

ZEPHYR

JULY 1973 JUILLET

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TRACKING THE BRIGHTON TORNADO BY RADAR AND COMPUTER

by D.G. Peterson

On Friday, July 13, 1973, a tornado struck Brighton, Ontario at about 7:30 in the evening EDT (2330 GMT). The storm which contained the tornado was observed by the weather radar at the Meteorological Research Station (Station WH) at Woodbridge, Ontario, some 80 nautical miles (92 statute miles) west of Brighton. The computer system which was designed as the prototype for future radar data recording and transmitting systems was in operation at the time and produced "snapshot" pictures of the storm every 6 minutes on magnetic tape.

The following pictures show computer-generated maps of the radar echos from precipitation at an altitude of 1.5 Kilometers (about 5000 feet). The lightest shade of gray within the picture indicates a rainfall rate of 0.02-0.2 inches per hour, the darkest indicates 1-4 inches per hour. For ease of orientation, the computer has added to the echo picture a set of concentric range rings at 10, 20, 40, 60, 80, 100 and 120 nautical miles from the radar. An outline map showing Lakes Ontario, Erie, Huron, Georgian Bay and Simcoe was also added, and squares for cities such as Buffalo, Hamilton, London, Kitchener, Parry Sound, Barrie, Peterborough and Belleville.

The storm which spawned the tornado began about 4:45 p.m. EDT (2045 GMT) over Lake Simcoe. It was well developed as it passed over Peterborough to the South-East about 6:30 p.m. EDT. Upon reaching the shore of Lake Ontario, the storm intensified into several cells, one of which became the Brighton tornado. The storm dissipated quickly at Brighton (total time about 7:15 - 8:00 p.m. EDT) but was still intense as it passed over Trenton. It was severe enough at 8:00 p.m. EDT to cause power fluctuations strong enough to disrupt the operation of a prototype MARS-II Marine automatic weather station installed at Point Petre.

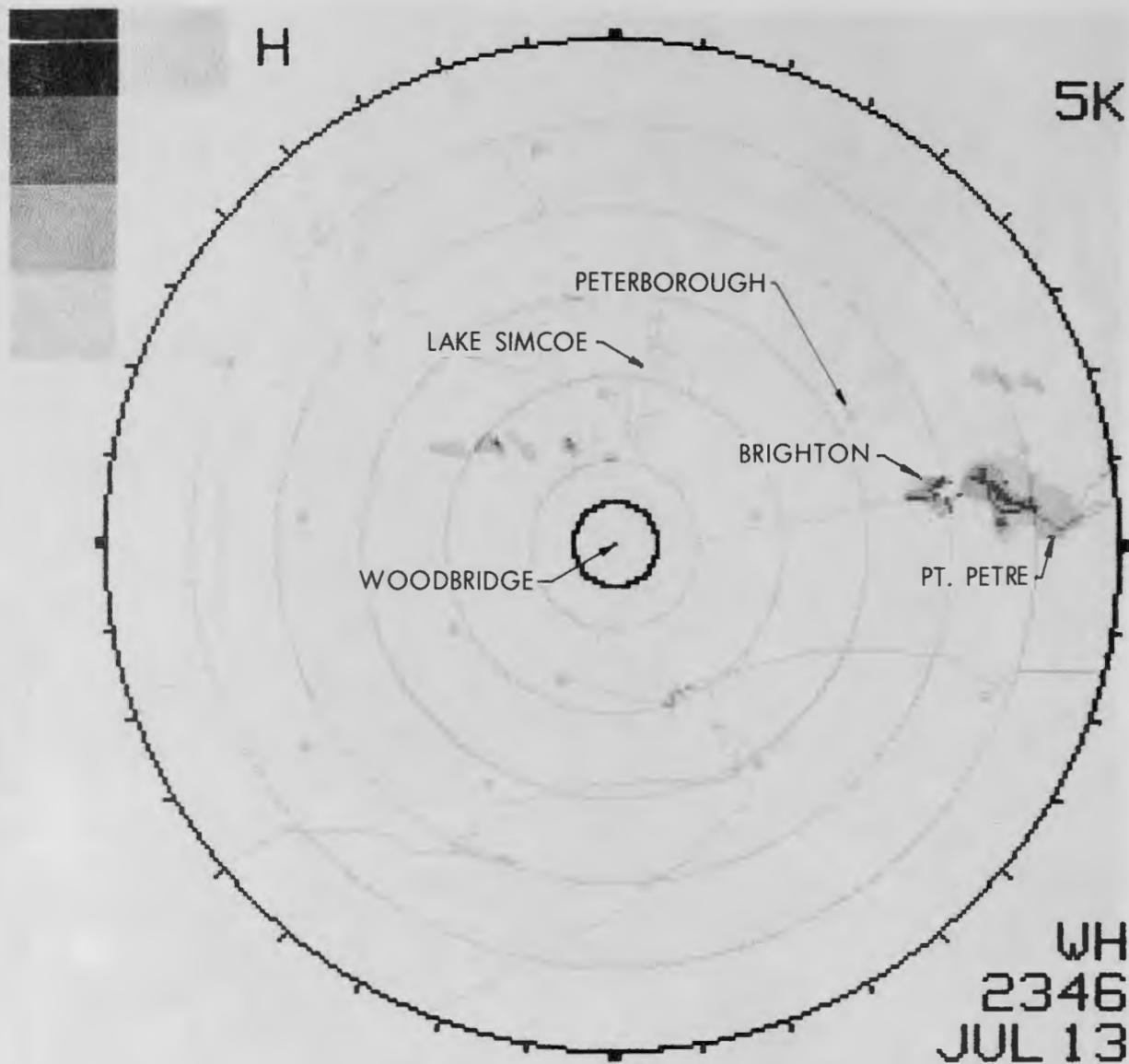
Routine control and modification of such storms as the Brighton storm is a long way off, but better and timelier warnings will be available when similar operational radar-computer systems are installed across Canada in the next few years.



