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

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Cover page: Among the factors that have most contributed to the development of meteorology in Canada, we can mention the start of the aviation industry for which the knowledge of meteorological conditions is essential for security and the computer industry which has made possible the rapid integration of the data from the global telecommunication network and the development of sophisticated forecastic models. These two development factors are illustrated on the cover page to celebrate the 125th anniversary of meteorological services in Canada. Happy anniversary and have a fruitful reading! (See page 162 for additional details).

Page couverture: Parmi tous les facteurs qui ont contribué au développement de la météorologie au Canada, on peut mentionner les débuts de l'aviation où la connaissance des conditions météorologiques est essentielle pour la sécurité et également l'informatique qui a permis l'intégration rapide des données du réseau global de télécommunication et le développement des modèles de prévisions sophistiqués. Ces deux facteurs de développement sont illustrés sur la page couverture à l'occasion du 125e anniversaire de la météorologie au Canada. Bon anniversaire et bonne lecture! (Voir page 162 pour plus de renseignements).

Next Issue - Prochain numéro

The next issue of the ***Bulletin 25 (1)***, February 1997, will go to press by mid-February. We need your contributions, short articles, notes, presentations, chronicles, etc., by early February. Don't miss your chance!

Le prochain numéro du ***Bulletin 25 (1)***, Février 1997 sera mis sous presse vers la mi-février. Vos contributions sont les bienvenues. Veuillez bien me les faire parvenir d'ici le début du mois de février. Ne manquez surtout pas votre coup!

Merci Neil!

The present issue of CMOS Bulletin SCMO is due to the constant and dedicated effort of Neil Campbell, Executive Director of our Society. Thank you Neil!

Ce présent numéro du bulletin n'aurait jamais vu le jour sans le travail efficace et continu de Neil Campbell, Directeur exécutif de la Société SCMO. Merci Neil!

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Scenes from Meteorology and Early Years of Transatlantic Aviation

by Neil J. Campbell

Foreword

This article describes some of the early beginnings of transatlantic flight and the RAF Ferry Command based on interviews with P.D. McTaggart-Cowan, a former Director of the Canadian Meteorological Service, by Dave Phillips. Dr. McTaggart-Cowan joined the Meteorological Service in England and was later posted to Newfoundland and charged with the responsibility of establishing weather services for transatlantic flights before WW II. He and his group continued their meteorological forecasting services after war broke out and served the RAF Ferry Command from its formation to the close of the war.

The interviews of prominent figures in the Canadian Meteorological Service by Dave Phillips were undertaken as part of an Oral History of this Service. Permission was given to CMOS to research relevant interviews for the 125th Anniversary of the Canadian Weather Services in Canada. There is a wealth of historical material and personal anecdotes in those interviews which turned this project into an enjoyable experience. I am deeply indebted to Dave Phillips for providing me with these manuscripts and also to Morley K. Thomas who suggested other references, principally "Ocean Bridge - The History of the RAF Ferry Command" by Carl A. Christie which has been used to expand on McTaggart-Cowan's account of transatlantic flight. Morley's own book "Forecasts for Flying" served as another source of valuable information, in particular his chapter on "Forecasting for Transatlantic Aviation".

Avant-propos

Cet article (Scènes de la météorologie et des premières années de l'aviation transatlantique) décrit certains des premiers vols transatlantiques et les débuts du RAF Ferry Command basés sur des entrevues avec P.D. McTaggart-Cowan, un ancien directeur des services météorologiques canadiens, recueillies par Dave Phillips.

Dr. McTaggart-Cowan s'est joint au "Meteorological Service" en Angleterre et fut ensuite muté à Terre-Neuve où il avait la responsabilité de mettre sur pied des services météorologiques pour les vols transatlantiques avant la Deuxième Guerre mondiale. Son groupe et lui ont continué leurs services de prévisions météorologiques après le début de la guerre et ont servi le RAF Ferry Command de ses débuts jusqu'à la fin de la guerre.

Les entrevues de personnes importantes au sein des services météorologiques canadiens par Dave Phillips ont été enregistrées pour faire partie de l'Historique oral de ces services. La SCMO a obtenu l'autorisation de sélectionner les entrevues pertinentes pour le 125ième anniversaire des services météorologiques au Canada. Il existe une mine de documents historiques et d'anecdotes personnelles dans ces entrevues qui ont rendu ce projet une expérience très agréable. Je suis extrêmement redevable à Dave Phillips de m'avoir donné ces manuscrits et également à Morley K. Thomas qui m'a suggéré d'autres références, plus précisément "Ocean Bridge - The History of the RAF Ferry Command" par Carl A. Christie qui a été utilisé pour développer le compte-rendu du vol transatlantique de McTaggart-Cowan. Le livre de Morley "Forecasts for Flying" a également été une précieuse source d'information, tout particulièrement le chapitre sur les prévisions pour les vols transatlantiques.

Early Start

Experimental transatlantic aviation flights from Britain to Newfoundland and return were under consideration as early as 1932, during which time an agreement was being drawn up by Canada, Britain, the Irish Free State and Newfoundland pledging to develop a transatlantic air service. Nothing much took place until the Ottawa conference of 1935 which basically set out the goal to create an imperial transatlantic service in three stages. Imperial Airways would first undertake a series of survey flights and follow up with an experimental airmail service and finally passenger and airmail services. A further conference in Washington confirmed a grant of privileges to Pan American which had actually obtained landing rights in Newfoundland and Canada some years beforehand.

The Canadian government agreed to provide meteorological services for Newfoundland and the western half of the Atlantic Ocean, a service which was brought about in view of the fact Newfoundland was virtually bankrupt and could not contribute financially to the agreement despite the fact the island was strategically positioned as the western terminus of the main Atlantic

crossing. Britain agreed to build an airport for land-based aircraft - a vision or an idle promise in that no land-based aircraft of the day could fly the Atlantic.

New Meteorological Service in NFLD

John Patterson, the Director of the Canadian Meteorological Service, was charged with the responsibility of establishing a full-fledged meteorological service for Newfoundland. Archibald and Jacobson from the Service were sent out to set up the observing network. It eventually was made up mostly of lighthouses and previously-established observing stations at Cape Race and in the Strait of Belle Isle which was used for storm warnings.

Pat McTaggart-Cowan, a Rhodes scholar, born in Scotland, was coming out of Oxford University in 1936 when John Patterson, head of the Canadian Meteorological Service, offered him a position with the Service. McTaggart-Cowan was immediately sent to Croydon to join a group that was engaged in writing a Green Paper for the British Government on the feasibility of Atlantic flight. McTaggart-Cowan, who knew nothing about meteorology at the time, was taken in by S.P. Peters, who later became Deputy Director of the British Meteorological Service. It was under his watchful eye that McTaggart-Cowan became a self-taught meteorologist. Besides Peters and McTaggart-Cowan, others in the group included Pat Meade, Arthur Davies and Portas, all of whom worked one way or another on the problems of weather forecasting for transatlantic flights and subsequently established their reputations in the British Meteorological Service and World Meteorological Organization.

The Croydon group became expert in Atlantic marine meteorology and when McTaggart-Cowan was posted to Newfoundland in 1937 to head up its meteorological services, he brought his marine and European climate expertise with him which then had to be passed on to his Canadian-trained colleagues who were more specialized in continental meteorology.

Flying Boats!

Experimental transatlantic flights began in 1937 with a Pan Am flying boat departure from Botwood, Newfoundland, to England and an Imperial Airlines "Empire" flying boat out of Foynes, Ireland. These flights and others that followed marked the beginning of transatlantic aviation but at this point no mail or passengers had been carried. The "Empire" flying boats had no room for cargo when carrying fuel for the crossing. To solve the problem the British piggy-backed a powerful four-engine float plane on a flying boat for launching (see front cover), a procedure developed by the Mayo Composite Aircraft Company. In July of 1938 the seaplane "Mercury" was carried out over the coast of Ireland on top of the flying boat "Maia" where she was launched under their combined power. "Mercury", flown by Don Bennett, flew non-stop to Montreal carrying a load of mail and newspapers, the first ever commercial air mail cargo flown across the Atlantic.

In-flight refuelling techniques were also practised with the flying boats in order to increase their range. By doing so, such aircraft did not have to land in Ireland flying to England or in Newfoundland on return flights.

The early experimental flying boat flights from Newfoundland were conducted initially by pilots from Imperial Airways and Pan American Airways and then later by American Export Airways. The Germans also successfully conducted flying boat exercises from a mother ship in the Gulf of St. Lawrence using the meteorological forecasts from Gander and Botwood. The Italians were in the act as well with flights of military aircraft across the northern part of the North Atlantic through Hebron on the Labrador coast, again using Newfoundland weather forecasts for the Atlantic.

"Wrong-way" Corrigan, the American aviator who filed a flight plan from New York City to San Francisco and ended up flying the Atlantic availed himself of the forecast services from Newfoundland by asking about Atlantic weather on his fly-over. His identification marks were spotted, leaving little doubt as to who he was and what he was up to.

The French were also flying a huge flying boat, the "Latécoére", across the Atlantic using the weather services from Newfoundland. This aircraft was described as being built like a cruiser with six engines, requiring about five miles of open water to get airborne, but once up it could fly a phenomenal distance. The plane was of such a size that it had an open deck on the outside of the hull to allow the crew to handle anchor chains.

Construction of a land-based airport (Gander) was already under way in 1937. At that time, the main forecast office was located at Botwood, the flying boat base, but in December 1938 the meteorologists along with the communications group, about fifty men in all, were moved to Gander in expectation of land-based aircraft that would start flying overseas by the summer of 1939. Botwood continued to serve the flying boats, making it necessary to maintain two forecast offices. In those days there were no teletype or facsimile services and weather reports had to be relayed by radio morse code to Botwood. A twenty-four hour service was run for all flights, or until the flight was past the point of no return over the Atlantic, or control was turned over to New York or Boucherville, Québec.

Meteorological Products

A full set of weather maps and forecasts were made every day for the flying boats. The only break came when flying operations had to cease due to ice build-up on the wings from propeller spray. During the winter months the staff were then busied improving their knowledge of winter weather, how to forecast it, training and trouble-shooting observing stations.

What was practised during the transatlantic flight trials were the procedures and protocols worked out at Croydon. As meteorologists and pilots on both sides of the Atlantic gained experience in weather forecasting, ocean flying and exchange of terminal data, the procedures were carefully refined and improved. It was a very deliberate process, bearing in mind that only morse code radio communication existed. There was no voice contact between base and aircraft and base to base. The methodologies that evolved from these trials continued right into the war years.

In practice the staff at Botwood would go aboard the aircraft with weather maps in hand and be briefed by the crew on weather conditions encountered. McTaggart-Cowan was on a first-name basis with many of the pilots some of whom were his colleagues in the Croydon group; they were the cream of the Imperial Airways pilots and, like McTaggart-Cowan, totally dedicated to see a successful conclusion of the trials. He was known to them as "McFog".

The first intended land-based aircraft scheduled to fly the Atlantic was the British-built, all-wood "Albatross". Unfortunately, it broke its back on an overload test before it ever flew the Atlantic. The next aircraft slated to fly was a French Farman-built aircraft but war broke out and the flight was first delayed then cancelled altogether; the plane had the range and could have flown the Atlantic quite handily.

War Time

Transatlantic flying was on a very small scale by the time war broke out; there were virtually no ground support systems, or radio aids to navigation. Flying boat operations ended in October because of icing conditions. When war broke out the two British flying boats, the "Caribou" and "Cabot", were taken into service by the RAF and British transatlantic flights came to an end. Pan Am turned its attention to the Azores. Oddly enough, transatlantic flying received no military attention until the tide of war turned against Britain in the Atlantic.

In the fall of 1939 the fate of Atlantic aviation hung in the balance. On one side were the three individuals at Gander determined to prove that Atlantic flight was possible and practical: McTaggart-Cowan, Pattison, an RAF Squadron Leader, who was the senior Operations Officer in Newfoundland, and Feaver, a senior communications officer. They believed that flying the Atlantic was going to prove to be a critical factor in the war.

The British and Canadian governments on the other hand, were of another opinion and instructions were issued by the two governments that operations were to be wound down at Gander and the runways mined in the event the Germans attempted to use them.

Needless to say, the meteorological staff at Gander were dumbfounded by the decision to "close down" Gander. To maintain some semblance of activity, the staff busied themselves with observational records and maintenance of equipment. Incomplete interim reports were issued and winding down activities were stalled. The situation continued into the spring of 1940 when the RCAF in Halifax realized its Digby bombers used for anti-submarine warfare lacked the range and were ineffective for patrol off the coast of Newfoundland. This situation resulted in a request to use Gander as a base for anti-submarine patrol.

This British position to close down Gander was not too surprising in view of the opposition of the British Air Ministry and the RAF to the creation of the Atlantic Ferry Service in the belief that it was suicidal to fly aircraft across the North Atlantic in winter. It eventually took Lord Beaverbrook and the Ministry of Aircraft Production to push the opposition aside and set the wheels in motion to organize the transatlantic service.

The "re-opening" of Gander was welcome news with the arrival of the RCAF No. 10 Bomber-Reconnaissance Squadron. By this time transatlantic flights were on again and Taffy Powell, a colleague of McTaggart-Cowan's from Croydon and a seasoned flying-boat captain with Imperial Airways, arrived to take charge of ground operations in preparation for transatlantic bomber flights. The meteorological section at Gander, including McTaggart-Cowan, were made available to the ferry service and he became the ferry service's chief weatherman in North America.

The first flights were organized by the Canadian Pacific Air Services under Powell who had been loaned to them by the RCAF. All flights were controlled by Powell and McTaggart-Cowan. McTaggart-Cowan would present the weather conditions for the North Atlantic while Powell had the authority to say "go" or "no go". Later on Powell convinced Patterson that McTaggart-Cowan should be seconded to the RAF. Don Bennett, the pilot of the seaplane "Mercury" and another colleague of McTaggart-Cowan's, was sent to Canada as flying superintendent; he was instrumental in overseeing the delivery of the first aircraft to Britain and personally tested the pilots and radio operators who had to qualify for ferry service.

In the early part of the war, civilians and private companies were ferrying aircraft overseas; the original pilots were from Imperial Airways and "pilots of fortune" from all over the world who received handsome pay offers of up to $600 a flight with two trips a month guaranteed, plus expenses.

