ISSN 1195-8898

# CMOS BULLETIN SCMO

Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

June / juin 1999

Vol. 27 No. 3

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

Editor / Rédacteur: Paul-André Bolduc
Marine Environmental Data Service
Department of Fisheries and Oceans
12082 - 200 Kent Street
Ottawa, Ontario, K1A 0E6, Canada
☎ (613) 990-0231; Fax (613) 993-4658
E-Mail: BOLDUC@MEDS-SDMM.DFO-MPO.GC.CA
Canadian Publications Product Sales Agreement #0869228
Envois de publications canadiennes Numéro de convention #0869228

**Cover page:** The picture shown on the cover page is a reduced format reprint of a woodcut by W. Scheuer published in the Saxby Gale section of the 1985 book *A History of Fort Lawrence: Times, Tides and Towns*, by Trenholm et al. Our readers are invited to examine the details of the image and to reflect upon the question as to whether 'The Great Storm' was the 1869 Saxby Gale, or not? Then turn to the addendum following the bibliography at page 72 of Alan Ruffman's article on the Saxby Gale (page 67).

**Page couverture:** L'image sur la page couverture est une reproduction petit format d'une gravure de W. Scheuer publiée dans la section Saxby Gale du livre de 1985, *A History of Fort Lawrence: Times, Tides and Towns*, par Trenholm et al. On invite le lecteur a examiner les détails de l'image et à se poser la question: est-ce que la Grande tempête (The Great Storm) était la tempête de Saxby ou non? Passez ensuite à l'addendum qui suit la bibliographie à la page 72 de l'article d'Allan Ruffman sur la tempête de Saxby (page 67).

## Next Issue / Prochain numéro

Next issue of the *CMOS Bulletin SCMO* will be published in August 1999. Please send your articles, notes, reports or news items at the earliest to the address given above. We have an urgent need for your article.

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en août 1999. Prière de nous faire parvenir vos articles, notes, rapports ou nouvelles au plus tôt à l'adresse indiquée ci-dessus. Nous avons un besoin urgent d'articles.

## Note from the Editor / Avis du Rédacteur

We are dedicating this issue to all persons involved in weather prediction. Although we are taking for granted today's weather forecast, we sometime forget that it has been a long road to achieve today's performance as shown by the two articles at pages 67 and 74.

Ce numéro est dédié à tous ceux impliqués dans la prédiction météo. Bien que présentement nous prenons pour acquis les prédictions météorologiques, nous oublions parfois que le chemin parcouru fut difficile pour en arriver à la performance d'aujourd'hui tel que démontré dans les deux articles en page 67 et 74.

## Canadian Meteorological and Oceanographic Society (CMOS)

## Société canadienne de météorologie et d'océanographie (SCMO)

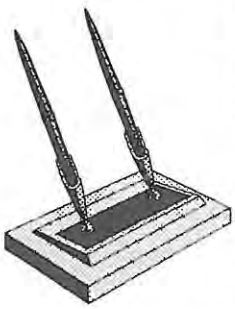


## CMOS e-mail address

cmos@meds-sdmm.dfo-mpo.gc.ca
http://www.meds-sdmm.dfo-mpo.gc.ca/cmos/

## Adresses électroniques de la SCMO

....from the President's desk



First of all I want to heartily thank Bill Pugsley for the leadership he has given CMOS over the past year. He has delivered on most of the goals he set out a year ago and initiated a number of new measures besides. Notable among these are establishing a new position for membership issues, a revitalised graduate student award program renamed in memory of Tertia Hughes, the taking on of the SCOR/ECOR Secretariat by CMOS and the establishment of a new Committee on School and Public Education.

Our Web-Master, Bob Jones, with Bill's full support, has developed the CMOS web-site to the point that it is now a major asset of the Society. This, along with some excellent work by our Director of Publications, Richard Asselin, has allowed the establishment of Atmosphere-Ocean On-Line. With such an example to follow and with the help of the ongoing members of the Executive and Council, the hardworking members of our staff, Neil Campbell, Uri Schwarz, Dorothy Neale and Richard Asselin, not to mention the assurance of being able to pass the torch to newly elected Vice-President Peter Taylor when the Society executive moves to Toronto next year, I take on the leadership of the Society with a great deal of assurance and optimism.

Le 33ième Congrès, organisé à Montréal par Pierre Dubreuil, Jean-Guy Cantin et Hal Ritchie, a été un franc succès. Au delà de 400 participants ont pu assister à 270 présentations scientifiques. Ce succès, tant sur le plan scientifique que sur le plan social, fut possible grâce à la participation de plusieurs membres du centre de Montréal. Qui peut oublier le magnifique concert présenté par le fameux Kelvin Band?!

Le Congrès de Montréal est à peine terminé que nous songeons déjà au prochain. Nous anticipons avec plaisir le 34e congrès qui sera organisé par le chapitre de l'Ile de Vancouver sous le leadership de Greg Flato. Greg est déjà bien connu de nos membres en tant que conférencier officiel de SCMO/CICS pour l'année 1999. The 34th Congress will take place between 29 May and 2 June 2000 at the University of Victoria.

(Continued on next page - Suite à la page suivante)

*Volume 27 No. 3*
*June 1999 - juin 1999*

## Inside / En Bref



Printed in Ottawa, Ontario, by M.O.M. Printing
Imprimé sous les presses de M.O.M. Printing, Ottawa, Ontario.

## Note from the Editor / Avis du Rédacteur

We apologize for the late distribution of the last issue of the *CMOS Bulletin SCMO*. The delay was beyond our control. We are taking steps to ensure this will not happen again.

Nous nous excusons pour la distribution tardive du dernier numéro du *CMOS Bulletin SCMO*. Ce retard était en dehors de notre contrôle. Nous prenons présentement des mesures pour que ceci ne se reproduise plus.

*Paul-André Bolduc, Rédacteur / Editor*
*CMOS Bulletin SCMO*

Now, I would like to share with you some of the goals I will strive to attain over the coming year.

First, we will make serious efforts to reverse the decline in membership we have suffered in recent years. The new executive position responsible for membership issues will work with the Centres and Chapters to follow up on every opportunity to present the Society to prospective new members. The resumption of recruiting of meteorologists by Environment Canada is a hopeful sign of renewal in the ranks of operational forecasters. Greater visibility for the Society will be sought through revitalisation of the certification and endorsement programs, more joint sponsorship of meetings with other groups and more tour speakers and meetings open to a broad public. Public policy statements on several subjects are in the final stages of review and these will be publicized as much as possible. The new Committee on School and Public Education will undoubtedly find many opportunities to promote public interest in and understanding of our sciences and perhaps find us new members in other areas, notably education.

Deuxièmement, j'aimerais augmenter le soutien que la Société donne au secteur privé en météorologie et en océanographie. A few companies (Seimac and Weather Research House) have recently shown their support for the Society by sponsoring the CMOS supplements to the NSERC Graduate Fellowship Program. We need to find out how to make participation in our Congresses as exhibitors and in our Bulletin as advertisers more attractive to the private sector. The consultant certification and weathercaster endorsement programs will be re-visited and given greater prominence. The Society will press Environment Canada for a clearer statement of policy on commercial activity and a clearer interface with the private sector for access to data and other information for commercial purposes and to universities for research and teaching purposes, at a reasonable cost.

Finalement, je pense que le vrai pouvoir de la Société réside dans le fait qu'elle réunie les différents secteurs de nos professions: le secteur public, le secteur privé et le secteur académique. This gives us the unique opportunity to facilitate partnerships among these sectors. There is undoubtedly an enhanced role possible here for our University and Professional Education Committee as well as for the new Committee on School and Public Education. We should be using these committees as conduits for expressing the needs and capabilities of the non-government sectors to complement the strong public good service capability of the government sector. We need to facilitate participation on key committees involved with the NSERC re-allocation exercise and make sure that our sciences are prominently featured at the appropriate time and place.

The Society is, overall, in very good shape but there remain many challenges. Les années pénibles de contractions budgétaires dans le secteur public semblent maintenant terminées. Environment Canada has recently announced the re-commencement of hiring of meteorologists. Funding for science in general is increasing. There are rumours of renewed attention by governments to environmental issues; the next federal budget may well be a "green" one. Le Congrès à Montréal nous a fourni plusieurs exemples de contributions possibles de nos professions à la sécurité et la prospérité du grand public en fournissant des prévisions environnementales de tout type. CMOS needs to publicize that capability wherever and whenever it can. If we succeed, we can look forward to the new millennium with optimism and confidence.

*Ian Rutherford,*
*President / Président*
*CMOS / SCMO*

---

## Atmosphere-Ocean 37-2
## Contents / Table des matières



*Sheila Bourque*
*Technical Editor*

# A Multi-disciplinary and Inter-scientific Study of The Saxby Gale: an October 4-5, 1869 hybrid hurricane and record storm surge

by Alan Ruffman[1]


## Résumé

C'était une tempête tardive pour la saison. Et pourtant, ni la Nouvelle-Angleterre, ni le Nouveau-Brunswick, ni la côte de Noel et les environs de Windsor en Nouvelle-Écosse ne pouvaient bénéficier des alertes météorologiques dont nous disposons aujourd'hui, et qui auraient pu les prévenir. Il n'y avait pas non plus de plateforme d'observation spatiale avec son arsenal de détecteurs qui auraient pu suivre la progression de ce que David Ludlum (1963) appela "La grande tempête et déluge du nord-est", alors qu'elle dérivait le long de la côte est lors des premiers jours d'octobre 1869. Il n'y avait pas de pilote courageux pour voler à travers l'oeil de la "tempête de Saxby" et mesurer sa très basse pression centrale lorqu'elle atteignit les Caraïbes tard en septembre. Il n'y avait pas de ballon-sonde qu'un service météorologique aurait pu lancer dans les environs de la tempête tropicale -- pas d'avion pour larguer des sondes afin de mesurer les environs dangeureux du mur de l'oeil central. En fait, il n'y avait même pas encore de service météorologique au Canada ou aux États-Unis. Il n'y avait pas de téléphone, de sans-fil, de canal météo sur le câble, ou CNN, pour alerter clairement les provinces maritimes de l'approche imminente d'un ouragan. Et il n'y avait pas de mesures d'urgence prévues pour aider à réparer les dégats que la tempête de Saxby laissa sur son passage. Savions-nous qu'un ouragan, atteignant peut-être la catégorie 2 à l'échelle de Saffir-Simpson, était juste à nos portes la nuit du 4 au 5 octobre 1869? Eh bien, sachez que plusieurs observateurs se trouvaient le long de la trajectoire de la tempête et ses environs, autant au sol qu'en mer. Et plus d'une cinquantaine de reportages quotidiens et hebdomadaires le long de la trajectoire de la tempête provenaient des journeaux de l'est des États-Unis, de la Nouvelle-Angleterre, du Maine et des provinces maritimes canadiennes.


## Introduction

New England, New Brunswick, the Bay of Fundy shore, Chignecto Bay and the Minas Basin, the Noel Shore and Windsor areas of Nova Scotia had none of today's weather warnings to prepare them for the arrival of this late season tropical cyclone. There were no space observation platforms with their vast array of sensors to document the steady progress of what David Ludlum (1963) called 'The Great Northeastern Rainstorm and Flood' as it moved up the eastern seaboard in the early days of October 1869. There were no aircraft with daring pilots to fly into the eye of the 'Saxby Gale' to measure the very low central pressure of the cyclone as it first traversed the Caribbean in late September. There were no weather balloons for the weather service to launch in the areas peripheral to the tropical cyclone — no aircraft drop sondes to sample the dangerous inner eye wall. Indeed, there was not yet a weather service in either the United States or in Canada. There were no telephone, wireless, cable television weather channels, or CNN, to send out a clear warning of an impending hurricane to the Maritime Provinces. And there was no Emergency Measures Organization to assist in cleaning up the mess that the Saxby Gale left behind.

The understanding of the so-called 'circular storms' which had begun to form in the 1830s was still relatively rudimentary and mariners could often not make use of such knowledge since telegraph communication was not yet widely available to send out a warning ahead of the storm. So how do we know that there was a tropical cyclone perhaps as serious as a Category 2 hurricane, on the Saffir-Simpson Scale, on the evening of October 4-5, 1869? Well, in fact there were any number of observers on the ground, and out at sea, in the path of the storm and along its edges. And there were at least fifty daily and weekly newspapers reporting along the track of the storm in the eastern United States, in New England, Maine, and in the Maritime Provinces of Canada.

## Written reports

An exhaustive event-specific search, supported by the Atmospheric Environment Branch of the Canada Department of Environment, has been completed for the October 1869 Saxby Gale. This event was a major news event in 1869, and an album of more than 1,000 articles has been assembled from Maine and the Atlantic Provinces. The search has also documented an earlier September 8, 1869 very serious hurricane that came ashore in southern Maine. Indeed, 1869 appears to have been a moderately busy year for tropical storms. Most of the primary sources from Atlantic Canadian and Maine newspapers have been captured, along with later articles and some personal accounts of the day. The original Stephen Martin Saxby (1804-1883) letters to *The Standard* of London, England on December 25, 1868 (Fig. 1) and on September 16, 1869 (Fig. 2) have been recovered, wherein

[1]President, Geomarine Associates Ltd. 5112 Prince Street
P.O. Box 41, Station M, Halifax, Nova Scotia Canada B3J 2L4

he predicted, on a worldwide basis, not only a very high perigean 'spring' astronomic tide, but that it would be accompanied by 'equinoctial gales' starting at 0700 local London [standard] time on October 5, 1869. Saxby wrongly believed that stormy weather was controlled by the moon when it was at apogee and over the equator, and he was actively promoting this view in the 1860s. He was fortuitously proven right in the Bay of Fundy and Maine though the cause was a tropical (or post-tropical) cyclone that came in from the Gulf of Maine and made landfall at about the Maine-New Brunswick border area on the evening of October 4, 1869 and raged in the Bay of Fundy area well into the next morning of the 5th.

While no scientific studies were done at the time[2], a forensic analysis of newspapers and other primary reports of this storm are beginning to reveal its parameters, its widespread effects, the damage, and a large loss of life. The study is now assisting Atlantic weather forecasters (or should we say hindcasters?) to understand a middle latitude type of "hybrid" storm and the circumstances which can allow a tropical storm, or a hurricane, to occasionally reintensify, and to gain energy, by combining with a baroclinic weather system. These rare, but extreme, circumstances are thought to have led to Hurricane Hazel in October of 1954 which did so much damage in the western Toronto area when over 200 mm of rain fell in less than 24 hours (Knox, 1955).

The tropical cyclone of September 1775 that affected eastern Newfoundland and Saint-Pierre et Miquelon may have been such a hybrid event and may have cost up to 4,000 lives (Ruffman, 1995); this is a storm that still needs more meteorological data and further research to sort it out (Rappaport and Ruffman, 1999). A late August 1873 hurricane which affected the Gulf of St. Lawrence cost in the order of 600 lives and may have been such a re-intensified tropical cyclone. The hurricane of October 1869 is beginning to look like such a re-intensification of a tropical cyclone. It should have been in its normal decay mode as it left the warm, energy-giving, waters of the Gulf Stream and passed north northeastward over the colder Gulf of Maine, then over the coastline at about the United States-Canadian border; instead it was still a very powerful storm as it came ashore.

[2]This is not quite true. W.F. Ganong, the famous New Brunswick natural scientist, gathered much data on this storm and these data have not yet been examined by the author (Ganong, 1911). D.L. Hutchinson read a paper before the Canadian Institute on November 18, 1911 and made the rather astute observation: *So far as I have been able to trace the storm it was in the vicinity of the Southern States on the second. ....[p. 258]; In all probability the storm was one of tropical or semi-tropical origin characterized to the southwest by extremely heavy precipitation and greatly increasing in energy as it moved towards Eastern Maine and the western portion of New Brunswick. [p. 259].* In modem times the tropical origin of this storm has become forgotten, and it was a letter of mine to a Cuban-American researcher living in Florida that led to the first attempt to define the track as the storm approached Canada (Fernández-Partagás and Diaz, 1995).

*COMING WEATHER.*

TO THE EDITOR.

SIR,—On the 1st June, 1863, you, in your journal, kindly permitted me to offer a special warning as to the period between the 10th and 13th December of that year. After giving my reasons for expecting very serious weather in that December, I said, "Now let any man tell me what other influence can be adduced to coincide for that period so as to increase the chance of our having the most destructive storm and the most dangerous tide with which the earth can *without miracle* be visited." Well-known and widely-known fulfilments justified this prediction, and those results are my apology for asking permission to acquaint the world through your columns with what threatens, not only us in Great Britain, but all parts of the earth as about to happen in the coming year.

Some of your readers may probably be incredulous as to weather warnings given at so long an interval before an expected danger: allow me, therefore, first to give at least one authentic instance of absolute fulfilment (as published by me some time early in 1864).

A stranger to me, Captain Stanley, of Burnhamovery, wrote to me on 2d November, 1863, as follows:—"Observing your letter in the *Standard* of 1st June," &c., . . ." would you still advise us to take every precaution against this coming tide?" (I strongly renewed my advice as to the sea walls of the Lincolnshire and Norfolk fens). On 21st December, 1863, he again wrote:—"The tide made its appearance much earlier than usual—at 7.45 (a.m. of Sunday 13th), the tide was at its highest, being a very large tide; should we have had a gale from the north-west it would have overflowed all our banks. I think you were perfectly justified in giving warning. I may say your warning has induced a long-neglected sea bank to be put in repair."

I need say no more, except that on the same day (Dec. 13) the dock master of the Victoria Dock, London, found 30 feet water on the dock sill, which enabled him to dock the largest merchant ship afloat (the Great Republic), and also the iron-clad Monitor (there being an excessive rise of about eight feet).

I now beg leave to state, with regard to 1863, that at seven a.m., on October 5, the moon will be at the part of her orbit which is nearest to the earth. Her attraction will, therefore, be at its maximum force. At noon of the same day the moon will be on the earth's equator, a circumstance which never occurs without marked atmospheric disturbance, and at two p.m. of the same day lines drawn from the earth's centre would cut the sun and moon in the same arc of right ascension (the moon's attraction and the sun's attraction will therefore be acting in the same direction); in other words, the new moon will be on the earth's equator when in perigee, and nothing more threatening can, I say, occur without miracle. (The earth, it is true, will not be in peribelion by some 10 or 17 seconds of semi-diameter.)

