



## Anthropocene film kick-starts Rio+20

A THREE-MINUTE film, *Welcome to the Anthropocene*, co-produced and directed by IGBP's Director of Communications Owen Gaffney, opened the Rio+20 summit in front of 188 heads of state and ministers. The film was introduced by UN Secretary-General Ban Ki-moon who mentioned IGBP and the Planet Under Pressure conference. The summit attracted 50,000 people.

The short film, which was created as part of the first online educational website dedicated to the Anthropocene ([www.anthropocene.info](http://www.anthropocene.info)), quickly became an online sensation.

Since its launch at the Planet Under Pressure conference it has been viewed about 800,000 times and articles on it have appeared on the New York Times, BBC, Time, the Atlantic, Gizmodo and other influential sites.

"The feedback for this project has been tremendous. We achieved all our primary goals," said Owen Gaffney.

## Future Earth launched

A NEW ten-year international initiative on global environmental research for sustainability was launched at the mammoth UN Rio+20 summit in June.

The initiative, Future Earth: Research for global sustainability, aims to provide a cutting-edge platform to coordinate scientific research internationally.

Future Earth, which will include IGBP and several other global-environmental-change programmes, will be designed in partnership with governments, business and, more broadly, society. The initiative is scientifically sponsored by an alliance of partners, including the International Council for Science (ICSU), the International Social Science Council (ISSC), the Belmont Forum of funding agencies, the United Nations University, the UN Environment Programme and UNESCO, with the active engagement of the World Meteorological Organization (WMO).

"The future of IGBP is very much with Future Earth. We recognise that the international research agenda must develop a strategic focus on global sustainability," said IGBP Executive Director Professor Sybil Seitzinger.

But endorsement comes with caveats. Future Earth was the main item on the agenda of IGBP's recent scientific committee meeting, held in Bergen, Norway, in May.

The committee supported the idea of Future Earth but called into question the process developed by the alliance of partners. In a strongly-worded letter sent to ICSU President, Professor Yuan Tseh Lee, IGBP criticised the process saying, "The IGBP Scientific Committee supports the aspirations of the Future Earth initiative, but has strong concerns about the minimal engagement to date with IGBP, and the lack of detailed science and implementation plans."

Despite ongoing difficulties, three global-environmental-change programmes – IGBP, DIVERSITAS and the International Human Dimensions Programme on Global Environmental

Change – have signalled their willingness to merge into a new single organisation. The World Climate Research Programme (WCRP) will be an independent partner, supporting Future Earth strategically and intellectually.

To co-design the Future Earth research agenda, further consultations will be held in 2012 and 2013 including an online consultation. Workshops will be held in Africa, Asia and Latin America between October and December 2012.

More information: [www.icsu.org/future-earth](http://www.icsu.org/future-earth)

## A different take on wealth

CONVENTIONAL means of measuring a nation's wealth do not sufficiently account for the state of natural resources or ecosystems. Moreover, they do not consider the long-term sustainability of national policies. The Inclusive Wealth Report, launched at Rio+20, seeks to rectify the situation by providing a new tool: the Inclusive Wealth Index. Results show changes in inclusive wealth from 1990 to 2008 and feature a long-term comparison to Gross Domestic Product (GDP) for an initial group of 20 countries. The report was produced by the International Human Dimensions Programme on Global Environmental Change (IHDP) and its partners.

More information: [www.ihdp.unu.edu/article/read/iwr](http://www.ihdp.unu.edu/article/read/iwr)

## Erratum

GLOBAL CHANGE, Issue 78, page 11.

The graph did not account for negative values of the climate-change index. However, the values were reported correctly. The graph has now been corrected in the online PDF version.

# EVENTS

## 2012

### October

**13-20.** DISCCRS VII: Interdisciplinary Climate Change Research Symposium. Colorado Springs, USA.

**24-26.** IIASA 40th Anniversary Conference. Vienna and Laxenburg, Austria.

### November

**28-30.** IGBP Officers' Meeting. Canberra, Australia. Preceded by the 2nd Biennial Australian Earth System Outlook Conference (26-27 November).

