ISSN 1195-8898

CMOS
BULLETIN
SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

June / juin 2005

Vol.33 No.3

Operational Synoptic Maps of Surface Currents

Cartes synoptiques opérationnelles des courants de surface

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....from the President's Desk

CMOS friends and colleagues:

Well, here it is already – the duet from the Presidents' Desks. Serving as President for the past year has been an honour and privilege for me. With your strong support we have had a busy and productive year which is covered in the *CMOS Annual Review 2004 Revue annuelle de la SCMO* that was presented at our Annual General Meeting on May 31 at CMOS/SCMO 2005 Congress in Vancouver, and can also be found by clicking on the "*CMOS Bulletin*" tab in the Members Only section of our CMOS web site www.cmos.ca. Our Society thrives because of the continuing involvement of many volunteers who are active on committees and in CMOS centres across Canada, and I express my gratitude to all of you. In particular, I would like to thank fellow Council members, staff in the CMOS Office, and especially the Executive members whose dedication, efficiency and enthusiasm as members of the CMOS team have made this year so enjoyable.

There are a few individuals whom I would be remiss not to mention. Ian Rutherford's expert handling of his new responsibilities as Executive Director has certainly been a great help to me as President, and to us all through the continuing modernization of our National CMOS Office. After providing a smooth transition for the "Nova Scotia" executive during his year as President, Allyn Clarke continued to be actively involved as Past-President, sharing his wise counsel and corporate memory, and carrying several files for us. Thank you, Allyn, for your three years of outstanding service on the CMOS Executive. Which brings us to our Vice-President, Susan Woodbury, who has thoughtfully and effectively jumped into her responsibilities, enhancing clarity and focus within the Executive as she prepared to take over the reins at this time. I look forward to another active year on the Executive under Susan's leadership, and I am sure that she will enjoy your continuing support and enthusiasm.

Harold (Hal) Ritchie, Outgoing President / Président sortant

On behalf of the entire membership I would like to express my sincere thanks to Hal Ritchie for his sound leadership of the CMOS Council and Executive over the past year.

I am looking forward to working with the staff of the National CMOS Office and the Council. This year we will review the CMOS vision as expressed in the paper, *CMOS in 2003/2004 and its Future*, to ensure that we are meeting our targets and to set new goals. I encourage all members to contact me, the CMOS Office and/or the Council regarding meteorological and oceanographic topics with which CMOS can be of assistance. Together we will do our part to write the next chapter of CMOS' distinguished history.

(Continued on page 67 - Suite à la page 67)

Volume 33 No.3
June 2005 — Juin 2005

Inside / En Bref

Printed in Kanata, Ontario, by Gilmore Printing Services Inc.
Imprimé sous les presses de Gilmore Printing Services Inc., Kanata, Ontario.

CMOS Bulletin SCMO
"at the service of its members / au service de ses membres"

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Cover page: The cover page pictures show the first two distinguished recipients of the Parsons Medal at the luncheon where they received their award. The Parsons Medal is a new award to pay tribute to excellence in Canadian ocean sciences. It will be awarded annually by DFO to a Canadian scientist for outstanding lifetime contributions to multidisciplinary facets of ocean sciences. From left to right, Dr. Carol Lalli, (Dr. Parsons' wife), Dr. Timothy Parsons, Dr. Daniel Ware and his wife Madeleine. To learn more, please read the article on **page 76.** Photos are courtesy of Estelle Couture, DFO.

Page couverture: Les images en page couverture montrent les deux premiers récipiendaires distingués de la médaille Parsons au petit-déjeuner où ils ont reçu leur prix. La médaille Parsons est un nouveau prix visant à rendre hommage à l'excellence dans le domaine des sciences de la mer au Canada. Le prix sera décerné chaque année par le MPO à un scientifique canadien qui se sera distingué dans un domaine pluridisciplinaire lié aux sciences de la mer. De gauche à droite, Dr. Carol Lalli, (épouse du Dr. Parsons), Dr. Timothy Parsons, Dr. Daniel Ware et son épouse Madeleine. Pour en apprendre plus, prière de lire l'article en **page 76**. Les photos sont la gracieuseté de Estelle Couture, MPO.

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Canadian Meteorological and Oceanographic Society (CMOS)
Société canadienne de météorologie et d'océanographie (SCMO)

Executive / Exécutif

From the President's Desk (Continued - Suite)

I have worked in both the public and private sectors, in both meteorology and oceanography, during my career. I trust that this diverse background will assist me to serve you and CMOS effectively.

Susan Woodbury,
Incoming President / Nouvelle présidente

Letter to the Editor

Date: 12 May 2005

Subject: Canadian WMO membership questioned in recent published book

On beginning to read *"At Home in the World, Canada's Global Vision for the 21st Century"* written by Jennifer Welsh, 2004, I found it quite readable and interesting, with many ideas that seemed logical and sensible. For a book on foreign policy in this age of global environmental concerns, however, it said surprisingly little about the environment. Also, while it discussed some issues rather thoroughly, other points appeared to be treated quite superficially.

On page 159, Welsh laments that Canada is a "serial joiner". We are "part of a network of international organizations that range from big ones, such as NATO or WTO, to those below the radar screen, such as the Organization for Security and Co-operation in Europe (OSCE) or the World Meteorological Organization." Further on she says "We can no longer be part of international clubs simply for the sake of membership." Then, on page 160, she says we need to continually review our affiliations. "In some cases, this may result in a scaling back of Canadian commitments, but in other cases it could mean greater involvement in new kinds of conflict prevention and peace-building activities." I doubt that she would think the WMO fit the latter description, so I suppose she would consider it as one of those "international clubs" that we should no longer be part of.

I agree that our affiliations [to international organizations] should be reviewed routinely, but to cite the WMO as an example of an organization Canada may not need seems bizarre. Elsewhere in the book Welsh says Canada should aspire to be a "model citizen" of the international community, but I doubt if the other 180-plus WMO member countries would think we were a model citizen if we tried to withdraw from the WMO. We'd be accused of "not pulling our weight", as she would say. The WMO has been a UN agency since 1951, but its predecessor, the International Meteorological Organization, was formed over 120 years ago. The WMO exists because it's needed, and we belong because we need it.

When I look at Internet weather maps from the Meteorological Service of Canada, that include real-time data for many stations beyond our borders, it seems to me the WMO is one of those entities that, "if it didn't exist, we'd have to invent it". As the late Ivan Head noted,

"One of the most useful of WMO activities has been the invaluable 'World Weather Watch' which provides for the gathering and broad dissemination of meteorological observations [from around the world]" (On a Hinge of History, 1991). That's just one part of WMO's work. I was involved in one of the other parts, agricultural meteorology, in particular in co-editing a WMO Technical Note on agriculture in severe climates, and in spending six weeks as a WMO agroclimatic mapping consultant in Ethiopia in 1985.

Professor Welsh's book was so well liked by our government that they had her help prepare the Canadian International Policy Statement that was issued in April, so I think we should pay attention to what she has to say. Unfortunately, her apparent complete lack of understanding of the WMO and of why Canada needs to belong to it is probably shared by most of the general public.

Dan Williams,
Agroclimatologist (retired 1985) & CMOS member

Date: 6 June 2005

Subject: CMOS member receives two awards

Dr. Tad Murty, a member of CMOS, is receiving two awards in 2005. The first one is the Professional man of the year award from the Indo-Canada Chamber of Commerce, which will be presented to him at a ceremony in Toronto on June 11th 2005. The second is a gold medal in Oceanography from the Indian Geophysical Union, which will be presented to him in India on 7th December 2005.

Tad served with DFO for 27 years, and then served three years as the Director of Australia's National Tidal Facility in Adelaide, then worked for over seven years with Baird & Associates Coastal Engineers in Ottawa. He is now an Adjunct Professor in the department of Civil Engineering, University of Ottawa.

Foggy Landings[1]

by Douglas Morris[2]

Résumé: Avez-vous déjà regardé par le hublot pendant que l'avion descend toujours plus bas tout en vous demandant quand et si la terre va enfin apparaître? Plusieurs d'entre nous ont sans aucun doute fait une expérience semblable mais qu'en est-il vraiment? Comment les pilotes trouvent-ils heureusement la piste d'atterrissage?

Have you ever looked out of an airplane window as it descends lower and lower wondering when, and if, the ground will appear? Many of us have probably been on flights like this...but just how do pilots find the runway?

A pilot's approach

Despite what seems to be a precarious situation, commercial, and some private, pilots routinely fly safely into clouds with the aid of instruments. A handful of different instrument approaches are currently available, but the most precise and preferred approach is the instrument landing system (ILS) which provides both vertical and horizontal guidance in low cloud conditions, fog, rain, snow, haze, and other obscuring phenomena.

The nuts and bolts of an ILS

How does it work? A localizer signal at the far end of the runway guides the pilot or autopilot in a straight line toward the runway while a glideslope signal on the sides of the runway leads the aircraft down vertically. An easy way to visualize a precision approach is to picture a children's slide at the park. The aircraft flies at altitude just as a child sits on top of the slide. The airplane is then eventually steered in the direction of the runway whereby the flight deck instruments "lock on" to both the localizer and glideslope signals. The precision approach guides the pilot down to his or her landing sight (runway) just as the slide guides the child to a landing. A localizer provides left-right orientation with the runway, similar to the sidewalls of the slide. The angle of this approach is typically three degrees. It's the angle you may have noticed airplanes maintaining while following one another on approach to a busy runway.

The other big parts to an ILS

Several other components augment the ILS and add safety to low approaches. These include devices that transmit exact distances from the runway, high intensity runway and approach lighting (the intensity ranges from a dim setting of one to power zapping strength five), radio beacon markers that depict important distances to the pilot. One such marker is called the final approach fix (FAF) typically located four to six miles from the airport. At this point the pilot should have the landing gear down, a clearance to land from the "control tower" and final flap settings for landing. Sitting by itself is a runway visual range (RVR) sensor along the edge of the runway that comes alive when visibility begins to deteriorate. It measures distance seen through obscuring weather phenomena in units of feet. It gives a very accurate idea as to what a pilot can expect to see...or not see.

Not all ILS's are created equal

There are three different categories of an ILS, differentiated by their decision height (DH) and prevailing visibility. DH is the indicated altitude at which a pilot must decide to either continue the approach to a landing or to abort. A category I ILS (the least accurate) has a DH of 200 feet above ground with most large airports around the world having this type. Height is determined by a barometric altimeter where a pilot must adjust to the most recent pressure reading in the area. Every pilot knows just one tenth of change in pressure in inches of mercury translates into a discrepancy of 100 feet.

A category II ILS has a lower decision height -100 feet- but height is now determined by a device that bounces signals

[1] Reproduced from *Weatherwise* with the written authorization of the Editor and the author.

[2] Air Canada Pilot, Certified Meteorologist.

from the airplane to the ground and back called a radar altimeter (or radio altimeter). It allows the airplane to descend with a higher safety margin. The last, but certainly not least, is the Category III approach.

Welcome to Autoland

Category III ILS (autoland) has two levels; the first level brings the aircraft to a mere 50 feet above the runway, whereby the pilot must make a snap decision. The second fully automated level has no decision height, meaning pilots do not look outside and wait for the bump. A gamut of requirements must be met to allow such an approach. The ground facilities must have high intensity runway lights, centerline lighting, various markings on the runway, additional RVR sensors and back-up airport emergency power ensuring the runways and taxiways are lit up and the ILS is functioning, even during power outages. On board the aircraft, sophisticated autopilots bring the aircraft to the ground, automatically correcting for winds all the way to touch down. Only major airports around the world have such a system with most only having the system on one runway. (Vancouver and Toronto Pearson have the only CAT III runways in Canada). Pilots must be certified to do autolands requiring check outs in flight simulators every six months. The airline company and aircraft must also be certified for autolands. As you can see there are a lot of parameters that must be met – clearly separating the amateurs from the pros.

For the airliner I fly, an autothrust system adjusts engine power settings to ensure proper speed is obtained. In fact, it will even bring the engines to idle at touchdown. An autobrake system supplies the correct amount of braking at touchdown to stop the aircraft. As well, there are many computers that monitor all of the aircraft systems to ensure everything is functioning at 100 per cent. They even make synthesized altitude call outs to the pilots.

Waiting for the bump

The absolute minimum visibility for a category III landing is less than the length of a football field with next to nothing to see when approaching at speeds of 150 mph. Once air traffic controllers clear the aircraft for a category III approach, the pilots attentively monitor the automatic systems, overpowering the urge to look outside and patiently wait for the "bump." Even with the main landing gear firmly on the runway, the flight deck may still be mired in fog because of the landing angle. From ab initio training, pilots are taught to trust their instruments; still, autoland bestows a much higher level of faith in technology.

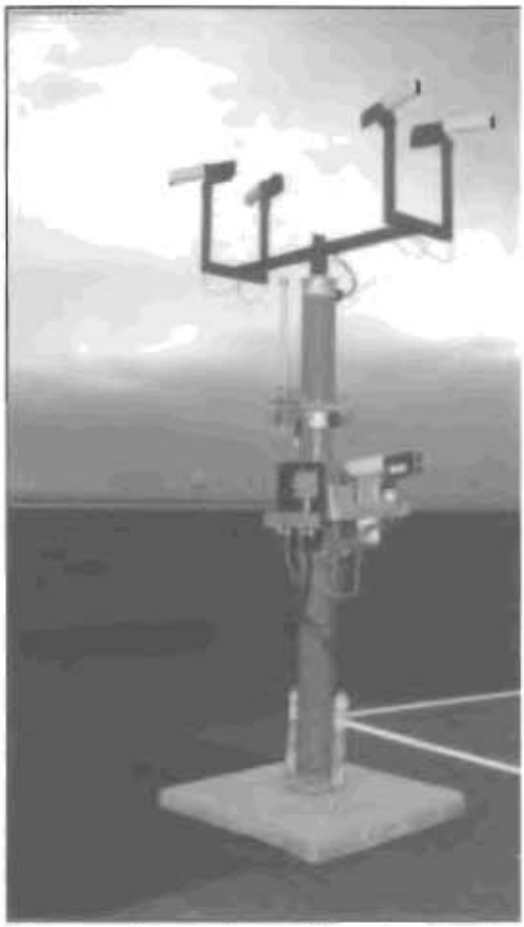
Because the system is so accurate, the automatic pilot must be disengaged after landing or else the aircraft will try to reposition itself back on the centerline of the runway. Finding the terminal building in such heavy fog can be a task, but many airports have bright green lights embedded in the taxiways to guide the pilots to the gate.