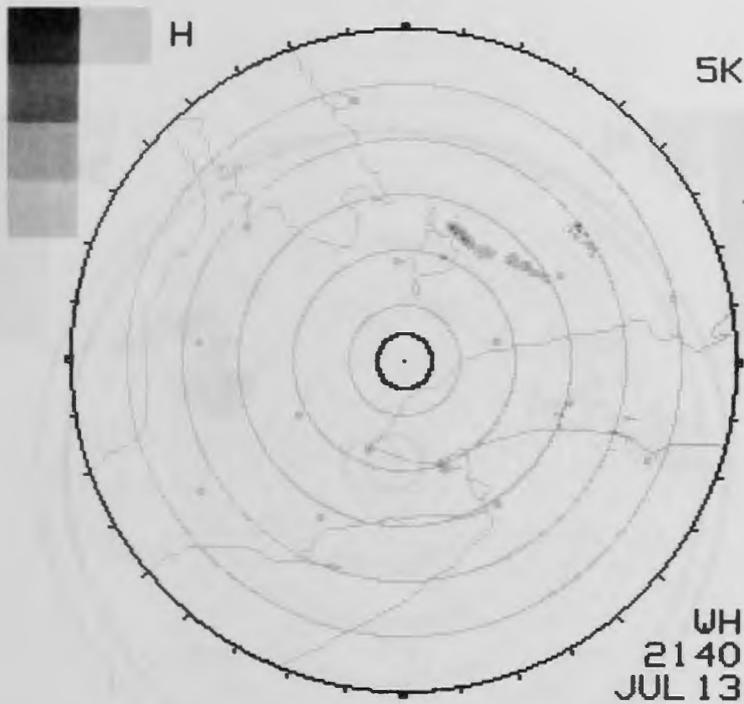
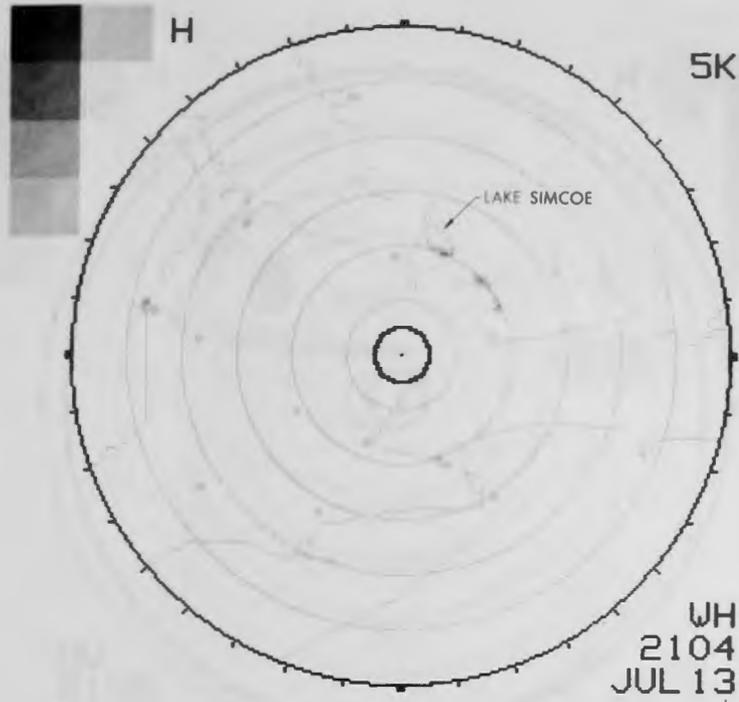
Typical damage caused by the tornado which struck Brighton, Ontario on July 13, 1973.



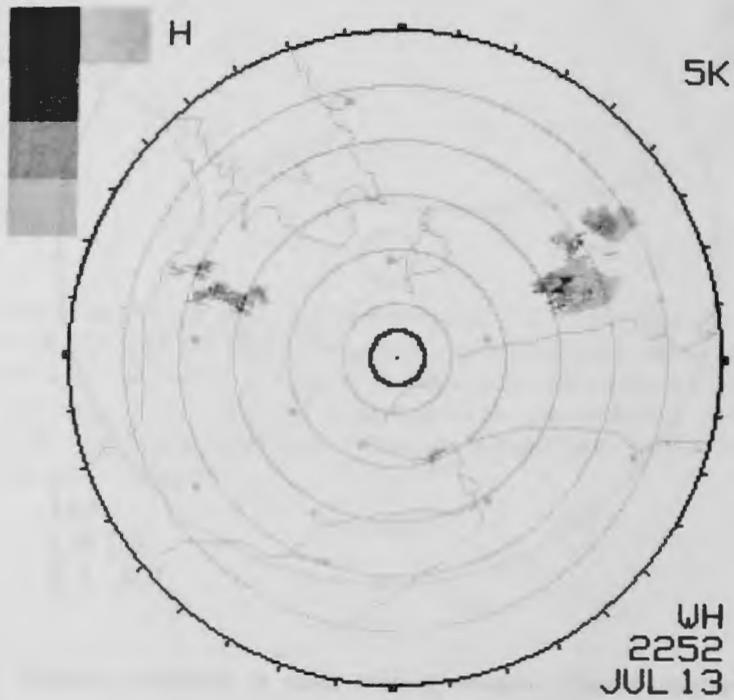
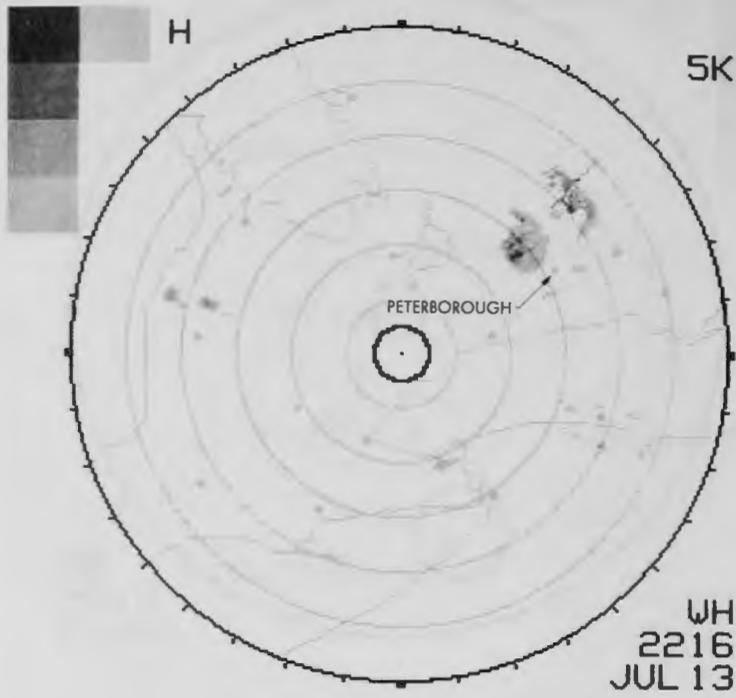
Photos Courtesy The Trentonian