With your permission, I will, during September next, for the safety of mariners, briefly remind your readers of this warning. In the meanwhile there will be time for the repair of unsafe sea walls, and for the circulation of this notice, by means of your far-reaching voice, throughout the wide world.

At the period referred to in 1863 the moon happened to be in extreme south declination, and accordingly the greater devastations occurred in the southern hemisphere (*e.g.*, Melbourne—*vide* London *Times* of Feb. 13, 1864—the Cape of Good Hope, &c.), but next year the two hemispheres will be affected alike.

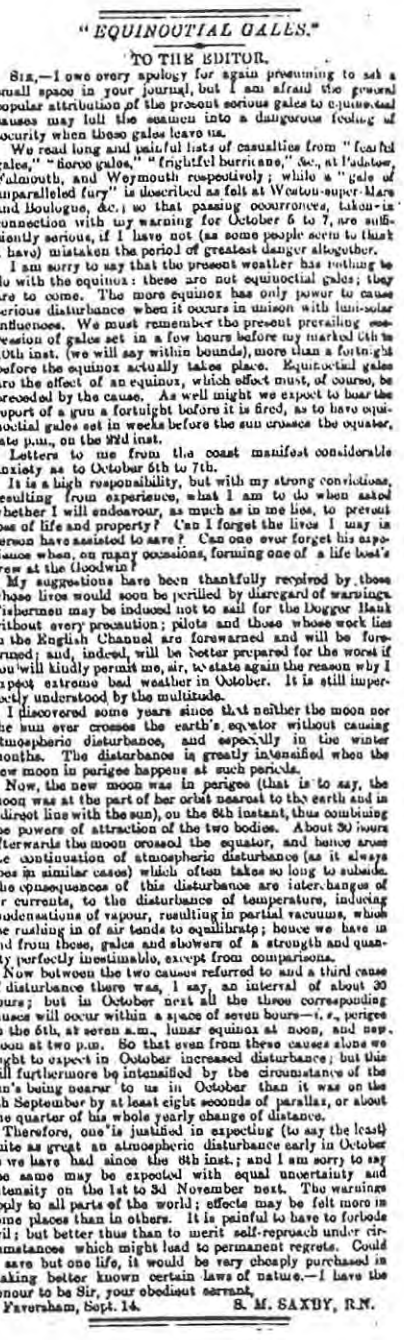
I am quite aware that in taking this step I am allowing a sense of social duty to outweigh personal considerations; but I accept the consequences.—I have, &c.,

Dec 21. S. M. SAXBY, R.N.

Figure 1: S.M. Saxby's first letter to *The Standard* of London, England, published on Friday, December 25, 1868 (No.13, 851, p.5, col.7 (middle)).

The firsthand newspaper accounts, as well as family and folklore knowledge, present an often graphic view of the centre of the hurricane making landfall in the area of Passamaquoddy Bay. Winds on the 'righthand' side of the storm track were strong enough to cause a large amount of forest blowdown and then an increased forest fire hazard in the years following as the woods were full of dry fallen trees. Significant building destruction and damage were reported in the areas immediately adjacent to both sides of the border, with roads and railways blocked by fallen trees and debris. Many vessels blew ashore in the Eastport,

Maine-St. Andrews, New Brunswick area including the barque *GENII* with the loss of eleven lives. As the storm came ashore it may still have been a Category 2 event with sustained winds in the 154 to 176 km/hr (96 to 110 mph) range.



"EQUINOCTIAL GALES."

TO THE EDITOR.

SIR,—I owe every apology for again presuming to set a small space in your journal, but I am afraid the general popular attribution of the present serious gales to equinoctial causes may lull the seamen into a dangerous feeling of security when these gales leave us.

We read long and painful lists of casualties from "fearful gales," "fierce gales," "frightful hurricane," &c., at Padstow, Falmouth, and Weymouth respectively; while a "gale of unparalleled fury" is described as felt at Weston-super-Mare and Boulogne, &c.; so that passing occurrences, taken in connection with my warning for October 5 to 7, are sufficiently serious, if I have not (as some people seem to think I have) mistaken the period of greatest danger altogether.

I am sorry to say that the present weather has nothing to do with the equinox: these are not equinoctial gales; they are to come. The mere equinox has only power to cause serious disturbance when it occurs in unison with lunar-solar influences. We must remember the present prevailing succession of gales set in a few hours before my marked 6th to 10th inst. (we will say within bounds), more than a fortnight before the equinox actually takes place. Equinoctial gales are the effect of an equinox, which effect must, of course, be preceded by the cause. As well might we expect to hear the report of a gun a fortnight before it is fired, as to have equinoctial gales set in weeks before the sun crosses the equator, late p.m., on the 22d inst.

Letters to me from the coast manifest considerable anxiety as to October 6th to 7th.

It is a high responsibility, but with my strong convictions, resulting from experience, what I am to do when asked whether I will endeavour, as much as in me lies, to prevent loss of life and property? Can I forget the lives I may in person have assisted to save? Can one ever forget his experience when, on many occasions, forming one of a life boat's crew at the Goodwin?

My suggestions have been thankfully received by those whose lives would soon be perilled by disregard of warnings. Fishermen may be induced not to sail for the Dogger Bank without every precaution; pilots and those whose work lies in the English Channel are forewarned and will be forearmed; and, indeed, will be better prepared for the worst if you will kindly permit me, sir, to state again the reason why I expect extreme bad weather in October. It is still imperfectly understood by the multitude.

I discovered some years since that neither the moon nor the sun ever crosses the earth's equator without causing atmospheric disturbance, and especially in the winter months. The disturbance is greatly intensified when the new moon in perigee happens at such periods.

Now, the new moon was in perigee (that is to say, the moon was at the part of her orbit nearest to the earth and in a direct line with the sun), on the 8th instant, thus combining the powers of attraction of the two bodies. About 30 hours afterwards the moon crossed the equator, and hence arose the continuation of atmospheric disturbance (as it always does in similar cases) which often takes so long to subside. The consequences of this disturbance are inter-changes of air currents, to the disturbance of temperature, inducing condensations of vapour, resulting in partial vacuums, which the rushing in of air tends to equilibrate; hence we have in and from these, gales and showers of a strength and quantity perfectly inestimable, except from comparisons.

Now between the two causes referred to and a third cause of disturbance there was, I say, an interval of about 30 hours; but in October next all the three corresponding causes will occur within a space of seven hours—i. e., perigee on the 6th, at seven a.m., lunar equinox at noon, and new moon at two p.m. So that even from these causes alone we ought to expect in October increased disturbance; but this will furthermore be intensified by the circumstance of the sun's being nearer to us in October than it was on the 6th September by at least eight seconds of parallax, or about one quarter of his whole yearly change of distance.

Therefore, one is justified in expecting (to say the least) quite as great an atmospheric disturbance early in October as we have had since the 6th inst.; and I am sorry to say the same may be expected with equal uncertainty and intensity on the 1st to 3d November next. The warnings apply to all parts of the world; effects may be felt more in some places than in others. It is painful to have to forbode evil; but better thus than to merit self-reproach under circumstances which might lead to permanent regrets. Could I save but one life, it would be very cheaply purchased in making better known certain laws of nature.—I have the honour to be Sir, your obedient servant,

Faversham, Sept. 14. S. M. SAXBY, R.N.

Figure 2: Saxby's followup letter published in the Thursday, September 16, 1869 issue of *The Standard* (No.14, 078, p. 2, col. 7 (middle)). It appears to have been this letter that got reported in the press of Atlantic Canada prior to the storm's predicted date.

The counterclockwise winds around the centre drove the storm surge up the Bay of Fundy to overtop most, if not all, of the Acadian and later dykes in the Minas Basin, Chignecto Bay, and Cumberland Basin (Parkes *et al.*, 1999). The storm surge then flooded lowlands such as the Tantramar Marsh and areas of the present-day communities of Moncton, Sackville, and Amherst, in addition to Truro, Great Village, and Maitland. The Dominion Atlantic Railway which was still under construction to the Annapolis Valley of Nova Scotia suffered serious erosional damage to the new roadbed from the storm waves on top of the very high water levels; this delayed its startup by several weeks. The storm surge was able to drive up the Saint John River against the river current and apparently the water rose three feet at Fredericton. On the 'lefthand' side of the storm track, huge amounts of rain were unloaded in the northern New England states through to eastern New York State (Figure 1). One Maine farmer recorded 8.25 inches (210 mm) of rain during the "freshet" (*Farmington Chronicle*, Vol. XXIV, No. 46, p. 2, col. 3 (middle)). Virtually every bridge in Maine went out and over a million logs escaped their booms and went downstream. The tally of the total deaths from this hurricane is currently approaching 100 in the United States and Canada.

## Saxby's prediction

The ocean's astronomic tides can be hindcast with a high degree of accuracy. The Saxby Gale 'storm surge' arrived close to the top of a very high perigean 'spring' tide, hence the 'Saxby Tide' arrived at almost the very worst time; however, if the Saxby Gale had arrived about three days later the perigean astronomic high tide would have been up to 0.6 metres higher in the upper Bay of Fundy. Out of the newspapers and other accounts is emerging a number of recoverable points to document the actual water level of the 'Saxby Tide'. These points can be levelled-in by surveyors and tied to the geodetic datum and then used to estimate the maximum height of the Saxby Gale storm surge above the astronomic tide. The geodetic levelling-in by the Canadian Hydrographic Service of the Saxby storm surge mark on the plaque in Tidal Bore Park in Moncton gives a +10.1 m geodetic elevation for the 'Saxby Tide' level, suggesting a storm surge in the order of 1.7 to 2.0 metres added onto the perigean astronomic high tide of that October 4-5, 1869 night; this may well be a record historic positive storm surge for the upper Bay of Fundy.

In the Minas Basin area a Truro newspaper tells us of a house in Great Village (the Boomer[sic = Bulmer] House), that still survives as a Provincial Heritage Property, which was surrounded by water at the height of the Saxby Gale. Commonly-known local folklore has it that the surviving Frieze and Roy General Store in Maitland had its lower shelves and groceries wetted, while a surviving house in Maitland on Cedar Street (the Brown House) was not quite flooded thus providing an upper limit to the height of the storm surge. W. Bell Dawson, the famous early tidal officer, made an estimate of the height of the 'Saxby Tide' at Noel River in a 1917 publication using a locally-recorded

mark. Recently-recovered family recollections indicate that the maximum level of the Saxby storm surge on the Webber farm on the road to Burntcoat Head reached into, or just above, a small group of Russet apple trees just to the northeast behind the outbuildings. In Parrsboro the square-rigged vessel of Captain Durant sailed with blind luck safely over Light House Bar into the safety of the harbour (Anonymous, no date). The community of Minudie was cut off by the storm surge, as was 'The Point' in the Densmore Mills area of the Noel Shore. Each of these locations gives one an important estimate of the 1869 elevation of the 'Saxby Tide', hence of the storm surge caused by the hurricane.

Figure 3: Until now, Stephen Martin Saxby's (1804-1883) image has not been known in North America, and as far as we know has not ever been published before. The author and John D. Reid of Ottawa searched long and hard for his image, and it was John with his genealogical skills who located Saxby's great-great-granddaughter Joy Sandison in Dumfries, Scotland. Full credit and thanks go to Ida Daphne Joy Sandison and to John Reid for sharing this photo of Saxby in his later years.

## Storm Track

Fig. 4 shows a revised track of the Saxby's storm as suggested by Abraham and Parkes, 1998. In Taylor Village, New Brunswick, a schooner broke its moorings and was lifted by the storm surge and driven over the dykes into an orchard (Gillcash, 1988); the 'canal' dug to free the schooner can still be seen today. In Windsor, Nova Scotia, the storm surge is said to have risen to a particular cross-street, and Grace Moreland (1869) reports that the water rose seven feet up the inside of the Baptist church vestry (alas, lost to fire in 1894). All these points, and hopefully others still to be discovered, if recovered and systematically levelled-in, will provide estimates of the elevation of the water surface in the upper Bay of Fundy during the highest water levels of the 'Saxby Tide', hence of the storm surge. Other points suggested such as a lower window lintel on the Custom House in Amherst now appear to be quite spurious, and others such as the locally-known Saxby flooding well up on the door frame of a house in Truro remain to be verified and checked out. It may be that, if there was an opportunity to examine the internal parts of the walls of the Truro house, of the Frieze and Roy General Store, or of the pre-1869 bank next door to it in Maitland, a clear, muddy-water stain may be found inside the wall to give an unambiguous level of the 1869 'Saxby' storm surge.

By capturing recoverable levels of the highest water levels on October 4-5, 1869, these can be corrected for eustatic sealevel rise over the past 130 years and for differential isostatic rebound to allow maps to be plotted showing the coastal areas that would be inundated today were such an event to recur. The 1869 salt water inundation flooded into parts of marshes, farmland, coastal lowlands, and lakes or ponds where no salt water had been known for perhaps more than 110 years, or since at least the 1759 storm and related storm surge that so impacted the early Acadian settlements in western Nova Scotia. In 1869 the salt water lay in the lowlands for several days before it slowly drained back to the sea. In some cases the dykes took weeks to repair so the twice-daily inundation continued for some time. A careful examination of the microfossils and flora in cores in strategic undisturbed locations may well find a thin Saxby Gale marker horizon and deeper in the cores a record of earlier major storm surges such as the 1759 event.

Provincial and municipal planners, flood plain advisory committee members, town councils, developers, citizens, shore property owners, EMO officials, police, and insurance firms ignore such data at their peril. They would be wise to assess the growing body of knowledge on the Saxby Gale and its significant storm surge. While these hybrid types of tropical cyclones are rare, they have occurred and they will recur. There are also a number of known historic winter and summer storms that have followed similar tracks to the Saxby hurricane, and some of these have led to reported flooding in low coastal areas in the Bay of Fundy area. And eventually these sorts of storm surges will recur when the astronomic tides are high, or even higher. Sea levels along the Nova Scotian coast of the Bay of Fundy are very slowly rising relative to the land, and thus a repeat of a Saxby Gale type of event and its storm surge will only become more serious in the future.

## Acknowledgements

This paper, while mainly based in the forensic study being carried out from primarily newspaper sources, has drawn liberally on the work being done on this event within the Atmospheric Environment Branch by Jim Abraham and George Parkes and their colleagues, and within the Canadian Hydrographic Service at the Bedford Institute of

Oceanography by Charles O'Reilly. The Atmospheric Environment Branch has funded the collection of the primary sources by Suzanne Moulton, Gwen Martin, Irene Fennell, William Glen, and Daniel Boyce. George Parkes and John D. Reid of Ottawa read earlier versions of the manuscript and I have profited from their comments and suggestions. Joy Sandison of Dumfries, Scotland, supplied the photograph of her great-great-grandfather Stephen Martin Saxby and is to be thanked, along with John D.Reid, for rescuing this chap from virtual anonymity.

Talks on the Saxby Gale in various shapes and sizes have been presented by the author at least nine times in the past year. An earlier extended abstract of one such talk was published in *Argonauta* in the recent April issue; this paper builds on it and presents a further revised and expanded review, a bibliography, and figures.

## Bibliography Supplemented by Selected Saxby Gale References

Abraham, Jim and George Parkes. 1998. *The Saxby Gale* Part 1: Meteorology [Abstract]. Thirty-second Annual Canadian Meteorological and Oceanographic Society Congress, June 1-4, Dartmouth, Nova Scotia, Program and Abstracts, Session 1B3 Extreme Events, Paper 1B3.4, Monday, June 1, p. 8.

Abraham, Jim, George Parkes and Peter Boyer. 1999. *The Transition of the "Saxby Gale" into an Extratropical Storm* [Extended Abstract]. 23rd Conference on Hurricanes and Tropical Meteorology, Committee on Tropical Meteorology and Tropical Cyclones, American Meteorological Society, 79th Annual Meeting, January 10-15, Dallas, Texas, Preprints, Vol. II, Paper 11A.3, Thursday, January 14, pp. 795-798.

Anonymous. no date. *The Great Saxby Gale*. **in** W. Conrad Byers, Editor, Our Parrsborough Shore Heritage Scrapbook. Series #2, Time Frame Photo, Parrsboro, Nova Scotia, 52 pp., unpaged; p. [32].

Anonymous. 1911. *"The Saxby Gale"*. Bulletin of the Natural History Society of New Brunswick, No. XXIX, Vol. VI, Part III, Saint John, Barnes and Company, pp. 325-330.

Anonymous. 1935. *The Famous Saxby Gale. The Worst Storm in the History of the County*. Recalled Possibly by Veteran Residents of the Community. The News & Sentinel, Amherst, Nova Scotia, Friday, June 28, No. 55, p. 11, cols. 1-5, reprint of circa October 7, 1869 newspaper account of a presently-unknown origin.

Anonymous. 1969. *Saxby's Gale*. Museum Memo, Vol. 1, No. 3, September, New Brunswick Museum, Saint John, New Brunswick, History Department, pp. [3]-[5].

Dawson, W. Bell. 1917. *Tides at the Head of the Bay of Fundy*. **in** Tide Levels and Datum Planes in Eastern Canada, pp. 93-95.

Desplanque, C. and D.J. Mossman. 1999. *Storm Tides in the Bay of Fundy* [Abstract]. Annual General Meeting & Colloquium, Current Research in the Atlantic Provinces III, Atlantic Geoscience Society, February 5 and 6, Amherst, Nova Scotia, Program and Abstracts, p. 17.

Elliott, Shirley B. 1961. *The Saxby Gale*. Novascotianna XXXIV, [Nova Scotia], Journal of Education, October, pp. 49-54.

Evans, Kim. [1974]. *The Great Storm*. Mount Allison University Archives, Student Research Papers Collection, Geography 300, [January], 22 pp. plus appendix of Maps, Footnotes and Bibliography, 19 pp., unpaged.

