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Press release¹

Scientific Excellence for Society: EU Descartes Prize Finalists Announced

Key words: science, prize, collaboration, quality of life

The finalists for the EU Prize for Scientific excellence are now revealed. The Descartes Prize – now in its third year – was designed by the European Commission's Research Directorate General to reward scientific projects that address the concerns of citizens and contribute to Europe's competitiveness. The prize-giving ceremony will take place in Munich on 5th December 2002, following the selection of winners by the Grand Jury, composed of nine eminent figures reflecting the wide spectrum of scientific disciplines and excellence.

Scientific collaboration across Europe, leading to major breakthroughs ranging from AIDS and cancer research to environmentally friendly catalysts, is being encouraged by the European Union through the €1 million EU Descartes Prize.

The ten finalists for the 2002 Prize have now been announced. They were selected from a range of 108 entries – the highest number in the Prize's history. Philippe Busquin, European Commissioner for Research, said, "I welcome the growing interest in the Descartes Prize. In Europe we need more research with our best scientists from different countries working together. Through the EU Descartes Prize, we want to nurture and reward teams of scientists that become excellent through European collaboration."

The ten finalists for 2002 span a wide range of fields of scientific endeavour, including information sciences, medicine, engineering, chemistry and quantum physics. The EU Descartes Prize is also open to social sciences, this year represented by a study on gender differences in political and business elites of industrialised countries.

One benefit of the Prize is that it provides encouragement for the exchange of knowledge, bringing together and complementing research capacities from a number of countries in Europe (the EU Member States, the Associate States and in particular the candidate countries of Central and Eastern Europe - CEECs) and even outside Europe. For example, one finalist project – which uses the micromachining capabilities of semiconductor materials to develop new communication technologies – involves researchers from Romania, Greece, Italy, Sweden, Hungary and Russia. While another, concerning the genetic basis of Crohn's disease, resulted from collaboration between the UK, Norway, South Korea and Denmark.

To be eligible for the Prize, projects must include partners from at least one Associated State and one Member State, or two different European Union Member States. It is interesting to note that the average number of partners per project is growing. This year, the average number of countries involved in submissions is nine and the largest number of partners amongst this year's finalists is 27.

¹ For more information on the European Commission's Research DG, including previous press releases, visit our Web site at <http://europa.eu.int/comm/research>

Past winners of the EU Descartes Prize have demonstrated its track record of encouraging research leading to groundbreaking advances. In 2001, one of the winners was a six-nation team that created a centralised European facility for HIV drug screening. Following the award of the Prize, this facility pioneered new drugs that will play a key role in the treatment of several thousand AIDS and Hepatitis B patients.

Work by other previous winners has led to major advances in treating skin cancer, provided more environmentally friendly catalysts for the chemical industry, contributed to understanding of the chemistry of star and planet formation, and developed cost-efficient processes in the identification and product-tagging markets.

This year's prize-giving ceremony will take place in Munich, at the European Patent Office, on 5th December 2002.

The Grand Jury, who will select the winners, brings together persons from academic, industrial and public life. It is chaired by Yves Michot, former President of Aérospatiale Matra. Other members are Professor Helena Illnerová, President of the Academy of Sciences of the Czech Republic, Prague, who has also carried out extensive research into the biological clock of mammals; Sir John Maddox, scientific author and former editor of *Nature*; Dr Ulf Merbold of the European Space Agency who was the first European to fly a Space Shuttle mission; Professor Nikolaï Platé, Vice President of the Academy of Sciences of Russia, who figures amongst the most respected chemists in Russia; Professor Anna Roosevelt, curator of the Field Museum in Chicago who has made major discoveries about the earliest Americans at the Pedra Pintada site in Brazil, and Rudi Thomaes, President of Alcatel Bell.

This year also sees two new members to the Grand Jury: Professor Erne Ergma, Vice President of the Academy of Sciences of Estonia, a specialist in the field of physics and mathematics and Dr Ion Siotis, also a physicist by training, and the President of the National Hellenic Research Foundation.

