



SCARnewsletter

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Welcome to the latest issue of the SCAR Newsletter, the first of 2014.

The hugely successful Open Science Conference held in New Zealand this August was an excellent reminder of the breadth and quality of international science being carried out in the Antarctic region by scientists from across the world. Symposia on *Antarctic Conservation in the 21st Century*, *Innovations in Antarctic Science* and *Connections between the Southern Continents* supplemented the science sessions, as well as a host of workshops and other side events. A reminder that the 2016 meetings will be held in Kuala Lumpur, Malaysia (<http://scar2016.com>) and, even

before that, the next SCAR ISAES meeting will be held in Goa, India in 2015 (<http://isaes2015.ncaor.gov.in>).

During the SCAR Delegates' Meeting held in New Zealand this September, two new countries joined SCAR – the Czech Republic and the Islamic Republic of Iran – bringing the total number of countries in the SCAR family to 39. Two new Vice Presidents were also elected – Azizan Abu Samah (Malaysia) and Terry Wilson (USA). The SCAR Delegates also decided on Davos, Switzerland as the location for the SCAR 2018 meetings.

This year we are awarding four Fellowships, with COMNAP awarding

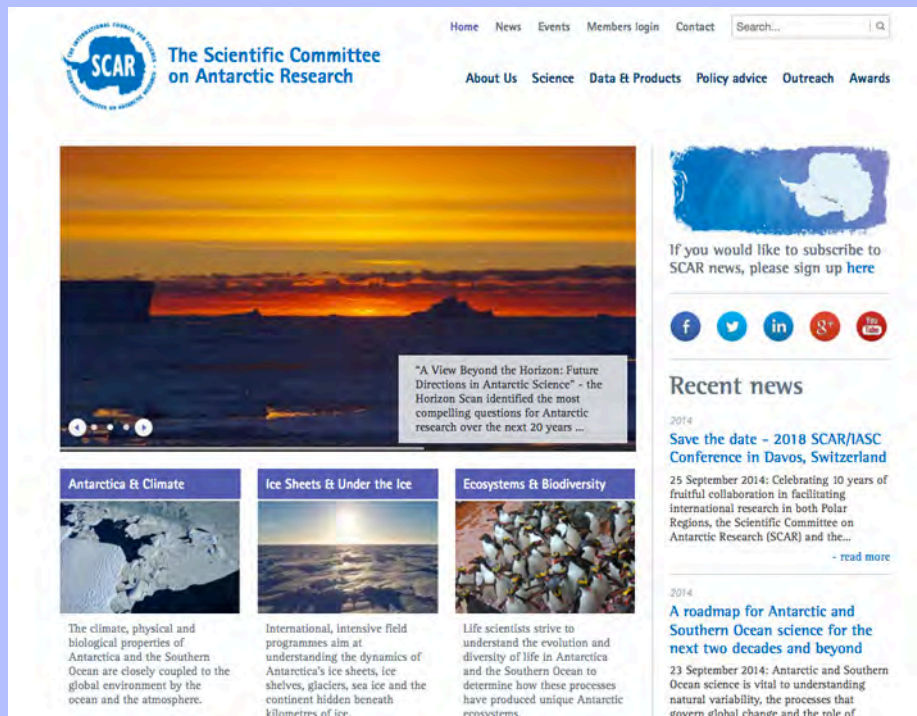
an additional two. From next year, we will be using the funds SCAR was awarded from the Prix Biodiversité to offer an additional Prince Albert II of Monaco Fellowship, with a focus on biodiversity research.

Following the crowdsourcing of over 850 unique scientific questions and the nomination of almost 500 leading scientists by the SCAR community, the 1st SCAR Antarctic and Southern Ocean Science Horizon Scan assembled more than 70 of the world's leading Antarctic scientists, policy makers and visionaries (including many early career scientists) in Queenstown, NZ, in April this year. The outcomes have so far been published in *Nature* and *Antarctic Science*. See page 3 for details.

Over the next two years SCAR will produce its next Strategic Plan 2017+. The input of the next generation of polar scientists will be critical and we will explore ways in which to engage APECS in this process.

Finally, some news about changes in the SCAR Secretariat. After more than four years as Executive Officer of SCAR, Renuka Badhe is moving on to bigger and better things by becoming the new Executive Secretary of the European Polar Board. I'm sure you'll join us in wishing her all the best in the future!

For further information and to keep up-to-date with SCAR news, see the new website at www.scar.org or join us on Facebook, LinkedIn, Google+ or Twitter.



The home page of the new SCAR website, which went live in July: www.scar.org

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SCAR focus on . . . The Antarctic Environments Portal

Linking Antarctic Science and Policy

The Antarctic Environments Portal (www.environments.aq) is the link between the growing body of scientific research on Antarctica and the governance work of the Antarctic Treaty System, in particular through the Committee for Environmental Protection (CEP). There is a pressing need to ensure that policy makers have easy access to scientific information on Antarctic environments.

The CEP is mandated to advise the Antarctic Treaty Parties on measures to enhance the comprehensive protection of the Antarctic environment, including on the state of Antarctic environments and the need for scientific research and environmental monitoring. The CEP's priority topics include managing risks associated with non-native species in Antarctica, considering the implications of climate change, and maintaining awareness of and responding to threats to biodiversity. The Portal is structured around the CEP's priority topics, and also provides a mechanism for scientists to raise emerging issues of relevance to the CEP.

The CEP has been advised that rapid changes in ocean and air temperature, sea ice extent and species distribution and abundance are being observed in parts of the Antarctic, and that further rapid changes are expected over the next century. These changes may be compounded by human activity. For the CEP to fulfil its mandate within the context of changing Antarctic environments and increasing human activity, ready access to high quality, reliable, up-to-date scientifically-based information is needed.

The Portal is operating in a beta (or development) phase but will be fully functional by June 2015. In the coming year we will be incorporating more content and completing and testing the technical aspects of the website. The ability to log in and contribute material to the Portal is now in place.

The current management of the Antarctic Environments Portal is provided by Antarctica New Zealand, the technical design and development is currently provided by Landcare Research New Zealand. Partner organisations are: SCAR, the Australian Antarctic Division, Monash University, Melbourne, Australia,



the Norwegian Polar Institute and the Université Libre de Bruxelles, Belgium. A steering group comprised of scientists, policy and technical experts and a SCAR representative provide leadership, oversight and expert guidance to the Project Manager.

In this interim development phase of the project, text in the Portal has been prepared by interested scientists and policy makers who have been approached by the Steering Group, and the Steering Group are functioning as an editorial committee. External reviews are being facilitated through SCAR's Standing Committee on the Antarctic Treaty System.

