



Specific goal

- Creation of regionally complementary infrastructure for technology development and transfer combined with innovations infrastructure (implementation of Juncker's initiative)
- Contribution to the development of ESFRI objects (such as EU-OPENSREEN, ESS-Lund, EPOS, PRACE), associated as a Regional Partner Facility to the ESFRI, in the legal form of ERIC.

The criteria to identify Smart regional collaboration areas:



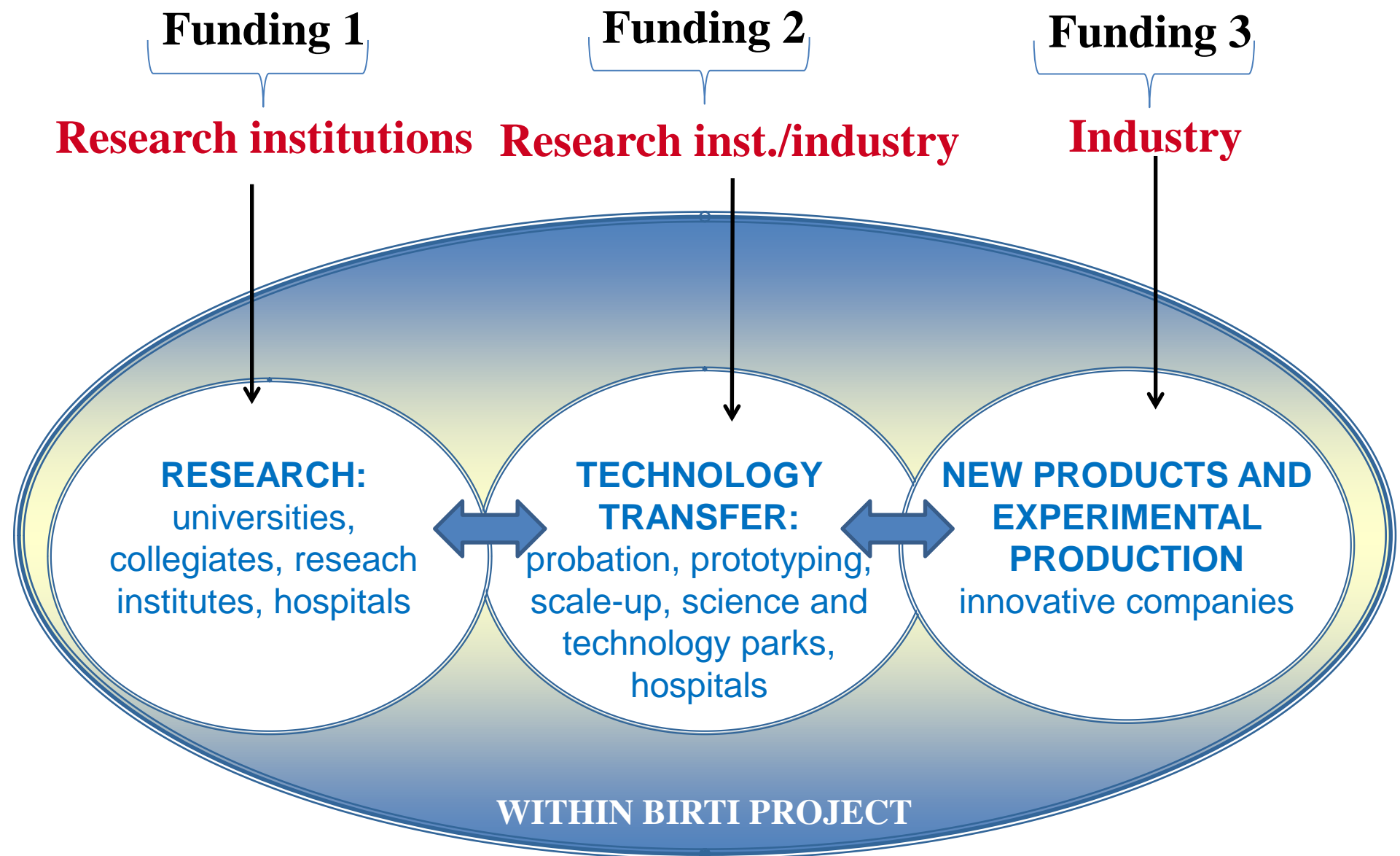
- leading research area in some of the countries of region;
- regional or pan-European significance – RPFs, ERIC;
- unique technology of infrastructure for region;
- availability of human resources.
- socio-economical relevance;
- synergies with other areas.