### December

**3-7.** American Geophysical Union Fall Meeting. San Francisco, USA.

## 2013

### January

**15-17.** Third International Symposium on Arctic Research (ISAR-3). Tokyo, Japan.

**23-25.** Climate and Beyond: Knowledge Production About Planet Earth and the Global Environment as Indicators of Social Change. Bern, Switzerland.

**28-31.** IMBER IMBIZO III. Goa, India.

### February

**13-16.** PAGES 4th Open Science Meeting. The Past: A Compass for Future Earth. Goa, India.

### March

**18-20.** First European Climate Change Adaptation Conference. Hamburg, Germany.

### April

**4-5.** Holocene Climate Change. London, United Kingdom.

**17-19.** 28th IGBP Scientific Committee Meeting. Bern, Switzerland.



## ELINOR OSTROM (1933 – 2012)

ELINOR OSTROM, or Lin as she was known to friends and colleagues, contradicted the received wisdom that resources such as forests, fresh water, arable land or fisheries are best managed through government intervention or privatisation.

In 2009, following a lifetime's work on common resources, Lin was awarded the Nobel Prize in Economics, the first woman to achieve this distinction. Many economists expressed surprise at the Nobel Committee's decision. Not because Lin was a woman, but because she was a political scientist rather than an economist.

Lin loved people. She loved going out in the field and observing first hand how societies looked after their resources. Time and time again her work showed that common resources were often in better shape if managed by people working cooperatively and collaboratively, rather than forced to comply through top down carrot-and-stick waving.

From Spanish irrigation schemes to Nepalese

forests, left to their own devices people draw up their own arrangements that are often cheaper to operate, more equitable and easier to patrol than heavy-handed bureaucratic solutions. Moreover, the resources are frequently managed more sustainably.

In her Nobel Lecture, *Beyond Markets and States: Polycentric governance of complex economic systems*, she noted: "...isolated, anonymous individuals overharvest from common-pool resources. Simply allowing communication, or 'cheap talk', "enables participants to reduce overharvesting and increase joint payoffs, contrary to game-theoretical predictions. Large studies of irrigation systems in Nepal and forests around the world challenge the presumption that governments always do a better job than users in organizing and protecting important resources."

In the last two decades researchers have demonstrated that the mother of all common

resources – Earth's life-support system – is under threat. Early attempts at multilateral binding international agreements have come to naught.

In her later years, Lin's attention focused on this vexing challenge. In an article that appeared days before the UN's Rio+20 summit she argued: "It would be a mistake to rely on singular global policies to solve the problem of managing our common resources."

Instead, she discussed the importance of encouraging and promoting multiple overlapping systems at different scales. These governance solutions should be designed with flexibility in mind so they can evolve and adapt rapidly to changing conditions, but also to new innovations, she argued. They must incorporate redundancy to create resilience. They must learn from one another, allowing the best ideas to spread while ensuring poorer ideas have a short life.

In an interview published in this magazine, Lin emphasised that "the polycentric approach advocates complex,

multi-level systems to tackle what is a complex, multi-level problem." This became a guiding theme for the recent Planet Under Pressure conference. Lin was appointed chief scientific advisor to the conference. In this role she provided intellectual guidance to the scientific committee and helped develop the first State of the Planet Declaration, published on the final day of the conference.

Lin's health deteriorated rapidly in early 2012. Chemotherapy for pancreatic cancer sapped her strength, but she refused to give up her work.

On 12 June Lin died at the age of 78. The timing was just days before the opening of Rio+20. The summit – the largest in UN history – was charged with finding solutions to managing globally common resources. Undoubtedly Lin's work has influenced the outcome, though we will have to wait a decade or more for a clear picture to emerge.

Lin is dearly missed by the global-environmental-change community. She has inspired us all.

## JOÃO MORAIS LEAVES IGBP



The Royal Swedish Academy of Sciences/Eric Hult

A DEFINING characteristic of humans is our ability to transform our surroundings to suit our selves. As the population has swollen to seven billion, we have transformed our planet. Understanding this transformation and its implications is critical to increasing our knowledge of the Earth system. For 16 years, João Morais (IGBP's Deputy Director for Social Sciences) advised and guided IGBP and its projects towards a deeper appreciation of the social, cultural and economic factors relating to global change.