The Portal includes summaries of the state of knowledge on CEP priority issues, the management of those issues and environmental pressures. Information in the Portal is based on peer-reviewed science and existing CEP materials. The content is intended to be non-technical and apolitical. It is subject to a robust editorial process.



Interactive map on the environments.aq website



Contributions to the Portal will have an impact on policy development and will support the informed management and governance of the Antarctic. The involvement of the science community in this project is fundamental to its success. The project supports SCAR's mission to provide independent, sound, scientifically-based advice to the Antarctic Treaty System, but depends on the science community's interest in communicating their work.

We invite and encourage participation in the project. For more information or to get involved, please contact Birgit Njaastad <b.njaastad@antarcticanz.govt.nz>.

News of the 1st Antarctic and Southern Ocean Science Horizon Scan

The 80 most pressing scientific questions

In April 2014, SCAR convened 75 scientists and policy-makers from 22 countries to agree on the priorities for Antarctic research for the next two decades and beyond. This is the first time the international Antarctic community has formulated a collective vision through discussions, debate and voting.

The official outcomes of the 1st Antarctic and Southern Ocean Science Horizon Scan were published online as a Comment in the journal *Nature* entitled “Six priorities for Antarctic science” (August 2014) and as an article in *Antarctic Science* entitled “A roadmap for Antarctic and Southern Ocean science for the next two decades and beyond” (September 2014).

The Horizon Scan narrowed a list of hundreds of scientific questions to the 80 most pressing ones. The questions fall broadly into six scientific priorities:

1. define the global reach of the Antarctic atmosphere and Southern Ocean;
2. understand how, where and why ice sheets lose mass;
3. reveal Antarctica's history;
4. learn how Antarctic life evolved and survived;
5. observe space and the Universe; and
6. recognize and mitigate human influences.

A few examples of critical questions that need to be answered include:

- How will the recovering ozone hole and rising greenhouse-gas concentrations affect regional and global atmospheric circulation and climate?
- Will changes in the Southern Ocean result in feedbacks that accelerate or slow the pace of climate change?
- What factors control Antarctic sea-ice seasonality, distribution and volume?
- Are there thresholds in atmospheric CO₂ concentrations beyond which ice sheets collapse and the seas rise dramatically?
- What do geological signatures of past relative sea level tell us about when



and where planetary ice has been gained or lost?

- What are the genomic, molecular and cellular bases of adaptation in the Antarctic?
- What is the nature of the Dark Universe?
- What is the current and potential value of Antarctic ecosystem services and how can they be preserved?

The assembled experts concluded that, to answer the 80 highest priority questions, it will be necessary to provide long-term sustained and stable research funding; access to all of Antarctica throughout the year; application of emerging technologies; strengthened protection of the region; growth in international cooperation; and improved communication among all interested parties. Maximizing scientific return while minimizing the human footprint should be the goal, and coordinated international efforts that engage diverse stakeholders will be crucial.

Former SCAR President, Mahlon ‘Chuck’ Kennicutt II, who led the Horizon Scan, summarized that “Antarctic science is clearly globally important. The southern polar community must act together if it is to address some of the most pressing issues facing society.... It is time for nations involved in southern polar research to embrace a renewed spirit of cooperation as espoused by the founders of the Antarctic Treaty - in actions not just words.” While this is the first Antarctic Horizon Scan, it is recommended that SCAR repeat the Hori-

zon Scan exercise every four to six years in support of national strategic planning efforts and emerging integrated science, conservation and policy efforts.

Communicating the global importance of Antarctica to the public must be a priority. Narratives need to better explain how the region affects and is influenced by people's daily lives. Antarctic success stories, such as signs of ozone recovery, engender confidence in the power of changes in behaviour. SCAR President, Jerónimo López-Martínez concluded, “Antarctic science is today particularly important to our understanding of how the Antarctic and Earth system work, what this foretells about the future of our planet and the role that humans play in observed change. The challenge is to find new ways for the global Antarctic community to act together to realize this potential for the benefit of all.”

For more information, read the articles in *Nature* (<http://www.nature.com/news/polar-research-six-priorities-for-antarctic-science-1.15658>) and *Antarctic Science* (<http://dx.doi.org/10.1017/S0954102014000674>).

For the list of 80 questions identified by the Scan, see: www.scar.org/scar_media/documents/horizonscan/HS_Final_List_of_Questions.pdf

For full information on the Horizon Scan, visit www.scar.org/horizonscanning

International Symposium on Antarctic Earth Sciences 2015 (ISAES XII)

The 12th International Symposium on Antarctic Earth Sciences (ISAES) will take place from 13-17 July 2015 in Goa, India, hosted by the Earth System Science Organization (ESSO) of the Ministry of Earth Sciences, and its R&D Wing, the National Centre for Antarctic and Ocean Research (NCAOR).

ISAES is a SCAR-initiative aimed at showcasing



Antarctic geoscience research, taking stock of the accomplishments of the International community and providing guidance for future studies. India is only the second Asian country to host ISAES in its 50 year history.

Pre-registration is now available. For more information, see the Events page in this issue, or visit the Symposium website: isaes2015.ncaor.gov.in

News from SCAR

Two new countries and two new Vice Presidents join the SCAR Family

During the SCAR Delegates' Meeting held in New Zealand this September, two new countries joined SCAR – the Czech Republic and the Islamic Republic of Iran – bringing the total number of countries in the SCAR family to 39. Two new Vice Presidents were also elected: Azizan Abu Samah (Malaysia) and Terry Wilson (USA).



Terry Wilson is professor of geological sciences at Ohio State University. With her research group, she investigates the structural architecture of the Earth, how continents rift,

and the interaction of the solid Earth and ice sheets in Antarctica, using structural field observations, geophysical data and GPS. Dr Wilson is the US delegate to SCAR, is active as chair of SCAR's Scientific Research Programme SERCE (Solid Earth Responses and influence on Cryospheric Evolution) and has extensive experience working to create and sustain international programmes and collaboration. Dr Wilson earned her PhD in geology from Columbia University in 1983.

Prof Dr Azizan Abu Samah is a meteorologist with a PhD from the University of Reading, UK. He is currently a professor in the Department of Geography, University of Malaya, Malaysia. He is also the Director of the National Antarctic Research Centre and Deputy Director of the Institute of Earth and Ocean Sciences at the same university. His main interest

is on tropical-polar and air-sea interactions. He was involved in a number of scientific advisory steering committees such as SHIVA (an EU Framework Programme), the



UK's NERC International Opportunities Fund, Asian Network on Climate Science and Technology (ANCST) and the Association of Pacific Rim Universities' Climate Change Mitigation and Adaptation Strategies (CMAS). He was a member of SCAR's 1st Horizon Scan in Atmospheric Sciences.