Key areas of BIRTI activities

- **Research:** upgraded laboratories in the universities, research institutes and hospitals, where innovation potential is created. Also study and lifelong learning is provided;
- **Technology development and transfer:** research and technology park structures with multiple support any possibilities for prototype development, possibilities for approbation and scaling of new innovative products` or services` development;
- **Innovative business:** experimental plants and enterprises where internationally competitive goods and services with added value are produced.

Regional partners operate in their core areas in coordinated way



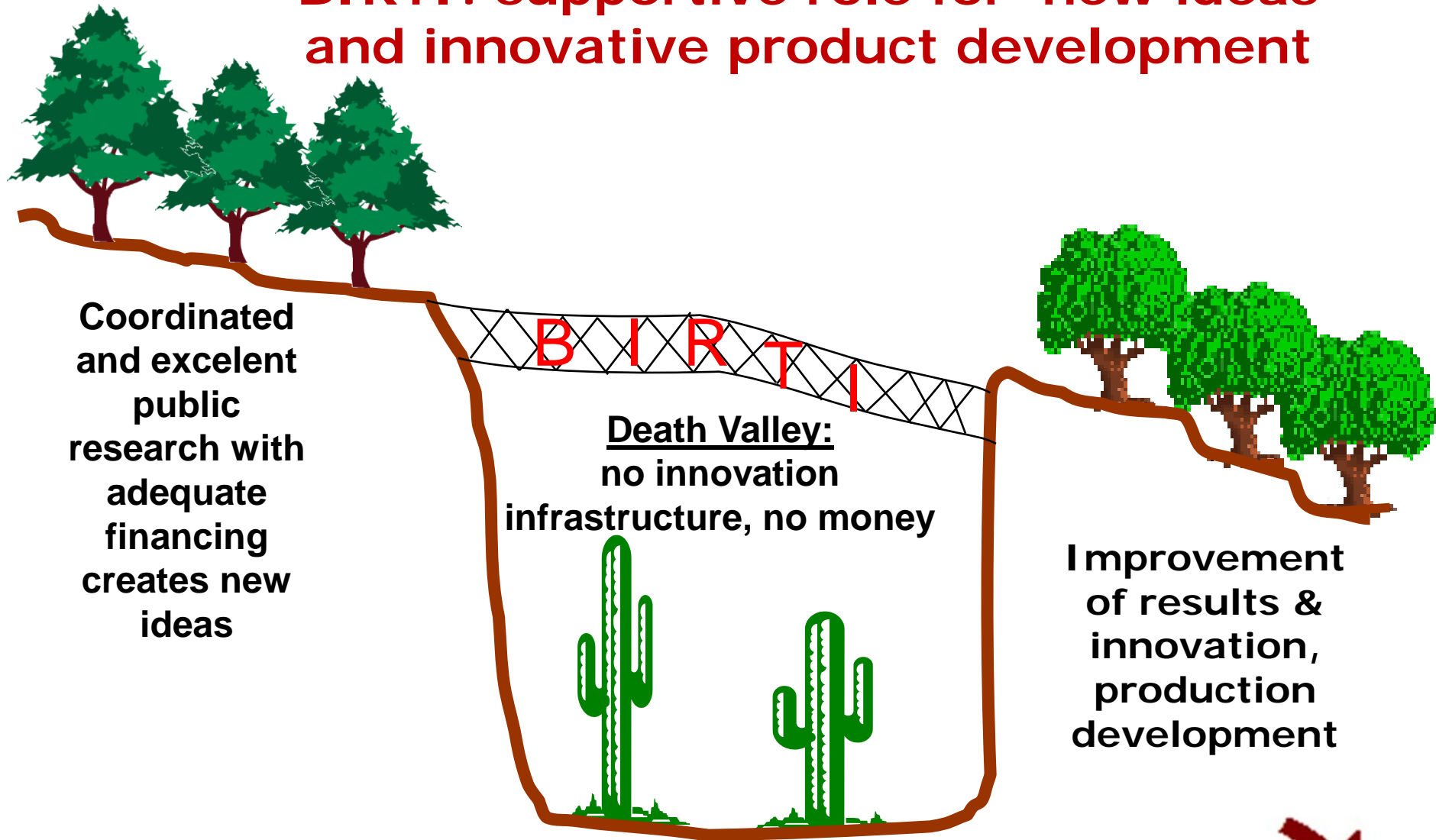
➤ **BIRTI would coordinate development of:**