For further media information concerning the Descartes Prize and projects:

Should you like more information on this year's Descartes Prize, on past projects or if you are interested in an interview with project co-ordinators or the Commission officers involved, please contact:

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The Descartes Prize is a part of the Research Directorate General's Improving the Human Research Potential Programme (1998-2002):
<http://www.cordis.lu/improving/home.html>
The Descartes Prize website: <http://www.cordis.lu/descartes>

Note to Editors: Background information on this year's finalists

The Descartes Prize Finalists 2002

New discoveries of the Earth's interior provide answers to the origins of natural disasters

Field of research: Earth sciences

Joint UK/Germany research has achieved significant advances in understanding the composition of the Earth's mantle and metallic core, which has been a long standing problem for geochemists. The scientists demonstrated that the major seismic discontinuity, occurring at a depth of 660 km, is caused by mineral phase transformations. Experimental studies at high pressures and temperatures enabled the researchers to estimate the composition of the metallic core and explain how the composition of the Earth's mantle evolved. Thanks to the experiments, the scientists identified the chemical ^{40}K (potassium) responsible for generating part of the heat required deep in the Earth to drive the "geodynamo". The project results will enable us to better understand the origins of natural disasters, such as earthquakes and volcanic eruptions. The discoveries could also be applied in future space missions for understanding the composition and evolution of other planets.

Project title: Structure and composition of Earth's deep interior

Project co-ordinated by Prof. Bernard Wood from the University of Bristol (UK) in association with the research team of Prof. Dave Rubie from the University of Bayreuth (Germany).

Pan-European collaboration leads to the development of new communication technologies

Field of research: Information sciences

The MEMSWAVE project brought together a consortium of nine different European research teams, whose main objective was to develop new microsystems (MEMS) technologies applied in microwave and mm wave circuits manufacturing. It is very difficult to produce high performance low cost communication systems using classical technologies. The consortium found a solution in using the micromachining capabilities of semiconductor materials (silicon and Gallium Arsenide) and very thin (1-2 micrometers) dielectric or semiconductor membranes. The project resulted in the production of state-of-the-art micromachined filters and receiver modules. These will pave the way for a new generation of communication technologies applicable in satellite and mobile radio communication systems, anti-collision radars, intruder radar alarm systems and sensors for humidity detection.

Project title: Micromachined circuits for microwave and millimeter wave applications – Acronym MEMSWAVE

Project co-ordinated by Dr. Alexandru Müller and Prof. Dan Dascalu from IMT Bucharest (Romania) in co-operation with research teams from CNR Rome, Tor Vergata University Rome, IRST Trento (Italy), FORTH Heraklion (Greece), Uppsala University (Sweden), HAS Budapest (Hungary) and ISP Kiev and Microsensor Ltd Kiev (Ukraine).

Towards new drugs to help Multiple Sclerosis patients

Field of research: Life sciences

Multiple sclerosis (MS) is a chronic inflammatory degenerative disease of the nervous system, for which there is no curative treatment. This research work offers major contributions to the understanding of the disease. Trans-national collaboration led to the development of a transgenic mouse possessing the genetic defects of the human MS patients. Through their experiments, the team succeeded in describing the immunological process of the disease. They identified immune targets in the brains of MS patients and explained how MS reactive immune cells are not subject to tolerance induction. They also demonstrated how a viral antigen can mimic a self-peptide of the nervous system and trigger the disease. The researchers' main aim is to develop new drugs and immunomodulatory therapies, which are urgently needed for the treatment of MS patients. They are working with European industrial partners on developing these new drugs, some of which are already being tested.

Project title: Autocreativity in multiple sclerosis: structural, functional and pathological studies

Project co-ordinated by Prof. Lars Fugger from Aarhus University Hospital, Copenhagen (Denmark) in co-operation with research teams from Copenhagen University Hospital and the Danish School of Pharmacy (Denmark), Lund University (Sweden), Dundee University (Scotland), Oxford University (England) and Albert Einstein College of Medicine (USA).