2014 SCAR Medal awardees

During the SCAR Open Science Conference in Auckland, NZ, two SCAR medals were awarded. The first, the SCAR Medal for Excellence in Antarctic Research went to Steven Chown for his extensive contributions to Antarctic Science and policy and to SCAR. The second, the SCAR Medal for International Scientific Coordination, was awarded jointly to Mahlon "Chuck" Kennicutt and Rasik Ravindra for their collaborative and coordination roles in the science community and the leadership and vision they have both shown to the community. The medals were awarded during the banquet by the SCAR President, Jerónimo López-Martínez.

Steven Chown works across a broad range of areas in the biological sciences and has also included in his work insights from several other scientific disciplines and from the humanities, having developed the latter especially with regard to policy work and the documentation of the history of South Africa's involvement in the Antarctic. Steven has made fundamental contributions to animal physiology. He has developed the field of macro-



physiology, reflecting his capability across the fields of physiology and ecology and the drivers of diversity variation at both small and large scales. His fundamental work in understanding the ecology of Antarctic terrestrial systems has also meant integration of data on the geological and climatic history of the region to interpret the current distribution of diversity.

The success of the 1st SCAR Antarctic and Southern Ocean Science Horizon Scan, which assembled the world's leading Antarctic scientists, policy makers, leaders, and visionaries to identify the most important scientific questions to be addressed by research in and from the southern Polar Regions over the next two decades, is testament to the effectiveness of Chuck Kennicutt's ability to gather and develop international cooperation in research planning. Chuck has also been at the forefront of international cooperation in subglacial lakes research for over ten years, as well as serving on the SCAR Executive Committee, as Vice President between 2004-08, President from 2008-12, and as Past President 2012-14.



Dr Rasik Ravindra has been involved in SCAR at all levels, and as a Vice-President of SCAR (2008-12), leading the Capacity Building, Education and Training advisory group. He was able to raise the profile of SCAR capacity building by providing considerable energy and efforts to bring funds to support early career scientists, and provided critical input for the SCAR Visiting Professors scheme. From an international perspective, he was key in raising the profile of India, and other Asian countries, in Antarctic research as chairman of the Asian Forum for Polar Sciences (AFOPS), as well as Vice Chair at both COMNAP and the XXIX ATCM. Furthermore, he is acknowledged for building scientific collaborations between a wide range of European, South American and Australasian countries.



SCAR congratulates the Awardees and wishes them continued success in their scientific endeavours.

For more information on SCAR Medals, visit the medals section of the website: www.scar.org/awards/medals

SCAR and Antarctic Science

Tim Naish awarded 2014 Muse Prize

Professor Tim Naish has been awarded the 2014 Muse Prize, for his outstanding research in understanding Antarctica's response to past and present climate change and the role of Antarctica's ice sheets in global sea-level change through time.

He led the first season of the ambitious and highly successful Antarctic Drilling Program (ANDRILL) where his international team pioneered innovative drilling technology to obtain sedimentary records of the past 13 million years, paving the way for further successful drilling in previously inaccessible ice-covered areas. As Chair of

the ANDRILL Steering Committee, he continued to be actively involved in overseeing the programme, including securing funding for the next phase. More recently, he has played an influential role in the process of translating science into policy



as a lead author on the Paleoclimate chapter of the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). He is currently Director of the Antarctic Research Centre, Victoria University of Wellington, which continues to develop and has more than trebled its capacity under his direction.

The Prize Ceremony was held at the SCAR Open Science Conference in Auckland in August 2014.

For further details of the Martha T Muse Prize for Science and Policy in Antarctica, please visit www.museprize.org

New chairs of the Southern Ocean Observing System

SCAR and SCOR are pleased to announce the new members of the Southern Ocean Observing System (SOOS) Executive Committee. Anna Wahlin takes over from Mike Meredith as the Physical Sciences Co-Chair and joins Os-

car Schofield, the Biological Sciences Co-Chair, in leading the Scientific Committee. There are also two new positions in the Executive Committee: Sebastiaan Swart is the Physical Sciences Vice Chair, and Andrew Constable is the Biological Sci-

ences Vice Chair.

Visit the SOOS website (www.soos.aq/) for more information on the Executive and Steering Committee members, as well as additional information on the SOOS.

Antarctica's protected areas are inadequate, unrepresentative, and at risk

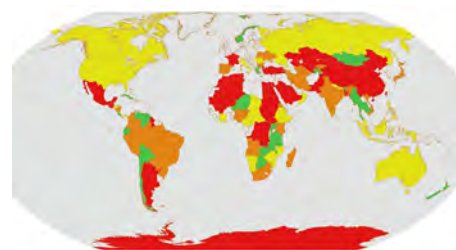
Antarctica is widely regarded as one of the planet's last true wildernesses, insulated from threat by its remoteness and declaration as a natural reserve dedicated to peace and science. However, rapidly growing human activity is accelerating threats to biodiversity.

The authors in a new article in *PLOS Biology* (including the current and incoming Chief Officers of SCAR's Standing Committee on the Antarctic Treaty System) determined how well the existing protected-area system represents terrestrial biodiversity and assessed the risk to protected areas from biological invasions, the region's most significant conservation threat.

They found that Antarctica is one of the planet's least protected regions, with only 1.5% of its ice-free area formally designated as specially protected areas. Five of the distinct ice-free eco-regions have no specially designated areas for the protection of biodiversity. Every one of the 55 designated areas that protect Antarctica's biodiversity lies closer to sites of high human activity than expected by chance, and seven lie in high-risk areas for biological invasions. By any measure, including Aichi Target 11 under the Convention on Biological Diversity, Antarctic biodiversity is poorly protected by reserves, and those reserves are threatened.

For links to more information, including

the *Science Daily* news item and the full paper in *PLOS Biology*, go to <http://www.scar.org/2014/554-antarcticas-protected-areas-at-risk>



Protected-area coverage of 83 countries and Antarctica. Countries are classified into different coloured quartiles: green = highest quartile, yellow = second highest quartile, orange = second lowest quartile, and red = lowest quartile.

Glaciers in northern Antarctic Peninsula melting faster than ever despite increased snowfall

Past SCAR Fellow, Bethan Davies, discusses in *Nature Climate Change* how increased snowfall will not prevent the continued melting of glaciers in the northern Antarctic Peninsula.

