7.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

7.1 International Council for Science (ICSU)

Deliang Chen was appointed as the ICSU Executive Director since last year's SCOR meeting. Here is his bio from the ICSU Web site.

Deliang Chen is an internationally renowned climate researcher and he has made an important contribution to the understanding of regional climate changes in Sweden and China. In addition, he has been successfully working in various international research environments, coordinating international and national research efforts, training students/postdocs from different countries/cultures, and integrating various scientific disciplines.

He holds the prestigious August Röhss Chair in Physical Geography directed towards Geoinformatics and is Professor of Physical Meteorology at the University of Gothenburg, Sweden. Formerly he has been Director of the Gothenburg Atmospheric Sciences Centre in Sweden, and Science Director of Beijing Climate Center. He has also served on numerous international and national committees and boards. He has been appointed guest professor and honorable professor by several Academies and Universities in the world.

7.1.1 International Geosphere-Biosphere Programme

International Geosphere-Biosphere Programme

Update for SCOR Executive Committee Meeting 2009

Wendy Broadgate, Deputy Director, Natural Sciences, IGBP Secretariat

IGBP values its collaboration with SCOR. With SCOR, IGBP co-sponsors GLOBEC, SOLAS and IMBER.

Prof. Sybil Seitzinger is new Executive Director of IGBP

Sybil took up the position of Executive Director in September 2008. She comes from Rutgers University, Institute of Marine and Coastal Sciences where she has been a visiting Professor since 1994. She has been a member of the IGBP Scientific Committee since 2003 and her areas of expertise include biogeochemistry, nutrient dynamics, and land/atmosphere/ocean interactions.

Sybil's goals as the incoming Executive Director are many. But top of this list are to lead the development of a Strategic Vision and Prioritization Process for IGBP activities; maximize the scientific, policy and practice impacts of IGBP-related science; and secure a stable funding base. Promoting the science that our Core Projects are doing is an integral component of all the above.

IGBP Synthesis and Exploration

The IGBP Scientific Committee, which includes representation from all ICSU global change programmes, has proposed ten major synthesis themes in preparation for the IGBP open science conference in 2012. Steering committee members, with inputs from IGBP core projects, national committees and partners, will lead the studies of each proposal.

1. Limits to growth
2. Implications of human responses to global warming
3. Nutrient cycling in the land/atmosphere/ocean system
4. The global nitrogen assessment
5. Earth system resilience
6. The cryosphere
7. Megacities and the coastal zone
8. The needs of least developed countries
9. The role of land cover and land use in modulating climate
10. Aerosols

Fast Track Initiatives

Three new Fast Track Initiatives have been launched for the period 2009-2011, listed below. SCOR involvement and co-sponsorship of FTIs is encouraged.

- *Upper Ocean Nutrient Limitation: processes, patterns and potential for change*, coordinated by Mark Moore (UK), Matt Mills (US), Doug Wallace (Chair of SOLAS), and the SOLAS International Project Office

- *Regionalisation of the Nitrogen Visualisation Tool*, coordinated by Albert Bleeker (Netherlands) and Jim Galloway (US)

- *Megacities and the Coastal Zone: air-sea interactions,* coordinated by Roland von Glasow (SOLAS SSC) and Tim Jickells (UK), Tong Zhu (co-Chair of IGAC SSC) and Yutaka Kondo (IGAC SSC), and Jozeph Pacyna, (former Chair of LOICZ).

SCOR/IOC/IGBP/IAEA Second Symposium on the Ocean in a High CO_2 World

216 experts from 32 countries met in Monaco from 6-9 October to discuss ocean acidification and its consequences for ocean ecosystems and society. The meeting highlighted the measurable effects of ocean acidification, the vulnerability of coastal and polar regions as well as the little known effects on whole ecosystems and resulted in the Monaco Declaration which was launched on 30 January and received wide media coverage. The Declaration calls for urgent action to limit damages to marine ecosystems due to accelerating ocean acidification. It draws on the Research Priorities Report on Ocean Acidification, which summarises the advances presented at the Symposium. A Summary for Policymakers was published in July 2009 and distributed

worldwide. All publications are available from: www.ocean-acidification.net, the ocean acidification website supported by the symposium sponsors.

Open Science Conference 2012

IGBP is planning a major Open Science Conference in 2012, *Planet under pressure: new knowledge, new solutions*. The next Symposium on The Ocean in a High-CO_2 World is also planned for 2012 and IGBP and SCOR will be coordinating on dates and venue to avoid clashes.

ICSU Review of IGBP

Over the past 2 years, ICSU has undertaken a review of the Earth System Science Partnership (ESSP), IGBP and WCRP. Some key recommendations are for IGBP to (a) develop a strategic vision and prioritize activities; (b) maximize scientific, policy and practice impacts of IGBP-related science; (c) reinstate Fast-track Initiatives; and (d) reconsider the size and composition of the SC for strategic decision-making. IGBP immediately took steps to address these recommendations, and progress is ongoing.

The ICSU Review of IGBP is available from http://www.icsu.org/2_resourcecentre/Resource.php4?rub=8&id=305.

ICSU Holistic Strategy for Earth System Research

ICSU is spearheading a process to engage the scientific community to develop a holistic strategy for Earth system research. This strategy will both encourage scientific innovation and address policy needs. For more information on the this Earth system visioning process, please visit http://visioning.icsu.org

Regional Groupings of Global Change Research Committees

Fourteen European National Committees (including Russia) have established a European Alliance of Global Change Research. The purpose is to promote and support supranational European Global Change science, covering all aspects from basic to applied research and including collaboration with African colleagues. It aims to improve the dialogue with decision makers and stakeholders, the support to the Global Change Programmes, and facilitate young scientists' participation at the European level.

A similar regional grouping is planned in Latin America and an initial meeting took place in Brazil in November 2008. The meeting united a subset of Latin American leaders in Global Change Science and IGBP National Committee members to discuss how to strengthen global change science and its impacts in Latin America and, in particular, how the IGBP might help in that process.

Special Issue of the IGBP NewsLetter on Oceans

IGBP produced a special issue of the IGBP NewsLetter on Oceans in April 2009, with articles from SCOR, IMBER, GLOBEC, SOLAS and LOICZ. The volume, which includes summary highlights from the Monaco Symposium is available from: http://www.igbp.net/documents/resources/NL-73_for-web.pdf

IGBP Annual Report

IGBP's Annual Report is available for download from: http://www.igbp.net/page.php?pid=217

7.1.2 World Climate Research Programme (WCRP)

7.1.3 Scientific Committee on Antarctic Research (SCAR)

SCOR and SCAR continue their productive partnership as co-sponsors of the SCAR/SCOR Expert Group on Oceanography (see http://www.clivar.org/organization/southern/expertgroup/index.htm). The group's major focus for the past few years has been the development of a Southern Ocean Observing System (SOOS). The SOOS Planning Document is nearly completed and the Expert Group will begin discussion of SOOS implementation at an opportunistic meeting on Sept. 26 in conjunction with the OceanObs'09 meeting. Ed Urban will be attending the Sept. 26 meeting, as will Julie Hall (IMBER Chair) and John Gunn (convener of the SCOR/CoML Workshop on Ocean Biology Observatories).

7.1.4 Scientific Committee on Problems of the Environment (SCOPE)

Annelies Pierrot-Bults
Report 13th GENERAL ASSEMBLY of SCOPE
London, UK, 9-12 June 2009

Fifteen countries and eighteen organizations were represented at the 13th General Assembly of SCOPE.

Report of the President:
After ICSU decided SCOPE was not core business for them and other institutions could do this work, it is necessary to look at new opportunities. SCOPE is recognized for long-standing networks and active partnerships of interdisciplinary experts in biophysical, social and natural sciences. The strength of SCOPE is also its speedy response to demands for action and its many publications, from books to policy briefs. More-focused activities were achieved by streamlining the portfolio from 22 to 6 projects, all of which are very active. SCOPE is an independent international institution and a legal body in France since 1971.

Report of the Treasurer:
In addition to the audited papers for 2008 the Treasurer reported verbally in this plenary session. During 4 difficult years SCOPE has survived, but is vulnerable and one of the reasons is the declining income because of the conversion from dollars payments into euros. SCOPE has succeeded in reducing costs by hard cuts in staff employment and organizational costs of executive meetings. The overall financial situation is stable and payments of some big countries are expected to balance the budget.

Report of the Secretary
The focus of SCOPE has been on scientific direction and ensuring financial security. This needs a lean and efficient system of organization, scientific credibility, rapid product delivery and initiate and/or strengthened discussions with a number of partners. There is a need to open up this organization to a much wider audience and participation. SCOPE has a role to play as a bridge between science and policy makers by producing not just assessments but a sound synthesis, which will have added value.

Report of the Editor-in-Chief
New ways of publications, for example, electronic publications versus paper have to be discussed. To attract young scientists it is necessary to publish peer-reviewed documents with impact factors, preferably with pre-access on the Internet. The contract with Island Press, a not-for-profit publisher, has to be discussed.

Future of SCOPE
Paul Risser, Chris Field and Cheryll Palm joined in from the United States on a conference call in the plenary discussion. The participants in the GA all felt the desirability to continue SCOPE's activities. Besides the tasks mentioned in the Resolutions, SCOPE can play a role in a series of "frontier of sciences" symposia and region-specific topics. Ocean acidification is one of them. SCOPE has to do assessments and syntheses on an interdisciplinary basis that speak to priorities of identified regions delivering results that are also relevant on the global scale. The outputs should be developed with and for intended end users. The constitution needs to change to widen the membership to accommodate other kinds of members and long-term affiliations with similar-interest institutions. Several scientific institutions mentioned that they will be happy to continue working with SCOPE on the basis of scientific projects and shared interests (e.g. EEA, IUCN, UNEP, SCOR and IUBS) are interested in continued cooperation with SCOPE. SCOPE signed an MOU with UNESCO and during the GA a message from UNESCO was positive for continued cooperation and contained encouragement to apply for formal status with UNESCO. There are several offers and possibilities for a new location of the SCOPE office.

Working Group Sessions

WG on Membership and Partnership
Chair: Jaquie McClade (alt David Stanner) Rapporteur: Mary Schole

WG on Emerging Topics
Chair Venu Ittekott Rapporteur Osvaldo Sala

WG on Publications, Outreach and Visibility of SCOPE
Chair Jake Peters Rapporteur Nide Adipe

WG on Finances
Chair Johannes Karte Rapporteur: Ian Douglas
A.C. Pierrot-Bults attended the the working group on finances.

Election of the Executive Committee

See resolutions.

Next (14th) General Assembly of SCOPE

It is proposed that its next meeting should take place during the second quarter of 2012. No invitation has been received so far from SCOPE Members for hosting the next meeting of the General Assembly. Attention is drawn to the requirement that such invitations be accompanied by a written statement specifying that the Assembly will be organised and conducted in accordance with the ICSU Guidelines for the Free Circulation of Scientists, as endorsed by the SCOPE General Assembly at its VIth meeting in 1985.

Scientific Symposium (Friday 12th June, all day)

The UK Committee of SCOPE brought together international experts to discuss "Finance, food and energy crises: consequences for the environment and land use change". The symposium was very well attended. There were four sessions:

Session 1: Land use and resource competition,
Session 2: Climate change and land use,
Session 3: Finance, food and energy and
Session 4: Integration: policy and legal issues.

Both energy and finance have combined to create a new set of demands and pressures on the environment that complicate the path towards a global system for managing and adapting to climate change. It is an opportune time to make a rapid appraisal and review of how the current

problems affect our environmental priorities and what they will mean for land use and land cover, and thus for future trends in climate.