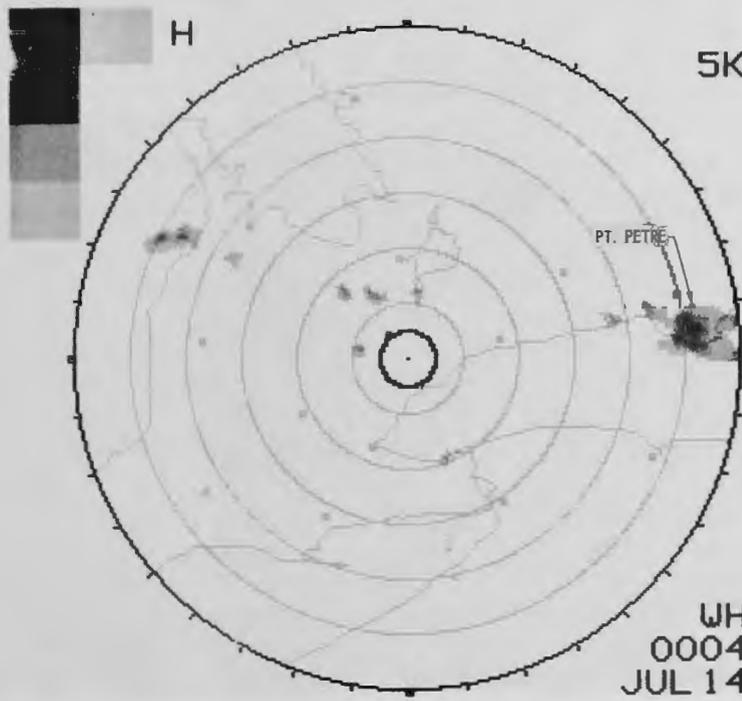
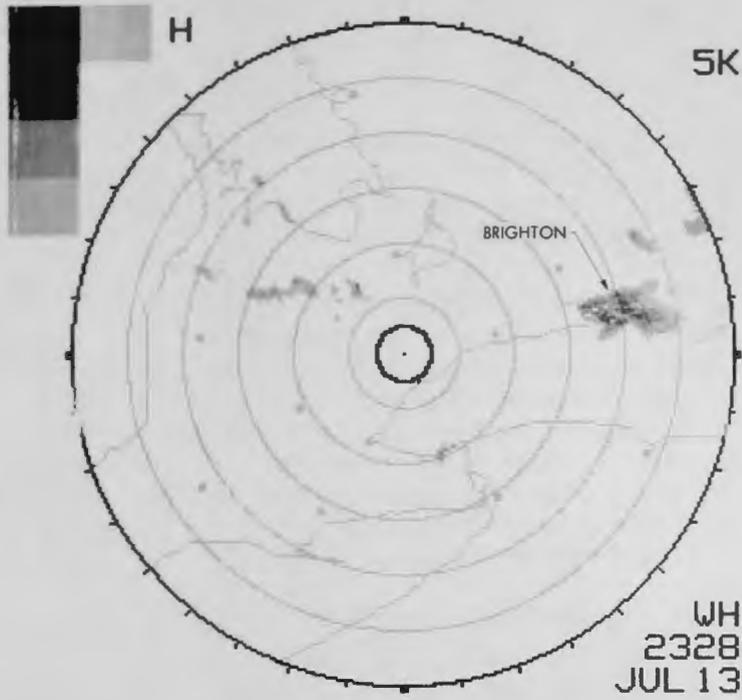


Precipitation echos at an altitude of 1.5 kilometres (about 5000 feet) shortly after the tornado struck Brighton (2346 GMT or 7:46 PM EDT). The computer-generated range rings (10, 20, 40, 60, 80, 100, and 120 nautical miles) as well as outlines of Lakes Ontario, Erie, Huron, Georgian Bay and Simcoe are shown on the radar picture. Brighton is located at the intersection of the north shore of Lake Ontario and the 80 nautical-mile range ring. Trenton is 10 miles east of Brighton and Point Petre is on the shore 25 miles east of Brighton.



Representative radar-computer pictures taken at 36-minute intervals through the life of the storm.





1973 FIELD PROGRAM TO COLLECT GRAUPEL PARTICLES IN ALBERTA

by Robert S. Schemenauer

Cloud physics is concerned predominantly with the formation, growth and fall of precipitation particles, as well as their interaction with the cloud environment. One problem within this framework that has received a lot of attention in Canada in recent years is that of developing a viable hail suppression technique.

Currently, "competition" is felt to be the process by which hail suppression could or does work, i.e., the introduction of a large number of artificial nuclei will produce large numbers of ice crystals or small frozen cloud droplets. These will then compete for the available liquid water resulting in large numbers of small hailstones instead of fewer, but more damaging, large hailstones. The intermediate stage between the ice crystal and the hailstone is the graupel particle. Graupels are white opaque particles which have formed through the accretion and freezing of clouds droplets on ice crystals; they resemble sector of spheres (conical) or take on a spherical or irregular shape, Figure 1. In our latitudes they will normally act as centres for hailstones or form rain if they melt.

There are many problems in this concept of hail suppression, a fundamental one is to determine in what concentration graupels are found naturally; parallel problems are the determination of graupel size and shape distributions and the variability of these distributions from storm to storm. As there is no Canadian data (and very little in the world) on these subjects, Drs. Chisholm* and Schemenauer of the Cloud Physics Research Division undertook a four-week field experiment in April and May of this year to obtain this basic information.

Graupels are less than 5 mm (typical 1-3 mm) in maximum dimension and have a typical density of 0.6 g cm^{-3} , they therefore will melt rapidly if surface temperatures are significantly above freezing. For this reason the high altitudes and low temperatures (in April and May) found in the Rocky Mountain foothills west of Red Deer, Figure 2, are ideal for the collection of graupels. In addition this is the area that spawns many of the damaging hail storms that cross Alberta in the summer so that data obtained in this area may be relevant to hailstorm initiation on the prairies.

There were two parts to the experiments. The first was the photographing of sample pads which had been exposed for a measured time period and the subsequent close up photography of individual particles on the pads. The photographic system is shown in Figure 3. The second part of the experiments was the collection of samples of graupels which were taken back to the laboratory for physical and chemical analysis. A four wheel drive GMC Jimmy, Figure 4, borrowed from the AES Numerical Studies Division, was used for transportation. Dry ice was carried to cool the collection pads and to use in storing samples collected.

Heavy graupel showers were encountered on three days and light showers, Figure 5, on three further days. The data obtained have been analyzed to determine number concentrations and size and shape distributions. The laboratory analysis is continuing. The size distributions obtained were exponential with sizes ranging from 0.5 mm (experimental lower limit) to a maximum of 7 mm. The shapes were predominantly

*Now with the Air Quality Research Branch.



A conical graupel.



Limestone mountain from the forestry trail on Corkscrew mountain.



Photographic equipment in the back of the truck.



GMC Jimmy on the forestry trail.



Shower over the foothills.



Road obstruction on the prairies.

conical, particularly in the case of the larger particles. The average apex angle for the conical particles was 75° . Number densities could differ by an order of magnitude or more. Because of the sequential sampling method used, variations in number densities as well as size ranges could be seen throughout a shower as individual cells passed overhead.

Other Cloud Physics personnel in the region over the summer are collecting hail samples with a mobile sampling unit and shipping them back to Toronto for analysis. This will continue until the end of the hail season giving a four month sampling of graupel and hail showers in the foothills. These samples are being analyzed for continuity in particle shape, structure and concentration.