Fernández-Partagás, José J. and Henry F. Diaz. 1995. *A Reconstruction of Historical Tropical Cyclone Frequency in the Atlantic from Documentary and Other Historical Sources 1851-1880*, Part 1: 1851-1870. Climate Diagnostics Center, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder, Colorado, April, 173 pp. in three sections. Storms of 1865-1870 by José J. Fernández-Partagás, 71 pp.; Year 1869, pp. 50-57; Storm 10, 1869 (Oct. 4), pp. 56-57 plus map on p. 53.

Ganong, W.F. 1911. *A Preliminary Study of the Saxby Gale*. Bulletin of the Natural History Society of New Brunswick, Vol. VI, Pt. III, No. XXIX, read May 2, notes in the Ganong Collection, Archives, New Brunswick Museum, Saint John, New Brunswick.

Gillcash, Edith. 1988. *Taylor Village*. privately published, third edition, 124 pp.; October 4, 1869 letter of Sarah M. Taylor to Melbourne M. Taylor; October 4 and 5, 1869 letters of Joseph R. Taylor to his brother; October 14, 1869 letter of Melbourne M. Taylor to his brother and image of barque *ROBERT GODFREY* under juryrig, pp. 44-49; log entries schooner *CAPELLA*, Captain Alfred Taylor en route from Dorchester, New Brunswick to New York City, October 3-5, 1869, p. 63.

Haliburton, Gordon M. 1955. *A History of Railways in Nova Scotia*. Unpublished MA thesis, Department of History, Dalhousie University, Halifax, Nova Scotia.

Hutchinson, D.L. 1911. *The Saxby Gale*. Transactions of the Canadian Institute. Vol. IX, Part 3, No. 22, read November 18, pp. 253-259.

Knox, J.L. 1955. *The Storm "Hazel"*, Synoptic resumé of its development as it approached Southern Ontario. Bulletin of the American Meteorological Society, Vol. 36, pp. 239-246.

Ludlum, David M. 1963. *Early American Hurricanes 1492-1870*. The History of American Weather series, American Meteorological Society, Boston, Massachusetts; 198 pp., reprinted 1989. Saxby's Gale and The Great Northeastern Rainstorm and Flood of October 1869, pp. 108-111.

MacLean, Peter. 1979. *The Saxby Gale.* The Atlantic Advocate, January, pp. 45-47.

Moreland, Grace. 1869. *Mail*, Windsor, Nova Scotia, Friday, October 8.

Parkes, G.S., L.A. Ketch and C.T. O'Reilly. 1998. *The Saxby Gale* Part II, The Saxby Tide and other storm surge events in the Bay of Fundy [Abstract]. Thirty-second Annual Canadian Meteorological and Oceanographic Society Congress, June 1-4, Dartmouth, Nova Scotia, Program and Abstracts, Session 1B3 Extreme Events, Paper 1B3.5, Monday, June 1, p. 9.

Parkes, George S., Lorne A. Ketch, Charles T. O'Reilly, John Shaw and Alan Ruffman. 1999. *The Saxby Gale of 1869 in the Canadian Maritimes, A case study of flooding potential in the Bay of Fundy* [Extended Abstract]. 23rd Conference on Hurricanes and Tropical Meteorology, Committee on Tropical Meteorology and Tropical Cyclones, American Meteorological Society, 79th Annual Meeting, January 10-15, Dallas, Texas, Preprints, Vol. II, Paper 11A.2, Thursday, January 14, pp. 791-794.

Rappaport, Edward N. and Alan Ruffman. 1999. *The Catastrophic 1775 Hurricane(s): The Search for Data and Understanding* [Extended Abstract]. 23rd Conference on Hurricanes and Tropical Meteorology, Committee on Tropical Meteorology and Tropical Cyclones, American Meteorological Society, 79th Annual Meeting, January 10-15, Dallas, Texas, Preprints, Vol. II, Paper 11A.1, Thursday, January 14, pp. 787-790.

Ruffman, Alan. 1996. *The Multidisciplinary Rediscovery and Tracking of "The Great Newfoundland and Saint-Pierre et Miquelon Hurricane of September 1775".* The Northern Mariner/Le Marin du nord, Vol. VI, No. 3, July, pp. 11-23.

Ruffman, Alan. 1997. *Hurricane Hortense: A Fortuitous Warning.* shunpiking Nova Scotia's Discovery Magazine, Vol. 2, No. 5, Issue No. 15, September, pp. 11-13.

Ruffman, Alan. 1997. *The Saxby Gale Research Project on 1869 Saxby Gale Underway.* Upshore · Downshore A Celebration of Life on the Hants Shore, East Walton, Nova Scotia, Vol. 1, No. 2, December, p. 18.

Ruffman, Alan. 1998. *The Saxby Gale Part III, Forensic Study of the Impacts* [Abstract]. Thirty-second Annual Canadian Meteorological and Oceanographic Society Congress, June 1-4, Dartmouth, Nova Scotia, Program and Abstracts, Session 1B3 Extreme Events, Paper 1B3.6, Monday, June 1, p. 9.

Ruffman, Alan. 1999. *The 'Saxby Tide' of October 4-5, 1869: A possible geological marker around the Bay of Fundy* [Abstract]. Annual General Meeting & Colloquium, Current Research in the Atlantic Provinces III, Atlantic Geoscience Society, February 5 and 6, Amherst, Nova Scotia, Program and Abstracts, p. 37.

Ruffman, Alan. 1999. *The Saxby Gale: an October 4-5, 1869 Tropical Cyclone with a Hybrid Twist. Argonauta*, The Newsletter of The Canadian Nautical Research Society, Vol. XVI, No. 2, April, pp. 3-5.

Saxby, S[tephen] M[artin]. 1868. *Coming Weather.* To the Editor. letter dated December 21, *The Standard*, London, England, Friday, December 25, Issue No. 13,851, p. 5, col. 7 (middle).

Saxby, S[tephen]. M[artin]. 1869. "*Equinoctial Gales.*" To the Editor. letter dated September 14, *The Standard*, London, England, Thursday, September 16, Issue No. 14,078, p. 2, col. 7 (middle).

Scheuer, W. 1873. *Shediac, N.B.-The Intercolonial RR. Pier at Point du Chêne, the Day After The Great Storm.* printed woodcut, Artefact CE.37.1.23., 24 x 34.1 cm, Dr. J.C. Webster Collection, Fort Beauséjour National Historic Site, Aulac, New Brunswick; reprinted p. 156 of A History of Fort Lawrence Times, Tides and Towns, 1985, by Trenholm *et al.*, first published The Canadian Illustrated News, October 4, p. 216.

Trenholm, Gladys, Miep Norden and Josephine Trenholm. 1985. *A History of Fort Lawrence: Times, Tides and Towns.* Privately published, Sherwood Printing Ltd., Edmonton, Alberta, __ pp.

Woodworth, Marguerite. 1936. *History of the Dominion Atlantic Railway.* Kentville, October.

## Addendum re Scheuer woodcut (Front cover)

It was George Parkes at the Atmospheric Environment Branch who first looked at the image and the map of the Saxby Gale track. He observed that, if the map of the track was correct, then winds would have been generally offshore at Pointe du Chêne, New Brunswick, on the righthand side of the storm centre; further, the October 1869 newspaper sources were reporting little damage along this shore of the Gulf of St. Lawrence which is logical with offshore winds and no storm surge expected.

A Spring 1999 note from Fred Farrell of the Provincial Archives of New Brunswick verified that the InterColonial Railroad (I.C.R.) did take over the European & North American Railway in 1869 so that the pier at Pointe du Chêne could well be an I.C.R. pier by the time the October

hurricane arrived. However, Brenda P. Orr of The Moncton Museum noted in an April 6, 1999 letter that one would not have expected the changeover from the ENAR logo to the ICR logo on all the jumbled-up boxcars in the image to have been completed by that time. This image was in The Moncton Museum collection as having been obtained from the National Archives of Canada (NAC) No. C 59380.

While NAC and the National Library of Canada had not yet got to my letter and faxes to check the image, John D. Reid of Ottawa came through again and has identified the image as one from p. 216 of *The Canadian Illustrated News* of October 4, 1873. Thus "The Great Storm" of the image is not the Saxby Gale, but rather the hurricane of August 24-25, 1873 — grist for another tale, another time.

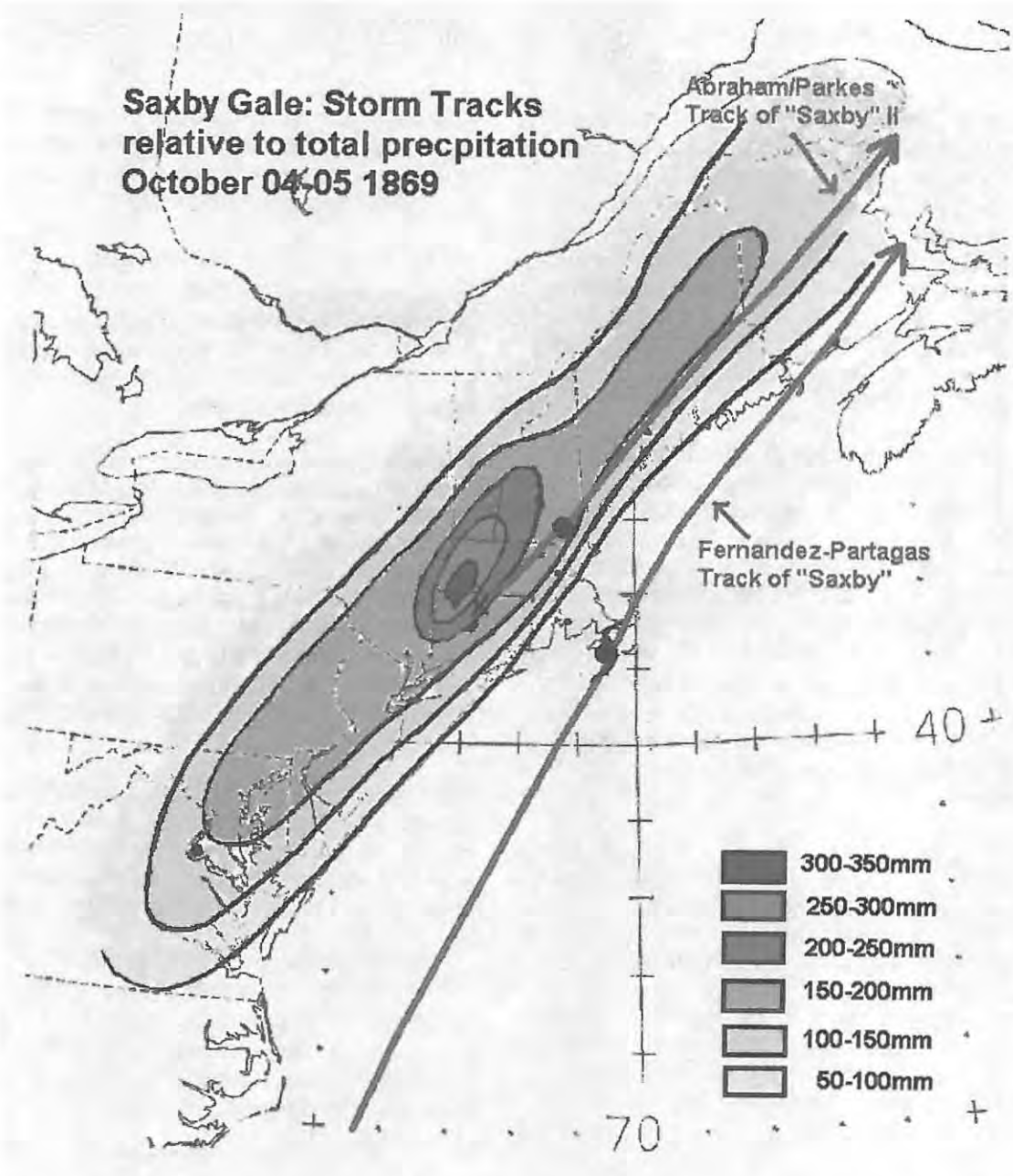



Figure 4: The re-evaluated storm track of the October 4-5, 1869 Saxby Gale tropical cyclone showing the total precipitation in mm, as prepared by Jim Abraham and George Parkes of the Atmospheric Environment Branch of Environment Canada, Dartmouth, Nova Scotia. This figure was originally presented to the June 1, 1998 CMOS/SCMO Congress in Dartmouth, Nova Scotia, as part of a trilogy on this hurricane that gave rise to a record storm surge in the Bay of Fundy, along with significant wind damage and upwards of 100 deaths along its track.

# Not Weather Wise, Much Other Wise
# Wiggins of the Finance Department

by John Digby Reid [1]

**Résumé:** Les prévisions météorologiques du siècle dernier furent le théâtre dans lequel deux visions opposées s'affrontèrent : l'émergence de la météorologie en tant que science d'une part, et la vieille école astronomique basée sur les mouvements lunaires d'autre part. Au Canada, un fonctionnaire excentrique du ministère des finances à Ottawa, E. Stone Wiggins, avait fait la une des journaux à travers le monde durant les années 1880 avec ses prévisions à long terme basées sur ces principes astronomiques. L'histoire de M. Wiggins est presentée ici, avec un accent particulier sur sa fameuse prévision pour le 11 mars 1883. On mentionne également ses autres croyances peu orthodoxes. Le nom de M. Wiggins est mentionné sur une plaque à Ottawa, la seule d'ailleurs dediée à un météorologiste, qui personnifie l'héritage qu'il nous a légué.

A 30-year veteran of the Federal Finance Department, exceptional in neither economics nor bookkeeping, seems an unlikely prospect to be called "one of the most unique figures to come before the public eye in Canada." Yet that's how his 1910 obituary described E. Stone Wiggins who gained an international reputation for storm prophecies and unorthodox science. Handsome yet bookish, capable of considerable charm and a sweet smile, he might have been counted a renaissance man had he been more worldly, and his ideas, dogmatically asserted with Victorian embellishment, less eccentric.

Ezekiel Stone Wiggins was born in New Brunswick on December 4th, 1839, the son of Daniel Slocum Wiggins and Elizabeth Titus Stone, both of United Empire Loyalist descent. He went to secondary school in Ontario, and stayed to become a teacher, probably in Mariposa township — it was from there he married his cousin, Susan Anna Wiggins in 1862. The first sign of his unconventional, forthrightly stated views came in 1864 in his book "The Architecture of the Heavens"[1] which advanced the theory that there is no light in interplanetary space, only in the atmosphere of the planets. He concluded that "worlds may revolve near us, but having no atmosphere may be forever hidden from the view of the astronomer".

Although he never practised medicine he claimed to have a Doctor of Medicine degree from the Philadelphia University of Medicine and Surgery. His second class honours BA in Mathematics in 1869 from Albert College, Belleville, Ontario, was legitimate, with an MA granted in the following year while he was working as a Superintendent of Schools. He taught in Ingersoll, Oxford County, and was first principal of the Institute for the Education of the Blind in Brantford from 1871 to 1874. During this period he also claimed to have acquired a Doctor of Law degree.

Following his father's death in 1873, but more likely motivated by differences with the new Liberal Ontario government, he retumed to New Brunswick to establish his own school for boys in Saint John.

In 1876 the schoolmaster started into his stride as a public figure. He wrote to the Saint John *Globe* in July[2] claiming to have identified a marine monster seen near Boston, its head 12 feet above the water, as the far-famed geologic animal the plesiosaurus-dolichodeirus of the Oolitic era, extinct for millions of years.

Embarking on a political campaign in his native riding of Queens, he discredited the sitting Liberal member that he refused to run again. Wiggins became the candidate for the Conservatives of Sir John A. Macdonald in the 1878 election. In this first secret ballot in Canadian federal election history Wiggins gained 36% of the vote, but the Liberal, Mr. King, won Queens. Macdonald formed the government and Wiggins got a consolation prize, moving to Ottawa as second class clerk in the Finance Department. His Minister was Queens County native, Sir Leonard Tilley.

Starting in 1881 Wiggins' avocation became storm prophecy for which he earned an international reputation. Hoping to profit, he kept the details of his forecast technique secret. It seems to have been a combination of astrology, moon-lore and climatological statistics.

He was greatly inspired by British naval instructor Stephen Martin Saxby (1804-1883) who made a successful prophecy[3] of a disastrous October 1869 storm in New Brunswick, a nearly one year warning. Wiggins was frequently quoted referring to the superior or inferior conjunction of the moon, and to its being at perigee while

---

[1] The architecture of the heavens: containing a new theory of the universe and the extent of the deluge, and testimony of the Bible and geology in opposition to the views of Dr. Colenso / by Ezekiel S. Wiggins PUBLISHER: [Montreal? : s.n.], 1864 (Montreal : J. Lovell)

[2] Referenced in "Wigginism: Chinook, Vol , No 1, October 1978.

[3] See article "The Great Saxby Gale of October 1869" in The Beaver, October-November 1995. Also recent articles by Alan Rothman (in the *CMOS Bulletin SCMO*, Vol.27, No.3, pp 67-73).

directly over the equator, indicators used by Saxby[4].

Perhaps he also felt an affinity with his namesake, Ezekiel, the last of the major Old Testament prophets.

There are records of his storm predictions for February and August 1882, but his most widely known prophecy was published later that year — for a storm the following March strongly indicated by Saxby's lunar criteria. In a letter to the Ottawa Citizen published on the 22nd of September under the heading "An Astronomer's Warning: The Greatest Storm of the 19th Century Coming," he first struck out at the "utter uselessness of our meteorological bureaus." Then comes his "announcement":

> A great storm will strike this planet on the 9th of March next. It will first be felt in the Northern Pacific, and will cross the meridian of Ottawa at noon (5 o'clock p.m. London time) of Sunday, March 11th, 1883. No vessel smaller than a Cunarder will be able to live in this tempest. India, the South of Europe, England, and especially the North American continent, will be the theatre of its ravages. As all the low lands on the Atlantic will be submerged, I advise shipbuilders to place their prospective vessels high upon the stocks, and farmers having loose valuables, as hay, cattle, etc., to remove them to a place of safety. I beg further most respectfully to appeal to the honourable Minister of Marine that he will peremptorily order up the storm drums on all the Canadian coast not later than the 20th of February, and thus permit no vessel to leave harbour. If this is not done hundreds of lives will be lost and millions' worth of property destroyed.