In September, Professor Morais left IGBP to take up a new position at the Research Cooperation Unit (FORSK) of the Swedish International Development Cooperation Agency (Sida).

A respected archaeologist, Professor Morais joined IGBP in 1995 from the Tropical Research Institute and the Lusophone University in Lisbon, Portugal, to forge links between social and natural sciences. Originally from Mozambique, he worked tirelessly to spearhead a drive to develop global-change national committees throughout Africa, Europe, Asia and the Americas. This blossomed into a powerful internationally coordinated research network.

Many of the key intellectual developments in Earth-system science emerged during Professor Morais's period with IGBP. Indeed, he can take considerable credit for positioning socio-economic considerations at the centre

of global-change research coordinated by IGBP.

In 1996, the archaeologist took a nascent programme on human dimensions and helped shape it into the International Human Dimensions Programme on Global Environmental Change.

Through developing and participating in landmark events such as the 2001 conference in Amsterdam and the Dahlem workshop on civilisations and the environment, Professor Morais was instrumental in steering IGBP towards developing the Integrated History and Future of People on Earth (IHOPE) project.

More recently, Professor Morais had a key role in creating the trans-disciplinary agenda for the Planet Under Pressure conference and raising funds to support the attendance of hundreds of scientists from the developing world.

On his time at IGBP, Professor Morais said, "It has been a joyful journey; I

will particularly miss kindred spirits throughout IGBP and throughout the world."

"I witnessed IGBP performing best when overcoming knowledge fragmentation and regional divides," he added. "I believe the challenge ahead is to expand on both quantitative and normative knowledge – what it is to be human and valued in the Anthropocene – to better understand socio-cultural mindsets and seek solutions that transcend disciplinary biases, language and culture."

He remarked that to achieve this IGBP and partners must evolve to truly represent universal collaboration across countries and regions.

During his long career at IGBP Professor Morais embodied this vision.

He has been a valued colleague and critical strategic thinker within IGBP. His wisdom, warm personality and truly global perspective will be missed.

### Iconic synthesis now freely available

FOR those scouring Earth for evidence we have entered a new geological epoch – the Anthropocene – look no further than between the covers of IGBP's iconic first synthesis, *Global Change and the Earth System: A Planet Under Pressure* (Steffen *et al.* 2004). For the first time, this meticulous and detailed tome is available to download freely.

*Global Change and the Earth System's* 336 pages capture the state of the planet and the pressure it is now under. The synthesis contains a collection of 24 graphs that have become known as the "Great

Acceleration". Twelve graphs show how the global economic engine has exploded in size in the last 60 years. The next 12 graphs show how this has directly influenced the geosphere and biosphere. These graphs have appeared in thousands of presentations relating to global change and the Anthropocene, most recently at the opening of the Rio+20 summit and in a presentation to the Dalai Lama.

Now, as IGBP embarks on synthesising its second phase, the contract with the book's publisher, Springer, has expired allowing IGBP to make it freely available.

The publication, a culmination of 15 years' work by thousands

of scientists worldwide, was the pinnacle of IGBP's first phase.

The synthesis led to the emergence of five landmark concepts in Earth-system research.

First, the notion that Earth is an interconnected system with humans as an integral part.

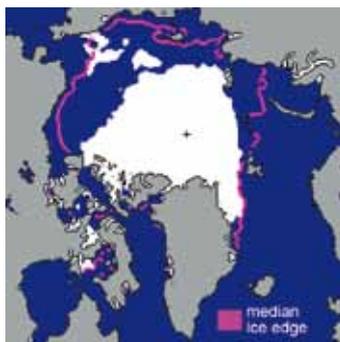
Second, the unprecedented spurt in human activity beginning around the middle of the last century – the "Great Acceleration" – accompanied by significant changes in the biophysical Earth system.

Third, the Anthropocene: humans have become the prime driver of change on the planet, pushing it into what might be a new geological epoch.

Fourth, the possibility of crossing irreversible thresholds in the Earth system. The combined impact of human societies risks major long-term global change with potentially deleterious consequences for humanity.

And finally, the need for and possibility of planetary stewardship in a rapidly changing world. The final chapter argues that "global sustainability" is for the benefit of all societies, a sentiment echoed in the close of the preface, which ends, "A truly global system of science is needed for coping with the challenges that lie ahead."

