



MILLENNIUM  
TECHNOLOGY  
PRIZE

*Finland's tribute to life-enhancing technological innovations*

# NOMINATION GUIDE

2004



Tim Berners-Lee

2006



Shuji Nakamura

2008



Robert Langer

2010



Michael Grätzel

2012



## CHAIRMAN'S GREETING



MORE THAN EVER, in both developed and developing countries, our world needs scientific and technological innovations that help us solve the challenges of our time.

Millions live without access to clean water and beyond the reach of even the most basic medical care. An ever-increasing proportion of the world's population suffers from air pollution. In developed regions, cities are suffocating under the burden of excess traffic. While the justifiable ambition of a better life for billions requires new sources of energy, we cannot allow such developments to destroy the environment we all depend on.

THESE ARE JUST A FEW OF THE CHALLENGES WE FACE.

The only way forward is to recognise and help accelerate the deployment of new, effective technologies. Innovation is crucial to the future of humankind. Technology Academy Finland's mission is to promote scientific research, innovation and new applications based on humane values, enhancing people's quality of life by encouraging the development of new technological solutions.

The Millennium Technology Prize was created to inspire and recognise innovations that provide answers to today's challenges. At the level of one million euros, the Prize is one of the world's most prestigious individual awards for technological innovation.

We invite you to help us fulfil our mission. Your nominations of candidates whose work is worthy of the Prize, based on the guidelines presented in detail on our website, will be both highly appreciated and warmly welcome.

**Dr. Stig Gustavson, Chairman  
Technology Academy Finland**

## GENERAL PRINCIPLES

### GROUNDBREAKING INNOVATION

The Millennium Technology Prize is awarded for a specific groundbreaking innovation in the field of technology.

### IMPACT ON QUALITY OF LIFE

The winning innovation must be shown to enhance people's quality of life and sustainable development both now and in the future. The Prize is not awarded for cumulative accomplishments over a lifetime career.

### EXTENT OF CHANGE

Significant factors in the evaluation process include the number of people affected by an innovation and the extent of the changes they experience as a consequence. Technologies that have not yet been applied in practice are not eligible for the award.

### CONTINUOUS DEVELOPMENT

The awarding of the Prize is also intended to stimulate further cutting-edge research and development in science and technology. Due consideration is also therefore given to each nominee's current activities. Ideally, nominees continue to be engaged in work that further advances their innovation and its practical applications.

The nomination criteria are presented in detail on the Millennium Technology Prize website:

[www.millenniumprize.fi](http://www.millenniumprize.fi) > 2012 PRIZE >

Call for Nominations



## NOMINATIONS

### SCHEDULE

The nomination period begins on 10 January 2011 and ends on 31 July 2011. The selection process is presented in detail on the Millennium Technology Prize website.

### NOMINEES

The Millennium Technology Prize can be awarded to a single individual or to a research and development team. It can also be shared between two or three individuals who are shown to have made a critical contribution of essentially equal merit to the success of the innovation. Citizens of all nations are eligible.

### NOMINATORS

Science and engineering academies, universities, research institutes, industrial enterprises and associations may submit nominations for the Millennium Technology Prize. Self-nominations are not accepted. All qualifying nominations are valid for a single selection round.

### REQUIRED MATERIAL

All nomination material must be provided in English and delivered to Technology Academy Finland by 31 July 2011, preferably using e-mail: [nomination2012@technologyacademy.fi](mailto:nomination2012@technologyacademy.fi).