The first land-planes across the Atlantic were Hudson bombers. Everything had to be stripped out of the cabin to provide for additional fuel tanks to give them the range. At that time there was only a handful of civilian pilots and RAF navigators and the decision was made to send them off in groups of seven with one navigator in the lead aircraft. They were supposed to play follow-the-leader across the Atlantic. McTaggart-Cowan and his colleagues knew this was an impossible task especially on night flights. Despite their misgivings they prepared detailed forecasts and flight plans with compass headings for each of ten zones covering the Atlantic. The first transatlantic delivery attempt of six Hudson bombers was undertaken on November 10, 1940, with Bennett as the leader and designated navigator.

Routes were picked that kept the aircraft south of the centre of any pressure depression so if the storm was deeper than anticipated, they would first drift south and then drift north. The pilots were never aware that they had been off course because it was self-correcting. Self-correcting courses were a necessity since the planes could be off-course within an hour. On no account could the planes get north of the centre of a depression because if they encountered head winds they would simply not make their destination. The range capabilities of the Hudsons were that marginal.

Limited Instrumentation

It was a miracle that the pilots ever found their designated landing fields; there were virtually no navigational aids in place for the approach to Britain. One small marine beacon on Storrey Island, a little rock off the north coast of Ireland, served as the only aid to home on. In thinking back from the time of his interview with Dave Phillips, McTaggart-Cowan thought it signalled for only two minutes out of twenty minutes!

As the number of flights increased there were many stormy rows with security people in Britain over the location of additional navigational beacons and the use of cypher language or plain English. Finally, a beacon was approved and set up at Durnacross for incoming aircraft and the pilots were able to receive information in plain English.

The tempo of the overseas operations increased incessantly as more aircraft appeared on the scene for delivery; the shortage of experienced pilots emerged as a critical factor. The resolution of the problem was far from simple and not without acrimonious debate, but eventually the civilian operation was turned into the RAF Ferry Command with remarkably few changes of the personnel involved. It came into existence in July of 1941. The gain in the changeover was the increased size of the aircrew pool.

The success of the airlift operations depended on the skills of the weather forecasters and the trust that grew with the operational people. Each one played a role in the decision as to whether flying was a "go" or "no go".

By war's end almost ten thousand aircraft were successfully ferried across the Atlantic Ocean but in so doing some five hundred aircrew and sixty passengers lost their lives in accidents. Tragically, Sir Frederick Banting, the co-discoverer of insulin, was killed in the very first fatal crash of the ferry service.

Job Well Done

As the need for meteorological services wound down, McTaggart-Cowan was assigned to the Canadian team involved in the establishment of the International Civil Aviation Organization (ICAO). He served as the Secretary for the Air Navigation Commission of ICAO. He was later appointed Director of the Canadian Meteorological Service in 1959, a position he held until 1964. From there, he was appointed the founding President of Simon Fraser University and later the Executive Director of the Science Council of Canada. He is now retired and lives in Bracebridge, Ontario.

References

Christie, Carl A., 1995, *Ocean Bridge - The History of the RAF Ferry Command*, University of Toronto Press, 458 p.

Thomas, Morley K., 1996, *Forecasts for Flying*, ECW Press, 264 p.

About the author: After having completed an impressive career with the Federal Department of Fisheries and Oceans and having played a major role as an oceanographer both on the national and international scenes, Dr. Neil J. Campbell is now the Executive Director of the Canadian Meteorological and Oceanographic Society.

Quelques mots sur l'auteur: Après avoir complété une brillante carrière au sein du ministère fédéral des Pêches et Océans et avoir apporté une contribution importante autant sur la scène nationale qu'internationale en tant qu'océanographe, le Dr Neil J. Campbell est présentement le directeur-exécutif de la Société canadienne de météorologie et d'océanographie.

125 Years of Weather Services

by Morley Thomas

It is ironic, perhaps, that in this celebration of weather services, to reveal that the man who started the Meteorological Service did not want to provide a service, at least for some time. Professor George Templeman Kingston, director of the Toronto Observatory, asked for and was given $5,000 in 1871 to organize a network of climate observing stations. He wished to begin work on a research scheme in which he would collect the observations and study the weather patterns. He thought this research would take him several years to complete and only after the weather patterns had been determined would he attempt to issue storm warnings.

But the Deputy Minister of Marine and Fisheries, who had obtained the money for him, "suggested" that he begin cooperating with the Americans who had just begun an operational storm warning system. And so it was that observers in Montreal, Saint John and Halifax were put on the payroll in July 1871; more observers were taken on in 1872 and a data exchange was begun with the Americans who provided some storm warnings for Canada for a few years. By 1876, the Toronto Central Office was producing general forecasts and storm warnings for the populated areas of Eastern Canada. And, with observations from his network of stations, the director also began a climate data service for government, the private sector and the general public.

During the 1880s, the Meteorological Service expanded across the country with the railway and settlement. By the turn of the century, daily weather forecasts were issued from Toronto for just about all of settled Canada west to the Rockies while a Victoria office issued forecasts for southern British Columbia. There were now more than 100 storm warning agents who, when so instructed, hoisted drums or baskets on poles near ports and harbours to warn of approaching storms. Forecasts were sent to newspapers, posted at railroad stations and post offices and in some parts of the country even displayed on the outside of trains. And, in 1883, the Meteorological Service became reponsible for providing, by telegraph on a daily basis, a national time service. This had been provided locally at several eastern cities where there were observatories capable of determining exact time by the transit of stars. The Toronto Central Office was to coordinate this service for more than 50 years.

By the time of the Great War, the Service had about 50 full-time employees; 35 of these were at the Central Office and one or more at each of Victoria, Edmonton, Moose Jaw, Winnipeg, Quebec City, Saint John and Halifax. At most of these offices, and at Montreal, where McGill University received an annual grant for the work, climate data, weather forecasts and the correct time were provided to the public. Seismological observations were made at Victoria and Toronto and an earthquake information service was provided in British Columbia.

The Meteorological Service was not considered essential during the Great War and lost people and resources. After the war, there was significant demand for more services and an office was set up in the Winnipeg Grain Exchange to serve the grain trade. A start was made in distributing public weather forecasts by radio. In the mid-1920s, forestry officials became enthused over the possibility that forecasts of humidity and thunderstorms might be of great value in forest fire protection work. For a few years it looked as if the needs of forestry would necessitate an expansion of the Meteorological Service but the foresters became increasingly disappointed with the meteorological forecasts and the program was relegated to a minor role by 1930.

Aviation had made some demands for service during the early 1920s but the Meteorological Service had neither a mandate to provide special aviation services nor the resources to do so. By the late 1920s political pressure brought a grant of $30,000 for service to aviation and, for two or three years, much attention was given to serving the needs of an experimental airship program designed for "Empire bonding," that is for the transport of people and mail between Britain and the Empire. The R-100 made a successful flight to Canada in the summer of 1930 and then the Meteorological Service turned to setting up an airmail weather service on both the Prairies and in eastern Canada. A dozen or so airport weather observing offices were put in place and it was proposed to put two meteorologists in an aviation forecast office at Winnipeg. But the worsening Depression forced the Post Office to cancel the airmail contracts and the Service had to close the new airport offices by 1932 and discharge the airport observers.

Then, during the mid-1930s, the Meteorological Service had a little time to prepare for the demands from aviation they knew would come when the economy improved. In 1936, a new Department of Transport was organized with an Air Services Branch that included the Meteorological Service, renamed the Meteorological Division. A few years earlier, a graduate degree course in meteorology had been established with the University of Toronto and graduates of this course were now hired to staff new aviation forecast offices at Vancouver, Winnipeg, Montreal and Toronto. At about the same time as Trans-Canada Airlines was beginning scheduled flights across the country, the Meterological Service began to forecast for experimental flying boat flights across the north Atlantic. Based at Botwood and then Gander, Newfoundland, meteorologists developed new techniques and methods to provide a forecast service over an ocean from which there were very few weather reports. By Labour Day 1939, about 37 of the 50 or so meteorologists in the country were employed in aviation meteorology.

World War II brought an unprecedented demand for aviation meteorology. Canada agreed to host the British Commonwealth Air Training Plan, a program in which the RCAF produced 130,000 air-crew within five years or so. Most of the aircrew trainees required instruction in meteorology as well as forecasts for flying training. Forecasting and weather briefing services were also essential to the safety of crews and the effectiveness of operational missions and the ferrying of aircraft over the Atlantic. To meet these needs, the Meteorological Division hired and trained over 370 college graduates and seconded most of them to the RCAF as civilian Meterological Officers. Some received advanced training and went to the Aviation Forecast Offices and to the transatlantic forecast offices. The number of these forecast offices grew from four to seventeen in wartime and there were as many as sixty-six meteorological offices at RCAF training and operational bases.

Late in the war the need for military aviation meteorology decreased rapidly and two-thirds of the wartime meteorologists departed. But civilian needs for service began to rapidly increase and fortunately, the economy and politics of the day allowed the Meteorological Division to grow. The regional aviation forecasters took over public and marine weather forecasting, city offices were opened and special services were provided for radio and TV interests. Numerical weather prediction methods were developed, a Central Analysis Office was opened and, by the mid-1960s, a new forecasting system was in place involving CAO (later called the Canadian Meteorological Centre), several Weather Centrals and many Weather Offices. In addition, the Meteorological Service provided more than 100 meteorolgists to the Armed Forces, to continue a policy called the Single Service System. As research provided better numerical models, increasing computer power allowed the computer to take over much of the analysis and forecasting work.

After being overshadowed by operational weather services for some time, climate and applied meteorology services responded to public needs and expanded markedly after the war. Punched cards and then computers allowed an improved and expanded climate data service and a secondment policy was introduced under which the Service loaned meteorologists to such other organizations as Agriculture, Forestry, and the National Research Council to work in the various fields of applied meteorology and climatology (another example of the Single Service System). Then, as a result of national concerns over disastrous floods, increasing air pollution problems, and development of resources in the Arctic, a headquarters staff of service specialists was established. This culminated 25 or so years ago as regional staffs were built up to provide many of these scientific services. Also, during the late 1950s, the Service was given responsibility for a program of aerial ice reconnaissance and ice forecasting to support cold weather shipping.

Then, 25 years ago, in 1971, the Meteorological Branch (by this time briefly called the Canadian Weather Service) moved from Transport to a new Environment Canada and became the Atmospheric Environment Service. The traditional services were maintained at the same time as the scope and mandate of the Service was greatly enlarged and a research program in air quality and related sectors was expanded. Six years ago, the Green Plan was introduced and AES began to expand its research service to support departmental issues and initiatives in such sectors as toxic chemicals, smog, global warming or climate change, ozone depletion and acid rain. And more recently the AES developed and began to issue daily forecasts of the UV Index.

In the most recent decade, such essential environmental services as public, aviation, and marine weather forecasting and ice information and forecasting services have been maintained

although significant rationalization and downsizing have taken place. In other areas, government policy has caused a shift of responsibility for delivering services in applied meteorology and responsibility for delivering services in applied meteorology and climatology; cost recovery is now very important and the private sector has more opportunities than it ever had before.

Weather forecasts, climate information, and applied meteorological and related services have proved to be of great value to Canadians over the past 125 years. This is most unlikely to change and so a national service must remain at the heart of the weather service sector regardless of who actually provides the services to the users.

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Source: "*Celebrating 125 Years of Weather Services to Canadians*," paper given on October 2, 1996, while celebrating the 125th Anniversary in Downsview, Ontario.

About the author: Having published several articles on different aspects of the climate of Canada and two books on the history of meteorology in Canada, Morley Thomas is now Fellow of the American and Royal Meteorological Societies, Life Member of the Canadian Meteorological and Oceanographic Society which he has served on the national executive 1950-51, 1964-70 and as President in 1968-1970. He has been awarded the Patterson Medal in 1980 and the Massey Medal in 1985.

Quelques mots sur l'auteur: Après avoir publié plusieurs articles sur les différents aspects du climat au Canada ainsi que deux livres sur l'histoire de la météorologie au Canada, Morley Thomas est présentement "Fellow of the American and Royal Meteorological Societies", membre à vie de la Société canadienne de météorologie et d'océanographie dont il fut le président en 1968-1970 après avoir servi sur le conseil exécutif de 1950-51 et de 1964-70. Pour son travail, il a mérité les médailles Patterson (1980) et Massey (1985).

About This Special Issue of the CMOS Bulletin SCMO

Members of CMOS and readers of the Bulletin were informed some time ago by the Executive and Editor that an attempt would be made to dedicate the December issue of the Bulletin to the 125th Anniversary of Weather Services in Canada.

It only took the suggestions of a few respondents to overwhelm us with ideas and material. Our initial concern about finding adequate material changed very quickly to one of how to squeeze everything into the regular format of the Bulletin.

Of the ideas that emerged thought was first given to reproducing shortened versions of papers presented from the days this Society was a Branch of the Royal Meteorological Service, re-runs of some of Rube Hornstein's CBC radio presentations and something on the establishment of the Joint Arctic Weather Stations. Morley Thomas, Dave Phillips and Ken Hare came to our rescue with their ideas that finally set us on a course of commissioning, writing, editing and preparing the contents of this Bulletin. We would like to thank Morley and Rod Rogers of McGill University for their valuable contributions.

We hope this anniversary issue of the Bulletin will stir some memories and serve to document some rather remarkable Canadian achievements.

Your team,

Paul-André Bolduc
Dorothy Neale
Richard Asselin
Neil Campbell
Uri Schwarz

A Short History of Meteorology at McGill

by R.R. Rogers

Although the Department of Meteorology was established in 1959, the history of meteorology at McGill actually had its start a century earlier. It was in 1856 that Charles Smallwood, M.D., from the University of London, received an honorary LL.D. from McGill and an appointment (also honorary) as Professor of Meteorology. This was just a year after George Templeman Kingston had been appointed Professor of Meteorology at the University of Toronto, the first such appointment on the continent. With a residence and medical practice in St. Martin, Quebec (now downtown Laval), Dr. Smallwood in 1841 had added to his establishment a small wooden building to house observing equipment and apparatus "for the purpose of Meteorology." An enthusiastic observer and student of the weather, he took regular readings several times a day of the temperature, pressure, and precipitation amounts, and kept notes on the temperatures of springs and rivers, the flowering dates of plants and trees, and the time of appearance of animals, birds, fish, and insects. In 1863 he moved the equipment from St. Martin to a small stone building on the McGill grounds. The McGill Observatory was thus established and continued without interruption until 1992, when the responsibility for downtown Montreal weather observations was taken over by Environment Canada.