Resolutions of the 13th General Assembly of SCOPE
London, UK, 9-12 June 2009

Recognizing the critical time for SCOPE to make a transition, the 13th General Assembly of SCOPE forwards the following Resolutions of this Assembly to the Executive Committee for critical examination and necessary action.

1. SCOPE Strategic Plan

The 13th General Assembly mandates the Executive Committee to set up a subcommittee to revise the Strategic Plan, taking into consideration principles set out below, and further decides that the Strategic Plan be submitted to approval by a mail ballot of all voting members. SCOPE will seek to:

a. Develop and implement an interdisciplinary science agenda of high relevance to decision makers;
b. Take the leadership in identifying the frontiers of environmental science and technology;
c. Undertake assessments and syntheses that address the priorities of specific regions while maintaining global relevance; and
d. Develop outputs with and for its users founded on partnerships.

2. Memberships and Partnerships

The 13th General Assembly decides that:

a) SCOPE membership be broadened based on a principle of inclusiveness;
b) Membership be designed to impart constancy to Members' association with SCOPE;
c) Members and potential Members must have a demonstrated interest in bringing the best science to bear on environmental stewardship;
d) New memberships are approved by the General Assembly or by the Executive Committee whenever appropriate;
e) Members are required to pay an annual subscription fee that will be used for operational core funding, and possibly for seed funds towards project development;
f) Each Member has one vote;
g) Membership categories are:
    1. academic, scientific and research institutions, scientific academies, research councils, or associations of such institutions, and scientific unions,
    2. businesses and associations and federations of business and industry,
    3. civil society organizations,
    4. governmental and inter-governmental organizations;
h) Members have the right to:
    1. propose topics for projects,
    2. participate actively in projects,

3. propose topics for foresight workshops and/or interdisciplinary symposia,
4. participate and vote in General Assemblies;

i) SCOPE undertakes to nurture membership by:
   1. addressing Members' scientific and environmental issues,
   2. providing accounts of its activities to Members,
   3. organizing with Members such activities as projects, international symposia and fora;
j) In addition to memberships, SCOPE will continue to work with partners and to grow our number of partnerships. These partnerships will be based on the principles of collaboration and will facilitate interactions with non-member institutions. Such interactions may include projects or repeated collaborations or the provision of services or funds to SCOPE.

3. Scientific Programme

The 13th General Assembly:

a) Recommends that the SCOPE programme be relevant to the scientific community, and to management and policy;
b) Recommends that SCOPE intensify its efforts to ensure that its programme take a leadership role in frontiers of environmental sciences and cross-cutting research, including natural sciences, social sciences, and engineering;
c) Reiterates the need that young scientists and female scientists be more involved in SCOPE activities including projects, workshops, and publications;
d) Urges SCOPE to make its outputs more available to both the wider scientific audience
e) Urges the Executive Committee to revise the guidelines for SCOPE projects.

4. Publications, Outreach and Visibility

The 13th General Assembly:

a) Mandates the Executive Committee to establish a committee on publications to assist
b) Recommends that the Publications Committee make it a high priority to commission (or find a suitably experienced contributor to undertake) a web site redesign, and monitor its use;
c) Recommends that the Publication Committee examine publishing needs including online posting, circulation of pdfs and the use of publishing houses such as Earthscan or Island Press, to evaluate alternatives for future publications.

5. Financial Matters

The 13th General Assembly:

a) Accepts the report of the Finance Committee, adopts the audited accounts for the period since the previous ordinary session of the General Assembly as submitted by the Treasurer, and discharges the Treasurer of liability;
b) Requests the Executive Committee to make efforts to collect arrears in payment of yearly contributions and to enquire about alternative adhering bodies from countries that have not contributed to the budget of SCOPE for several years;
c) Decides a change to Euros as SCOPE's base currency at the time SCOPE begins to recruit new members and adopts the new structure. The change should take place at the opening of the new fiscal year on 1st January 2010. The scale of yearly contributions shall be converted from US dollars to Euros at the average exchange rate for the six months January-June 2009;
d) Decides that annual contributions presently paid by Member organisations shall remain the same for 2010, be increased therafter by 2% for 2011 and a further 3% for 2012;
e) Recommends that the Executive Committee give high priority to seeking alternative funding for SCOPE and to recruiting new members; and further recommends the setting up of a sub-group of the Executive Committee entirely dedicated to this task;
f) Reiterates that all projects that SCOPE operates and manages should normally have their funds directed through SCOPE, and include coordination costs, whether in the form of an overhead, or of direct costing of Secretariat expenditure or a combination of both;

Concerning the operation and staffing of the office in Paris, the General Assembly:

g) Recommends that the Secretariat and the Executive Committee should immediately explore the possibilities in Paris for new office premises for the period after October 2010; acknowledges with thanks the generous offer made by the IUCN to locate the SCOPE Secretariat within its new headquarters in Gland, Switzerland; and further notes that while attractive, this offer would have considerable financial implications due to liabilities under French labour laws;
h) Recommends that SCOPE make provision for compulsory retirement bonuses;
i) Urges that the costs of closing the Paris office be established and taken into consideration by the Executive Committee;
j) Recommends that the legal situation with regard to financial liabilities for both the Executive Committee (or the Officers) and the Executive Director be investigated and the provision of a liability insurance for foreign associations in Paris be investigated;
k) Recommends that as soon as financially possible, more staff time be funded, including an allocation of time for a membership secretary, as membership administration may become a much larger task in the new structure.

6. Changes in the SCOPE Constitution

The 13th General Assembly:

a) Decides that urgent changes needed in the constitution as regards membership and as per article 2) above are immediately accepted and effective;

b) Mandates the Executive Committee to establish an ad hoc committee to further revise the Constitution; and decides that such further changes be approved by electronic mail ballot by at least 50% of all SCOPE Members.

7. Appreciations

The 13th General Assembly expresses its deep appreciation to the Foreign Secretary, Prof. Lorna Casselton, and staff of Royal Society of London, to Dr Jeremy Woods and staff of the Imperial College London, and to the members of the British National SCOPE Committee, for their excellent arrangements and facilities in hosting the 13th General Assembly, and for arranging a stimulating and excellent symposium; The 13th General Assembly further expressed its thanks to:

a) the Chairpersons and members of SCOPE Scientific Advisory Committees for their continued leadership and commitment;
b) the long-serving Members of the Executive Committee;
c) the Secretariat for its dedication and services;
d) the President and the Executive Committee for their visionary leadership;
e) the Members of SCOPE for attending and devoting outstanding attention to the scientific programme and to environmental problems throughout the world;
f) the many scientists who have contributed to the workshops, symposia and written materials in the SCOPE projects throughout the world.

Elections

The 13th General Assembly of SCOPE, meeting in London, UK, from June 8-11, 2009, elected Officers and Members of the Executive Committee for the 2009-2012 triennium as follows:

Officers

Paul Risser (USA) President
Yonglong Lu (China/CAST) 1st Vice-President
Holm Tiessen (Germany) 2nd Vice-President
Ahmed Farghally (Egypt) Treasurer
Mary Scholes (South Africa) Secretary General

Members

Magdy Attia (Egypt)
Chang-Hung Chou (China/The Academy located in Taipei)
Carlos Joly (Brazil)
Annelies Pierrot-Bults (The Netherlands) Representing SCOR
Jon Samseth (Norway) Representing IUPAP

London, 11 June 2009

7.2 Affiliated Organizations

7.2.1 International Association for Biological Oceanography (IABO)

7.2.2 International Association for Meteorology and Atmospheric Sciences (IAMAS)

International Association of Meteorology and Atmospheric Sciences
2009 Annual Report to SCOR
4 September 2009

The key IAMAS activities over the past year have been: 1) planning for and holding the joint IAMAS/IAPSO/IACS scientific symposium in Montreal, Canada from 19-29 July, 2009; 2) planning for the IUGG General Assembly in Melbourne in July 2011; 3) initial planning for the joint IAMAS/IACS scientific assembly to be held in Switzerland in 2013; 4) IAMAS liaison activities continued; and 5) the diverse activities of the ten commissions that make up IAMAS.

1. The Joint Scientific Assembly of IAMAS/IAPSO/IACS in Montreal, July 2009
The joint IAMAS/IAPSO/IACS scientific assembly was held in Montreal, Canada on 19-29 July 2009 (see http://www.moca-09.org/index.asp), drawing something like 1400 participants from countries around the world. This was the first such joint assembly including the new International Association of Cryospheric Sciences (IACS). The Scientific Organizing Committee, made up of the association's secretaries general, together with the National Organizing Committee, did an excellent job of organizing the individual symposia around topics that were of interest to those from all three associations, thus promoting a lot of interdisciplinary presentations and discussions. A number of session generated headlines:

(a) Robert Bindschadler of NASA summarized results relating to the state of the Greenland and Antarctic ice sheets, indicating that new results since the 2007 IPCC fourth assessment report suggested that the mid-range estimate for the sea level contribution of these ice sheets during the 21st century was now estimated at 1 ± 0.5 meters, which would be in addition to the estimate of the IPCC for the contributions due to thermal expansion and melting of mountain glaciers. Thus, the central estimate for the total projected sea level rise from all factors should now be considered to be between 1.0 and 1.5 meters.
(b) A panel discussion regarding possible geoengineering of the climate system was held (I was organizer). The presentations, dealing with potential global climate modification using stratospheric aerosols, with the potential use of geoengineering approaches to deal with regional impacts, and with some of the various social and governance issues, led to a very lively discussion from a broad range of perspectives. For the Melbourne meeting, a scientific symposium is expected to be devoted to this topic of growing interest.

The actual conduct of the scientific assembly was greatly aided by holding it in a major convention center rather than on a university campus, as occurred in Perugia in 2007, leading to many logistical problems. The one concern at the Montreal meeting was the high registration fee, necessitated in large part because of the cost for the convention center. How this all gets

worked out in the future remains to be resolved.

Final figures are not yet in, but IAMAS had pledged nearly $100K in support of young scientists from financially less well off nations to attend, likely greatly helping to ensure the very significant participation of early-career scientists.

2. The IUGG General Assembly in Melbourne in 2011

Planning for the IUGG General Assembly in Melbourne, to be held from June 27 to July 8, is well underway. The secretaries general of the eight associations will meet in October to start the coalescence of their initial suggestions for the scientific symposia.

3. Joint IAMAS/IACS Scientific Assembly in Switzerland in 2013

IAMAS and IACS decided to hold a joint scientific assembly in 2013 in Switzerland (IAPSO will be meeting jointly with other IUGG associations). Given the accelerating loss of mountain glaciers due to global warming, this seemed a particularly appropriate location to be focusing on the coupling of the atmosphere and cryosphere. Date is still to be determined.

4. Liaison Activities

IAMAS liaison activities continued through the year, including to WCRP, SCOR, and, particularly through its commissions, to a number of the major international scientific projects.

5. Activities of the IAMAS Commissions

IAMAS has ten commissions, several of which are involved in activities that interact with SCOR-sponsored projects and activities. For example, the International Commission on Atmospheric Chemistry and Global Pollution (ICACGP) is active in a number of projects dealing with air-ocean exchanges that are of interest to SOLAS. Several of these commissions hold their own quadrennial meetings, and attendance at these ranges up to several hundred. For example, ICACGP will hold a joint conference with IGAC in Halifax, Canada on July 11-16, 2010.

The Officers of IAMAS

The current officers are:

President: Prof. Guoxiong Wu (China)
Past President: Dr. Michael MacCracken (USA)
Secretary-General: Dr. Hans Volkert (Germany)
Vice-President (2): Dr. Anne Thompson (USA) and Dr. M. A. F. da Silva Dias (Brazil)
Members at Large (4): Prof. T. Yasunari (Japan), Dr. V. Kattsov (Russia), Prof. S. Stefan (Romania), and Dr. E. H. Berbery (Argentina)

There will be elections in Melbourne for the office of President, Vice-President (2), and Member-at-Large (2). Commission officers are listed on the commission Web pages, which are accessible through the IAMAS Web site at www.iamas.org; their elections take place on the

schedule of the commissions, which meet at least every four years.

