

The International Council for Science

ISSN 1998-0337

SCAR **bulletin**

No. 171 APRIL 2009

Report of SCAR's 3rd Cross-Linkages Workshop, 2009



Published by the

SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

at the

Scott Polar Research Institute, Cambridge, United Kingdom

Report of SCAR 3rd Cross-Linkages Workshop, 2009

University of Modena & Reggio Emilia
DIMEc Dept (Engineering Faculty)
University of Modena & Reggio Emilia
Via Vignolese 905, Modena 41100, Italy

0900 Feb 5 to 1700 Feb 6.

For Acronyms see Appendix 3

Attendees

SSG-GS - Alessandro Capra
SSG-PS - Maurizio Candidi
SSG-LS - Kathy Conlan
SRP- AAA John Storey
SRP-ACE - Carlota Escutia Dotti
SRP-AGCS - John Turner
SRP-EBA - Guido di Prisco and Dominic Hodgson
SRP-ICESTAR - Annika Seppälä
SRP-SALE - Carlo Barbante
EXCOM - Chuck Kennicutt and Toni Meloni
SCADM - Kim Finney
SC-AGI - Roberto Cervellati
IASC – Volker Rachold (by phone)
Secretariat - Colin Summerhayes
Observer – Carlo Alberto Ricci

Unable to attend: IASC - Heinz Miller

1. Introduction and Welcome:

Professor Angeloreste Adrisano welcomed participants to Modena, the University and the Faculty. Alessandro Capra welcomed participants to the DIMEc Department and explained the meeting arrangements and logistics, including arrangements for a meeting dinner to be hosted by the Italian SCAR Committee on February 5. SCAR Vice President Toni Meloni agreed to chair the meeting and invited participants to briefly introduce themselves.

The SCAR President, Chuck Kennicutt, thanked everyone for attending, and set out the background to the meeting, noting that the Delegates at XXX SCAR in Moscow (July 2008) approved the holding of a 3rd Cross-Linkages Workshop as a follow up to the ones held in Amsterdam (2005) and Rome (2006). These workshops are a mechanism to facilitate interdisciplinary linkages between and among SCAR's Scientific Research Programmes (SRPs) and Standing Scientific Groups (SSGs) and data and information groups (Standing Committees on Antarctic Data Management (SC-ADM) and Antarctic Geographic Information (SC-AGI)). The first was organised by SSG-LS, and the second by SSG-PS, so it is now the turn of SSG-GS (Alessandro Capra) to be host. A key objective is to continually evolve the SCAR portfolio of projects; in that context the cross-linkages group can be seen as a

programme incubator. The outcomes will feed in to the development of the next version of the Strategic Plan (2010-2016).

2. Reports on Progress Against Actions from Rome Meeting

Maurizio Candidi (Chief Officer of SSG-PS) noted that significant collective cross-disciplinary progress had been made against targets since the previous meetings (Rome, November 2006, and Amsterdam, November 2005). He noted the following successful cross-linkages; progress is marked in **bold text**:

The multi-disciplinary SCAR/SCOR Expert Group on the Oceans now reports to both SSG-PS and SSG-LS. **After the Modena meeting it was agreed that the group would be shared between SSG-PS and SSG-LS.**

There was a cross-disciplinary AGCS-ACE-EBA workshop during the SCAR meeting in Hobart in July 2006. **These teams now work together to contribute to the Antarctic Climate Change and Environment (ACCE) report. An SSG-PS and SSG-LS Group has been formed on Prediction of Changes in the Physical and Biological Environment of the Antarctica.**

AGCS and ICESTAR should work together on weather and upper atmosphere linkages. We still need to assess the influence of upper atmosphere processes on climate. **For the future AGCS could develop links with the CAWSES-2 programme of SCOSTEP.**

SSG-GS (through its GIANT Expert Group) and ICESTAR share common interests in GPS. **A cross-SSG Group has been formed on GPS for Weather and Space Forecasting. These groups also work together through the IPY UAMPY consortium on Upper Atmosphere Monitoring for the Polar Year.**

ACE, EBA and SALE could work together to examine the development of biological refugia during past glaciations. **An initial link was made during the 10th ISAES meeting in Sta Barbara. A group has been formed to develop a Code of Conduct for Exploration and Research of Subglacial Aquatic Environments.**

To get the best out of King George Island science for the benefit of the wider SCAR community, **an expanded joint SSG King George Island Coordination Group was established – see agenda item 4.**

The Rome meeting had also recommended developing a link between the SCAR and IASC paleoclimate programmes (ACE and APEX) – **link now made.**

The Amsterdam meeting had noted a need for ACE to develop links with the International Partnership in Ice Core Sciences (IPICS). **IPICS is now an Expert Group, co-sponsored with IGBP-PAGES, and linked to ACE.**

Participants noted that SCAR initially had one cross-linked group in the Subglacial Antarctic Lake Environments programme (SALE). They also noted that subsequently other cross linked groups have been formed:-

- SSG-GS and SSG-PS have agreed to form a joint group to examine cold seeps and hydrothermal mounds.
- A SSG-LS and SSG-PS group was formed to advise on Antarctic Fuel Spills.

Thus the level of cross-linked activity has increased considerably since 2004, when all we had as a cross-linked group was SALE.

Recommendations from Rome and Amsterdam that remain unfulfilled at present include:

- (a) A link between SSG-Life Sciences and the ECA group (Environmental Contamination in Antarctica) – e.g. for analysing penguin droppings for chemical contaminants;
- (b) A link between permafrost and climate and permafrost and biology;
- (c) Creating an aerosols group and linking it to environmental contamination activities;
- (d) Creating an Aerosol READER database.
- (e) Making PAntOS a fully cross-SSG activity.
- (f) Making all SCAR data fields available via the SCAR web site (**see agenda item 7.1**).
- (g) Creating a focus on the SCAR web site for chemistry.
- (h) Considering ocean chemistry past, present and future in relation to ocean acidification; - the topic is addressed briefly in the draft ACCE report and in the draft SOOS report.
- (i) Drafting a SCAR data policy/strategy (**see agenda item 7.1**).