For specific guidelines and enquiries regarding the submission of nominations, please contact D.Sc. (Tech.) Ainomaija Haarla, President and CEO of Technology Academy Finland at: [ainomaija.haarla@technologyacademy.fi](mailto:ainomaija.haarla@technologyacademy.fi)

For detailed information and nomination documents, please visit the Millennium Technology Prize website: [www.millenniumprize.fi](http://www.millenniumprize.fi) > 2012 PRIZE > Call for Nominations

## SELECTION PROCESS

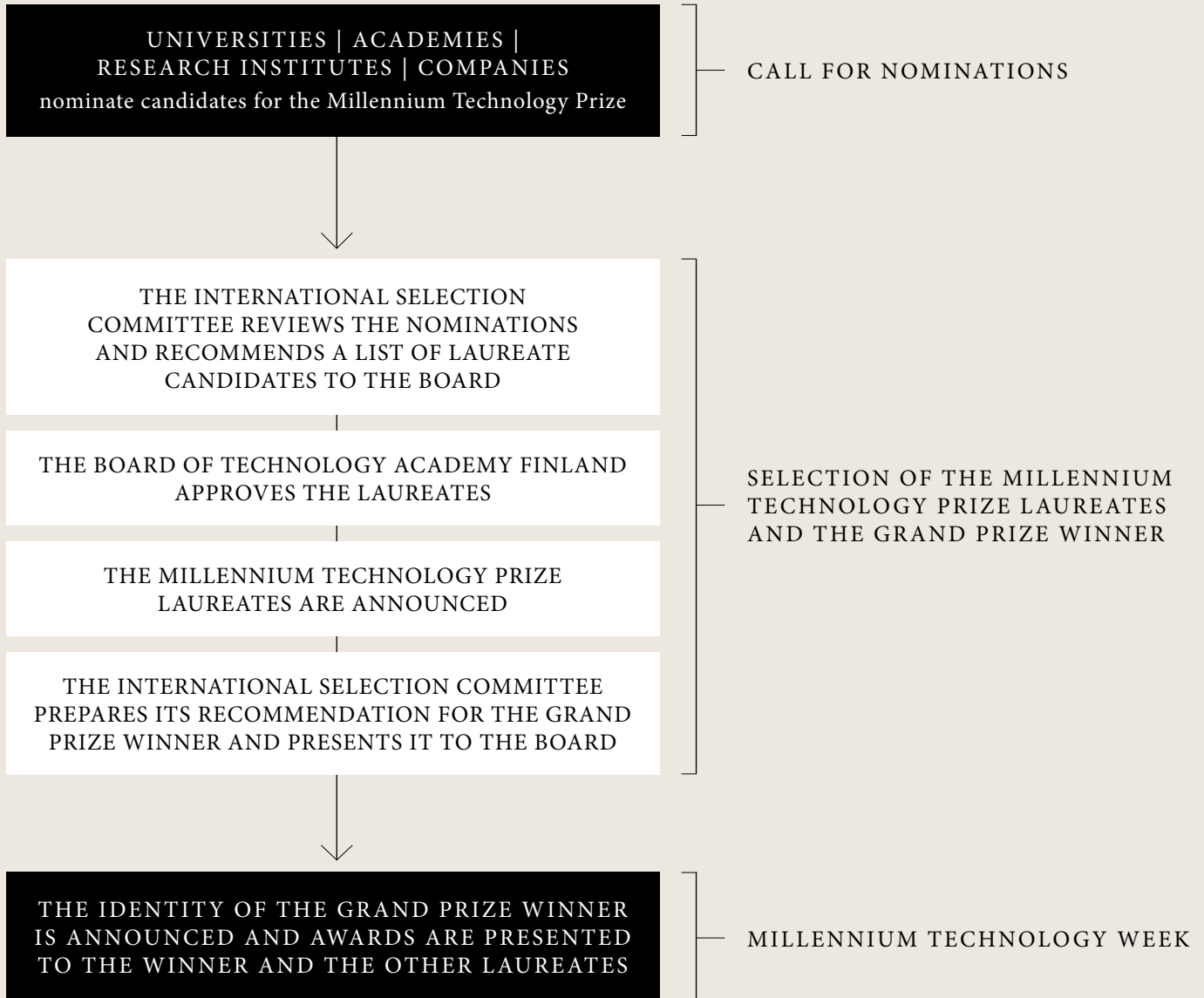
THE LAUREATES and the Grand Prize Winner are selected by the Board of Technology Academy Finland based on recommendations by the International Selection Committee, a distinguished network of leading Finnish and international scientists and technologists. The Board's decisions are final and there is no appeal.