Submitted by: Michael C. MacCracken, Past-President of IAMAS and IUGG/IAMAS liaison to SCOR

7.2.3 International Association for the Physical Sciences of the Ocean (IAPSO)

International Association for the Physical Sciences of the Oceans (IAPSO)

2008-09 IAPSO Activities -- Report to SCOR (August 2009)

IAPSO is a constituent Association of IUGG (The International Union of Geodesy and Geophysics). The main activity of IAPSO is to arrange scientific assemblies. IAPSO also works through Permanent Services to aid the ocean science community, Commissions dealing with specific phenomena with severe impact on society, and through Working Groups jointly with SCOR, which put focus on special scientific questions for some years. In the IAPSO activities, it is important to spread knowledge to developing countries. This is done, by including developing country scientists in the activities, and by financially supporting their attendance at scientific meetings. More information can be found on the IAPSO website.

Every fourth year IUGG together with its associations arrange a General Assembly. The next IUGG General Assembly "Earth on the Edge: Science for a Sustainable Planet" will take place in Melbourne, Australia 28 June–7 July 2011. See http://www.iugg2011.com. The SGs of IUGG and its Associations met in Munich in May 2009 to start the planning of the scientific symposia.

Between two IUGG General Assemblies, IAPSO arranges an assembly jointly with other organizations. The Assembly "MOCA-09 - Our warming planet" was arranged jointly with the IUGG Associations IAMAS, IAPSO and IACS in Montreal, Canada, during July 19 – 29, 2009. Most of the time this year has been devoted to the planning of this assembly. Some 1350 scientists from over 50 countries could choose among 53 symposia (sessions), consisting of 21 joint, 10 sponsored by IAPSO,18 by IAMAS, and 5 by IACS.

The new SCOR/IAPSO WG 133 OceanScope held the first meeting during three days before MOCA-09. Also the SCOR/IAPSO WG 129 Deep Ocean Exchanges with the Shelf (DOES) met during MOCA-09. In addition, DOES sponsored one symposium at MOCA-09. IAPSO provided some financial support both for the new working group (via SCOR) and for the attendance of members of the DOES WG (provided directly from IAPSO to two WG members).
During the Assembly IAPSO awards were presented and decided upon. Professor Harry L. Bryden FRS, University of Southampton, UK, was awarded the 2009 Prince Albert I Medal of

IAPSO, "...in recognition of his fundamental contributions to understanding the ocean's role in the global climate system." The ceremony was followed by the Prince Albert I Medal Memorial Lecture by the awardee, entitled “Monitoring the Variability in he Circulation of the North Atlantic Ocean”. Dr. Bamol A. Sow of Senegal was selected to receive the 2009 Eugene LaFond Medal, which is awarded to an early career ocean scientist from a developing world country who presents an excellent paper on oceanography at an IAPSO or jointly sponsored IAPSO symposium. The title of his oral presentation at MOCA-09 was "Simulation of the Senegalese and Mauritanian Upwelling: How are the Winds actually Driving SST Variability and Water Mass Renewal?” He made his presentation at the DOES symposium mentioned above. Dr Sow was also invited to attend one of the WG meetings as a representative from developing countries.

During the Assembly IAPSO held one General Business Meeting (GBM) and two Executive Committee (EC) meetings. On the agendas were, for example, the visibility of IAPSO, how to establish the inclusion biogeochemistry in IAPSO, the relationship to IABO, and the connection with other (national) marine associations. The offer from Sweden to host and organize the 2013 Assembly in Gothenburg on 22–26 July was discussed and has been approved by the IAPSO EC and the National Correspondents in attendance at the GBM.

IAPSO Services, Commissions and Working Groups report every second year. In particular, oral reports from the chairs of the three SCOR/IAPSO Working Groups 127 (Thermodynamics and equation of state of seawater), 129 (DOES) and 133 (OceanScope) were presented at the General Business Meeting during MOCA-09. An updated pamphlet describing IAPSO has been prepared and was distributed widely at MOCA-09. General information about IAPSO can be found on website http://iapso.sweweb.net/_db

Members of IAPSO EC (for 2007-2011):
President: Lawrence Mysak, Canada
Secretary General: Johan Rodhe, Sweden
Past President: Shiro Imawaki, Japan
Vice President: Denise Smythe-Wright, UK
Vice President: Eugene Morozov, Russia
Treasurer: Fred Camfield, USA

EC Members:
Isabelle Ansorge, South Africa
Silvia Blanc, Argentina
W. John Gould, UK
John Middleton, Australia
Temel Oguz, Turkey
Stefania Sparnocchia, Italy

Report prepared by
Johan Rodhe, SG of IAPSO

7.3 Affiliated Programs

SCOR-Affiliated Projects and Programs

SCOR sponsors many, but not all, of the major international ocean research projects and programs. Some projects not co-sponsored by SCOR can gain benefits from association with SCOR, such as (1) increased visibility; (2) participation in SCOR activities, such as project coordination meetings and annual SCOR meetings; (3) opportunities to provide comments on working group proposals and membership; (4) access to national SCOR contacts; and (5) opportunities to apply for SCOR funding for travel of scientists from developing countries and countries with economies in transition to their workshops and symposia. In 1995, SCOR developed the option of formal affiliation of relevant projects/programs with SCOR. Unlike projects sponsored by SCOR, affiliated projects and programs receive funding from organizations besides SCOR and do not need staff support from SCOR.

SCOR's role in relation to affiliated projects and programs is one of advice and regular review. SCOR gives advice about appropriate balances on the projects' steering committees and adequate rotations of these committees to renew the committees' memberships regularly. SCOR's national contacts can be used to find new members in regions where there is a need, or to entrain new countries into projects. SCOR can also provide an independent mechanism for the review of planning documents such as science or implementation plans.

Application for SCOR Affiliation

Application to SCOR for program affiliation should be initiated with a proposal of 2 to 5 pages, sent to SCOR at least three months before an annual SCOR meeting. The proposal should include an outline of the program's science plan, the terms of reference, current membership of the steering committee, and rotation procedures and schedule. The proposal for SCOR affiliation should also address the following criteria, accepted at the 1995 SCOR Executive Committee meeting (see *1995 SCOR Proceedings*). The Executive Committee agreed that in order to become a SCOR-affiliated project/program, an activity must

- be truly international, with a committee membership that rotates on a regular basis;
- show evidence of existing financial and/or organizational support;
- demonstrate a benefit from SCOR affiliation;
- have a scientifically well-integrated theme;
- show that it is in SCOR's interests to establish this affiliation;
- be of broad scale and global importance;
- show, as appropriate, that any scheme of membership dues includes some nominal level so as to encourage the widest possible international participation by all countries; and
- be willing to adhere to the SCOR Publication Policy.

After a program is affiliated with SCOR, annual reports are required, and scientific presentations may be requested at any annual SCOR meeting, as a basis for the decision on continuing the relationship between SCOR and each project/program. The Chair of each affiliated project/program serves as an ex-officio member of SCOR as a Scientific Rapporteur (see SCOR Constitution, paragraph 4). Continued affiliation with SCOR depends on the project meeting the guidelines specified above, and maintaining high scientific quality and adequate rotations of committee members and chairs.

Reports to SCOR

Annual reports to SCOR should answer the following questions and present any additional information that the project/program would like to transmit to SCOR:

- What scientific accomplishments have been achieved by the project/program in the past year?
- How has the project's steering committee membership changed in the past year?
- What is the financial status of the project?
- What is the status of the project's secretariat?
- What are the plans for the scientific development and implementation of the project over the next two to three years?
- How is the project interacting with and contributing to other SCOR activities?

In addition, projects/programs should communicate regularly with their SCOR Executive Committee Reporter regarding their activities and progress.

7.3.1 Program to Study Ocean Mixing Processes

7.3.2 Census of Marine Life (CoML) (affiliated in 2002)

Mission:
Assess and explain the changing diversity, distribution, and abundance of marine species from the past to the present, and project future marine life.

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David Farmer	USA	Michael Sinclair	CANADA
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Executive Committee Reporter: Peter Burkill

Census of Marine Life
Annual Report to SCOR

August 2009

The Census of Marine Life was formally established in 2000 and became an Affiliated Program of SCOR in 2002. In 2010, this international research program will release its first report on the status of knowledge of marine biodiversity. The results will cover information from 14 Ocean Realm Field Projects, historical studies (HMAP – History of Marine Animal Populations), modeling and prediction (FMAP – Future of Marine Animal Populations), 22 groups working on cross-project questions, and 13 national and regional committees (NRICs). All of the data from these studies, the NRICs and from other sources of biodiversity information will be accessible through the Ocean Biogeographic Information System (OBIS – www.iobis.org). In 2009, this program-wide synthesis has been underway for more than a year and will produce a range of products. These include: (1) the Census "digest" book, a science book written by Paul Snelgrove for a general audience (*Blue Census: Making Global Ocean Life Count*—tentative title—published by Cambridge University Press); (2) a science book written for a general scientific audience and including chapters contributed by the History of Marine Animal Populations, Future of Marine Animal Populations and each of the 14 Ocean Realm projects (*Life in the World Ocean: Diversity, Distribution and Abundance*—tentative title—published by Wiley-Blackwell); (3) a special collection of papers for *PLoS-ONE* contributed by each of the National and Regional Committees (NRICs) (*Marine Biodiversity and Biogeography: Regional Comparisons of Global Issues*—tentative title); (4) more than 200 papers in the scientific literature, including a cluster of articles in an issue of *Nature*, based on synthesis and analysis within individual Census projects and across multiple projects ("cross-project" efforts); (5) a series of videos, including some proposed original computer animations, highlighting the major messages and scientific accomplishments of the Census; (6) a map of marine life diversity, distribution and abundance produced by National Geographic and the Census Mapping & Visualization Team; (7) a popular book of marine life for the general public by Nancy Knowlton of the Census Coral Reefs project (*Citizens of the Sea: 101 Wondrous Creatures from the Census of Marine Life*—tentative title—published by National Geographic); and (8) a report of the Scientific Contributions of the Census of Marine Life: 2010 (the "2010 Report"). The following report provides an update on the program's status and plans in 2008.

Scientific Accomplishments

In 2009, field work began to ebb as focus changed to analysis and synthesis. Still, the expeditions that occurred in late 2008 and 2009 resulted in exciting discoveries.

Diversity

In the Southern Ocean, Census Antarctic (CAML) researchers discovered many potential new species including sea cucumbers, sponges, and komokiaceans (deep ocean protozoa). The scientists also collected a rare mollusk, named *Laevipilina antarctica*, which they believe played a role in how segmentation evolved in marine invertebrates.

Census Zooplankton (CMarZ) scientists discovered at least 85 new species of zooplankton. In addition, four genera and one family were officially deemed new to science. During one expedition in the Atlantic Ocean from Germany to South Africa, scientists collected zooplankton from the surface down to below 5,000m. Taxonomic experts and geneticists worked together to identify and barcode the DNA from hundreds of species. As expected, several new species of small crustaceans called ostracods or seed shrimp and other groups were found.

Squat lobsters are found in all oceans, at all depths, and in all marine habitats, but are especially abundant on continental margins. Census Continental Margin (COMARGE) scientists compiled a list of the 870 known species of squat lobsters and an electronic library of relevant literature. Researchers are confident that hundreds of other species of squat lobsters are yet to be discovered.