Temperatures are currently rising rapidly in the Antarctic Peninsula. Because warmer air holds more moisture, the amount of snowfall has also increased. Some researchers have suggested that this may offset the melting of the glaciers. However

this study found that just a small rise in air temperature increased melting so much that even large amounts of extra snowfall could not prevent glacier recession.

"These small glaciers around the edge of the Antarctic Peninsula are likely to contribute most to rising sea levels over the coming decades, because they can respond quickly to climate change", said Dr Davies. "This study is the first to show how glaciers in this vulnerable region are

likely to respond to climate change in future. Our findings demonstrate that the melting will increase greatly even with a slight rise in temperature, offsetting any benefits from increased snowfall."

For links to the press release on the Royal Holloway University of London website and to the paper in *Nature Climate Change*, go to <http://www.scar.org/2014/597-glaciers-in-antarctic-peninsula-melting-faster-than-ever>

Antarctic Science

Major West Antarctic glacier melting from geothermal source

Thwaites Glacier, the large, rapidly changing outlet of the West Antarctic Ice Sheet, is not only being eroded by the ocean, it's being melted from below by geothermal heat, researchers at the Institute for Geophysics at The University of Texas at Austin (UTIG) reported in the June 2014 issue of the *Proceedings of the National Academy of Sciences*.

The findings significantly change the understanding of conditions beneath the West Antarctic Ice Sheet, where accurate information has previously been unobtain-

able.

The Thwaites Glacier has been the focus of considerable attention in recent weeks as other groups of researchers found the glacier is on the way to collapse, but more data and computer modelling are needed to determine when the collapse will begin in earnest and at what rate the sea level will increase as it proceeds. The new observations by UTIG will greatly inform these ice sheet modelling efforts.

Using radar techniques to map how water flows under ice sheets, researchers were able to estimate ice melting rates and thus

identify significant sources of geothermal heat under Thwaites Glacier. They found these sources are distributed over a wider area and are much hotter than previously assumed. The geothermal heat contributed significantly to melting of the underside of the glacier, and it might be a key factor in allowing the ice sheet to slide, affecting the ice sheet's stability and its contribution to future sea level rise.

For links to the UTIG news item and the original paper, go to <http://www.scar.org/2014/550-major-west-antarctic-glacier-melting-from-geothermal-source>

Key glaciers in West Antarctica are in an irreversible retreat

Key glaciers in West Antarctica are in an irreversible retreat, a study team led by the US space agency (NASA) says. It analysed 40 years of observations of six big ice streams draining into the Amundsen Bay and concluded that nothing now can stop them melting away.

Although these are abrupt changes, the timescales involved are likely measured in centuries, the researchers add. If the glaciers really do disappear, they would add roughly 1.2m to global sea level rise.

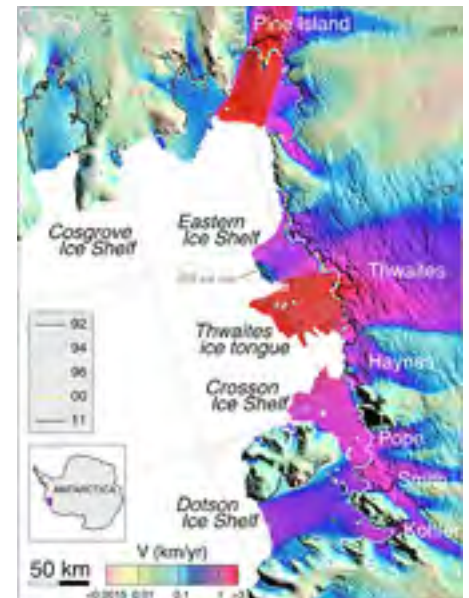
Lead author of the study, Prof Eric Rignot, said warm ocean water was relentlessly eating away at the glaciers' fronts and that the geometry of the sea bed in the area meant that this erosion had now entered a runaway process.

"We present observational evidence that

a large section of the West Antarctic Ice Sheet has gone into a state of irreversible retreat; it has passed the point of no return," the agency glaciologist explained.

The Amundsen Bay sector includes some of the biggest and fastest moving glaciers on Earth. Pine Island Glacier (PIG), over which there has been intense research interest of late, covers about 160,000 sq km, or about two-thirds the area of the UK. Like the Thwaites, Smith, Haynes, Pope and Kohler Glaciers in this region, the PIG has been thinning rapidly. And its grounding line - the zone where the glacier enters the sea and lifts up and floats - has also reversed tens of kilometres over recent decades.

For links to further information, including the original paper, go to <http://www.scar.org/2014/545-key-glaciers-in-west-antarctica-are-in-irreversible-retreat>



Velocity of the Amundsen Sea (AS) sector of West Antarctica derived using radar data from winter 1996. For a full description, see Figure 1 in the original study paper.

Antarctic ice sheet less stable than assumed, researchers say

A massive melt from the Antarctic ice sheet 14,600 years ago helped increase global sea levels by four metres per century, according to a new study.

The findings show how closely linked ocean dynamics and ice sheet melting are, which should help scientists currently modelling future sea level increases. Since the last glacial maximum between 26,000 and 19,000 years ago, when a significant amount of water was locked up on land, sea levels have risen by about 130 metres.

"This study suggests that a significant amount, we can't say exactly how much, it could be 50 per cent, was coming from

the Antarctic ice sheet." says one of the study's authors, Dr Laurie Meniel of the University of New South Wales.

The study, led by Dr Michael Weber of the University of Cologne, took marine sediment cores samples from Iceberg Alley in Antarctica's Scotia Sea. The samples contained layers called iceberg rafted debris, which contains coarse material trapped in the ice as it moves across land and is released during melting.

The core samples revealed a major ice melt episode or "pulse" occurring between 20,000 and 19,000 years ago, followed by seven larger pulse events between 17,000 and 9000 years ago. "These were times

when debris was more abundant than at other times, indicating occasions when more of the Antarctic ice sheet melted," says Meniel.

According to Michael Weber, the Antarctic ice sheet was considered to be relatively stable and its decline was thought to be uniform. "The sediment record suggests a different pattern - one that is more episodic and suggests that parts of the ice sheet repeatedly became unstable during the last deglaciation," Weber added.

For links to a *Nature World News* item and the original paper in *Nature*, go to <http://www.scar.org/2014/549-antarctic-ice-sheet-less-stable-than-assumed>

Antarctic Science

ESA's Cryosat mission sees Antarctic ice losses double

Antarctica is now losing about 160 billion tonnes of ice a year to the ocean - twice as much as when the continent was last surveyed.

The new assessment comes from Europe's Cryosat spacecraft, which has a radar instrument specifically designed to measure the shape of the ice sheet. The melt loss from the White Continent is sufficient to push up global sea levels by around 0.43mm per year.

