



# r é f l e x i o n s

*Chercher, former et agir pour le développement durable*

## **International scientific symposium**

June 7, 2019

## **Event presentation**

## **RÉFLEXIONS : RESEARCHING, EDUCATING AND ACTING FOR SUSTAINABLE DEVELOPMENT**

You agreed to speak to the international symposium Réflexions on June 7 and we are very grateful. Please find in this document abstracts by sessions and speakers' biographies in order for you to best prepare for the symposium of June 7.





## VENUE AND PROGRAM

The conference will take place on the École Polytechnique campus in Palaiseau, which is located about 12 miles south of Paris. The campus was inaugurated in 1976 and is now part of the Paris-Saclay Technology Cluster, where several engineering schools and higher education institutions are based in close proximity to the R&D centers of large industrial groups such as EDF, Thales and Horiba.

### *Program*

**9:00 - 9:30am**

**Opening speech**

Eric Labaye, President of École Polytechnique,  
Ingénieur Polytechnicien students.

**9:30 - 10:30am**

**Global warming: science and geopolitics**

Valérie Masson-Delmotte, Michał Kurtyka, Scott Barrett

**11:00 - 12:00 noon**

**Toward a low-carbon economy**

Jean Tirole, Anna Creti, Jean-Marc Jancovici, Benoît Leguet

**1:30 - 2:30pm**

**Research at l'X for sustainable development**

Gérard Mourou, Philippe Drobinski,  
Camille Duprat, Bérengère Lebental

**2:30 - 3:30pm**

**Breath and nourishment: urgent challenges for health**

Shanggen Fan, Marion Guillou,  
Markus Amann, Matthieu Coutière

**4:00 - 4:30pm**

**Invest in sustainable development**

**4:30 - 5:00pm**

**Closing speech**

**8:30am to 6:00pm**

Demonstration area in the Grand Hall

## MASTER OF CEREMONIES



**Paul de Brem** hosts events related to science, technology, innovation, business and entrepreneurship. For twenty years, he has led over 500 conferences and debates, and he also conducts communication training courses for professionals (media training, PowerPoint, web writing etc.). He has taught science journalism at Sorbonne University for the past seven years. As a science journalist in television and print media for over twenty years, he has collaborated with LCI, France 2, France 24, Le Journal du Dimanche, L'Express, Le Figaro and Eurêka, to name but a few.

## GLOBAL WARMING: SCIENCE AND GEOPOLITICS

### *Cross talks - English session*

Climate change is now a proven scientific fact. Following the first indicators recorded in the late 1980s and based on all the reports of the Intergovernmental Panel on Climate Change (IPCC), a consensus has emerged showing an average temperature increase of between 0.8 and 1.2°C from 1850 to the present day.

Although this may seem relatively modest in absolute terms, it actually represents an overwhelming increase on a geological time scale, and reflects a profound shift in our planet's climate system. Evidence of the role of human activity in causing this temperature rise has also been confirmed, linked principally to our use of fossil fuels that release considerable amounts of greenhouse gases into the atmosphere.

What are the concrete consequences of climate change that are either already apparent or unavoidable in the foreseeable future? Is the objective proposed by the Paris Agreement on climate change - of ensuring that the average temperature increase of the earth does not exceed 1.5°C by 2100 - still an achievable one?

The scale and complexity of the challenges faced by humankind in terms of sustainable management of natural resources and limiting global warming call for unprecedented international cooperation. But the question remains: how do we go about dividing up this burden equitably between formerly industrialized and emerging countries? And are the current decision-makers up to the challenge?

*With Valérie Masson-Delmotte, Michał Kurtyka and Scott Barrett.*

## VALÉRIE MASSON-DELMOTTE



Valérie Masson-Delmotte is a Senior Scientist at CEA, working within the Laboratory of Climate and Environmental Sciences of the Institut Pierre Simon Laplace. She also co-chairs Working Group I of the IPCC for its Sixth Assessment Report (2015-2022), focusing on the physical basis of climate change. Following an educational background in the physics of fluids from École Centrale de Paris, Masson-Delmotte's research has focused on quantifying and understanding past climate and water cycle variability, particularly through isotopic analysis of ice cores, as well as on assessing climate models. Her research has resulted in over 250 scientific publications and won numerous awards. She is also committed to sharing knowledge from the field of climate science with the general public and young audiences.



## MICHAŁ KURTYKA



COP24 President, Secretary of State at the Ministry of Environment of Poland, Michał Kurtyka is responsible for implementation of climate policy. Earlier, as Secretary of State in the Ministry of Energy, he was responsible for technological development and innovation in the energy sector and international relations. He also created the governmental programme for the development of electromobility in Poland. Michał Kurtyka is graduated from École polytechnique (Year of entry 1994), Warsaw University and Warsaw School of Economics.