Discovery of the first gene responsible for Chronic inflammatory bowel disease

Field of research: Life sciences

Chronic inflammation is one of the outstanding medical challenges faced by researchers. It appears that both genetic risks and environmental factors are involved. The main contribution of the researcher teams lays in the identification of the first gene, from a range of unknown gene diseases, responsible for Crohn's disease (chronic inflammatory bowel disease). They confirmed the involvement of chromosome 16 where they first identified a gene (NOD2) with three mutations associated to the disease. Crohn's disease increasingly affects industrialised societies and the research demonstrates that there is heterogeneity between populations. Consequently, it could mean that modern therapies may have different outcomes in the European countries. This discovery represents a major breakthrough in clinical medicine as Crohn's disease shows similarities with other diseases such as asthma, atopic eczema, psoriasis and periodontitis. Further research will, therefore, investigate whether there are any overlaps between the clinical presentation and genetic make-up of Crohn's disease and these other inflammatory diseases.

Project title: Genetic basis of Crohn's disease: Etiology and clinical impact

Project co-ordinated by Prof. Stephan Schreiber from University Hospital Kiel (Germany) in co-operation with research teams from Guy's, King's and St. Thomas' School of Medicine in London (UK), Rikshospitalet in Oslo (Norway), Yonsei University College of Medicine in Seoul (South Korea) and the Institute of Medical Biochemistry and Genetics in Copenhagen (Denmark).

Male monopoly of public life is opening up to women

Field of research: Socio-economic sciences

Many transformations are taking place in our contemporary world. This unique 27 nation comparative survey contributes to shedding light on some of them, e.g. how male monopoly of public life is opening up to women and what this means for them and the democratic societies they live in. The researchers focused on the tiny number of women who have passed the hurdles, reaching top positions in the business world and the political arena and compared them to their male colleagues in similar leadership positions. The study revealed some gender differences and many similarities in pathways and uses of power. Fewer gender differences emerge in activities and attitudes related to leaders' power positions. Women leaders differ most notably from their male counterparts in their social and educational backgrounds and their family lives. The research also confirms how adoption of public policies promoting gender equality—as in the Nordic countries—facilitates women's access to leading positions. The results of this study will have a major impact on our perception of society and might form the basis of new concepts in the area of Human Resources.

Project title: Gender differences in political and business elites of industrial countries

Project co-ordinated by Prof. Mino Vianello from University of Rome "La Sapienza" (Italy) in co-operation with research teams from 26 industrialised countries (21 European and 6 other industrialised democracies).

The universe's biggest explosions since the Big Bang

Field of research: Basic sciences

The research conducted by scientists from six different European countries confirmed theoretical predictions that gamma-ray bursts (GRBs) are the most powerful explosions in the Universe, second only to the Big Bang. They emit high energy radiation and originate in very distant galaxies, where stars form at a prodigious rate. These discoveries were made possible thanks to the unique multi-faceted capabilities of the Italian/Dutch satellite BeppoSAX. The satellite's operations team provided accurate and rapid locations of GRBs to the scientific community, thus enabling scientists to precisely determine the distance of the GRBs. New clues support what were once speculations that bursts represented the explosive death of massive stars. The GRBs may become unique probes of extreme physics and cosmology, allowing astronomers to trace the history of star formations in the early cosmos.

Project title: Solving the gamma-ray burst riddle: the universe's biggest explosions

Project co-ordinated by Dr. Edward Van den Heuvel from the University of Amsterdam (the Netherlands) in co-operation with research teams from the University of Amsterdam, SRON and NASA/MSFC (the Netherlands), CNR/IASF in Roma, INAF Trieste and the University of Ferrara (Italy), the University of Copenhagen (Denmark), LAEFF-INTA (Spain), Cambridge University (the UK) and AIP (Germany).

Self Compacting Concrete improves workers' health and safety

Field of research: Engineering

Concrete is the world's most widely used material, however, it is one of the sectors with the worst health and safety problems, forcing most of Europe's concrete workers to retire from their job, sometimes as early as age 35. The project has revolutionised the construction industry by developing Self Compacting Concrete (SCC) that does not need vibration to be compacted, improving thus the health and safety of workers, preventing them from getting back problems and "white fingers" caused by bad blood circulation. The quality of SCC is as high or higher than traditional concrete and is competitive in price. The project consisted of extensive advanced research that was combined with full-scale tests in civil engineering and housing. The teams successfully compiled information on and recommended standards for the properties and use of SCC. It is already on the market at an affordable price, thus placing Europe far ahead of Japan and the USA in SCC research and exploitation.