Smallwood died ten years after his move to McGill and was succeeded as Observatory Director by Clement Henry McLeod, who had just graduated in McGill's first class in engineering. The next year, in 1874, McGill became a "chief station" in the new observing network of the Canadian Meteorological Service, connected directly by telegraph to the central forecast office, reporting observations every three hours. One of McLeod's specialties, as a civil engineer, was surveying. Accordingly, his first achievement at the Observatory was to establish its exact longitude. By determining the longitude relative to Harvard College, and later relative to Greenwich, he was able to improve slightly the figures for the whole North American continent. With McLeod as superintendent, McGill Observatory became the principal time-keeping observatory in Canada in addition to its weather observing duties. In the late 1920s, the Dominion Observatory in Ottawa took over the task of being the country's time keeper, but for another forty years the railways continued to operate on McGill Observatory time.

During his half-century as Director, McLeod worked on meteorological problems in collaboration with some of McGill's most eminent physicists. He and H.L. Callendar studied the variation of soil temperature with depth. With H.T. Barnes he measured the temperature difference between the Observatory and the top of Mount Royal, finding that changes at the Observatory were often anticipated by those on the mountain, before the ideas of fronts and airmasses had been conceived. After McLeod's death in 1917, Barnes continued with research on the physics of ice for another two decades and became a world authority in this field.

It was World War II that led to a resurgence of activity in meteorology at McGill. Wartime needs had stimulated great advances in weather observing and forecasting. Afterwards there was a world-wide flowering of meteorological research, in which McGill would play an important part. Two new faculty members arrived just after the war who set the course for McGill meteorology for years to come.

Stewart Marshall, from Queen's University and the Cavendish Laboratories, had been among the first to observe precipitation by radar in the war years. From 1943 he headed Project Stormy Weather of the Canadian Army Operational Research Group, the purpose of which was to make sense of the "weather" echoes. In 1945 he joined the Department of Physics, transplanting Stormy Weather research from the National Research Council to McGill and initiating the unbroken history of radar meteorology at McGill. Marshall's first graduate students were Walter Palmer, who had been with him in Ottawa, Kenrick Gunn, and Walter Hitschfeld.

In 1946, George Kimble, Chairman of Geography, attracted to McGill Kenneth Hare, an Englishman with wartime experience as a meteorologist with the RAF. Kimble, himself an Englishman, had arrived only a year earlier as McGill's first Professor of Geography, and had served in the war in the British Naval Meteorological Service. Hare began a research program focused on the synoptic meteorology and climatology of polar regions. One of his first graduate students was Svenn Orvig, a Norwegian who had flown for Ferry Command. The program grew, and the Department of Geography awarded several graduate degrees essentially in meteorology. In

1954, Hare arranged to have transferred to McGill from UCLA a research project in polar meteorology supported by the U.S. Air Force Cambridge Research Laboratories (AFCRL), thereby forming the Arctic Meteorology Research Group. Coming with the project was Arthur Belmont, who had been a key participant at UCLA.

By 1959 the research and teaching activities of the Stormy Weather Group and the Arctic Meteorology Group, both enjoying financial support from American and Canadian sources, had grown to such an extent that the University approved the formation of a Department of Meteorology. Geography had already offered an M.Sc. in Meteorology on a "restricted basis," and the University had agreed in 1955 to offer on the same basis a Ph.D. in Meteorology for students working under Hare in Geography or Marshall in Physics, with Hare serving as "chairman" for administrative purposes. Arthur Belmont received his degree by this arrangement in 1956, with Dr. Hare as supervisor, and was thus McGill's first Ph.D. graduate in Meteorology. The following year Richard H. Douglas was awarded a Ph.D. in Meteorology under Dr. Marshall.

At the time the Department was established, the Stormy Weather Group consisted of Marshall, Hitschfeld, Gunn, and Douglas. Tom East and Walter Palmer, active members of the group in the early 50s, had left McGill, while M.P. Langleben and P.R. Wallace had by then moved away from atmospheric science but remained in the McGill Physics Department. E.J. Stansbury of Physics was just changing his research interests from the Eaton Electronics Laboratory to the Stormy Weather Group. The Arctic Meteorology Group consisted of Hare, Orvig, and Byron Boville, Belmont having left McGill.

In the Stormy Weather Group, research highlights up to 1960 included the work by Marshall and Palmer on raindrop size distributions; that of Gunn and Hitschfeld on droplet growth by coalescence; the research with Milton Kerker of Clarkson College and David Atlas of AFCRL on scattering and depolarization by non-spherical particles; Langleben's studies of the sizes and fall speeds of snowflakes; Gunn and East's calculations of the influence of precipitation on microwave propagation; the work by Marshall, Hitschfeld, Wallace, and Ph.D. student Arnett Dennis on radar signal fluctuations; the work with another student, Caroline Rigby, on precipitation development; Douglas's study of snow generating cells and later his initiation of the Alberta Hail Project; laboratory studies on freezing nucleation by Stansbury; and a continuous series of technical innovations to improve radar as a meteorological instrument. This remarkable research record easily made McGill a leader in radar meteorology. The only close competition was from the Weather Radar Project of the MIT Meteorology Department, also established at the end of World War II.

Accomplishments in the Arctic Meteorology Group to 1960 included Hare's monumental study of the climatology of the Canadian Subarctic, early work on airmass modification over open water by F.E. Burbidge, micrometeorological studies related to glaciers by Orvig, Mariano Estoque's work on Arctic circulation, and Boville's analysis of the dynamics of the circumpolar vortex. For the five years up to 1956 Orvig had served as Assistant Director, and then Director, of the Montreal-based Arctic Institute of North America. The series of Stanstead Seminars, launched by Hare in 1955, continues to the present.

Charter members of the Department of Meteorology were Marshall, Hitschfeld, and Douglas from Physics, and Hare, Orvig, and Boville from Geography. Marshall and Hitschfeld held joint appointments in Physics, Hare in Geography. Marshall was appointed Chairman in 1960. From the beginning there were good relations between the Department and the Canadian Meteorological Service (now called the Atmospheric Environment Service). While they were graduate students at McGill, Boville and Douglas had been on leave from the Meteorological Service. They were mature students with broad experience in operational meteorology and applied research. With the blessing of the Meteorological Service, they remained to join the faculty of the new Department. The Superintendent of Atmospheric Research in the Meteorological Service, Dr. Warren Godson, often came to McGill in the late 50s and early 60s to advise and collaborate with the Arctic Meteorology Group.

In a letter of February 1960 to McGill Principal F.V. Cyril James, Dr. Patrick D. McTaggart-Cowan, Director of the Meteorological Service (later to become Executive Director of the Science Council of Canada), wrote:

> *"I would like to assure you that I am personally delighted that McGill University is establishing a Department of Meteorology and I know the Department will*

make a valuable contribution in the field through the years, as in fact it has already through the efforts of Professor Hare and Professor Marshall."

To this nice expression of support, he added:

"Quite apart from my personal interest, the Meteorological Service has perhaps a very real and selfish interest . . . in that the teaching conducted by the McGill Department of Meteorology will produce well-trained graduates which we hope will help to reduce the very great shortage of meteorologists in Canada with which we have been contending since the end of the war."

Now, 37 years later, the shortage over, McGill has awarded more than two-hundred B.Sc. degrees, close to 270 M.Sc. degrees, and an even hundred Ph.D. degrees in Meteorology. Nearly half of the graduates have taken positions with the Meteorological Service. In fact, a list of McGill Ph.D. graduates who have stayed in Canada is almost a "Who's Who" of leading scientists and administrators in the Atmospheric Environment Service.

Graduate and undergraduate curricula in Meteorology were introduced as soon as the Department was established. At the undergraduate level the plan was to have a program strong in physics and mathematics, including sufficient meteorology for professional employment or for postgraduate study in meteorology at any university. The graduate program was designed to accommodate students from physics or applied mathematics with little prior exposure to meteorology, because at that time there were no other undergraduate meteorology programs in Canada. Although this approach imposed a relatively heavy course load on graduate students, the M.Sc. program was nevertheless strongly oriented toward research, including a second year devoted to thesis research. With some adjustments, the original plan has served the Department well over the intervening years.

Although the research programs already had considerable momentum on their own, the formation of the Department led to an expansion of activity. More students were attracted to meteorology than previously and many were better prepared for research, through courses designed specifically for the subject rather than traditional physics or geography. At least half of the M.Sc. students through the decade of the 60s and a few years beyond were AES meteorologists on academic leave with financial support provided by their employer. It is clear in retrospect that the graduate teaching program, as it took shape in the early years, was strengthened by the regular presence of a significant proportion of students with experience in operational meteorology. They could readily see the connection between theory and the practical problems of weather forecasting. Moreover, because they did not require financial support from the Department, the research income which otherwise would have been needed to support students was free to use for research associates and postdoctoral fellows.

By the mid-60s there were two distinct areas of activity within the Stormy Weather Group. Some staff members and students did research centered on radar and laboratory studies in Montreal; others were affiliated with the Alberta Hail Project. The Montreal-based research was still supported by contracts with AFCRL, but an increasing fraction came from Canadian sources, primarily NRC and the AES. In 1967, AFCRL presented Dr. Marshall with a brand-new radar having outstanding potential for meteorological work. A laboratory on the campus of Macdonald College was built to accommodate the radar and had its formal opening in 1968, just in time for the 13th Conference on Radar Meteorology of the American Meteorological Society, held at McGill in August of that year.

The Alberta Hail Project was a unique example of what can be achieved through creative management and friendly collaboration: the Alberta Research Council provided staff and facilities for the field program; the National Research Council built the radar at the field site in Penhold, Alberta; the AES provided meteorologists and observers; McGill was responsible for scientific direction, with financial support through a contract with AES. Major advances were made in understanding atmospheric processes associated with hail production and in perfecting new observing techniques. A theory of hailstorms and hail development was introduced by Hitschfeld and Douglas, and later elaborated by Ph.D. students Marianne English and Alex Chisholm. A novel way to analyse the airflow around storms was developed by Norman Thyer and Gerd Ragette.

Two other Ph.D. students, Brian Barge and Robert Humphries, were first to use the new NRC radar for meteorological studies, and with Glen McCormick and Archie Hendry of NRC pioneered the techniques of polarization-diversity measurements. On the theoretical side, Ramesh Srivastava in the early 60s analyzed the relation between cloud dynamics and precipitation development in a one-dimensional, time-varying numerical model, initiating what was to become a major area of cloud physics. His work at McGill was the starting point for a continuous progression of research through Ian Harris, Takao Takeda, J.T. Steiner, and now M.K. Yau and his students. Innovative laboratory work on freezing nucleation was carried out by Dr. Stansbury and Gabor Vali, providing insight on hail formation from a microphysical perspective. Their techniques, developed further and applied elsewhere, led quite unexpectedly to the discovery of biogenic ice nuclei and the possibility of reducing frost damage to plants through biological controls.

By the time the Department had formed, the Arctic Meteorology Group had two branches, one concerned with physical climatology, the other with large-scale dynamics. Eberhart Vowinckel, who arrived in 1960, worked first as a research associate with Dr. Orvig and later became a regular faculty member. His specialty was the energy exchange between vegetated surfaces (particularly forests) and the atmosphere, which complemented similar work of Orvig for snow and ice surfaces. Their close collaboration produced a number of now classic papers on energy budget climatology, originally over polar surfaces but gradually extending to any kind of earth surface. Their Arctic research culminated in the book Climates of the Polar Regions, edited by Orvig and including a large part co-authored by Vowinckel and Orvig.

Peter Summers was among the first to study quantitatively the meteorological aspects of urban air pollution. In his Ph.D. thesis of 1964, the then-novel concept of the "urban heat island" was used to explain pollution phenomena in Montréal. After devoting more than a decade to research in hail and cloud physics, Dr. Summers returned to pollution studies and was for many years a leader in acid rain research in the Air Quality Branch of the AES.

The research in dynamic meteorology in the early 60s was directed by B.W. Boville. His students worked on computer modeling of atmospheric flows and on observational studies of large-scale energetics and dynamics. Highlights of the early years are without doubt the contributions made in the development of spectral models. André Robert's Ph.D. thesis, for example, was the first global, primitive equation, spectral model of the atmosphere to be published. Further contributions to this rapidly-expanding field grew from the work of Philip Merilees as a Ph.D. student and later a faculty member. One of his students, Roger Daley, has become a leader in spectral modeling.

The decades of the 70s and 80s saw the Department through periods of growth and retrenchment, but throughout this time there was a steady output of research in physical and dynamic meteorology, and continuing rejuvenation by new generations of graduate students. With the foundation provided by the Stormy Weather Group and long experience in storm studies from the Alberta Hail Project, the Department was well prepared to contribute to the expanding field of mesoscale meteorology. Unbroken progress continued in large-scale dynamics, and the work in atmospheric radiation initiated by Dr. Hitschfeld was continuing in the new context of climate effects and pollution studies. A signal event of the mid-80s was the formation of a new Climate Research Group. Acting on an opportunity provided by the AES, the Department was successful in obtaining two new faculty positions through the Industrial Research Chair program of NSERC. This event marked the beginning of a period of expansion in which the scope of research activities widened to include oceanography, satellite meteorology, and a broader range of geophysical fluid dynamics than ever before. The expansion enabled strengthening of two long-established areas of research, synoptic meteorology and radar meteorology, by bringing in new faculty members who have added to McGill's record of achievement in these fields, and by acquiring advanced research facilities for atmospheric remote sensing. In 1992, the name of the Department was changed to Atmospheric and Oceanic Sciences to reflect the breadth of the teaching and research activities.

At present, the Department has never been more vigorous, by measures of vitality such as faculty size, graduate student enrollment, research income, and quantity and quality of publications. But McGill, like most universities, is facing a budget crisis, which places a strain on all academic units. Pressures are mounting to change our ways of teaching and doing research, and it is safe to predict that the next few years will see some significant modifications in the

academic programs of the Department. Yet it is also safe to forecast that atmospheric science will continue to be a strength of McGill University, which has one of the longest histories of research in meteorology of any North American university.

About the author: R.R. Rogers is professor of meteorology and past chairman of the Department of Meteorology (now Atmospheric and Oceanic Sciences) at McGill University. He studied meteorology at the University of Texas, Massachusetts Institute of Technology, and New York University. He worked in the Applied Physics Department of Cornell Aeronautical Laboratory in Buffalo, New York, before moving to Canada and joining the McGill Stormy Weather Group in 1966. He teaches courses in physical meteorology and does research in atmospheric remote sensing. With M.K. Yau he wrote a widely used textbook in cloud physics.