The autoland system truly is a marvel and exemplifies just how technical aircraft and airports have become. Nothing can replace the skill of an experienced pilot, but when extremely poor visibility dictates a category III autoland, technology rules.

Seeing Through the Fog[3]

by Douglas Morris[4]

When it comes to the weather, most people are concerned with the temperature. But for a pilot, visibility is at the top of the list.



RVR sensor found at most Canadian airports

When fog rolls in at the airport, a pilot is lucky to have the runway visual range (RVR) Sensor. This invaluable instrument helps to ensure safe takeoffs and landings by estimating how far down the runway a pilot can see. The RVR sensor is a welcome replacement for transmissometers, the old instruments that measured visibility on runways. Not only is the new sensor less

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[3] Reproduced from *Weatherwise* with the written authorization of the Editor and the author.

[4] Air Canada Pilot, Certified Meteorologist.

expensive, but it's also more reliable and accurate than the old machinery, which required constant recalibration and sometimes stopped working due to mechanical problems. Located off to the side, the RVR sensor sits on a ten foot high pole near the touchdown point (typically 1,000 feet from the end of the runway). The instrument, described by one engineer as an "expensive coat rack," is made up of two heads that emit light and two receivers that calculate how much of that light is scattered. Many sensors perform the same task with just two heads.

When you drive in thick fog and see the headlights of an oncoming car, you may also see a halo effect caused by the fog scattering the light in all directions. The thicker the fog, the greater the light diffusion. The same principle applies on the runway; the sensor records this scatter effect and converts it into RVR data. It then relays this information to air traffic controllers and to the personnel at the airport's weather office, who disseminate it to the national weather system.

The higher the scatter factor, the lower the visibility. When visibility is reduced to one mile or less, the air traffic controllers broadcast the RVR to landing and departing aircraft. Depending on a number of factors, including the specific runway and aircraft type, a decision is made on whether or not to proceed with the takeoffs and landings. So the next time you're in a plane taxiing for takeoff, keep an eye out for the RVR Sensor, one of the pilot's most trusted allies.

Accurate Weather Information Offers Huge Cost Savings to Economy

Submitted by Vered Levant[5]

As weather continues to make headlines around the world, the importance of accurate, timely meteorological information grows in importance. While most Canadians link meteorological expertise with a traditional sector such as agriculture, meteorology also impacts transportation, construction, and tourism. Accurate and precise forecasts offer tremendous potential cost savings to the Canadian economy.

"*2005 Changing Climate: Canadian Meteorological Employment Report*", which ECO (Environmental Careers Organization) Canada has just released, is intended to provide a greater understanding of the Canadian meteorological sector by outlining common activities of meteorological employment, documenting the existing and forecast labour market conditions, and offering recommendations on steps that should be taken to support this important sector.

Produced at the request of the Canadian Meteorological and Oceanographic Society (CMOS) Private Sector Committee, the report reveals that there are critical obstacles to growth of the sector that need to be addressed to ensure that it can meet its full economic and employment potential.

"*It is important that Canada understand the meteorological sector's human resource requirements in order to ensure its ongoing growth and prosperity,*" says Ian Rutherford, Executive Director, CMOS.

In total, 9,200 meteorological practitioners are currently employed in Canada, and this number is expected to increase. The projected future demand for trained practitioners is high — 2,350 by 2010. At the same time, private sector employers are pointing to shortages in the supply of trained meteorologists, exacerbated by low enrolments in related academic programs. This could impact the quality of weather information that is provided to Canadians and Canadian businesses.

According to Vered Levant, ECO Canada labour market researcher, a strong economic case exists for assessing the importance of meteorology to society as much greater than its current labour force size would suggest. "*Timely and accurate weather forecasts may save hundreds of millions of dollars for industry and Canadians generally, and may reduce the risk of loss of life*" she says.

To obtain an electronic copy of the report, visit www.eco.ca and click on the 'Products' link. If you wish to receive a hard copy, send an email to info@eco.ca with your request.

CMOS exists for the advancement of meteorology and oceanography in Canada.

Le but de la SCMO est de stimuler l'intérêt pour la météorologie et l'océanographie au Canada.

[5] Project Manager, ECO Canada

Cosmic radiation, sun spot cycles, satellite data and hockey sticks: Has the related science behind the Kyoto Protocol weakened, or strengthened?

by Henry Hengeveld[1]

On April 13, the Ministers of Environment Canada, Industry Canada and Natural Resources Canada called a joint news conference in Ottawa to lay out their new plan for meeting Canada's commitments under the Kyoto Protocol. Such action is necessary, they noted, because of the international consensus that uncontrolled emissions of greenhouse gases would lead to a large and problematic change in global climates. As evidence, they cited several of the relevant conclusions of the Intergovernmental Panel on Climate Change, the UN body tasked with comprehensive science assessments to advise policy makers.

Meanwhile, on the same day and in the same town, another news conference was being held to argue the very opposite. Convened by the Calgary based Friends of Science Society, this second press briefing profiled several Canadian scientists who argued that recent new research results undermine the scientific basis for the FCCC and its Kyoto Protocol, and thus challenged the wisdom of Canada continuing to maintain its commitments under the Protocol. They suggested that the Canadian government should delay its implementation of the Kyoto Protocol until a thorough, public review of the current state of climate science has been conducted by climate experts.

These 'contrarian' arguments are not new. Over the past few years, a number of often acrimonious articles and op-ed pieces published in Canadian media have presented similar arguments. Some of the articles go much further, arguing that these 'new findings' are being withheld from politicians through scientific conspiracy, that the IPCC crowd is unwilling to debate the science with dissenters, and that 'bad' science is getting published in refereed literature because of inadequate 'auditing' of climate science. The over-riding question, of course, is whether or not there is substance to their concerns.

In the following paragraphs, I have attempted to examine the legitimacy of the arguments raised by the Friends of Science Society and their associates, particularly as they relate to four specific concerns: i) Trends in troposphere temperatures in recent decades; ii) the role of cosmic radiation as a primary cause of climate change; iii) the relationship between sunspot cycle lengths and observed changes in climate over the past century; and finally iv) the accuracy of paleoclimate reconstructions for the past two millennia used for intercomparison with 20th century instrumental temperature records

i) Does satellite microwave data for the lower atmosphere contradict the warming trend observed in surface data over the past few decades?

Since the late 1970s, sensors on a sequence of 12 NOAA satellites have been recording microwave signals from the lower atmosphere that can be used to infer temperatures throughout the lower atmosphere for all regions around the world. These sensors record temperatures indirectly by measuring microwave emissions from oxygen molecules within the atmosphere, the intensity of which is related to ambient temperature of the emitting molecule. Until recently, the analysis of these data suggested that the lower 10 km of the atmosphere had warmed only very slightly since 1979, in sharp contrast to the 0.17°C/decade warming recorded at the surface for the same period (Christy et al. 2001). These differences have been frequently cited by critics of the global warming 'hypothesis' as evidence that surface data may be inaccurate and that there may actually have been no significant warming in recent years. Such a conclusion would also challenge the credibility of climate models, since results of model simulations suggest rising greenhouse gas concentrations should already have caused a significant amount of global warming. Alternatively, if both records are correct, the critics argue that these same models have failed to accurately simulate differences in climate processes taking place at the surface from those in the lower atmosphere.

During 2004, several new studies have clarified this debate. These pointed out that the original analysis of the satellite data had inadequately corrected for contamination of the microwave signals from radiation from the stratosphere above, which has been cooling due to ozone depletion and other factors. More importantly, it had not correctly adjusted the data for instrumental and orbital differences between one satellite system and the next (Figure 1). When these errors were corrected, the warming trends derived from the satellite data for the lower atmosphere became very similar to that at the surface (Fu et al. 2004a,b; Gillett et al., 2004; Grody et al. 2004; Tett,S. and Thorne,P. 2004.)

[1] Emeritus Associate, Meteorological Service of Canada

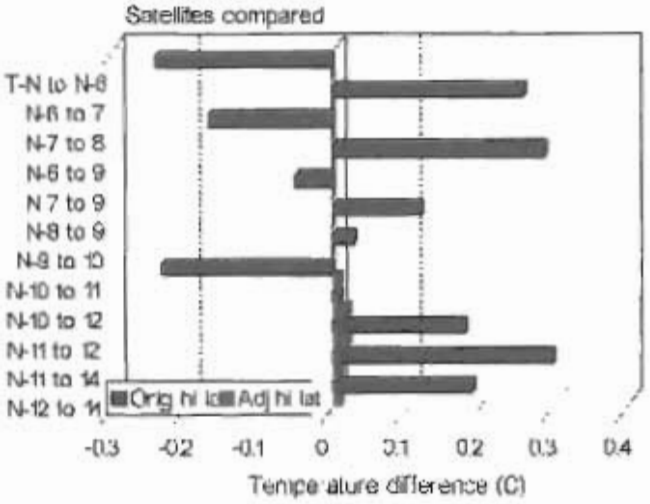

Figure 1. Blue bars show estimated adjustment required between different satellite data sets to correct for changes in orbit characteristics. Red bars show residual error following corrections applied by Grody et al (2004).

ii) Has the data used for the 'hockey stick' shaped trend curve for temperatures for the Northern Hemisphere over the past millennium been analyzed correctly?

In the IPCC Third Assessment Report, one of the pieces of evidence used to support the conclusion that recent climate change is difficult to attribute to natural causes was a reconstruction from multiple paleoclimate data sources of Northern Hemispheric temperature anomalies over the past 1000 years. This reconstruction, prepared by American paleoclimatologist Michael Mann and colleagues (Mann and Jones 1999), showed a slow cooling of hemispheric temperatures from medieval times to about 150 years ago, then a rapid rise to current temperatures, which are the warmest of the record. A small group of critics, led by Canadians Stephen McIntyre and Ross McKitrick, have challenged the validity of the graph, which they dubbed the 'hockey stick' curve (McIntyre and McKitrick 2005; Soon et al. 2004). They argue that this analysis was based on insufficient data and that both the data and the analysis method were flawed. Although the allegations are controversial and have been challenged by Mann and others (Andranava et al. 2004; Jones and Mann 2004; Mann et al. 2004), other studies do suggest that Mann's results may have underestimated the degree of variability in the long-term climate record (Moberg 2005; Esper et al. 2005; Von Storch 2004; Osborne and Briffa 2004). They suggest that, while the 20th century may indeed still be the warmest of the period, paleo reconstructions are highly sensitive to the calibration techniques used, and that the amplitude of past climate variability have likely been underestimated by the Mann et al. reconstruction. The shape of the millennial temperature curve may therefore be more like an undulating serpent with its head sticking up than a 'hockey stick' (Figure 2). However, these experts also agree that the debate about the shape of the curve, while as yet not over, does not significantly alter the IPCC TAR conclusion that most of the warming during the last 50 years has been human-induced. That conclusion was not based on the unusualness of recent temperatures but on climate model studies directly attributing recent changes to specific causes.

Fig. 2a)

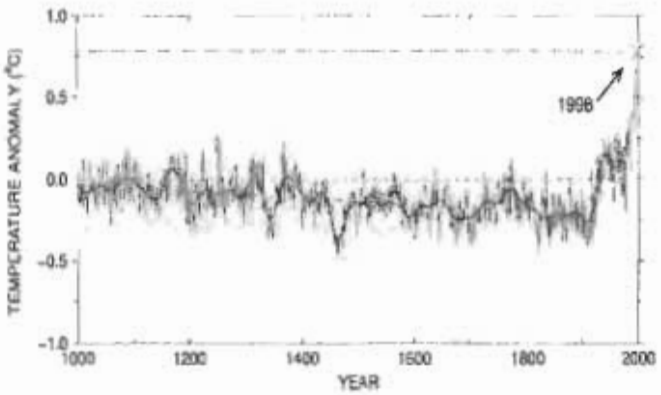

Fig. 2b)

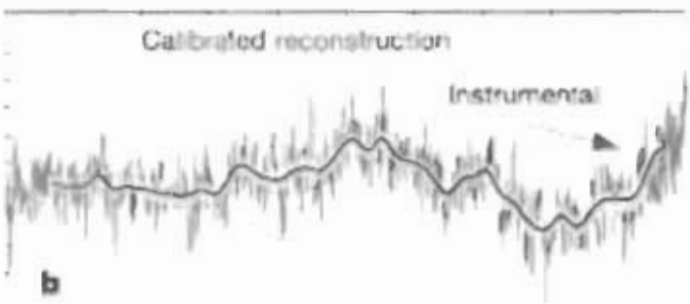

Figure 2. Reconstruction of past climates by Moberg et al. (2005) that includes low frequency variability derived from borehole data suggests a more intense Little Ice Age, shown in Fig 2a, than that implied by reconstructions in Fig 2b by Mann et al (1999). However, the 1990s still remain the warmest decade of the millennium.

iii) Can natural changes in cosmic radiation explain recent climate change?

In 2003, Israeli astrophysicist Nir Shaviv and Canadian paleoclimatologist Jan Veizer jointly published a paper in the American geological journal *GSA TODAY(Shaviv and Veizer 2003)* that suggested a strong correlation between 150 million year cycles in the earth's climate (reconstructed from chemical analysis of ocean sediments) and the movement of our solar system through our galaxy. The latter would affect the intensity

of cosmic radiation reaching the earth which, in theory, could influence cloud cover and hence climate. The authors estimated that about two-thirds of the very long variations in climate (over the past 500 million years) could be explained by this mechanism. They also suggest that, if all of the remaining climate variations over the same period were due entirely to CO_2 concentration changes, the Earth's climate sensitivity to changes in CO_2 concentrations would be much lower than that estimated by the IPCC (Figure 3).

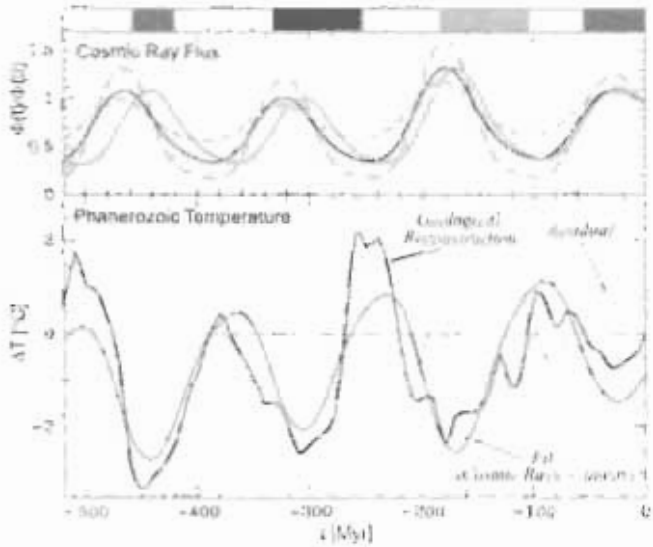

Figure 3. Reconstructed cosmic ray fluxes and paleo temperatures as presented by Shaviv and Veizer (2003).