It is hoped that the fundamental data obtained here will be of use in interpreting the radar structure of storms and in cloud modelling as well as in understanding present hail suppression concepts.

NEW UPPER AIR STATION AT SHELBURNE, N.S.

On November 1, 1972, a new Upper Air Station began rawinsonde observations twice daily at 0000Z and 1200Z at Shelburne in southwestern Nova Scotia.

The new station expands the Atmospheric Environment Services network of Upper Air Stations to a total of thirty-five in Canada. While most of the stations of this type are located in isolated or semi isolated localities, there are a few that are considered as preferred stations due to their geographical location. Shelburne is one of these since it is located only about five miles as the crow flies, in a southeast direction, from the town of Shelburne which has a population of about 5,000 people.

In addition to two rawinsonde observations per day, the staff keep a climatological record, covering maximum and minimum temperature, precipitation and hours of bright sunshine. Although the station is equipped with the necessary instruments to assume a complete 24-hour weather program, staff shortage does not allow 24-hour coverage at this time. However, it is hoped that a full program will be implemented in the near future.

The rawinsonde observations are passed to Halifax Atlantic Weather Central by means of telex and the climate records to Regional Office in Moncton, in the usual manner, at the end of each month.

The staff at the new station consists of four seasoned technicians, including the Acting Officer-in-Charge, Mr. John Brown. Other members of the staff include Linden Tanner, Dexter Cadger and Howard Mosher. They all live in or around the town and commute to the station daily.

There is a Decca Navigation Station just down the road about half a mile. The telecom station manager, Mr. John McNeil, and his staff take care of the sophisticated GMD equipment which is used to track the balloons.



U/A station looking SE.



Looking NW.



Releasing the balloon.



John and Lin busy doing the rawin and raob.



John Brown mans the theodolite

while



*John McNeil copies the readings for the RMS. (theodolite
GMD comparison).*

The buildings are of modern design with the operations building being a two storey type which affords ample room for the operation. The hydrogen building is equipped with a hydrolitic generator for manufacturing hydrogen. It has doors on three sides to facilitate the release of balloons according to the direction of the wind.

When one visits the site, there are two choices of roads. One is to drive five miles over a dirt road which is usually full of pot holes and rough. The other is to drive around the east side of the peninsula a distance of about twelve miles over a paved road.

To the staff there is an advantage in so far as one would save some gas to drive the shorter route, but the saving would probably go for replacing nuts and bolts that come loose due to excessive vibration. So it really does not matter which road you take. Minor inconveniences are outweighed by the advantages of living in a town and working at an Upper Air Station, both of which are situated on the mainland in the southwestern part of Canada's Ocean Playground.

RETIREMENT OF MISS HILDA BURTCH

On Thursday, July 12, 1973, about 50 friends and colleagues of Hilda Burtch gathered for a special luncheon at the Four Winds Restaurant near AES Headquarters in Toronto to honour her on her retirement from the Atmospheric Environment Service. When Miss Burtch joined the Meteorological Service staff in 1931 there were only two other full-time women employees at 315 Bloor Street West. The central office, as Headquarters was then called, had been reorganized that year into the following divisions – Administrative, Forecast, Climatological, Physics and Magnetic. Mr. Andrew Thomson had just joined the staff and was placed in charge of the Physics Division. The same year two special typists



were appointed to operate the new teletype machines which had been installed in the teletype office in lieu of the Morse system. Miss Burtch's original position was secretary to the Dominion Climatologist, Mr. A.J. Connor, and she quickly earned a reputation for her speedy and efficient typing. After Mr. Connor's retirement in 1949, Miss Burtch was Mr. C.C. Boughner's secretary for a number of years before transferring to a clerical position where she was, for many years, responsible for the temperature, precipitation and wind abstracts. Mr. Boughner returned from his own retirement for the luncheon and on behalf of Miss Burtch's friends and colleagues presented her with an outdoor redwood furniture set and a purse for carpeting the balcony of her new apartment in Toronto.

ON N'A PLUS LES ETES QU'ON AVAIT

QUEBEC

Jeudi, le 13 juin 1816

Nous avons observé dans la Gazette de Jeudi dernier, le 6 du courant, la circonstance extraordinaire d'une chute de Neige ce jour là de plus d'une heure de durée. Depuis ce tems la saison a donné des signes de sévérité permanente et extraordinaire. Le 6 après-midi, lorsque les nuages se sont dissipés, le haut des Montagnes au nord de cette Ville a paru couvert de Neige, les plus éloignés paroisoient en avoir un pied d'épais. Le 7 il y a eu un peu de Neige, le Thermomètre étant toujours au point de gelée. A dix heures et demie du soir, les couvertures des Maisons, les rues et places de la ville étoient entièrement recouvertes de Neige: et le lendemain le 8, la compagne dans les environs étoit dans le même état, ayant, douze jours avant le solstice d'été, l'apparence du milieu de Décembre. Un Monsieur, qui étoit, Vendredi dernier, au côté Sud, à cinq lieues du Fleuve, a trouvé des bancs de neige jusqu'à l'essieu de sa voiture, et une poudrerie comme dans le milieu de l'Hiver. Le 8 la neige a continué à tomber par intervalles dans différentes parties. Il a encore neigé le 9. Depuis le 6 jusqu'au 10 il a gelé tous les nuits. Le 7, la terre, dans des situation exposées, a gelé dans le jour. Le vent a été constamment fort du Nord-Ouest, chassant devant lui des masses immenses de nuages qui cachoient continuellement le Soleil. Ce ne fut que Dimanche après midi qu'ils se dissipèrent. On vit alors que quoique la neige qui étoit tombée dans la nuit du 7 eût disparu de bonne heure le lendemain, le sommet des montagnes dans le Nord et dans le Sud étoit encore couvert de neige. Sur le côté Ouest de la Rivière Chaudière, il y avoit encore de grands morceaux de terre déserte qui étoient encore couverts, et ils restèrent de même jusqu'à Lundi. Nous sommes informés que dans cette partie-là la neige est restée pendant quelque tems environ un pied de hauteur.

Parmi le grand nombre de circonstances extraordinaires qui ont accompagné une saison sans exemple, de la mémoire des habitants, ou dans les annales du Pays, nous avons observé que Jeudi, un grand nombre d'oiseaux qu'on ne voit ordinairement que dans les grands bois, ont paru dans la Ville, et l'on en voyoit dans toutes les rues et mêmes dans les vaisseaux. Plusieurs toiboient morts dans les rues, et d'autres étoient détruits par des jeunes gens ou des personnes cruelles. Les hirondelles ont entièrement disparu pendant plusieurs jours. Plusieurs espèces d'arbres ont laissé tomber leurs feuilles qui étoient fanées

avant que d'être à moitié ouvertes. Dans la Campagne un grand nombre de Moutons nouvellement tondus ont été tués par le froid. Les habitans prudents ont mis leur bestiaux à l'abri pendant plusieurs jours. Dans presque toutes les maisons les Poêles ont été régulièrement chauffés comme en Hiver.