Scientists report the data in the journal

Geophysical Research Letters. The new study incorporates three years of measurements from 2010 to 2013, and updates a synthesis of observations made by other satellites over the period 2005 to 2010.

Cryosat has been using its altimeter to trace changes in the height of the ice sheet, as it gains mass through snowfall, and loses mass through melting. The study authors divide the continent into three sectors - the West Antarctic, the East Antarctic, and the Antarctic Peninsula, which is the long finger of land reaching

up towards South America.

Ice losses are most pronounced in the Amundsen Sea sector of West Antarctica although, overall, Cryosat finds all three regions to be losing ice, with the average elevation of the full ice sheet falling annually by almost 2cm.

For links to the ESA news item and to the original paper in *Geophysical Research Letters*, go to <http://www.scar.org/2014/547-esa-cryosat-sees-antarctic-ice-losses-double>

Error discovered in Antarctic sea-ice record

Rising temperatures have caused the amount of Arctic sea ice to shrink dramatically since global observations began in the 1970s. But on the other side of the world, sea ice in Antarctica was at first steady — and then began to slowly expand in the mid-2000s.

Some researchers now say that the Antarctic trend may have been inflated by an error in the decades-long record of satellite observations of Southern Hemisphere sea ice. Scientists process data from microwave-sensing satellites using one

of two standard algorithms to distinguish bright sea ice from dark open water.

Researchers led by Ian Eisenman, a climatologist at the Scripps Institution of Oceanography in San Diego, California, discovered a mismatch between an older and a newer version of the same NASA sea-ice data set that occurred when a satellite sensor was replaced in December 1991. Such "jumps" in data are caused by slight differences in the satellites' sensitivity, and are usually corrected when scientists process the data collected by

the probes.

But the error that Eisenman identified wasn't obvious. He found it only by comparing an old version of the data set with a 2008 version, and says that the data were too noisy to tell which version had been mishandled.

For links to news items and the original paper in *The Cryosphere*, go to <http://www.scar.org/2014/572-error-discovered-in-antarctic-sea-ice-record>

Increase in Antarctic sea ice observed

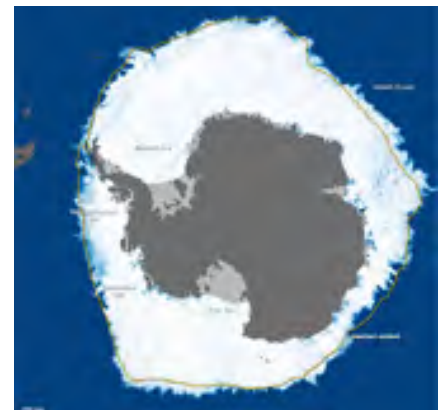
According to the National Snow and Ice Data Center (NSIDC), while Arctic sea ice continued its long-term decline in 2014, sea ice on the other side of the planet was headed in the opposite direction.

The map shows Antarctic sea ice on September 19, 2014. While it was not yet possible to determine if the ice had reached its maximum extent for the year, the five-day average had already surpassed 20 million square kilometres (7.70 million square miles) for the first time in the modern satel-

lite record, according to NSIDC.

"This is not unexpected," said Nathan Kurtz, a NASA cryospheric scientist. He noted that many climate models actually predict a short-term increase in Antarctic sea ice. In the long-term, "increasing near-surface air temperatures are expected to have the stronger effect and begin to melt the ice and halt the expansion", he added.

For more details and a link to the article on the NASA website, go to <http://www.scar.org/2014/602-increase-in-antarctic-sea-ice-observed>



Volcanic history of the Antarctic helps with future climate models

An international study of ice cores has helped researchers pave the way for a better understanding of how Antarctica's volcanoes have affected the global climate over the past 2,000 years.

Combining work from research teams in the US and Australia, the study has "filled in" the record of Antarctica's historic volcanic sulphuric emissions.

Large volcanic eruptions can have a significant impact on the global climate through the release of sulphur dioxide. This leads

to the formation of microscopic particles known as volcanic sulphate aerosols. By reflecting the sun's radiation back to space, these particles cool the earth, and have been linked to short term global cooling. They then gradually fall back to earth, depositing in the clean Antarctic snow.

Dr Tas van Ommen, glaciologist with Australian Antarctic Division, worked with co-author Mark Curran studying one of the primary ice cores from the Law Dome site.

"As a result of this work, we now have

what we call a 'volcanic forcing record'," he said. "This tells us when [volcanoes] occurred and how big they were, for the last 2000 years. We can combine that with knowledge of how the climate has changed over that period and test climate models. We now have more confidence in the models that can get the past right, as we predict what's happening in the future."

For links to a news item and the original paper, go to <http://www.scar.org/2014/557-volcanic-history-of-antarctic-helps-future-climate-models>

Antarctic Science

Lead pollution beat explorers to South Pole

Norwegian explorer Roald Amundsen became the first man to reach the South Pole in December 1911. More than 100 years later, an international team of scientists has proved that air pollution from industrial activities arrived at the South Pole long before any human.

Using data from 16 ice cores collected from widely spaced locations around the Antarctic continent including the South Pole, a group led by Joe McConnell of the Desert Research Institute (DRI), Nevada, created the most accurate and precise reconstruction to date of lead pollution over Earth's southernmost continent. The new record, described in an article published in *Nature's Scientific Reports*, spans a 410-year period from 1600 to 2010.

"Our new record shows the dramatic impact of industrial activities such as smelting, mining and fossil fuel burning on even the most remote parts of the world," McConnell said.

"It is very clear that industrial lead contamination was pervasive throughout Antarctica by the late 19th century, more than two decades before the first explorers made it to the South Pole," he added. "The idea

that Amundsen and Scott were travelling over snow that clearly was contaminated by lead from smelting and mining in Australia, and that lead pollution at that time was nearly as high as any time ever since, is surprising to say the least."

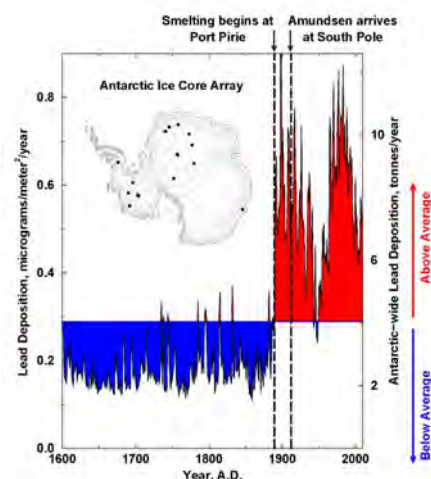
The study included ice cores collected by researchers in the US, the UK, Australia and Germany.