À propos de l'auteur: R.R. Rogers est professeur de météorologie et ancien président du département de météorologie (maintenant Sciences atmosphériques et océaniques) de l'Université McGill. Il a étudié la météorologie à l'Université du Texas, au Massuchusetts Institute of Technology et à l'Université de New York. Il a travaillé dans le département de la physique appliquée du laboratoire aéronautique de Cornell, Buffalo, New York, avant de venir au Canada en 1966 pour se joindre au groupe "Stormy Weather" de McGill. Il enseigne la météorologie physique et fait de la recherche sur la télédétection dans l'atmosphère. Il a écrit avec M.K. Yau un livre bien connu sur la physique des nuages.

From Gordon McBean's desk

Dear CMOS Members,

I am pleased to have been invited to say a few words for this issue of the CMOS Bulletin SCMO which is dedicated to 125 years of meteorological services in Canada. AES has organized a number of anniversary celebrations across Canada honouring this occasion but this issue of the Bulletin is rather special. For many of us it will bring back fond memories of events and colleagues. It is a contribution to the historical achievements of those dedicated individuals who have served Canada faithfully in the advancement of weather services.

I would like to take this opportuniy of thanking CMOS for sharing this anniversary with us and look forward to our continued close collaboration in the future.

Gordon McBean

Quelques mots de Gordon McBean

Cher(e)s membres de la SCMO,

J'ai le plaisir d'avoir été invité à vous dire quelques mots pour ce numéro du CMOS Bulletin SCMO qui est dédié au 125^{ième} anniversaire des services météorologiques au Canada. Le SEA a organisé d'un bout à l'autre du Canada de nombreuses activités pour célébrer cet anniversaire, mais ce numéro du Bulletin est plutôt spécial. Pour nombre d'entre nous, ce numéro nous rappellera de bons souvenirs de collègues et d'évènements. Il s'agit d'une contribution aux exploits historiques de ceux qui se sont dévoués loyalement pour le Canada dans le but de faire avancer les services météorologiques.

J'aimerais également remercier la SCMO de partager cet anniversaire avec nous et j'espère que nous continuerons à collaborer étroitement dans le futur.

Gordon McBean

Canadian Meteorology and WMO

by Morley Thomas

Introduction

If most Canadian meteorologists and oceanographers ever think about the World Meteorological Organization at all, they must find it to be somewhat of a mystery. Is it a supernational body that makes the rules, definitions and procedures for the Atmospheric Environment Service and other foreign meteorological services to follow? Is it an international body that organizes vast global research programs? Or is it sort of an old-boys' club in which privileged Canadians go to meetings in Geneva and other world-class cities to experience the good life? Perhaps it is a bit of each and certainly a whole lot more.

Like the United Nations General Assembly, most WMO Congresses offer remarkable theatre where representatives of the different countries usually play predictable roles, and politics often turn out to be more important than the science of meteorology. But, as a Canadian delegate to Congresses and other WMO meetigs, one does learn more about the science, the scientists and the management of meteorology than he or she might otherwise learn. And you do get to travel and to meet and form lasting friendships with meteorologists from other countries.

Canadian meteorologists are fortunate. Representing a large country without aspirations of global dominance but with a reputation for sound meteorological education and training, Canadians usually play influential roles in WMO and are often elected to offices for which meteorologists from other countries would gladly pay dearly. But a Canadian who is elected to a WMO post should not become over-inflated; there is very little national prestige for such posts in this country and quite a lot of a Canadian's regular work may have piled up and be waiting at home when he or she returns from WMO duties.

The Organization

The World Meteorological Organization is a specialized agency of the United Nations. Its purpose is to facilitate worldwide cooperation in the establishment of reporting stations and to promote the standardization of observations, their exchange and the publication of data; to promote operational hydrology and the application of meteorology to human activities; and to encourage research and training in meteorology. A rather huge task! The reader will note, however, that all the verbs used in describing the purpose of WMO are ones like facilitate, promote and encourage. Although a sizeable Secretariat is located in Geneva, the work of WMO is largely done in the member countries and by their representatives on commissions, working groups, at conferences and planning meetings and whatever. The Secretariat staff cordinate the work of these bodies and meetings and handle the bureaucracy. (Secretariat people might well argue that they play a much larger role than this in plannng and running the organization!)

WMO History

The present WMO came into existence in March 1950 when a specified number of countries, including Canada, had ratified the Convention. There was an earlier body, the International Meteorological Organization, which was founded following the Vienna Meteorological Congress of 1873. For practical considerations associated with the daily exchange of data between Canada and the United States, a unique system of data coding and transmission was developed in North America. However, the early Meteorological Service of Canada directors, Kingston and Carpmael, monitored the work of the IMO and attempted to adhere to its definitions, standards and observer instructions. Shortly after he became director of the Canadian service in 1896, R.F. (later Sir Frederic) Stupart travelled to a Conference of Directors in Paris; he was the first Canadian to directly participate in IMO affairs. And it might be noted that, to make the most of his travel time and expenses, Stupart inspected observing stations in Atlantic Canada both going over and coming back by sea.

Although the attendance of directors at IMO meetings was approved by their respective countries, IMO was an informal organization, a sort of directors' club. The directors had no power or authority to commit their countries to binding rules and regulations. IMO did, however, play a real role in the early standardization of observations and the exchange of data in real time for operational weather forecasting. IMO was also active in promoting atmospheric research and in the application of climate data and information to agriculture, aviation, marine transportation and other social and economic endeavours. To facilitate this work, IMO began to set up technical commissions as early as the early 1880s. With the meetings always held in Europe, Canadian participation in IMO affairs was limited to that of the director until about the time of World War II.

After the war, in August 1947, Canada hosted meetings of all the technical commissions in Toronto. Both John Patterson and Andrew Thomson were enthusiastic meteorological internationalists; the commissions had been invited to Toronto in 1941 but the war intervened. Since most European services had been impoverished by the war, the Canadian directors felt it was important to show the European directors that meetings could be held on the veritable shoe string. And the Toronto meetings were; the month-long meetings were held in the far-from-luxurious and then quite shabby basement of the old

McMaster University building on Bloor Street near the Meteorological Office and delegates were billeted in university residences. It is uncertain what effect such spartan surroundings had on the 100 or so foreign delegates but that brief exposure to international meteorology made a lasting effect on young Canadian meteorologists who sat in as observers at some of the meetings.

Every country with a sovereign national meteorological or hydrometeorological service is entitled to membership in the World Meteorological Organization (along with having a flag, a seat at the United Nations and a national airline!). The WMO Convention calls for the director of each national service to be his country's Permanent Representative and every four years they and other delegates meet at a World Meteorological Congress. There, general policy is determined, programs and budgets are debated and approved, consideration is given to new and amended technical regulations and officers are elected for the next four year period. Numerous factors are used to determine each country's assessment; Canada's annual financial contribution amounts to about three percent of the Organization's budget. Of the 176 members (as of February 1996), only seven are assessed more than Canada; the United States leads with an assessment of about twenty-five percent of WMO's budget.

An Executive Council (earlier the Executive Committee), composed of thirty-six directors of national services, meet annually with advisors to implement the decisions made at Congress and to supervise the approved programs. Also, to coordinate activities in various parts of the world, there are six Regional Associations (RAs) based on geography. Canada belongs to RA-IV, North and Central America. Although there are no Regional Secretariats as such, Regional Offices and officers have been put in place in some Regions to assist developing countries.

Canadian Participation

Canada sends several delegates to each WMO Congress and to the RA-IV sessions, both of which meet every four years. Canadian meteorologists have played a leading role in WMO. In 1951, Andrew Thomson, then director, became the first president of RA-IV and thus a member of the WMO Executive Council. His successor, Patrick McTaggart-Cowan, was elected a member of the Executive Committee in 1960 and later became president of the Region. The next head of the Canadian service, Reg Noble, was elected RA-IV president in 1966 and later directly to the Executive Council. Because of our continuing and substantial contribution to international meteorology, Canada has rarely been without representation on the Executive Council. In addition to those already named - Warren Godson, Arthur Collin, Howard Ferguson, Elizabeth Dowdeswell and Gordon McBean have, in turn, been elected to the Executive Council. Since 1973 there have not been any Canadian presidents of the Regional Association but Jim Bruce served as a WMO vice-president from 1983 to 1986.

Technical Commissions

Canada has always sent two or more experts to sessions of the technical commissions which meet every four years to study and recommend on subjects within their specific mandates. Members of the commissions write and edit the WMO technical notes, reports, manuals and guides as well as organize and participate in training sessions for staff members of developing countries, seminars and conferences on specific subjects.

There are eight WMO technical commissions dealing with basic operations and facilities, atmospheric sciences research, and applications to economic and social activities. Canada has been very active in the work of the technical commissions and has provided one or more presidents for seven of the eight. John Patterson was the first president of the Commission for Instruments and Methods of Observation in the early 1950s. During the 1960s, Clarence Boughner was elected president of the Commission for Climatology and Keith McLeod of the Commission for Marine Meteorology. During the 1970s and early 1980s, Warren Godson served a term as president of the Commission for Atmospheric Research; Wolfgang Baier (Agriculure Canada), of the Commission for Agricultural Meteorology; Bob Clark (Inland Waters), of Hydrology; Bob Dodds of Aviation Meteorology and Morley Thomas of Climatology. In fact, for a period in the late 1970s, Canadians headed four of the eight technical commissions! Currently (1996), Jan Kruus is serving as president of the Commission for Instruments and Methods of Observation. The only commission never to have been presided over by a Canadian is that for Basic Systems.

WMO Programs

The work of WMO is organized into seven major scientific and technical programs. The basic program, and the one with the highest priority, is that for the World Weather Watch. This program deals with the operational exchange of weather observations amongst countries and has subprograms to advise and plan on the density of surface and upper air observing stations, on the quality of data and on data transmission. All observing, processing and transmission facilities are, of course, operated by the individual countries. WMO's World Weather Watch Program ensures there are standards in place to allow countries to provide efficient services within their borders.

Another program of great importance is the World Climate Program. The WCP exists to promote the improvement of the understanding of climate processes through internationally coordinated research and the monitoring of climate change. WMO is the lead agency in the World

Climate Program in which such other international bodies as the UN Environment Program, the Intergovernmntal Oceanographic Commission, Food and Agriculture Organization and the International Council of Scientific Unions also participate. The WCP provides significant contributions to the work of the Intergovernmental Panel on Climate Change, whose scientific assessments are very newsworthy of late.

There are three other somewhat smaller programs - Atmospheric Research and Environment, Applications of Meteorology and Hydrology and Water Resources Programs. The first promotes atmospheric research with emphasis on weather-prediction research, tropical meteorology, droughts and weather modification. Within this program, the Global Atmospheric Watch integrates monitoring and research activities in ozone, precipitation chemistry and carbon dioxide. The second deals with four vital areas of the application of meteorological services - public weather, agricultural meteorology; aeronautical meteorology and marine meteorology. Finally, the Hydrology and Water Resources Program is concerned with the assessment of the quantity and quality of water resources, and water-related hazards. This program is coordinated with UNESCO's International Hydrological Program.

Two additional programs concern the broad reach of WMO activities - the Education and Training and the Technical Cooperation Programs. The first promotes all kinds of training and is closely interrelated with the work of the technical and scientific programs. The second deals with the transfer of meteorological and hydrological knowledge and proven technology among member countries.

Canadian Honours

To mark the work accomplished by its predecessor, the International Meteorological Organization, the WMO annually gives an award, the IMO Prize - the highest distinction which can be offered by the Organization. Over the past twenty-five or so years three Canadians have been singled out for this award - Warren Godson in 1974, Kenneth Hare in 1988 and James Bruce in 1994. It must also be mentioned that Canada has contributed several meteorologists, technicians, translators, etc. to the WMO Secretariat over the decades. Secretariat positions are advertised for competition amongst nationals of all member countries and there is usually one or more Canadians on staff in term appointments. In recent years, some Canadian appointments have been at a high level. During the period from 1982 to 1989, the Deputy Secretary-General position has been held by three Canadians - Roland List (University of Toronto), Don Smith and Jim Bruce. There have been two World Climate Conferences and Canadians have played leading roles in organizing and coordinating these large and important meetings - Ken Hare in 1979 and Howard Ferguson in 1990.

Your Participation

Participation in WMO activities can be very rewarding to a Canadian scientist. Introduction to WMO activities is usually through appointment to a specialist working group or as a rapporteur (one who researches a specific subject over a year or two and reports with recommendations for future action). Such appointments are by no means limited to AES employees. Take every opportunity to participate in WMO activities. If no opportunities appear, make one! Scores of Canadians have particpated in recent decades and few, if any, ever regret their WMO experiences.

Quelques mots sur ce numéro spécial

Les membres de la SCMO et les lecteurs du Bulletin ont récemment été informés par l'Exécutif et l'Éditeur de la possibilité d'une publication spéciale dédiée au 125^{e} anniversaire des services météorologiques au Canada devant paraître dans le numéro de décembre.

Nous avons reçu plusieurs suggestions de nos lecteurs. Notre préoccupation première de trouver suffisamment de matériel pour publication a été remplacée par l'obligation de tout concentrer dans le format régulier du Bulletin!

Parmi les premières idées reçues, nous avons considéré de publier des versions abrégées des présentations faites lorsque cette Société était une direction de la "Royal Meteorological Service", de re-publier certaines présentations de Rube Hornstein à la radio CBC et un article sur l'établissement d'une station conjointe dans l'Arctique. Morley Thomas, Dave Phillips et Ken Hare nous ont plutôt suggéré plusieurs idées pour écrire, éditer et préparer un contenu nouveau pour ce Bulletin. Nous voulons remercier Messieurs Thomas et Rod Rogers de l'Université McGill pour leurs excellentes contributions.

Nous espérons que ce numéro spécial du Bulletin vous fera revivre quelques vieux souvenirs et servira à documenter certaines réalisations canadiennes remarquables.

Votre équipe,

Paul-André Bolduc Neil Campbell
Dorothy Neale Uri Schwarz Richard Asselin

Canada and the Weatherships

by U. Schwarz

The story of the weatherships is of particular interest to CMOS members because it is an example of a system used for meteorological and oceanographic observations and in which Canada participated from its early beginnings.

The concept of stationing ships along oceanic air routes dates back nearly 80 years when a number of ships were deployed along the route of the British airship R34's crossing of the Atlantic in 1919. After a number of years of planning, which included the use of merchant ships for surface observations, the French Meteorological Service put in operation one weathership that remained in service from July 1937 to September 1939. The program came to an end with the advent of the Second World War.

Weather intelligence emerged as a strategic commodity for both sides during the war but as the Allies gained an upper hand in the Atlantic, weathership observations grew and expanded, and by 1945 up to 21 weatherships were stationed in the Atlantic alone. However, as soon as the war ended this military-driven effort decreased rapidly.