Participants suggested a need for the following additional links:

- (j) linking the Continuous Plankton Recorder Expert Group (SSG-LS) to AGCS;
- (k) linking to John Shanklin's ozone web site

[Action 1: Secretariat to follow up on unfulfilled recommendations a-k]

3. Updates on Implementation of SRPs

3.1 Astronomy and Astrophysics from Antarctica Scientific Research Programme (AAA)

John Storey described this new bipolar programme with Arctic sites as well. Its launch is timely, this being the International Year of Astronomy. Among other things he noted that high-resolution optical telescopes must be placed above the near-ground boundary layer, i.e. at heights of about 30m. For some kinds of astronomy Dome A is better than South Pole, while Dome C is perhaps better than Dome A from the point of view of interference from auroras. For the purposes of cross linkages he noted that:

- astronomers launch radiosondes to determine upper atmosphere conditions – these data will also be useful to meteorologists (AGCS).
- astronomers need to coordinate with upper atmosphere people (e.g. ICESTAR) regarding total column water vapour and regarding auroras.
- AAA needs to link to SCADM.

John Turner noted that meteorologists can now forecast cloudiness very well, which may be useful to astronomers.

3.2 Antarctic Climate Evolution (ACE) programme

Carlota Escutia Dotti described exciting new developments, including the IPY Antarctica's Gamburtsev Provinces Programme (AGAP) to investigate the under-ice Gamburtsev Mountains, which will provide extensive new radio echo-sounding coverage of the ice sheet; plans for ANDRILL to drill in various places; plans for the Integrated Ocean Drilling Programme (IODP) expedition to the Wilkes Land coast (now postponed). Several new publications have appeared recently, and ACE work featured prominently in the January 09 issue of PAGES News. The 1st ACE Symposium will take place on 7-11 September, in Granada, Spain. There are plans to apply for a Chapman or a Gordon Conference on polar paleoclimate records. Links are well established with ANDRILL, IGBP-PAGES, SCADM, SALE, AGCS, EBA, AGAP, IPICS and several major IPY programmes (BIPOMAC, Plates and Gates etc).

3.3 Antarctica in the Global Climate System (AGCS) Programme

John Tuner described progress with AGCS, especially the development of the Antarctic Climate Change and the Environment (ACCE) review that will be a southern equivalent of the Arctic Climate Impact Assessment published in 2005. The first part (State of the Antarctic and Southern Ocean Climate System) was published in January 2009 in Reviews of Geophysics. Part II is due out in mid 2009, and includes the biology. Databases have been developed for Met- Ocean and Ice (ITASE core) data (Met-READER, Ocean-READER, and Ice-READER). There is a recent Tony Worby paper on sea ice in the Journal of Geophysical Research, and a major sea ice database has been developed [<http://data.aad.gov.au/aadc/seaice/>]. A major synthesis workshop was held in Maine in September 2008 to review results of ITASE ice cores. AGCS has several key targets, among them quantifying Southern Ocean circulation, heat and freshwater fluxes, and investigating tropical-polar connections. There remains a need to develop a key fields database containing monthly and seasonal fields of quantities such as surface pressure, wind speed, ocean currents etc (see further discussion in 7.1 below).

3.4 Evolution and Biodiversity in the Antarctic (EBA) Programme

Guido DiPrisco and Dominic Hodgson (on behalf of Pete Convey) introduced this topic. Dominic reminded us that <0.5% of the continent is ice-free, mostly within 200 km of the coast; that most terrestrial ecosystems are therefore islands in the ice (or offshore); and that very few have been visited to establish their biodiversity. We have little idea of how past glaciations affected terrestrial organisms. There are abundant signs that life has survived advances of ice to the shelf edge, so such advances cannot have been uniform – there must always have been ‘refugia’. Molecular clocks show nematodes have been maintained for at least 45 Million years. At least 30% of invertebrates and 50% of lichen species are endemic, and a “Wallace Line” separates the populations of the continent and the peninsula, again suggesting the longevity of present arrangements. The current ice sheet paradigm therefore needs review. Speaking for the marine side, Guido noted that EBA also embraces other SCAR activities including the Census of Antarctic Marine Life (CAML), MarBIN (the Marine Biodiversity Information Network), and ICED (Integrating Climate and Ecosystem Dynamics in the Southern Ocean). CAML has been extremely successful in promoting multiple cruises and sampling novel environments, like the seabed exposed by the collapse of the Larsen ice shelf. ICED is now focused on Southern Ocean ecosystem modelling, with an emphasis on cross-disciplinary aspects. There

are extensive ongoing studies of genes and proteins in marine organisms, allowing studies of thermal adaptation at the molecular level. Studies are planned on patterns of gene flow in populations of amphipod crustaceans. Antarctic benthic systems are not as stable as once thought, but that they are exposed to dynamic conditions and respond to environmental changes. Efforts continue to clarify the tolerance of assemblages to changes in food supply. Gradients are being investigated (e.g. from shallow to deep waters, or along latitudes) to detect ecological controls and changes over time. The aim is to predict the evolution of marine Antarctic ecosystems. Dispersal of invasive species is also being investigated, their spatial dynamics are being monitored and rates of dispersal modeled, much of it via the IPY Aliens project. Many papers on EBA will be presented as part of the 10th SCAR International Biology Symposium Sapporo, Japan, 26 - 31 July.