Distribution

Census Arctic (ArcOD) researchers studied life living in the coldest conditions in the global ocean. Seawater freezes at 1.8° C, but the temperatures in the sea ice brine channels they study can drop to –25° C where brine is more than six times saltier than regular seawater. Despite such extremes, researchers found that sea ice algae, such as diatoms, and flagellates thrived in this environment in concentrations of thousands of individuals per liter.

The CMarZ team found a comb jelly, or ctenophore, at the record depth of 7,217m in the Ryukyu Trench near Japan. This was the deepest recorded siting of this species ever. This unique species is raising questions about the availability of food resources. It was found at a depth thought incapable of supporting predators like this one, which is not an active hunter.

COMARGE researchers aboard the RRS *James Cook* investigated deep-sea submarine canyons off Portugal and found that species richness was almost double in the more active Nazaré Canyon than in Lisbon Canyon. This was surprising because Lisbon Canyon is connected to a river supply and hence, potentially, a large source of organic matter that would foster large populations of filter-feeding organisms.

Census research from the Mid-Atlantic Ridge (MAR-ECO) project found that certain skate and ray species may be well established and breeding on the ridge. Before this discovery, scientists thought the skates and rays migrated through the Mid-Atlantic Ridge, rather than taking up residence there.

Abundance

Census researchers in Chile discovered masses of giant, filamentous, multi-cellular marine bacteria in the eastern South Pacific Ocean. These bacterial mats are made up of diverse organisms and may be “living fossils” that developed in the earliest ocean, when oxygen was either absent or much diminished, and lived on the toxic gas hydrogen sulfide.

HMAP researchers found, with 95% statistical confidence, that in the early 1800s, the New Zealand southern right whale population contained between 22,000 and 32,000 individuals—roughly 30 times as many as today. The population declined rapidly once whaling began. By 1925, perhaps as few as 25 reproductive females survived. Today, at about 1,000 individuals, the animals are being studied around sub-Antarctic islands south of New Zealand, and the estimated historic size of New Zealand's southern right whale population is already being incorporated into models of the New Zealand coastal ecosystem to help guide conservation and management.

Census scientists participating in the Gulf of Maine (GoMA) project studied fish migrations using new Ocean Acoustic Waveguide Remote Sensing (OAWRS) technology. Using this technology, they witnessed the origins of a mass gathering of hundreds of millions of fish and their subsequent migration, signifying the first time scientists have studied a migration of animals from beginning to end. Previously, biologists used theories and computer simulations to predict these migrations, but OAWRS has allowed for large-scale field-based studies. The team studied Atlantic herring near Boston and found that when the density of fish gathering reached a certain point, it triggered a synchronization of movement of millions of fish over a large area much like that of the wave at a football stadium. Herring gather off the coast of Boston during spawning season at night to spawn under the cover of darkness. Come morning, the fish migrate back into the deeper waters and disband. OAWRS should allow better monitoring of fish populations and management opportunities.

Technologies and other contributions to the community

OBIS currently serves more than 19 million data records covering 106,000 species from 643 databases. This means that there are currently geo-referenced species points in OBIS for about 46 percent of the known marine species (up from 34 percent one year ago).

In June 2009, the International Oceanographic Commission (IOC) adopted a resolution accepting OBIS as a program within its International Oceanographic Data and Information Exchange (IODE) program. Under the terms of the resolution, OBIS activity would continue under IODE, and the OBIS Secretariat at Rutgers University (USA) could become the host of an IOC Program Office. Currently, discussions are in progress to work out the details of this integration and to investigate the establishment of IOC cooperation with OBIS' contributors and other stakeholders. A multi-source fund has been set up by IOC to allow member nations to contribute toward OBIS' continued research and operation into the future. While obstacles (mainly financial) still exist, this resolution was a major step toward guaranteeing OBIS' sustainability beyond 2010 when the Census funding ends.

OBIS is a leading partner in the World Register of Marine Species (WoRMS), an international effort to consolidate the world databases of ocean organisms. Part of this process involves identifying aliases. WoRMS now contains 146,109 validated marine species names, 69 percent of which have been checked for aliases. The final goal of WoRMS is to capture all of the estimated 230,000 marine species by 2010, in synchrony with the completion of the Census.

The Marine Barcode of Life (MarBOL), representing a partnership between the Consortium for the Barcode of Life and the Census, has barcoded more than 12,000 marine species. Its goal is to

barcode 50,000 species by October 2010. MarBOL contributors are also preparing a special collection of papers for *PLoS-ONE* to be available by September or October 2010.

The Census partnered with Google Earth on its version 5.0, which was released in February 2009 and contained the long-awaited ocean layer and enhanced ocean content. The Census has a dedicated layer in Google "Ocean," which means that users who download Google Earth 5.0 automatically have access to geo-referenced information about Census explorations. Thousands of data points, which include images of sea life, video and descriptions of marine species were supplied by the Census' Mapping & Visualization and Education & Outreach Teams, as well as affiliated project GTOPP (Global Tracking of Pelagic Predators—the globalization of the current Census Tagging of Pacific Predators – TOPP project).

Census Coral Reef (CReefs) scientists have been developing and testing Autonomous Reef Monitoring Structures (ARMS), which are colonized by organisms that inhabit coral reefs. ARMS are artificial structures designed to mimic the complex structure of a natural reef. As invertebrates and other reef creatures inhabit the cracks and crevices in the structure, researchers see how colonization of coral reef space occurs. With this information, marine scientists can better understand the health of reefs and policy makers can develop scientifically based management strategies.

In the Census, innovation does not always refer to technology. The COMARGE team took a novel approach in searching for active methane seeps in the Chilean margin. Rather than deploying sophisticated and expensive technologies to locate seep sites, researchers followed the fisherman. They launched their search in known fishing grounds of the Patagonian toothfish, which were suspected to congregate near methane seeps. Their search found some of the fishing grounds had hard carbonate sea floors, associated with methane seeps.

Census projects played a key role in the International Polar Year (IPY), which completed in 2009. In the Arctic, the Census ArcOD project led the IPY marine biodiversity cluster of 13 projects from eight countries on more than 20 expeditions. In the Southern Ocean, the Census CAML project coordinated the science on ten major expeditions by vessels from nine different countries. The Census also initiated a collaborative program, referred to as LA-CAML, focusing on Antarctic marine life in seven South American countries.

Education and Outreach

The Census has had overwhelming success in education and outreach. At the peak of its field phase, the program was named one of the "Six most important experiments in the world" by *Discover* magazine (December 2007) and its studies in the Antarctic were highlighted as one of *Time* magazine's "10 best scientific discoveries" of 2007 (24 December). The reach of its three press releases per year has grown to more than 50 countries and around 20 languages. In 2009, press releases focused on IPY (February) and HMAP (May).

The Census has a successful partnership with National Geographic, which incorporates Census content into its many products such as websites, film, television, short format video, radio, photo galleries, maps, magazines and books. National Geographic's inclusion of Census video, imagery and information significantly increases the visibility of our program. The partnership

has also resulted in an agreement with National Geographic to co-produce the Public Presentation and Press Conference to announce the culmination of the Census' ten years of research. This event—The Census of Marine Life 2010: A Decade of Discovery—will take place in London on October 4, 2010.

The Census partners with the Encyclopedia of Life toward the development of marine species pages. Census websites and electronically available products in 2010 will contain links from taxon names to pages on EOL. Census participants are also contributing information and imagery to EOL. The goal is to have pages for as many of the 230,000 marine species as possible by October 2010.

The Census continues to work closely with Galatée Films on the release of its *Oceans* production. The film is currently scheduled to have its world premier in January 2010 (a delay from what we've previously reported). In various cities around the world where the film is released, the Census will co-organize science symposia with Galatée to promote marine science and the scientific approach of filmmaking.

Program Governance and Administration

The Census international Scientific Steering Committee (SSC), the governing body of the program, meets three times per year. It includes 16 members from around the world:

Dr. Ian Poiner (*Chair*), Australian Institute for Marine Science, Australia
Dr. Victor Ariel Gallardo (*Vice Chair*), University of Concepcion, Chile
Dr. Myriam Sibuet (*Vice Chair*), Ifremer (Retired), France
Dr. Vera Alexander, University of Alaska Fairbanks, USA
Dr. D. James Baker, Science and Management Consultant, USA
Dr. Patricio Bernal, Intergovernmental Oceanographic Commission, France/Chile
Dr. Dorairajasingam Chandramohan, National Institute of Oceanography (Retired), India
Dr. David Farmer, University of Rhode Island, USA
Dr. Serge Garcia, Food and Agriculture Organization (Retired), Italy
Dr. J. Frederick Grassle, Rutgers University, USA
Dr. Carlo Heip, Netherlands Institute of Ecology, Netherlands/Belgium
Dr. Poul Holm, Trinity College Dublin, Ireland/Denmark
Dr. Yoshihisa Shirayama, Kyoto University, Japan
Dr. Michael Sinclair, Bedford Institute of Oceanography, Canada
Dr. Song Sun, Institute of Oceanology, China
Dr. Meryl J. Williams, Future Harvest Alliance Office, Malaysia/Australia

The SSC also includes six ex-officio members, which ensure strong links to important synthesis- and legacy-related efforts within the program:

Dr. Daniel Costa, University of California Santa Cruz, USA ("Census 2020")
Dr. Patrick Halpin, Duke University, USA (Mapping & Visualization)
Ms. Sara Hickox, University of Rhode Island, USA (Education & Outreach)
Dr. Enric Sala, National Geographic Pristine Seas Project, USA/Spain
Dr. Paul Snelgrove, Memorial University, Canada (Census Synthesis)

Dr. Edward Vanden Berghe, Rutgers University, USA/Belgium (OBIS)

The program has 11 formal national and regional committees (NRICs) that are compiling regional synthesis papers, assembling national and regional OBIS datasets and addressing local research priorities. The hope is that the NRIC networks will continue to serve as a legacy of the Census after 2010 and promote Census findings, technologies and approaches to surveying marine biodiversity for societal applications, research and monitoring programs and ocean and coastal observation systems. National committees are located in Australia, Canada, China, Indonesia, Japan and the United States. Regional committees are located in the Caribbean, Europe, the Indian Ocean, South America, and Sub-Saharan Africa. Though not formally established as NRICs, coordinated efforts under the auspices of the Census have been underway in South Korea and the Arabian Sea, and both are expected to contribute to the NRIC synthesis collection in *PLoS-ONE*.

In 2008, the Census formally established a Synthesis Group, chaired by Paul Snelgrove. This group is responsible for oversight and intellectual guidance on the overall synthesis of Census findings. The Synthesis Group meets four times per year.

The Census international Secretariat is located at the Consortium for Ocean Leadership in Washington, D.C. In April 2008, it received renewed funding to continue administering the program through its formal culmination in December 2010. The Secretariat supports two half-time Senior Scientists: Dr. Patricia Miloslavich (Universidad Simon Bolivar, Venezuela) and Dr. Ron O'Dor (Dalhousie University, Canada).

We estimate total commitments to the Census, including ship-time and other contributions, to be about $600 million. These funds come from traditional sources, including governments and private organizations, and support scientific research, outreach and education, and project management.

Plans for 2010

The Census announces its findings in October 2010 and formally ends in December 2010, but Census findings in scientific journals and other publications will appear throughout 2010. In fact, these have already started to appear, including several special issues of journals (e.g., *Zootaxa*, Vol. 2096, *Deep Sea Research II*, Vol. 55(1-2)) focused on Census project findings. The NRIC issue of *PLoS-ONE* and the Wiley-Blackwell project book are scheduled for publication in (northern) spring and late (northern) summer 2010, respectively. All publications will be tracked and incorporated into overall communications efforts throughout the year, including not only press releases but also information through websites, newsletters, blogs and social networking sites. The most significant Census publications in 2010—the digest book, popular book, National Geographic map, and a potential cluster of papers in *Nature*—will be withheld for a formal Public Presentation and associated press release on October 4, 2010. This robust strategy of "rolling out" the products and using a variety of media and publication types will ensure we reach a number of audiences and are not overshadowed by world events by focusing on a single release.