Subsequently, however, several critiques of the Shaviv-Veizer study pointed out that the authors shifted the cosmic radiation curve, for unexplained reasons, by some 60 million years relative to the temperature reconstruction in order to get the strong correlation noted in the reported results (Rahmstorf et al. 2004; Royer et al 2004). Without this shift, there was no significant correlation between the two curves. Furthermore, subsequent improvements to the temperature curve that allow for shifts in sediment acidity over time show better agreement with past CO_2 concentration reconstructions than with the 'adjusted' cosmic radiation curve. The Shaviv and Veizer study also failed to consider other known major influences and feedbacks on climate over such long time scales – such as continental drift and changes in the Earth's orbit around the sun. Finally, forces that affect the Earth's climate on times scales of 150 million years may be totally unrelated to forces that affect climate on a century time scale, and vice versa. Comparing such is, figuratively speaking, like comparing factors affecting weather over the past 4000 years with those affecting weather over the past 24 hours. Hence, the results reported by Shaviv and Veizer have added very little to the debate on what has caused changes in climate over the past century, or what is likely to occur over the next.

iv) Can changes in solar radiation over the past century explain recent climate change?

In the early 1990s, Danish solar scientists Eigil Friis-Christensen and Knud Lassen published a reconstruction of variations on the length of the solar sunspot cycles over the period of 1880 to 1990 that displayed a strong correlation with records of observed average global surface temperatures. These results were updated in 1995 and 2000, with similar results (Friis-Christensen and Lassen 1991; Lassen and Friis-Christensen 1995, Lassen and Friis-Christensen 2000). However, other solar radiation experts have noted that the shape of the sunspot reconstruction for the last few decades of the Friis-Christensen/Lassen record is an artefact of how the data was handled and, in fact, not real (Damon and Laut 2004; Stott et al 2003). When these artefacts are corrected, the mean sunspot cycle length actually shows a slight decline – in sharp contrast to the significant climate warming over the same time period (Figure 4). However, despite the refutation of the original Danish studies, their results are still often but incorrectly cited as evidence that recent warming can be fully explained by solar forcings.

Fig. 4a)

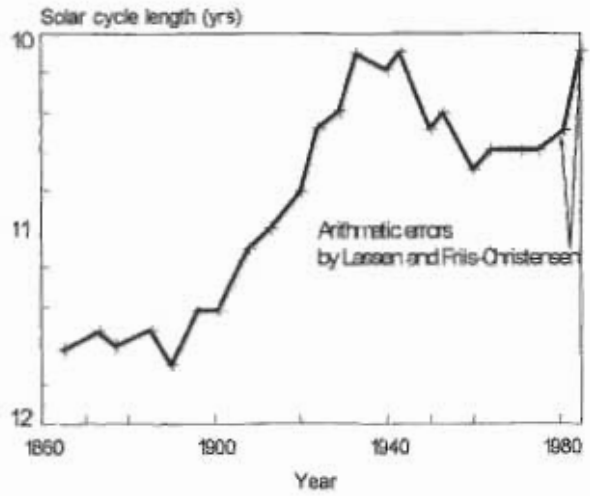

Fig. 4b)

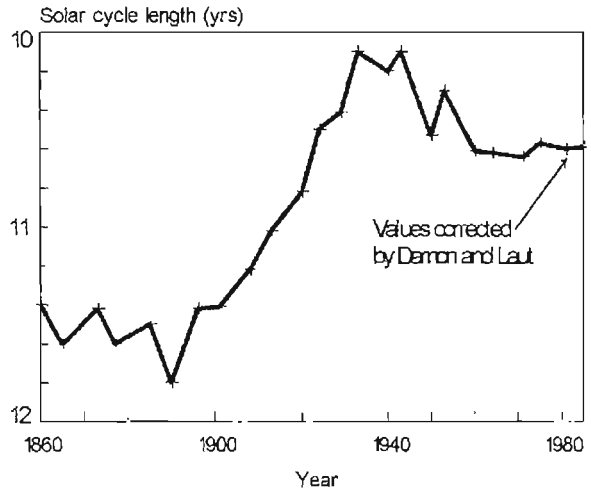

Figure 4. Comparison of reconstruction of solar cycle lengths by a) Lassen and Friis-Christensen (2000) with similar reconstruction by b) Damon and Laut using corrected data.

Given the above evidence from recent peer-reviewed literature, what are we to make of the pronouncements of the Friends of Science Society and its associates?

First, let me say that I do not doubt the sincerity of the people involved. I have exchanged e-mails, had coffee or lunch or interacted in other ways with many of them, and find them passionate about their views and convinced that they are right. Our interactions have, in general been polite and respectful, although I have been no more successful in convincing them that the risks of human induced climate change are real and significant than they have been in persuading me of the opposite.

However, I do find that at least some of them do not understand the challenge of dealing with complex science, or the role of peer-review and science assessments in meeting this challenge. Complex science like that related to the climate system involves many different fields of expertise that are interconnected through a network of non-linear climate system feedbacks. A huge volume of literature exploring climate system science has accumulated over time (tens of thousands of refereed papers) – a volume that defies assessment by a small group of experts. Rather, it requires the involvement of many experts from the full range of disciplines involved, each adding their unique input and placing that input within the context of the full spectrum of the available scientific knowledge. Only through comprehensive assessments and expanded peer review can one hope to put all these pieces together. Ironically, the FSS calls for a 'public review of the current state of climate science ... conducted by climate experts', yet rejects the results of precisely such comprehensive reviews undertaken by the IPCC. The latest IPCC assessment, for example, involved more than 2400 international experts, each contributing from a basis of expertise established through their own research and publications on related science in refereed scientific journals. The 108 Canadian scientists involved in the latest reviews were likewise involved because of their own well-established expertise. Following the release of the latest assessment, academies of science from around the world strongly endorsed both the process involved and the results.

The bottom line is that the recent literature has, in fact, strengthened the IPCC conclusions with respect to human interference with the climate system, not weakened them.

The public media, of course, loves controversy, partly because controversy is good entertainment. As one well-respected science reporter recently informed me, if 98 out of 100 scientists in a conference setting agree on a particular conclusion, but the remaining two have polarized and opposing perspectives, he would talk to those two and largely ignore the rest. "That is", he said, "where the 'story' is". The result of such biased reporting, under the guise of 'balanced coverage, is in reality a misinformed public. A recent study into US media coverage of climate science between 1988 and 2002 supports this concern (Boykoff and Boykoff 2004).

Perhaps its time for a learned society such as CMOS to step in the breach and become more pro-active in informing Canadians on what the science community is really saying.

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CMOS 39th Annual Congress **Vancouver, B.C., Wednesday June 1, 2005**

Patterson Medal Award Presentations

The Patterson Distinguished Service Medal is the Meteorological Service of Canada's most prestigious award. It was created in 1946 in honour of Dr. John Patterson who was Director and Controller from 1929 to 1946 of what is now the Meteorological Service of Canada. The Patterson Medal is awarded to individuals in recognition of their distinguished service to meteorology in Canada.

We are here today to recognize two outstanding members of our meteorological community, Dr. Ian Rutherford and Dr. Ted Shepherd.

Dr. Ian Rutherford accepting the Patterson Medal

Dr. Ian Rutherford began his career as a forecaster in Goose Bay, Labrador. After becoming involved in the early days of numerical analysis his career took him into developing four dimensional data systems assimilation, models of which are still in use today. This unique contribution in establishing assimilation schemes led to an invitation to work in the European Centre for Medium Range Weather Forecasting in the United Kingdom, where he headed a research team which developed the data assimilation systems for the Global Atmospheric Research Programme (GARP). Ian was the Director of the Meteorological Services Research Branch of the Atmospheric Environment Science (AES), now the Meteorological Service of Canada (MSC), and later the position of Director-General, Atmospheric Research. After serving for only a brief period in this position he was appointed Director-General of the Weather Services Directorate of AES.

Ian's managerial skills became well-recognized in the Department of the Environment (DOE) where he was appointed and served as Director-General, National Parks, Parks Canada and later as Director-General of State of the Environment Reporting (SOER). Upon his retirement in 1996, he became the Consulting Research Manager for the Canadian Institute for Climate Studies (CICS) whose mandate was to develop research on atmosphere-ocean circulation models.

Throughout his active meteorological career he served with distinction as chair of the Montréal and Ottawa Centres of CMOS as well as on the Scientific and Prizes and Awards Committees, two of the most important committees of CMOS. He was elected President of the Society in 1999 and during his term in office, founded and chaired the initial Board of Trustees of the Canadian Foundation for Climate and Atmospheric Sciences. He remains active in public policy issues when and where they deal with meteorology and/or climate. He represents the Canadian Meteorological and Oceanographic Society in the Partnership Group on Science and Engineering (PAGSE) and the Canadian Consortium for Research (CCR). Ian now serves the meteorological and oceanographic community at large in Canada as the Executive Director of CMOS.

On behalf of the Meteorological Service of Canada, it gives me great pleasure to present the Patterson Distinguished Service Medal to Dr. Ian Rutherford.

Dr. Ted Shepherd receiving his medal from Michel Béland

Dr. Ted Shepherd has provided outstanding leadership of the Canadian Middle Atmosphere Modelling project and its successor, the Global Chemistry for Climate project. In combination, these projects have drawn together government and university researchers from across Canada, provided training for numerous graduate students and postdoctoral fellows, and led to the development of a strong and vibrant middle atmosphere modelling program within Canada, and attracted prominent scientists from other countries as visitors and collaborators. This program is at the forefront of the field and has energized the middle atmosphere research community within Canada.

Ted's leadership role in the quality and strength of Canadian middle atmosphere research is well recognized. For many years Ted served on the Scientific Steering Group of the World Climate Research Program (WCRP) core project entitled Stratospheric Processes and their Role in Climate (SPARC). He continues to be active in the SPARC project and plays a leadership role in the program on Stratosphere - Troposphere Dynamical Coupling, one of the three main thematic programs within SPARC. He was a chapter lead author in the 1998 WMO/UNEP Ozone Assessment and, as a contributor, has been instrumental in ensuring that results of the Canadian Middle Atmosphere Model (CMAM) simulations have been used in the most recent (2002) Ozone assessment process.

In the past year Ted has been instrumental in bringing the SPARC International Program Office to Canada and establishing it in the Physics Department at the University of Toronto. This was a significant achievement, indicative of the

high international profile of Canadian middle atmosphere research.

Ted has maintained a vigorous research program of his own and is widely regarded as one of the leading atmospheric dynamicists of the current generation. He has published numerous widely cited contributions in a wide range of topics and plays a leading role in the science as a whole. He is the current Editor in Chief of the Journal of the Atmospheric Sciences, a leading international journal for theoretical meteorology.

He has supervised numerous graduate students and post-doctoral researchers many of these are also continuing to make significant contributions in their own right.

On behalf of the Meteorological Service of Canada, it gives me great pleasure to present the Patterson Distinguished Service Medal to Dr. Ted Shepherd.

Michel Béland
Director General, Atmospheric and Climate Sciences
Meteorological Service of Canada

Parsons Medal Award Presentations

Fisheries and Oceans Canada has established a new award to pay tribute to excellence in Canadian ocean sciences. The Timothy R. Parsons Medal will be awarded annually to a scientist for outstanding lifetime contributions to multidisciplinary facets of ocean sciences or for a recent exceptional achievement, while working within a Canadian institution.

This award is named after Dr. Timothy R. Parsons to commemorate his distinguished career as a Fisheries Research Board of Canada researcher, university professor, broadly-read author and recipient of the prestigious 2001 Japan Prize. During his career and continuing past his retirement, Dr. Parsons has devoted himself to obtaining a holistic understanding of the marine ecosystems, more specifically, understanding the interactions between the ocean and the food web.

Dr. Parsons was presented the very first Timothy R. Parsons medal for his outstanding contributions and exceptional dedication to ocean sciences and to the people he has trained, mentored and inspired.

Dr. Timothy Parsons receiving his award from Dr. Wendy Watson-Wright

Dr. Parsons' career in oceanography began in 1958 with the Fisheries Research Board of Canada in Nanaimo, B.C. Tim was hired by one of the grandfathers of Pacific Coast oceanography, Dr. Jack Tully, and worked closely with the influential John Strickland for several years. Dr. Strickland was keen to establish routine methods for seawater measurements, an interest that spawned the influential book by Strickland and Parsons entitled "A Practical Handbook of Seawater Analysis", which is considered the "bible" of marine scientists. Well-used copies are found on the benches of virtually every oceanographic laboratory today.

Dr. Parsons is one of the pioneers of the "ecosystem approach" to conservation-based fisheries management and pollution studies. Through "controlled ecosystem pollution experiments" in Saanich Inlet, beside the Institute of Ocean Sciences, he, along with international colleagues, was able to analyse how low levels of pollutants affected the food-web from plankton to fish. This was revolutionary during a time when much study was focused on fish in isolation of their habitat. Dr. Parsons' research broke new ground and encouraged others to understand how human activity impacts our environment.

In 1971, the University of British Columbia lured Tim to academia. At UBC, Tim saw that his students were lacking books on methods in biological oceanography. Over the next years, he published and continued to revise books that were broadly used by oceanographic students for many years. One notable example is the book entitled "Biological Oceanographic Processes" which remains the classic text book for students of biological oceanography.

Tim's influence is felt within Fisheries and Oceans Canada through both his ideas on fisheries oceanography and through the many staff that either studied under him or worked with him during his university tenure in the 1970s and 1980s.

Since most of Dr. Parsons' research was carried out in the Pacific Ocean, he naturally developed strong ties with Japanese scientists. He credits some of his enthusiasm for fisheries oceanography as arising from insights and convictions of Japanese colleagues. In 2001, Tim was awarded the prestigious 17th Japan Prize, for his outstanding work in Marine Biology.

The second Timothy R. Parsons medal was awarded to Dr. Daniel Ware for his outstanding contribution to the field of fisheries oceanography.