- R&D infrastructure in areas of scientific excellence (according to 3S strategy);
- technology transfer infrastructure
- innovation infrastructure in public sector for technology development and transfer as well as experimental production
- information exchange system about needs of industry → to scientists and competencies of scientists → to industry

Project will contribute to attracting of EU funding:

- for innovation targeted research and innovation
- for creating TD+I infrastructure

BIRTI: supportive role for new ideas and innovative product development



Modified: Dr. Charles Wessner, USA



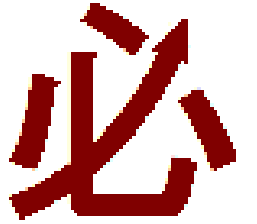


BIRTI Platform in Latvia

Include 3 Clusters in three out of six 3S specialization areas of Latvia:

- Biopharmacy and Organic Chemistry (**BioPharmAlliance**);
- Nanostructured Materials and High Energy Radiation, (**NanoTechEnergy**);
- Smart Technologies in Engineering and ICT, (**BaltSmartTech**).

Needs for Innovation Infrastructure in Latvia (I)



- Pharmacology and Molecular Biology Research Centre including GLP-compliant test and animal facility and National Biobank (participation in EU-OPENSCREEN, EATRIS);
- Scale-up and pilot production facilities of chemistry and biotechnology based products, vaccines, personalized medicine products and final dosage forms of both human and veterinary medicines (participation in EATRIS);
- Centre of Structural Biology on the basis of existing competence in protein crystallography and NMR studies (participation in INSTRUMENT);
- Development of the area of former Salaspils nuclear reactor, establishing new 30 MeV cyclotron facility and high energy radiation generating and exploiting instruments (ESS-Lund, INSTRUMENT, EURO-BIOIMAGING);

Needs for Innovation Infrastructure in Latvia (2)



- The network of radio, laser and optical telescopes for acquisition and analysis of geospatial information and tracing of minor objects in space (EPOS, E-ELT);
- Latvian Centre of Nanotechnologies and Material Science (HIPER, ESS-Lund, EuroFEL);
- ICT infrastructure backbone and data centers (ELIXIR);

Why Biopharmacy (including biotechnology) as a common smart specialization area in Baltic region?



- High class internationally recognized scientific institutions in pharmacy, medicine, biotechnology and molecular biology are present in Baltic States and Baltic Sea region
- Latvian Institute of Organic Synthesis is one of leading 5 Stars player in medicinal chemistry and drug design and discovery, enabling supply of clinical candidates for new medicines
- High class medicinal universities and hospitals involved in high class science including pharmacology and testing of new medicine are present in all countries of region
- Pharmaceutical and Biotechnological industry is present in region



Why open access CRO in public sector for drug discovery are needed?



- In recent years, the concept of a comprehensive single-source provider from drug development through commercial manufacture has emerged. This concept has been implemented by providers known today as **contract development and manufacturing organizations (CMOs)**.
- CMOs are a response to the competitive international nature of the pharmaceutical market as well as the increasing demand for outsourced services. With lower-cost international manufacturers capturing an increasing percentage of the contract manufacturing market, specialization may be an effective hedge against loss of market share.