All potential Laureates are asked in advance to accept their appearance on the list of nominees eligible for the Millennium Technology Prize. All Laureates, their research and their innovations will be presented to both the international media and the general public.


The winner of the 2012 Millennium Technology Prize will be announced during Millennium Technology Week in Helsinki in June, with awards for the Grand Prize Winner and the Laureates being presented at a festive award ceremony.

The Millennium Technology Prize enjoys the patronage of the President of Finland.

# SELECTION PROCESS STEP BY STEP



# INTERNATIONAL SELECTION COMMITTEE

CHAIRMAN 



## Chancellor Jarl-Thure Eriksson, Finland

Dr. Eriksson is Chancellor of Åbo Akademi University and was formerly Rector of Tampere University of Technology. His areas of research include superconductivity, complex systems and neural networks. Dr. Eriksson has been Chairman of the Board of the Foundation for Finnish Inventions and

a member of the National Innovation Strategy steering group. He has held positions in numerous international organisations including the Association of European Universities Institutional Evaluation Team and the IEA Expert Committee on HiTc Superconductivity.





## Professor Eva-Mari Aro, Finland

Dr. Aro is Professor in Molecular Plant Biology at the University of Turku. Her primary area of research is photosynthesis, solar-energy conversion and chloroplast signalling. She holds several honours and awards and currently heads the Academy of Finland's Center of Excellence. Dr. Aro has worked in a number

of leading international research institutions and universities and has held key positions in several international organisations, including the Presidency of the International Society of Photosynthesis Research (ISPR) and membership of the Steering Committee of the European Initiative for Clean Solar Fuels.





## Dr. Craig R. Barrett, United States of America

Dr. Barrett is the retired CEO/Chairman of the Board of Intel Corporation. He was appointed as an Associate Professor at Stanford University after receiving a BSc, MSc and PhD in Materials Science. He chairs Change The Equation, Achieve, Inc., Dossia, and the Skolkovo Foundation Council Board

of Directors. Dr. Barrett is a leading advocate for improving educational standards in the United States and around the world, and is a vocal spokesman for the value that technology can provide in raising social and economic standards globally.





## Academician Riitta Hari, Finland

Dr. Hari MD PhD is director of both the multidisciplinary Brain Research Unit of the Low Temperature Laboratory at Finland's Aalto University and the national Center of Excellence on Systems Neuroscience and Neuroimaging. She has pioneered the use of magnetoencephalography (MEG)

in providing insights into different aspects of brain function in both healthy subjects and patient groups. Dr. Hari has supervised 34 PhD theses and is a Member of the National Academy of Sciences (NAS) of the USA. Her research interests include systems-level human neuroscience and brain imaging.

**Professor Bengt Kasemo, Sweden**

Dr. Kasemo has been Professor of Physics at the Chalmers University of Technology in Gothenburg since 1983 and headed a research group of up to 40 people working on Surface Science, Nanoscience and Nanotechnology, Catalysis for Emission Cleaning and Sustainable Energy Technology until his partial retirement in 2009. He has co-founded several

start-up companies. Dr. Kasemo is also a co-founder of the internationally-recognised Competence Center for Catalysis at Chalmers, whose member companies include Volvo AB, Volvo Personal Cars (Ford), and Saab AB (GM). He has published 420 scientific papers and his work has been cited more than 13,000 times.

**Professor Martti Mäntylä, Finland**

Dr. Mäntylä is Chief Strategy Officer of EIT ICT Labs, the European Institute of Innovations and Technology's Knowledge and Innovation Community (KIC) on the future information society, and is also Professor of Information Technology at Finland's Aalto University. From 1999 to 2008 he was the founding Director of the

Helsinki Institute for Information Technology, a joint research institute established by the Helsinki University of Technology and the University of Helsinki, and he continues to co-lead the Ubiquitous Interaction research group. His area of expertise is the user-centric design of digital communication services and products.