After the war, commercial civilian flights across the North Atlantic (and to a lesser extent, across the North Pacific) began to develop and expand rapidly from year to year. It soon became clear that weather observations could only be reliably furnished by a system of ships stationed across the Atlantic. The Provisional International Civil Aviation Organization organized a meeting of various countries bordering on the North Atlantic Ocean to study the problem of developing a program for weather observations.

The number of stations, the services to be provided, division of responsibility and financing amongst the participating countries were laid out. Canada agreed to operate weather station "Baker" jointly with the United States. A naval frigate, "HMCS St. Stephen", was modified and equipped for weather duty. She was manned by naval personnel and carried a staff of experienced meteorological observers and commenced her duties on station "Baker" in 1947.

The International Agreement on North Atlantic Weather Stations specified the services that had to be performed by the ships. Each vessel had to be capable of providing weather observations, search and rescue services, navigational aids and communications, and miscellaneous oceanographic and scientific observations.

In 1947 thirteen weatherships were deployed under the auspices of the International Civil Aviation Organization (ICAO) headquartered in Montreal. Administration of the system led to regular meetings of Member States participating in the scheme - those with aircraft flying over the ocean serviced by the ships, including States as far from the oceanic areas in question as Israel, Switzerland and Venezuela. At these meetings, agreements were worked out and modified as to the services to be performed by the ships, and the payments to be made by States for these services, depending on the number of flights per country. In the case of countries providing the ships, the costs were deducted from the amount they were required to pay for the upkeep of weathership operations.

The North Atlanic weathership system was eventually set at nine stations, located as shown in Fig. 1. Of those, Canada shared responsibility for Station "B" (for "Baker"), off Labrador, with the United States. The other stations being manned were by France, the Netherlands, Norway, Sweden, United Kingdom, and the United States. In 1950 it was agreed by Canada and the United States that the USA would man Station "B" alone, and Canada would take over and man Station "P" (for "Papa") in the North Pacific at 50° N 145° W on its own (Fig.2).

The aircraft engaged in transatlantic flight in those days were slow and only capable of flying at relatively low levels. The fact the flights were scheduled made the need for prevailing wind and weather conditions more imperative than their earlier military counterparts when flights were scheduled for favourable flying conditions only.

Weather information, actual and forecast, still used Morse code communications, and relays of messages were often needed. Navigational aids were also provided by the ships with DF (direction finding) bearings and radar fixes.

While on station the weatherships were the sea-going platforms providing meteorological, communications and navigational services to ocean-transiting aircraft. Their marine program included:

- Meteorological Services;
- Surface observations eight times daily, with special observations in between if specified changes occurred;
- Upper wind observations four times daily to at least 55,000 feet;
- Radiosonde observations (upper air temperature, pressure and humidity) at least twice daily, but preferably four times.

These observations were to be transmitted to appropriate shore stations, as well as, on request, to aircraft. Special weather data were expected to be supplied to aircraft in

the event of ditching at sea including the following:

Communication Services:

- Receipt of safety, distress or emergency calls; continuous listening watch on international distress frequencies;
- Communication with aircraft or vessels for distress, emergency or safety purposes;
- Provision of normal ship-air communications, including receipt and relay of aircraft weather observations and ship observations;
- Communication with land stations.

Navigational Services:

- As required, direction finding, radio beacon and microwave search radar services.

Search and Rescue Services:

- Ships were to be equipped with the necessary equipment for search and rescue operations and the crews trained to support these functions.

The taking of weather observations at sea required special technical designs differing from those normally used at a land observing station. Some instruments had to be gimbal-mounted to remain horizontal and in equilibrium. Corrosion from salt spray also had to be taken into account, as well as sea-spray contamination of rain gauges. The ship's movement had to be constantly taken into account when taking upper wind observations by means of theodolites or radar. The ships were constantly under way, and even in bad weather conditions, they were required to stay within an assigned area of ten square miles. All of the above required much thought, ingenuity and determination to succeed in performing some very difficult procedures in fair and foul weather.

The ships were obligated to respond to emergencies and distress at sea and all ships were equipped for marine and aircraft emergencies with crews well-trained in handling the appropriate equipment. Fortunately, these services were seldom called upon but the rescue of some 68 persons from the Flying Boat "Bermuda Queen" which ditched near Station "C" in 1947 served to illustrate the wisdom of having such services available.

As time went on, the need for the weathership services declined; satellites began to provide much of the weather data formerly provided by the ships, as well as communication and navigational aid facilities. The need for continuing to provide low level weather information was in decline and less of a requirement for high-altitude jet aircraft. Finally, experience had shown that the ships were rarely called upon in the event of ditching or search and rescue services.

The need for weathership-based aviation services could no longer be justified by ICAO and in 1974 the World Meteorological Organization (WMO) assumed the responsibility of a new North Atlantic Ocean Station (NAOS) system for meteorological purposes. It consisted of four stations manned only by European States as the USA had withdrawn, for the simple reason that Atlantic weather systems moved away from North America towards Europe. The withdrawal of the United States was offset by the offer of ships from the USSR. The weathership program continued until the end of 1990 when satellite observations had progressed to the point that ships taking meteorological observations were redundant.

As mentioned earlier, Canada and the United States agreed bilaterally to assume responsibilitities for Station "Papa" in the Pacific and "Baker" in the Atlantic, respectively. Station "Papa" located at 50° N 145° W (Fig.2) was first manned by Canada in 1945 with a Canadian corvette, "HMCS Woodstock". It was a trying operation at the time because hostilities with Japan made it necessary for the ship to be fully armed and manned in the event of combat. Later when the bilateral agreement came into effect "St. Stephen" was transferred from the east coast to Victoria to act as standby ship for Station "Papa".

In December of 1950 the former RCN frigate "St. Catharines" made her first patrol as a weathership under the marine Branch of the Department of Transport. The frigate, "Stonetown" also saw service as a weathership.

In 1966/67 these two ships were replaced by much more up-to-date vessels "Vancouver" and "Quadra", specially designed for weathership operations by Campbell and Co. of Montreal. The ships had a displacement of 5,530 tons and measured 404 feet in overall length, with a top speed of 18 kts.

Their meteorological program was similar to the NAOS program, namely three-hourly weather observations, six-hourly upper wind measurements by radar and twelve-hourly upper air temperature and humidity measurements by radiosondes. These observations were transmitted by radio to Vancouver from where they entered the Canadian, North American and world-wide data networks.

Additionally, the ships provided navigational and communication aids to aircraft and ships, as well as search and rescue services. The position of the ships was constantly checked by means of LORAN in addition to solar and astral observations.

The international recognition of Station "Papa" was considerably enhanced by its performance as an

oceanographic vessel under the direction of Dr. J.P. Tully and staff of the Pacific Oceanographic Group of the Fisheries Research Board of Canada and much has been written on the oceanographic programs conducted by this group at Station "Papa".

The "Vancouver" and "Quadra" were state-of-the-art vessels each carrying a crew of about 96, including 15 scientific and technical staff made up of meteorologists, oceanographers and electronic technicians. The crews served at sea for six weeks, followed by six weeks off.

Station "Papa" continued in operation until 1985 when it was discontinued by the government, despite protests by many scientific organizations, including CMOS.

References:

L.J. Slobinski, 1952, *Canadian Ocean Weather Stations*, Transactions of the Royal Society of Canada, Vol XLVI, Series III, Canadian Committee on Oceanography.

The author is indebted to Mr. T. Fox, ICAO; Mr. K.J. McLeod, WMO; and Mr. F. Barber, DFO retired, for source material provided in the preparation of this article.

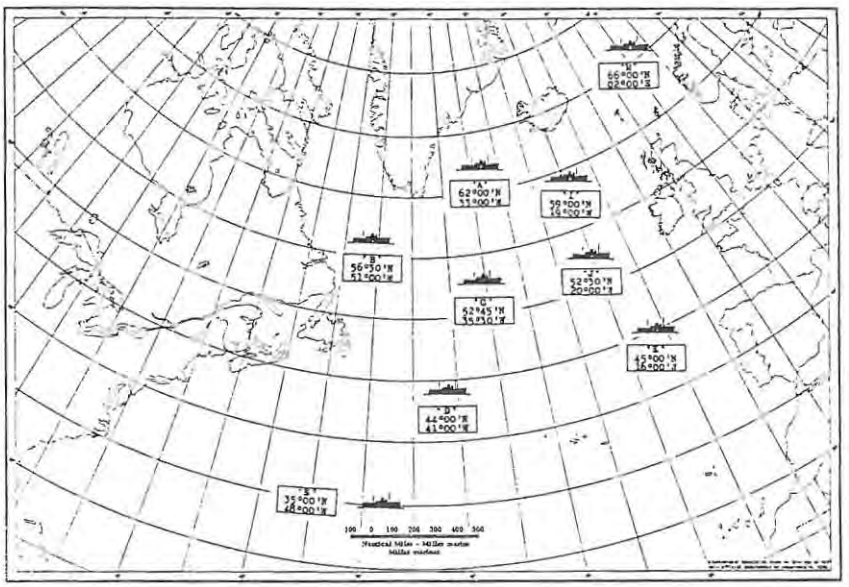

Fig 1: The North Atlantic Weathership System showing 9 Ocean Stations

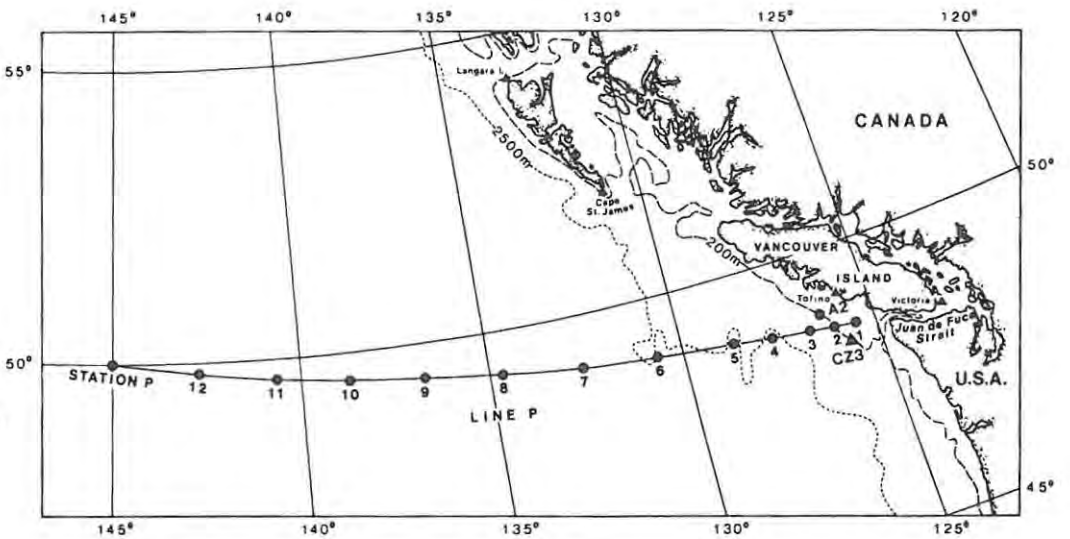

Fig 2: Location of Station "P" and Line "P" Stations, Station A2, Station CZ3 and selected place names in the Pacific Ocean. Figure taken from Tabata, S, B. Thomas and D. Ramsden, 1986, *Annual and Interannual Variability of Steric Sea Level along Line P in the Northeast Pacific Ocean*, Journal of Physical Oceanography, Vol.16, No.8, p.1379.

Report on the Third International Convocation of Geophysical Societies

Brisbane, Australia , September 10, 1996
by Charles A. Lin, McGill University

I attended this meeting as the representative of CMOS. The meeting was chaired by Sean Solomon of the American Geophysical Union (AGU). There were 19 participants from Australia, Canada, France, Germany, Japan, New Zealand, United Kingdom and the United States. The Canadian attendees were W. Peltier (Canadian Geophysical Union), J. Samson (Canadian Association of Physicists) and myself. The societies represented ranged from large organizations such as the AGU (32,000 members) to smaller societies like CMOS.

The meeting started with introductory remarks from each representative. Some of the highlights of presentations follow. The Australian Geological Society invested $100,000 to put together a CD-ROM consisting of 20 geologic formations in Australia. It was developed with input from high school teachers. Their Society has started an active program to recruit high school students. One hundred and forty free memberships were given out to honour students and 78 of them converted to regular membership the following year. The Royal Astronomical Society representative noted that information on the impact on "wealth creation and quality of life" (WCQL) is now required of all new initiatives. The difficulties faced by the smaller societies are not unlike those faced by CMOS - declining membership and insufficient funds for full-time staff.

The discussion then moved on to more specific topics. I have summarized these presentations below as they appeared in the agenda.

1. Role of geoscience societies in the current socio-economic environment

There was more discussion of the emphasis on "WCQL" in today's socio-economic environment. Societies are being pressured to be increasingly relevant in this respect. In terms of communication to the lay people, a good rule of thumb is "keep it simple, keep it ethical".

Rapport sur la troisième Convocation internationale des sociétés de géophysique

Brisbane (Australie), le 10 septembre 1996
par Charles A. Lin, Université McGill

C'est en qualité de représentant de la SCMO que j'ai participé à cette rencontre. Sean Solomon de l'American Geophysical Union (AGU) présida la rencontre, laquelle regroupait 19 participants provenant d'Australie, du Canada, de la France, de l'Allemagne, du Japon, de la Nouvelle-Zélande, du Royaume-Uni ainsi que des États-Unis. Les autres représentants canadiens étaient W. Peltier (Union géophysique canadienne) et J. Samson (Association canadienne des physiciens et physiciennes). Les organismes représentés couvrent un vaste éventail allant de l'AGU (32 000) membres à de petites sociétés telle la SCMO.

Lors d'un tour de table au début de la rencontre, chacun des représentants prononça quelques paroles d'introduction. J'ai noté ci dessous les faits saillants. La Société géologique australienne a investi 100 000$ dans la création d'un cédérom portant sur 20 formations géologiques d'Australie. Plusieurs enseignants du niveau secondaire participèrent à son développement. Leur société s'est lancée très activement dans un programme ayant pour but de recruter des élèves du secondaire. Afin d'honorer des élèves méritants, 140 d'entre eux reçurent une adhésion gratuite à la Société, et 78 de ceux-ci ont renouvelé leur abonnement l'année suivante. Le représentant de la Société royale d'astronomie indiqua que chaque proposition de nouvelle initiative doit maintenant être accompagnée d'une étude d'impact sur la "création de richesse et la qualité de vie" (CRQV). Tout comme la SCMO, la plupart des petites sociétés sont confrontées aux mêmes difficultés: le déclin du nombre de membres et l'insuffisance de fonds pour l'embauche de personnel permanent.