Structure and goals of BioPharmAlliance in Latvia



- Latvian BioPharmAlliance is a cluster of research and innovation centers and companies in field of chemistry, pharmacy and biotechnology – participant of BIRTI
- The goal of BioPharmAlliance is recovering of full cycle R&D&I capacities of drug design and discovery in region and a creation of new medicines and technologies for pharmaceutical industry

BioPharmAlliance partners in Latvia

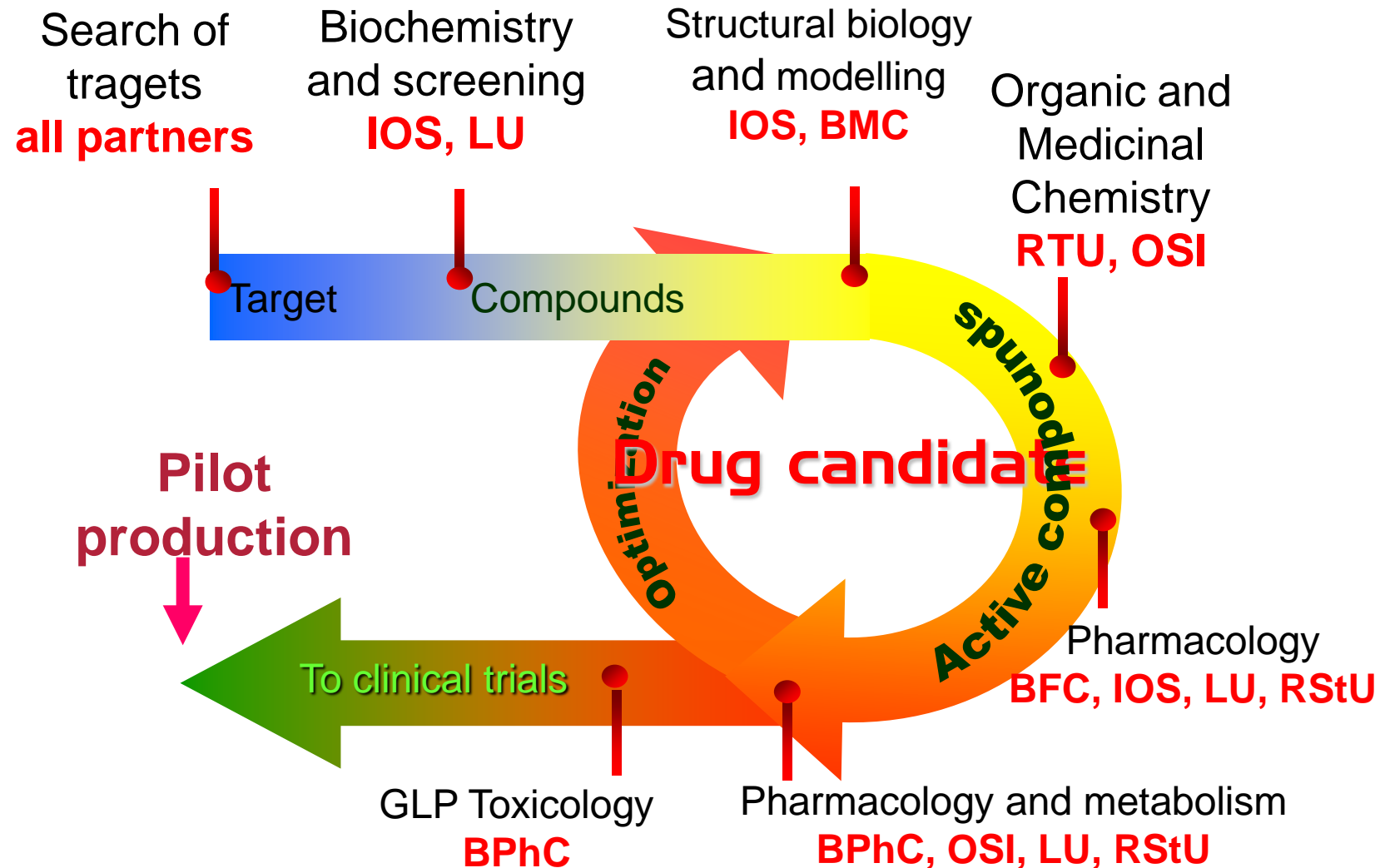
- Institute of Organic Synthesis (OSI),
- Scientific Institute of Food Safety, Animal Health and Environment (BIOR),
- Study Centre of Biomedicine (BMC),
- University of Latvia (LU),
- Riga Technical University (RTU),
- Daugavpils University (DU),
- Riga Stradina University (RStU)
- Pauls Stradins Clinical University Hospital,
- Eastern Clinical University Hospital,
- Mechanics and Technology College of Olaine
- Chemical, pharmaceutical and biotechnological companies