3.5 Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR) Programme

Annika Seppälä introduced ICESTAR, with a description of the coupled sun-magnetosphere-ionosphere-upper atmosphere system, showing how different kinds of particles produce different kinds of effects and are focused at different altitudes. The poles are key places for observing these effects because particles move along the Earth's magnetic field lines towards the poles, making it relatively easy to quantify different processes there. ICESTAR has sponsored several major community meetings – the Greenland Space Science Symposium in May 2007, the Winter School on Auroral Substorms, in Iceland in November 2007, and the Polar Gateways Arctic Sunrise Symposium in Barrow, Alaska in January 2008. Highlights include participation in the Nordic Ionospheric Sounding Rocket Seeding Experiment (NISSE), and a study of Geospace affecting the chemistry of the upper atmosphere. Particle precipitation into the middle atmosphere increases ionization, which leads to production of NO_x ($\text{NO} + \text{NO}_2$), which cause catalytic ozone destruction ($\text{O}_3 \gg \text{O}_2$), which in turn affects climate. NO_x production can be observed from the GOMOS (Global Ozone Monitoring by Occultation of Stars) spectrometer on Envisat at 30-70 km altitude at $>60^\circ\text{S}$. The polar vortex encourages the descent of NO_x to levels where it can damage ozone.

3.6 Subglacial Antarctic Lake Environments (SALE) Programme

Carlo Barbante described SALE, showing among other things that models indicate that basal melting of 2-5mm/yr is common over much of Antarctica, with higher rates (5-10mm/yr) focused around the coast. More than 145 subglacial lakes have now been identified, containing enough water to cover the continent to a depth of 1m. Many of the lakes appear to be hydrologically connected. It is necessary to sample the lakes to understand the system. Studies from other subglacial systems (e.g. Arctic) reveal diverse microbial assemblages, so it is vital that sampling technology is clean. Inclusions in ice above Lake Vostok suggest that it may contain chemolithoautotrophic bacteria from a hydrothermal system. US-UK Plans exist to sample Lake Ellsworth with a hot water drill to access the lake, and a probe to collect samples. The US is looking at the possibility of sampling the West Antarctic Ice Streams. Russia aims to sample Lake Vostok in the 2009-10 or 2010-11 seasons. SALE is working to provide a code of conduct for subglacial lake sampling. SALE will hold an AGU Chapman Conference on subglacial aquatic environments in 2010.

4. Possible Links between SSGs

4.1 Standing Scientific Group on Geosciences (SSG-GS)

Introduced by Chief Officer Alessandro Capra. The joint ICESTAR – POLENET Action Group on GPS for Weather and Space Weather Forecasting is shared between SSG-GS and SSG-PS, and led by Giorgiana de Franceschi and Pierguido Sarti. The principal ICESTAR interest is through the IPY programme on Upper Atmosphere Monitoring for Polar Year (UAMPY), which aims to develop upper atmosphere observing networks for mapping ionospheric features, and to make conjugate studies of magnetospheric-ionospheric coupling processes. The principal SSG-GS interest is through the IPY programme on Polar Earth Observing Network (POLENET), which aims to create a multipurpose network of GPS stations so as to enhance multidisciplinary applications of GPS. The action group aims to exchange data, expertise and technologies between the two groups, e.g. to improve observation of water vapour concentrations in the atmosphere and to image the Antarctic ionosphere. The AG will hold its first workshop, in Modena, in May.

POLENET is a major focus for the SSG-GS. It aims to develop monitoring capability and to obtain key data on geodynamic processes from geophysical observatories across the continent measuring GPS, gravity, tides, seismic activity, and meteorological properties. GPS is used to measure crustal motion, gravimetry to measure mass change, tide gauges to measure sea level change, all to help understand the stability and mass balance of the ice sheet. SSG-GS now has a Scientific Programme Planning Group on Solid Earth Responses and influences on Cryospheric Evolution (SERCE), which will replace POLENET in due course. SERCE will study: interactions between the ice sheet and the solid earth; glacial isostatic adjustments and ice mass changes; and feedbacks between ice dynamics and the solid earth. It will rely heavily on the newly established POLENET infrastructure of instruments, and will help to support inter and multidisciplinary analyses of various kinds, e.g. involving SSG-PS and ICESTAR.

SSG-GS has also developed a new Action Group on Cold Seeps and Hydrothermal Vents, which should be shared with SSG-LS. It will identify areas within the CCAMLR region likely to contain Vulnerable Marine Ecosystems around cold seeps and hydrothermal vents. Geophysical surveys can help find seeps by identifying seep plumes (e.g. gas bubbles) through the water column, and can then be used to map seep domains. Side-scanning sonar can also be used to identify and map seep locations. Geochemical techniques can be used to track hydrothermal plumes back to source. Biological investigations are needed to identify and map vent and seep communities. The AG will hold a workshop to develop field guides and recognition guidelines for seeps and vents in 2009, so as to provide advice to CCAMLR during 2009. Regional working groups will review available data in 2009-2010.

[Action 2: Secretariat to ensure link develops with SSG-LS on SEEPS Group]

4.2 Standing Scientific Group on Life Sciences (SSG-LS)

Introduced by Chief Officer Kathy Conlan. Much of the group's work has already been touched on above. The Human Biology and Medicine Group is collaborating closely with its COMNAP equivalent and collaborated with the SCAR Birds Group on birds as a vector in spreading Lyme Disease. The Continuous Plankton Recorder Expert Group continues to make good progress, and CPR tows will be added across

Drake Passage. CPR results show significant changes in the marine ecosystem, with a change from krill to copepods, with reduced size of copepods and an increase in foraminiferans. These changes need to be linked to physical and chemical changes so that they can be understood as the basis for forecasting future change. That is a topic for EBA and AGCS and the Continuous Plankton Recorder Expert Group. SCAR has now amalgamated its birds and seals expert groups into a new Birds and Marine Mammals Expert Group, which ought to have its first meeting during 2009. Groups like these were important for providing CCAMLR with the Big Picture in marine biology. The SOOS group is now working on the use of seals as carriers of observing equipment. ICED is working on models of top predator distribution. The Code of Conduct on Terrestrial Field work was recently completed and will be presented to ATCM in April. The next big thing is the 10th Biology Symposium, in Sapporo in July.