Les discussions se protèrent ensuite vers des sujets plus spécifiques. J'en fait un résumé ci-bas en suivant l'ordre indiqué dans l'ordre du jour.

1. Rôle des sociétés géoscientifiques dans l'environnement socio-économique d'aujourd'hui

On discuta avec encore plus d'emphase du concept de "CRQV" tel qu'on doit le concevoir dans l'environnement socio-économique actuel. De plus en plus on exige des sociétés savantes qu'elles démontrent leur pertinence à ce niveau. Pour ce qui est de l'aspect communication aux non-initiés, la règle qu'il faut continuer d'appliquer est celle combinant "la simplification et l'éthique".

2. Geoscience education

The UK representative noted that geology is not included in the national curriculum for elementary and high schools, as teachers believe the material is too difficult to teach. There was consensus that societies need to work on teacher education. Societies can start by exchanging any available teacher and student kits. There should be orientation sessions for scientists who would like to give talks at elementary and high schools. The risk here is that if the talk is pitched at too high a level, it could put off students. If possible, younger speakers, about 5-10 years older than the audience, should be recruited.

2. Éducation en géosience

Le représentant du Royaume-Uni indiqua que le curriculum national des niveaux élémentaire et secondaire de son pays exclut la géologie comme matière obligatoire car les enseignants estiment qu'elle est trop difficile à enseigner. Les participants firent consensus sur la proposition qu'il fallait travailler davantage à former des éducateurs. Les société pourraient commencer par échanger entre elles les pochettes d'information à l'intention des éducateurs et des élèves qui sont déjà disponibles. On devrait également organiser des sessions d'information à l'intention des scientifiques intéressés à donner des conférences dans les écoles élémentaires et secondaires. Il faut toutefois éviter de faire des présentations trop savantes afin de ne pas décourager les auditeurs. Si possible, il faudrait recruter de jeunes conférenciers qui soient dans une fourchette d'âge de 5 à 10 ans plus élevé que celle de leur auditoire.

3. Public perception of earth and space sciences

Societies can act as a filter for information about geosciences. A list of experts could be put on the Web. To be effective with the public, AGU press officers are given courses on media techniques.

3. Perception du public des sciences de la terre et de l'espace

Les sociétés peuvent agir en tant que filtres pour ce qui est de l'information qui circule à propos des géosciences. Une liste d'experts pourrait utilement être inscrite sur le Web. À l'AGU, on a fait en sorte que les agents d'information reçoivent des cours sur les techniques médiatiques afin d'améliorer leur efficacité.

4. Responsibility of societies to the public

There was some discussion on setting up a code of ethics. However, a push in this direction might result in a loss of amateur members. In any case, standards already exist in the various publications of societies. It was noted that the three Canadian societies represented (CMOS, CGU, CAP) had not made any significant efforts in setting up a general code of ethics.

Is there anyone interested in following up on ethical guidelines for CMOS; please let us know?

S'il y a quelqu'un intéressé à faire le suivi de la question du code d'éthique pour la SCMO, prière de nous le faire savoir?

4. Responsabilités des sociétés vis-à-vis le public

On a discuté de l'idée d'établir un code d'éthique. Il fut toutefois convenu qu'une telle initiative pourrait entraîner le départ des membres amateurs. De toute façon, la plupart des publications des diverses sociétés se conforment déjà à des normes. Il fut noté que les trois sociétés canadiennes représentées à la rencontre (SCMO, UGC et ACP) n'avaient fait que peu d'efforts pour établir des codes d'éthiques généraux.

5. Strengthening our scientific societies

Unanimity of purpose is needed here. In terms of strengthening publications, societies should compete vigorously with for-profit publishers. However, it might be difficult to make significant progress as authors will likely continue to publish in those journals.

5. Renforcement de nos sociétés scientifiques

Pour y parvenir, il faut que tous travaillent avec la même résolution. Pour renforcer leurs publications, les sociétés doivent concurrencer vigoureusement les éditeurs à but lucratif. Il sera toutefois difficile de réaliser des progrès importants car il faut prévoir que les auteurs continueront de publier dans ces revues.

Action Items

1. Societies should coordinate their meetings and conferences to avoid conflict as much as possible. One way to do this is to send the timetable to AGU by e-mail. AGU will put this information on the Web.

2. Activity lists related to education and description of source kits should be sent to AGU.

3. Any information societies have on ethical guidelines should be sent to AGU.

The AGU will contact each society regarding the above action items. In the meantime, societies can start gathering the material, and identify a contact person for AGU.

If you have comments or suggestions for CMOS, please send them in to the Editor. Is there anyone interested in following up on ethical guidelines for CMOS; please let us know?

Le suivi

1. Autant que possible, les sociétés devraient coordonner leurs rencontres et conférences afin d'éviter les conflits. Une façon de le faire est de voir à ce que l'horaire de ces réunions soit acheminé vers l'AGU par courrier électronique. L'AGU se chargera d'introduire cet horaire sur le Web.
2. Il faudrait que les listes d'activités ayant trait à l'éducation de même que la description des pochettes d'information soient acheminées vers l'AGU.
3. Il serait bon que les sociétés fassent parvenir à l'AGU l'information dont elles disposent relativement aux lignes directrices sur l'éthique.

L'AGU fera un suivi sur toutes ces questions en prenant contact avec chacune des sociétés. Entre-temps, les sociétés devraient commencer à réunir le matériel et désigner une personne pour faire le lien avec l'AGU.

Si vous avez des commentaires ou des suggestions à fournir à la SCMO, veuillez bien, s'il-vous-plaît, les faire parvenir à l'éditeur. S'il y a quelqu'un intéressé à faire le suivi de la question du code d'éthique pour la SCMO, prière de nous le faire savoir.

ALBERTA HAIL
"40th Anniversary" REUNION
5 - 8 June 1997

Forty years ago, a co-operative hailstorm research project commenced in Alberta, Canada. It was started by a few stalwart individuals and forward-looking agencies as the Alberta Hail Studies Project (ALHAS). Systematic field observations, including weather radar, began in the summer of 1957. A large number of innovative scientific activities were brought to bear on the hail issue over the ensuing years involving a dozen agencies and several hundred people as the project grew to become the Alberta Hail Project (AHP). In order to celebrate the world-wide recognition achieved by this program, that carried on for nearly four decades, a reunion for all agencies and people involved is planned for 5-8 June 1997.

Since several of the Project participants will be attending the CMOS Annual Congress in Saskatoon, this offers an ideal opportunity to commence the reunion with a scientific session on hail and an informal dinner on Thursday 5 June. Over the following weekend an extensive social program (in the old Project style) is being planned in the Red Deer-Penhold area, where a block of rooms is being held at the Red Deer Lodge. Events being considered include:- a reminiscent mixer on Friday evening at the Penholder Inn; a visit to the new hail suppression project field site; a lunch BBQ; a ball-game; golf; a banquet on Saturday evening and a wrap-up brunch on Sunday.

Everyone who was involved in any of the various phases of the projects in whatever capacity, is invited to attend both, or either, of the reunion locations to renew old friendships. Since the current whereabouts of a large number of former participants is not known, please pass the Reunion news on to anyone you know who might be interested.

Information on the Red Deer-Penhold arrangements for the Reunion will be posted and updated, as they are developed, on the web site:

http://www.infoharvest.ab.ca/AHP/reunion.html

or can be obtained from: Jim Renick, 11 Warwick Drive, Red Deer, Alberta, T4N 6L4, Canada.
e-mail: **renick@agt.net**
Telephone: (403) 347-1545; Fax: (403) 340-1340

General information about the Reunion and the Scientific Session on Hail can be obtained from Dr. Peter Summers, 805-30 Harding Blvd. West, Richmond Hill, Ontario L4C 9M3, Canada. Telephone: (905) 508-7509.
e-mail: **psummers@idirect.com**

In order to get an early indication of the number of people who may be participating, especially in the Red Deer portion of the reunion, please inform Peter Summers as soon as possible if you plan to do so. Hope to see you there !

Peter Summers

The Canadian Meteorological and Oceanographic Society (CMOS) is pleased to announce the imminent publication of a special issue of Atmosphere-Ocean dedicated to the memory of Dr. André Robert, who passed away on November 19, 1993. Dr. Robert had a long and distinguished career in numerical methods for atmospheric and fluid models. Among his major contributions are the first integration of a global spectral primitive equation model, the development of the Robert-Asselin time filter, and pioneering studies in the use of the semi-implicit and semi-Lagrangian methods. The André J. Robert memorial volume of Atmosphere-Ocean on "Numerical Methods for Atmospheric and Oceanic Modelling" is a collection of papers by leading scientists in the field of numerical modelling. The refereed papers are based on invited presentations made at the André J. Robert Memorial Symposium on Numerical Methods in Atmospheric and Oceanic Sciences, held at the Université du Québec à Montréal, October 5-7, 1994.

Of the 27 papers in the hardcover special volume, 25 are research papers reporting or reviewing recent original research findings. The other two papers present a historical perspective of numerical weather prediction and Dr. Robert's pioneering contributions to numerical modelling.

The authors are from laboratories around the world. They include Drs. Takashi Nitta (Japan), Roger Daley (U.S.A.), Dale Haidvogel (U.S.A.), T.N. Krishnamurti (U.S.A.), Michael Cullen (U.K.), Roger Pielke (U.S.A.), Piotr Smolarkiewicz (U.S.A.), John Dukowicz (U.S.A.), John McGregor (Australia), John Bates (U.S.A.), Lance Leslie (Australia), Jean-François Geleyn (France), Fedor Mesinger (U.S.A.), René Laprise (Canada), David Williamson (U.S.A.), Andrew Staniforth (Canada), Philippe Courtier (France), Bennert Machenhauer (Germany), Eigil Kaas (Denmark), Jean Côté (Canada), Charles Lin (Canada), Clive Temperton (U.K.), Harold Ritchie (Canada), Robert Benoît (Canada), Robert Sadourny (France) and Kikuro Miyakoda (U.S.A.). The papers cover different aspects of numerical methods in meteorology and oceanography. They include extensions of the semi-implicit and semi-Lagrangian schemes, non-hydrostatic models, applications of models using the semi-Lagrangian scheme, data assimilation, operational model development, air-sea interaction and ocean models, and discussion of unresolved issues. This Memorial volume is a most fitting tribute to the fundamental contributions made by Dr. Robert. In addition to the above papers, the volume will also include several previously unpublished articles by Dr. Robert.

C'est avec plaisir que la Société canadienne de météorologie et d'océanographie (SCMO) annonce la publication imminente d'un numéro spécial d'Atmosphère-Océan à la mémoire d'André Robert, décédé le 19 novembre 1993. André Robert a eu une carrière longue et remarquable en méthodes numériques appliquées aux modèles des fluides et de l'atmosphère. Parmi ses contributions majeures, on retrouve la première intégration d'un modèle spectral global utilisant les équations primitives, le développement du filtre temporel Robert-Asselin ainsi que des études fondamentales dans l'usage des méthodes semi-implicite et semi-lagrangienne. Le numéro d'Atmosphère-Océan à la mémoire d'André J. Robert, intitulé "Les méthodes numériques en sciences atmosphériques et océaniques", regroupe des articles de scientifiques renommés dans le domaine de la modélisation numérique. Ces articles, révisés par des comités de lecture, sont basés sur des conférences présentées au Symposium à la mémoire d'André Robert sur les méthodes numériques en sciences atmosphériques et océaniques, qui a eu lieu à l'Université du Québec à Montréal, du 5 au 7 octobre 1994.

Des 27 articles de ce volume spécial à reliure cartonnée, 25 sont des articles de recherche rapportant ou faisant la revue de découvertes originales récentes. Les deux autres articles présentent une perspective historique de la prévision météorologique numérique et des contributions originales d'André Robert à la modélisation numérique.

Les auteurs proviennent de laboratoires situés à travers le monde. Il s'agit de Takashi Nitta (Japon), Roger Daley (É.-U.), Dale Haidvogel (É.-U.), T.N. Krishnamurti (É.-U.), Michael Cullen (Royaume-Uni), Roger Pielke (É.-U.), Piotr Smolarkiewicz (É.-U.), John Dukowicz (É.-U.), John McGregor (Australie), John Bates (É.-U.), Lance Leslie (Australie), Jean-François Geleyn (France), Fedor Mesinger (É.-U.), René Laprise (Canada), David Williamson (É.-U.), Andrew Staniforth (Canada), Philippe Courtier (France), Bennert Machenhauer (Allemagne), Eigil Kaas (Danemark), Jean Côté (Canada), Charles Lin (Canada), Clive Temperton (Royaume-Uni), Harold Ritchie (Canada), Robert Benoît (Canada), Robert Sadourny (France) and Kikuro Miyakoda (É.-U.). Les articles couvrent différents aspects des méthodes numériques en météorologie et en océanographie, incluant des extensions aux schémas semi-implicite et semi-lagrangien, les modèles non-hydrostatiques, les applications des modèles utilisant le schéma semi-lagrangien, l'assimilation des données, le développement des modèles opérationnels, l'interaction air-mer et les modèles océaniques, ainsi qu'une discussion de problèmes importants non résolus. Ce volume commémoratif est un hommage des plus appropriés aux contributions fondamentales d'André

The guest editors for the special volume are Charles Lin (McGill University), René Laprise (Université du Québec à Montréal) and Harold Ritchie (Atmospheric Environment Service, Environment Canada).

For further information and pre-publication orders, please contact:

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Robert. En plus des articles mentionnés ci-dessus, le volume comprend plusieurs articles d'André Robert qui n'ont jamais été publiés.

Les rédacteurs invités de ce volume spécial sont Charles Lin (Université McGill), René Laprise (Université du Québec à Montréal) et Harold Ritchie (Service de l'Environnement atmosphérique, Environnement Canada).

Pour plus de renseignements ou pour commander à l'avance, vous êtes priés de rejoindre:

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The late Dr. André Robert / Feu le Dr André Robert

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Rates are based on black and white camera-ready copy, subscribed for a minimum of six issues of the CMOS Bulletin SCMO (Feb., Apr., Jun., Aug., Oct., Dec.).

Rates for a single issue are 1.5 times the above rates.

Other charges may apply if typesetting, artwork or photography are required. Rates for colour will be quoted upon request.

Canadian residents and businesses must pay the Goods and Services Tax (7%).

Material must be in the hands of the Director of Publications at least two months in advance of printing.