Project title: Rational production and improved working environment through Self Compacting Concrete
Project co-ordinated by Dr. Marianne Grauers from NCC, Solna (Sweden) in co-operation with research teams from CBI Institute, Betongindustri and Luleå University of Technology (Sweden), LCPC and Vinci GTM (France), the University of Paisley (Scotland), Sika (Spain) and Bekaert (Belgium).

Chemical reactions responsible for the stripes on zebras or the motifs of shells

Field of research: Basic sciences

How can chemical reactions be responsible for the spontaneous emergence of numerous patterns on the coats of leopards or giraffes? The first explanation came in 1952 from the British mathematician A. Turing who suggested that reaction and diffusion processes might lead to stable chemical patterns. He encapsulated this mechanism in a simple mathematical formula. Though biologists ignored Turing's hypothesis, it became the object of pursuit of experimentalists and chemical theorists. Evidence that such a mechanism could govern chemical systems did not emerge until the joint Bordeaux/Brussels research team produced a stationary pattern of spots in a thin gel, continuously feeding a fresh solution in a special open spatial chemical reactor. Now, the team is investigating patterning processes resulting from cross-coupling between chemical reactions and geometric changes of chemically sensitive hydrogels. These chemical systems are the first clear evidence that the Turing mechanism does actually occur in nature.

Project title: Chemical morphogenesis
Project co-ordinated by Mr. Patrick de Kepper from Centre de Recherche Paul Pascal, Pessac (France) in co-operation with research teams from CNRS (France) and ULB in Brussels (Belgium).

Scientists overcome the quantum noise for improved optical communications

Field of research: Information sciences

Quantum effects are usually thought to be very small and difficult to detect. However, with the impressive progress in telecommunication systems, quantum effects are now introducing limitations in the performances of transmissions. The ACQUIRE Consortium demonstrated novel systems allowing circumvention of the quantum noise that blurs the signals and sets limits for the data rate in a telecommunication line. More specifically, they invented very low-noise electro-optical devices, such as light sources, amplifiers and couplers, that were the world's first, with unprecedented characteristics. Moreover they discovered processes underlying quantum noise generation in semiconductor lasers, basic elements of optical communications, that lead to practical improvements in the fabrication of devices. These results opened the way for quantum communications, now a very active field of research.

Project title: ACQUIRE: Advance Quantum Information Research
Project co-ordinated by Dr. Elisabeth Giacobino from Université Pierre et Marie Curie, Paris (France) in co-operation with research teams from ENS/CNRS, CNET and IOTA/CNRS (France), DERA (UK), FAU (Germany), Università degli Studi dell'Insubria in Como, Pirelli Laboratories in Milano (Italy) and RUL (the Netherlands).

New asynchronous circuits: towards cost-effective and less complicated designs

Field of research: Engineering

Most electronic circuits used today are synchronous, meaning that they work like a marching army paced by an "officer", the clock. Asynchronous circuits, whose co-ordination is defined by local interaction between communicating components, are potentially more efficient and less power consuming than synchronous circuits. They can be used in high-security applications such as smart-cards, since they are inherently more "electrically quiet". However, they have traditionally been considered difficult and expensive to design, because co-ordinating the tasks of different components without a "conductor" requires the usage of techniques for distributed control that are not often taught to designers at schools. The team of scientists developed the theory and CAD (computer aided design) tools to solve different problems in the design flow of asynchronous circuits. They built "petrify", a software tool that is currently being used by more than 20 academic and industrial institutions for various purposes: research in CAD tools, research in asynchronous circuit design and design of prototypes (microprocessors, communication devices, smart cards, devices for medical aids, etc).

Project title: Petrify: methodology and tool for logic synthesis of asynchronous circuits

Project co-ordinated by Prof. Jordi Cortadella from Universitat Politècnica de Catalunya, Barcelona (Spain) in co-operation with research teams from Politecnico di Torino (Italy), the University of Newcastle upon Tyne (UK), Intel Corporation and Cadence Design Systems (USA).