

Mathematicians tackle global issues

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More than 100 academic institutions and scholarly societies have joined in a major world-wide initiative: Mathematics of Planet Earth (MPE) 2013. This year-long effort will highlight the contributions made by mathematics in tackling global problems, including natural disasters such as hurricanes, earthquakes, and tsunamis; climate change; sustainability; and pandemics. MPE2013 partners will sponsor workshops, research conferences, public lectures, outreach events, and educational opportunities for all ages. Each country from a partner institution will host a special launch to the year.

MPE2013 enjoys the patronage of UNESCO, the United Nations Educational, Scientific, and Cultural Organization. The Director-General of UNESCO, Irena Bokova, said, "UNESCO strongly supports this extraordinary collaboration of mathematicians around the world to advance research on fundamental questions about planet Earth, to nurture a better understanding of global issues, to help inform the public, and to enrich the school curriculum about the essential role of [mathematics](#) in the challenges facing our planet."

MPE2013 will bring public awareness of the interdisciplinary nature of scientific research and the unique role played by mathematics in facing global challenges. This broad initiative will involve top researchers in fields as diverse as medicine, engineering, and finance, as well as mathematics, to solve some of the world's most challenging problems. Mathematics will also play a role in the solution to long-term issues including security for e-finance, more accurate predictions of natural disasters, the adaptation of interacting ecosystems to change, and the

spread of diseases.

"My dream is now shared by so many scientists around the world that MPE2013 is developing on its own. This unprecedented collaboration will last beyond 2013." noted Christiane Rousseau, initiator of MPE2013 and Professor of Mathematics at the University of Montreal. "This broad initiative seeks to involve some of the world's finest minds to solve some of the world's toughest problems," said Brian Conrey, leader of MPE2013 in the United States and Director of the American Institute of Mathematics.

Examples of recent applications of mathematics to MPE problems include:

- improved strategies for recharging underground aquifers;
- a better model for how government and industry can work together to decrease pollution;
- successful modeling of the transmission of epidemic diseases allowing the design of strategies to control or eradicate them; and
- developing a greater theoretical understanding of viruses and the drugs necessary to tackle them.

Long-term problems in which mathematics will play a role include:

- quantifying uncertainty in climate change;
- more [accurate predictions](#) of natural disasters including earthquakes, volcanoes, and tsunamis;
- the adaptation of ecosystems to [climate change](#);
- sustainable economic models; and
- the preservation of biodiversity.

According to Mary Lou Zeeman, co-director of the Mathematics and Climate Research Network, "Mathematical modeling has given us a

better understanding of how to combat infectious diseases. We can evaluate the percentage of the population that must be vaccinated to eradicate a disease and we can measure the impact of education and other interventions on the spread of a disease."

"Achieving sustainability requires understanding the complex interactions between a vast number of systems including climate, economics, technological progress, geology, ecology, space science, population control, security, global politics, and mass psychology," says Doyne Farmer, Director of the Oxford Martin Programme on Complexity at the University of Oxford. "Sustainability forces us to think clearly about our vision of the future, putting philosophy into direct contact with science. As scientists our job is to try to understand causes and effects, both by making predictions and by quantifying the vast uncertainties in these predictions as best we can. But we need mathematicians to work with physicists, ecologists, economists, etc., to ensure that we are using the right model."

MPE2013 can impact health care through a better understanding of how to control pandemics, and it can contribute to the green economy by aiding in the design of high-performance materials for batteries and solar cells.

Mathematics is becoming an increasingly popular career path for people who want to be part of the solution to the problems of our planet. High school and college students can share in the excitement of MPE2013 through new educational materials being developed for core mathematics courses. Activities, readings, and seminar lesson plans will be freely available to any teacher who wants to engage students in discovering how the mathematical sciences can have a global impact.

Provided by American Institute of Mathematics

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