CMOS recommends bilingual advertising, and will provide translation for short texts.

* Les membres corporatifs et de soutient ont droit à une réduction de 20% des taux affichés.

Les taux supposent l'usage d'une copie prête à photographier en blanc et noir et une commande d'au moins six parutions du CMOS Bulletin SCMO (fév., avr., juin, aou., oct., déc.).

Les taux pour une seule édition sont 1.5 fois les taux ci-haut.

Des frais additionnels peuvent s'appliquer si de la mise en page, dessin ou photographie sont nécessaires. Les taux pour la couleur seront fournis sur demande.

Les résidents et corporations canadiennes doivent payer la taxe sur les biens et services (7%).

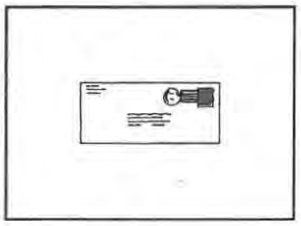
Le matériel doit être reçu par le directeur des publications au moins deux mois avant la date d'impression.

La Société recommande les annonces bilingues et s'engage à faire la traduction pour les textes courts.

Letters to the Editor / Lettres au Rédacteur

A long way!

Yes, we've come a long way indeed, when I remember the primitive technologies and theoretical groping of the WW II days.



Radiosondes were in development but soundings were few and far between. The instruments themselves were relatively primitive and prone to mechanical faults and erroneous data. With little more than visual weather observations, trying to divine what was going on above the overcast was a frustrating struggle.

One attempt to overcome the lack of upper air information is worth recording. It was carried out under the direction of Dr. Tom Howe, who was regional met. chief at Edmonton during WW II. With the cooperation of the RCAF, a de Havilland Moth - a little bi-plane of pre-war vintage - was fitted with a thermometer that extended through the floor and into the airstream. Temperature readings were taken and recorded up to the maximum altitude of the aircraft, perhaps 10,000 ft. ASL.

Each morning, weather permitting (!), the flight was made and readings supplied to the Met. Section; and, as I remember it, put on the teletype to other units in the region.

I cannot testify to the usefulness of the results of these observations, or their accuracy. The exercise does underline the elementary stage of meteorological science that we struggled with.

Yes, we've come a long way!

Walt Fryers.

Note from the Editor

The ideas expressed in the letters to the Editor are the sole responsibility of their respective authors. Our readers are encouraged to provide comments and/or criticism.

Avis du Rédacteur

Les idées exprimées dans les lettres au Rédacteur sont la seule responsabilité de leurs auteurs respectifs. Nos lecteurs sont encouragés à les critiquer et à nous faire parvenir leurs commentaires.

A short note about Walt Fryers...

He was recruited by Dr. John Patterson into the first class of "Meteorological Assistants" in the fall of 1940 for service in the British Commonwealth Air Training Plan of WW II. By spring of 1941, he was Senior Meteorological Officer at #3 Service Flying Training School at Calgary. He continued there until the end of the war.

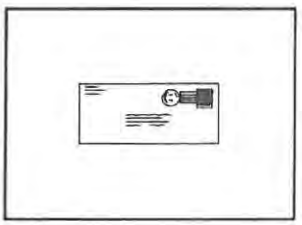
After further stints with the Army Exercise Musk Ox, the RCAF Photo Flight at The Pas and the Regina Met Office, Walt was assigned in 1954 to the brand new RCAF Station Cold Lake, Alberta. His tour there included a three-year period at Zweibrucken, Germany, from 1957 to 1960.

Back at Cold Lake, Walt spent his latter years as Meteorologist with the Aerospace Engineering and Test Establishment (AETE). He retired in 1975 at 63 years of age, after 35 years with the Canadian Meteorological Service. He continues as a faithful member of CMOS.

CMOS Bulletin SCMO Editor

"Scouter Doug" and other titles

Doug Bancroft goes by many titles including "Scouter Doug" by the members of the Scout Troop he helps lead, "Senior Staff Officer Meteorology and Oceanography" at Maritime Forces Pacific Headquarters, "Dear" amongst other terms of endearment from his wife Eileen, and Lieutenant Commander as the Executive Officer at Victoria's Naval Reserve Division, HMCS Malahat. The zeal with which Doug attacks his Naval Reserve duties, in fact all facets of his life, was recognized by his Commanding Officer Captain(N) Jennifer Bennett. Bennett chronicled Doug's exemplary career in nominating Doug for the Order of Military Merit. Bennett has joked that Doug "....not only walks on water, he brings his lake along". The board responsible for deciding which nominations for this prestigious honour deserve merit agreed with Bennett that Doug was deserving of the Order of Military Merit which was bestowed upon him at a ceremony presided over by the Governor General, Roméo LeBlanc, in Ottawa. Doug was honoured, "..tickled pink" and took advantage of the trip to Ottawa to spend some quality time alone with Eileen.



Doug, a member of CMOS, continues to expend a lot of effort improving the West Coast Navy's meteorological and oceanographic forecast capabilities and optimizing Fleet support. Recent initiatives include the acquisition of an HRPT site, the development of an oceanographic forecasting capability through numerical modelling and the use of empirical orthogonal functions to generate temperature and salinity profiles from scanty sea surface data.

Doug is sure to show his trademark enthusiasm and excel during a year-long leave of absence from the office while he takes command of the newly launched Maritime Coastal Defence Vessel HMCS YELLOWKNIFE. Upon its acceptance into the Navy, Doug and his crew will bring the ship back to Esquimalt via the Panama Canal - an adventure Doug eagerly anticipates.

Congratulations Doug from the Canadian Meteorological and Oceanographic Society. You now lay claim to one of the most unique signature blocks amongst the Society's members; namely....Scouter Doug, O.M.M., C.D.!

Your friend Alex!

Note from the Editor: Lt(N) Alex Grant is the Staff Officer for Oceanography at the MetOc Centre, Maritime Forces Pacific HQ, FMS Victoria, B.C.

Holiday Greetings from our President

On behalf of the CMOS Executive and Council, I would like to take this opportunity to wish Season's Greetings and a Happy New Year to you and your families and I encourage you to take full advantage of the holiday season. We should all be optimistic for this coming year which will no doubt present new challenges and opportunities for the oceanographic and atmospheric sciences.

I am also looking forward to our Annual Congress which will be held in Saskatoon this Spring where I will be seeing many of you. The Council would like to encourage you to attend and to participate actively in the scientific, business and social activities of the Congress.

Peter Zwack

Meilleurs voeux du Nouvel An de notre président

De la part de l'Exécutif et du Conseil de la SCMO, j'aimerais vous souhaiter nos meilleurs voeux pour le temps des Fêtes ainsi que pour le Nouvel An et je vous incite à profiter pleinement de cette belle saison. Nous devrions tous être optimistes pour l'année qui vient car elle présentera sûrement de nouveaux défis et opportunités pour les sciences océaniques et atmosphériques.

J'anticipe avec plaisir notre Congrès Annuel, qui aura lieu à Saskatoon ce printemps, où je verrai plusieurs d'entre vous. Le Conseil aimerait vous encourager à assister et à participer activement aux activités scientifiques, d'affaires et sociales du Congrès.

Peter Zwack

About our cover page

The floatplane "Mercury" shown on the front cover on top of the flying boat "Maia" carried the first airmail ever across the Atlantic on July 21-22, 1938. She was launched airborne at Foynes, Ireland and landed in Montreal after a non-stop flight of twenty hours and twenty minutes. She was piloted by Don Bennett, a colleague of Pat McTaggart-Cowan's, who also played a key role in transatlantic flight and in establishing the RAF Ferry Command.

Photo of the Shorts-Mayo Composite Aircraft by permission of Short Brothers plc, Northern Ireland, a Member of Bombardier Aerospace.

The photograph on the right shows the Weatherman's electronic helper, a Control Data G-20 high-speed electronic computer in the Department of Transport's Central Analysis Office at Montréal International Airport digesting basic meteorological data at a rate of 100,000 computations per second. The photograph was taken in October 1963.

New CMOS Director of Publications

Dr. J.M.R. (Richard) Asselin

Richard received a BSc (Math) from Université de Montréal in 1962, and MSc (Met.) and PhD (Met.) from McGill University in 1964 and 1970. From 1964 to 1978, he was a scientist at Recherche en Prévision Numérique in Dorval, serving as Head of the Division from 1974 to 1978. During that time he developed various algorithms utilized in numerical weather prediction models and initialization.

From 1979 to 1989, he was Director of Meteorology and Oceanography at National Defence Headquarters, except for a period in 1984-85 when he was Director General of Information for Environment Canada. He moved to Agriculture Canada in 1989, first as Director of the Land Resources Research Centre, and later as Director of the Centre for Land and Biological Resources Research, until his retirement in December 1995.

Richard has served the CMOS as a member of the executive of Montréal Centre in the 1970s and as Vice-President and President of the Society in 1982 and 1983 respectively. Armed with a vast experience as scientist and manager, he now accepts the challenge to serve the objectives of the Society by overseeing the continued improvement of its publications, including Atmosphere-Ocean, CMOS Bulletin SCMO, WWW Homepage, Annual Review and other special publications.

Welcome aboard Richard!

New Editor - CMOS Homepage

R.L. (Bob) Jones

In 1996 Bob completed a 35-year career in the Public Service, all of it in meteorology and oceanography. After graduating from Transport Canada's meteorologist course in 1961, he spent twenty years with the Department of National Defence serving in various weather forecasting and staff officer positions in Canada and Germany. While with DND, he worked in marine meteorology with the Navy and received oceanographic training from U.S. and Canadian Forces. During this period, Bob also worked in the Ice Forecasting Offices in Halifax and Ottawa.

From 1981 until retirement, Bob worked with the AES policy and planning group in Hull doing a grab-bag of things including program evaluation, audit, policy analysis and briefing notes, answering letters to the Minister, United Way campaign, computer services, planning office moves, and CMOS. His CMOS activities included Chair of the Ottawa Centre, Chair of the Professionalism Committee, Corresponding Secretary and Councillor with the National Executive in Ottawa and, in the early 1990s, presentation at Congresses and publication of his paper "Canadian Disasters - An Historical Survey". Early in retirement, Bob is keeping busy as editor of the CMOS Homepage and continuing curling at the "Navy" Curling Club in Ottawa.

Welcome back Bob!

Rappel: Prix et Bourses de la SCMO pour 1996

L'appel annuel de la Société canadienne de météorologie et d'océanographie pour les prix et bourses est présentement en ouvert. Tous les membres de la société sont encouragés à présenter des nominations des personnes qu'elles considèrent comme ayant contribuées de façon importante dans leur sphère d'activités tant en océanographie qu'en météorologie. Les catégories de prix sont:

1) Prix du président;
2) Médaille J.P. Tully en océanographie;
3) Météorologie appliquée;
4) Océanographie appliquée;
5) Météorologie opérationnelle;
6) Prix d'étudiant gradué;
7) Citation environnementale;
8) Citation pour présentation des prévisions météorologiques.

Chaque catégorie a des critères différents et spécifiques de sélection qui doivent être rencontrés pour qu'une nomination soit considérée. Pour de plus amples détails, prière de consulter les pages 134-135 du CMOS Bulletin SCMO (Vol.24, No.5, Oct. 1996) ou contactez Dave Phillips. Toutes les soumissions doivent être reçues par le Secrétaire, vendredi, le 31 janvier 1997.

M. Dave Phillips
Secrétaire du comité SCMO pour les prix et bourses
3320 rue Pleasant, Richmond, B.C. V7E 2P4
Téléphone: (604) 664-9185: Fac-similé: (604) 664-9004
courrier électronique:
phillipsd@ecvancouver.pwc.bc.doe.ca

Quote of the month

"We will never escape the ecosystem and the limits of the ecosystem. Whether we like it or not, we are caught in the food chain, eating and being eaten."

William McNeil.

Richard Asselin
Directeur des publications SCMO

Richard a reçu un BSc (math.) de l'U. de Montréal en 1962, ainsi qu'une MSc (météo.) et un PhD (météo.) de l'U. McGill en 1964 et 1970. De 1964 à 1978, il fit des recherches à Recherche en prévision numérique à Dorval, occupant le poste de chef de la division de 1974 à 1978. Durant cette période, il développa divers algorithmes utilisés dans les modèles de prévision et leur initialisation.

De 1979 à 1989, il fut directeur de la Météorologie et de l'océanographie au quartier général de la Défense, sauf pour une période en 1984-85 alors qu'il était directeur général de l'Information à Environnement Canada. Il passa à Agriculture Canada en 1989, d'abord comme directeur du Centre de recherches sur les ressources pédologiques, et par la suite comme directeur du Centre de recherches sur les terres et les ressources biologiques, et prit sa retraite en décembre 1995.

Richard a servi la SCMO comme membre de l'exécutif du Centre de Montréal dans les années 1970 et comme vice-président puis président de la Société en 1982 et 1983. Il fut nommé membre à vie par la Société en 1994. Fort d'une vaste expérience comme chercheur et gestionnaire, il accepte maintenant le défi de faire avancer les objectifs de la Société en veillant au développement progressif de ses publications, incluant Atmosphère-Océan, le CMOS Bulletin SCMO, la page d'accueil sur l'internet, la Revue annuelle ainsi que diverses autres publications.

Bienvenue dans notre équipe Richard!

Biographie - Bob Jones

C'est en 1996 que Bob mit fin à une carrière de 35 années dans la Fonction publique fédérale, toutes en météorologie et en océanographie. Après sa graduation du cours de météorologiste en 1961, il servit 20 ans dans divers postes de prévisionniste ou d'officier d'état major au sein du Ministère de la défense nationale, au Canada et en Allemagne. Au sein du MDN il travailla en météorologie marine avec la Marine et reçu la formation en océanographie des forces canadiennes et des É.U. Durant cette période il travailla aussi au Centre de prévision des glaces à Halifax et à Ottawa.

Depuis 1981 jusqu'à sa retraite, Bob oeuvra avec le groupe des politiques et planification du SEA à Hull, impliqué dans mille et une choses telles que: évaluation de programmes, vérification, analyse de politiques, notes de breffage, réponse aux lettres du ministre, Centraide, services d'informatique, planification de déménagement du bureau, ainsi que SCMO. Ses contributions à la SCMO incluent son rôle comme président du Centre d'Ottawa, président du comité sur le professionalisme, secrétaire de correspondance et conseiller auprès de l'exécutif national à Ottawa, de mème que, au début des années 1990, publication et présentation à divers congrès de son article intitulé "Canadian Disasters - An Historical Survey". Tout juste à la retraite, Bob s'occupe comme éditeur de la page d'accueil de la SCMO et il continue de jouer au curling au"Navy Curling Club" d'Ottawa.