BioPharmAlliance



Clustering of Drug Discovery and Development activities



BioPharmAlliance

Organic chemistry research centre
IOS, RTU

Research centre on molecular and structural biology
IOS; BMC, LU

Molecular pharmacology research centre
IOS, LU

Veterinary pharmaceutical centre
BIOR, IOS, MTCO

Centre of molecular diagnostics, personalized medicine and stem cell therapy
BMC, LU

National biobank
BMC, IOS, LU, MTCO, BIOR

Pilot plant of highly potent API's
IOS, MTCO

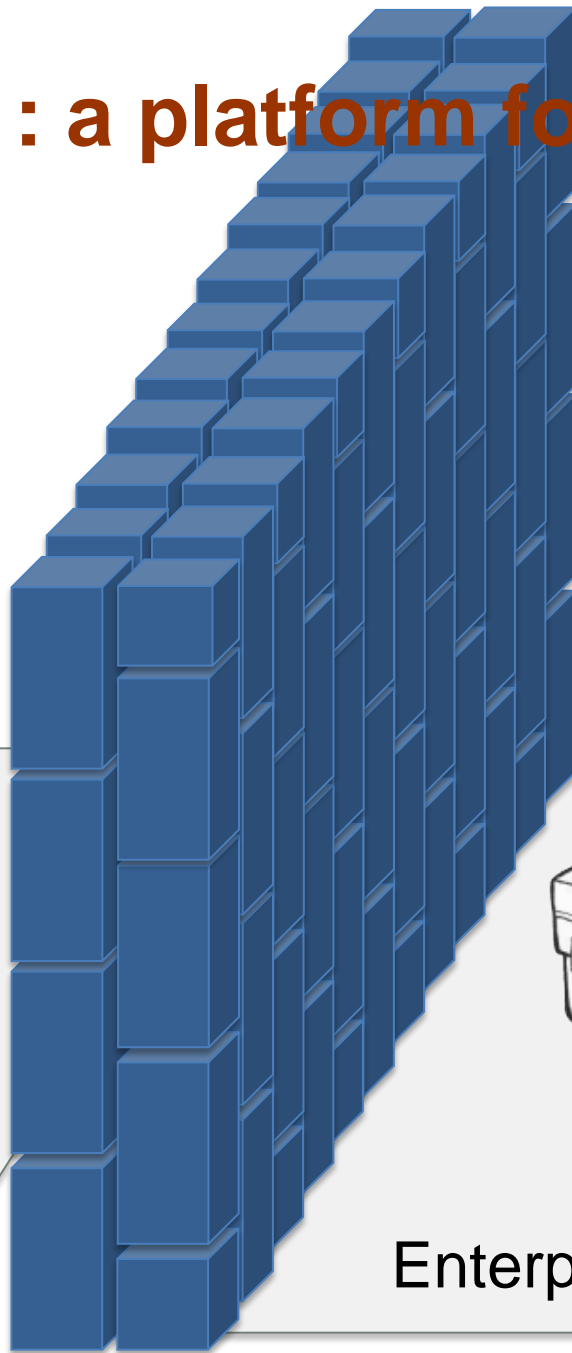
Biotechnology scale-up laboratory and pilot plant

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BIRTI : a platform for cooperation!