"Lead is a toxic heavy metal with strong potential to harm ecosystems," said co-author Paul Vallelonga of the University of Copenhagen. "While concentrations measured in Antarctic ice cores are very low, the records show that atmospheric concentrations and deposition rates increased approximately six-fold in the late 1880s, coincident with the start of mining at Broken Hill in southern Australia and smelting at nearby Port Pirie."

The similar timing and magnitude of changes in lead deposition across Antarctica, as well as the characteristic isotopic signature of Broken Hill lead found throughout the continent, suggest that this single emission source in southern Australia was responsible for the introduction of lead pollution into Antarctica at the end of the 19th century and remains a signifi-

cant source today, the authors report.

For links to the DRI Press Release, a *Science Daily* news item and the original paper in *Nature's Scientific Reports*, go to <http://www.scar.org/2014/593-lead-pollution-beat-explorers-to-south-pole>



Composite ice core records of lead in Antarctica from 1600 to 2010. The areas shaded blue and red indicate when lead values were below or above the 410-year average, respectively, highlighting the dramatic change before and after industrialization in the Southern Hemisphere. Image taken from Figure 1 in the study.

Antarctic species dwindle as icebergs batter shores year-round

The Antarctic shore is a place of huge contrasts, as quiet, dark and frozen winters give way to bright, clear waters, thick with algae and peppered with drifting icebergs in summer.

But as the planet has warmed in the last two decades, losses of sea ice in winter

have left icebergs free to roam for most of the year. As a result, say researchers reporting in *Current Biology* on June 16, boulders on the shallow seabed - once encrusted with a rich assemblage of species in intense competition for limited space - now mostly support a single species. The climate-linked increase in iceberg activity

has left all other species so rare as to be almost irrelevant.

For links to the *Science Daily* news item and the paper in *Current Biology*, go to <http://www.scar.org/2014/553-antarctic-species-dwindle-as-icebergs-batter-shores-year-round>

Whales sustain fisheries: Blue whales stimulate primary production in the Southern Ocean

It has previously been asserted that baleen whales compete with fisheries by consuming potentially harvestable marine resources. The "surplus-yield model" suggests that whale prey becomes available to fisheries if whales are removed, and has been presented as a justification for whaling.

However, recent findings indicate that whales enhance ecosystem productivity by defecating iron that stimulates primary productivity in iron-limited waters. While juvenile whales and pregnant or lactating females retain iron for growth and milk production, non-breeding adult whales

defecate most of the iron they consume.

In this study, the authors modified the surplus-yield model to incorporate iron defecation. The traditional surplus-yield model predicts that 1011 kg of carbon yr⁻¹ would become unavailable to fisheries. How-



Image: <http://school.discoveryeducation.com/schooladventures/planetoccean/bluewhale.html>

ever, this ignores the nutrient recycling role of whales. Their model suggests the population of blue whales would defecate enough iron to stimulate primary production equivalent to that required to support prey consumption by them. By defecating iron-rich feces, blue whales promote Southern Ocean productivity, rather than reducing fishery yields.

For links to the Flinders University news item and the original paper in *Marine Mammal Science*, go to <http://www.scar.org/2014/552-whales-sustain-fisheries-in-southern-ocean>

Antarctic Science

Toddler penguins buddy up for survival

Traveling with a pal is often more fun than going solo. And it may just help baby king penguins live to adulthood.

Soon after chicks are born, their parents leave them for weeks at a time to go fishing. With the adults away, the furry young king penguins huddle in groups called crèches to keep warm and discourage predators. Hanging out in one spot helps returning parents find their young in a colony of up to 500,000 individuals spread over several kilometres. Bad weather or predators sometimes will force a chick to wander hundreds of metres from its crèche, but the baby birds are canny navigators and almost always find their way back.

This homing ability is sharpened when chicks travel in pairs, according to findings reported online in *Animal Behaviour*.

In the study, blindfolded pairs of chicks were carried 140 metres away from their crèche and placed in a walled-off arena. Each chick was fitted with a GPS “flipper-band” and spun gently to disorient it. After the walls were removed, the chicks were tracked as they waddled home. Chicks from different crèches hung together for short distances before going their separate ways. Chicks from the same crèche tended to pair up for the whole journey home — mimicking each other’s movements, swapping turns leading the way, and taking straighter paths home. In both instances, paired penguins walked faster than solo birds did.

Sticking together also helped penguins from the same crèche arrive closer to the exact spot from which they’d been spirited away. The advantage of buddying up, the researchers speculate, may be that birds

can use their collective familiarity with environmental cues to travel faster.

For links to the *Science Shot* item and the original paper in *Animal Behaviour*, go to <http://www.scar.org/2014/556-toddler-penguins-buddy-up-for-survival>



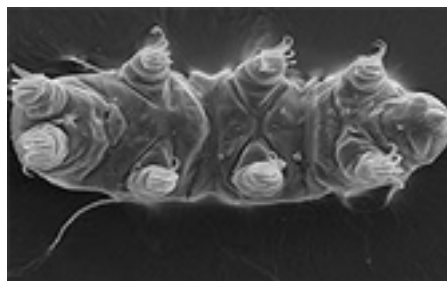
A pair of chicks equipped with GPS loggers at the release location. Image taken from Figure 1 in the study.

Scientists announce discovery of tiny new animal in Antarctica’s Victoria Land

Scientists have discovered a new member of the tardigrade family. Also known as water bears or moss piglets, these are widespread and ancient microscopic animals, around half a millimetre long at most and generally found in moss and lichen, where they eat plant cells or small invertebrates.

Members of the group are found everywhere from high mountains and hot deserts to the deep ocean. Their success stems partly from the fact they’re among the toughest creatures we know of, able to deal with extremes of cold, heat, pressure,

dehydration, poison and radioactivity that would kill almost anything else — indeed, they are the only kind of animal that we



Electron microscope image of new tardigrade

know can survive in the vacuum of space.

The discovery of the genus in Antarctica adds to the evidence that it’s an old lineage descended from forebears that were present on the ancient supercontinent of Gondwana, and that it has changed relatively little since then compared to other tardigrade genera.

For links to the *NERC Planet Earth Online* news item and the original paper in *Polar Biology*, go to <http://www.scar.org/2014/555-discovery-of-tiny-new-antarctic-animal>

Compact genome of the world’s coldest insect

Antarctica’s cold, desert environment is inhospitable to most forms of terrestrial life and insects, the dominant life form on most continents, are represented by a single endemic Antarctic species, a wingless midge, *Belgica antarctica*.