The Associated Press carried Wiggins' prediction, and it appeared in newspapers in the United States and Europe. To give additional publicity he published an almanac[5]. It included conventional information on daily sunrise and sunset times, a general weather outlook for the month including the prospect for storms, and extracts of correspondence regarding his announcement.

People took notice. Charles Carpmael, head of Canada's weather service, advised his Deputy Minister[6]: "I regard Mr. Wiggins' forecasts from a meteorological point of view as perfectly absurd".

Mr. Emmett, an insurance underwriter of Ramsgate, England, wrote to the meteorological office in London asking advice. The head of the office replied: "The prophecy to which you allude emanates from some man in the Finance Department of the Canadian Government. It is utter nonsense. No living man can predict the weather two days beforehand, much less six months. The idea that the Admiralty have ordered ships to be in port is also absurd and utterly false."

As the date for the predicted catastrophe approached, newspaper coverage intensified. Fishermen refused to go to sea. Halifax became the focus and Wiggins said he would travel there to witness the event. When a gale struck on March 6th, newspapers asked if his storm had come early. Wiggins replied in the Ottawa Citizen that it was "one of the celestial warriors running to battle... moving to position to join with the great storm.", and reiterated that he was expecting the greatest possible storm on this planet.

Did Wiggins' storm come? Weather maps for this period show two ordinary low pressure systems. One travelled northward along the east coast of the US. The other moved over the Upper Great Lakes. They joined over Maine, producing gales for a short while, and continued to Anticosti Island and the Strait of Belle Isle. At Halifax the water was more than two feet higher than the normal spring tides, but perigean spring tides bring exceptionally high water even in the absence of a storm. Winds attained 38 miles per hour at Halifax and 47 mph at Yarmouth, virtually the same as for the gale a few days earlier.

Initial editorial opinion was divided. The New York Times was quick to judge him a failure and fraud in its March 12th edition. "This man has made many prophecies at sundry times, the failure of which has attracted little attention." "Wiggins is consigned to the limbo of exploded humbugs." The Halifax Chronicle, which had printed a very critical editorial a few days earlier, called the prophecy partially fulfilled; while according to the Montreal Herald of the same day "events proved that Dr. Wiggins was absolutely right."

Wiggins made his own judgment. In the Ottawa Citizen he wrote: "As will be seen from the telegrams, this prophecy, founded on astronomical calculations, has been literally fulfilled. The highest tidal wave ever known at Halifax, greater even than that of 1869 (referring to the Saxby Gale which was not particularly strong at Halifax), occurred on Saturday afternoon, and the same is true of Rhode Island and other points on the Atlantic coast. I have received telegrams from all parts, from Quebec to Sandy Hook, saying that my prophesy was fulfilled." So he reported himself satisfied with the prediction.

After some reflection, Canadian papers came down on the same side as the New York Times, if less harshly. The Hamilton Times wrote editorially: "If Wiggins had merely promised an ordinary March blow, as a result of his consulting the planets, no one could have found fault with

---

[4] Saxby's Weather System or Lunar Influence on Weather/ By S. M. Saxby PUBLISHER: London, Longman and Co., 1864, DESCRIPTION: 119 p 2nd Edition.

[5] Wiggins Storm Herald With Almanac, 1883 / by E. Stone Wiggins PUBLISHER: Toronto : Grip Print. and Pub. Co., 1883. DESCRIPTION: 40 p. : fold. map, port. ; 20 cm.

[6] Letter in the Archives of the Atmospheric Environment Service, Downsview, Ontario.

him. As in the majority of past years, the weather has been stormy for a few days back, but no great damage has resulted, and the terrible calamities prophesied by the assistant of Sir Leonard Tilley are nowhere evident. Wiggins has no more right to claim verification of his prognostications because the weather was squally on Friday and Saturday last than the Times would have to credit prescience if it now asserted that the dog days would come in July and August."

In April 1883 he secured a leave of absence from the Government to allow him to lecture. His Minister, who had come under pressure from political opponents to "muzzle his assistant," must have welcomed this temporary departure. He spoke in Quebec, Montreal and Halifax as well as several other locations in the Maritimes.

Continuing to refine his prediction techniques he wrote to the New York Tribune on June 3rd 1884 postulating the existence of one or more invisible moons — invisible because they lacked an atmosphere — in order to explain deficiencies in his forecasts. A rebuff from the scientific community came in an August 1884 editorial in The American Meteorological Journal:

> "Mr. Wiggins assumes that weather and earthquakes depend on the moon and, when the moon will not do the work required of it, he freely adds another moon or two. Evidently the method is capable of indefinite expansion; a hundred invisible moons can be added if necessary, and with these he can account for anything. The simplicity and adaptability of this method needs no further illustration. We note that an additional advantage is that it disposes of all anxious labor and worry which most scientific investigators have to go through in adjusting their theories to known principles. We proceed, with sincere regret, to deprive Mr. Wiggins of the right of priority to his method. The fact is that it has been employed by operators of his class from time immemorial. But, though he loses his priority in discovery and method, he can not be deprived of the colossal imagination nor of the heroic contempt for logic, which are displayed with unmistakable clearness in his whole letter and in his previous publications, and his graceful disregard of the usually accepted principles of science are worthy of our highest admiration."

He lectured at the Brooklyn Union in September 1884 ostensibly demonstrating that there is a perpetual current of electricity running from east to west over the earth's surface, which he used to explain the earth's magnetic field, and said that by its aid, messages might be sent from mountain top to mountain top. He explicitly predicted wireless telegraphy, but only for east to west transmission at the same latitude.

Wiggins continued to produce forecasts, and for earthquakes as well as storms. An extended correspondence with the Department of Marine, and supposedly a letter to the Prime Minister, requested the government to commission a study of his forecast methods. If his technique was judged valid he asked that the government issue storm warnings credited to be "by Wiggins method"; and also for a one-time payment equivalent to the annual budget of the meteorological service. In preparation for this he was asked to document his previous forecasts which he apparently did in a 46-page hand-written letter[7].

As weather forecasters know, it's not only the predicted storms that don't appear that sap your credibility, it's also the ones that you miss forecasting. In the Ottawa Citizen on April 6th 1886 a poem appeared illustrating the peril.

The study never happened — the hanging of Louis Riel in Regina gave the government a political storm to worry about. Was there another reason he didn't pursue the cause? In October 1886 he wrote he "could not longer endure the tide of opposition to which I was subjected." Privately he came to acknowledge the limitations of his storm predictions, and even expressed muted support for the expansion of regular meteorological services[8].

For a while Wiggins dropped into obscurity, secure in the confines of the East Block offices of the Finance Department. He built a home called Arbor House, now a heritage property, in Britannia Bay and served on the local parish council. In 1899 he served as President of the Britannia Boathouse Club, now the Britannia Yacht Club, where his faded portrait still hangs.

For a journalist, Wiggins must have a been an irresistible attraction on a slow news day, and in the 1900s he regained some prominence being quoted in the Ottawa media. Headlines included "Professor Wiggins says the Sun is Inhabited", "Second Moon in the Heavens Responsible for Cold Weather in the Opinion of Prof. Wiggins", and "Prof. Wiggins to Sue Marconi." He spoke with conviction and was quotable: "In time oranges will grow in Canada and great orchards will hold up their golden fruit before the mirror of Hudson's Bay", and "Remember what Marconi says must be taken with a grain of salt weighing in the neighbourhood of 140 pounds." In turn the press felt free to respond in kind. In the Toronto Star "Prof. Wiggins claims to have seen two moons lately, but lots of people in Ottawa get that way every night"; and in the Brantford Courier "Mr. E. Stone Wiggins, who keeps baby cyclones tied up in his back yard, says that the origin of the

---

[7] A copy of this letter was reportedly in Wiggins' letter book. It was last in the possession of his brother, Charles M. Wiggins, who died in Kingston in 1954. The government copy appears to have been lost in a fire in the 1920s that burned most early Department of Marine records.

[8] Letter in the Archives of the Atmospheric Environment Service, Downsview, Ontario.

cool weather has been two moons in the sky. Many a man has found frigidity to result from a similar cause."

## NOT WEATHER WISE, MUCH OTHER WISE

BY A DRIFT-BOUND PASSENGER

(FOR THE CITIZEN)

Heavy storm began at Ottawa 9 a. m., April 2; still raging, 6 p.m., April 3; snowfall, 24 inches; by far the greatest of the year.

N.B. — No warning from Wiggins

Wiggins, O delusive prophet Wiggins
Though your very dubious fame has spread abroad,
The behaviour of the weather in those disguises
Plainly tells us your professions are a fraud.

That rude March would have his equinoctial bluster
It was safe for any almanac to say;
But if special storm predictions would pass muster,
They must specify the place and name the day.

Scaring honest people living by the ocean,
Threatening tempests which neglect to appear;
You inpieted sailors, chiefly Nova Scotia,
A sadly needed fortnight's wage last year.

And now, Wiggins, what on earth have you been doing,
Say where's your vaunted skill in Zadkeil lore,
While 'neath your very nose a storm was brewing,
The like of which we've scarcely seen before?

Yet not a whisper from our Mahdi prophet!
Our oracle of Ottawa was dumb!
If still you stride the tripod, pray get off it —
Collapse, subside, come down, ah, Wiggins, come!

We railway travellers had from you no warning,
Drifts bar our progress, engines shriek in vain;
Here we must shiver till to-morrow morning —
Sweet our revenge if you were on our train.

Too long imposed on women of both sexes,
In time the errant humbug to explode,
Which reasonable people often vexes,
You gales foretell - Pshaw, Wiggins, you "be blowed"!

Two feet of snowfall! Wild nor'-easter blowing!
The third of April, Storms defy all rule
No hint from Wiggins. Need there further showing
That weather wisdom makes its April fools?

Wiggins remained a public servant until two years before his death in 1910. He was buried at St. Luke's Anglican Church, Young's Hove on the shore of Grand Lake, New Brunswick, where his tombstone reads,

**Professor**
**Stone Wiggins**
**B.A., M.A., M.D., L.L.D.**
**Canada's distinguished scientist and scholar**
**Dec 4, 1839 - Aug 14, 1910**

Newspapers were factual in their obituaries, emphasizing the positive. In later years articles with titles like "Weather Prophet of the (18)80s put Percy Saltzman to Shame" and "Weather Seer Still Not Matched" gave a rosy picture of his weather prophecies — "tornadoes and blizzards which he pinpointed ... struck precisely when and where he warned."

Stone Wiggins is no longer remembered, except for a series of family histories[9] for his native Queens County that he wrote in 1876. However, Arbour House that he built in Britannia was designated as of architectural interest in 1994. A plaque notes that Wiggins was an amateur meteorologist.

At a time of accelerating change, with science and technology becoming increasingly the domain of the specialist, Wiggins' opinions became a media diversion as he remained steadfast to the ideas in his first book. Born before there were official weather observations in Canada, he lived through a period when meteorological science, although still in a primitive state of development, prevailed over astrology and superstition and became part of our social fabric.

## Acknowledgement

Morley Thomas, CMOS and AES Archivist, helped greatly in finding items on Wiggins in the AES archives. Thanks also to staff at the AES Library in Downsview, the Reference Sections of the Ottawa Public Library, Saint John Regional Library, National Library of Canada, Queens County (New Brunswick) Historical Society and New Brunswick Archives.

(1) 57 Vanhurst Place, Ottawa, Ontario, K1V 9Z7;
Tel: (613) 736-0544; E-mail: jedr@intranet.ca
John Reid is a former President of CMOS.

[9] The History of Queens County / by E. Stone Wiggins ; edited by Richard and Sandra Thorne PUBLISHER: Gagetown, N.B. : Queens County Historical Society, 1993. DESCRIPTION: 130p., [2] p. of plates : ports. ; 28 cm.

# The Solution:
# A National Mitigation Policy

by Alan W. Pang[1]

## Résumé

L'Institut pour la réduction des pertes de nature catastrophique (IRPC) a été fondé en 1998 par l'industrie canadienne d'assurance pour la propriété et les pertes humaines. La mission de l'IRPC est de réduire les pertes de vie et de propriété dues aux phénomènes météorologiques violents et aux tremblements de terre.

L'industrie de l'assurance accepte son rôle de chef de file afin d'aider les canadiens à gérer les risques de pertes de nature catastrophique dues aux désastres naturels. Nous remplissons deux rôles distincts, quoique complémentaires. Le premier est celui d'assister les canadiens à se remettre d'un désastre. C'est la fonction clé des assureurs, et un rôle dont nous sommes fiers de remplir. Le second rôle, celui rempli par l'IRPC, est de trouver des solutions afin de diminuer les risques rencontrés par les canadiens.

## Introduction

The Institute for Catastrophic Loss Reduction (ICLR) was established in 1998 by the Canadian property and casualty insurance industry. ICLR's mission is to reduce the loss of life and property resulting from severe weather and earthquakes. The insurance community accepts its leadership role in helping Canadians to manage the risk of catastrophic losses due to natural disasters. We have two distinct but complementary roles. The first is to assist Canadians to recover from a disaster. This is the core function for insurers, and a role that we are very proud to play. The second role, and the one played by ICLR, is to find ways to lower the risk Canadians face.

## Background

The frequency and severity of weather-related catastrophes have been rising sharply around the world during the last decade. Canada's three largest and most destructive catastrophes have occurred the last two and a half years, and even greater risks lie ahead. The 1996 Saguenay flood, the 1997 Red River flood and the 1998 Ice Storm caused significant disruption and hardship to more than four million Canadians. Table 1 shown below provides a sampling of the larger catastrophic losses paid by Canadian insurers in the 1990s. Please note that the loss figures exclude federal and provincial financial assistance arrangements and economic losses. Also, the figures do not take into account the human suffering, e.g., elevated stress levels and burnout sustained by individuals and families as a result of major natural disasters.

## Four Trends Increasing Canada's Vulnerability

There are four major trends contributing to the disturbing increase in catastrophic losses in Canada.

Population Growth.

There are over 30 million people living in Canada. Our population and economy continue to grow, resulting in a greater accumulation of property. In the past, many storms occurred in open spaces but now they would impact someone's home or business.

Urbanization.

Today 16 million or over 50% of Canadians live in large urban centres and the concentration is increasing. For example, between 1988 and 1998 Calgary's population increased by 162,000 people or 19.8%.

Aging Infrastructure.

Our infrastructures are old, deteriorating and not built to design standards necessary to meet the demands for larger populations. The average age of sewer systems in Canada is over 50 years.

Climate Change.

There is a clear scientific consensus that the global climate system is changing, and extreme weather events are increasing in frequency and severity.

---

[1]Alan W. Pang joined the Institute for Catastrophic Loss Reduction as the full-time Managing Director in May 1998. Alan is on secondment from his position as Vice President of Aon Re Canada. He has been using his extensive reinsurance brokering experience to assess and communicate the impact of severe weather and earthquakes on the insurance community. He can be reached at (416) 362-2031, ext. 342 and at apang@iclr.org.

| Date of Loss | Location | Type of Loss | Insurance Loss |
|---|---|---|---|
| March 27 & 28, 1991 | Sarnia | Tornado | $25,407,000 |
| July 3, 1991 | Red Deer | Storm | $28,202,000 |
| September 7, 1991 | Calgary | Hailstorm | $342,745,000 |
| July 31, 1992 | Calgary | Hailstorm | $22,078,000 |
| November 12-13, 1992 | Southern Ontario | Windstorm | $36,437,000 |
| July 24-26, 1993 | Winnipeg | Water Damage | $58,326,000 |
| August 8, 9 & 14, 1993 | Winnipeg | Water Damage | $62,374,000 |
| June 6-9, 1995 | Calgary | Water Damage | $20,764,000 |
| June 10, 1995 | Southern Alberta | Hailstorm | $26,389,000 |
| July 13-15, 1995 | Southern Ontario | Storms | $53,439,000 |
| July 17, 1995 | Calgary | Hailstorm | $52,304,000 |
| July 16, 1996 | Calgary | Hailstorm | $119,091,000 |
| July 16, 1996 | Winnipeg | Hailstorm | $146,825,000 |
| July 19-20, 1996 | Saguenay, Québec | Water Damage | $165,426,000 |
| August 8, 1996 | Ottawa | Water Damage | $20,257,000 |
| November 9, 1996 | Montreal & Québec City | Water Damage | $62,531,000 |
| February 27, 1997 | Niagara Peninsula | Wind | $20,813,000 |
| April/May 1997 | Red River Valley | Water Damage | $72,000,000 |
| January 4-10, 1998 | Eastern Ontario, Québec, New Brunswick & Nova Scotia | Ice Storm | $1,440,000,000* |
| January 1999 | Southern Ontario | Snow Storm & Water Damage | $50,000,000* |

**Estimate*

Table 1: Samples of the larger catastrophic losses paid by Canadian insurers in the 1990s.

## The Solution: A National Mitigation Policy

Canada's performance in the response and recovery components of emergency management has always been very good. However, we must improve in the other two components, preparation and mitigation, to ensure appropriate actions will significantly reduce the loss of life, human suffering, economic disruption and property damage.

In the fall of 1998, ICLR in partnership with Emergency Preparedness Canada sponsored five regional mitigation workshops (in Edmonton, Winnipeg, Toronto, Halifax and St-Jean-sur-Richelieu, Québec) and a National Conference on Mitigation in Toronto to draft Canada's National Mitigation Policy. This consultation process involved over 400 stakeholder group representatives, from the private sector, not-for-profit organizations, First Nations, utility companies, academia and all levels of government.

The participants agreed that a National Mitigation Policy would achieve the following goals:

- Provide a focused national effort to reduce the impact of disasters;
- Provide a plan to outline the logical roles for each stakeholder group;
- Improve the coordination of the effort and resources used for disaster mitigation across Canada;
- Enhance public awareness of disasters and what individuals and communities can do about it;
- Reduce human suffering, loss of life and property damage arising from natural disasters.