Dr. Daniel Ware is a nationally and internationally renowned fisheries scientist with a strong research and publication record in ecology-based multidisciplinary studies. Dan is a pioneer in the investigation of the inter-relationships between fish stocks and physical environmental factors. He devoted himself to quantifying the effects of environmental variability on fish communities through a combination of field and modeling research. Throughout his career, Dan has challenged conventional wisdom and produced influential papers that have changed the way fisheries scientists and managers view the world. Dan has the unique ability to break down very complex scientific questions into readily

understood concepts for administrators, other scientists, fishermen, and the general public.

Dr. Wendy Watson-Wright, Dr. Daniel Ware & Dr. Timothy Parsons

Dan began his scientific career at the University of British Columbia where he received his doctorate in 1971. A postdoctoral position and a permanent posting followed on the Atlantic coast, at the Bedford Institute of Oceanography, where Dan conducted lab and at-sea research on bioenergetics, fisheries oceanography, stock recruitment theory and early life history of pelagic fish.

After a decade in the Maritimes, Dan returned to the West Coast in 1982 where he was appointed Head of the Herring Section at the Pacific Biological Station. In 1985, he co-initiated and coordinated the La Perouse Project, a long-term multidisciplinary study involving scientists at the Pacific Biological Station in Nanaimo and the Institute of Ocean Sciences in Sidney. The aim of the project was to measure the inter-annual variation in physical and biological conditions on La Perouse Bank and the implications for pelagic and groundfish production in this important upwelling ecosystem.

By the 1990s he was selected as the First Chair of the Science Board of the North Pacific Marine Science Organization (PICES), as a member of the editorial board of the journal, Fisheries Oceanography, and as a member of the GLOBEC International Strategic Planning committee.

Simultaneously, Dan participated in the Canada-Japan Science and Technology Program from 1991 to 1999 to conduct a comparative study of the British Columbia and Oyashio Current coastal ecosystems with Japanese scientists.

To sum up, Dr. Ware is a world leader in both observational and modeling research into the impact of changing ocean processes and primary productivity on commercial fisheries in the Pacific Ocean, and has made major contributions to the science and administration of PICES since its inception in the early 1990s. He has been a very supportive mentor to a cadre of students and scientific colleagues and continues to share his knowledge and insights into ecology theories with both the academic and fishing communities.

Dr. Wendy Watson-Wright
ADM, Science
Department of Fisheries and Oceans

Parsons Award Acceptance Speech

Chairpersons, ladies and gentlemen - I would like to thank you, Dr. Watson-Wright, for your kind comments and for the presentation of this medal. For me, it is a wonderful experience. I was very fortunate in 1958 when Drs. Alfred Needler and Jack Tully presented Dr. Strickland and me with the idea that we should try to discover new ways of managing fisheries. The unfortunate early demise of Dr. Strickland has left me, in a historical sense, the only recipient of an award which was, I feel, initiated by others, nearly fifty years ago.

Following their prophetic planning, we have today a new generation of scientists who are achieving data collections and interpretations that would have been unbelievable fifty years ago. And let me emphasize that point, that it is data collections, and **not** the unverifiable computer models, that have advanced our knowledge of the oceans.

It is a daunting task to consider that marine scientists are required to understand 7/10^{ths} of the area of the world, and, by volume, ten times the land mass, using an army of scientists who probably number less than one percent the world's scientific effort. It is no surprise to me that we are going to be harassed by politics and by some unreasonable views of environmentalists when we lack the manpower to rapidly understand the oceans.

Having outlined the difficulty of the problems in ocean science, I find it strange that both environmental groups and some academics criticize DFO policies, especially when there is often a cryptic political agenda. The introduction of oceanography as a science for fisheries management has shown us that there is no "status quo" that can be preserved in the oceans. Enormous ocean forces can drastically alter the production of harvestable resources - thefore academics who have repeatedly rejected oceanography and taught a science of fisheries management based only on population dynamics, have been wrong. Similarly environmental groups who immediately attribute a decline in a fishery to their particular money-raising cause, are not showing any appreciation of how complex these systems really are *in toto*.

This is a moment in the history of fisheries and oceanography when we can recognize the start of a new era in which we can study whole ecosystems. For myself, my past research has been its own reward, but the future recognition of other scientists is an important mechanism by which we can encourage younger persons to progress toward new levels, new goals, new ideas - all aimed at revealing how Nature really works.

With the founding of such societies as CMOS, I am greatly encouraged that a sensible body of scientific opinion will eventually prevail. Thank you CMOS for hosting this event, and DFO and others who have supported the initiation of this medal - thank you for your constructive role in furthering our understanding of the world we live in.

Dr. Timothy Parsons

Oceanic Engineering in Canada - A Puzzle – What is missing?

Report on a Blue Ribbon Panel Discussion
Ocean Innovation 2004
Victoria, British Columbia, October 26, 2004

Panelists:
Geoff L. Holland, 2WE Associates and former Chair of the IOC
Michael Isaacson, Dean, Faculty of Applied Science, UBC
James R. McFarlane, CEO of International Submarine Engineeering
Judith A. Whittick, CEO of C-CORE

Editors:
Randy Gillespie, Canadian GeoProject Centre and CNC/ECOR
James A. Bull, Canada Centre for Inland Waters and CNC/ECOR

Moderator: **James S Collins, Chair, CNC/ECOR**

Executive Summary: Victoria, British Columbia, was the venue for Canada's premiere ocean technology event *OCEAN INNOVATION 2004* (October 24-26th). Organized by CCMC (www.ccmc.nf.ca), the conference featured several oceans-focused themes. One of the more enlightening activities was a panel discussion organized by the Canadian National Committee for the Engineering Committee on Oceanic Resources (CNC/ECOR). The panel brought together representatives from government, university and the private sector. The Chair of the panel, Dr. Jim Collins (University of Victoria), set the stage for the deliberations by way of a simple question: What is missing in the dynamic of Canadian ocean engineering?

While the intention was to discuss ocean engineering in Canada, the discussion actually oscillated between 'What is ocean engineering and why is it important', to 'What is ocean innovation and why is Canada so poor at it'? Based on the outcome of the panel discussion, the answers to these questions may be summarized as follows:

- Engineers need good fundamentals. Ocean engineers learn their craft 'on the job'.
- Engineering graduates prefer to work for large companies, or do they? Some graduates prefer the security of a large company; others prefer the challenges of working for a small company in a cutting edge area such as ocean technology. More research is needed to better understand where engineering graduates end up (small business, big business, government or academia).
- The ocean sector in Canada lacks long-term, multi-tier relationships like those that exist in the aerospace industry (for example). Engineering students (graduate and undergraduate) are seen to be the key to these long-term relationships. They represent a form of 'indirect commercialization'.
- Better collaboration among government, industry and academia is needed in order to fully leverage expenditures in ocean innovation. Major projects such as NEPTUNE/VENUS represent excellent opportunities to drive collaboration, innovation and success.
- Canada is not doing a good job in the area of ocean innovation (turning ideas into money). The failure of the Fast Cat project undertaken by BC Ferry Corporation, and the subsequent award of a contract to a German yard to build new ferries based on old technology point to major problems in how Canada is approaching opportunities for ocean innovation and ocean engineering.
- Economic activity in the oceans will drive ocean innovation and the demand for ocean engineering. This is already happening on the East Coast of Canada where offshore oil and gas development represents a significant local market driver with considerable potential for export opportunities.
- Canada needs to be a global player in ocean engineering and innovation. The ocean market is international, and other countries are much more aggressive than Canada in terms of economic nationalism.
- We must collectively set goals for ocean engineering in Canada, and invest our relative wealth wisely to achieve these goals. As the saying goes, if we don't know where we are going, then any road will take us there.

MAIN REPORT

Introduction of Panel: James S. Collins, Chair, CNC/ECOR

Jim Collins is an Adjunct Faculty Member of the Electrical and Computer Engineering Department of the University of Victoria as well as Vice President for Professional Activities of the IEEE Oceanic Engineering Society. CNC/ECOR, the Canadian National Committee of the Engineering Committee on Oceanic Resources, aims to promote the contribution of oceanic engineering to Canada and internationally. For more information please see www.ecor.ca .

Remarks by Judith A. Whittick, President and CEO, C-CORE:
Judith has over 30 years' experience in business and technology management. As President of **C-CORE**, her responsibilities include business development, strategic planning, policy development, and the management and implementation of corporate systems at C-CORE.

She holds a number of directorships in emerging technology-based companies and sits on a number of national advisory boards including the Canadian Space Agency Advisory Council and PRECARN Associates Inc. Judith is an Honorary member of the Engineering Institute of Canada, an Honorary member of the Association of Professional Engineers and Geoscientists of Newfoundland and the recipient of the 1999 MMS Corporate Leadership Award from Minerals Management Service, United States Department of the Interior.

Ms. Whittick's key points:
Long-term relationships among industry, government and academia are key; the key to building these long term relationships are graduate students; government should consider some form of incentive to encourage SME's (Small and medium size enterprises) to work with universities.

C-CORE employs sixty persons and is totally self-financed by doing industrial R&D. This creates an environment of entrepreneurship and survival. I call it a tactical R&D response team because we can respond very quickly, unlike academia who have many other priorities and responsibilities. We can deliver on project time lines; we can deliver, on budget, all those kinds of things that industry often wants.

When we first started we were tied to the offshore ocean area, but we wanted to survive, so we diversified our expertise into other areas. The fact of life out there -- the ocean technology area is made up of small companies. Small companies do not necessarily have the capacity to invest [in R&D]. That's one of the challenges in the puzzle of the partnership among industry, government and academia. I don't think we have developed in the ocean industry enough of what I call long-term marriages. It's more than partnerships -- marriages. Marriages take a lot of effort. There's the up part. There's the down part. At the end of the day what organizations like academia -- and ourselves – want is long-term R&D relationships. It's not quick fixes for money.

Let's look at the Canadian environment in this regard. Except in very niche areas, we don't have those long-term relationships. I think we're missing out on the ball. I believe that the mechanism to get that relationship going is through our university graduate students. Those are the young, dynamic folks who have got brilliant ideas, are willing and able to work 24 hours a day, seven days a week (which is very cost effective labour-wise), and can bridge the gap between universities and industry.

University research in Canada represents a third of our GDP. That's the highest of the G-7 nations. But if you look at our innovation capacity [turning ideas into money], we're not very good at it. One reason for this is that we're siloed with regard to funding. CFI (Canadian Foundation for Innovation) pays for university. We don't have mechanisms that easily have that partnership funding mechanisms. Yes, we have cooperative research grants (CRGs), but that only pays for the academic activities. In Canada we try to be very fair and never move across these three silos. I think we should. If you look at the latest budget speech, we see $50 million to be invested in research and commercialization as we move forward in the university environment. This is peanuts. I don't think that's going to be an effective answer to what we need.

Let's look at the ocean sector. The ocean technology sector is predominantly SMEs, but only 10 percent of SMEs will turn to universities for their research and development. Why? Because they come from a different place. SMEs come from [a mindset of] 'What does the market need', whereas academia comes from [a mindset of] 'This is a great research area to be in'. If you don't have that marriage at the beginning, you will never get that relationship. I'm afraid government is a mystery to me. We [C-Core] moved away from Canadian government [as a client] a long time ago. We used to work very closely with Geoff Holland, for example, but when Geoff said 80 percent of his budget had to go towards operational expenses, leaving only 20 percent for contract research activities, we said [that business line is dead for us]. [That was many years ago, so] I can't comment on interaction with Canadian government.

In the innovation exercise 'fourth pillar' organizations were mentioned. These enable groups to move among industry,

government and academia. [As such, these organizations help to] enable marriages. Organizations like ourselves and others that are in the room -- I think those are effective vehicles -- not the only vehicles but effective vehicles.

What do I see as the answer? Well, of all the challenges I know in the research environment, understanding the operational environment in which industry has to operate is key to success. We need to get more [people] from academia out and actually working inside companies to know what their [drivers and priorities are]. We need to get some of the entrepreneurs back into academia and get that enthusiasm into the graduate students and develop that relationship. I still come back to the fact that it's the graduate students that we have to focus on. They are the ones that we have to use to make these marriages work.

Money talks. We have to have [financial] incentives in the academic environment. We have to have [financial] incentives in the SME environment. SME's need some sort of tax benefit in return for engaging with academia, other than just the usual SME tax credits.

Those are kind of the parts of the Canadian [ocean engineering] puzzle. We're still siloed. We haven't developed the necessary long-term marriages among government, academia and industry. These are some of the suggestions that I believe [are key to success of Canadian ocean engineering] in the future.

Remarks by Geoff Holland, Past Chair, Intergovernmental Oceanic Commission:

Mr. Holland received a Bachelor of Science degree in mathematics and physics and a Master of Science degree in fluid dynamics from London University. He came to Canada and in 1968 joined the federal government service to be responsible for a program to monitor the wave activity around the Canadian coasts. Mr. Holland remained with the same federal ocean science organization until his retirement from the Department of Fisheries and Oceans in August 1999. He attained the position of Director General for Physical and Chemical Ocean Sciences. During the 31 years in government, Mr. Holland participated in many international marine policy issues and organizations and assumed several important international responsibilities. Among these, he was part of the Canadian delegation to the Law of the Sea negotiations and led the Canadian delegation to the London Dumping Convention through its first twenty years, ending as Chairman 1985-90. He chaired the first intergovernmental meeting of the Global Ocean Observing System, which led to its establishment in 1993. He was elected Chairman of the Intergovernmental Oceanographic Commission of UNESCO in 1995-1999. Mr. Holland is now a Director of 2WE Associates Consulting Ltd and was, until recently, one of the two oceans Ambassadors to the Minister, DFO.

Mr. Holland's key points:
Need to focus on adapting the ocean environment to our benefit; better data and information are necessary to make better decisions; government must decide how to invest wisely in the ocean sector.

I'm going to step back and look at the broader picture. I am not an engineer, but I have spent 50 years in various ocean activities at both national and international levels. I know that effectively all ocean activities depend on the skill to have the engineering ability for success.

We have been challenged to examine the issues that are the most important to the development of ocean engineering in Canada. The future of ocean engineering in Canada will depend not only on the national situation, but also on international developments. We have to consider those before we can consider why these issues should be high on this country's agenda.

There is no doubt that the global ocean engineering capability is staggering. We can build drilling rigs the size of skyscrapers and yet sophisticated enough to position themselves over a few metres of a four-mile or two-mile long drilling string. We can instrument a single fish and monitor it via satellite. We can process gigabits of data from multi-beam sonar arrays to give us bathymetry and detailed seabed characteristics. Despite these achievements, in my opinion we have hardly scratched the surface of future possibilities for ocean development and the concurrent engineering challenges to be faced.