Nous nous flattons que le tort fait aux récoltes dans le voisinage de cette ville. n'est pas tout à fait aussi grand qu'on auroit pu le craindre. La neige de vendredi dans la nuit les a protégées contre les grandes gelées. Si la végétation eût été plus avancée, elle auroit souffert davantage. Les boutons des arbres fruitiers étoient à peine ouverts. Dans les situations exposées les arbres des forêts ont beaucoup souffert quoique les feuilles ne fussent pas à moitié ouvertes. Les jardins et les arbres fruitiers sauvages qui étoient en fleurs, ont beaucoup souffert.

La dernière année a été une des plus tardives que l'on eût encore jamais vues dans le Pays: le 4 Juin les arbres n'étoient pas en feuilles. Maintenant, le 12, ils ne sont pas aussi avancés qu'ils l'étoient l'année dernière le 4.

Nous n'avons eu que cinq ou six jours ou six jours où le Thermomètre se soit élevé au dessus de 60° de Fahrenheit. Quant au retard de la saison, nous voyons les mêmes plaintes dans toute la partie Nord des Etats-Unis. Le 15 Mai il a gelé dans la Virginie et la Pensilvanie. Vers le même tems on s'est plaint du froid sur le Mississipi et le Missouri, et le long du Ohio. Le Lac Erié n'a été débarrassé des glaces que vers le 10 Mai. Tout le long du Fleuve St. Laurent, et même à Halifax les plaintes sont les mêmes.

Dans des circonstances aussi défavorables aux productions de la terre dans une aussi grande étendue de Pays, on ne peut pas recommander trop de précautions contre la disette. Nous n'avons que quelques jours pendant lesquels on peut semer des patates, de l'orge et des navets, avec quelque espérance qu'ils viendront à maturité. On ne devrait rien négliger de ce qui peut pourvoir une subsistance pour l'homme et les animaux, quoique nous puissions encore être favorisés d'une meilleure année que ne l'indiquent les apparences actuelles.

OCEAN WEATHER STATION PAPA ASSISTS IN SKYLAB EARTH RESOURCES PROJECT

On June 12, 1973, Headquarters received an urgent request from Dr. Willard Pierson of New York University in connection with earth resources measurements being made on board the Skylab satellite. Skylab was to pass over our Ocean Weather Station PAPA at 50°N, 145°W, at 1343 GMT, June 13, and special measurements were to be made from which surface meteorological and state of sea conditions could be determined. The meteorological staff of C.C.G.S. QUADRA, which was on station at the time, was asked to make special observations of wind speed and direction, wave height, clouds, air temperature, and sea temperature over a twenty minute period centred on the time of the pass. This information would serve as ground truth for the Skylab measurements. The weather ship staff made the observations (at 3:40 a.m. ships' time); the data were relayed to Headquarters by message, and passed on to Dr. Pierson the next day. It will be some time before the results of the tests are known.

ICE DISPLAY PIANC, OTTAWA 9-12 JULY, 1973

The Permanent International Association of Navigation Congresses quadrennial convention in Ottawa featured a number of displays relating to marine navigation. Among these was an exhibit demonstrating the work of the Ice Division of AES.

Delegates to PIANC conventions are marine experts from the maritime nations of the world. They represent Government and Industry, inland and ocean navigation. Many are engineers and specialists in the field of ship construction, communications, etc. Their prime concerns are scientific and technical developments which affect marine navigation. These conventions permit exchanges of information on these developments and related problems between nations at a very high level. This convention had broad international press coverage.

Our exhibit, a 20' x 20' area, was designed by Information Canada to highlight some of the features of the ice program. Coordination was handled by A.P. Beaton in Ottawa, and by Lloyd Clarke, C.I. Taggart and A. Lavinski, of Headquarters staff in Toronto. A bluish background, including the rug, was chosen to portray a feeling of coldness throughout the exhibit. When back-lighting was used this was very effective, particularly the "open water" areas of Hudson Bay.



Model of Lockheed Electra 188C

Static features of the display were:

- an area of operations charts showing the year-round extent of our reconnaissance and forecast activity, the "active areas" at the time of the congress, the bases from which aerial reconnaissance is flown, and the location of the radio facsimile transmitters over which ice charts are broadcast.



Views of AES Exhibit at PIANC – Ottawa

- a stylized map of the Hudson Bay area, with an overlay showing actual ice conditions in the bay.
- two aircraft models (24 inch wingspan): the Lockheed Electra 188C – in its first year of service under AES contract, and the Douglas DC4 – our flying platform from 1966-1972.

a series of pictures (20" x 23") of operations and equipment in the Electra Aircraft, including infra-red film strips and a laser profilometer trace.

several blown-up color transparencies, back-lighted, showing ice, icebergs and ship operations in ice.

samples of Very High Resolution Radiometer pictures from NOAA-2, and Earth Resources Technology Satellite pictures, indicating the potential of these recent developments in observing technology.

a sample of a composite ice chart prepared in the Ice Central for mail distribution to a long list of multipurpose users.

Side Looking Airborne Radar imagery -- the all weather tool for ice observing (but which we do not have in our electronic kit at the present time).

The "live" feature of the exhibit was facsimile transmission and reception of ice and weather charts. Over a broadband circuit three transmissions per day were made from the Ice Central to the display booth in the Chateau Laurier Hotel. A radio facsimile transmitter, similar to those which the ice reconnaissance aircraft use for direct relays to ice-breakers was on display and was used to make transmissions from one side of the exhibit to the other.

The exhibit was manned by John Comeau from the Ice Observing Unit in Toronto with assistance from Fred Geddes of Ice Central.

Exhibits were open for viewing from 9:00 a.m. to 7:00 p.m. Monday to Thursday and most delegates appear to have visited them. Our display was one of four from D.O.F M.O.T. also had four, with single exhibits from Telesat Canada, Ports Canada, National Research Council, St. Lawrence Seaway Authority and the Department of Public Works. Comments on the complete display were quite complimentary, and our exhibit from the Ice Division was apparently one of the more interesting.

IN MEMORIAM

The Western Region was saddened by the death of Rodney Kitt Holbrook on July 30, 1973 after a lengthy illness.

Rod was 51 years old and served as Officer-In-Charge of Calgary Weather Office since 1966. He is survived by his wife Edna, a son Robert and a daughter Susan.