In October 2010, we will hold a series of events in London. These include the Public Presentation and Press Conference (October 4), a science symposium (October 5-6), a "celebration" (October 6) and a final meeting of the Census leadership (October 7). These events are mainly by invitation, but several participants from Census-related SCOR activities would be present, including, but not limited to, Ed Urban, Alex Rogers and David Farmer.

We will continue its partnerships with the Barcode of Life, EOL, Google, National Geographic and Galatée, all of which will contribute to scientific products and/or communications efforts through 2010.

In conjunction with synthesis activities, the Census will also focus efforts on ensuring that findings reach policy-related organizations that can use the information to improve management and conservation in the ocean. The SSC has identified a list of target audiences to this end, including the Convention on Biological Diversity, the Intergovernmental Oceanographic Commission, and the International Union for Conservation of Nature. An ancillary goal of these efforts is building ongoing support for marine biodiversity research beyond 2010.

Also toward building support for ongoing research, the SSC fostered an ad hoc group—the Census 2020 Science Council—to identify research priorities and the "next big things" for marine biodiversity science. From this, the hope is that the science community can develop a plan and seek support. Ed Urban, SCOR Executive Director, participated in the Census 2020 meetings.

Relationship to other SCOR activities

CoML has ongoing collaboration with the SCOR Panel on New Technologies for Observing Marine Life. Chaired by Alex Rogers (Institute of Zoology, London), this Panel makes recommendations to the CoML projects regarding technologies that are applicable to their research and more broadly communicates the benefits and potential of novel technologies for studying marine life. This year the Panel will hold a workshop on Ocean Biology Observatories (September) to outline observatories that could address the challenges of observing ocean life and its response to global change. The Panel will produce a series of papers for a special collection in *PLoS-ONE* that will summarize the Census' impact on and use of technologies. Finally, the Panel has financially supported two cross-project synthesis efforts within the Census—"Animals as Oceanographers" and "Integrating tag technologies of the Census Tagging of Pacific Predators and Pacific Ocean Shelf Tracking projects."

The Census is actively promoting methodologies and technologies to the ocean observing community, namely the Global Ocean Observing System (GOOS) and the Global Earth Observing System of Systems (GEOSS). Ron O'Dor, Census Senior Scientist, will organize a community forum on biodiversity at the September 2009 OceanObs conference, in which SCOR Technology Panel members will participate. We work with the Partnership for Observation of the Global Oceans (POGO) on many of our efforts with the observing community and also look to SCOR, specifically the Technology Panel to support us, as appropriate.

The Census participated in the SCOR 50th Anniversary meeting in October 2008, as well as the third Summit of Marine Programs in March-April 2009. The Census shares—and supports to the extent possible—SCOR's goals toward community collaboration, data sharing, education and

outreach, and capacity building.

There is natural cross-over between CoML and SCOR through their vast networks of scientists. CoML shares active personnel with both SCOR-sponsored programs IMBER and GLOBEC. Ann Bucklin, Principal Investigator of the Census CMarZ and leader of the Census' integrative initiative in DNA barcoding (MarBOL), is a former member of the IMBER SSC. Mike Roman, a former member of the Census U.S. Committee, is a current member of the IMBER SSC. Dave Karl, of the CoML ICoMM project, and Rory Wilson, of TOPP, are on the joint IMBER-GLOBEC working group for "end-to-end food webs." Ruben Escribano, former chair and current member of the CoML South American regional committee, and Jeff Runge, an advisor to the CoML Gulf of Maine project, are current members of the GLOBEC SSC. Peter Wiebe, a participant of the Census CMarZ project, leads U.S. GLOBEC in Georges Bank. Additional personnel from CMarZ, TOPP, MAR-ECO, and the Gulf of Maine projects are active in GLOBEC regional and science activities. Senior Scientist Ron O'Dor participates in CLIOTOP meetings.

Additionally, many of the individual Census projects have partnerships with other programs of interest to SCOR. The Chemosynthetic (ChEss) project collaborates with InterRidge, a SCOR Affiliated Program, on cruises, workshops and database development. The Census ArcOD and CAML projects were lead coordinating projects for marine biology in the International Polar Year. Through our efforts to integrate Census and ocean technologies and data into GOOS and GEOSS, we work closely with POGO, which is also a close partner of SCOR in many activities.

7.3.3 International Antarctic Zone Program - iAnZone (Affiliated in 1996)

Goal and Objectives:
The primary goal of the international Antarctic Zone (iAnZone) program is to advance our quantitative knowledge and modeling capability of the seasonal cycle and interannual variability of the ocean and its sea ice cover, with emphasis on climate-relevant fluxes that couple the Antarctic Zone to the atmosphere and to the global ocean. The iAnZone group has been involved in the development and coordination of three large Antarctic zone projects and also organizes meetings intended to inform others of national research and field programs for the purpose of "value-added" linkages among the participants.

Terms of Reference

- To identify, develop, and coordinate research projects meeting the iAnZone goal.
- To provide a forum for the exchange of iAnZone research plans, results, and data.
- To participate in and assist with the coordination between Antarctic Zone and global climate research programs, with other Southern Ocean programs, and with colleagues.
- To advise SCOR on the development of appropriate observing system (e.g., for GOOS, GCOS), data sets, and modeling strategies needed to understand the scales and mechanisms of climate variability within the Antarctic Zone.

For more detailed information on iAnZone's scientific programs, see their Web site at http://www.ldeo.columbia.edu/physocean/ianzone/

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Executive Committee Reporter: Jorma Kuparinen

7.3.4 International Marine Global Change Study (IMAGES) (affiliated in 1995)

IMAGES (International Marine Global Change Study) is a program of Past Global Changes (PAGES), a core project of the International Geosphere-Biosphere Programme (IGBP), and is affiliated with SCOR. IMAGES was initiated to respond to the challenge of understanding the mechanisms and consequences of climatic changes using oceanic sedimentary records. The overriding IMAGES science issue is to quantify climate and chemical variability of the ocean on time scales of oceanic and cryospheric processes; to determine its sensitivity to identified internal and external forcings, and to determine its role in controlling atmospheric CO_2. In order to achieve these scientific objectives, IMAGES proposes to coordinate a global program to collect and study marine sediment records to address three fundamental questions:

1. How have changes in surface ocean properties controlled the evolution of global heat transfer through the deep and surface ocean and thereby modified climate?
2. How have changes in ocean circulation, ocean chemistry, and biological activity interacted to generate the observed record of atmospheric pCO_2 over the past 300 kyr?
3. How closely has continental climate linked to ocean surface and deep-water properties?

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D. Kroon	NETHERLANDS		

Director: Ralph Schneider
Executive Committee Reporter: John Compton

7.3.5 InterRidge - International Ridge Studies (affiliated in 1996)

Terms of reference:

- To build and maintain an interactive international ridge-research community
- To identify, through InterRidge working groups and the workshops and conferences they organize, the most compelling questions in ridge research and develop program plans to address these questions
- To continue to develop scientific, technical and logistical co-operation among nations and to strengthen international foundations for innovative research.
- To provide current information about research activities through the InterRidge website and *IR News*.
- To encourage participation of smaller oceanographic countries and individual scientists from non-seagoing countries.
- Through education and outreach, to communicate the importance and excitement of ridge research to the general public and decision makers worldwide.
- To act as a representative body for international ridge scientists in policy discussions.

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		Steve Scott	CANADA

Coordinator: Stace Beaulieu

Executive Committee Reporter: John Compton

2009 InterRidge Update for SCOR

The InterRidge (IR) program office is now in its third year at Woods Hole Oceanographic Institution (WHOI). The IR office will remain at WHOI through the end of 2009 and is led by a multi-disciplinary team: Jian Lin (IR Chair, marine geophysics/tectonics/geodynamics), Chris German (IR Co-Chair, geochemistry/hydrothermal activity), and Stace Beaulieu (IR Coordinator, deep-sea biology). In the past year, IR expanded from 30 to 31 regional and national memberships with the addition of Bulgaria as a Corresponding Member. The ~2,500 individual members in IR now come from a total of 62 countries. The biweekly "interridge-mail" e-news is sent to more than 1,600 IR members, and our e-mailing list for job postings ("interridge-classifieds") has more than 150 IR members. The IR office will move to the National Oceanography Centre, Southampton, UK, for 2010-2012, with Bramley Murton and Jonathan Copley as new Chair and Co-chair, respectively.

InterRidge (http://www.interridge.org) promotes interdisciplinary, international studies of oceanic spreading centers by creating a global research community, planning and coordinating new science programs that no single nation can achieve alone, exchanging scientific information, and sharing new technologies and facilities. InterRidge is also dedicated to reaching out to the public, scientists and governments, and to providing a unified voice for ocean ridge researchers worldwide.

IR Working Groups (WGs) play an essential role in promoting, facilitating, and coordinating new research that follows a focused theme of emerging scientific promise, or is conducted in a unique geographic setting along global ridge-crests where advances in science will benefit significantly from IR coordination. The WGs discuss issues related to focused science themes, convene group meetings and community-wide workshops, and promote and coordinate new international research cruises and related work. There are 7 IR WGs active in 2009.

Following are just a few examples of exciting progress of the IR WGs in the past year:

InterRidge co-sponsoring SCOR WG 135

• *Hydrothermal energy and ocean carbon cycles (Contact: Nadine Le Bris, France, and Chris German, USA)*

InterRidge is pleased to serve as co-sponsor for the new SCOR WG 135: "Hydrothermal energy transfer and its impact on ocean carbon cycles." This is the first SCOR WG in over ten years to derive from IR activities. The WG will hold its first meeting in Woods Hole, MA, USA, in Nov. 2009.

Recommendations from Seafloor Mineralization WG

• *Seafloor mineralization (Contact: Maurice Tivey, USA)*

Members of the Seafloor Mineralization WG helped to organize a Science and Policy Workshop on Deep-Sea Mining of Seafloor Massive Sulfides, held in Woods Hole, MA, USA, in April

2009. The WG met in a closed session following the workshop and produced a set of scientific questions and recommendations that was submitted to the International Seabed Authority in advance of their annual session at which the draft regulations for polymetallic sulfides was discussed. The WG meeting report is available online at: http://www.interridge.org/node/5797. A sound scientific base of knowledge would both advance science and also inform the commercial and political world of the importance of these multi-faceted resources and encourage responsible development. Following the meeting, two members of the WG proposed a workshop which IR will co-sponsor in 2010: "Design of Marine Protected Areas for Chemosynthetic Ecosystems Potentially Threatened by Human Activities in the Deep Sea."

Deep-Earth Sampling WG involved in several international meetings

• *Deep-earth sampling (Contact: Benoit Ildefonse, France)*

Members of the DES WG have been active in this past year, in preparation for the upcoming IODP New Ventures in Exploring Scientific Targets (INVEST) workshop in Sept. 2009. The focus of this meeting is to define the scientific research goals of the second phase of the IODP, expected to begin late in 2013. In addition to holding a WG meeting at the AGU Fall Meeting in Dec. 2008 and a pre-INVEST workshop in July 2009, titled "Melting, Magma, Fluids, and Life," the WG is involved in an ECORD Summer School on "Geodynamics of Mid-Ocean Ridges."