Rather than marvelling at present day achievements, I think we should be considering what the future holds and speculating on how and when civilization will truly engage in understanding and mobilizing the three quarters of the planet that are occupied by the ocean, because it **will** happen. I am not advocating turning the marine environment into an industrial wasteland. Development has to be sensible and sustainable. The ocean is first and foremost a critical part of the environment that supports us, providing a habitable climate, a breathable atmosphere, an abundance of water and many of the living and non-living resources necessary for our existence. The marine environment must be protected and nurtured for our own selfish benefit.

But understanding must precede actions, and precaution must be present when uncertainty exists. Nevertheless, with wise management I believe it is only a matter of time before the resources of the ocean and ocean space itself will become an even more important part of our lives than they are today.

Humans are but one of the millions of species competing for life on this planet. If success is measured by survival time, we are relative newcomers. There are other species with much longer histories than ourselves. However, for a

species to be successful and survive, it is necessary for it to be selfish, to adapt its environment and to use other species to its advantage. This has happened over the billion years of evolution on the planet. It is abundantly clear that man has adapted the terrestrial environment to his own needs. Look at agriculture practices from rice paddies to prairies, forestry, transportation systems, hydroelectric dams, cities, industries. Even our parks and gardens have left the terrestrial environment a much different place than it was at the birth of civilization. We have also made many mistakes along the way.

The human species possesses tremendous capacity for change, but in the past these changes have rarely been initiated for the benefit of the species as a whole. The realization that individual actions can have an accumulated impact on the planetary environment has been slow in coming. As our technological capability increases, more care must be taken to eliminate or minimize unwanted impacts. For the oceans the potential for serious and irreversible impact is far greater in the three-dimensional dynamic marine environment than it is on land. On the other hand, the ocean is still largely undeveloped, it's international in character -- the majority of it is -- and could provide a real opportunity for cooperation and mutual benefit. The ocean will be the frontier of the future and that means greater global markets and large returns for those countries that wish to invest in ocean engineering.

Within the broad range of ocean engineering opportunities there may need to be focus for action, but the choices are endless. Knowledge and information is a top priority. Every activity will need a greater understanding of the ocean environment. Decision-making must be based on reliable and timely information. Global changes need to be monitored closely. There will be a need for more innovative instrumentation, observing systems, data management, research and modelling. Ship-borne observations will be complemented by arrays such as NEPTUNE (North East Pacific Time-series Undersea Networked Experiments; see http://www.neptune.washington.edu/) and VENUS (Victoria Experimental Network Under the Sea), automated floats, satellite and sonar.

Fisheries and aquaculture have a huge requirement for better management and improved technology and fishing practices. We haven't reached the wall in terms of protein from the sea; rather we are where agriculture was over a few centuries ago. Shipping and hydrocarbon development will continue to provide large markets for the foreseeable future, but there are other areas that will be growing, such as renewable energy, exploring and developing the resources of the deep sea. Huge amounts will need to be spent on sea defences in the face of rising sea levels and the increasing occurrence of severe weather events. It is inconceivable to me that ocean space will not eventually be used for habitation. As more and more structures are built on the ocean, such as wind farms, airports, drilling systems and fish farms, the time when people settle and live on the ocean surface draws closer. Then ocean engineers will have a field day.

In conclusion, Canada faces three oceans. It possesses a longer coastline than any other country and owns a tremendous offshore area. Against these advantages she has a relatively small population to support ocean initiatives. To obtain any political priority for the national ocean agenda has been a continuous struggle. However, science and technology is one of the four pillars of the newly announced Ocean Action Plan. It would seem worthwhile for government to consider a policy that would invest in the creation of a viable and internationally competitive ocean industry in Canada. It would have to address training and the supply of the qualified work force that will be needed. That was one of the things I didn't hear Arthur Carty mention in his very good talk yesterday -- the need for trained personnel. Judith made a point of that. The engineering community itself in Canada will have to help government with these activities.

As I say, there's a broad range of ocean activities out there. We have to decide as a country what is the focus for -- the best focus for ourselves. In return, the economic benefit that will come to this country will help us address the ocean management and initiatives within our own country. We need to manage wisely the coasts and the offshore areas that are now under our jurisdiction. I think one of the missing pieces of the puzzle is that government. has got to choose how it spends its money. As I said, we have a small population and we don't have maybe the resources of some of the larger populations. If we spend them wisely and we generate an economic return from that money, then I think that's the best way forward. Thank you.

Remarks by James McFarlane, President and CEO, International Submarine Engineering:

James R. McFarlane is president and founder of International Submarine Engineering (ISE). Since 1975 he has directed the design, construction and operation of tethered and untethered remotely operated vehicles (ROVs) and the development of autonomous vehicles. Previously, he served as vice president of engineering and operations of International Hydrodynamics, and prior to that as a naval officer in the Canadian Armed Forces. He is a founding member of the Canadian Academy of Engineering. He has authored numerous technical papers on submarines, human-occupied submersibles, ROVs, and autonomous vehicles. He received his B.Sc. degree in mechanical engineering from the University of New Brunswick, an M.S. in naval architecture and marine engineering, and a degree in naval engineering from the Massachusetts Institute of Technology. He has received four honorary Doctorate degrees.

International Submarine Engineering Ltd. is a world leader in the design and development of autonomous and remotely operated underwater vehicles and robotic systems. The robotics sector of the company's business has expanded to encompass engineered solutions for the space, offshore and industrial markets. This technology is integrated with real-time control and vision software, developed by ISE's Controls Group. ISE provides the know-how and the capability to complete large Systems Integration projects and to bring concepts to market.

Dr. McFarlane's key points:
Learn by doing; be international – markets are global; beware economic nationalism; focus public sector investment in initiatives that allow Canadian ocean technology industry to exercise its capabilities.

Canadian ocean engineering, a puzzle, what is missing? I hold the view that ocean engineering is the same as other forms of engineering. To be an engineer you have to be an engineer. You can't be an engineer if you aren't an engineer. "What we have to do we learn by doing" (Aristotle around 350 BC). Nothing has changed.

The reason learning by doing works is that it strikes the heart of basic memory processes upon which humans rely. Human memory is based in scripts and general scripts. We learn how to do things and then we learn how what we have learned is right or wrong. We have to exercise our capability. This is true in university and in industry. The time rate of change of our engineering is determined by the amount of money, by innovation and by engineering. It is also determined to some extent by political considerations. In whatever level of activity we're going to be involved in today, we're going to have to be international. You can't make an investment dealing in hamburgers without having markets around the world. With that, you're going to end up being involved with economic nationalism.

When I started International Submarine Engineering, the plan was to go to the North Sea where the water was colder and deeper and they were technologically intensive, where the Gulf of Mexico was warm and relatively shallow, and therefore not as challenging, relatively. Very quickly I got over there and started to work. Shortly after, there started to be economic nationalism brought to the fore. That lasted for a period of 10 or 12 years. That had an enormous impact on our ability to exercise our capability. At one time, 15 years ago, 85 percent of the technology in the North Sea was British. That tells you that there was economic nationalism. Nevertheless, in these other countries we are the guests. We have no rights to entry to their countries.

There will come a time when diligent research over long periods brings to light things that now lie hidden. Our descendants will be amazed that we do not know that which is so plain to them. "Many discoveries are reserved for generations yet to come" (Seneca Seventh Book of Natural Questions). Nothing has changed. The key to the puzzle is to exercise our capability which means that there has to be money because without the money we can't exercise our capabilities. Thank you.

Remarks by Dr. Michael Isaacson, Dean, Faculty of Applied Science, University of British Columbia:

Dr. Michael Isaacson has been Dean of the Faculty of Applied Science at the University of British Columbia since 1997. He is also a professor of civil engineering specializing in coastal and ocean engineering. He is the author of over 200 technical papers and co-author of two texts, and has served as a specialist consultant on a wide variety of engineering projects for government agencies, major oil companies, consulting engineering companies and law firms. He is a Fellow of the Canadian Academy of Engineering, the Engineering Institute of Canada, the Canadian Society for Civil Engineering, and the American Society of Civil Engineers.

Established in 1915, UBC's Faculty of Applied Science served as British Columbia's only engineering school for more than 55 years, and remains the only engineering school in B.C. that provides programs and research across a wide range of engineering disciplines, producing some 75% of B.C.'s engineering graduates. Approximately 2,900 undergraduate and 950 graduate students are currently enrolled. The Departments of Civil and Mechanical Engineering have offered graduate programs relating to naval architecture, ocean engineering and coastal engineering. Many of these graduates have gone on to hold senior positions in the ocean engineering and consulting engineering industries in Canada and throughout the world.

Dr. Isaacson's Key points:
Ocean engineering is a complex Venn diagram; graduate students represent a conduit for 'indirect commercialization' into industry; demand for ocean engineers will fluctuate depending on economic activity in the ocean sector; economic return is a key driver (as it is in other sectors such as the environment).

I want to spend a little bit of time giving you the university perspective on the topic. In order to do so, one has to ask 'what is ocean engineering?' The simple answer is that it is engineering related to ocean activities. However, a more interesting perspective is to look at the kinds of adjacent, application areas there are, to get a feeling for the range of industries and applications that ocean engineers are involved with. We have the oil and gas exploration and development activities. Even within that one area itself, if you're doing that in the Beaufort Sea, you move into ice engineering; if you do it in British Columbia, you move into earthquake engineering. You have fisheries activities. You

have instrumentation, robotics and devices. You have the military side -- submarines. You have shipping and ports. Then you move into coastal engineering and naval architecture. You can see it's one of those areas that really is a lovely, complex diagram touching on a whole range of adjacent interests and activities.

From the education side, I think of it as the undergraduate and graduate students that are developed who might be of use to that industry. On the undergraduate side, the large engineering disciplines are civil, mechanical and electrical. Students need to have fundamental knowledge in those areas. Industry typically needs a mix of bachelors student as well as graduate students -- the masters and PhD graduates -- people with more specialized knowledge and research expertise. Depending on the status of the industry, there's a requirement for a whole range of these kinds of graduates.

The research activities at universities really are driven largely by the curiosity of the professors, by the needs of industry, and by where the money is. There's an interesting balance. Judith talked about the short-term response time. Universities typically take a little bit longer. There is a mix between long-term stability and where an industry is going. What are the long-term questions versus the short-term, immediate answers that might be needed for specific projects. There's a mix between commercialization in the traditional sense -- developing patents and intellectual property – versus indirect commercialization, which is what I think of as graduate students going out into the work force, taking their ideas and entering industry. There's not only research in the sense of developing those new ideas, but there's code development, which is another side of activity where one tries to improve practice over time.

Again, there's quite a mix of the kinds of research activities one does. If you look at my own university in particular, we might have perhaps a dozen or half a dozen of what you might call ocean engineers. They're scattered around. They're electrical engineers, mechanical engineers, civil engineers and oceanographers. One of the features of ocean engineering is that it's a specific industry without a focused knowledge base. I use the analogy with the mining industry. You have mining engineers. Again, they rely on knowledge from electrical, civil, and mechanical engineering and the like. The demand fluctuates. In our own case, we have seen the numbers go from maybe five students wanting to go into mining engineering now to over 30 students. As the economy changes, as the regulatory environment changes, demand fluctuates up and down. Universities bring in a bit of stability to that.

The same thing applies to ocean engineering. In a sense, one needs really a critical mass to be able to sustain the number of students that are created at the different levels, the kinds of research that are needed. How does one make that happen? One extreme is, if nobody wants graduates in that discipline, there is no economic activity, then one doesn't need ocean engineers. It's the stimuli that come from societal developments that drive the demand. That might be through oil and gas exploration or aquaculture or fisheries -- whatever other economic activities are needed. Then it's a combination of industry with government and with universities deciding and developing a vision and discussing how this might develop, how large it might grow and then giving the universities the critical mass to be able to develop those programs and make those kinds of things happen. There's that mixture of participants again. Jim talked about industry, government and universities, and it's that mixture of individuals that collectively develop the wisdom to enhance this particular discipline. At the end of the day, typically what is driving it is economic return. Economic return is certainly a key driver. Other aspects are environmental considerations, sustainability considerations and so on. That's just touching on different aspects of the role universities might play in that.

SUMMARY OF THE DISCUSSION SESSION

The following is a summary of discussion points raised following the panel remarks. We have attributed discussion points to audience members when appropriate. In some cases the order of the topics raised has been altered, and discussion points raised at different times during the session have been grouped. We have elected to arrange the discussion points under two major headings – ocean engineering and ocean innovation.

1) Ocean Engineering:

ENGINEERS NEED GOOD FUNDAMENTALS. OCEAN ENGINEERS LEARN THEIR CRAFT 'ON THE JOB' [JIM McFARLANE, INTERNATIONAL SUBMARINE ENGINEERING]: We need engineers with good fundamentals -- mechanical engineering, electrical engineering, engineering physics, etc. Then companies need to put some investment into training them in the specifics of ocean engineering.

[RESPONSE FROM MICHAEL ISAACSON]: Ocean engineering is a vast area with many facets. Aspects of it need civil engineering. Aspects of it need advanced, PhD-level expertise in developing software systems. There's quite a broad spectrum of needs.

ENGINEERING GRADUATES PREFER TO WORK IN LARGE COMPANIES, OR DO THEY? [COMMENT from audience]: Going to work for an SME may present problems for graduate and undergraduate engineers. Many graduates tend to look at the big firms, like General Motors for example, which they see as being able to offer better career development opportunities, and perhaps a better salary package than a small firm. Also, small firms typically want someone who already has five or ten years' experience, not someone who will need months or years of training.

[RESPONSE FROM JIM McFARLANE]: Small firms offer the novice engineer the opportunity to really get involved in a project and see it through from beginning to end. Large firms tend not to be so 'hands on'. We don't find it difficult to get engineers to come to work at a place that is developing frontier technology.

[RESPONSE from audience]: Students are such a dynamic group of people that they can really change the world. Young people come into this industry (ocean technology) after finishing school and they are full of energy, full of new ideas. It's a perfect match. It's a perfect time to employ these people. (Ed: A quick poll of coop engineering placement offices at the major Canadian universities should reveal statistics on where most graduates go to work (SME's, big business, government, etc.). Additional research would be required if we want to understand why they took the jobs they did, and whether or not they stayed with those initial jobs.