He served with the RCAF in World War II and joined the Canadian Meteorological Service in 1948. He was stationed at a number of Canadian Forces Weather Offices including Dartmouth, Macdonald and Portage la Prairie before proceeding overseas to an assignment at Zweibrücken from 1960 to 1964. Upon returning to Canada he was posted to Canadian Forces Weather Office at Namao and transferred later to Weather Office, Edmonton before assuming responsibility as Officer-in-Charge of Weather Office, Calgary.

His friendly manner combined with a ready sense of humour contributed to his popularity with his colleagues in the Atmospheric Environment Service and other government departments, industry and the academic community.

He was President of the Calgary Professional Institute and active in the Federal Institute of Management. He enjoyed work with environment groups and promoted education in the science of Meteorology in Calgary schools and the university.

A.R.T. SURVEY OF LAKE ONTARIO

by Joan Schwartz

On July 9, 1973, I tagged along with George Irbe on an A.R.T. survey of Lake Ontario. Having just graduated as a specialist in geography, I was interested in the techniques and results of the survey and eager for the chance to view familiar countryside from the air. It provided an excellent opportunity to observe the physical layout of the land as well as the urban and agricultural patterns bordering the Lake. Land and water, forest and farm, cities, towns and ribbons of highway all took on new meaning when seen from this exciting, new perspective.

The survey was conducted by George Irbe, A.E.S. HQTRS, Lakes and Marine Applications Section. Here pilot Howard Carter of Toronto Airways, Buttonville, is seen with the plane used, a Piper Aztec.



The Niagara Escarpment, 200 to 275 feet high, rises abruptly near Grimsby but, as seen here, more gradually in the vicinity of Beamsville. The wooded scarp face separates the orchards and vineyards of the sheltered Iroquois Plain (below) from the pattern of mixed farming on the Haldimand Plain (above). The widening of the Queen Elizabeth Way has cut a great swath through the fruitbelt, particularly near Grimsby, retiring forever much valuable agricultural land.



The survey took us over the central portion of Toronto three times in all. From takeoff at Buttonville, we headed southwest across the city to begin the temperature readings at Bronte. Here, the business district south of Queen Street is seen with the Western Gap and Island Airport in the background during the overland pass from Humber Bay to Frenchman Bay. Returning to Buttonville from the end of the survey at Clarkson, we crossed the city once again. On this third pass, mid-afternoon turbulence over the strongly heated urban landscape prevented further attempts to photograph the city.

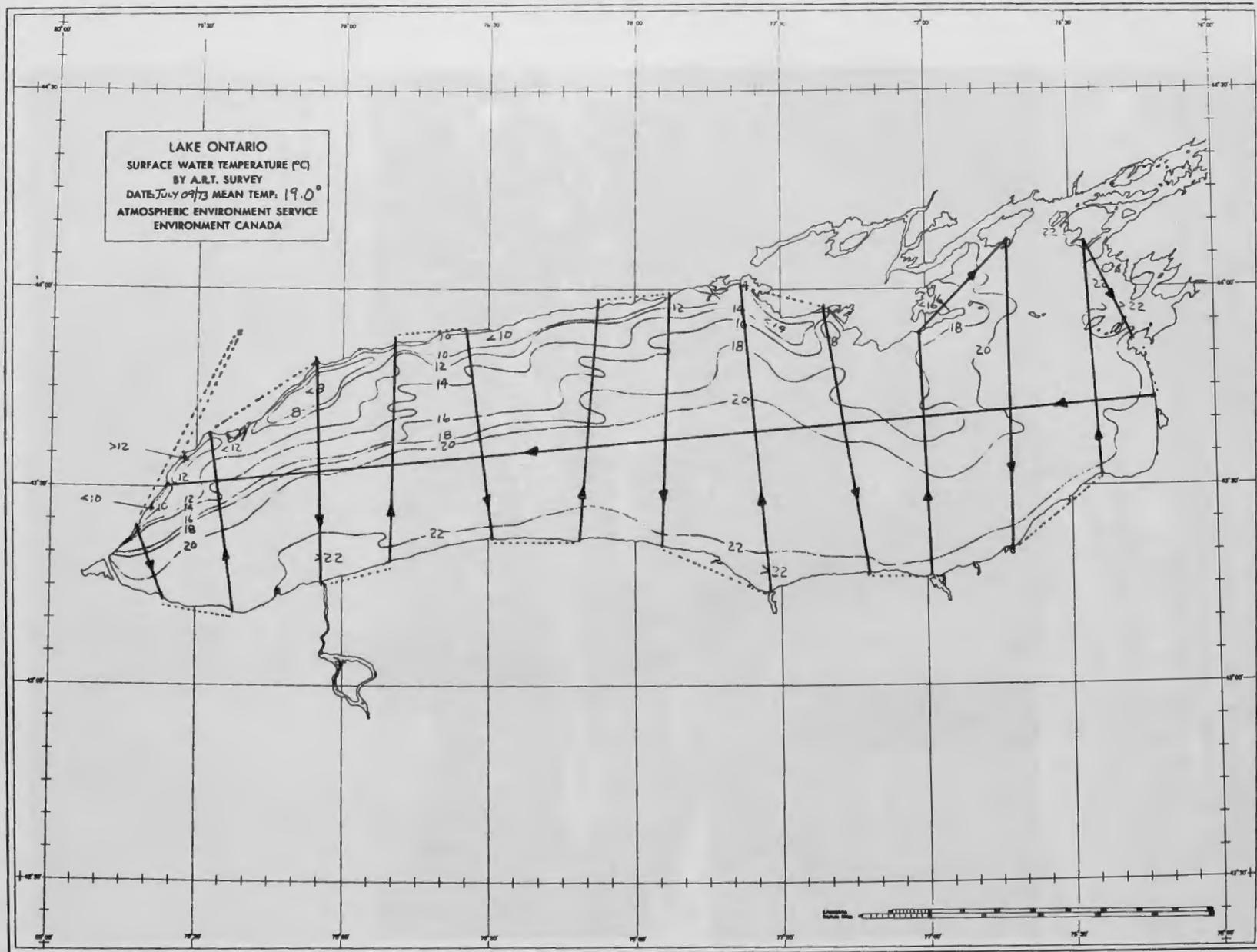


Flying south for our third run over the lake, we had a view of the Pickering nuclear generating station. Upwelling along this portion of the north shore kept the water cool at 6.1°C , but the "plume" of the generating station inflated temperatures by more than 50% to 9.7°C . Due to west winds, only part of the plume was detected. A similar situation was indicated by the trace in the area of the nuclear power plant at Nine Mile Point, New York.



An hour long over-lake run from South Sandy Creek, New York to Clarkson completed the survey. Here, Clarkson is in the foreground with Port Credit and the Lakeview generating station to the east. Our course provided a good look at the oil refining operations which mark the Eastern terminus of the Trans-Canada Pipeline. We returned to Buttonville, touching down almost six hours after takeoff. A valuable experience, the flight will long be remembered.