4th International Symposium on Chemosynthesis-Based Ecosystems (CBE)

• *Vent ecology (Contact: Stephane Hourdez, France, and Yoshi Fujiwara, Japan)*

The new IR Vent Ecology WG held its first meeting during the 4th CBE Symposium in July 2009 in Okinawa, Japan. The WG is spearheading efforts to promote the sharing of biological specimens collected at hydrothermal vent sites and international collaboration for high throughput genomic sequencing efforts.

First meeting of Long-Range Exploration WG

• *Long-range ridge exploration (Contact: Colin Devey, Germany)*

The goal of the LRE WG is to promote international collaboration and develop strategies for the use of cutting-edge AUV technology and state-of-the-art sensors in the systematic exploration of ridge hydrothermal and other processes on regional and ocean-basin scales. This WG will hold its first meeting in Woods Hole, MA, USA, in Sept. 2009.

Other InterRidge Office activities in 2009

In 2009 we also expanded the IR Student and Postdoctoral Fellowship Program (http://www.interridge.org/fellowship), thanks to a grant from the International Seabed Authority Endowment Fund. Two Fellowships of $5000 US each were awarded in May 2009. These fellowships are designed to encourage international collaboration on any aspect of ridge-crest science by graduate students and postdocs. The ISA-funded fellowships are geared towards young researchers in developing countries.

The IR Coordinator Stace Beaulieu has teamed with Edward Baker (NOAA PMEL) and IR Co-Chair Chris German to revise the InterRidge Global Hydrothermal Vent Fields Database. This database is expected to be posted to the IR website and submitted as a manuscript by the end of the year.

For more information about IR's recent activities as well as national updates, please check the IR website and most recent newsletter (http://www.interridge.org/IRNewsletter) or contact the IR office (coordinator@interridge.org) for a hard copy of the 2009 InterRidge News which will be published in Nov. 2009.

Jian Lin (InterRidge Chair), Chris German (InterRidge Co-Chair), Stace Beaulieu (InterRidge Coordinator)

7.3.6 International Ocean Colour Coordinating Group (IOCCG) (Affiliated in 1997)

IOCCG is an international group of experts in the field of satellite ocean colour that acts as a liaison and communication channel between users, managers, and agencies in the ocean colour arena.

Terms of Reference:

- To serve as a communication and coordination channel between data providers and the global user community of satellite ocean-colour data, and so to maximize the benefits that accumulate from international investments in ocean-colour science and technology.
- To construct a partnership, at the international level, between the space agencies and the users of satellite ocean-colour data to develop and coordinate data utilization.
- To work closely with the appropriate international bodies (including CEOS, IOC and SCOR), international scientific programs (such as IGBP and GOOS), satellite ocean-colour mission offices and other agencies (such as environmental and fishing agencies) to harmonize the international effort and advance ocean-colour science and its applications.
- To develop a collective voice for the community of users of ocean-colour data and to articulate this voice to the appropriate international bodies, international scientific programs and space agencies.
- To promote the long-term continuity of satellite ocean-colour data sets; the development of operational, ocean-colour data services and new generations of ocean-colour sensors; and the integration of data from complementary ocean sensors.

Chair:

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Membership:

Yu-Hwan Ahn	KOREA		
David Antoine	FRANCE	Milton Kampel	BRAZIL/INPE
Stuart Bernard	SOUTH AFRICA	Samantha Lavender	UK
Hans Bonecamp	Eumetsat, EC	Zhihua Mao	CHINA-Beijing
Paula Bontempi	USA/NASA	Hiroshi Murakami	JAPAN
Yves Crevier	CANADA	Rangnath Navalgund	INDIA
Curtiss Davis	USA/Naval Res. Lab	Peter Regner	ITALY
Paul DiGiacomo	USA	Tasuku Tanaka	JAPAN
Roland Doerffer	GERMANY	Eric Thouvenot	FRANCE/CNES
Mark Dowel	ITALY/JRC	Scarla Weeks	AUSTRALIA
Nicolas Hoepffner	ITALY/JRC		

Executive Committee Reporter: Jorma Kuparinen

SCOR AFFILIATED PROGRAM

International Ocean-Colour Co-ordinating Group (IOCCG) Report of Activities 2008 - 2009

Venetia Stuart (IOCCG Project Scientist)

1. Background

The International Ocean-Colour Co-ordinating Group (IOCCG) was founded in 1996 under the auspices of the IOC (Intergovernmental Oceanographic Commission), and has been an Affiliated Program of SCOR since 1998. It is also an Associate Member of CEOS (Committee of Earth Observation Satellites). The group was established to encourage communication and international co-operation between the providers of ocean-colour data (*i.e.* the various space agencies that possess ocean-colour sensors), and the users of ocean-colour data (scientists, researchers and program managers). Information retrieved from ocean-colour remote sensing can contribute to our understanding of the planetary carbon cycle and climate research, as well as other biological and biogeochemical processes in the oceans. Ocean-colour data also has many other important applications including management of marine resources and coastal zone monitoring and management.

The IOCCG consists of a Committee of around 20 members, comprised of scientific members (selected experts in the field of satellite ocean colour), as well as agency members (representatives from various space agencies providing sponsorship). The group is currently chaired by Prof. James Yoder (Woods Hole Oceanographic Institution, USA) who will step down in January 2010 and will be replaced by Dr. David Antoine (LOV, Villefranche). The IOCCG Project Office is located at the Bedford Institute of Oceanography (Canada), and is staffed by Project Scientist, Dr. Venetia Stuart.

2. Scientific Activities

Scientific issues related to various aspects of ocean-colour technology and its applications are traditionally addressed by scientific working groups (WGs). The end product of these working groups is generally the publication of an IOCCG Report. To date, seven such reports have been published by the IOCCG, and three others are ready for publication, including a report prepared by the SAFARI Project which is addressing GEO Task AG-06-02. These reports are always in high demand by scientists, managers and students from around the world. Another four IOCCG WGs are in various stages of deliberation, and a new WG on "Ocean Colour Level-1 Requirements", to be led

by NASA, was proposed and accepted at the last IOCCG meeting. Information on all these working groups and projects is given below.

2.1 Recently Completed IOCCG WGs (reports in press)

The IOCCG reports from the three working groups listed below are in various stages of publication, ranging from being edited and formatted to being ready for printing and distribution. It is anticipated that at least two of the three will be printed this year.

2.1.1 Global Ecological Provinces WG. Chairs: Mark Dowell (JRC, Italy) and Trevor Platt (Plymouth Marine Laboratory, UK)

The final report of this WG has been reviewed by the IOCCG Committee and has been accepted for publication, and should be printed within the next few months (IOCCG Report 8: "*Partition of the Ocean into Ecological Provinces: Role of Ocean Colour Radiometry"*). The aim of the working group was to review the utility of ocean partitions as a tool for the interpretation and application of ocean-colour data, including applications dealing with the ocean carbon cycle, climate change and resource management. The report will be distributed free of charge to all members on the IOCCG mailing list.

2.1.2 Atmospheric Correction Algorithm WG. Chair: Menghua Wang (University of Maryland, USA)

The working group has completed a number of inter-comparison exercises, and have prepared a draft report, which was recently reviewed by the IOCCG Committee. The report was accepted for publication and should be printed later this year/early 2010. Since atmospheric correction is a key procedure in ocean-colour remote sensing, it is important to have quantitative evaluations and comparisons for the performance of the atmospheric correction algorithms used to derive global ocean-colour products from various ocean colour-sensors. The objectives of this WG included quantifying the performance of atmospheric correction algorithms used by SeaWiFS, MODIS, OCTS, GLI and MERIS missions, so that derived products from these ocean-colour missions can be meaningfully compared and possibly merged. The final report will be distributed free of charge to all members on the IOCCG mailing list.

2.1.3 SAFARI Project

The Group on Earth Observations (GEO) established Task AG-06-02 to stimulate interest in the use of remote sensing as an important tool to address problems in fisheries research and management. An element of the Task is the SAFARI Project (Societal Applications in Fisheries and Aquaculture using Remote Sensing Imagery), directed by Trevor Platt and Venetia Stuart (Project Scientist Marie-Helene Forget), and funded by the Canadian Space Agency and GEO. The SAFARI initiative hosted an international workshop on the Use of Remotely-Sensed Data as an Aid to Fisheries Research and Fisheries Management in March 2008 to bring together EO and

fisheries experts from a range of communities, and to prepare an outline for an IOCCG monograph on this topic. The final report has been accepted for publication by the IOCCG Committee, and is currently being edited and formatted, and should be printed within the next few months.

2.2 On-going IOCCG WGs

Three of the four IOCCG working groups listed below are relatively new and have been making good progress. The fourth WG (2.2.1 Calibration WG) has been in existence for some time, and may be incorporated into the new Level 1 Requirements WG report (Item 2.3.1).

2.2.1 Calibration of Ocean-Colour Sensors WG. Chair: Robert Frouin (Scripps, USA)

This WG has examined the various approaches used for pre- and post-launch calibration of different ocean-colour sensors, but the final report is still not ready for publication. At the last IOCCG Committee meeting (April 2009), the consensus of the various agencies was that this was an important working group and an important topic, and that it was essential to get the material published. A suggestion was made to incorporate the completed chapters in the newly proposed working group on Level 1 Requirements since it was so relevant to the topic (see Item 2.3.1 below). This option will be further discussed once the draft report of the Level 1 Requirements WG has been prepared. Alternatively, the Calibration report will be published as is, when it has been finalised.

2.2.2 Bio-optical Sensors on Argo Floats WG. Chair: Hervé Claustre (Laboratoire d'Océanographie de Villefranche, France).

Ocean-colour radiometry is a powerful tool, but has some limitations (cloud cover, calibration problems *etc*.). To reach its full potential it must be complemented with other techniques, *e.g.* making use of Argo-like floats. A network of ~ 3,000 Argo profiling floats currently samples the global ocean for temperature and salinity. Argo floats with optical/ biogeochemical sensors have the potential to provide high density, biogeochemical data at relatively low cost, and present a very promising avenue for synergetic applications with remote sensing of ocean colour, including calibration/validation activities.

This WG has met twice over the past year (February and November 2008, Villefranche, France), and the group proposed three types of Argo-like floats for bio-optical activities: the CAL-VAL-float (for validation only), the BIO-ARGO (for biogeochemistry and validation) and the Carbon-float (for a more complete range of biogeochemical measurements, including carbon). A pilot study was also recommended to initiate interactions with other groups before developing large-scale applications. A draft IOCCG report is in preparation and should be available for comment and discussion by the end of the year. NASA is interested in funding the pilot BIO-Argo study, especially since the data will be useful to study carbon cycle processes.

2.2.3 Phytoplankton Functional Types (PFT) WG. Chair: Shubha Sathyendranath (PML, UK)

PFTs are conceptual groupings of phytoplankton species which have an ecological functionality in common *e.g*. nitrogen fixers or calcifiers. They are of interest to the biogeochemical community because they are relevant proxies of ecosystem function and can be potentially derived from ocean-colour remote sensing through direct or indirect effects. A draft report is being prepared by the WG. Chapter 1 is complete and provides an introduction and background to PFTs, Chapter 2, dealing with complementary *in situ* methods of measuring phytoplankton functional types, is in preparation, while the rest of the report is still in the planning stages. Chapter 3 will deal with various remote-sensing algorithms used to examine functional types, while Chapter 4 will examine how various approaches are complementary to each other, with the advantages and disadvantages of each method. The WG is avoiding a timeline, but will complete their work as fast as possible, mostly via email.