2) Ocean Innovation:

THE OCEAN SECTOR IN CANADA LACKS LONG-TERM, MULTI-TIER RELATIONSHIPS [COMMENT from audience]: In the aerospace industry, for example, there are many long-term partnerships between the major players -- the Boeings or Bombardiers or Pratt Whitneys -- and the second-tier and third-tier firms. The ocean industry in Canada does not have this first-tier, second-tier, third-tier structure. We don't have that many Canadian major players (Ed: Petro-Canada, EnCana, Canada Steamship Lines are three examples). The ones we do have don't seem to have long-term relationships with Canadian suppliers (Ed: Some research would be needed to confirm this. And if so, then why not?).

[RESPONSE FROM JUDITH WHITTICK]: In the US, major investments by the Navy tend to drive the development of new companies and new technologies, and help to bootstrap these companies into the marketplace. As a result, a US company with a similar capability profile to C-Core (that employs 60 persons) would employ anywhere between 2,000 and 5,000 people. These are our competitors. As for offshore oil and gas, we have found that these companies are not great purchasers of new technology. They want proven technology. And small businesses in Canada typically don't deal directly with the buyer; they deal with the second- or third-tier contractors, such as Haliburton or Schlumberger. These buyers are not easy to work with because they are foreign-based companies. In general, Canadian suppliers don't have Canadian industry clients to latch on to.

BETTER COLLABORATION AMONG GOVERNMENT, INDUSTRY AND ACADEMIA IS NEEDED IN ORDER TO FULLY LEVERAGE EXPENDITURES IN OCEAN INNOVATION [COMMENTS from audience and CNC/ECOR member HARRY WEILER, AXYS TECHNOLOGIES]: In British Columbia we have a major ocean research project involving a hundred million dollars of public sector investment, and nobody seems to know how to bridge the gap of turning that into a huge windfall. We seem to be stumbling all over ourselves with no specific direction on how to leverage that investment. I think there's a problem of leadership in all four pillars -- industry, government, academia and not- for- profit. These players have to come together around a common strategy. Government can lead in areas of purchasing policy and in the way that we fund our universities. It's not the universities' fault that they have been put into the situation where they're chasing dollars that force them to make certain decisions that aren't necessarily compatible with a long-term sustainable strategy. This has led to, in my experience, a fundamental distrust between universities and the ocean technology industry. As a small business operator, when I look at universities, I'm looking for pure and applied research, whereas I see my company as having a role to play in development and commercialization of the results of this research. Under the current regime, there is no easy working relationship between universities and high tech industry. (Ed: There were no representatives of ocean industry (big business) at the forum. As such, references to 'industry' throughout the discussion apply to small, high tech businesses.)

CANADA IS NOT DOING A GOOD JOB IN THE AREA OF OCEAN INNOVATION (TURNING IDEAS INTO MONEY) [JIM COLLINS, UNIVERSITY OF VICTORIA]: In British Columbia we have a classic example of Canadian ocean engineering and innovation gone wrong. We have a ferry system that's larger than the Canadian navy and yet when BC Ferry Corporation commissioned and built the new Fast Cats, the project was a complete failure (Ed: The project went significantly over budget and there were major structural problems with the completed vessels). Now BC Ferry Corporation has announced that it is going to build new ferries that are based on older technology and they have selected a German yard to do the work. This sequence of events is an example of a problem with the innovation system in Canada. And it's not the only example. Thirty or forty years ago we built a rig a kilometre from here in Victoria Harbour. How many rigs have you seen built in Victoria, let alone Canada, in the last five years? There are some major problems here that need to be dealt with.

[RESPONSE from audience]. We need innovation, and we need money to innovate. We don't need innovation in asking for money. We need innovation in using money to achieve social and economic benefits. We keep throwing money at things, but we don't use the money in ways that advance ingenuity and innovation to our own benefit.

[RESPONSE FROM GEOFF HOLLAND]: In Art Carty's keynote address at the Ocean Innovation 2004 conference he cited the example of a Canadian naval architect who is a world leader in tug design – an innovator, a frontier researcher. But where were the tugs he designed being built? They were being built in Singapore and in Spain and elsewhere. So, how much of the profit from those tugs is

coming to Canada, and how much is going to the people who are building the tugs? It would seem to me that we likely receive about 5% of the total project value in return for our innovation. So, should we be focusing our efforts on how to get more manufacturing work? Can we have a viable ocean industry in Canada -- a real competitive, world-wide ocean industry, if we don't have the manufacturing capability? And what role should government (including the Canadian military) play in terms of procurement policies, etc.?

[RESPONSE from audience]: Canada is not going to be a world leader in manufacturing in the 21st century. We cannot compete with the Chinese, the Koreans, etc. We need to concentrate on knowledge, ingenuity and innovation. We have to learn to deal with these in a systemic way and not talk about engineering systems, but rather human systems and social systems and global systems. I am reminded of a movie called October Sky in the beginning of the space industry where you had young kids in the US experimenting with rockets in 1954 and this ingenuity was nurtured and led to major advances in space flight.

[RESPONSE from audience] Ipsos-Reid is now doing an electronic survey of the business leaders in the western provinces on policy issues related to the growth of the environmental technology industry. This industry is facing many of the same issues that ocean engineering is facing: What's the market? Where is the money? How do you help SMEs? and so on. Eight policy instruments to address these questions were identified at a workshop in December 2003. The workshop report is available at http://www.wd.gc.ca/innovation/etf/rpts/etf_final_e.pdf

INNOVATION IS AN ENEMY OF THE STATUS QUO [COMMENT from audience]: Innovation is a vehicle for the future, and an enemy of the status quo. I struggle with this fact every day. I think everybody who is in the high tech business has the same challenge because new technology and new ways of doing things are the enemy of the way things are done now. Therefore, in Canada we have an old system battling with new innovation. It will never work. We need changes in the system. If we don't do this -- if we don't invest money wisely -- if we don't provide a new mechanism to make innovative ideas work, then we will continue to struggle with an impossible problem. Its like trying to build a new vehicle using an old hammer. It's impossible.

ECONOMIC ACTIVITY IN THE OCEANS WILL DRIVE OCEAN INNOVATION AND THE DEMAND FOR OCEAN ENGINEERING [MICHAEL ISAACSON, UNIVERSITY OF BRITISH COLUMBIA]: In order for the shipbuilding industry (or any other ocean industry) in Canada to be competitive, it must have a 'critical mass' of market demand within Canada, but must also be positioned to respond to international market opportunities. Offshore oil and gas development off the East Coast of Canada is providing the 'critical mass' market for certain services and expertise. This, in turn, drives the need for certain types and numbers of graduates.

[RESPONSE from unidentified audience member]: We often run into people with innovative ideas but they don't listen to the marketplace. They ask 'Why don't you like our technology'? They can't accept that it's not that the market doesn't like the technology, it's that the market either doesn't need the technology, or doesn't know that it needs the technology (Ed: Economist Geoffrey Moore has published widely on the 'technology adoption cycle'. See Moore, G. A. (1991) Crossing the Chasm, Harper Business, New York for more information.)

CANADA MUST ESTABLISH SOME CLEAR GOALS REGARDING OCEAN INNOVATION AND OCEAN ENGINEERING [COMMENTS from audience]: Is there some country that stands out that does ocean engineering and ocean innovation correctly? Who can we look to as a model of how to do things better in Canada? Do the Danes or Dutch or the Japanese or some other country do it right?

[RESPONSE FROM GEOFF HOLLAND]: I think Finland is a pretty good example. They've got the innovation, and they've got the cruise industry, and they build the ships.

[RESPONSE from audience]: I lived in Finland. Their government heavily subsidizes the ship-building and cruise industries. I suspect that the taxpayers of Canada would not want the Government of Canada to subsidize somebody else's ships by twenty percent.

Climat et vin

Six cents ans de météo

D'après le magazine L'Actualité, édition du 1er avril 2005, Section Géographica, Vol.30, No.5, p.3, six cents ans d'archives paroissiales bourguignonnes ont permis à des météorologues français de relever des températures similaires aux températures actuelles (vers 1380, 1420 et 1520, et de nouveau entre 1630 et 1680), alors qu'ils visaient à prouver le contraire. La date de récolte du pinot noir, étroitement liée à la température, a en effet été notée depuis 1370. Les chercheurs signalent cependant que le 20e siècle a été le plus chaud pour toute la période étudiée et que 2003 a battu tous les records, avec 5,86° au-dessus de la moyenne, plus que les 4,10° de 1523.

The Third MSC Forecasters' Forum: Overview and Recommendations

by Dov Richard Bensimon, Serge Desormeaux, Mario Gaudette, Louis Lefaivre, David M.L. Sills, Gilles Simard and Jean-François Voros

Environment Canada, Meteorological Service of Canada

1. Overview of the event

The third annual forecasters' forum (FF3) of the Meteorological Service of Canada of Environment Canada was held at the Crowne Plaza hotel in Montréal, Québec from February 15 to 17, 2005. The first forum had been held in Victoria in February 2003 and the second in Toronto in February 2004. One hundred and sixty-three (163) persons registered for the event, of which approximately half were operational forecasters. The authors listed above formed the organizing committee for the event.

Contrary to many other scientific gatherings, the idea behind the forecaster forums is to allow operational meteorologists from across MSC to meet and discuss issues that are important to operations. The aim of the forum is for participants to formulate recommendations to MSC senior management on a variety of issues. Each day of the event, therefore, had a specific theme[1]:

- Day 1: The Future Role of the Operational Meteorologist.
- Day 2: The Human-Machine Mix: The Shape of Tools to Come.
- Day 3: Probabilistic Forecasts, Products and Services.

Each day of the forum was divided into two sessions:

- Morning sessions featured invited speakers delivering talks around the theme of the day. Several speakers came from within MSC; others came from the private sector, the media and other branches of government. Examples of topics discussed were: nowcasting, ensemble forecasts, conveying probabilities to the public, the needs of the media for weather information.

- Afternoon sessions had participants divided into groups to answer questions related to the theme of the day. In answering these questions, participants developed recommendations. An example of questions discussed was asking participants whether or not they thought that the NinJo workstation project was headed in the right direction. They were also asked to express their likes, dislikes and concerns about the workstation.

A few points regarding the forum:

[1] The full agenda for the forum is available on-line at http://www.msc.ec.gc.ca/conferences/forecaster_forum/2005/index_e.html

- The event was organized to be completely bilingual, with both written and simultaneous translation available to all participants. Presenters were also able to give talks in either French or English.

- The event was dedicated to the memory of Brian Murphy, a well-respected meteorologist who passed away on June 30, 2004. (Ref.: *CMOS Bulletin SCMO*, Vol.32, No.6, page 178).

- Following the forum, a survey was sent to participants. In it participants stated that they generally enjoyed the event, and made several recommendations as to how to improve future fora as well as suggesting future topics for discussion.

2. Recommendations from the forum

Recommendations were formulated based on participants' responses and put forth to upper management at MSC. These covered a variety of topics including:

- MSC Transition / Vision
- Response to FF II Recommendations
- The Future Role of the Operational Meteorologist
- Forecast System Paradigms
- The NinJo Workstation
- Nowcasting
- Probabilistic Forecast Products

In some cases, MSC staff asked management for clarification of existing policies or formulation of new ones. Recommendations were made concerning "**The Future Role of the Operational Meteorologist**", which is the name of a committee formed during the last year within MSC. This committee was tasked with coming up with a vision of what the role of operational meteorologists will be within the MSC in the next 10-15 years.

The NinJo workstation is a project to create a "one-stop-shopping" workstation for operational meteorologists in Canada. Having such a workstation in place would reduce the large number of pieces of software to support across the country. Developers of the workstation are working with user representatives from each regional office so as to ensure that the workstation will be as relevant and pertinent to users as possible. It is hoped that this workstation will also include weather event simulators, devices that have proven to be quite useful in other national meteorological services.

It is likely that there will be increased use of probabilistic information in forecasts in the future. Participants stated that depending on the user, it would make sense to include more probabilistic information for certain specialized clients, while others may prefer a simpler format. This underlines the importance of conducting surveys amongst clients to see what their needs are before developing new products in MSC.

As an example of a recommendation that came from the forum, participants determined that "more forecaster training on ensemble systems and probabilistic products is needed before probabilistic information can be used to a greater extent in public forecasts and severe weather bulletins". The issue of keeping up-to-date with the latest technologies is always a relevant one in operational meteorology, and this recommendation illustrates the need that many operational meteorologists have for updating their knowledge on a regular basis.

3. Summary of the forum

The third annual forecasters' forum (FF3) brought together 163 participants from all across MSC to discuss organizational issues relevant to operational meteorology. Recommendations based on these discussions were then formulated and put forth to management for further action. Participants were generally pleased with the event, and a large majority recommended holding another forum next year.

Note from the authors: A presentation summarizing the forum was given at the CMOS Congress in Vancouver, B.C. on May 31st 2005.

85th Annual American Meteorological Society Conference
Building the Earth Information System
9 - 14 January 2005
San Diego, CA, USA

Conference Report prepared by Gary Lines
Climate Change Division, Meteorological Service Canada - Atlantic Region

Introduction

Every year the American Meteorological Society (AMS) hosts a gathering of Science Symposiums in a major US city. The event draws hundreds of participants, from many countries and age-groups.

This year the Conference was held at the San Diego Convention Center in Downtown San Diego, California. Such a facility is chosen for its large and many meeting rooms and usually houses the main social function, the Annual Awards Banquet.

This year's broad theme was "Building the Earth Information System" with two important sub-themes of "Living with a Limited Water Supply" and "Living in the Coastal Zone". Sessions this year included the 16th Conference on Climate Variability and Change and the 21st International Conference on Interactive Information Processing Systems.

Session Details

The Conference opened with a keynote address by Dr. James Mahoney, second-in-command to Conrad Lautenbacher, current head of the Global Earth Observing System of Systems (GEOSS) for NOAA. Lautenbacher was scheduled to speak but appears to have been pulled away to deal with US response to the Tsunami Relief in Indonesia. Dr. Mahoney is a past president of AMS and a fairly familiar figure to most of the audience. He delivered Lautenbacher's talk on GEOSS as well as spoke briefly on the tsunami threat to the US. He stressed the idea that educated users of environmental information were critical to the success of any environmental information system, emphasizing that billions of dollars invested in technology to observe the earth is useless if the resulting data is not used wisely and effectively. With regard to the Tsunami event, he confirmed that NOAA has deployed DART buoys to the Indian Ocean to aid the observing network there. He also talked about "Tsunami-ready" communities program

that NOAA supports for US locations.