[Action 3: Secretariat and SSG-LS to contact Birds and Marine Mammals Group (eg chair) to check on progress]

4.3 Standing Scientific Group on Physical Sciences (SSG-PS)

Introduced by Chief Officer Maurizio Candidi. Most of the group's work has already been touched on above.

4.4 King George Island Science

Introduced by Colin Summerhayes. Recognising the concerns raised about KGI science at the Rome cross-linkages meeting, a workshop had been held in St Petersburg on July 6, 2008, during SCAR Science week. This led to the Delegates approving revamping of the former KGI Action Group to become the Cross-SSG King George Island Science Coordination Action Group, led by SCAR Vice President Sergio Marensi and involving all three SSG Chief Officers or their representatives. The Group is now working to develop a plan of action. In the meantime, SCAR has agreed to explore with COMNAP ways in which individual scientists and national operators might improve coordination of science activities across King George Island (KGI) in the interest of encouraging a greater contribution from KGI activities to achieving the goals of SCAR scientific programs. A paper had been drafted for presentation at the COMNAP meeting in Punta Arenas in August, and was circulated to Modena participants ahead of time. It is recognized that the interests and prerogatives of national operators must remain sacrosanct. However, a coordinated and standard approach to data gathering, observations, logistics and utilization of infrastructure would benefit all parties operating on King George Island as well as SCAR's science programs. At the outset, it is recognised that there are already good examples of scientific cooperation between different operators on KGI, for example: in creating an archive of meteorological and upper air data; in analysing climate parameters; in coordinating glaciological research on the age of the KGI ice cover; in conservation and environmental monitoring in Admiralty Bay; in permafrost dynamics; and in analysing sea surface temperatures. A good example of scientific cooperation is Dallmann Laboratory at Jubany Station. However, much more could be accomplished by way of contributing to the SCAR science programmes. Many features of KGI are of considerable scientific interest and of direct relevance to SCAR scientific activities and programs. Existing and future research efforts on KGI have the potential to significantly contribute to SCAR science. The SCAR KGI Geographical Information System (GIS) provides a framework to integrate collected

data and information. Mutually beneficial cooperation and partnerships can be realized at KGI if duplication of efforts is minimized, infrastructure and logistics are shared to reduce costs and impacts, and standard techniques and sets of variables are agreed between national scientists collaborating with each other and with SCAR science activities. The realization of these opportunities can only occur if there is a desire for mutually beneficial partnerships and if bi- and multi-lateral agreements to advance common goals can be negotiated. SCAR is ready to assist operators and national scientists in moving forward for the benefit of the wider scientific community. To facilitate the process of developing closer links to KGI operators, SCAR President Chuck Kennicutt was planning to visit bases on KGI during late February/early March.

[Action 4: Secretariat to finalise the draft KGI paper, with COMNAP, for presentation to COMNAP]

[Action 5: Secretariat to ask KGI operators and ATS Secretariat if they would be interested in a courtesy visit from SCAR President during his impending visit to KGI and Buenos Aires]

5. Interactions with IASC, IACS and others (e.g. WCRP/IGBP)

5.1 IASC [telephone conference with Volker Rachold]

IASC continues to work closely with SCAR. Following successful completion of the joint SCAR/IASC Open Science Conference in St Petersburg (July 2008) (the 1st IPY Science Conference), SCAR and IASC are now part of the team organising the 2nd IPY Science Conference for June 8-12, 2009, in Oslo. Together with the Arctic Council, IASC is leading development of the Sustained Arctic Observing Networks (SAON), which is a model for SCAR's PANTOS. With the same partner IASC is also developing a study on Snow, Water, Ice, and Permafrost in the Arctic (SWIPA), a study of the effect of climate on the cryosphere. With the Arctic Ocean Science Board (AOSB), IASC is also developing the International Study of Arctic Change (ISAC), a long-term, multidisciplinary programme to study the effects of environmental changes on the circumpolar Arctic system and the globe, as the basis for developing the best adaptation and mitigation strategies. IASC now co-sponsors with SCAR (i) the Climate and Cryosphere (CliC) programme (with WCRP); and (ii) the Association of Polar Early Career Explorers (APECS); and is part of (iii) an agreement between SCAR, IASC and the International Association for Cryosphere Sciences (IACS). These links make polar activities more efficient. IASC has invited SCAR to participate in Arctic Science Summit Week, in Bergen, March 23-27. SCAR and IASC expect to inherit certain responsibilities for managing the IPY legacy, and to that end have formed a BiPolar Action Group (BiPAG) to advise the SCAR and IASC Executive Committees on the best way forward.

5.2 Future Interactions with COMNAP

Chuck Kennicutt explained that in recent meeting with COMNAP it had been agreed that SCAR would provide advice on future directions in Antarctic science; a copy of the draft paper "Antarctic Science in the 21st Century" had been provided to participants ahead of time. It would be presented to COMNAP at its meeting in Punta Arenas in August. The KGI paper would also be presented there.