2.2.4 Ocean Colour from a Geostationary Platform. Chair: David Antoine (LOV, France)

The motivation behind the formation of this WG was that several projects have been submitted to various agencies (ESA, NASA, CNES) in the past decade for ocean-colour geostationary platforms, and one is scheduled for launch this year (GOCI on COMS-1, from Korea). The interest for such observations is growing, and other missions might be scheduled within the next 5 years, so it is important for the IOCCG to contribute by setting up requirements, advocating for coordination and fostering collaboration among the Agencies. Geostationary ocean-colour observations will provide better temporal coverage, as well as the possibility of following episodic events at the scale of hours, and will also improve the match between the temporal scale of satellite observations and those of models. The first meeting of this WG took place in South Korea in conjunction with the Korean GOCI workshop (November 2008). An outline of an IOCCG report was drafted at the meeting, and a draft report should be available by the end of this year. The report will include chapters on science questions and applications, requirements for ocean-colour observations from a geostationary platform, calibration requirements, algorithm specificities and synergistic aspects.

2.3 New IOCCG WGs

Proposals for four new IOCCG working groups were received at the last IOCCG Committee meeting, one of which was accepted to move forward (see below), while the other three were placed on hold until after the completion of the current on-going WGs.

2.3.1. Level-1 Requirements

A proposal for a new IOCCG WG on Level 1 Requirements for Ocean Colour Sensors was put forward by NASA at the last IOCCG meeting (April 2009). Perspectives have changed dramatically over the past 10 years since publication of the first IOCCG report on *Minimum Requirements for an Operational Ocean Colour Sensor for the Open Ocean* (IOCCG Report 1, 1998). It is now possible to measure more complex ocean variables, as well as physiological

features of phytoplankton using ocean-colour radiometry. All sensors listed in Report 1 (apart from SGLI) have already been launched, and for ocean biology, the minimum requirements have changed dramatically in the past decade, and the range of applications has multiplied. New ocean radiometers require many more bands so the current suite of requirements as listed in IOCCG Report 1 require updating. It was proposed that a new report on Level-1 requirements should be prepared, which should also include pre-launch and on-orbit requirements, including vicarious calibration and on-orbit calibration (it was proposed to use the material already written from the Calibration WG for this section). This report should also address desired measurements for which there is no capability at the present time *e.g*. mixed layer depth. The proposal for this new WG was accepted by the IOCCG Committee and it was recommended that Bryan Franz (NASA) be approached to act as Chair of the WG.

3. Capacity Building Initiatives

The IOCCG also has a strong interest in capacity building and has sponsored and coordinated numerous advanced training courses in many parts of the world. This year the IOCCG is co-sponsoring two training events:

3.1 Training Course on Inversion Procedures (10-14 August 2009, Germany)

The GKSS Research Centre (Geesthacht, Germany), in conjunction with the IOCCG, will be conducting an advanced training course/workshop on inversion procedures in ocean-colour remote sensing on 10-14 August 2009 in Hamburg, Germany. The course is being organised by Dr. Roland Doerffer (GKSS) and will deal with complex waters with different optical components. The objectives of the workshop are to provide participants with an overview of inversion methods and models, as well as to prepare bio-optical models and training data sets for inversion methods. Using these data, participants will be taught how to use various inversion techniques. The course is intended for scientists or advanced graduate students working with ocean-colour data in coastal waters. All participants should have a strong mathematical background as well as experience in programming. A number of scholarships will be available to help defray expenses.

3.2 Ocean Colour Training Course (12 - 23 October 2009, Tanzania)

The Joint Research Centre (EC), in conjunction with the IOCCG, is offering a training course on "*Methods and Applications of Ocean Colour Remote Sensing in African Coastal and Regional Seas*". The course will take place on 12-23 October 2009 at the University of Dar-es-Salaam, Zanzibar, Tanzania and will be co-sponsored by several organisations. The course is intended for scientists, environmental managers, graduate students, and post-doctoral fellows from all African and Western Indian Ocean countries. Candidates should be fluent in English and have adequate computer skills. A limited number of scholarships will be awarded to help cover travel and accommodation expenses (IOCCG will be sponsoring three students from West Africa).

4. Coordination and Liaison

4.1 Annual IOCCG meeting

The IOCCG Committee meets once a year to coordinate the activities of the group as a whole, and to review the progress of the various working groups, discuss plans for the year ahead and propose new working groups and training initiatives. The last meeting of the IOCCG Committee was hosted by the Second Institute of Oceanography (SIO), State Oceanic Administration (SOA), China and took place in Hangzhou (20-22 April 2009). The meeting was attended 19 Committee members plus 9 invited participants, and provided an excellent opportunity for all parties to come together to share ideas and discuss issues facing the ocean-colour community in various parts of the world, as well as to plan a number of new initiatives. The minutes of the meeting are available on the IOCCG website at http://www.ioccg.org/reports/ioccg_meeting14.html. The Committee meeting was followed by an International Ocean Colour workshop (23-24 April 2009), which was attended by many young ocean-colour scientists from the area as well as IOCCG Committee members. The agenda for the workshop, plus all the presentations can be viewed at: http://oceancolor.soed.org.cn/index.htm

The IOCCG Executive Committee also meets once a year to discuss the finances of the group and to make decisions on proposals for new IOCCG working groups, training initiatives, requests for funding, proposals for new members, and other issues. The next IOCCG Committee meeting will be hosted by INPE (Brazilian Space Agency), and is scheduled to take place in Brazil on 18-20 January 2010.

4.2 IOCCG's Contribution to GEO and CEOS

The role of CEOS is to coordinate all Earth observation satellites and to act as the main implementation body for the space segment of GEOSS (Global Earth Observation System of Systems) through the Strategic Implementation Team (SIT). The Group on Earth Observations (GEO), in turn, coordinates international efforts to build a GEOSS, targeted at nine societal benefit areas. A number of GEO work plan tasks are related to IOCCG's remit:

4.2.1 AR-09-02a (Ocean Colour Radiometry-Virtual Constellation)

CEOS recently developed the concept of virtual, space-based "*Constellations*" in support of GEO objectives and as a space component of GEOSS. A Constellation is a coordinated set of space and/or ground segment capabilities from different partners that focus on observing a particular parameter or set of parameters of the Earth system. The IOCCG recently proposed the "Ocean-Colour Radiometry─Virtual Constellation (OCR-VC)" which has since been accepted by CEOS. The OCR-VC will provide long time series of calibrated ocean-colour radiances at key wavelength bands from measurements obtained from multiple satellites. An Implementation Plan is currently being drafted for Phase 1 OCR-VC activities and will include calibration, validation, merging of satellite and *in situ* data, product generation, as well as development and demonstrations of new and improved applications, and capacity building activities. A final draft of the implementation plan will be submitted at the upcoming SIT meeting (September 2009, Darmstadt, Germany). All space

agency representatives serving on the IOCCG Committee fully support the OCR-VC and are taking a leadership role in the activities. The OCR-VC group is Co-Chaired by Hiroshi Murakami (JAXA, Japan) and Mark Dowell (JRC, EC).

4.2.2 AG-06-02 (Data Utilization and Aquaculture)

IOCCG is playing major role in this GEO task by enhancing utilization of Earth observations in fisheries and aquaculture through the SAFARI Project (see Section 2.1.3 above for further details).

4.2.3 EC-09-01a (Ecosystem Classification and Mapping)

This task was established to coordinate and improve the observation, characterization and monitoring of terrestrial, freshwater, and ocean ecosystems – especially in terms of acquisition and use of satellite and *in-situ* observation. One of the goals is to promote the characterization and mapping of ocean ecosystems at regional and global scales. This topic is the focus of the IOCCG working group investigating the partitioning of the ocean ecosystem into biogeographical provinces using ocean-colour data as an aid in delineating the boundaries (see Item 2.1.1. above). Ocean-colour partitions can be applied to global-scale oceanographic problems such as the ocean carbon cycle and climate change, as well as to management of marine resources in general, and to fisheries management in particular.

4.2.4 EC-09-01c (Regional Networks for Ecosystems)

This Task is building upon existing initiatives (*e.g*. the ANTARES Programme, created under the auspices of the IOCCG) to develop a global network for ecosystems, and to coordinate activities to strengthen observing capacity in developing countries, which is also one of IOCCG's long-standing objectives. The ChloroGIN activity was established to form a global network of networks whose goal is to define a model for international sharing of resources to promote coastal ecosystem observations (both satellite and *in-situ*) within GEO. The primary satellite dataset considered in ChloroGIN is ocean-colour radiometry. Several specific IOCCG activities directly contribute to ChloroGIN's developments including IOCCG support to capacity building through intensive training courses as well as contributions by several IOCCG WGs (*e.g.* proposed regional algorithm WG).

5. Outreach

The IOCCG connects with the global user community through a variety of outreach information schemes including a website, newsletters, training courses, brochures, reports and information sessions at conferences and workshops. The comprehensive IOCCG website (see http://www.ioccg.org) provides a wealth of information on data sources, software, training opportunities, conferences, an extensive bibliography, employment opportunities and status of current and future ocean-colour sensors. In addition, the Project Office distributes a quarterly electronic newsletter to more than 1,000 subscribers, keeping the ocean-colour user community informed of important events, research activities, training initiatives and mission status news. The IOCCG Reports are distributed free of charge to the ocean-colour user community and the IOCCG

brochure entitled *"Why Ocean Colour? The Societal Benefits of Ocean Colour Radiometry"* is now available in Portuguese, Spanish and Japanese (Chinese and Korean in press).

6. Current Membership of the IOCCG

The IOCCG Committee consists of about 20 members drawn from Space Agencies and the ocean-colour community, selected to reflect a balance of both providers and users of ocean-colour data, as well as geographical location. The term of service is usually three years except where the members' participation is governed by a Space Agency nomination. Rotation of members is being implemented according to a roster (three members marked with an asterisk are expected to step down after the next Committee meeting). The group is currently chaired by Prof. James Yoder (Woods Hole Oceanographic Institution, USA) and will be taken over by Dr. David Antoine in January 2010.

IOCCG Committee Members (2009/2010)

Ahn, Yu-Hwan	-	Korea Ocean Research and Development Institute, Korea
Antoine, David (incoming Chair)		Laboratoire de Physique et Chimie Marines, France
Bernard, Stewart	-	University of Cape Town, South Africa
Bonekamp, Hans	-	Eumetsat, EC
Bontempi, Paula	-	NASA HQ, USA
Crevier, Yves	-	Canadian Space Agency, Canada
Davis, Curtiss*	-	Oregon State University, USA
DiGiacomo, Paul	-	NOAA, USA
Doerffer, Roland	-	GKSS, Germany
Dowell, Mark*	-	JRC, Italy
Hoepffner, Nicolas	-	Joint Research Centre, Italy
Kampel, Milton	-	INPE, Brazil
Lavender, Samantha*	-	University of Plymouth, UK
Mao, Zhihua	-	Second Institute of Oceanography, China
Murakami, Hiroshi	-	JAXA EORC, Japan
Navalgund, Rangnath	-	ISRO, India
Regner, Peter	-	ESA/ESRIN, Italy
Tanaka, Tasuku	-	Yamaguchi University, Japan
Thouvenot, Eric	-	CNES, France
Weeks, Scarla	-	University of Queensland, Australia
Yoder, James (Chair)	-	Woods Hole Oceanographic Institution, USA

7. List of Sponsors

Activities of the IOCCG are dependent upon financial contributions from national Space Agencies and other organisations, and upon infrastructure support from SCOR. Representatives from the funding agencies form members of the Executive Committee. This year the IOCCG received new sponsorship from the Indian Space Research Organisation (ISRO).