Over the next three days I attended a number of sessions, primarily dealing with climate observation and forecasting. The climate sessions were worthwhile to heighten my knowledge of the current science. Research in the UK is now producing one-year temperature forecasts based on El Niño. Work on tree rings has resulted in identifying an underestimate of the amount of atmospheric cooling after volcanic eruptions. It was previously assumed that volcanic ash blocked enough sunlight to disrupt tree growth. While that is true, there is enough diffuse radiation to promote some growth, resulting in an underestimate of the impact and hence cooling.

Other work focusing on reproducing climate of the early Holocene resulted in a rather surprising result. In comparisons of model runs for the late 19th and early 20th century, natural forcings played a smaller role than expected in explaining the temperature change. Natural forcings such as volcanic eruptions still dominate at the decadal level but anthropogenic forcing is evident in the longer time scale and provided a closer model result when compared with observed temperatures.

Of particular note was a talk by Chris Schar, from Switzerland, on the extreme heat wave event in Europe last summer. He explained the work they did to try and identify the "rareness" of the event. If you assume a normal probability distribution and look at the "tails" of the distribution you should find the rare events. However this event was so "extreme" that it was a significant outlier. The only possible way to explain it was to modify the distribution by not only warming the mean temperature but by changing the variability (flattening the distribution). In order to account for this event the standard deviation had to change by at least 100%. When climate change scenarios were applied to this event, there was some correlation but the variability was still not varied enough. It was concluded that the temperature distribution needs not only to shift higher (mean warming) and flatten but it may also need to become more asymmetrical. One potential driver for such variability change is change in land surface processes (not handled well by most models). Such changes to vegetation and soil moisture may be a factor in changing the frequency of this type of event.

An entire session was held on the hydrology of semi-arid regions, including an interesting talk by James Hurrell. Dr. Hurrell is best known for his work on the ENSO and the NAO. In this talk he looked at the link between drying in central Africa and global SSTs. He found that warm SSTs in the Indian Ocean is forcing drying in South Africa while warming of South Atlantic SSTs is drying the Sahel region. If such warm anomalies continue, central and southern Africa will be at risk for significant drying over the next 100 years.

And finally, I attended a session dedicated to the upcoming Fourth Assessment Report (FAR) of the IPCC, due out in 2006 (or possibly 2007). There is a very tight schedule for submission of studies and reports over the coming year and the session head, Susan Solomon, will be working on several of the Working Groups to ensure that relevant information gets in to the Assessment. The talks in this session focused primarily on Radiative Forcing and its role in determining how the atmosphere "responds" to increasing greenhouse gases. It is certainly one of the areas debated scientifically for the past few years. The National Academy of Science has recently released a report on Radiative Forcing, similar to their report on global warming, in order to define some of the issues and provide either answers or recommendations on the way ahead for research.

By far this was the most crowded session and most interested audience of any I attended. It should be interesting to see how the next IPCC Assessment goes, especially since it is now led by an American.

For information on the highlights of the Conference from the AMS perspective, you can connect via the following web link:

http://www.ametsoc.org/meet/85annual/highlights.html

Note from the Editor: The 2005 AMS Annual Meeting, organized around the broad theme of **"Building the Earth Information System"**, brought over 2,600 attendees to the San Diego Convention Center.

RAPPEL - RAPPEL - RAPPEL

COMMENT ATTEINDRE LE SITE WEB POUR MEMBRES SEULEMENT

1) ALLEZ AU BAS DE LA PAGE WWW.SCMO.CA

2) NOM D'UTILISATEUR: LES SIX PREMIERS CARACTÈRES DE VOTRE NOM DE FAMILLE (ou moins s'il est plus court) SUIVIS DE VOTRE NUMÉRO DE MEMBRE, sans espaces.

3) MOT DE PASSE INITIAL: VOTRE NUMÉRO DE MEMBRE (sur votre étiquette postale)

En cas de difficulté, veuillez contacter Lise à affaires@scmo.ca (613) 991-4494.

Private Sector Committee News

Submitted by Susan Woodbury[2]

New Chair
I am pleased to report that Daniel Jobin of World Weatherwatch/RadHyPs was appointed the chair of the committee effective June 1, 2005.

Business Case/Strategic Plan
A business case/strategic plan was completed on March 31, 2005. It analyzes the state of the meteorological and oceanographic private sector in Canada today. It provides a situation analysis, examines the results of a survey of the CMOS Private Sector Directory subscribers, and provides ten examples of models of governance. Further, it describes the opportunities, strengths and weaknesses of the sector.

There is sufficient evidence to conclude that a new industry association would strengthen the private sector and help it to grow domestically and internationally. However, the transition from the existing services provided by the CMOS Private Sector Committee to a new organization (NewOrg) will take several years.

The report outlines the vision, mission and goals and objectives of NewOrg. Further it provides a detailed list of activities (next steps) to be completed prior to the establishment of NewOrg. If you wish to download a copy of the report, go to the members only section of our website, https://www1.cmos.ca/

Human Resources Study
Representatives of the meteorological private sector along with government and academia acted as the National Steering Committee for the meteorological employment study. Conducted by ECO Canada (formerly the Canadian Council on Human Resources in the Environment Industry), this study is now posted on the web. (see short article on page 70 in this *CMOS Bulletin SCMO* issue received from ECO Canada).

The CMOS Private Sector Committee wishes to thank the CMOS members who completed the survey, participated in focus groups and contributed to its success.

Referrals to CMOS Private Sector Directory
CMOS Private Sector Directory now boasts **54** members. To find out more about the meteorological and oceanographic private sector in Canada, go to http://www.cmos.ca/Privatesector/directory.html. Over 150 referrals have been sent to the directory subscribers since the inception of the service in April 2004. The subscribers are very satisfied with the service.

We received a very complimentary note from Purchasing Department at Honda Canada Mfg thanking us for the referral service. The Honda representative said that they received half a dozen replies from private sector companies. "Thanks for your service, it worked great."

Atmosphere-Ocean 43-2 Paper Order

OC-251
Cold Water Intrusion in the Eastern Gulf of Alaska in 2002 by William Crawford, Peter Sutherland and Peter van Hardenberg.

AO-609
An Evolving Seasonal Forecasting System Using Bayes' Theorem by G. J. Boer.

OC-255
Nutrients in The Gully, Scotian Shelf, Canada by Peter M. Strain and Philip A. Yeats.

AO-616
Atmospheric Circulation Comparisons between the 2001 and 2002 and the 1961 and 1988 Canadian Prairie Droughts by Barrie R. Bonsal and Elaine E. Wheaton.

AO-410
A Study of Extratropical Transition in the Western North Atlantic Ocean, 1963-1996 by Chris T. Fogarty and John R. Gyakum.

Next Issue *CMOS Bulletin SCMO*

Next issue of the CMOS Bulletin SCMO will be published in **August 2005**. Please send your articles, notes, workshop reports or news items before **July 8, 2005** to the address given on page 66. We have an URGENT need for your written contributions.

Prochain numéro du *CMOS Bulletin SCMO*

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en **août 2005**. Prière de nous faire parvenir avant le **8 juillet 2005** vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page 66. Nous avons un besoin URGENT de vos contributions écrites.

---

[2] Past Chair, former CMOS Vice-President, now new elected CMOS President

CMOS Prizes and Awards announced at the 39th Annual Banquet

Park Plaza Hotel, Richmond, B.C.
June 2, 2005

President's Prize

To **Dr. Frédéric Fabry** for his very innovative and important contribution to radar meteorology in deriving humidity fields from meteorological radar ground-clutter echoes, as highlighted by his paper, co-authored with Frush, Zawadzki and Kilambi, "*On the extraction of near-surface index of refraction using radar phase measurements from ground targets*", published in the *Journal of Atmospheric and Oceanic Technology* **14**, 978-987, 1997. His idea represents a breakthrough in radar meteorology in using ground clutter, considered until then a useless field, to derive near-surface moisture fields that can be used in many applications such as short-term and Numerical Weather Prediction forecasting. The importance of this breakthrough can be ascertained by the fact that several national weather services indicated their interest in transferring this new science to operations.

Tully Medal in Oceanography

To **Brian Petrie** for an outstanding career in oceanography, the breadth and impacts of numerous collaborations, and his sustained leadership to the description, understanding and implications of physical oceanographic variability in the Atlantic Canadian coastal ocean."

Andrew Thomson Prize in Applied Meteorology

To **Peter Bowyer** for his innovative work in operational extreme-wave analysis and prediction, along with his accomplishments in education and outreach in the area of the extratropical transition of hurricanes. As a program manager of the Canadian Hurricane Centre, Peter has made important contributions to the forecasting of hurricanes and their impacts in Canada, and in the application of his scientific knowledge to support decision making of those involved in mitigating risks related to hurricanes and educating users.

Rube Hornstein Medal in Operational Meteorology

To **Merton Horita** for his long and productive career developing and transferring sophisticated technology to operational meteorology. Mert is a strong, resourceful and innovative leader who accomplished many "firsts" during his career while remaining the consummate professional with a sense of humour.

The Roger Daley Postdoctoral Publication Award

Was awarded, for the very first time, to **Benjamin Murray**, University of British Columbia, for his important and innovative scientific work in the area of ice cloud formation in the Earth's atmosphere as highlighted by his paper, co-authored with Knopf and Bertram, "*The formation of cubic ice under conditions relevant to Earth's atmosphere*", published in March 2005 in *Nature*.

The results obtained by Dr. Murray and his co-researchers are considered a major discovery in the area of cloud physics and atmospheric sciences, and may change our current understanding of ice clouds in the atmosphere, an important component of the Earth's climate system.

Dr. Murray (left on photo) accepted his award from Charlie Daley, Roger Daley's son. Lucia Daley, Rogers' widow, was also present for the ceremony.

Tertia M.C. Hughes Memorial Graduate Student Prize

To **Damon Matthews** for his outstanding Ph.D. thesis work at the University of Victoria, on "*Land cover change, vegetation dynamics and the global carbon cycle: experiments with the UVic Earth System Climate Model*". This work has significantly advanced our understanding of how changes in land use affect climate.

The Prize in Applied Oceanography

The Prize in Applied Oceanography was not awarded this year.

Citations

To **Attilla Danko** and **Allan Rahill**, for setting up and maintaining a Web site called "The Clear Sky Clock" on which they provide real-time forecast information of clear and dark skies over North and Central America. This Web site is highly praised by the professional and amateur astronomical community in providing invaluable information on observing conditions a few days in advance and is a vivid example of the application of meteorology in support of astronomy.

Neil J. Campbell Medal for Exceptional Volunteer Service

The first medal was presented to **Neil J. Campbell** himself for more than 25 years of volunteer service to CMOS at both the local centre and national levels, including as Chair of the Ottawa Centre 1978, member or chair of numerous committees through the 1980s, President of CMOS in 1984 and Executive Director of CMOS from 1994 through 2004. During his tenure as volunteer Executive Director, Neil not only substantially advanced the operations of the CMOS office, but he excelled in getting other volunteers to take on important duties and made sure that they were recognized for their efforts by implementing awards and honoraria, none of which he ever accepted himself. He unhesitatingly took on additional roles for CMOS, such as sponsoring the formation of the Canadian Foundation for Climate and Atmospheric Sciences, taking on responsibility for the Canadian National Committees for SCOR and ECOR and found a way to deliver them, again by finding volunteers. This medal is established in his honour and is intended to be the ultimate recognition for volunteer contributions to CMOS.

Dr. Campbell was present to accept his award and received a standing ovation from the audience.

CMOS Fellow

The title of CMOS Fellow was conferred on **Theodore (Ted) Shepherd**, University of Toronto, in recognition of his outstanding personal research in atmospheric dynamics, his leadership of collaborative middle atmosphere research and modelling programs in Canada, his mentoring of students and his leading contributions to the World Climate Research Program and its core project on Stratospheric Processes and their Role in Climate (SPARC).

Professor Shepherd is a world recognized atmospheric dynamicist. He has provided outstanding leadership for the Canadian Middle Atmosphere Modelling and Global Chemistry for Climate Modelling programs. He is a widely cited author and communicator (speaker). His enthusiasm has energized successful collaborations, provided opportunities and mentoring for students and a focus for an unusually wide range of topics from observations to laboratory studies.

Unfortunately Prof. Shepherd had to leave Congress early and was not available to accept this honour. However, it will be presented during Congress in Toronto in 2006.

The CMOS / Weather Network / Météomédia Scholarship

Charlotte H. Gabites

(offered to a Canadian female student enrolled in the 3rd or 4th year of an atmospheric science degree program at a Canadian university and with career aspirations as a forecast meteorologist, on-air meteorologist or meteorological briefer)

The scholarship was awarded to **Charlotte H. Gabites**, University of British Columbia, for excellence in her studies by John Mills, Vice-President, Content Pelmorex Communications Inc.

CMOS Undergraduate Scholarships

(Provide $500 for students in their penultimate year of studies to support their final year) were awarded to:

Heather Antoniuk

- **Heather Antoniuk**, University of Alberta, who was present to accept her award; and

- **Michael J. Taylor**, York University, whose award was accepted on his behalf by Prof. Peter Taylor.

The Campbell Scientific Corp. Best Student Poster Prize

Claude Labine

Was presented by Claude Labine to **Heather Raven** of the University of Alberta. Her research work in collaboration with Brian Weins of Environment Canada in Edmonton is entitled *"Beryllium as a Tracer of Stratospheric Contribution to Ground Level Ozone at Harlech, Alberta"*.

(Continued on page 94 - Suite à la page 94)


Photo 1


Photo 2


Photo 3


Photo 4


Photo 5


Photo 6


Photo 7


Photo 8


Photo 9

Photo 10


Photo 11


Photo 12

Photos legend

Photo 1: Diane Houle-Rutherford & John Mills & Claude Labine.
Photo 2: Susan Woodbury & Ian Rutherford.
Photo 3: Hal Ritchie, former president, and wife Edith.
Photo 4: Laurie Neil, Sylvie Gravel & Rich Pawlowicz.
Photo 5: A happy table at banquet.
Photo 6: Dick Stoddart & Eleanor Campbell.
Photo 7: A happy dancing couple.
Photo 8: Susan Woodbury, new President, addressing the audience.
Photo 9: Rich Pawlowicz & Laurie Neil giving the CMOS Plaques to Sylvie Gravel (Toronto Centre).
Photo 10: Geoff Holland in front of the Neptune - Venus poster during their special session.
Photo 11: Lise Harvey at registration desk.
Photo 12: Group of veteran oceanographers;
seated in front: Tim Parsons & C.S. Wong;
back row: George Pickard, Neil Campbell & Allyn Clarke.