## SCOTT BARRETT



Lenfest-Earth Institute Professor of Natural Resource Economics at Columbia University, Vice Dean of the School of International and Public Affairs. His research focuses on the design of institutions to address global problems requiring international cooperation. He has been writing on climate change for more than 25 years. Currently, he is also working on governance of the world's oceans and the eradication of malaria.

## TOWARD A LOW-CARBON ECONOMY

### *Round table - French session*

The climate directly affects the habitability of our planet. As such, it is one of the most precious of humanity's collective shared assets. Today, this asset is being threatened by the divergent interests of two main groups on the international playing field: long-established industrialized countries and emerging countries.

In 1990, formerly industrialized countries were responsible for the majority of the world's cumulative greenhouse gas emissions. In the present day, emerging countries (China, India, Brazil and South Africa) are emitting the same amount. Which of the two groups must shoulder the largest share of humanity's "carbon debt"?

For we no longer need to prove that human-produced CO<sub>2</sub> impacts the average rise of global surface temperatures through the greenhouse effect. Since 1750, human activity has been responsible for the emission of close to 2000 billion tons of CO<sub>2</sub> into the atmosphere, half of which has been emitted between 1970 and the current day.

The latest IPCC report examined the potential consequences of a 1.5°C rise in the average global temperature compared to the temperature before the industrial revolution, and demonstrated that this figure would be significantly less damaging to ecosystems than a rise of 2°C. The challenge of not exceeding the 1.5°C increase would mean cutting greenhouse gas emissions in half by 2030 and achieving carbon neutrality by 2050.

Such ambitious objectives would require a complete overhaul of our energy systems and the way we think about production, consumption, transportation, labor division within a globalized economy, and even urban planning.

In what way can this transition take place and how can we prepare for it? Could a carbon tax be the magic remedy? Is our economic system sufficiently flexible and socially just in order to accommodate such an upheaval?

*With Jean Tirole, Anna Creti, Jean-Marc Jancovici and Benoît Leguet.*

## JEAN TIROLE



Laureate of the 2014 Sveriges Riksbank prize in economic sciences in memory of Alfred Nobel, 2007 CNRS gold medal, Jean Tirole is honorary chairman of the Jean-Jacques Laffont - Toulouse School of Economics Foundation and chairman of the Institute for Advanced Study in Toulouse. He is also affiliated with MIT, where he holds a visiting position, the Ecole des Hautes Etudes en Sciences Sociales, and the Institut de France. Professor Tirole's research covers industrial organization, regulation, finance, macroeconomics and banking, and psychology-based economics. Published in English in 2017, his latest book entitled Economics for the Common Good is accessible to a wide audience and available in a number of other languages.

## ANNA CRETI



Anna Creti is professor of economics at the University of Paris-Dauphine, Dauphine Laboratory of Economics and the Center of Geopolitics of Energy and Raw Materials. She was responsible for the «Energy and CO<sub>2</sub> Price Modeling» axis of the Paris-Dauphine Foundation «European Electricity Markets» Chair. She is also the Scientific Director of both the Paris-Dauphine Foundation «Economics of Natural Gas» and the Europlace Institute of Finance (IEF) «Climate Economics» Chairs. Anna Creti's latest research focuses on environmental regulation, the carbon market, energy transition and renewable energy.

## JEAN-MARC JANCOVICI



Member of the French High Council for the Climate under the Prime Minister, Jean-Marc Jancovici is a graduate of École Polytechnique (Year of Entry: 1981) and ENST. He is the developer of the Bilan Carbone (carbon accounting) assessment tool. In 2007, he co-founded Carbone 4, a consultancy firm specializing in carbon strategy. Jancovici is also the president of the Shift Project think tank, which he founded in 2010. He has been a professor at Mines ParisTech since 2008, and chaired X-environnement, a group that organizes conferences for scientific outreach, from 2000 to 2017.

## BENOÎT LEGUET



Benoît Leguet is the Managing Director of I4CE, a think tank devoted to the economics of energy transition, where since 2002 he has worked to support public and private decision-makers in transitioning to a low-carbon and climate-resilient economy. He is a member of several panels of experts, including the French High Council for the Climate, the Economic Council for Sustainable Development (CEDD), and the Scientific Committee of the GoodPlanet Foundation. Benoît Leguet is a graduate of École Polytechnique (Year of Entry: 1997) and ENSTA ParisTech (2002).

## RESEARCH AT L'X FOR SUSTAINABLE DEVELOPMENT

### *Short talks - French session*

For 225 years, École Polytechnique has been a space for developing and sharing knowledge. Its Research Center, comprising 23 laboratories, produces cutting-edge results across all fields.