- CNES (Centre National d'Etudes Spatiales, France)
- CSA (Canadian Space Agency)
- DFO (Department of Fisheries and Oceans, BIO, Canada)
- ESA (European Space Agency)
- GKSS (Germany)
- ISRO (Indian Space Research Organisation)
- JAXA (Japan Aerospace Exploration Agency)
- JRC (Joint Research Centre, EC)
- KORDI (Korean Oceanographic Research Institute)
- NASA (National Aeronautics Space Administration)
- NOAA (National Oceanic and Atmospheric Administration)

The Bedford Institute of Oceanography (Department of Fisheries and Oceans, Canada) has been providing in-kind support since the project's inception (office space, computer, informatics support, fax, phone and postage). The Brazilian Space Agency (INPE) and the National Centre of Earth observation (NCEO, UK) have indicated that they are interested in sponsoring IOCCG activities in 2010. SCOR provides logistic support and also manages the NASA funds. The IOCCG has benefited from the efficient and professional manner in which its funds have been managed by SCOR, and it has also been strengthened by having visible links with one of the major international and intergovernmental organizations in the marine sphere.

7.4 Other Organizations

7.4.1 Partnership for Observation of the Global Ocean (POGO)

7.4.2 Arctic Ocean Sciences Board

Science Report Ocean Sciences Board of the Arctic

The mission of the Scientific Standing Committee for Marine Sciences: Arctic Ocean Sciences Board (AOSB) is to facilitate multidisciplinary multinational science research in the Arctic Ocean and surrounding seas. The AOSB has fulfilled this mission by focusing its activities in three priority areas. These are:

- The state and fate of Arctic perennial sea ice;
- Long-term study of the geological record of the Arctic Ocean; and
- Improving our understanding of the feedbacks between physical drivers, biological production and biogeochemical cycles.

The state and fate of Arctic perennial sea ice

The integrated Arctic Ocean Observing System (iAOOS), conceived and sponsored by AOSB, was a coordination proposal approved by the IPY Joint Committee in 2006. It is designed to optimize the cohesion and coverage of monitoring of the Arctic Ocean and surrounding seas during the IPY.

The focus of iAOOS is Arctic change, particularly the fate of perennial arctic sea-ice and the climatic and social effects of its disappearance. iAOOS has viewed the ocean-atmosphere-cryosphere system of high northern latitudes operating as a complete system for the first time with an aim to understanding this system and testing its predictability. Because of key technological advances, we had the means to measure almost any key variable at almost any place and time that we needed to describe the ocean-atmosphere-cryosphere system of high latitudes. The IPY provided the necessary stimulus for piecing together the available PIs, gear, ships and funding on the pan-Arctic scale that seemed necessary to making the attempt.

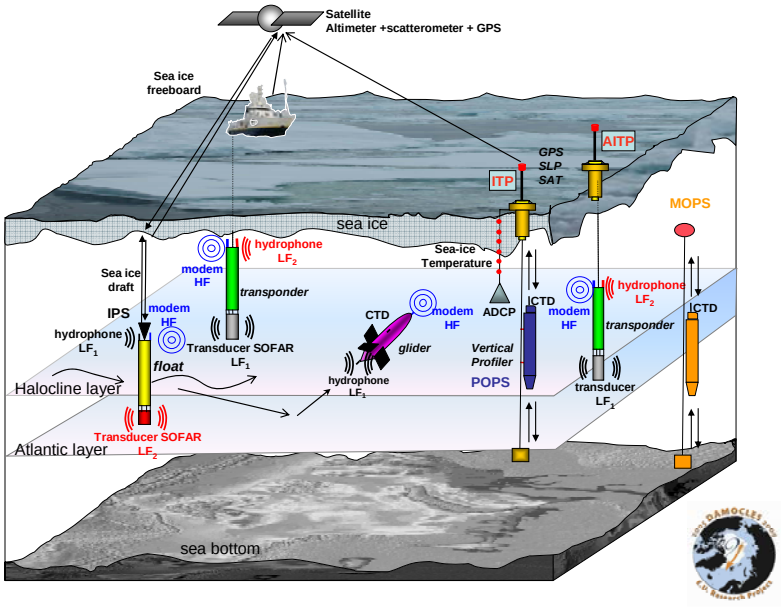

Figure 1. Damocles depiction of measurements taken from space to seabed**.**

The many tasks and initial results of iAOOS are outlined in two reports developed for the AOSB by Dr. Robert Dickson of CEFAS in the UK. The reports together, "The integrated Arctic Ocean Observing System (iAOOS) in 2007" and its sister report "The integrated Arctic Ocean Observing System (iAOOS) in 2008," provide a complete account of the main activities of iAOOS during the IPY, including cruises taken, instrumentation deployed, and measurements made. The reports attempt to describe first results of iAOOS. It is important to note that the results from iAOOS could only be achieved through the intense international collaboration taking place during the IPY. The 2008 report concludes with key recommendations of observation tasks and methods which should be sustained into the so-called IPY legacy phase. As Dr. Dickson explains in his Nature Geosciences commentary from the June 2009 issue, "Paradoxically, as the International Polar Year ends, we enter its most important phase. Now we must decide—and quickly—which mix of observations to sustain, based on what we have learnt."

In 2009, the Arctic Ocean Sciences Board, as the Scientific Standing Committee on Marine Sciences for IASC, will support the development of a legacy phase report by Dr. Dickson. The report aims to develop, with the help of 12-15 key scientists from various countries and disciplines, a fully-costed proposal for an integrated, sustained and pan-Arctic observing effort focused on the role of the northern seas in climate. The report will be ready in time for the post-IPY conference in Oslo in June 2010.

Long-term study of the geological record of the Arctic Ocean

The modern Arctic Ocean appears to be changing faster than any other region. To understand the potential extent of high latitude climate change, it is necessary to sample the history stored in the sediments filling the basins and covering the ridges of the Arctic Ocean. These sediments have been imaged with seismic reflection data, but, except for the superficial record, which has been piston cored, they have been sampled only on the Lomonosov Ridge in 2004 during the Arctic Coring Expedition (ACEX; IODP Leg 302) and in 1993 in the ice-free waters over the Yermak Plateau to the North of Svalbard (ODP Leg 151). On November 3rd thru 5th of 2008, a meeting was held at the Alfred Wegener Institute in Bremerhaven, Germany to plan the future of scientific drilling in the Arctic Ocean.

One hundred and forty one applications were received for the 95 available seats. The Consortium for Ocean Leadership provided support for the workshop through the U.S. Science Support Program associated with the Integrated Ocean Drilling Program and through the Nansen Arctic Drilling Program. In addition to these funds, contributions from European Science Foundation supported European and American participants. The Arctic Ocean Sciences Board (supported 3 participants) and contributions from six oil companies (BP, ConocoPhillips, ExxonMobil, Statoil, the Norwegian Petroleum Directorate and Shell) made it possible to support Canadian, Russian, Japanese and Korean participants.

In planning this meeting, the conveners attempted to mesh the arctic science and the ocean drilling communities. To develop a common reference frame, the first day of the meeting focused on presentations about what is known about the Arctic Ocean, the limited history of high-latitude drilling and the process of developing proposals for IODP. The next day and a half was spent in break out groups discussing the questions to be addressed by drilling and targets for arctic scientific drilling.

On the final day, the participants committed to submitting new IODP pre-proposals for Arctic Ocean drilling. Based on discussions at this meeting, we believe approximately ten new pre-proposals will be submitted to IODP. These proposals will be submitted at a critical time, both for the future of Arctic Ocean science and the future of scientific ocean drilling. Only in the last few years, through dedicated efforts of a number of research groups, have there been sufficient data to propose testable hypotheses and to select drill sites on most of the significant bathymetric features.

A community-wide (USA, Europe, Japan, and others), multidisciplinary and international conference – INVEST IODP New Ventures in Exploring Scientific Targets - is planned for September 2009 to discuss future directions of scientific ocean drilling beyond 2013. The INVEST process will define the future of scientific ocean drilling. It will be important to have people there to directly represent the future of Arctic Ocean drilling. The SSC for Marine

Sciences: AOSB is committed to supporting 3-6 Arctic scientists to participate in the INVEST meeting.

Arctic in Rapid Transition (ART)

During the winter of 2008-09 the Early Career Scientists sub-group of the Marine Roundtable of the ICARP II produced a project proposal entitled Arctic in Rapid Transition. The ART initiative is a proposed integrative, multi-disciplinary, long-term pan-Arctic program to study changes and feedbacks with respect to physical characteristics and biogeochemical cycles of the Arctic Ocean and its biological productive capacity. ART will focus on integrating data on past and present transitional states of the Arctic Ocean that can be used synergistically with ongoing monitoring, observing and modelling efforts, to better assess future changes. Specific aims are to develop process-oriented perspectives on sea ice variability and biological productivity that merge knowledge on centennial through millennial timescales (acquired from geologic records) with decadal through seasonal variations (recorded in instrumental and observational records). An equally important aspect of ART is to help bridge processes and ecosystem responses on shelves, margins and the central Arctic Ocean, all of which are facing rapid transition. This knowledge is necessary to improve our ability to understand, predict and adapt to current and future Arctic transitions.

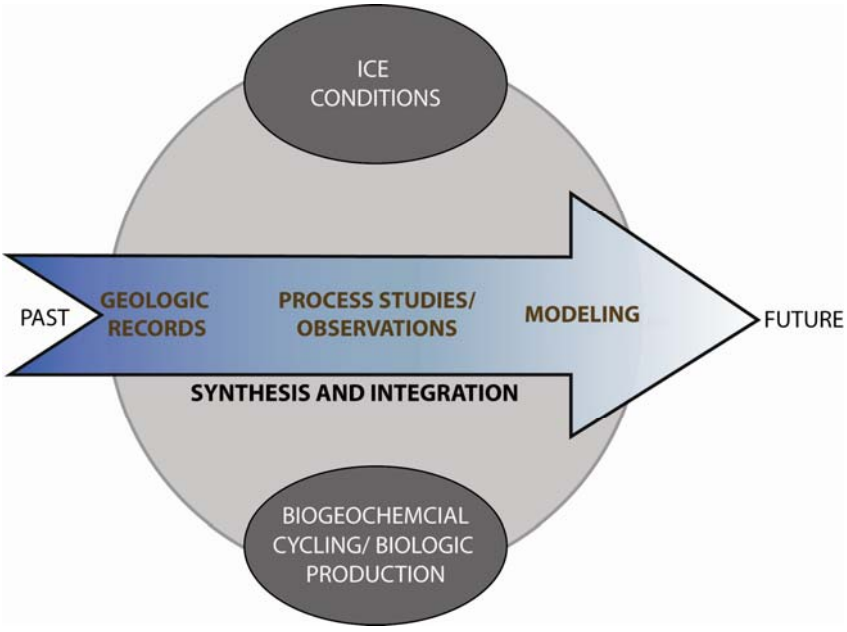

Figure 2: Schematic representing the conceptual approach to address the multidisciplinary challenges of the Arctic in Rapid Transition.

At the 2009 Arctic Science Summit Week in Bergen, the concept of the ART Initiative was formally presented to the Arctic Ocean Sciences Board (AOSB) and received with enthusiasm. The AOSB expressed its strong support for the ART Initiative and in turn requested that the ICARP II Marine Group Roundtable and greater community develop a science and implementation plan for ART. The AOSB believes that in order to further the overall goals of the ART program, it is critical to develop the ART concept into a science plan with implementation and funding strategies for the plan.

The next step is an ART Initiation Workshop which will be held November 7-9, 2009 in Fairbanks, Alaska to write a complete science and implementation plan for ART. A written workshop report (including an executive summary and specific recommendations for action) will be made available online and in printed format shortly after the close of the workshop. The results of the workshop will also be presented to the AOSB and IASC steering committees during the ASSW 2010 in Nuuk, Greenland. By April 2010, the full science and implementation plan will be made available on the IASC website and through various list servers for comment from the broader community.