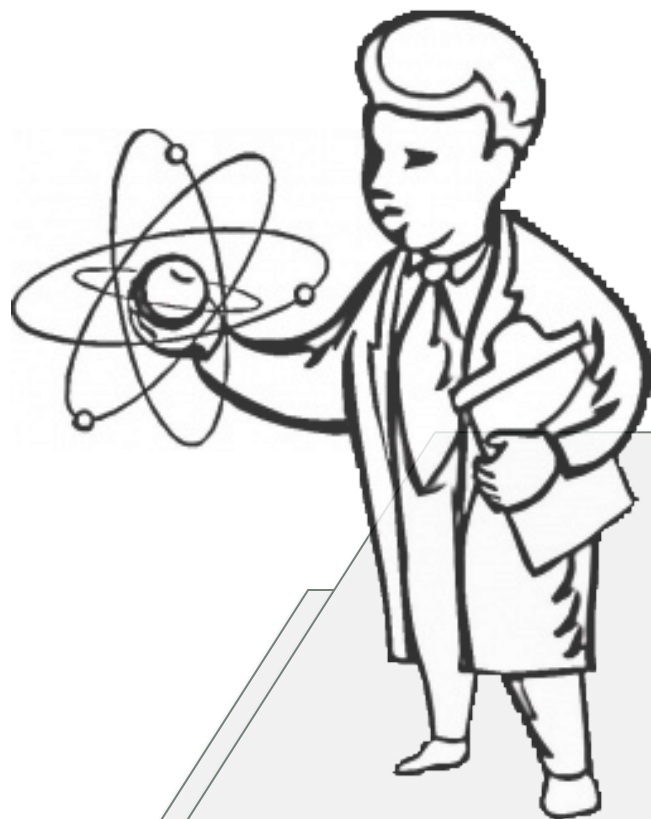


Researcher



Entrepreneur

BIRTI : a platform for cooperation!

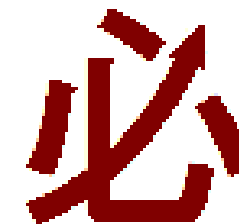


Researcher



Entrepreneur

BIRTI platform



BIRTI project development so far

- ❖ On 31st of May, 2011 Cabinet of Ministers accepted the Report “On strategic projects, relevant for Latvia, within the European Multi-annual Financial Framework after 2013”;
- ❖ BIRTI project has been discussed at the following meetings :
 - Prime Ministers‘ of three Baltic states - on 10.11.2011;
 - three Baltic state Ministries of Foreign Affairs – on 25.11.2011
 - three leading Universities of Baltic states - on 22.11.2011;
 - strategic Partnership meeting of Estonia and Latvia - on 16.12.2011;
 - Baltic Technical Universities - on 06.01.2012;
 - three Baltic state universities and Ministries of Education and Science – on 16.01.2012.

Challenges for R&DT+I



2015.



2018.



2020.

Thank You for attention!





BIRTI

What is the Cluster of Nanostructured Materials, High Energy Radiation and NanoTechEnergy?

This a cluster of research centres and companies with specialization fields in mechatronics, cyber-physical systems, functional materials, smart energy and water technologies, aeronautics and astronautics

Specialization fields in engineering and ICT

1. Mechatronics
2. Cyber-physical systems
3. Functional materials
4. Smart energy and water technologies
5. Aeronautics and astronautics



Testing ground of solar thermal collectors and photovoltaic panels in Institute of Physical Energetics

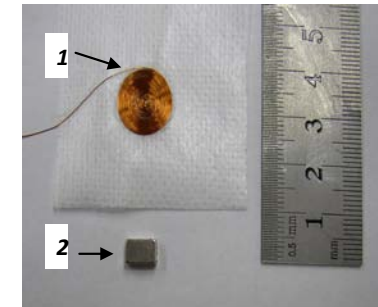


RTU Riga Biomaterial Innovation and Development Center



Ventspils International Radio Astronomy Center

Electromechanical generator converting energy of motion into electricity (can be used in smart clothing):



1. Mechatronics

1. Research focus

- automation systems of industrial and transport processes
- smart clothing
- submarine robot design and experimental manufacturing
- methods of non-destructive control of engineering systems
- adaptronics, micromechanical sensors

2. Expected results

- smart clothing with integrated sensors, climate control, diagnostics
- submarine robot systems
- innovative actuators for submarine
- robot systems
- non-destructive control technologies
- for railway tracks, etc.
- smart micro sensors



Windbreaker indicating «overheating» of child (RTU)



Autonomous remotely controlled robot-fish (RTU)

2. Cyber-physical systems

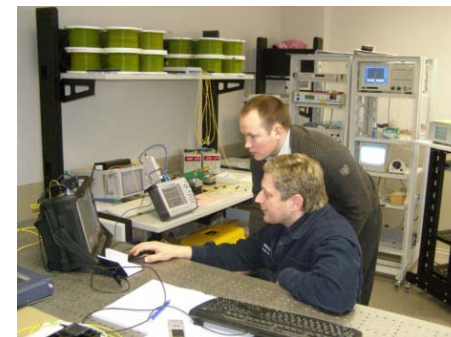


1. Research focus

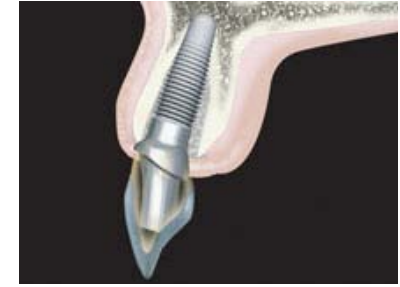
- smart ICT systems - artificial intelligence, model-based decision making systems, sensor networks, multi-robot systems
- optical multiplexing communication systems, passive optical networks
- high performance programmable complex measurement systems
- modeling of knowledge flows