Student Travel Bursary Recipients
Récipiendaires des bourses de voyage pour étudiants

Name / Nom	University / Université	Supervisor / Superviseur
	Amount / Montant: $500	
Sarah Jane Eaton	Memorial University of NFLD	Mark Wilson
Reza Ghoddousi-Fard	University of New Brunswick	Peter Dare
Moritz Lehmann	Dalhousie University	John Cullen
Clark Richards	Memorial University of NFLD	Brad de Young
	Amount / Montant: $375	
Teresa Fisico	University of Manitoba	John Hanesiak
Steve Gibson	McGill University	Ronald Stewart
Alexandra Jahn	McGill University	Lawrence Mysak
Erika Klyszejko	University of Waterloo	Nicholas Kouwen
Martine Lizotte	Université Laval	Maurice Levasseur
Dorina Surcel	Université du Québec à Montréal	René Laprise
	Amount / Montant: $250	
Sébastien Chouinard	McGill University	John Gyakum
Julien Pommier	Université du Québec à Rimouski	Michel Gosselin
Barbara Winter	McGill University	Charles Lin

The CMOS Student Travel Bursary awards an amount of about $5000, funded from Congress revenues, to assist and encourage presentations by students, especially first-time presenters, and to equalize geographical cost factors. Thirty-seven applications were received this year and of those thirteen were chosen for awards after ranking them based on a) membership status, b) acceptance of previous awards, c) status in Congress program (presenters, first authors, etc.), d) geographical distance, e) other factors.

La SCMO attribue des bourses de voyage pour étudiants pour un montant approximatif de 5 000$ à même les revenus du Congrès pour aider et encourager des présentations faites par des étudiants, surtout si c'est leur première expérience. Cette politique égalise les coûts dus aux facteurs géographiques. Trente-sept applications furent reçues cette année et treize ont été choisies pour recevoir une bourse. Le choix a été fait en utilisant les considérations suivantes a) le statut de membre de la SCMO, b) l'acceptation antérieure de bourses, c) le statut au congrès (présentateurs, premier auteur, etc.) d) la distance géographique, e) autres facteurs.

Next CMOS Congress

The next CMOS Congress will be held in Toronto, Ontario, from May 30 to June 2, 2006. The selected theme of the Congress is "*Weather, Oceans & Climate*" with a sub-theme of "*Exploring the Connections*". This will be the 40th Congress of the Society. Please insert these important dates in your agenda for next year.

Prochain congrès de la SCMO

Le prochain congrès de la SCMO se tiendra à Toronto, Ontario, du 30 mai au 2 juin 2006. Le thème choisi pour le congrès est "*Météo, océans et climat*" avec comme sous-thème "*Explorer les liens*". Ce sera le quarantième congrès de la Société. Prière d'inscrire ces dates importantes dans votre agenda pour l'an prochain.

Prizes and Awards Announced at the 39th CMOS Annual Banquet (Continued - Suite)

The CMOS - Weather Research House Scholarship Supplement

- To **Tiffany Shaw**, Department of Earth and Ocean Sciences, UBC, who is continuing her studies at University of Toronto with Ted Shepherd under whom she is investigating problems in theoretical atmospheric dynamics. This scholarship is valued at $10,000 if held for two years. Ms. Shaw is in her second year under this scholarship.

- To **Joshua Nault**, University of Alberta, who is a doctoral student under Prof. Bruce Sutherland and his thesis work concentrates on the propagation of internal gravity waves in the stratosphere and the ocean. Mr. Nault is in his first year under this scholarship.

Photos on pages 76-78 and 91-93 are courtesy of Paul-André Bolduc, *CMOS Bulletin SCMO* Editor.

Huntsman Award 25th Anniversary

Interdisciplinary Marine Science: **Dr. Robert F. Anderson** of the Lamont-Doherty Earth Observatory of Columbia University, for his innovative contributions in the fields of biochemical cycles, ocean sedimentation and climate variability, through his development and use of pioneering radioisotope tracers and his scientific leadership in multidisciplinary programs.

Biological/Fisheries Oceanography: **Dr. Sallie (Penny) W. Chisholm** of the Massachusetts Institute of Technology (MIT), for her insightful and lasting contributions to the fields of biological oceanography and microbial ecology which have fundamentally changed our perspective of the nature of life in the sea.

Marine Geosciences: **Dr. Edouard Bard** of the Université d'Aix-Marseille and Collège de France, for his significant contributions to isotopic dating and proxy thermometry techniques and their application to studies of the Earth's paleoclimate and, in particular, its ice-age climate and sea level dynamics.

Physical/Chemical Oceanography: **Dr. Trevor J. McDougall**, of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia, for his leading role in developing a practical understanding of important thermodynamic and dynamic processes in the ocean, which are a key to the determination of the mixing motions that so strongly influence ocean circulation and heat transport.

The complete citations for the winners can be read at http://www.bio.gc.ca/huntsman/winner-e.html.

The medals will be awarded during a special two-day event, September 6 and 7 2005, in Halifax, Nova Scotia, Canada. The event will include medal presentations, distinguished lectures by the award winners and plenty of social gatherings (including an award banquet!). Watch http://www.bio.gc.ca/huntsman/huntsman25-e.html for more announcements as plans are being finalized. For those in the area, and also for those who would like to visit us (weather is usually beautiful at that time of the year), mark these dates on your calendar as this will be a unique opportunity to celebrate excellence in oceanographic research.

Alain Vézina
Chair, Huntsman Foundation
Bedford Institute of Oceanography
Dartmouth, NS

Canada's Climate Change Plan

The Government of Canada has released an updated plan entitled "*Moving forward on Climate Change: A Plan for Honouring our Kyoto Commitment*". For information and to download the plan, please access http://www.climatechange.gc.ca/english/newsroom/2005/plan05_NR.asp

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Sustainability in Canada: 2005 Update

The Canadian Institute for Environmental Law and Policy (CIELAP) has published a report on Canada's progress towards sustainable development. The report addresses why sustainability is important, what sustainability means in practical terms and how Canada can approach sustainability more quickly and effectively. The report also identifies a set of sustainability priorities. A summary report, highlighting achievements and recommendations, is available at http://www.cielap.org/sustainsummary_eng.pdf. The full report is available at http://www.cielap.org/sustainupdate_eng.pdf.

New Publications and Reports

1) "*The Ecosystem Approach: Coherent Actions for Marine and Coastal Environments*", sponsored by English Nature, provides an interpretation of the ecosystem approach, as well as providing a framework to help set actions on sustainable development. To download the report, access http://www.english-nature.org.uk/pubs/publication/pub_search.asp and enter CORP1.68 in the box labelled 'Catalogue code/Research Report No' and click on 'Search'.

2) The interactive Canadian Atlas Online (CAOL) has been launched by Canadian Geographic. It is available at http://www.canadiangeographic.ca/atlas/.

3) The Victoria Harbours Atlas is a comprehensive, web-based mapping and information tool for the Victoria, British Columbia harbour areas and their watersheds. It is available at http://www.harboursatlas.ca.

4) A workshop was held in Ottawa, Ontario in October 2004 to plan a coordinated program for Canada in the international initiative Census of Marine Life (CoML). Meeting outcomes include the identification of research priorities for a new Canadian CoML proposal and the election of a steering committee to help direct a national research agenda on marine biodiversity. The report of the Canadian Census of Marine Life: Three Oceans of Biodiversity Workshop is now available at http://www.coreocean.org/Dev2Go.web?id=247906&rnd=8001.

Arctic Coastal Dynamics Program

The Arctic Coastal Dynamics (ACD) program is a multi-disciplinary, multi-national forum to exchange ideas and information. The overall objective of ACD is to improve the understanding of circum-Arctic coastal dynamics as a function of environmental forcing, coastal geology and cryology and morphodynamic behaviour. In October 2004, Canada hosted the 5th annual Arctic Coastal Dynamics Workshop at McGill University in Montréal, Québec. For information on the ACD program and workshop, please access http://www.acd2004.mcgill.ca/.

Clear Evidence of Human-Produced Warming in World's Oceans

In a new study conducted by researchers at the Scripps Institution and the Lawrence Livermore National Laboratory's Program for Climate Model Diagnosis and Intercomparison (PCMDI), a combination of computer models and real-world "observed" data were used to capture signals of the penetration of greenhouse gas-influenced warming in the oceans. The results clearly indicate that the warming is produced by human activities. For more information, please access http://scrippsnews.ucsd.edu/article_detail.cfm?article_num=666
or
http://www.aaas.org/news/releases/2005/0217warmingwarning.shtml.

Research Survey: Economic Effect of Climate Change on Tourism

A research project is being conducted on the economic effect of climate change on tourism in the Bouctouche coastal region of New Brunswick. Feedback is being sought from people who have visited this community. The survey questions will relate to how travel choices may change in response to the effects of climate change. The project is a component of the study on the *"Impacts of Sea-Level Rise and Climate Change on the Coastal Zone of Southeastern New Brunswick"*. For information, access http://atlantic-web1.ns.ec.gc.ca/slr/default.asp?lang=En&n=C1F7C103-1.

Global Earth Observing System of Systems 10-Year Plan Endorsed

At the 3rd Earth Observation Summit held in February 2005 in Brussels, Belgium, representatives of 54 nations and over 40 international organizations endorsed a 10-year plan that details concrete steps towards comprehensive cooperation for Earth observation. The Global Earth Observing System of Systems (GEOSS) brings together many of the nations and agencies that have been using Earth observation tools independently. For information and to access the Summit Reference document, access http://earthobservations.org.

Images of the Indian Ocean Near Epicentre of Tsunami

The UK's Royal Navy survey ship HMS Scott has collected unique images of the Indian Ocean seabed near the epicentre of the earthquake and tsunami that devastated the region on 26 December 2004. It is the first time that the seafloor has been observed so soon after an earthquake of this magnitude, which measured 9.0 on the Richter scale. The work is being carried out to further the understanding of earthquakes and assist prediction of such events. For more information, access http://www.royal-navy.mod.uk/rn/content.php3?page=1&article=863.

Call for Paper Proposals for a Special Canadian Theme Issue of the Coastal Management Journal

The theme of the special issue is "*Canadian Coastal and Ocean Management: Are we gaining momentum in implementing Canada's Oceans Act*?" The objectives are to present a comprehensive review and analysis of Canada's progress towards implementing Integrated Coastal and Ocean Management (ICOM), and to analyze Canada's contribution to date in the development of global ICOM. 30 April is the deadline for submitting paper proposals and 31 August is the deadline for submitting the full papers. For information, access http://www.omrn.ca/documents/OMRN%20Call%20for%20Papers,%202005.pdf.

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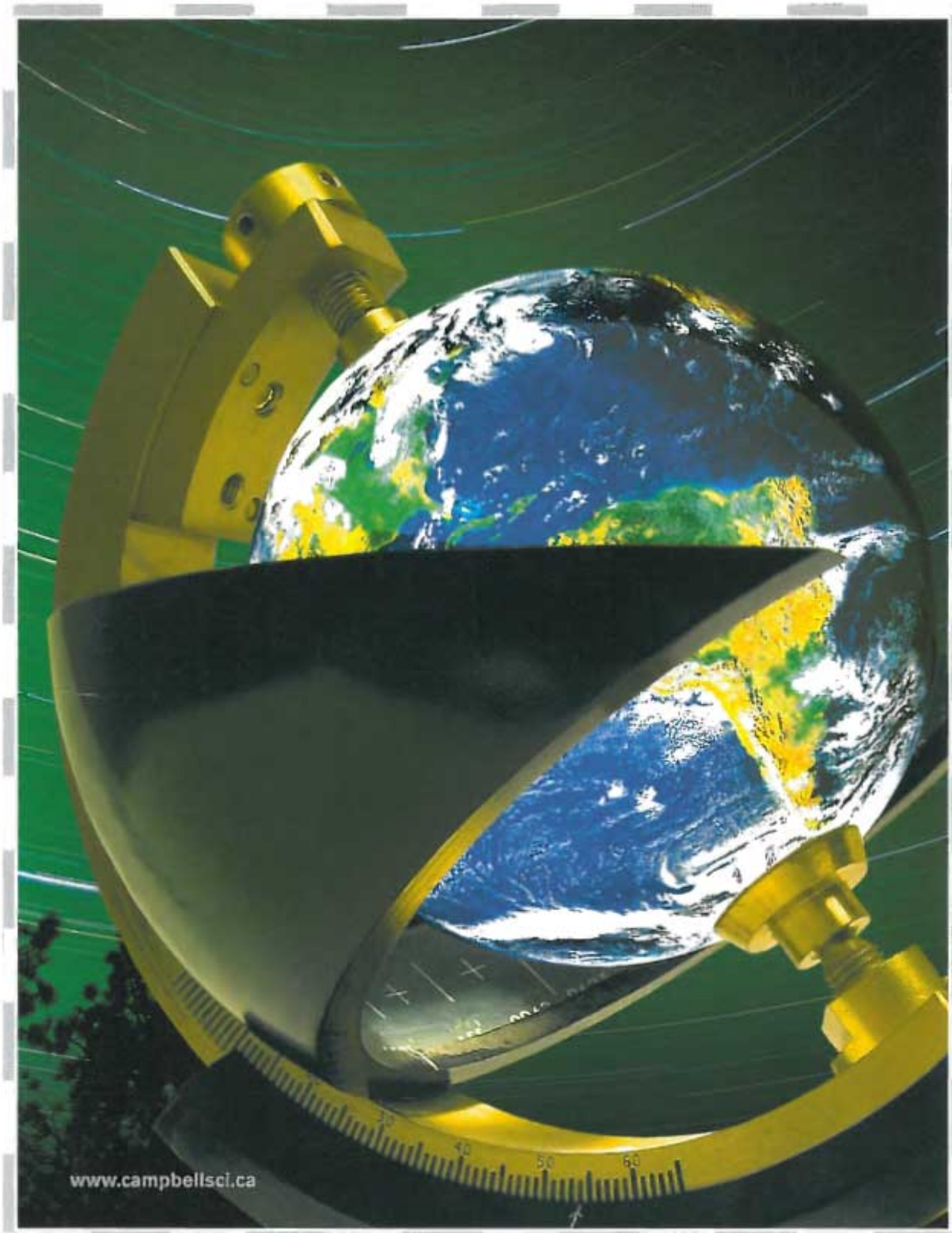

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