Map showing route and results of A.R.T. survey, July 9, 1973.

REGIONAL SHORT RANGE PREDICTION MODEL APPLIED TO WEST COAST AREA

Automated and fully up-to-date short range prognostic charts of m.s.l. pressure can be usefully prepared for areas along the West Coast of B.C. using a combination of satellite data, six-hourly ship reports and hourly reports from coastal stations. That is the indication as a result of a test carried out on nine consecutive days of last winter by the Forecast Research Division of the Meteorological Services Research Branch.

The test was in connection with a study of the utility of satellite data and ocean weather ship reports and was reported on at the Canadian Meteorological Congress in Halifax in June.

The main indications of this small sample study were:

- (1) That satellite vertical temperature profile data, now available regularly between 0300 and 0800Z over the eastern Pacific (also 1500Z - 2000Z), supply information useful for defining the surface pressure field and which is comparable in value to the regular reports from itinerant shipping. 18-hour progs prepared using the satellite data up to an hour before the 06Z reports scored as well as those produced from 06Z and 07Z data, using the latest ship data, thus showing the value of the satellite data in updating as soon as it is available.
- (2) That these satellite data can be combined with coastal hourly and regular ship reports to produce up-to-date short range prognostics out to 18-24 hours which score significantly better than do time-interpolations of CMC prognostics available at the same time, but not assimilating data after 00Z (or 12Z as the case may be).
- (3) Objective analyses are of the same general quality as a good hand analysis.

The nine day test was made using data saved on magnetic tape permitting the use of a commercial computing centre to carry out the computations on different selections of the data. Hourly data assimilating was carried out and forecasts were prepared at 5Z, 7Z and at 21Z. Comparisons were made on the basis of 18 hour forecasts of the pressure gradient along the coast of B.C. and Alaska.

The grid used was at 127 km spacing, and included all of the Aleutians and coastal Alaska and B.C. Time-dependent lateral boundaries were taken from CMC prognostics. The 500 mb prognostic flow which enters the prediction equations at each hourly time step was obtained by time and space interpolation from the same CMC forecast model. Scores obtained were comparable with those obtained using the Regional Update Model for the Great Lakes area at the National Test Bed Facility which is operated by the Forecast Research Division in order to provide a simulation of the computer and communication facilities of a Weather Office for testing prediction models and techniques.

J. GLENN DYER RETIRES

J. Glenn Dyer, Deputy Chief, Overseas Operations Division, U.S. National Weather Service NOAA, and principal architect and mover of the U.S. participation in the Joint Arctic Weather Stations in the High Arctic, retired in June 1973.

He was deeply involved in every aspect of the operation of JAWS stations from their inception until U.S. participation ceased in 1971, following 25 successful years of co-operation.



On June 27, 1973 in Washington D.C. at a dinner in his honour, Dan Buss of AES, presented him with a certificate of appreciation on behalf of J.R.H. Noble, ADM of AES, and the Canadian Meteorological Staff who, over the years, enjoyed a high standard of arctic living at the JAWS stations due to his concerned involvement.

MANAGEMENT BY MOTIVATION SEMINAR

During the week of May 6-11, 1973 the Management by Motivation Seminar was conducted at the Muskoka Sands Inn, near Gravenhurst, Ont. This was not an unusual event, because 50 of our A.E.S. managers had previously studied in one of these seminars between January 1969 and November 1971 when we had a few managers at a time "hitch-hike" on seminars conducted by D.V.A. Training Officers J. Forrester and D. Ferguson. What makes it an event worthy of note is; this was the first seminar to be conducted by A.E.S. staff mainly for A.E.S. managers.

The seminar got off to a good start when Mr. F.W. Benum, Director General, Field Services, spoke to the participants at the opening dinner Sunday, May 6th on behalf of senior management.



There were seven teams in all; four seven-member teams; two six-member teams, and one five-member team.

A couple of teams were caught in action.

Would you believe that the smallest team moved from lowest efficiency score on the first task to the highest on the third task?

Would you also believe the same team was judged winner on the caste study assignment?



This was the first seminar in which the winning team won awards. Lamps-of-knowledge were presented to each team member plus two bottles of wine to celebrate the occasion.



Roy Bourke leads a General Session on theory of learning.

Don Barrett leading a General Session.



If you see faces you don't recognize, it could be because they are from outside A.E.S. There were three managers from other units of DOE Ontario Area; One from M.O.T.; one from D.V.A.; two from D.N.D.; and; five from Canada P.O.



S.F. Lucas, Area Staff Training Officer, D.O.E., Ontario area was ably assisted by D. Aston, Central Services, D.G. Barrett and R.S. Bourke, Instrument Branch, and H.W. Johnston, Field Services, who formed a team to research and refine the material in preparation for the seminar and were co-leaders who carried the responsibility for specific segments of the seminar.





All teams gathered in general assembly for team presentations, film viewing, and other discussions pertinent to the objectives of the seminar.

There were as many solutions to the case study as there were teams. This was one in which the team roleplayed the principles in the case, proof that learning can take place in a pleasurable situation! (There are those authorities who maintain that pleasantness is paramount in making the learning "stick".)



There were other pleasantries too – the waitresses! Each was presented with a small gift for the pleasant service they rendered in the dining room throughout the week.



Oh yes! All the participants and leaders ate during the week.

According to written, anonymous critiques completed by participants, this Management by Motivation Seminar was one of the best yet conducted.

INFORMATION FROM GOOSE BAY

(Excerpt from an information handout prepared by the staff at Goose Bay W.O. for distribution during the open house recently held at Goose Air Base).

In spite of an ever accelerating technology, man is still very susceptible to the whims of the weather. Violent events such as hurricanes, tornadoes, floods and droughts continue to take catastrophic toll of life and property. Table (1) shows the average annual cost of hurricanes, in millions of dollars, spent in the United States and Canada.

Damage	300.0
Aircraft reconnaissance	2.5
Communications	0.2
Protection	2.9
Evacuation	2.0
Special Interests	2.0

Faced with such figures, one can appreciate the importance of accurate forecasts. From virtually no warning during the first two decades of this century, skill has increased to forecasts giving a 24-hour displacement error of about 100 miles.

Modification of hurricanes is a possibility. In the 1960's the United States began work on Project Stormfury. Although man does not as yet have the power to disperse hurricanes, it is hoped that he may be able to reduce their damaging effects.

Tornadoes are another awesome force of nature. In 1925 a single tornado killed 695, injured 2,027 and caused \$40,000,000 worth of damage.

Floods can be even more devastating. In 1887, China suffered one of the most destructive floods in history when the Hwang-Ho and Yellow Rivers overflowed in September. Water rose 70 feet inundating 50,000 square miles. 2,000,000 people were made homeless, 300 villages were swept away and 900,000 people were killed.