The participants at the mitigation workshops provided the following key components for a successful National Mitigation Policy:

**1) A coordinated national mitigation effort is needed**
We can do a better job at coordinating our mitigation efforts to put Canadians and their property less at risk. At present, we are under-utilizing our resources and expertise.

**2) Mitigation is an investment, not a cost**
The participants agreed that we must invest in risk reduction measures to ensure the long-term economic viability of our communities.

**3) Mitigation must be aligned properly with other public policy priorities**
It must fit in with the protection of natural resources, caring for the disadvantaged, economic growth and job creation.

**4) Effective leadership is required**
Leadership must be shared among government, the private sector, not-for-profit organizations and other stakeholders. It should be based on a shared commitment and agreement to reduce Canada's vulnerability.

**5) Partnerships are required**
A successful mitigation policy requires partnerships between all levels of government, the private sector, not-for-profit organizations and other stakeholders. Roles and responsibilities must be determined and each stakeholder group must pull its own weight and feel confident that the other groups will follow through with their commitments.

**6) Local action will be the most effective**
Local communities know their environment the best. They are capable of determining the level of risk they can accept in future natural disasters.

**7) Flexibility is important**
We live in a rugged country. Each region has its own vulnerabilities requiring unique mitigation solutions. For example, a floodway works well in Winnipeg but not in Vancouver, where dams are the solution.

**8) There is a need to develop a mitigation culture through education and public awareness**
Canadians must include mitigation in their daily decision-making rather than rely on government to provide assistance after a natural disaster. Education and public awareness should increase Canadians' knowledge of the level of risk affecting their communities and the actions they can take along with their community to reduce the impact.

**9) Applied natural hazard research is needed**
Natural hazard research currently being conducted must be more practical and the results communicated to decision-makers.

## The Approach

The national consultations also identified the following specific actions for implementation.

**1) Create a natural disaster protection fund**
Over the past three years, governments have spent an average of $500 million a year on disaster response and recovery. The federal government should establish a pool of funds by setting aside an additional 10% of the final disaster response-and-recover cost to invest in the reduction of Canada's long-term natural hazard vulnerability. If the federal government had done this for the past three years, we could have allocated $50 million towards mitigation. In the United States, the Federal Emergency Management Agency sets aside 15% of the total expenditures on disaster response and recover for mitigation.

In Canada, the fund could be spent on some large projects similar to the Winnipeg Floodway that require government funding. In April/May 1997, the floodway diverted 59,100 cubic feet per second of floodwater around Winnipeg, saving more than 100,000 homes. A portion of the fund could also be used to repair/replace the aging and antiquated sewer system infrastructure in our urban centres.

**2) Form a national mitigation partnership**
Mitigation partnerships involving all levels of government, the private sector and other stakeholder groups are vital to a successful National Mitigation Policy. No single sector, including government, has all of the ideas and resources required to reduce the impact of natural hazards across Canada.

**3) Public donations could be directed to mitigation**
Volunteer donations that exceed response and recovery expenditures after major disasters could be used directly for mitigative actions to reduce the impact of future disasters.

**4) Establish a national mitigation secretariat to coordinate mitigation activities across the country**
The national mitigation secretariat's role would include setting priorities, guidelines and performance indicators. The secretariat will share successful mitigative techniques and research information with stakeholder groups who may face similar hazards.

**5) Incorporate mitigation as a basic responsibility and priority for each government department**
Government-funded projects must include a component for risk assessment. Projects that reduce the vulnerability of Canadians to disasters would be given a higher priority. This approach would enhance the development of a mitigation culture.

A draft copy of the National Mitigation Policy for Canada has been widely circulated to over 700 representatives from the stakeholder groups for their individual feedback. There remain many challenges in order to change the draft policy into a formal National Mitigation Program for Canada. The Institute for Catastrophic Loss Reduction has accepted this challenge and will continue to work with the key stakeholder groups to produce a successful National Mitigation Policy for Canada.

## National Mitigation Policy (Executive Summary)

### Building resilient communities

Natural disasters occur regularly in Canada. Sometimes the effects are devastating. More than four million Canadians were victims of the 1996 Saguenay flooding, the 1997 flood in the Red River Basin, or the 1998 ice storm. The impact of nature's hazards has increased dramatically in recent years, and this alarming trend is expected to continue. Canadians seek leadership to improve our resilience to future disasters.

In the fall of 1998, more than 400 people participated in discussions about our preparedness for disasters. Workshops and a national mitigation conference were held across the country, co-sponsored by the Institute for Catastrophic Loss Reduction and Emergency Preparedness Canada. Participants included a broad range of stakeholders, including not-for-profit organizations, First Nations groups, industry, academia and all levels of Government. There was a strong consensus for action as outlined in this report.

Canada has a proven record of effective emergency response and recovery. There are clear responsibilities for what occurs during and after a disaster. Unfortunately, decisions continue to be taken which make people, their homes and businesses more vulnerable. Responsibilities to mitigate the impact of disasters have not been defined, coordinated and reported on in a systematic manner. Our disaster management policies and practices need to take greater account of reducing longer-term vulnerability.

We have the knowledge and the capability to design and implement better means of protecting Canadians. The national consultations identified a range of mechanisms to build on our strengths in response and recovery, and better protect Canadians from disasters. The consultations outlined the critical elements of a national mitigation program including the creation of a national secretariat to provide opportunities for groups to learn from each other, and a natural disaster protection fund to reduce the cost of future disaster response and recovery costs. A portion of future response and recovery expenditures should be used to protect against the next disaster. This effort will be most effective if it involves a partnership among government, private industry and the not-for-profit sector, and the acceptance of risk reduction in the minds and deeds of every Canadian. Risk reduction should become a basic

## Politique nationale de réduction des sinistres (Sommaire)

### Bâtir des communautés résistantes

Le Canada est périodiquement la cible d'un désastre naturel dont les effets sont parfois dévastateurs. Plus de quatre millions de Canadiens sont été touchés par les inondations du Saguenay de 1996, le débordement de la rivière Rouge de 1997 ou la tempête de verglas de 1998. L'impact des désastres d'origine naturelle s'est grandement accru ces dernières années, et l'on prévoit que cette tendance alarmante se maintiendra. Les Canadiens comptent sur leurs dirigeants pour accroître la capacité du pays de résister aux désastres que nous réserve l'avenir.

À l'automne de 1998, plus de 400 personnes ont participé à des discussions sur notre niveau de préparation à la survenance d'un désastre. Des ateliers et une conférence nationale sur la réduction des sinistres ont eu lieu à travers le pays, sous la coprésidence de l'Institut de réduction des sinistres catastrophiques et de Protection civile Canada. Les participants comprenaient un grand nombre d'intervenants, y compris des organismes à but non lucratif, des groupes des Premières nations, de même que des représentants de l'industrie, des milieux universitaires et de tous les échelons de l'administration publique. Les consultations ont permis de dégager un solide consensus en faveur des mesures décrites dans le présent rapport.

Le Canada est reconnu pour l'efficacité de ses mesures d'urgence et de reprise des activités. Le partage des responsabilités, pendant comme après un désastre, est clair. Malheureusement, on continue de prendre des décisions qui rendent les gens, leurs habitations et leurs entreprises plus vulnérables. Les responsabilités en ce qui touche la réduction de l'impact des désastres n'ont pas encore été définies, coordonnées ou décrites dans des rapports de façon systématique. Nos politiques et pratiques de gestion des désastres doivent tenir davantage compte de la réduction de la vulnérabilité à plus long terme.

Nous avons les connaissances et les capacités nécessaires pour concevoir et mettre en place de meilleurs mécanismes de protection des Canadiens. Les consultations nationales ont fait ressortir une gamme de façons de mettre à profit nos compétences en matière d'intervention et de reprise des activités, et pour mieux protéger les Canadiens contre les désastres. Les consultations ont fait ressortir les éléments déterminants d'un programme national de réduction des sinistres, y compris la création d'un secrétariat national devant permettre aux différents groupes de tirer profit de leurs expériences respectives, de même qu'un fonds national de protection contre les désastres pour réduire le coût des mesures d'intervention et de reprise des activités qu'engendreront les désastres futurs. Une partie des dépenses futures consacrées aux mesures d'intervention

responsibility and priority for each sector.

et de reprise des activités devraient être utilisées pour nous protéger du prochain désastre. Cet effort sera d'une efficacité optimale s'il prévoit un partenariat entre le gouvernement, le secteur privé et le secteur à but non lucratif, de même qu'une prise de conscience, par tous les Canadiens, de l'importance de réduire les risques. Chaque secteur d'activité économique devrait faire de la réduction des risques une responsabilité de base et une priorité.

The time has come for Canada to lessen the impacts of disasters. This will save lives. It will help make Canadian communities more resilient and it will work to lessen the personal losses, human suffering and economic disruption. It will save money by reducing future expenditures on disaster recovery and response. These future savings will more than offset the short-term costs of a more concerted program of mitigation action. Working together we can build a Canada that is more resilient to natural perils.

Il est temps pour le Canada d'atténuer l'impact des désastres. Cela sauvera des vies, aidera à rendre les collectivités canadiennes plus résistantes et permettra de réduire les pertes de vie, la souffrance humaine et l'interruption des activités économiques. Cette intervention permettra de réaliser des économies, en réduisant les dépenses futures consacrées à l'intervention et à la reprise des activités après un désastre. Ces économies futures compenseront largement les coûts à court terme d'un programme mieux concerté de réduction des dépenses. En travaillant ensemble, nous pouvons bâtir un Canada mieux placé pour résister aux désastres naturels.

The mitigation conferences concluded that:

Les consultations sur la réduction des sinistres ont permis de dégager les conclusions suivantes:

1. The Institute for Catastrophic Loss Reduction, Emergency Preparedness Canada and other stakeholders should continue to champion the creation of a National Mitigation Policy for the promotion, advocacy and facilitation of a more integrated approach to disaster mitigation in Canada.

1. L'Institut de réduction des sinistres catastrophiques, Protection civile Canada et d'autres intervenants devraient continuer de promouvoir l'adoption d'une politique nationale sur la réduction des sinistres favorisant la mise en place d'une approche mieux intégrée en matière de réduction des désastres au Canada.

2. Stakeholders should provide formal support for a National Mitigation Policy and participate in the subsequent design and implementation of a program framework for mitigation.

2. Les intervenants devraient fournir un soutien concret en faveur de cette politique nationale, puis participer à l'élaboration et à l'exécution d'un cadre de réduction des sinistres.

---

## Job Offer / Offre d'emploi

## Senior Research Associate in Atmospheric Physics

Applications are solicited for a Senior Research Associate in the Department of Physics at the University of Toronto, in the area of Atmospheric Physics. The position involves both research and project management responsibilities. It requires research experience in atmospheric physics, with a doctoral-level degree and an established post-doctoral record demonstrating research excellence in the areas of atmospheric dynamics, climate modelling, and diagnostic analysis. The position also requires at least two years of experience in the management of complex research projects, and familiarity with unix environments and computer Fortran programming.

Applications consisting of a CV and the names of three references are due by 14 July 1999, and should be sent to Prof. T.G. Shepherd, Department of Physics, University of Toronto, 60 St. George St., Toronto M5S 1A7 Canada (phone: (416) 978-6824; fax: (416) 978-8905; e-mail: tgs@atmosp.physics.utoronto.ca).

The appointment is intended to be a continuing position, subject to the availability of funds. The salary level will be in the range $45,000-$60,000, depending on experience. The initial appointment will take effect 1 September 1999, and will extend to 30 June 2000.

In accordance with Immigration Canada requirements, this competition is restricted to citizens and permanent residents of Canada. The University of Toronto is committed to employment equity and encourages applications from qualified women and men, members of visible minorities, aboriginal persons, and persons with disabilities.

## 1998 Prizes and Awards

The President's Prize

To Isztar Zawadzki, for the development of the bistatic Doppler radar system at the J.S. Marshall Radar Observatory, and its application to the retrieval of three-dimensional wind fields.

A recognized world expert in radar meteorology, Prof. Zawadzki has already made several important contributions to the use of radar in hydrology, especially in the field of precipitation estimation. His work is based on observations, theoretical analysis, numerical modelling, and even laboratory experiments. His recent work is a major step towards the effective use of radar observations in prediction models.

It is a pleasure to recognize this innovative contribution with the 1998 President's Prize.

The J.P. Tully Medal in Oceanography

To Neil Oakey, for his longstanding influence on Canadian oceanography through his contributions to the vital and exacting task of measuring ocean turbulence.

One of the pioneers in measuring small-scale turbulence in the ocean, Dr. Oakey has made major contributions to instrument development, particularly loosely-tethered turbulence profilers which, despite initial skepticism from the community, have now become routine and the most common way to measure oceanic turbulence. This approach permits very rapid profiling and efficient use of ship time, and has opened a window into mixing in shallow water which is being exploited in studies of estuarine and coastal dynamics, and of the effects of small-scale mixing on marine biological systems. More recently, Neil has continued his pioneering efforts in near-surface turbulence measurement through the development of free-falling gliders to study the horizontal as well as the vertical distribution of microstructure.

Neil's scientific accomplishments are many and significant. In particular, he was the first to take a serious look at simultaneous spectra of dissipation-scale temperature and velocity microstructure, and was the first to establish a consistent method for relating temperature microstructure to the rate of dissipation of mechanical energy. He was also one of the first scientists to combine microstructure measurements with nutrient profiles, thus achieving a deeper understanding of the effects of turbulent mixing on biological productivity in the ocean.

Neil has also had a significant influence on the development of Canadian and international oceanography through his willingness to help newer investigators acquire the tools of the trade, by providing his data freely to others, and by enthusiastically sharing his time and expertise with colleagues and students. Thus, he has played an important role in educating the next generation of researchers and in establishing Canada as a leading oceanographic nation.

It is a pleasure to recognize these contributions with the 1998 J.P. Tully Medal in Oceanography.

The Dr. Andrew Thomson Prize in Applied Meteorology

To Robert Benoit for his leadership in the development of the MC2 (Mesoscale Compressible Community) model and the support afforded to the user community.

This state-of-the-art model has become an important tool for mesoscale research in Canada and around the world. The applications studied with the model, cover the full spectrum: severe convection events, validation of rainfall with radar data, air quality, agricultural and hydrological applications to name just a few. The MC2 model has also been featured in international field projects and intercomparison studies.

It is a pleasure to recognize this contribution with the 1998 Dr. Andrew Thomson Prize in Applied Meteorology.

The CMOS Prize in Applied Oceanography

To Peter Smith, David Greenberg, Donald Lawrence, Guoqi Han, Jennifer Shore, John Loder, Charles Hannah, Roger Pettipas and Brendan de Tracey, for providing daily forecasts of drift and ocean currents during the Swissair Flight 111 recovery operations.

Following the crash of Swissair Flight 111, this group of scientists adapted a continental shelf circulation model to generate daily forecasts of the velocity field in the crash site vicinity, using daily wind velocities, tides, and seasonal-mean currents as inputs. In the words of the overall commander of Ground Search and Rescue operations, the resulting debris drift flow forecasts were of "invaluable help" in allocating the limited resources at his disposal. This forecasting capability had not been in place previously at the Bedford Institute of Oceanography, and its implementation under difficult circumstances required a concerted effort on the part of all members of the group.

It is a pleasure to acknowledge the hard work and initiative of these individuals with the 1998 CMOS Prize in Applied Oceanography.

The Rube Hornstein Medal in Operational Meteorology

To André Méthot and Alain Patoine of the Development Branch of the Canadian Meteorological Centre (CMC) for their work leading to the operational implemention of the Global Environmental Multiscale (GEM) model.

Over a period of several years André and Alain played a crucial role in adapting and validating the model so that it could be of optimum use by the operational forecast community. Their understanding of both the needs of the operational community who would use the model and the developers has resulted in significant improvements to the utility of the GEM model to operational meteorologists around the country.

It is a pleasure to recognize André and Alain's contribution to operational meteorology by presenting them with the 1998 Rube Hornstein Medal.

CMOS Citation

To Richard Scott, Keith McCaul, Bill Beveridge and Mohamed Alkoka of the Regional Municipality of Ottawa-Carleton (RMOC), for their leadership in the application of meteorology to the problem of road weather forecasting.

The RMOC team worked hand in hand with the Regional Forecast Centre in Ottawa in the implementation of new road surface observing sites and forecast models specifically designed to increase the effectiveness of road treatment during winter weather conditions. As a result of these efforts, road weather forecasts are now regularly issued in Ontario. Applying salt proactively, results in increased road safety and reduced pollution.

It is a pleasure to recognize the work of the team of the Regional Municipality of Ottawa-Carleton by presenting them with this CMOS Citation for advancing the application of meteorology in Canada.

## Prix et Récompenses 1998

Le Prix du Président

À Isztar Zawadzki pour le développement du système de radar Doppler bi-statique à l'Observatoire J.S. Marshall et son application à la reconstruction du champ de vent tridimensionnel.

Expert mondial en météorologie radar, le Prof. Zawadzki a déjà plusieurs réalisations importantes à son actif dans l'application du radar en hydrologie, notamment dans le domaine de l'estimation de la precipitation. Son travail se fonde sur l'observation, l'analyse théorique, la modélisation numérique et même l'expérimentation en laboratoire. Ses travaux récents sont un pas important vers l'utilisation efficace des données radar en prévision numérique.

Cest un plaisir de reconnaître cette contribution originale avec le Prix du Président 1998.

La Médaille J.P. Tully en océanographie

À Neil Oakey pour son influence de longue date sur l'océanographie canadienne à travers ses contributions à la tâche vitale et ardue de mesurer la turbulence océanique.

Un des pionniers de la mesure de la turbulence de petite échelle dans l'océan, le Dr. Oakey a fait des contributions majeures au développement d'instruments de mesure, notamment les profileurs de turbulence captifs à liens souples, qui, en dépit du scepticisme initial de la communauté, sont maintenant d'usage courant et la manière la plus répandue de mesurer la turbulence océanique. Cette approche qui permet une prise de mesure rapide et un usage efficace du temps de croisière, a de plus ouvert une fenêtre sur le mélange en eau peu profonde qui est exploitée pour l'étude de la dynamique des estuaires et des côtes, ainsi que pour l'étude de l'effet du mélange de petite échelle sur la biologie marine. Plus récemment, Neil a continué son travail de pionnier de la mesure de la turbulence de surface avec le développement d'un planeur en chute libre pour l'étude de la distribution horizontale et verticale des microstructures.