6. Specific Requirements for Improving Linkages.

Toni Meloni led a general discussion on how linkages might be improved between SSGs and between SRPs. There was general agreement that cross-links had considerably improved in the past 4 years. The discussion moved to focus more on how SCAR could communicate better. The Executive Director asked if we are making best use of the SCAR web site. Participants like the web site, but recognise it is not interactive. Do we need to create, for instance:

- (i) a SCAR Wiki site (A wiki is a site that you can change. Someone starts a wiki on a topic they like and then allows other people to edit the wiki whenever they like). Perhaps the ACCE document should go on a Wiki site;
- (ii) a SCAR blog. Some SCAR sites already have blogs – e.g. ACE. Weblogs operate as open fora. But they need a moderator.

[Action 6: Secretariat to check what SCOR is doing in terms of wikis or blogs]

[Action 7: Secretariat to consider asking via an Antarctic science journal editorial what SCAR needs to do to improve its level of interaction]

7. Products and Services

7.1 Data and Information Management Strategy

Kim Finney introduced this topic, noting that JCADM has now changed to the Standing Committee on Antarctic Data Management, following COMNAP's withdrawal from the programme. SCADM is developing the SCAR Data and Information Management Strategy, a draft of which was circulated to the wider community prior to the Delegates meeting in 2008. A small action group headed by Vice President Sergio Marensi, with participation from all three SSGs is now reviewing and revising the document for consideration by EXCOM in August 2009. The latest draft was circulated in advance to Modena participants. ATCM needs an Antarctic Data Management System (ADMS) and one of SCADM's strategic aims is to provide it. Advice is first needed on what National Antarctic Data Centres are and what they should be doing, on what an ADMS could or should look like, on a properly coordinate approach to managing SCAR-related data. Without that advice we will continue with what is completely ad hoc – this is not acceptable. We need to design and build a system, capitalizing on pre-existing elements, partnering with what already exists, linking metadata to real data, linking to the SSGs to ensure that scientists get what they need. SCAR could follow SCOR's lead and develop a data citation system, to the benefit of PIs. The ideal system would include archive facilities to enable data to be re-used; easy to use interfaces; willing data providers; network components (data centres, virtual observatories, software) that can be stitched together. The strategy is aspirational but anticipates that implementation will be incremental. One starting point is the development of a data policy. Human resources may be required to manage the system. Recognising the shortage of internal funds, consideration should be given to requesting SCAR Members to 'second' appropriately qualified individuals to operate as the SCAR data coordinator.

Participants considered this an exciting new development.

[Action 8: AGCS consider using funds to pay for extraction of old data out of South American data collections from the peninsula and islands]

7.2 SC-AGI Products

Roberto Cervellati introduced this topic, noting that SC-AGI has been revitalised in recent years. It is designed to deliver a range of up-to-date geographic information products. Members of SC-AGI are appointed by national committees (26 so far). Details can be seen on the web site at <http://www.antsdi.scar.org/eggi/>.

Community projects include:

Antarctic Digital Database (ADD) www.add.scar.org; (managed at BAS).

Composite Gazetteer of Antarctica (CGA); managed at PNRA and AAD.

Map Catalogue; managed at AAD

Feature Catalogue; managed at AAD

King George Island GIS

Symbology Editor and Library (SEAL)

Relevant national enabling technologies include for example:

Landsat Image Mosaic Antarctica (LIMA); managed by USGS, BAS and NASA

Geospatial Information-Enabling Technologies

Cybercartographic Atlas (being developed)

Allan Hills place names map

Antarctic Coastal Change Project; managed by USGS and SPRI

Grove Mountains GIS portal project

History of Aerial Photography in Antarctica.

There have been some difficulties in utilising and managing the web site, which is located at Freiburg in Germany, and we are now looking for a new institutional home for it.

[Action 9: Ask all national committees if any is prepared to host the SC-AGI web site]

[Action 10: Failing finding a national agency to operate the SC-AGI web site, consider if it can be managed by the Secretariat]

[Action 11: Find an operator to manage the KGI GIS on KGI for the benefit of all KGI operators]

Google have displayed an interest in the Gazetteer. SCAR needs to continue to work with the International Hydrographic Office to encourage Members to undertake hydrographic surveys to produce bathymetric maps.

Roberto went on to provide some details of the Gazetteer, which has been managed by Italy for the past 17 years. It contains 36006 geographic names corresponding to 18209 geographical features and provided by 22 countries. The web site is updated quarterly (<http://data.aad.gov.au/aadc/gaz/scar/>), most recently on 1 Jan 2009. It has been published in print twice (1998 and 2000, with a supplement in 2004). The CGA database has now been moved on to the server at AAD, with new fields and new search capabilities. SCAR needs to give some consideration as to the possible future of the CGA.

There was general agreement that SC-AGI products need to have a much higher recognition and profile within SCAR and the wider world. It seems that some in COMNAP are willing to endorse use of the CGA, but not all (for political reasons). The same applies to the ATCM.

[Action 12: Henk Brolsma to liaise with Google regarding their request to use the SCAR Composite Gazetteer and to report back to the Executive on any issues arising]

7.3 SCAR Products and Services

Colin Summerhayes introduced the full list of SCAR services and products:

- Antarctic Data Directory System (ADDS)** (part of SCADM and therefore the responsibility of Kim Finney, Aus);
- REference Antarctic Data for Environmental Research (READER)** (part of AGCS under the responsibility of Steve Colwell, UK);
- Antarctic Digital Database (ADD)** (part of SC-AGI and under the responsibility of Paul Cooper, UK);
- Antarctic Biodiversity Database** (managed for SSG-LS by the Australian Antarctic Division, under the responsibility of Dave Watts);
- Marine Biodiversity Information Network (MarBIN)** (under SSG-LS and the responsibility of Bruno Danis, Bel);
- Composite Gazetteer of Antarctica** (an element of SC-AGI and now managed by the Australian Antarctic Division, with input from Roberto Cervellati, Ita);
- Seismic Data Library System (SDLS)** (managed for SSG-GS at the US Geological Survey under the responsibility of Alan Cooper, USA);
- Geodetic Data including: Master index for Antarctic positional control; Geophysical and geodetic observatories; and Geodetic Control Database;** (managed for SSG-GS by Reinhard Dietrich, Ger);
- Antarctic Map Catalogue** (managed by the Australian Antarctic Division, under the responsibility of Henk Brolsma);
- Antarctic Bedrock Mapping (BEDMAP)** (managed for SSG-GS/SSG-PS by David Vaughan, UK);
- Tide gauge data** (managed at the Proudman Oceanographic Laboratory, under the responsibility of Phil Woodworth, UK);
- International Bathymetric Chart of the Southern Ocean (IBCSO)** (managed for SSG-GS under the responsibility of Norbert Ott, Ger);
- Antarctic Digital Magnetic Anomaly Project (ADMMap)** (managed for SSG-GS under the responsibility of Marta Ghidella, Argentina);
- The SCAR King George Island Geographical Information System (KGIS)** (managed for SC-AGI under the responsibility of Steffen Vogt, Ger);
- The Continuous Plankton Recorder database (CPR)** (managed for SSG-LS under the responsibility of Graham Hosie, Aus);
- The Feature Catalogue** (managed by SC-AGI, through Henk Brolsma, Aus);

The Ocean READER database (part of AGCS under the responsibility of Mike Meredith, UK);

The Ice READER database (part of AGCS under the responsibility of Paul Mayewski, USA);

Sea Ice Database (part of AGCS and ASPeCt, and the responsibility of Tony Worby, Aus).

Participants agreed that all of these need a higher profile on the SCAR web site and in the wider community. The Secretariat will work on developing service level agreements with service providers to ensure all are in agreement about how these elements should be managed, displayed, marketed, and made available.

[Actions – As for delegates meeting]

8. Long-Term Observatories

8.1 PAntOS

M. Candidi reminded participants that PAntOS was set up to mimic the Sustained Arctic Observing Network (SAON) programme that was being set up in the north through partnership between IASC and the Arctic Council. Little progress was visible since the PAntOS meeting during SCAR's Science Business Week in St Petersburg in July.

[Action 13: M. Candidi to try to get a brief report on progress with and plans for PAntOS from Scott Palo – before EXCOM]

8.2 SOOS

C. Summerhayes reminded participants that there had been a major workshop on the Southern Ocean Observing System (SOOS) during SCAR's Science Business Week in St Petersburg in July, and that a draft science plan for SOOS was now more or less complete; publication is scheduled for the autumn.

9. Breakout Groups to Discuss Specific Developments

Three breakout groups were formed to develop thoughts on specific topics:

- (i) A SCAR Data Atlas (Turner, Finney, Summerhayes, Seppälä, Cervellati)
- (ii) Common use of large infrastructure (Di Prisco, Escutia, Storey, Capra, Meloni, Ricci)
- (iii) Environmental contamination in Antarctica (Candidi, Conlan, Kennicutt, Barbante, Hodgson);

The three groups reported to plenary as follows:

The Data Atlas group considered that there was merit in making data fields (e.g. maps, profiles) available on the SCAR web site, which could become a one stop shop for all kinds of materials useful for teaching purposes or for reference purposes (see draft of idealised contents list in Appendix 1).

The Infrastructure Group noted that as the experience of King George Island has shown, greater efficiencies can be achieved if projects from different nations can

share infrastructure and conduct research in a coordinated and collaborative manner. This collaboration can be extended on a region-by-region basis to include the Ross sea and ultimately all Antarctic regions. As illustrated by the IPY, identification of common scientific objectives is the first step towards optimizing the logistical arrangements and thus maximizing the scientific output of research campaigns. Adopting a collaborative approach from the beginning of the planning phase will lead to the best outcomes; where possible this planning phase should adopt a multidisciplinary approach in order to be fully inclusive. Examples of this approach could include:

- Coordinated planning of remote field expeditions
- Sharing of major infrastructure such as observatories, drilling platforms, stations and ships
- Sharing of data.

The Contamination Group considered whether or not it might be timely for SSG-LS and SSG-PS to examine the distribution and magnitude of Persistent Organic Pollutants (POPs) in relation to ecosystems and the physical environment. A UNEP Report was completed in 2002, which reviewed literature regarding contaminants detected in the Antarctic. It was decided that a decision on further action should await the production of the report on POPs by the Environmental Contamination in the Antarctic (ECA) Action Group (to be tabled at XXXII ATCM in April 2009), which is intended to update the UNEP report. In addition, the CEP may independently produce a paper on POPs in the Antarctic for the upcoming Southern Ocean Sentinels Workshop (20-24 April) and it would best to wait to see what it contains. Based on these developments, SSG-LS should consider any required next actions on POPs during its meeting in 2010.

The group next considered whether or not examination of UV effects on the biota might be another topic for Physical-Life Sciences cross linkages, but recalled that studies have indicated that - for the marine environment - ice cover, wave action and turbidity reduce UV penetration to the point that it is not considered to be a general threat in Antarctica. On the question of UV-B damage in terrestrial vegetation, recent Dutch research papers show that photosynthesis of terrestrial phototrophic organisms is unaffected, mainly because these organisms are protected against high levels of Photosynthetic Active Radiation (PAR), by various compounds attenuating or screening excess light, including UV-B. DNA can be damaged during daylight, but the damage is repaired overnight (or in periods of low light intensity). Much research effort was directed at this issue several years ago and it is unclear at this time that major unresolved issues are involved. SSG-LS may choose to consider the state-of the knowledge on this topic and recent developments on UV effects in the Antarctic at its 2010 meeting.