Bienvenue parmi nous Bob!

1996 CMOS Prizes and Awards: REMINDER

The Canadian Meteorological and Oceanographic Society's annual call for nominations for Prizes and Awards is now under way. All Society members are encouraged to consider nominating individuals of the meteorological or oceanographic community who have made significant contributions to their fields. The award categories are:

1) President's Prize; **2)** Tully Medal in Oceanography;
3) Applied Meteorology; **4)** Applied Oceanography;
5) Operational Meteorology; **6)** Graduate Student;
7) Environmental Citation;
8) Media Weather Presentation.

Each category has different and specific nomination criteria which must be met before any nomination can be considered. For details, please see p. 134-135 of the last issue (Vol 24, No.5, Oct. 1996) of the CMOS Bulletin SCMO or contact Dave Phillips. There is a deadline of Friday, January 31, 1997 for nominations to be received by: Mr. David Phillips, Secretary
CMOS Prizes and Awards Committee
3320 Pleasant Street, Richmond, B.C. V7E 2P4
Telephone: (604) 664-9185: Fax: (604) 664-9004
E-mail: phillipsd@ecvancouver.pwc.bc.doe.ca

Atmosphere-Ocean / Atmosphère-Océan

The following papers, in the order listed, will appear in Atmosphere-Ocean, Vol. 34, No 4:

- Oceanic Tides Over the Newfoundland and Scotian Shelves from TOPEX/POSEIDON Altimetry by GUOQI HAN, MOTO IKEDA and PETER C. SMITH;
- Radar Observations of Snow Formation in a Warm Pre-frontal Snowband by GERHARD W. REUTER and RAYMOND BEAUBIEN;
- Applications of the Cyclic Spectral Analysis to the Surface Temperature Fluctuations in a Stochastic Climate Model and a GCM Simulation by JIAN-PING HUANG, HAN-RU CHO and GERALD R. NORTH;
- The Synoptic- and Planetary-Scale Signatures of Precipitating Systems over the Mackenzie River Basin by GARY M. LACKMANN and JOHN R. GYAKUM;
- Forecast of Hydrological Parameters Over the Mackenzie River Basin: Sensitivity to Initial Conditions, Horizontal Resolution and Forecast Range by NILS EK and HAROLD RITCHIE.

Sheila Bourque

Invitation à présenter des communications 31ème congrès annuel de la SCMO

Le 31e Congrès annuel de la Société canadienne de météorologie et d'océanographie se tiendra à l'Université de la Saskatchewan à Saskatoon, Saskatchewan, Canada du 2 au 6 juin 1997. Le thème du congrès sera «les cycles de l'eau et de l'énergie» afin de refléter l'importance actuelle de deux projets de recherches interdisciplinaires au Canada, BOREAS et GEWEX/MAGS.

Un "Atelier sur le glaces marines", co-parrainé par l'Office national de l'énergie, le CRNSG et la SCMO, aura lieu en même temps que le congrès. Une session spéciale sur la "Grêle" est également prévue concurremment avec la réunion du 40ème anniversaire commémorant les programmes sur la grêle ALHAS/ALHAP de l'Alberta. Il y aura également des sessions spéciales sur l'hydrologie agricole et la science des sols, et sur l'océanographie.

Comme au cours des derniers congrès, les présentations orales et écrites ainsi que les expositions commerciales sur les tous les domaines de la météorologie, de l'océanographie et de l'hydrologie sont les bienvenues.

Voici la liste préliminaire des sessions:

1. Agriculture/météorologie forestière/climatologie
2. Hydrologie agricole et science des sols
3. Qualité de l'air
4. Chimie de l'atmosphère
5. Dynamique de l'atmosphère
6. Modélisation de l'atmosphère
7. Vagues océaniques et atmosphériques
8. Météorologie aéronautique
9. BOREAS
10. Météorologie de la couche limite
11. Océanographie chimique et limnologie
12. Services commerciaux et aux clients
13. Climat et variabilité interannuelle
14. Changement climatique
15. Modélisation du climat
16. Physique des nuages et des précipitations
17. Océan côtier et eaux intérieures
18. Hydrologie du climat froid
19. Assimilation des données
20. Océanographie biologique et des pêches
21. Dynamique géophysique des fluides
22. GEWEX/MAGS/GCIP
23. Grêle
24. Hydrométéorologie
25. Prévisions à long terme et saisonnières
26. Atelier sur les glaces marines
27. Processus à mésoéchelle et phénomène météorologique violent
28. Atmosphère moyenne et MAM*
29. Circulation océanique et modélisation
30. Océanographie opérationnelle
31. Paléoclimat
32. Rayonnement
33. Télédétection et radar
34. Glaces de mer et recherche arctique
35. Prévision météorologique
36. WOCE/CLIVAR

*MAM: modélisation de l'atmosphère moyenne

Les résumés de présentation doivent parvenir au Comité du programme scientifique (président, Dr. G.S. Strong) avant le 14 février 1997. Nous recommendons fortement aux auteurs de soumettre leur résumé par courrier électronique. Un modèle pour transmettre un résumé électronique peut être obtenu à la page d'accueil du Congrès 1997 de la SCMO à:
http://ecsask65.innovplace.saskatoon.sk.ca/pages/cmos97/congrs97.html
ou par protocole de transfert de fichier anonyme à:
ecsask65.innovplace.saskatoon.sk.ca,
fichier: **/pub/cmos/abstracts/form.**

Le comité apprécierait grandement que tous les efforts possibles soient déployés pour soumettre vos résumés par courrier électronique puisque cela accélérera le processus d'acceptation et d'impression et ainsi réduira les coûts et vous donnera aussi une réponse plus rapide.

Vous pouvez toujours soumettre votre résumé sur papier ou sur disquette à:

G.S. Strong, Président
Comité du programme scientifique du Congrès 1997
a/s Service de l'environnement atmosphérique
11 Innovation Boulevard
Saskatoon, Saskatchewan
S7N 3H5 Canada

Si vous soumettez votre résumé sur disquette, veuillez utiliser soit MS-Word, WordPerfect ou WordStar et indiquer le nom et la version du logiciel utilisés sur votre disquette. La page d'accueil, dont l'adresse est indiquée plus haut, répond à la plupart des questions concernant le Congrès 1997. Pour des renseignements plus généraux sur le programme scientifique, veuillez contacter Geoff Strong à:
Courrier électronique: **StrongG@nhrisv.nhrc.sk.doe.ca**
Téléphone: (306) 975-5809; Télécopieur: (306) 975-6516.

Pour des renseignements d'ordre général sur l'inscription, l'hébergement ou les arrangements locaux, veuillez vous adresser à M. Joe Eley à:
Courrier électronique: **EleyJ@nhrisv.nhrc.sk.doe.ca**
Téléphone: (306) 975-5685; Télécopieur: (306) 975-6516.

Pour des renseignements sur l'Atelier sur les glaces marines, veuillez vous adresser au Prof. E.P. Lozowski à:
Courrier électronique: **Edward.Lozowski@ualberta.ca**
Téléphone: (403) 492-0348; Télécopieur: (403) 492-2030.

Pour des renseignements à propos de la session sur la "Grêle", ou la réunion du 40ème anniversaire commémorant les programmes sur la grêle ALHAS/ALHAP, veuillez vous adresser au Dr. Peter Summers à:
Courrier électronique: **PSummers@idirect.com**
Téléphone. (905) 508-7509.

Pour des renseignements au sujet des expositions commerciales, veuillez vous adresser à M. Oscar Koren à:
Courrier électronique: **KorenO@aestor.am.doe.ca**
Téléphone: (905) 669-2365; Télécopieur: (905) 669-4838.

Call for Papers - CMOS 31st Annual Congress

The 31st Annual Congress of the Canadian Meteorological and Oceanographic Society will be held at the University of Saskatchewan, Saskatoon, Saskatchewan, Canada, June 2-6, 1997. The theme of the congress is "water and energy cycles", to reflect current focus on two major inter-disciplinary research projects in Canada, BOREAS and GEWEX/MAGS.

A "Marine Icing Workshop" will be held concurrently with the Congress, co-sponsored by the National Energy Board, NSERC, and CMOS. A special session on "Hail" is also planned in conjunction with a 40th Anniversary Reunion commemorating the Alberta ALMAS/ALHAP hail programs. In addition to these, special sessions are also being planned in agricultural hydrology & soil science and oceanography.

As in past congresses, oral and poster papers, and commercial exhibits in all areas of meteorology, oceanography, and hydrology are invited. A preliminary list of sessions is as follows:

1. Agriculture/Forest Meteorology/Climatology
2. Agricultural Hydrology and Soil Science
3. Air Quality
4. Atmospheric Chemistry
5. Atmospheric Dynamics
6. Atmospheric Modeling
7. Atmospheric/Oceanic Waves
8. Aviation Meteorology
9. BOREAS
10. Boundary Layer Meteorology
11. Chemical Oceanography and Limnology
12. Client and Commercial Services
13. Climate/Interannual Variability
14. Climate Change
15. Climate Modeling
16. Cloud and Precipitation Physics
17. Coastal Ocean and Inland Waters
18. Cold Climate Hydrology
19. Data Assimilation
20. Fisheries and Biological Oceanography
21. Geophysical Fluid Dynamics
22. GEWEX/MAGS/GCIP
23. Hail
24. Hydrometeorology
25. Long-Range/Seasonal Forecasting
26. Marine Icing Workshop
27. Mesoscale Processes & Severe Weather
28. Middle Atmosphere & MAM*
29. Ocean Circulation & Modeling
30. Operational Oceanography
31. Paleoclimate
32. Radiation
33. Remote Sensing & Radar
34. Sea Ice and Arctic Research
35. Weather Forecasting
36. WOCE/CLIVAR

*MAM:Middle Atmosphere Modelling

Abstracts of papers must be received by the Scientific Program Committee (Chair: G.S. Strong) by 14 February, 1997. Authors are strongly encourged to submit abstracts by e-mail. A template for sending an electronic abstract can be obtained through the CMOS Congress 97 homepage at:
http://ecsask65.innovplace.saskatoon.sk.ca/pages/cmos97/congrs97.html
or via anonymous ftp to:
ecsask65.innovplace.saskatoon.sk.ca
file: **/pub/cmos/abstracts/form.**

The committee would greatly appreciate all efforts to submit abstracts electronically, as this will accelerate the approval and printing processes and therefore reduce our costs, and also provide you a faster response. You may still submit your abstract in hard- (paper) or soft-copy (diskette) by forwarding it to:

G.S. Strong, Chair
Congress '97 Scientific Program
c/o Atmospheric Environment Service
11 Innovation Boulevard
Saskatoon, Sask.
S7N 3H5 -- Canada

If submitting your summary on diskette, please use MS-Word, WordPerfect or WordStar and write the name and version of your software on your diskette. The homepage whose address is given above will answer most questions concerning the Congress 1997.

For more general information on the scientific program, please contact Geoff Strong at:
e-mail: **StrongG@nhrisv.nhrc.sk.doe.ca**
Telephone: (306) 975-5809; Fax: (306) 975-6516.

For general enquiries regarding registration, accommodation, or other local arrangements, contact Mr. Joe Eley at: e-mail: **EleyJ@nhrisv.nhrc.sk.doe.ca**
Telephone: (306) 975-5685; Fax: (306) 975-6516

For inquiries specific to the "Marine Icing Workshop", contact Prof. E.P.Lozowski at:
e-mail: **Edward.Lozowski@ualberta.ca**
Telephone: (403) 492-0348; Fax: (403) 492-2030

For inquiries specific to the session on "Hail" or the Alberta Hail Projects (ALHAS/ALHAP) 40th Anniversary Reunion, contact Dr. Peter Summers at:
e-mail: **PSummers@idirect.com**
Telephone: (905) 508-7509

For inquiries regarding "commercial exhibits", contact Mr. Oscar Koren at:
e-mail: **KorenO@aestor.am.doe.ca**
Telephone (905) 669-2365; Fax: (905) 669-4838

Conference Announcement

The Skies Above Foundation announces the "From Carbon Cycle to Bicycle" conference April 29th to May 3rd, 1997, being held at University of Victoria, British Columbia. Full announcement particulars can be found at the Skies Above website http://www.islandnet.com/~skies/

We invite you to view the website announcement and to e-mail any suggestions or comments you may have. The site itself is updated daily with the latest confirmed speakers along with an abstract of the papers to be given. Please direct any inquiries to:

Bruce Torrie, e-mail **skies@islandnet.com** or
Dale Bertrand, e-mail **azatlan@pinc.com**

Keith C. Heidorn, PhD, ACM
#304-3220 Quadra St
Victoria, British Columbia
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CALL FOR PAPERS

12th Symposium on Boundary Layers and Turbulence

28 July - 1 Aug 1997

UBC, Vancouver, British Columbia, Canada

The 12th Symposium on Boundary Layers and Turbulence will be held during Monday 28 July through Friday 1 August 1997 at the University of British Columbia (UBC) in Vancouver, Canada. These meetings are cosponsored by the American Meteorological Society (AMS) and the Canadian Meteorological and Oceanographic Society (CMOS). This is a call for papers.

Possible Session Topics: surface layers, convective PBLs, stable PBLs, ceanic boundary layers, surface-flux parameterization, moisture budget, effects of surface heterogeneities, aggregation & area averaging, biosphere models, turbulence in vegetative canopies, complex terrain and mountain boundary layers, microstructure in oceans and atmospheres, coherent structures, nonlocal closures, mixing and internal waves, dynamics of stratified turbulence, boundary-layer clouds, entrainment processes, atmospheric PBL modeling, simulations including LES and DNS, and analysis techniques including wavelets, fractals, and chaos. Some sessions could be devoted to field programs, such as: GCIP results, TOGA-COARE BL results, LIFT results, COAST 96, other new field program results, and a commemorative session for the 30th anniversary of the Kansas surface-layer experiment. The following topics, while covered in other symposia, might also be considered: scalar concentration fluctuations and diffusion, turbulence instrumentation developments, wind engineering. We are open to other related topics.

Abstracts: Abstracts are due 17 January 1997. These should be just one or two paragraphs, with no figures nor equations, and will be used by the Committee on Boundary Layers and Turbulence to decide which papers to accept. Those of you notified of acceptance will be asked to submit preprint manuscripts to AMS by 15 April 1997. We prefer to receive the first abstracts in electronic form in any one of three ways, with our highest preference listed first:

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Coordination: For further information, please contact the program chair:

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