**Professor Konrad Osterwalder, Switzerland**

Dr. Osterwalder is Rector of the United Nations University and has been Under-Secretary-General of the United Nations since 2007. Appointed Professor of Mathematical Physics at Harvard University and then at ETH Zürich, the Swiss Federal Institute of Technology, he is also a member of the Swiss Academy of Technical

Sciences. He served as Rector of ETH from 1995 to 2007. His research is focused on the mathematical structure of relativistic quantum field theory, on elementary particle physics, and on statistical mechanics. Dr. Osterwalder has been teaching students in natural science and engineering for more than twenty years.

**Dr. Ayao Tsuge, Japan**

Dr. Tsuge is President of the Shibaura Institute of Technology. He is also an Executive Member of the Science Council of Japan and Vice President of the Engineering Academy of Japan. He received

his BA, MA and doctorate in engineering from the University of Tokyo. His areas of expertise include energy, environment and economy, innovation, the management of technology and international relations.

**Dr. Ainomaija Haarla, Finland**

Dr. Haarla MBA is the President & CEO of Technology Academy Finland. She has 30 years experience of working in the paper and metal industries both in Finland and abroad. Dr. Haarla is the Chairman of the Board of Korona Invest Oy (health care) and

a member of the boards of Neste Oil Oyj (oil refining and biofuels), Biohit Oyj (biotechnology) and Altia Oyj (alcoholic beverages). Her research interests include paper manufacturing technology, innovation management and competitiveness.

WINNERS OF THE MILLENNIUM  
TECHNOLOGY PRIZE

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## WINNER 2004

*Professor*

**TIM BERNERS-LEE**

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The inaugural Millennium Technology Prize was awarded in 2004 to Tim Berners-Lee, developer of the World Wide Web. His innovation has significantly enhanced people's ability to obtain information central to their lives. It encourages new types of social networks supporting transparency and democracy, and opens up new ways of managing information and businesses.

The World Wide Web has significantly enhanced our ability to obtain information in a completely new way. It represents huge potential for social exchange whilst also encouraging new types of social networks, supporting both transparency and democracy. The Web has opened up new ways of managing information and businesses.

Berners-Lee gave the World Wide Web to the world to use for free. "The decision to make the Web an open system was necessary for it to be universal. Had the technology been proprietary it would probably not have taken off. You can't propose that something be a universal space and at the same time keep control of it", he says. He currently leads the World Wide Web Consortium (w3c).



## WINNER 2006

*Professor*

**SHUJI NAKAMURA**

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In 2006, the Millennium Technology Prize was awarded to Professor Shuji Nakamura for developing new, revolutionary sources of light – bright-blue, green and white LEDs and a blue laser. His innovation has led to significant global energy savings by enabling highly-efficient illumination systems both in industrialised and developing countries.

Professor Nakamura is widely recognised as a world pioneer in developing light emitters based on the wide bandgap semiconductor gallium nitride. His prize-winning innovation is a new, solid-state, energy-saving source of light. Professor Nakamura's invention and devices developed using similar principles will have an extensive and positive impact on both quality of life and sustainable development.

LED lights are long-lasting and consume far less energy than normal incandescent lamps. The technology can also be applied to sterilise drinking water more efficiently and economically.

Commenting on the possible consequences of his invention, Professor Nakamura said: "The US Department of Energy estimates that more than USD 98 billion in energy savings could be realised by 2020 if we switch to solid-state lighting. This would also reduce the associated greenhouse gas emissions, and could have a significant effect on reducing global warming." Nakamura currently works at the University of California, Santa Barbara.



## WINNER 2008

*Professor*

**ROBERT LANGER**

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The 2008 Millennium Technology Prize was awarded to Professor Robert Langer for his invention and development of innovative biomaterials for controlled drug release and tissue regeneration. Langer's innovations have had a significant impact on fighting numerous diseases including cancer and heart conditions. Over 100 million people a year are already using advanced drug-delivery techniques.