In its patchy island habitat along the Antarctic Peninsula, *B. antarctica* is subjected to a range of environmental onslaughts including temperature extremes, periodic desiccation, exposure to both fresh water ice melt and high-salinity sea water, intense ultraviolet exposure, high nitrogen generated from penguin rookeries and elephant seal wallows, and high winds.

The adults, like those of many other species living on wind-swept islands, are wingless. The larvae, encased in ice for most of the year, require 2 years to complete their development and then pupate and emerge as adults at the beginning of their third austral summer. The wingless adults crawl over surfaces of rocks and other substrates, mate, lay eggs and die within 7–10 days after emergence.

Belgica antarctica, as the only insect endemic to Antarctica, offers a powerful model for probing responses to extreme temperatures, freeze tolerance, dehydration, osmotic stress, ultraviolet radiation and other forms of environmental stress.

A recent study shows that, at 99 megabases, *B. antarctica* has the smallest insect genome sequenced thus far. Although it has a similar number of genes as other Diptera, the midge genome has very low repeat density and a reduction in intron length. Environmental extremes appear to constrain genome architecture, not gene content. An abundance of genes associated with development, regulation of metabolism and responses to external stimuli may reflect adaptations for surviving in this harsh environment.

For links to the *NewScientist Zoologger* news item and the original paper in *Nature*, go to <http://www.scar.org/2014/588-compact-genome-of-worlds-coldest-insect>

Obituaries

Dr Philip M. Smith

The Polar world and SCAR have lost a great friend. Phil Smith, known to SCAR members as the leader of the review that led to major restructuring of SCAR in the early 2000s, passed on 16 February 2014.

Phil began his involvement in the Polar Regions when, as a young US Army Lieutenant, he was sent to Greenland as a navigator for the heavy tractor “swings” then traversing the Greenland Ice Sheet. Phil was trained by Major Palle Mogensen and Captain Bert Danielson for his work in Greenland.

When his tour of duty in the Arctic was completed, Phil made the decision to volunteer to join the US efforts in the International Geophysical Year 1957-1958 (IGY) in Antarctica, and there he joined with Bert Crary and others utilizing heavy tractors to haul materials for the construction of the US bases established as part of IGY.

After returning to the US, Phil became an early member of the Office of Polar Programs that was established in the National Science Foundation to continue the scientific efforts begun as part of the IGY. Bert Crary was the Chief Scientist and Phil served as the Deputy Director of OPP for a number of years.

His abilities were soon recognized by his colleagues in Washington DC and, in following years, he spent time in the Office



of Science and Technology Policy and the Office of Management and the Budget, followed by over a decade of leadership in the National Academy of Sciences and the National Research Council.

In the late 1990s, Phil was asked by the then president of SCAR to conduct a review of that organization. At that time, SCAR was operating on the same “plan” that was instituted when it was formed in the late 1950s, and the increase in size and activities were not reflected in the SCAR system of operation, leading to pressure to change from some quarters. After some reflection, he agreed to lead a review committee, and it is as a testament to his wise and skillful chairmanship

that reforms, which might well have been controversial, met with wide approval. Indeed, SCAR as we see it today is largely a result of that review. More recently he was asked and agreed to chair a “review of the review” for a fine tuning of the operation of SCAR. He was elected as an Honorary Member of SCAR to recognize his contributions to the organization.

Anyone who has worked with Phil knows that he was a unique individual. Outstanding leadership skills, the ability to get diverse groups to work together, but most importantly, he had the ability to see years ahead and to have an understanding of what was to come. He has been called a “futurist” by some.

Phil’s contributions to the continued growth and development of SCAR as an important organization in the international arena cannot be ignored. SCAR members owe a great debt to Phil and those of us who knew him well, some for over 50 years, will miss his skills, humour, and leadership. SCAR today is a far better and more relevant organization due largely to the efforts of Phil Smith.

From SCAR Presidents past and present:

Claude Lorius, 1986-1990

Antonio Rocha-Campos, 1994-1998

Robert Rutford, 1998-2002

Jorn Thiede, 2002-2006

Chris Rapley, 2006 – 2008

Mahlon “Chuck” Kennicutt II, 2008-2012

Jerónimo López-Martínez, 2012-2016

Martha Twitchell Muse

SCAR and the Selection Committee for the Martha T Muse Prize for Antarctic Science and Policy join the Tinker Foundation in mourning the passing of Martha T Muse on 9th February 2014.

Martha was a founding director of the Tinker Foundation. She served as its president for 27 years and its chairman for 33 years, retiring in 2008. It was under her direction that the Foundation became a leading funder of Latin American-related activities, providing support for educational, environmental, security, economic, legal and governance issues.

One of her final directives to the Tinker Foundation was incorporating Antarctic-related subjects under its funding mandate. Her passion for Antarctica was recognised with the Tinker Foundation establishing the Muse Prize for Science and Policy in Antarctica, an award for

mid-career Antarctic scientists and policy makers, recognised as leaders of tomorrow. The First Martha T Muse Fellows Colloquium was held in her honour in April



2014, in conjunction with the 1st Antarctic and Southern Ocean Science Horizon Scan in New Zealand.

Martha received her undergraduate degree from Barnard College in 1948 and a master’s degree in political science from Columbia University in 1955. In 1981, she received an honorary doctorate from Georgetown University. She was the first woman elected as a trustee to Columbia University and was among the first women named to the Board of the New York Stock Exchange and the Council on Foreign Relations.

For a detailed obituary, see the *New York Times* website (<http://www.legacy.com/obituaries/nytimes/obituary.aspx?pid=169642621>).

For details of the prize established in her honour, visit the Muse Prize website (<http://www.museprize.org/>).

Polar News and Announcements

Save the date - 2018 SCAR/IASC Conference in Davos, Switzerland

Celebrating 10 years of fruitful collaboration in facilitating international research in both Polar Regions, SCAR and the International Arctic Science Committee (IASC), have decided to arrange a second joint conference.

Building on the success of the 2008 SCAR/IASC Conference in St. Petersburg (Russia) and two subsequent conferences within the International Polar Year, the 2018 SCAR/IASC Conference will be hosted by the Swiss Committee on Po-

lar and High Altitude Research in Davos, Switzerland from 15-27 June 2018.

The Conference will include SCAR, IASC and other business and satellite meetings, an Open Science Conference and the XXXV SCAR Delegates' Meeting.

APECS News and Updates

APECS has enjoyed another active year with our membership and engagement for our members growing and expanding. We were again happy to partner with SCAR on several projects including the 2014 SCAR Open Conference (OSC) in August.