Les réalisations scientifiques de Neil sont nombreuses et significatives. En particulier, il fut le premier à regarder sérieusement les spectres simultanés des microstructure de température et de vitesse à l'échelle de la dissipation, et il fut le premier à établir une méthode cohérente pour relier les microstructures de température au taux de dissipation de l'énergie mécanique. Il fut aussi l'un des premiers chercheurs à combiner les mesures de microstructure avec les profils de nutriments, et obtenir ainsi une compréhension approfondie des effets du mélange turbulent sur la productivité biologique de l'océan.

Neil a aussi eu une influence marquante sur le développement de l'océanographie canadienne et internationale par son empressement à aider les chercheurs novices à acquérir les trucs du métier, en founissant ses données gracieusement et en partageant son temps et son expertise avec enthousiasme avec collègues et étudiants. Ainsi, il a joué un rôle important dans la formation de la prochaine génération de chercheurs et dans le positionnement du Canada dans le peloton de tête des nations océanographiques.

C'est un plaisir de reconnaître ces contributions avec la Médaille J.P. Tully en océanographie 1998.

Le Prix Andrew Thomson en météorologie appliquée

À Robert Benoit pour son leadership dans le développement du modèle MC2 (Mésoéchelle Compressible Communautaire) et le support prodigue à sa communauté d'usagers.

Ce modèle à la fine pointe du progrès est devenu un outil important pour la recherche à la mésoéchelle au Canada

et dans le monde. Le champ d'application du modèle MC2 couvre une gamme très étendue: événements de convection violente, validation de la précipitation avec des données radar, applications en qualité de l'air, en agriculture et en hydrologie pour n'en nommer que quelques unes. Le modèle MC2 s'est aussi illustré lors de campagnes de mesures internationales et d'études de comparaison de modèles.

Cest un plaisir de reconnaître cette contribution avec le Prix Andrew Thomson en météorologie appliquée 1998.

Le Prix de la SCMO en océanographie appliquée

À Peter Smith, David Greenberg, Donald Lawrence, Guoqi Han, Jennifer Shore, John Loder, Charles Hannah, Roger Pettipas et Brendan de Tracey, pour des prévisions joumalières de dérive et de courants océaniques durant les opérations de récupération du vol 111 de la Swissair.

À la suite de l'écrasement du vol 111 de la Swissair, ce groupe de chercheurs a adapté un modèle de circulation de plateau continental pour générer des prévisions joumalières de vitesse dans le voisinage du site de l'accident, avec comme données les vents de surface, les marées et la moyenne saisonnière des courants. Selon le responsable des opérations de recherche et sauvetage au sol, ces prévisions de dérive des débris ont été d'une précieuse assistance pour le déploiement des ressources limitées à sa disposition. Cette capacité opérationnelle n'existant pas auparavant à l'Institut d'océanographie de Bedford, son implementation dans des circonstances difficiles a nécessité un effort concerté de tous les membres du groupe.

C'est un plaisir de reconnaître le travail ardu et l'initiative de ce groupe d'individus avec le Prix de la SCMO en océanographie appliquée 1998.

La Médaille Rube Horostein en météorologie opérationnelle

À André Méthot et Alain Patoine de la Direction du développement du Centre météorologique canadien (CMC) pour leur travail qui a conduit à l'implémentation opérationnelle du modèle Global Environnemental Multiéchelle (GEM).

Sur une période de plusieurs années, André et Alain ont joué un rôle crucial pour la validation et l'adaptation du modèle aux besoins opérationnels. Leur compréhension à la fois des besoins de la communauté des météorologistes d'exploitation qui aurait à utiliser le modèle, et ceux de l'équipe de développement a résulté en une augmentation significative de l'utilité du modèle GEM aux météorologistes opérationnels à travers tout le pays.

Cest un plaisir de reconnaître la contribution d'André et d'Alain avec la Médaille Rube Hornstein en météorologie opérationnelle 1998.

Mention de la SCMO

À Richard Scott, Keith McCaul, Bill Beveridge et Mohamed Alkoka de la Municipalité régionale d'Ottawa-Carleton (MROC), pour leur leadership dans l'application de la météorologie au problème de la prévision de l'état des routes.

L'équipe de la MROC a travaillé de concert avec le bureau de prévision météorologique d'Ottawa pour l'implémentation de nouveaux sites d'observation et de capteurs au niveau de la chaussée, ainsi que de modèles de prévision adaptés spécifiquement pour accroître l'efficacité de l'épandage en conditions hivernales. À la suite de ces efforts, des bulletins de prévision de l'état des routes sont maintenant émis régulièrement en Ontario. L'application préventive et sélective de sel conduit à une augmentation de la sécurité routière et à une réduction de la pollution.

C'est un plaisir de reconnaître le travail de l'équipe de la Municipalité régionale d'Ottawa-Carleton par la présentation de cette Mention de la SCMO pour l'avancement de l'utilisation de la météorologie au Canada.

## Fellows of the Royal Society of Canada

We have just learned that both Ken Denman and C.S. Wong (both at IOS) have been elected Fellows of the Royal Society of Canada.

### Ken Denman

Ken Denman graduated from UBC in 1972 with a PhD in Physical Oceanography. He then worked for five years at Bedford Institute of Oceanography with Trevor Platt where they were virtually alone in studying the effects of physical processes on planktonic ecosystems. In 1977 he moved to the Institute of Ocean Sciences, where, together with David Mackas, he built up a biological oceanography program, focusing on determining how oceanographic and environmental factors affect planktonic foodwebs that support fish populations. In 1995 he was convener and lead author of a chapter titled 'Marine biotic responses to environmental change and feedbacks to climate' in the Intergovernmental Panel on Climate Change Second Assessment Report on the Science of Climate Change.

Ken is an internationally respected scientist who helped establish the linkages between physical and biological processes in the upper ocean. He was one of the first oceanographers to model the wind-mixed layer and among the first to recognize the importance of this layer to planktonic productivity. His application of spectral analysis methods to plankton dynamics has been the basis of many new developments in marine ecology. A coupled biogeochemical mixed layer model developed by Denman is providing new insight into how planktonic ecosystems regulate, store and transform oceanic carbon- topics critical to our understanding of global climate change.

## C.S. Wong

Dr. C.S. Wong is a Canadian citizen, bron in Hong Kong, and is the senior scientist of the Climate Chemistry group at the Institute of Ocean Sciences. He was first educated in chemistry at the University of Hong Kong, and then gained his PhD at the Scripps Institute of Oceanography, San Diego. Strangely, C.S. is already an FRSC, but in the former case a Fellow of the Royal Society of Chemistry (UK), and he is also a fellow of the Chemical Institute of Canada.

C.S. has been working in the general field of climate biogeochemistry ever since his Scripps days working with Professor Charles Keeling. He joined the Pacific Oceanographic Group of the Fisheries Research Board of Canada in 1968 as a chemical oceanographer and became Head of what was then known as the Ocean Chemistry Division.

C.S.'s current interests involve the fate of carbon dioxide and other radiatively active gases in the climate system of the Earth; studies of climate variability and the effects on the ecosystem of the N. Pacific; the use of exotic tracers to determine the general circulation of the ocean and finally, ocean storage of carbon dioxide and the feasibility of direct deep-sea disposal and mitigation by iron fertilization.

C.S. is active in international committees such as the $CO_2$ panel of the Intergovernmental Oceanographic Commission (IOC), the SCOR working group on $CO_2$ monitoring and many others. In 1992 C.S. was co-recipient of the Newcomb Cleveland Prize, awarded by the American Association for the Advancement of Science, for the best research paper published in Science that year in any field.

**Congratulations to both nominees!**

## CMOS First Fellows Nominated

At the last Congress in Montréal, the CMOS Fellows Committee announced the first Fellows of the Society. Nominations were sought through solicitation in the *CMOS Bulletin SCMO*, on the Society web site, and by personal solicitation.

The Committee members consist of the CMOS Past President (Chair), John Reid; Chair of the Scientific Committee, Charles Lin; Chair of the Accreditation Committee, Jim Salmon; Chair of the Prizes and Awards Committee, vacant; Member-at-large, Susan Allen.

The Committee members met electronically and unanimously agreed on the suitability of the following four nominess for appointment as CMOS Fellows.

**Prof. L.A. Mysak:** For his contributions to our knowledge of the oceans, sea ice and climate as researcher, teacher, and supervisor, and for leadership in the Canadian scientific community.

*Pour ses contributions à la connaissance des océans, de la glace de mer, et du climat en tant que chercheur et professeur et pour son leadership au sein de la communauté scientifique canadienne.*

**Dr. P.E. Merilees:** For research leadership in the atmospheric sciences and his contributions to advancing numerical weather prediction.

*Pour son leadership dans les sciences atmosphériques et ses contributions à l'avancement de la prévision numérique.*

**Mr. D.W. Phillips:** For outstanding service in communicating and interpreting weather and climate information to Canadians through the electronic and print media.

*Pour services extraordinaires à la communication et à l'interprétation de la météo et du climat aux canadiens en utilisant les média électroniques et imprimés.*

**Prof. P.A. Taylor:** For services to meteorology in Canada as researcher and educator, and internationally as editor and facilitator.

*Pour services à la météorologie au Canada en tant que chercheur, éducateur, et facilitateur et éditeur au niveau international.*

**Congratulations to all recipients!**
**Félicitations à tous les récipiendaires!**

## The Ocean Observing System for Climate

St-Raphaël, France
18 - 22 October 1999

The Ocean Observations Panel for Climate (OOPC) and the Upper Ocean Panel (UOP) of CLIVAR will convene an International Conference on the Ocean Observing System for Climate in Saint Raphaël, France, 18-22 October 1999.

This Conference, following oceanographic symposia in Biarritz 95 and 97, is being organized by the Centre National d'Études Spatiales (CNES), the French Space Agency, with the support of:

- National Aeronautics and Space Administration;
- National Oceanic and Atmospheric Administration;
- National Science Foundation;
- US Navy;
- Global Ocean Observing System;
- Global Climate Observing System;
- Intergovernmental Oceanographic Commission;
- Global Ocean Data Assimilation Experiment;
- Scientific Committee for Ocean Research;
- World Meteorological Organization;
- World Climate Research Programme;
- Bureau of Meteorology;
- European Space Agency;
- European Center for Research and Advanced Training in Scientific Computation;
- National Space Development Agency of Japan;
- Institut de Recherche pour le Développement;
- European Organization for the Exploitation of Meteorological Satellites;
- Service Hydrographique et Océanographique de la Marine;
- Centre National de la Recherche Scientifique;
- Météo-France;
- Institut Français de Recherche pour l'Exploitation de la Mer.

### Objectives

The major mission of the Conference is to define the optimum mix of measurements needed to meet the goals of climate programs such as CLIVAR, GCOS, and GOOS. The Conference will review current scientific climate program priorities, and existing and planned observational efforts that address those priorities. This review will serve as the basis for establishing community consensus on the most viable candidate technologies and implementation strategies for implementing a comprehensive, integrated, international climate observing system in support of research, forecasting, and climate assessment.

The Conference organizers solicit and invite broad input on all relevant aspects including both remote and direct sampling data systems and management, processing and data assimilation, and the generation of useful products. The emphasis on useful products means that the Conference will not be a forum for all topics related to oceanographic observation but will focus on those contributions that are regarded as fundamental and/or essential to the long-term prosperity of the ocean observing system for climate. The scientific objectives will follow those of the OOSDP Report and the CLIVAR Implementation Plan. The objectives of GODAE will be used as guidance for those observing elements with relevance beyond climate.

The organizers are seeking broad agreement from the community on the structure of the observing system to meet operational and research needs of the coming decade and beyond. They believe the Conference can be effectively used to herald in a new era for oceanography where the paradigm for ocean data is free and wide access and rapid, timely delivery.

The Conference will be followed by the TOPEX/POSEIDON and Jason-1 Science Working Team meeting on October 25 to 27, 1999, in the same Saint-Raphaël facilities. This meeting, co-organized by CNES and NASA, will be devoted to technical and scientific aspects of these two satellite altimetry missions which attest to the essential role of high accuracy altimetry in future ocean observing systems.

### Audience

The intended audience of the Conference includes:

- the community involved with systematic long term observations as well as technical and/or scientific aspects of the Ocean observing system;

- the agencies, groups and individuals dedicated to implementation and maintenance of the observing system;

- the community involved with data systems and the processing of ocean data;

- the community working on operational ocean model development and data assimilation techniques;

- the community involved with the use and exploitation of the observing system through applications and products;

- the patrons of the observing system and of those endeavours that are directly or indirectly dependent upon the successful implementation and maintenance of an ocean observing system for climate.

## Format

The Conference will be organized on the basis of plenary, poster and round-table sessions. It will include solicited papers addressing specific issues related to observing systems, and submitted papers. Round-table sessions are planned to generate comment on the papers, to identify and, where possible, to contribute to resolution of outstanding issues, and to provide input for final conclusions. The working languages will be English and French. Simultaneous interpretation will be provided during plenary sessions.

## Location

The Conference will be held at the Saint-Raphaël Conference Centre, at the Santa Lucia harbour, whose facilities include an auditorium, splinter meeting rooms, and a poster session area. Saint-Raphaël is a typical middle town in Provence located 70 kilometres west of Nice (40 min. drive by the highway from Nice airport) on the French Riviera. It includes 30 kilometres of beautiful coastline, just at the lower end of the Esterel hills. Touristic tours will be organized during the week-end, October 23-24, especially for those attending both events, the International Conference and the meeting of the TOPEX/POSEIDON and Jason-1 Science Working Team.

## Themes

1 - Users, applications, impacts and investment

- El Niño prediction and impacts
- Framework Convention on Climate Change / IPCC
- Science
- Investment and output

2 - Regional and phenomenological approaches

- Basin extended climate studies, high-latitudes
- Boundary currents
- Heat, water and carbon cycles
- Climate change

3 - Sampling and measurement

- Surface and low level atmosphere
- Upper ocean
- Deep ocean
- Remote sensing

4 - Data flow, processing and products

- Assembly, quality control, telemetry
- Synthesis and assimilation
- Distribution and availability of data and products

5 - Global perspectives

- Integration of system elements
- GODAE
- Global budgets
- Global climate model validation

6 - Evolution and the future

- New technology
- New frontiers in science
- Emerging applications and needs.

## Call for Abstracts

The deadline for the call for abstracts is June 30, 1999. Current information and submission details can be provided on the web site of the conference:

http://OCEANSOBS99.cls.fr

For further questions on abstract submission or inclusion in the mailing list, please contact the Conference organization secretariat at CTA (See address below). The submitted papers will be reviewed by the Scientific Committee. Notices of acceptance are presently scheduled for August 1999.

## Publications

The Conference proceedings will include the texts of the Conference papers and the main outcomes resulting from round-tables and discussions. Each author presenting a paper at the Conference will be asked to provide a manuscript. Instructions for the preparation of papers will be sent with the acceptance notice.

## Schedule

- Abstract submission deadline: June 30, 1999
- Acceptance: August 1999
- Conference registration: September 30, 1999

## Demonstration Area

During the Conference, a demonstration area will be organized to enable industry representatives and agencies concerned with the subject matter to present their wares and know-how. Detailed information on the exhibition will be provided either on the web site or at the Conference organization secretariat at CTA.

## Registration Fees

The registration fee is 1800 FF (VAT included) for the full week. It includes access to conference, poster and exhibition rooms, simultaneous interpretation, welcome cocktail, all lunches and coffee breaks, closing dinner and proceedings.

## Travel Support

Some level of support for participatants may be available by sponsoring agencies. Preference will be given to those who require assistance with travel costs and who present papers

and/or participate in the preparation of background papers. The Conference also has quite specific objectives, so resources will be directed to optimize the likelihood of the Conference meeting its goals. Please contact the Conference organization secretariat for further information.

## Scientific Committee

Chet Koblinsky, Co-chairperson, USA;
Neville Smith, Co-chairperson, Australia;
Lee Fu, USA; John Gould, UK;
David Legler, USA; Michael McPhaden, USA;
Yves Ménard, France; Nadia Pinardi, Italy;
Alain Ratier, Germany; Fritz Schott, Germany;
Kensule Takeuchi, Japan; Jacques Verron, France;
Ilana Wainer, Brazil.

## Information Request

In addition to the web site of the Conference, for further information please contact the Conference Organization Secretariat:

Capitole Tourisme Affaires - OCEANOBS99
22 avenue de Purpan
31700 Blagnac - France
Tel: 33 5 61 71 09 92/95; Fax: 33 5 61 71 44 37
e-mail: cta@pyrenet.fr
URL: http://OCEANOBS99.cls.fr

For information on scientific issues, please contact the Conference Scientific Secretariat:

OCEANOBS99, SOC Secretariat
C/-GODAE Project Office
Bureau of Meteorology Research Centre
Box 1289K
Melbourne Vic 3001, Australia
Tel: + 61 3 9669 4095; Fax: +61 3 9669 4660
e-mail: GODAE@BoM.gov.au
Web site: http://WWW.BoM.GOV.AU/OCEANOBS99/

# Le Système d'Observation de l'Océan pour le Climat

St-Raphaël, France
18 - 22 October 1999

L'OOPC (Ocean Observations Panel for Climate) et l'UOP (Upper Ocean Panel) du programme CLIVAR vous invitent à participer à la Conférence Internationale sur le Système d'Observation de l'Océan pour le Climat qui se déroulera à Saint Raphaël (France) du 18 au 22 octobre 1999.