The group next discussed Southern Ocean Acidification (SOA). This topic is a subset of those being considered by the SCAR/SCOR Expert Group on Oceans and development of a Southern Ocean Observing System. This group is jointly includes both physicists and biologists and should be considered as a cross-SSG group between SSG-PS and SSG-LS. The issue is of high interest for the IOC/SCOR International Ocean Carbon Coordination Project (IOCCP), with which the SCAR/SCOR Ocean Group is connected. The SOOS plan includes carbon observations that may contribute to the work of the IOCCP. The topic of ocean

acidification should be the subject of a paper for SSG-LS and SSG-PS at their 2010 meetings, with a view to determining if there are any additional roles that SCAR might assume in this topic area beyond its current involvement through its Oceans Group.

Finally the group discussed the issue of research on iron fertilization in the Southern Ocean, specifically the recent disruption of the Germany-India expedition. It was felt that this topic had received much scientific attention over the last decade and it was unclear if any additional actions by SCAR were warranted. The SSG-LS may wish to consider this topic at its 2010 meeting.

[Action 14: Secretariat should check with SSG-LS and SOOS communities to see what position SCAR needs to take, if any, on ocean acidification, and in what time frame – e.g. possibly a paper for consideration at XXXI SCAR]

[Action 15: Secretariat to work with John Turner and Kim Finney on the development of a data atlas page for the SCAR web site, aiming to have it substantially populated before XXXI SCAR]

[Action 16: All SCAR's database titles should be changed to include the word Antarctic(a) in their titles, to enable easy recognition on Google searches]

[Action 17: SSG-LS and SSG-PS to consider the need for joint production and consideration of papers on POPs and on ocean acidification for the 2010 SCAR meeting]

10. Conclusions

Toni Meloni summarised results noting that we had heard in the workshop that all programmes are doing well. All programme leaders are quite happy with the way the cross linkages are working to encourage more multidisciplinary approaches, with collaborations driven by science. This also indicates a way to pursue the IPY philosophy that will leave its legacy to all future polar activities. It is clear now that all nations will encounter more difficult times as far as financing their polar scientific activities is concerned. For this reason the collaborative approach will be even more important in the years to come. This collaborative approach should be addressed not only to scientific partnerships but also include logistical aspects, such as, for example, moorings, refuelling scientific stations, personnel transport, and so on.

SCAR will meet COMNAP in August in Punta Arenas and will confirm the importance of encouraging national programmes to work more strongly together and to strengthen their collaboration from science to logistics, following lessons of the IPY.

Chuck Kennicutt brought the meeting to a close, noting that there was an amazing amount of interaction taking place across the boundaries between the various SCAR groups, and that SCAR would undoubtedly benefit from the many linkages being developed. Over the past 4 years it has become evident that there is a continual increase in the number and quality of ideas, inputs and outcomes of this interaction, and he was pleased to see that people are prepared to lead the way. He felt that we were heading in the right direction and with good leadership at key levels within the organisation. He was impressed with the tremendous commitment provided by the volunteers present. This is an exciting time for Antarctic science and for SCAR.

[Action 18: Secretariat remind all participants of EXCOM and Chief Officers' August meetings in Punta Arenas of the meeting schedule]

The meeting closed at 1700.

11. List of Actions

Actions are summarised in Appendix 2.

APPENDIX 1. KEY DATA ATLAS (DRAFT)

Metadata (data about data e.g. The AMD)

Observations from the research station, field camps and ocean stations

- Station data
- Data from field camps (static and travelling)
- Ocean station data

The Antarctic data atlas (Charts, maps and fields)

- Atmosphere
 - o Near-surface
 - o Troposphere (0-10 km)
 - o Stratosphere (10-50 km)
 - Ozone
 - Trace gas concentrations
 - o Mesosphere/lower thermosphere (50-120 km)
 - Trace gas concentrations
 - o Geospace (above 120 km)
 - Aurora
 - Magnetic field strength
- Ocean
 - o Water masses (sub-surface)
 - o Surface parameters
 - SST
 - Wind speed and direction
 - topography
 - mean sea level
 - o Seabed
 - o Biology
 - Planktonic
 - Benthic
 - Mammals
 - Fish
 - Distribution maps

- Land – exposed and sub-surface geology
 - o Orographic/topographic height
 - o Exposed rock
 - Maps of rock type
 - o Sub-surface geology
 - Solid rock e.g. drill core
 - Magnetic fields
 - Geophysical profiling
 - Seismic
 - Gravity
 - o Terrestrial biology
 - Land surface biology
 - Lake biology
- Ice
 - o Sea ice
 - Extent
 - Concentration
 - Thickness
 - freeboard
 - o Land ice
 - Sub-ice lakes and streams
 - Bed topography (BEDMAP)
 - Surface motion
 -
 - o Permafrost

Topographic maps, geophysical fields (T, surface p etc)

SEARCH THE DATA SETS

APPENDIX 2. LIST OF ACTIONS

	Action	Who	When	Progress
1	Follow up on unfulfilled recommendations a-k	Secretariat	asap	
2	Ensure link develops with SSG-LS on SEEPS Group	Secretariat	asap	contacted O'Brien and Conlan
3	Contact Birds and Marine Mammals Group (eg chair) to check on progress	Secretariat and SSG-LS chair	asap	done
4	Finalise the draft KGI paper, with COMNAP, for presentation to COMNAP	Secretariat	asap	
5	Ask KGI operators and ATS Secretariat if they would be interested in a courtesy visit from SCAR President during his impending visit to KGI and Buenos Aires	Secretariat	asap	done
6	Check what SCOR is doing in terms of wikis or blogs	Secretariat	asap	done (SCOR doesn't do them)
7	Consider asking via an Antarctic science journal editorial what SCAR needs to do to improve its level of interaction	Secretariat	asap	
8	Consider using funds to pay for extraction of old data out of South American data collections from the peninsula and islands	AGCS and J Turner	asap	
9	Ask all national committees if any is prepared to host the SC-AGI web site	Secretariat	asap	
10	Failing finding a national agency to operate the SC-AGI web site, consider if it can be managed by the Secretariat	Secretariat	asap	
11	Find an operator to manage the KGI GIS on KGI for the benefit of all KGI operators	Secretariat	asap	
12	Liaise with Google regarding their request to use the SCAR Composite Gazetteer and report back to the Executive on any issues	H Brolsma	asap	