2. Expected results

- element constructions and modulation methods for high-speed (160 Gbit/s) multiplexed fibre communication systems (WDM) with high security level
- distributed autonomous robot systems for use in
- agriculture, forestry, environmental protection, etc.
- high performance measurement systems
- smart transport systems



3. Functional materials



*Bio-ceramic material
which allows to create bone
foundation for artificial teeth:*

1. Research focus

- functional renewable materials and technologies
- multi-functional textiles, composite materials and biomaterials
- technologies for surface modification of materials
- semiconductor, sensor, photonic material technologies
- engineering modelling of functional material characteristics

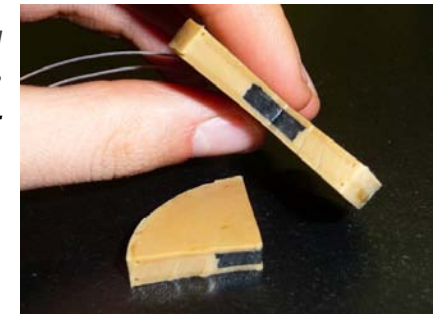
2. Expected results

- multifunctional materials and coatings (medical implants, sensors, thermostable materials, semiconductor and photonic materials, functional textiles)
- products made of composite materials (e.g. for use in transport)



*Biodegradable packaging
material*

*Super-elastic, mechanically durable and
humidity resistant sensor which can be
used in smart technologies:*



4. Smart energy and water technologies

1. Research focus

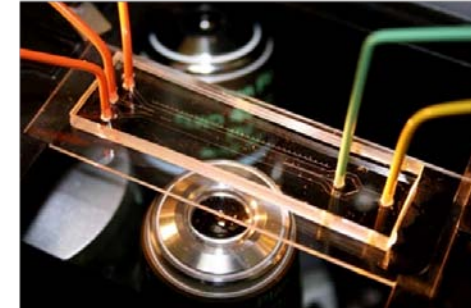
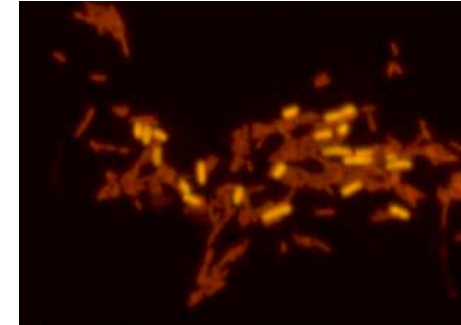
- electricity storage, control and conversion for smart grids, integration of renewable energy technol;
- energy efficiency, bioenergy production and conversion;
- technologies for safe and efficient water supply;
- capture and reduction of GHG and other air pollutants.

2. Expected results

- converters, storage and control devices for smart grids;
- automated platform for detecting of pathogens in drinking water, food and medicine;
- innovative energy efficiency systems for buildings;

- smart L
- innovat
- biofuel

Flue gas condensers saving 10-15% of wood fuel



Technology for rapid bacteriological control of liquids and surfaces-will allow to obtain test results in food industry, water supply industry, etc. considerably faster

5. Aeronautics and astronautics



1. Research focus

- design of convertiplanes (plane-helicopter hybrid), unmanned and light aircrafts and satellites
- monitoring of aviation and aerospace equipment
- Earth surveillance and environmental monitoring by using unmanned aircraft and satellites
- radioastronomy research in aerospace area

2. Expected results

- convertiplanes and unmanned aircraft for freight traffic
- innovative diagnostic systems for aviation and equipment
- GIS applications and technologies for Earth surveillance, image taking and transmission



Unmanned aircraft

*Earth surveillance with
unmanned aircraft*