Cette manifestation, qui fait suite aux colloques d'océanographie qui ont eu lieu à Biarritz en 1995 et 1997, est organisée par le Centre Nationale d'Études Spatiales (CNES), l'Agence Spatiale Française, avec le soutien de:

- National Aeronautics and Space Administration;
- National Oceanic and Atmospheric Administration;
- National Science Foundation;
- US Navy;
- Global Ocean Observing System;
- Global Climate Observing System;
- Intergovernmental Oceanographic Commission;
- Global Ocean Data Assimilation Experiment;
- Scientific Committee for Ocean Research;
- World Meteorological Organization;
- World Climate Research Programme;
- Bureau of Meteorology;
- European Space Agency;
- European Center for Research and Advanced Training in Scientific Computation;
- National Space Development Agency of Japan;
- Institut de Recherche pour le Développement;
- European Organization for the Exploitation of Meteorological Satellites;
- Service Hydrographique et Océanographique de la Marine;
- Centre National de la Recherche Scientifique;
- Météo-France;
- Institut Français de Recherche pour l'Exploitation de la Mer.

## Objectifs du Colloque

La Conférence a pour principale mission de définir une stratégie d'observation optimisée, apte à satisfaire ls objectifs des programmes sur le climat tels que CLIVAR, GCOS et GOOS. La Conférence servira à établir les priorités parmi les besoins scientifiques exprimés. Elle permettra d'évaluer les nombreux systèmes d'observation proposés pour accompagner les programmes dans le domaine de la recherche et de la prévision climatique. Les recommandations qui en découleront, jetteront les bases d'un consensus sur les techniques et les moyens à mettre en oeuvre pour élaborer un système d'observation, intégré, cohérent, bénéficiant d'un large soutien international.

Les organisateurs de la Conférence souhaitent solliciter et susciter de nombreuses interventions sur toutes les approches envisagées, y compris l'observation directe et depuis l'espace, la mise en place et la gestion des systèmes de données, le traitement et l'assimilation de données et la génération de produits dérivés. La Conférence ne sera donc pas un forum de discussion sur tous les sujets liés à l'observation océanographique, mais s'appuiera plutôt sur des contributions considérées comme fondamentales pour le succès à long terme d'un système d'observation des océans pour le climat. Les objectifs scientifiques seront dérivés de ceux du Rapport OOSDP (Ocean Observing System Development Panel), du Plan de mise en oeuvre CLIVAR et de ceux affichés dans GODAE.

Cette Conférence devrait permettre à la communauté impliquée d'atteindre un large consensus sur la structure du

système d'observation à mettre en place afin de répondre aux besoins opérationnels et scientifiques, pour la décennie à venir et au-delà. Cela marquera le départ d'une nouvelle ère pour l'océanographie, caractérisée par la libre mise à disposition et la transmission rapide des données océanographiques vers les utilisateurs.

Du 25 au 27 octobre 1999, aura lieu également au Palais des Congrès de Saint-Raphaël, la réunion du groupe scientifique TOPEX/POSEIDON et Jason-1. Cette réunion, co-organisée par le CNES et la NASA, sera consacrée aux aspects techniques et scientifiques de ces deux missions altimétriques, qui témoignent du rôle essentiel de l'altimétrie de haute précision dans les futurs systèmes d'observation de l'Océan.

## Participants

Les participants attendus à la Conférence sont issus des:

- équipes travaillant sur les longues séries d'observations systématiques ainsi que sur les aspects techniques et/ou scientifiques des systèmes dobservation de l'Océan;

- agence, groupes et individus spécialisés dans la mise en oeuvre et la gestion de systèmes d'observation;

- équipes impliquées dans les systèmes de données et le traitement des données océanographiques;

- équipes travaillant sur le développement de modèles opérationnels océaniques et l'assimilation de données;

- équipes qui utilisent et exploitent les systèmes d'observation par le biais des applications et des produits;

- sponsors des systèmes d'observation et de projets qui sont directement ou indirectement tributaires du succès de la mise en oeuvre et du fonctionnement des systèmes d'observation de l'océan pour le climat.

## Organisations de la Conférence

La Conférence sera organisée sur la base de sessions plénières, de sessions d'affichage et de tables-rondes. Les communications invitées, consacrées à des sujets spécifiques aux systèmes d'observation, seront présentées en session plénière. Les papiers soumis seront sélectionnés après soumission des résumés. Des tables-rondes sont prévues pour favoriser les discussions, identifier et, si possible, répondre aux questions en suspens et fournir des éléments pour les conclusions finales. Les articles, résumés et affiches pourront être présentés en français ou en anglais. L'interprétation simultanée sera assurée durant les conférences.

## Lieu

La Conférence se tiendra au Palais des Congrès de Saint-Raphaël, port de Santa Lucia. Saint-Raphaël est une ville typiquement provençale, située sur la Côte d'Azur, à 70 km à l'ouest de Nice (40mn par l'autoroute depuis l'aéroport de Nice). La ville s'étend sur 30 km le long du rivage méditerranéen et au bas des contreforts du Massif de l'Estérel. Des visites touristiques seront organisées durant le week-end du 23 et 24 octobre, en particulier à l'attention de ceux qui participeront aux deux événements, la Conférence Internationale et la réunion du groupe scientifique TOPEX/POSEIDON et Jason-1.

## Thèmes

1. Utilisateurs, applications, impacts et investissement

   - El Niño, prévisions et impacts;
   - convention cadre sur les chamgements climatiques / IPCC;
   - science;
   - investissement et retour.

2. Approche régionale et phénoménologique

   - études climatiques à l'échelle du bassin, hautes latitudes;
   - les tropiques et ENSO;
   - cycles: chaleur, eau, carbone;
   - changement climatique.

3. Échantillonnage et observations

   - en surface et à l'interface océan-atmosphère;
   - dans les couches superficielles de l'océan;
   - en profondeur;
   - par télédétection.

4. Flux de données, traitement des données et produits

   - Collecte, contrôle et télémesure;
   - Synthèse et assimilation;
   - Distribution et disponibilité des données et des produits.

5. Perspectives globales

   - Intégration des éléments du système;
   - GODAE;
   - Bilans globaux;
   - Validation du modèle climatique global.

6. Évolution et perspectives

   - nouvelles technologies;
   - nouvelles frontières scientifiques;
   - nouveaux besoins et applications.

## Soumission des résumés

La data limite de soumission des résumés était le 30 juin 1999. Toutes les informations concernant la soumission des papiers sont décrites en détails sur le site web:

http://OCEANSOBS99.cls.fr

Si nécessaire des informations complémentaires peuvent être obtenues auprès du secrétariat de l'organisation de la Conférence (voir adresse plus bas). Les résumés seront évalués par le comité scientifique, et les avis qui en résulteront seront transmis aux auteurs en août 1999.

## Publications

Les textes de la Conférence seront publiés dans les actes du symposium de même que les principales conclusions issues des tables-rondes. Tous les auteurs présentant une communication su symposium seront invités à soumettre un article. Les instructions concernant la soumission des articles et le format approprié seront transmis avec les avis d'acceptation.

## Calendrier des événements

- Date soumission des résumés: 30 juin 1999
- Notification aux auteurs: août 1999
- Inscription au colloque: 30 septembre 1999

## Exposition

Pendant toute la durée de la Conférence, une exposition et des démontrations seront organisées afin de permettre aux industriels et aux sociétés intéressés de présenter aux spécialistes réunis leur savoir faire dans le domaine. Des informations détaillées peuvent être obtenues sur le site web ou en s'adressant au secrétariat de l'organisation du colloque.

## Droit d'inscription

Le montant des droits d'inscription à la Conférence est de 1800 FF TTC. Les droits d'inscriptions comprennent l'accès aux salles de conférences, des affiches et d'exposition, la traduction simultanée, le cocktail de bienvenue, les déjeuners sur place, les pauses-café, le dîner de clôture et le recueil des actes.

## Aides de financement

Des aides partielles de financement pourront être octroyées su dossier par les sponsors aux participants ayant des difficultés à obtenir la totalité du financement nécessaire à leur séjour, priorité étant donnée à ceux qui présenteront des papiers ayant un intérêt direct vis-à-vis des thèmes abordés et des discussions qui en découlent. Prière de contacter le secrétariat de l'organisation pour de plus amples informations.

## Membres du Comité scientifique

Chet Koblinsky, Co-président, É-U;
Neville Smith, Co-président, Australie;
Lee Fu, É-U; John Gould, R-U;
David Legler, É-U; Michael McPhaden, É-U;
Yves Ménard, France; Nadia Pinardi, Italie;
Alain Ratier, Allemagne Fritz Schott, Allemagne;
Kensule Takeuchi, Japon; Jacques Verron, France;
Ilana Wainer, Brézil.

## Demande d'information

Des compléments d'information peuvent être obtenus auprès du Secrétariat de l'organisation:

Capitole Tourisme Affaires - OCEANOBS99
22 avenue de Purpan
31700 Blagnac - France
Tél: 33 5 61 71 09 92/95; Fax: 33 5 61 71 44 37
courriel: cta@pyrenet.fr
Site web: http://OCEANOBS99.cls.fr

et, pou tout ce qui concerne les questions scientifiques auprès du secrétariat scientifique:

OCEANOBS99, SOC Secretariat
C/-GODAE Project Office
Bureau of Meteorology Research Centre
Box 1289K
Melbourne Vic 3001, Australia
Tél: + 61 3 9669 4095; Fax: +61 3 9669 4660
courriel: GODAE@BoM.gov.au
Site web: http://WWW.BoM.GOV.AU/OCEANOBS99/

# International Conference on the Science and the Management of Protected Areas

## Call for Papers

A Call for Papers has been issued for the "International Conference on the Science and the Management of Protected Areas" (SAMPA IV) scheduled for 14-19 May 2000 at the University of Waterloo, Waterloo, ON. The Conference will sponsor a "Marine and Coastal Symposium" within the main event.

Hard-back proceedings from the Symposium will be published. For information, access the SAMPA website at:

http://landscape.acadiau.ca/sampaa/

or email Neil Munro at neil_munro@pch.gc.ca

## World Conference on Science for the Twenty-First Century: A New Commitment

Budapest, 26 June – 1 July, 1999

In Budapest, 26 June – 1 July, 1999, UNESCO and the International Council of Scientific Unions (ICSU), in co-operation with other partners, will convene a World Conference on Science for the Twenty-First Century: A New Commitment. This unique forum will provide an opportunity to discuss the role and impact of science in society. Although the Conference is not strictly a governmental meeting, Canada should be prepared to participate and debate the issues and their solutions.

### Background

Science, and the associated technological advances that it produces, have progressed at an astounding rate this past century and that rate continues to increase. It would seem that the ability of science to influence society is out-stripping the capacity of society to respond. The results of science are affecting the way we live and react with one another and also change our options for the future. It seems, therefore, that at every turn there is some moral or ethical question being raised concerning new knowledge and its application and, at the same time, the confidence of the public in scientific opinion has sunk to a low ebb. Unfortunately these changes are taking place against a background where science is needed more than ever before to address social and environmental problems of increasing magnitude.

The Conference on Science for the Twenty-First Century is most timely. The Conference will produce a Declaration on Science and a Science Agenda – Framework for Action. The former will underscore political commitment to the scientific endeavour and to the solution of problems at the interface between science and society. The latter will be an innovative and pragmatic framework for fostering partnerships in science and the use of science for development and the environment. Both documents have the potential to be significant statements in the future development of science policy nationally, and around the world. Canada should be prepared to contribute to the debate using its experience in Government, academia, professional societies and industry. These questions touch on all aspects of society. Some specific and general examples of issues are given below.

### Science for public good vs science for profit

The amount of research being paid for by industry is increasing at the same time as many governments are reducing their science budgets. In addition, the remaining governmental research is being constrained to produce more concrete, shorter-term benefits to the detriment of longer-term strategic and knowledge-building science. The expanding world population and consumption patterns are raising severe social and environmental problems. Poverty and hunger, the availability of water and energy, overpopulation and pollution will threaten peace and survivability in the next century. Reliable forecasts of arising issues and the careful analysis of potential solutions are a necessity. The use of a new approach for science and technology, addressing sustainability and common good rather than competitive gain, will be needed to overcome or mitigate these problems. Much more research is needed on fundamental questions rather than consumer and marketable products. It is governments that must respond to such threats as global warming, disease prevention, droughts and floods and the corresponding social needs. How to improve the use of science in governance and decision-making should be a recurring theme of the debate.

### Science, communications, and the public

There is no doubt that the image of science is tarnished. There will be many reasons for this, some of which can be attributed to the speed at which "sensational" scientific results can be released to an increasingly skeptical public. In the past scientific results were subjected to a long and involved peer review process. The present age of electronic communications allows yesterday's scientific experiments to be today's news. The public, in fact, faces a bewildering barrage of information daily that specifies "...research has shown that such and such is good or bad for the health, diet etc...etc.". In addition, the public realizes that research paid for by the tobacco, petroleum or pharmaceutical industries, for example, is unlikely to promote any aspect of science detrimental to the payee. Is it time for science to address its own professionalism?

### Science and health

Advances in medical research have led to perhaps the most dramatic confrontations with societal ethics. The prolongation of life, use of human and animal organs for transplant surgery, experiments with fertilization and cloning are just a few of the seeming miracles that society is dealing with at the moment. Life and health are fundamental questions for all. Unfortunately, the benefits and the effort are increasingly aimed at those that can pay. These are questions that society must ultimately deal with. How can society best use, or control, science in this connection? Can science contribute to the ethical questions to be dealt with and, if so, how?

### Science and food

Agricultural productivity relies increasingly on modern scientific advances. The use of pesticides and herbicides, are commonplace, and antibiotics and hormones, genetic engineering and selective breeding are becoming so. Is this the way forward for the next century? Will science be able to make a permanent and stable impact on food availability? Is government legislation and knowledge sufficient to safeguard the health of the public in the foreseeable future? How can science help to make food available to all?

## Science and energy

One of the most pressing global issues being tackled at the moment is the increase in greenhouse gases and the subsequent global warming. At present there is no viable alternatives to hydrocarbon-based energy. Is a reduction in world-wide carbon-dioxide output possible? What are the alternatives for the future? Can society change from its addiction to its prime energy source?

## The Conference

The Conference will address and involve national governments and institutions, educational and research establishments, members of the scientific community, the industrial sector, intergovernmental organizations and non-governmental organizations, as well as the media and public. Attendance will be limited, therefore prior consideration and debate of the issues is very important. The format of the Conference will consist of plenary sessions with key-note speeches and concurrent afternoon discussion sessions on more specific items.

The time available to plan for the Conference is very short. Nevertheless, the subject matter is important. The Canadian participants should take with them a detailed briefing of the main issues of importance to Canada together with some suggestions for policy statements and actions of national priority. For this reason, the various science communities in Canada are being canvassed for their views on the issues of highest concern. A national committee has been struck and has met in February, 1999 to discuss a Canadian approach to the Conference. Some preliminary thought on the content and thrust of Canadian interests will greatly benefit the discussion.

## Personal Comments about the Budapest Conference

I believe that it is a very timely Conference. Science, and the associated technological advances that it produces, have progressed at an astounding rate this past century and that rate continues to increase. It would seem that the ability of science to influence society is out-stripping the capacity of society to respond. The results of science are affecting the way we live and react with one another and also change our options for the future. It seems therefore, that at every turn there is some moral or ethical question being raised concerning new knowledge and its application and, at the same time, the confidence of the public in scientific opinion has sunk to a low ebb. Unfortunately these changes are taking place against a background where science is needed more than ever before to address social and environmental problems of increasing magnitude.

Has ocean science any specific need to be interested in the Conference? I believe so and again it is related to the issue of public good. The oceans are a global commons and a critical element of the life support system for our planet. Research relating to the wellbeing of the human race should not be used for personal gain. Therefore wording could be sought in the declaration of the Conference along the following lines.

"Much of the scientific knowledge and many of the technological advancements already present or will be emerging into our society, relate to, or can impact on, the life support systems of our planet. Research and development that directly or indirectly addresses the health of the global commons or the decisions that must be taken by society to prevent or alleviate damage to these systems, should be made freely available to the world community and not used for personal or private gain. This ethic should be accepted and applied at the level of individual scientist, organization and government."

In conclusion, I hope that governments will pay attention to the results of the Conference and apply necessary changes to their policies on science that will enable research and the associated technology to develop and serve humanity more effectively in the coming years.

*G.L. Holland,*
*President,*
*Intergovernmental Oceanographic Commission*

## Tertia M.C. Hughes Memorial Symposium November 23, 1999, McGill University

In remembrance of Tertia Hughes, former graduate student in the Department of Atmospheric and Oceanic Sciences, McGill University, during 1989-1995, a special memorial symposium will be held on Tuesday, November 23, 1999, marking the first anniversary of her passing.

The event, hosted jointly by the Centre for Climate and Global Change Research and the Department of Atmospheric and Oceanic Sciences, will be held at the McGill Faculty Club, 3450 McTavish Street, Montreal, Quebec, H3A 1X9, from 2:00 - 5:00 p.m. The symposium will be followed by a reception.

Tributes from close friends and colleagues will include, amongst others, presentations by Professor Andrew Weaver, University of Victoria, and Professor Jorge Sarmiento, Princeton University. For further information please contact:

Ms. Angie Mansi
Assistant to the Director
Centre for Climate & Global Change Research
McGill University
805 Sherbrooke Street West
Montreal, QC H3A 2K6 CANADA
Tel: (514) 398-3759; Fax: (514) 398-1381
Web site: http://www.mcgill.ca/ccgcr
E-mail: mansi@felix.geog.mcgill.ca

## Job Offer / Offre d'emploi

### Memorial University of Newfoundland
### Department of Physics and Physical Oceanography
### Assistant Professor

The Department of Physics and Physical Oceanography at Memorial University of Newfoundland is seeking candidates eligible for the NSERC University Faculty Award (UFA) program directed at increasing the representation of women in science. A candidate successful in receiving the UFA will be appointed as a regular tenure-track faculty member at the Assistant Professor level. The appointment will include teaching at the graduate and undergraduate levels. This position offers an opportunity to work in a large, comprehensive university in the community-oriented, culturally rich St. John's area, with close access to the many spectacular wilderness areas in Newfoundland.