APECS involvement at the 2014 SCAR OSC:

APECS and Polar Educators International (PEI) organised a full day workshop on science communication at the University of Auckland during the 2014 SCAR OSC. The workshop was well attended with around 50 participants and, although early career scientists made up the majority, some senior scientists and teachers also took part. Workshop themes were broad and diverse, aiming to work out interactively the various ways in which science can be communicated. On behalf of PEI, Sarah Bartholow and Heidi Roop presented *The Art of Communicating in the Classroom*. Early career scientists Hanne Nielsen, Lorna Little and Kimberley Collins talked about *The Power of Social Media* and how to make use of podcasts, blogs or twitter. Lecturer Jenny Rock and her students Ellen Sima and Lydia McLean introduced *Multiple Methods for Creative Communication*. Artists and academics Megan Jenkinson and Ruth Watson shared their experience with the medium of *Photography* and how it sometimes expresses more than words can. Dacia Herbulock and Peter Griffin from the Science Media Centre NZ gave an important lesson on *Media 101: The Do's and Don'ts When Interacting With the Media*. Rhian Salmon and Anton Van de Putte addressed the aspect of *In-Reach* (as opposed to outreach) in terms of better information exchange within and across disciplines. Overall, the workshop was very well perceived and a great success. Thanks go to COMNAP and Antarctica New Zealand, who sponsored the workshop, as well to all volunteers including Tristy Vick-Majors, Meagan Dewar and Holly Winton.

During the SCAR 2014 OSC, the SCAR Group Antarctic Climate Change in the 21st Century (AntClim21) sponsored an evening harbour cruise for APECS members aboard the catamaran *Ocean Eagle*. Although the event was open to all APECS members, numbers were limited to 50 places (which filled very quickly), plus 16 senior scientists. The event was a great opportunity for APECS members to mingle with the AntClim21 Steering Committee, as well as other Antarctic climate experts and members of the SCAR executive. An 'Antarctic Climate' themed pub quiz worked as an ice-breaker, with APECS members arranging themselves in groups of four and inviting a senior scientist to join their group. Senior scientists were then asked to help facilitate dialogue amongst the group in discussing answers to the questions. Feedback from attendees stated that this was an effective way to encourage dialogue and help 'break the ice' between early career and senior scientists. Finger food was served and there was a cash bar.

APECS director, Gerlis Furgmann, and an APECS representa-



tive, Alia Khan, also had the opportunity to attend the SCAR Delegates' Meeting as observers. This proved to be useful for APECS to better understand the structure of SCAR, and how we can continue to promote early career involvement.

APECS Workshop on the Antarctic Environments Portal:

The Antarctic Environments Portal (or 'the Portal' for short) is a promising project that aims to link Antarctic scientific research and knowledge with Antarctic policy-making through an online platform. Although a beta version of the platform was released earlier this year, the Portal is still under development. In this critical phase, the Portal project team asked for feedback and ideas from early career scientists. For this purpose, Birgit Njåstad (Portal project manager) and Sira Engelbertz (APECS) co-convened a workshop to discuss various issues around the Portal project. Ewan Mclvor (CEP Chair) started by explaining why policy-makers need access to scientific information, followed by Neil Gilbert's brief introduction to the Portal. The core of the workshop, however, was the group discussions where our five invited mentors – Neil Gilbert, Fraser Morgan, Steven Chown, José Xavier and David Walton – discussed with small groups of 5-7 early career scientists the following issues: technical design of the Portal, incentivising researchers to contribute to the Portal, how to ensure policy use, how to communicate complex science in a simple, yet comprehensive manner, and how to ensure an appropriate editing and review process. The workshop was perceived as a great success with the Portal project team very happy about the information gained from the group discussions. 25 early career scientists and participants of the workshop received a NZ\$ 50 scholarship each, which was kindly provided by the Norwegian government.

APECS Polar Weeks:

Each equinox, APECS helps in celebrating Polar Week with many of our partners, including SCAR. In September 2014, Polar Week activities were led by the strong efforts of APECS France and APECS Brazil, both with a focus on Antarctic science. For the fourth time in two years, APECS-France organized the French Polar week. More than 2200 students aged 6 to 16 participated in a series of 12 webinars and directly asked questions to polar scientists. Students from 100 French schools are also following a PhD student during a 6-week expedition on a sailboat along the Antarctic Peninsula and South Georgia. Thanks to a strong group of volunteers, support from the APECS Directorate, and funding from a French MP, APECS-France is also involved in various activities to promote early-career polar scientists in France.

Forthcoming Events

ISAES XII - 12th International Symposium on Antarctic Earth Sciences 13 - 17 July 2015, Goa, India



The International Symposium on Antarctic Earth Sciences (ISAES) is a SCAR-initiative aimed at showcasing Antarctic geoscience research, taking stock of the accomplishments of the international fraternity and providing guidance for future studies.

The first ISAES was held in 1963 in Cape Town, and the most recent (11th) in Edinburgh, with the Symposium traversing through Oslo, Madison, Adelaide, Cambridge, Tokyo, Siena, Wellington, Potsdam and Santa Barbara. In its 50-year history, Japan had been the only Asian country to host, but now India has the honour of hosting in 2015.

The submission of session proposals began on 1 August and

broad themes suggested so far include:

1. Transition from persistent to dynamic ice sheet: evidence from ocean sediments;
2. Comparative evolution of WAIS and EAIS during the Neogene;
3. Antarctica and the supercontinent evolution;
4. Cryosphere evolution in the Himalayas - global versus regional forcings;
5. Flight of continents and vertebrate evolution;
6. Large Igneous Provinces (LIP) in Gondwanaland;
7. Connections between the southern continents;
8. Southern Ocean processes;
9. Interactions between the solid earth and the cryosphere;
10. Climate, Palaeoclimate and Antarctica.

Pre-registration is now available. Visit the website for more information:

<http://isaes2015.ncaor.gov.in>

XXXIV SCAR Meetings and Open Science Conference 19-31 August 2016, Kuala Lumpur, Malaysia

The 2016 Open Science Conference will be held on 23-26 August, with the theme "*Antarctica in the Global Earth System: From the Poles to the Tropics*". The SCAR Delegates' Meeting will take place from 29-31 August.

Visit the website for more information:
<http://scar2016.com/>

XXXV SCAR Meetings and Open Science Conference 15-27 June 2018, Davos, Switzerland

Switzerland will host the XXXV SCAR 2018 meetings in the stunning location of Davos. The OSC will be held jointly with IASC. The venue will be Davos Congress, which is host to the annual World Economic Forum.

For information about Davos and the conference venue,
visit: www.davos.ch/en/

For details of further events, please visit: <http://www.scar.org/events>

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