From the heart of an atom to new frontiers in space, as well as economics, resource management, and big data management, the research conducted at École Polytechnique is well positioned to produce decisive technological breakthroughs.

Research at l'X also relates to real-world issues in line with those found in sustainable development, such as fresh water management. On the global scale, fresh water is a scarce resource, representing less than 1 % of all water on Earth. Moreover, its quality is far from guaranteed, as 2.6 million people die each year from diseases related to unsafe water.

How can we ensure the availability and optimal use of water in areas of its scarcity? Is it possible to use nanosensors to make cities in emerging countries cleaner and more sustainable? If nuclear power is to be a part of energy transition, how can we manage the final disposal of nuclear waste such that it does not become the burden of future generations? Renewable energy sources represent an incredible opportunity for transition, but at what point can they replace fossil fuels? Could big data and artificial intelligence help us on the road to reduced and improved energy consumption?

The answers to these questions and many others are currently under the microscope at the laboratories of École Polytechnique, where researchers are putting all their energy into tackling the challenges of sustainable development.

*With Gérard Mourou, Philippe Drobinski, Camille Duprat and Bérengère Lebental.*



## GÉRARD MOUROU



2018 Nobel Prize in Physics, Professor Haut-Collège at the École polytechnique, Gérard Mourou worked for most of his career in the United States, at the University of Rochester (N.Y.) then at the University of Michigan. Director of the Laboratoire d'Optique Appliquée (LOA) from 2005 to 2008, his most important invention remains the laser amplification technique known as Chirped Pulse Amplification (CPA), for which he was awarded the Nobel Prize shared with Donna Strickland. Professor Mourou proposed major research infrastructures such as ELI, Apollon and XCAN. He is Director of IZEST, international research platform associated with over 30 institutions and facilities worldwide.

## PHILIPPE DROBINSKI



Philippe Drobinski is a research director at CNRS, associate professor at École Polytechnique and Director of the Dynamic Meteorology Laboratory attached to the Institut Pierre Simon Laplace. He studies the evolution of regional climate in relation to energy resources. At École Polytechnique, he teaches meteorology and renewable energy management, and also coordinates the interdisciplinary Trend-X program. Trend-X brings together 10 research laboratories and stands as a testament to École Polytechnique's commitment to energy transition.

## CAMILLE DUPRAT



Camille Duprat is an assistant professor at École Polytechnique. After completing her PhD thesis in hydrodynamics at Université Pierre et Marie Curie, she joined Princeton University as a post-doctoral researcher to work on small-scale fluide-structure interactions. Currently a researcher at the École Polytechnique Hydrodynamics laboratory, her research focuses on textile-liquid interactions, and in particular on fog harvesting nets, using fiber deformation to optimize liquid collection. Camille Duprat holds the Jean Marjoulet professorship, which she dedicates to develop her research on the mechanics of smart textiles.

## BÉRENGÈRE LEBENTAL



A physicist specialized in nanomaterial-based sensors, Bérengère Lebental is research director at IFSTTAR, the French Institute of science and technology for transport, development and networks, and at LPICM, the laboratory of Physics of Interfaces and Thin Films of X and CNRS. Her research highlights the strong capabilities of nanosensors for urban and environmental monitoring: air pollution, water quality, sustainable infrastructures. She has coordinated several large-scale research projects on this topic: Equipex Sense-City, European projects Proteus and LOTUS. She is cofounder of startup Altaroad making roads smarter and safer.

## BREATH AND NOURISHMENT: URGENT CHALLENGES FOR HEALTH

### *Round table - English session*

From 1950 to the present day, the global population has grown from 2.5 billion to over 7 billion. Humans have drawn heavily on agricultural resources to support this population explosion, achieving huge productivity gains, particularly due to the mechanization and application of fertilizers and pesticides. The resulting increase in resources improved the global food situation up until the beginning of the 21st century. However, the pressure on ecosystems is now so great that we may need to question the sustainability of the progress we have made.

In addition, the 2008 financial and economic crisis sparked rising tensions around food prices, which led in 2010 to the return of significant global malnutrition. Over 800 million people worldwide are malnourished, representing 12 % of the population, with 500 million in Asia and over 220 million in sub-Saharan Africa.

The virtuous circle that was supposed to keep our diet in sync with the Earth's ecosystem has long since been broken. High-yield agriculture and intensive livestock farming are contributing to deforestation and the resultant loss of biodiversity.

On top of this, these activities release a cocktail of pollutants and effluents with abnormally high concentrations of various harmful substances directly into the air we breathe and the water that irrigates our soil. The impact of this damage on the ecosystem is so severe that it interferes with human activity.