Applications are invited from all eligible candidates; candidates with research interests that complement the existing activities of the Department are particularly encouraged to apply. The department has strong externally funded research programs in several areas including experimental, theoretical and computational studies of non-linear dynamics, membrane biophysics, polymer physics, magnetism, optical and vibrational spectroscopy, laboratory fluids, ocean acoustics, ocean circulation, and ocean modeling (for more details see the department web site: www.physics.mun.ca). The Department participates in interdisciplinary degree programs in Computational Science and Environmental Science.

Applications including a CV, letters of support from three references and a statement of research interests should be submitted to Dr. M. Morrow, Head, Department of Physics and Physical Oceanography, Memorial University of Newfoundland, St. John's, NF, A1B 3X7. All applications received before July 31 will be considered.

In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents of Canada. Memorial University is committed to the principles of employment equity and will consider applications from all qualified candidates. Partners of candidates for these positions are invited to include their resume for possible matching with other job opportunities.

## Stop the Press! What's New at CMOS?

Through an agreement with the Department of Fisheries and Oceans, CMOS will be providing the secretariatships for the National Committees of the Scientific Committee on Oceanic Research (SCOR) and the Engineering Committee on Oceanic Resources (ECOR). Both organizations are affiliated internationally.with NRC which is the national adhering member to the International Council of Scientific Unions (ICSU) for Canada.

SCOR and CMOS have had a long association with one another in that CMOS has provided the venue for SCOR meetings at Congress sessions. In fact, many members of CMOS have served on the national committee and participated as members on SCOR International Working Groups. Since its beginning some four decades ago, SCOR has served primarily as a body that facilitates international cooperation in oceanography. It brings together groups of individuals to discuss a variety of oceanographic problems. There are now fifteen active Working Groups but the list of past Working Groups exceeds one hundred.

Working Groups are established by SCOR on the basis of proposals received from national committees, other organizations or even individual scientists. The outcome of their work may be a scientific publication, a book or special volume of a journal. Working Group activities may lead to large-scale undertakings such as the International Marine Global Change Study (IMAGES) which arose from a SCOR Working Group on Sediment Coring for International Global Change Research. Membership of SCOR is open to all countries with active oceanographic research communities.

ECOR is a smaller and younger body than SCOR but essentially it works in the same way as SCOR but its thrust has an engineering orientation. It has several active Working Groups, two of which are the Wave Energy Working Group and the Marine Pollution Working Group; two others that are under consideration are Tanker Safety and Natural Marine Disasters.

We are expecting to feature reports and articles from SCOR and ECOR in forthcoming issues of the Bulletin which will help in making members aware of some of the current ocean studies. It is also our intention to establish a SCOR/ECOR Web site.

*Neil Campbell, Executive Director.*

## Canadian National Committee for SCOR

The Canadian National Committee (CNC) for SCOR (Scientific Committee on Oceanic Research) held its 1999 Annual Meeting on Sunday, May 30 in Montreal. This followed the practice of previous years of holding the meeting on the day set aside for committee meetings at the annual CMOS Congress. This year's meeting marked a change with respect to the CNC Secretariat, its location having recently been transferred from the Bedford Institute of Oceanography, Dartmouth, N.S. to the CMOS Secretariat in Ottawa. The Secretariat had been located at BIO since 1986.

The meeting was chaired by Dr. Ken Lee of DFO's Institut Maurice-Lamontagne. In opening the meeting, he welcomed two new members: Prof. Susan Allen of the University of British Columbia and Prof. Edwin Bourget of Université Laval. In addition to seven members, several observers were present including Dr. Charles Schafer, Chairperson of the Canadian National Committee for ECOR (Engineering Committee on Oceanic Resources) and Dr. Neil Campbell of the CMOS Secretariat.

A key part of CNC/SCOR meetings is the review of Canadian involvement in international programs. Prof. Barry Ruddick, Dalhousie University, reported on two World Climate Research Programme (WCRP) projects, WOCE and CLIVAR. In WOCE (World Ocean Circulation Experiment), the highlight of the past year was the international WOCE Scientific Conference held in Halifax in May, 1998. With the end of its intensive field program in 1997, WOCE has entered a synthesis and analysis phase that will extend until 2003. In Canada, several government institutes and universities are active including the University of Victoria, IOS Patricia Bay, UBC, McGill, Dalhousie, BIO and Memorial. Closely related to WOCE is the new WCRP project CLIVAR (Climate Variability and Predictability). Discussion at the CNC/SCOR meeting on CLIVAR centered on a 1998 document, "Canadian Activities Related to CLIVAR." It was noted that a national CLIVAR committee is expected to be established in the near future.

SCOR spearheads two major ongoing international research programs in oceanography, the Joint Global Ocean Flux Study (JGOFS) and the program on Global Ocean Ecosystems Dynamics (GLOBEC). Prof. Kim Juniper, UQÀM, reported on the Canadian JGOFS program, which has been carried out over the past ten years and funded in two phases. A recent proposal to NSERC for continued funding under a third phase was not successful. At the CNC/SCOR meeting it was suggested that the proposal, which focuses on the Labrador Sea, should be revamped and submitted to SCOR for consideration as a SCOR working group. The tentative title of the proposed working group is: "The relationship between climate change and the physical-biological mediation of carbon flux in marginal polar seas." GLOBEC Canada, which includes major activity on both the east and west coasts, is a national program that began in 1996. The first funding cycle (Phase-I) will end in 2000, and a plan is currently being developed for a second-round proposal. Phase-I is addressing the response of marine ecosystems to environmental variability. Prof Susan Allen will serve as CNC/SCOR's new representative on GLOBEC Canada.

Two other international programs on the agenda were GOOS (Global Ocean Observing System) and LOICZ (Land-Ocean Interaction in the Coastal Zone). Several Canadians are active in the former, including Ken Denman, DFO@IOS, who serves on the GOOS Steering Committee. Although LOICZ is active internationally, and several Canadians are involved, there is no Canadian national LOICZ program.

A major new international program getting under way is GEOHAB (Global Ecology and Oceanography of Harmful Algal Blooms). It is a joint SCOR-IOC initiative, and Prof. Bjorn Sundby, INRS Océanologie, is a member of the Scientific Steering Committee. With respect to Canadian activity, planning is currently under way to hold a national GEOHAB meeting for the purpose of designing and establishing a Canadian program in the field.

The typical SCOR working group is a small (8-10 members), international group established to address a specific scientific problem that will benefit from international attention. Canadians have traditionally been active in proposing and serving on SCOR working groups. Noted at the CNC/SCOR meeting was the recent approval of a Canadian proposal for a working group on "Transport and reaction in permeable marine sediments." This working group, which was initiated by Prof. Bernie Boudreau, Dalhousie University, was approved at the November 1998 SCOR General Meeting. Another working group that resulted from a Canadian proposal, "The impact of world fisheries harvests on the stability and diversity of marine ecosystems," is nearing the end of its work. Dr Mike Sinclair, DFO@BIO, is the chair of this working group.

Among other items considered at the meeting were: the status of the recommendations of the 1997 Workshop on Marine Science in Canada held at Memorial University; the documentation submitted in support of the 1999 assessment of the partnership agreement between the National Research Council and DFO in support of Canada's affiliation with SCOR; and activities of the Canadian National Committee for the Engineering Committee on Oceanic Resources (CNC/ECOR).

*Brian Nicholls,*
*A/Secretary CNC/SCOR*

## CMOS-ACCREDITED CONSULTANTS
## EXPERTS-CONSEILS ACCRÉDITÉS de la SCMO

**Mory Hirt**

Applied Aviation & Operational Meteorology

*Meteorology and Environmental Planning*
*401 Bently Street, Unit 4*
*Markham, Ontario, L3R 9T2 Canada*
*Tel: (416) 477-4120*
*Telex: 06-966599 (MEP MKHM)*

**Richard J. Kolomeychuk**

Applied Climatology and Meteorology
Hydrometeorology, Instrumentation

*Envirometrex Corporation*
*14A Hazelton Ave., Suite 302*
*Toronto, Ontario, M5R 2E2 Canada*
*Tel: (416) 928-0917 Fax: (416) 928-0714*
e-mail: kolomey@ibm.net

**Tom B. Low, Ph.D., P.Eng**

Research and Development Meteorology

*KelResearch Corporation*
*850-A Alness Street, Suite 9*
*Downsview, Ontario, M3J 2H5 Canada*
*Tel: (416) 736-0521* Fax: (416) 661-7171
E-mail: kel@nexus.yorku.ca

**Ian J. Miller, M.Sc.**

Marine Meteorology and Climatology
Applied Meteorology, Operational Meteorology
Broadcast Meteorology

*Météomédia / The Weather Network*
*1755, boul. René-Levesque Est, Suite 251*
*Montréal, Québec, H2K 4P6 Canada*
*Tel: (514) 597-1700 Fax: (514) 597-1591*

**Douw G. Steyn**

Air Pollution Meteorology
Boundary Layer & Meso-Scale Meteorology

*4064 West 19th Avenue*
*Vancouver, British Columbia, V6S 1E3 Canada*
*Tel: (604) 822-6407*
*Home: (604) 222-1266*

**Bill Thompson**

Flood Warning, Marine Applications
Integrated Monitoring and Prediction Systems
International Aid and Development Projects

*Atmospheric Environmental Consultants*
*112 Varsity Green Bay NW*
*Calgary, Alberta, T3B 3A7 Canada*
*Tel / Fax: (403) 286-6215*
*E-mail: thompsow@cadvision.com*

**Imagine your own business card in this empty space.**

**Call us now!**

**Imaginez votre propre carte d'affaire dans cet espace libre.**

**Appelez-nous immédiatement!**

CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY

LA SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE

112-150 Louis Pasteur, Ottawa, ON K1N 6N5
Tel - Tél: (613) 562-5616 Fax - Téléc: (613) 562-5615
E-mail - Couriel: cap@physics.uottawa.ca
Web: www.meds-sdmm.dfo-mpo.gc.ca/cmos/

# MEMBERSHIP APPLICATION / RENEWAL FORM
# DEMANDE D'ADHÉSION / RENOUVELLEMENT

☐ NEW APPLICATION / NOUVELLE DEMANDE ☐ RENEWAL / RENOUVELLEMENT

**MEMBER SINCE / MEMBRE DUPUIS** **MEMBERSHIP EXPIRES / ADHÉSION SE TERMINE**

| * | √ | MEMBERSHIP FEES - FRAIS D'ADHÉSION | RATE TARIF | REMITTANCE REMISE |
|---|---|---|---|---|
| | | REGULAR - RÉGULIER | 45.00 | |
| | | STUDENT - ETUDIANT * | 20.00 | |
| | | CORPORATE - CORPORATION * | 225.00 | |
| | | (FIRMS - CORPORATIONS, INSTITUTIONS) | | |
| | | SUSTAINING - DE SOUTIEN * | 170.00 | |
| | | (INDIVIDUALS ONLY - PARTICULIERS) | | |
| | | RETIRED - RETRAITÉ | 30.00 | |
| | | * INCLUDES ALL PUBLICATIONS - DONNE DROIT À TOUTES PUBLICATIONS | | |

| * | √ | MEMBER'S PUBLICATIONS FEES FRAIS DES PUBLICATIONS - MEMBRES | | |
|---|---|---|---|---|
| | | ATMOSPHERE - OCEAN | 35.00 | |
| | | CMOS BULLETIN SCMO (INCL.) | GRATIS | |
| | | PROGRAM & ABSTRACTS (ON REQUEST) PROGRAMME ET RÉSUMÉS (SUR DEMANDE) | GRATIS | |
| | | | | |
| | | SUB TOTAL - SOUS TOTAL | | |

| * | √ | VOLUNTARY CONTRIBUTIONS * CONTRIBUTION VOLONTAIRES * | |
|---|---|---|---|
| | | CMOS SCHOLARSHIP - BOURSE SCMO | |
| | | DEVELOPMENT FUND - FONDS DE DÉVELOPPEMENT | |
| | | RUBE HORNSTEIN FUND - FONDS DE RUBE HORNSTEIN | |
| | | J.P. TULLY FUND - FONDS DE J.P. TULLY | |
| | | * TAX DEDUCTIBLE - DONNE DROIT À DÉGRÈVEMENTS D'IMPÔT | |

**TOTAL** NOTE: GST & HST EXEMPT - EXEMPT DE TPS ET TVH $

**I WISH TO PAY BY: / JE DÉSIRE PAYER PAR:** ☐ CHEQUE / CHÈQUE ☐ MONEY ORDER / MANDAT

**OR / OU** CHARGE MY / CARTE ☐ MASTERCARD ☐ VISA

CARD N° / NO DE CARTE

EXPIRY DATE - DATE EXP.

X _____ SIGNATURE

If this is a student application please provide the name and signature of one of your professors. For records only; please indicate the institution and year studies will be completed and degree anticipated.

Si vous désirez devenir membre étudiant, S.V.P. obtenir le nom et la signature d'un de vos professeurs. Pour nos dossiers seulement; S.V.P. indiquez le nom de votre institution, l'année où vous finirez vos études et le diplôme attendu.

PROFESSOR'S NAME - NOM D'UN PROFESSEUR X _____ SIGNATURE

YEAR - ANNÉE INSTITUTION

☐ BSc ☐ MSc ☐ PhD

X _____ SIGNATURE OF APPLICANT - SIGNATURE DU DEMANDEUR DATE

**TITLE / TITRE** ☐ DR. / DR. ☐ MR. / M. ☐ MS / MME ☐ OTHER / AUTRE

**MAILING ADDRESS / ADRESSE POSTALE** ☐ RESIDENCE / RÉSIDENCE ☐ BUSINESS / BUREAU

POSTAL CODE / CODE POSTAL

TEL (B) FAX (B)

TEL (R) FAX (R)

E-MAIL - COURIEL

HOMEPAGE - PAGE D'ACCUEIL

**LANGUAGE PREFERENCE / LANGUE PRÉFÉRÉE** ☐ ENGLISH ☐ FRANÇAIS

**OPTIONAL / FACULTATIF** ☐ MALE / MASC. ☐ FEMALE / FÉMININ D.O.B. / D.D.N. (Y-A • M-M • D-J)

**AREA OF WORK / SECTEUR D'EMPLOI** ☐ INDUSTRY / INDUSTRIE ☐ GOV'T / GOUV. ☐ UNIV. / UNIV. ☐ RES. INST. / INST. RES. ☐ OTHER / AUTRE

**MAIN INTEREST / INTÉRÊT PRINCIPAL** ☐ METEOROLOGY / MÉTÉOROLOGIE ☐ OCEANOGRAPHY / OCÉANOGRAPHIE

**SPECIAL INTEREST / INTÉRÊTS SPÉCIAUX**

☐ HYDROLOGY / HYDROLOGIE
☐ FISHERIES OCEANOGRAPHY / OCÉANOGRAPHIE DES PÊCHES
☐ AGRICULTURE & FOREST / AGRICULTURE ET FORÊT
☐ MESOSCALE METEOROLOGY / MÉTÉOROLOGIE DE L'ECHELLE MÉSO
☐ FLOATING ICE / GLACES FLOTTANTES
☐ GLOBAL CHANGE / CHANGEMENT GLOBAL
☐ OPERATIONAL METEOROLOGY / MÉTÉOROLOGIE D'EXPLOITATION
☐ OTHER / AUTRE

**LOCAL CENTRE OR CHAPTER / CENTRE OU SECTION LOCALE** ☐ INSERT CODE / INSÉRER LE CODE

| | | | |
|---|---|---|---|
| VIS | VANCOUVER ISLAND CENTRE | MTL | CENTRE DE MONTRÉAL |
| BCM | B.C. MAINLAND CENTRE | QUE | CENTRE DE QUÉBEC |
| KEL | KELOWNA CHAPTER | RIM | CENTRE DE RIMOUSKI |
| ALT | ALBERTA CENTRE | HFX | HALIFAX CENTRE |
| SSK | SASKATCHEWAN CENTRE | NFD | NEWFOUNDLAND CENTRE |
| WIN | WINNIPEG CENTRE | NBK | NEWBRUNSWICK CHAPTER |
| TOR | TORONTO CENTRE | INT | INTERNATIONAL & USA |
| OTT | OTTAWA CENTRE | | |

☐ DO NOT PUBLISH MY NAME IN DIRECTORY / NE PAS PUBLIER MON NOM DANS LE RÉPERTOIRE

☐ DO NOT CIRCULATE MY NAME OUTSIDE CMOS / NE PAS FOURNIER MON NOM À D'AUTRES ORGANISMES

**FOR OFFICE USE ONLY - À L'USAGE DU SECRÉTARIAT**

**CMOS-SCMO**
**Suite 112, McDonald Building**
**University of Ottawa**
**150 Louis-Pasteur Ave.**
**Ottawa, Ontario**
**K1N 6N5**

Canadian Publications
Product Sales Agreement
# 0869228

Envois de publications
canadiennes Numéro de

Please send address changes to the above address. / Prière d'envoyer les changements d'adresse à l'adresse ci-haut.

---

# 34th CMOS Congress / 34e Congrès de la SCMO
# Victoria 2000

*The role of the Pacific in Climate and Weather*
*L'influence de l'océan Pacifique sur le climat et le temps*

29 may - 2 June 2000 UVIC 29 mai - 2 juin 2000

| | | |
|---|---|---|
| George Boer<br>george.boer@ec.gc.ca<br>☎ (250) 363-8226<br>Howard Freeland<br>freelandh@pac.dfo-mpo.gc.ca<br>☎ (250) 363-6590 | Co-Chairmen, Scientific Program Committee | Co-présidents, Comité du programme scientifique |
| John Fyfe<br>john.fyfe@ec.gc.ca<br>☎ (250) 363-8236 | Chairman, Local Arrangements Committee | Président, Comité local organisateur |
| Diane Masson<br>massond@pac.dfo-mpo.gc.ca<br>☎ (250) 363-6521 | Commercial Exhibits | Expositions commerciales |
| Greg Flato<br>greg.flato@ec.gc.ca<br>☎ (250) 421-4771 | Chairman of the Vancouver Island CMOS Chapter | Président du chapitre de l'Île de Vancouver de la SCMO |