The Top ten scientific developments in Latvia in 2009

In scientific research:

• A novel cardioprotective substance was discovered. It is 40 times more effective than Mildronate – the leading export drug in Latvia (*Dr.habil.chem.* Ivars Kalviņš., *Dr.pharm.* Maija Dambrova, *Dr.pharm.* Edgars Liepiņš, *Dr.chem.* Osvalds Pugovičs, *Dr.chem.* Einārs Loža; Latvian Institute of Organic Synthesis).

• A novel biomechanical substantiation for creation of new biomaterials for heart and cardiovascular system elements was developed. Research findings were achieved within the National Research Programme in medicine, 2006 – 2009 (*Dr.stud*. Mārtiņš Kalējs, *Dr.med.* Pēteris Stradiņš, *Dr.habil.med.* Romans Lācis, *Dr.habil.med*. Iveta Ozolanta, cardiac surgeon Jānis Pavārs, *Dr.habil.sc.ing.* Vladimirs Kasjanovs; Pauls Stradiņš Clinical University Hospital, Heart Surgery Center; Rīga Stradiņš University in cooperation with University of Lausanne).

• For the first time, dialects of Latvian language are being reflected within the context of Baltic languages (*Atlas of the Baltic Languages, A Prospect, 2009*). This comprehensive study advances the integration of these dialects into the European linguistic area (*Dr.habil.philol.* Ilga Jansone, *Dr.philol.* Anna Stafecka; Latvian Language Institute of the University of Latvia in cooperation with the Institute of Lithuanian Language).

• The first comprehensive investigation of the history and development of science and higher education in Latvia from the 13th century until 1862 was completed. The results of this investigation showing science and higher education as inseparable parts of the whole were published in an encyclopaedic monograph *The Beginnings of Science and Higher Education in Latvia* (in Latvian) authored by *Dr.habil.chem., Dr.hist.h.c.* Jānis Stradiņš; Institute of Latvian History, University of Latvia.

• A novel approach to the simulation of x-ray absorption spectra based on the combination of quantum chemistry and classical molecular dynamics methods was developed. This method allows a reconstruction of materials atomic structure by proper accounting of thermal disorder effects (*Dr.phys.* Aleksejs Kuzmins, Institute of Solid State Physics, University of Latvia; Professor Robert Evarestov, St. Petersburg State University).

• A mathematical model of flexible ferromagnetic filaments was developed. For the first time in the world, experimental models of these filaments were obtained and a number of theoretical regularities were established. These filaments allow creation of magnetically driven microengines and realization of transfer processes in biotechnologies and biomedicine (*Dr.habil.phys.* Andrejs Cēbers, *Dr.math.* Mihails Belovs, *Dr.stud*. Kaspars Ērglis).

In practical applications

• A novel and fully graphical interface „Semantic Latvia" was developed and approbated. The novelty of this achievement lies in the creation of an interface that makes web datasets directly accessible to domain specialists (medical doctors, users of national registers, etc.) without involving programmers for recoding (*Dr.sc.comp.* Guntis Bārzdiņš, *Dr. habil.sc.comp.* Audris Kalniņš, *Dr.math*. Kārlis Podnieks, *Dr.med*. Valdis Pīrāgs, University of Latvia).

• Technology for manufacturing a new porous high-temperature oxide ceramics was developed. The intrinsic characteristics of the said oxide ceramics make it suitable for the filtration of aggressive and hot liquids and a suitable material for high-temperature isolation (*Dr.habil.sc.ing.* Visvaldis Švinka, *Dr.sc.ing.* Ruta Švinka, *B.sc.ing.* Ieva Zaķe*, M.sc.ing.* Andris Butlers; Riga Technical University).

• A new summer barley variety „Austris" was officially released and registered. The new variety was developed using plant biotechnology technique (*Dr. agr.* Sofija Kaļiņina, *Dr.biol.* Dace Grauda, *Dr.habil.biol*. Īzaks Rašals, *Mg.agr*. Māra Bleidere, Ilze Grunte, *Mg.agr.* Solveiga Maļecka; Institute of Biology of the University of Latvia and State Stende Cereal Breeding Institute).

• Automatic device for prevention and elimination of asynchronous operation in power systems was developed and fabricated in Latvia. The device merits recognition for its capability to reduce fault occurrence in large-scale power systems and such devices are installed in the power systems of Estonia, Latvia and

Lithuania (*Dr.habil.sc.ing*. Antans Sauhats, *Dr.sc.ing.* Andrejs Utāns, *Dipl.ing.* Lilija Leite, *Dr.sc.ing.* Kārlis Briņķis; Riga Technical University, Institute of Physical Energetics).

• Technology for producing new heat-insulating building material from layered silicate and by-products of biodiesel production was developed (*Dr.habil.chem.* Uldis Sedmalis, *Dr.sc.ing.* Laimonis Bīdermanis, *Dr.sc.ing.* Andris Cimmers, *Dr.habil.chem.* Gaida Sedmale, *Dr.sc.ing.* Ingunda Šperberga, Riga Technical University).

• Peculiarities of some immunogenetic and biochemical parameters, that have potential benefit in the prognostication and treatment of patients with chronic viral hepatitis C, were clarified *(Dr.habil.med*. Ludmila Vīksna, *Dr.habil.med.* Arturs Sočņevs, *Dr.med.* Valentīna Sondore*, Dr.med.* Jāzeps Keišs, *Dr.habil.med.* Baiba Rozentāle; Riga Stradins University, Infectology Centre of Latvia).