	arising			
13	Try to get a brief report on progress with and plans for PAntOS from Scott Palo – before EXCOM	M. Candidi	asap	
14	Check with SSG-LS and SOOS communities to see what position SCAR needs to take, if any, on ocean acidification, and in what time frame – e.g. possibly a paper for consideration at XXXI SCAR	Secretariat	asap	done; a paper will be developed by SOOS and ICED for SSG-LS meeting
15	Work on the development of a data atlas page for the SCAR web site, aiming to have it substantially populated before XXXI SCAR	Secretariat, J. Turner and K. Finney	asap	
16	Change all SCAR's database titles to include the word Antarctic in their titles, to enable easy recognition on Google searches	Secretariat and service providers	asap	
17	Consider the need for joint production and consideration of papers on POPs and on ocean acidification for the 2010 SCAR meeting	SSG-LS and SSG-PS	2010 SCAR meeting	
18	Remind all participants of EXCOM and Chief Officers' August meetings in Punta Arenas of the meeting schedule	Secretariat	asap	done

Appendix 3. List of Acronyms

AAA	Astronomy and Astrophysics from Antarctica
AAD	Australian Antarctic Division
ACCE	Antarctic Climate Change and the Environment
ACE	Antarctic Climate Evolution
ADD	Antarctic Digital Database
ADDS	Antarctic Data Directory System
ADMAP	Antarctic Digital Magnetic Anomaly Project
ADMS	Antarctic Data Management System
AG	Action Group
AGAP	Antarctica's Gamburtsev Province project
AGCS	Antarctica in the Global Climate System
AGU	American Geophysical Union
AMD	Antarctic Master Directory
ANDRILL	Antarctic Geological Drilling Project
AOSB	Arctic Ocean Science Board
APECS	Association of Polar Early Career Scientists
APEX	IASC's Arctic Paleoclimate and its Extremes programme
ASPeCt	Antarctic Sea Ice Processes and Climate
ATCM	Antarctic Treaty Consultative Meeting
ATS	Antarctic Treaty System
BAS	British Antarctic Survey
BEDMAP	Antarctic Bedrock Mapping
BiPAG	Bipolar Action Group
BIPOMAC	Bipolar Climate Machinery (IPY Project)
CAML	Census of Antarctic Marine Life
CAWSES	Climate And Weather of the Sun-Earth System
CCAMLR	Convention on Conservation of Antarctic Living Marine Resources
CGA	Composite Gazetteer of Antarctica
CliC	Climate and Cryosphere Programme
COMNAP	Council of Managers of National Antarctic Programmes
CPR	Continuous Plankton Recorder
DNA	Deoxyribonucleic acid
EBA	Evolution and Biodiversity in the Antarctic
ECA	Environmental Contamination in Antarctica
EXCOM	SCAR Executive Committee
GIS	Geographical Information System
GOMOS	Global Ozone Monitoring by Occultation of Stars (on Envisat)
GPS	Global Positioning System
IACS	International Association of Cryospheric Sciences
IASC	International Arctic Science Committee
IBCSO	International Bathymetric Chart of the Southern Ocean
ICED	Integrated Climate and Ecosystem Dynamics in the Southern Ocean

ICESTAR	Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research
IGBP	International Geosphere-Biosphere Programme
IOCCP	International Ocean Carbon Coordination Project
IODP	Integrated Ocean Drilling Programme
IPICS	International Partnership in Ice Core Science
IPY	International Polar Year
ISAC	International Study of Arctic Change
ISAES	International Symposium on Antarctic Earth Science
ITASE	International Trans-Antarctic Scientific Expedition
JCADM	Joint Committee on Antarctic Data Management
KGI	King George Island
KGIS	King George Island Geographical Information System
LIMA	Landsat Image Mosaic Antarctica
MarBIN	Marine Biodiversity Information Network
NASA	National Aeronautics and Space Administration
PAGES	Past Global Change Programme
PAntOS	Pan-Antarctic Observations System
PAR	Photosynthetic Active Radiation
PNRA	Programma Nazionale Ricerche in Antartide
POLENET	Polar Earth Observing Network
POP	Persistent Organic Pollutants
READER	REference Antarctic Data for Environmental Research
SAON	Sustained Arctic Observing Networks
SALE	Subglacial Antarctic Lake Environments
SCAGI	Standing Committee on Antarctic Geographic Information
SCADM	Standing Committee on Antarctic Data Management (formerly Joint Committee on Antarctic Data Management)
SCOSTEP	Scientific Committee on Solar Terrestrial Physics
SDLS	Seismic Data Library System
SEAL	Symbology Editor and Library
SERCE	Solid Earth Responses and Influences on Cryosphere Evolution
SOA	Southern Ocean Acidification
SOOS	Southern Ocean Observing System
SPRI	Scott Polar Research Institute
SRP	Scientific Research Programme
SSG	Standing Scientific Group
SSG-GS	SSG on Geosciences
SSG-LS	SSG on Life Sciences
SSG-PS	SSG on Physical Sciences
SST	Sea Surface Temperature
UAMPY	Upper Atmosphere Monitoring for Polar Year
UNEP	United Nations Environment Programme
USGS	United States Geological Survey

UV-B Ultra Violet B (medium) wave radiation
WCRP World Climate Research Programme