Dr. Langer is widely regarded for his contributions to medicine and the emerging fields of biotechnology and is considered to have pioneered many new technologies, including transdermal delivery systems and tissue engineering.

He has been described as "one of history's most prolific inventors in the field of medicine" and holds more than 760 patents (granted or pending). He has also authored more than 1,100 scientific papers and has participated in the founding of many technology companies. Dr. Langer is the David H. Koch Institute Professor at Massachusetts Institute of Technology.

## LAUREATES 2008

*Professor*

**ALEC JEFFREYS**

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Sir Alec Jeffreys' innovation, The DNA fingerprinting technique, has brought a new level of justice to the world, reaffirming family relationships through kinship testing, and identifying the victims of disasters. Professor Jeffrey's holds the positions of Professor of Genetics and Royal Society Wolfson Research Professor at the University of Leicester.

*Professor*

**ANDREA VITERBI**

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Dr. Andrew Viterbi's innovation, the Viterbi algorithm, is used to avoid errors in wireless communications systems and digital devices such as mobile phones. The Viterbi algorithm decoder is a component in almost all digital mobile phones, improving the efficiency of phone networks and reducing costs. In March 2004, the University of Southern California School of Engineering was renamed the Viterbi School of Engineering, in his honour, following his \$52 million donation to the school.

## LAUREATES 2008

### *Professors*

**EMMANUEL DESURVIRE,  
RANDY GILES AND DAVID PAYNE**

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The erbium-doped fibre amplifier (EDFA), invented by

Professor Emmanuel Desurvire, Dr. Randy Giles and Professor David Payne, has resulted in a vast increase in the transmission capacity of global optical fibre networks. The EDFA has enabled an almost indefinite increase in the range of terrestrial and undersea data links and has permitted fibre-based telecommunications to be extended to all corners of the earth. Professor Desurvire is working as the Director of Thales' Research and Technology. Dr. Giles is Director of the Optical Subsystems and Advanced Photonics department in Bell Labs. Professor Payne holds the position of Director of the Optoelectronics Research Centre (ORC) at the University of Southampton.



## WINNER 2010

*Professor*

**MICHAEL GRÄTZEL**

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In 2010, the Millennium Technology Prize was awarded to Michael Grätzel, the father of dye-sensitised solar (DSC) cells. Also known as “Grätzel” cells, they are likely to play an important role in low-cost, large-scale solutions for energy production. This cost-effective way of harnessing abundant solar energy opens up opportunities for solving one of mankind’s greatest challenges.

Professor Grätzel’s innovation – third-generation photovoltaic technology – is often described as ‘artificial photosynthesis’.

A promising alternative to costly silicon photovoltaics, Grätzel cells are made of low-cost materials and do not require elaborate apparatus for their manufacture. They represent an attractive candidate for providing new sources of renewable energy.

DSC panels are flexible, lightweight, and produce electricity in low-light conditions. The next major step towards the large-scale commercialisation of dye-sensitised solar cells could be in the building industry, with photovoltaic materials being used in replacements for conventional roof, skylight or facade elements in the building envelope. Professor Grätzel is the Director of the Laboratory of Photonics and Interfaces at Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland.

## LAUREATES 2010

*Professor*

**SIR RICHARD FRIEND**

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Sir Richard Friend’s work in plastic electronics has revolutionized the field of optoelectronics. His initial innovation included producing organic light emitting diodes and his use of polymers as solution processed semiconductors has enabled products such as electronic paper, cheap organic solar cells and illuminating wall papers. Professor Friend is Cavendish Professor of Physics at the University of Cambridge, UK.

*Professor*

**STEPHEN FURBER**

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Stephen Furber is the principal designer of the ARM 32 bit RISC microprocessor. To date more than 18 billion ARM-based chips have been manufactured for use in ubiquitous computing applications, such as mobile phones, fixed and wireless networking, automobiles and health care, benefiting hundreds of millions worldwide. Professor Furber is Professor of Computer Engineering at the University of Manchester, UK.