See [www.igbp.net](http://www.igbp.net)



## Arctic sea ice: record low

IT IS official. This summer Arctic sea ice covered an area smaller than the previous low recorded in the summer of 2007. Notwithstanding annual variability, the extent of summer sea ice has been declining since satellite observations began in 1979, a trend that is particularly pronounced during the past decade or so.

In part, the rapid melting during August could be attributed to the effects of

a strong cyclone. But ice continued to be lost at a fair clip even after the cyclone. Temperatures in the region have not been exceptionally high this summer, unlike in 2007. This points to the role of another factor: multi-year ice.

A feature of the last few years has been the increased loss of old, multi-year ice. In normal circumstances, such ice tends to survive summer melting. Continued warming, though, has taken its toll. New ice that forms during the winter is less able to survive the following summer.

Additional information: <http://nsidc.org/arcticseaicenews/>

See also page 8 of this issue.

## Climate chemistry

THE FIFTH phase of the Coupled Model Intercomparison

Project (CMIP5) seeks to compare a suite of models to test their ability to reproduce past climate and project future climate change. The exercise focuses on CO<sub>2</sub>, but will not explore in detail a key source of variability in model results – short-lived climate forcings. The role of such forcings, including aerosols and tropospheric ozone, is instead being investigated by an effort co-sponsored by IGBP's IGAC project.

The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP) includes most of the models used by CMIP5. It aims to uncover atmospheric compositional changes and their effects on radiative forcing between 1850 and 2100. To this end, it is making use of the growing number of observations of atmospheric composition provided by various

satellite- and ground-based instruments. These observations will be used to test the results of climate models.

Shindell *et al.* report that the reduced air pollution in North America and Europe is more than compensated by increases in Asia. As a result, the cooling effect of aerosols has probably ameliorated the warming induced by greenhouse gases during recent years. Young *et al.* find that tropospheric ozone concentrations will be lower in the year 2100 as compared to the year 2000, except for the scenario that posits the highest future temperature increase.

These and other results are now available for review in a special issue of *Atmospheric Chemistry and Physics Discussions*.

[http://www.atmos-chem-phys-discuss.net/special\\_issue176.html](http://www.atmos-chem-phys-discuss.net/special_issue176.html)

## OCEAN ACIDIFICATION: PRESENT BEATS PAST

THE OCEANS may be acidifying faster today than they did in the last 300 million years, according to research published in the journal *Science* in March this year. The results are based on a workshop organised by IGBP's PAGES project.

In a review of hundreds of paleoceanographic studies, the researchers found evidence for only one interval in the last 300 million years when the oceans changed as fast as today: the Palaeocene-Eocene Thermal Maximum, or PETM. About 56 million years ago, a mysterious surge of carbon into the atmosphere warmed

the planet and turned the oceans corrosive. As many as half of all species of benthic foraminifera, a group of unicellular organisms that live at the ocean bottom, went extinct, which probably affected deep-sea organisms higher up in the food chain. The measure of ocean acidity – its pH – may have fallen as much as 0.45 units.

"These scientists have synthesised and evaluated evidence far back in Earth's history," said Candace Major, Program Officer in the National Science Foundation's

(NSF) Division of Ocean Sciences, which funded the research. "The ocean acidification we're seeing today is unprecedented," said Major, "even when viewed through the lens of the past 300 million years, a result of the very fast rates at which we're changing the chemistry of the atmosphere and oceans."

In the last hundred years, rising carbon dioxide from human activities has lowered ocean pH by 0.1 unit, an acidification rate at least ten times faster than 56 million years ago,

says Bärbel Hönisch, the study's lead author. The Intergovernmental Panel on Climate Change (IPCC) predicts that pH will fall another 0.2 units by 2100, raising the possibility that we may soon see ocean changes similar to those observed during the PETM.

Ocean acidification was the theme of a major conference last month in Monterey, California, organised by IGBP, the Scientific Committee on Oceanic Research and the Intergovernmental Oceanographic Commission.

Hönisch B *et al.* (2012). *Science* 335: 1058-1063, doi: 10.1126/science.1208277.