Fish is the main source of protein for 2.6 billion human beings, with the number of people working in fishing-related occupations reaching 200 million. But according to FAO, 58 % of fish species are caught to the maximum of their biological capacity in order to replenish stocks, and 31 % are either overexploited, depleted or recovering from depletion.

Depending on the species, it takes between 4 and 50 kg of plants to produce 1 kg of meat. This means that 4 to 50 times more agricultural land must be used to produce 1 kg of meat, when these plants could be directly consumed by humans.

With the world's population likely to reach 9 billion in 2050, how can we make all this data more consistent? How can we break the vicious circle between productivism and ecological impact? What are the alternatives?

*With Shenggen Fan, Marion Guillou, Markus Amann and Matthieu Coutière.*

## SHENGEN FAN



Director general of the International Food Policy Research Institute (IFPRI) since 2009. He is a member of the Lead Group for the Scaling Up Nutrition (SUN) Movement appointed by UN Secretary General Ban Ki Moon, and is one of the Champions of Target 12.3 of the Sustainable Development Goals. He serves as advisor to many national governments, including China and Vietnam, on agriculture, food security and nutrition. Dr. Fan received a PhD in applied economics from the University of Minnesota and bachelor's and master's degrees from Nanjing Agricultural University in China.

## MARION GUILLOU



Marion Guillou is Conseiller d'État on extraordinary service, and the Chairperson of Agreenium, the French Agricultural, Veterinary and Forestry Institute. She is a member of the French High Council for the Climate under the Prime Minister. She completed her PhD on the physico-chemistry of biological processes at the University of Nantes, and is an alum of École Polytechnique (Year of Entry: 1973) and an engineer in the Corps of Rural Engineering, Waters and Forests (IGREF). Guillou was Head of the French Directorate General for Food (DGAL) from 1996 to 2000. She has also held positions as President of École Polytechnique and President and Managing Director of INRA from 2004 to 2012. She is currently a member of the boards of directors of two international research centers, Bioversity and CIAT.

## MARKUS AMANN



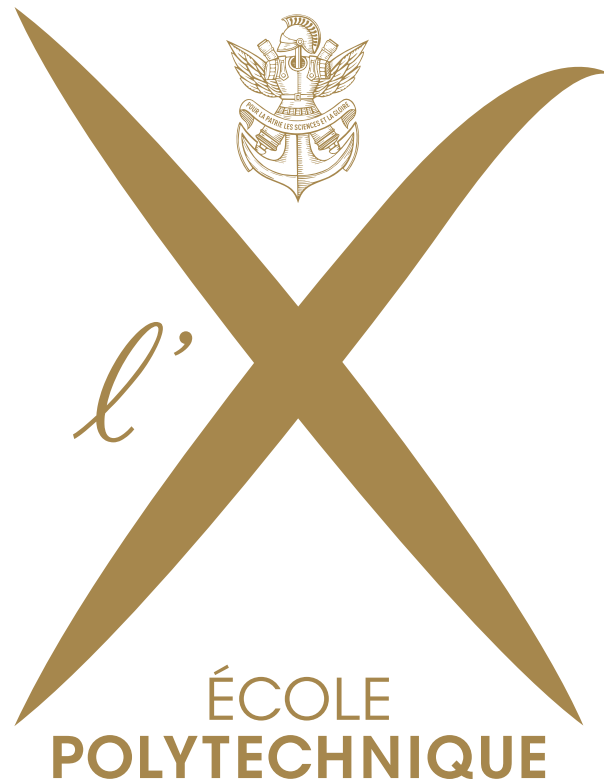
Markus Amann is Program Director of the Air Quality and Greenhouse Gases (AIR) Program and co-leader of IIASA's Greenhouse Gas Initiative. He is also Head of the Centre for Integrated Assessment Modelling (CIAM) of the European Monitoring and Evaluation Programme (EMEP). He is lead author for the Working Group III report of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). His research interests include the interface between science and policy and methods for the integrated assessment of environmental issues.



## MATTHIEU COUTIÈRE



École Polytechnique graduate, Matthieu Couitière (Year of Entry: 1991) has consistently sought to convert technological innovations into products that benefit the general public. He is the CEO of the start-up Air Serenity, which develops air purification technology that presents an optimal balance between energy consumption and user health. This technology was developed and patented at École Polytechnique. He previously directed Alcatel-Lucent's global branch, offering one-stop solutions for smart cities, and worked a strategy consultant with Mars & Co and subsequently with Vivendi. Matthieu Couitière began his career as CTO for the European launch of the American start-up, Akamai Technologies..



#### CONTACT

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