## CORPORATE PARTNERS

Cooperation with companies engaged in cutting-edge technological research and applications widens Technology Academy Finland's exposure to new innovations and their impact on society.

### KEMIRA

Kemira is a global over-two-billion-euro chemicals company that is focused on serving customers in water-intensive industries. Kemira's business operations are divided into customer-specific segments: Paper, Municipal & Industrial, Oil & Mining and ChemSolutions.

The company offers water quality and quantity management that improves customers' energy, water, and raw material efficiency. Kemira's vision is to be a leading water chemistry company.

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[www.kemira.com](http://www.kemira.com)

### NESTE OIL

Neste Oil is a refining and marketing company, with a production focus on premium-quality, lower-emission traffic fuels. The company produces a comprehensive range of major petroleum products and is the world's leading supplier of renewable diesel.

**NESTE OIL**

[www.nesteoil.com](http://www.nesteoil.com)

### NOKIA

Nokia is committed to connecting people to what matters to them by combining advanced mobile technology with personalized services. More than 1.3 billion people connect to one another with a Nokia, from our most affordable voice-optimized mobile phones to advanced Internet-connected smartphones sold in virtually every market in the world.

**NOKIA**

[www.nokia.com](http://www.nokia.com)

### OUTOTEC

Outotec develops and provides technology solutions for the sustainable use of Earth's natural resources. As the global leader in minerals and metals processing technology, Outotec has developed several breakthrough technologies over the decades. The company also offers innovative solutions for the chemicals industry, industrial water treatment and the utilization of alternative energy sources.

**Outotec**

[www.outotec.com](http://www.outotec.com)

## CORPORATE PARTNERS

### SAVCOR

The Savcor Group operates in three specialised business areas, offering high technology products and services for customers in the telecoms and forest industries and infrastructure repair. With its head office in Mikkeli, Finland, the company has its own operators in 15 countries.



[www.savcor.com](http://www.savcor.com)

### SEB

SEB is a leading Nordic financial services group. As a relationship bank, SEB in Sweden and the Baltic countries offers financial advice and a wide range of financial services. In Denmark, Finland, Norway and Germany the bank's operations have a strong focus on corporate and investment banking based on a full-service offering to corporate and institutional clients. The international nature of SEB's business is reflected in its presence in 20 countries worldwide.



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[www.metso.com](http://www.metso.com)



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[www.wartsila.fi](http://www.wartsila.fi)

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Technology Academy Finland offers members of the Industry Council visibility and opportunities to network with other companies, members of research communities and civil servants at a variety of events and discussion meetings.

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OKMETIC

OUTOKUMPU

Outotec



RUUKKI  
more with metals

SAVCOR

SEB



TALVIVAARA

VAISALA



software.  
point lms

# TAF

TECHNOLOGY  
ACADEMY  
FINLAND

# POWERING TECHNOLOGY EMPOWERING LIFE

TECHNOLOGY ACADEMY FINLAND's aim is to improve the quality of life through technology. We support scientific research and responsible innovation which has a positive impact on the well-being of people and the environment. In addition to the international Millennium Technology Prize, we promote new technological solutions through a range of grants, incentives and other awards.

Future technology needs new innovators. We therefore continuously encourage young people to focus on technology, mathematics and science. The interest that young people have in technology is particularly evident at our international Millennium Youth Camp.

Technology Academy Finland promotes interaction between the scientific community, business and government. The most notable actors contributing to our activities are the Finnish Academy of Technical Sciences (TTA) and the Swedish Academy of Engineering Sciences in Finland (STV). Business is represented through Technology Academy Finland's Industry Council (EKN).

[www.technologyacademy.fi](http://www.technologyacademy.fi)

*Awarding the Millennium Technology Prize*

## Contact information

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[www.technologyacademy.fi](http://www.technologyacademy.fi)

Detailed information  
and nomination documents:  
[www.millenniumprize.fi](http://www.millenniumprize.fi)  
> 2012 PRIZE  
> Call for Nominations

May 2011