Long-term weather variations are also important. During the first half of this century, the Northern Hemisphere experienced a period of unusually warm weather. The fifties and sixties have shown significant signs of a change to a wetter and colder climate, partly caused by air pollution.

Man is learning that the atmosphere can be overtaxed and made incapable of performing the functions demanded of it. The increase of dust into the atmosphere has caused portions of the earth to cool during the past 20 years as much as they had warmed during the past 150 years.

There are two types of air pollution: Natural and man-made. Examples of natural air pollution include particles entering the atmosphere from volcanoes, deserts, and forest fires. Examples of man-made pollutants are automobile exhaust, burning of fuel for power and heat, burning wastes, manufacturing processes, demolition and construction operations, atomic fallout and jet aircraft exhaust.

The daily output of every 1,000 operating automobiles in an urban community has been estimated to burden the air with 3.2 tons of carbon monoxide, 400 to 800

pounds of organic vapours and 100 to 300 pounds of nitrous oxides plus smaller amounts of sulphur and other chemicals.

For the average family, air pollution adds several hundred dollars per year in washing, cleaning, repairing and repainting bills.

NEWS FROM THE K.T. MCLEODS' IN IRAN (cont'd)

Continued from the May Issue.

The movement called 'Sufism' is common in this country. It was included in the University curriculum last term and we attended the interesting series of lectures given by internationally known Prof. Nasr.

The Islam religion which colonized Iran in the 7th century has come to fuse every aspect of Iranian life. Everything we think of as most beautifully Persian springs from this faith in one form or another – its rich architecture, exquisite miniature paintings, carvings, weaving designs, metalwork, pottery, the secret gardens, its literature and poetry. For Iran, earthly paradise has not been in mind only – imagining gardens lovelier than they are – no, they have seized upon fancy and turned it into fact. They have made of the desert a foil to their art, and used it as a painter uses a frame. The wall, a structural necessity of desert life, became in Persian hands an aesthetic device. They became masters of the courtyard and the arcade.

Their privacy is a high Persian priority and their artistry of reducing the scale of a vast wilderness to the scale of a single flower is half the Persian charm. The towns and cities are well treed and the citizens take pride in their care. Yes, they have given their beliefs their own special cast. Wherever you go Islam greets you with its ancient and modern splendours. The beautiful mosque is always looking up, over and down upon the full variety of life, while around are the mauve mountains, and above, the clear blue sky.

Five times a day Koran chanting and the call to worship is heard. Prayers can be said anywhere, while at work, or leisure, by the street curb, or wherever. It is Islam on the spot, or in the mosque. Every day Teheran broadcasts its traditional music, along with the drum beat and its poems, bringing its message and mystique into the home. This is a country where the lyric poets of long ago are remembered daily.

Just as change is sweeping the west, so it is in Asia, which holds the bulk of the world's population and has great wealth – a wealth of mostly untapped resources, such as oil, rubber and copper. It is also a country rich in literature, poetry and philosophy, and steeped in great and historical events and discoveries. It is rich in matters spiritual. The great religions of the world originated here. But in the midst of all this cultural affluence, many of its people are still illiterate, with a life expectancy of maybe less than 30 years, and a standard of living at times below minimum requirements. It is a part of the world filled with people with unrealized ambitions who wish for better circumstances for themselves and their children.

Iran is certainly on this march of change. The present Shah, called suddenly to the throne in 1944, immediately prepared a program of far reaching reforms for his country. A referendum on June 29, 1963, marked the beginning of Iran's so-called White Revolution. Its Chief is the Shah. He stripped men of their silken robes, women of their black overcovering (chadors), abolished titles of the nobility, attacked the power of the mullahs, weakened the power of the tribal leaders. In brief, this vote called for the end of the old feudal system, and thus the redistribution of the land to the people; the nationalization of the forest areas, pasture lands and national resources; new workers profit sharing plans; emancipation of women; the literary corps; health corps; and rural development, including its 15-20,000 cooperatives. All this entails improved transport facilities such as roads, railways, motor and air services; modern dams, added water and electrical supplies; new schools, new workers' homes, handicraft and cultural centres. The Peykan motor car, built in rapidly increasing numbers in Iran, together with imported cars, has made for Teheran a city traffic that is probably the most confused and desperate in the world.

Side by side with modernization one still sees flocks of sheep with their shepherd on the streets of the city. The small, faithful, and burdened donkeys pass us on the street sometimes so completely submerged with produce that they are barely visible except for two little eyes, four tiny feet and their clinking hoofs along the walk, with of course the master calling his wares in a highly individualized style. Along our kuchi, or lane, there can be several of us, craning our necks outside our kitchen windows to see what all the fuss is about, or waiting to buy our vegetables and bread. Camel caravans, with their tinkle bells, can be seen lumbering along the roadside near the city or heading into the desert. One might encounter a man, like a bundle of clothing lying in a hump, resting; or talkative women washing carpe's, laundry or dishes in the sluice stream, spring or open tubs along the streets; or heroic nomad women in area costume, seen at work in their garden, or doing colorful needle work or weaving, carrying supplies of water by head or hand, or just keeping watch.

At a corner a man is seen setting up his small 2 by 3 foot lettuce or nut stand; or a man squatted by his tiny one foot square, selling trinkets, stamps, his special brand of gum, muffins, or . . . Or we encounter something unrecognizable at first due to its towering load of utility items moving along atop tiny wheels; or a little man comes by balancing on his head his fragile store, - covered with net, an artificial bird or balloon atop circling in the breeze - filled with an assortment of miniature toys and gadgets, their owner hoping to attract children young or old, in order to realize a few rials (cents). It all forms a concept of each doing his own 'wee' thing, and at the same time feeling that his business is sufficiently important that he can be termed a 'merchant'.

These devoted 'merchants', perhaps with only a young son to assist at times, operate what must be the tiniest business set-up in the world - without strikes, personnel problems or complicated bookkeeping. They can attract the attention, wonder and puzzlement of the most sophisticated world traveller or expert of big business, whose philosophy and actions are geared to the milieu of acres of office space, masses of workers, high production and vast sales. All this modern bigness is without the cozy luxury of the human rapport we experience here, with these 'merchants' on the street curb as we join them in bargaining or a friendly chat, or just the privilege of looking and learning. After a walk through these streets, so full of life and living, one questions just where big business, with its mighty structures, is elbowing or heading. Should one tamper with this horizontal human and involved method, attempting to change it to our cold, lonely, mechanical, perpendicular hierarchy.

Yes, there are a myriad of essential elements in this background to be related with the country's great eventful past, its evolving present, and its future hopes. All are relevant to an understanding of Persia. All grow out from its past, as it does with any evolving nation. Its history, art and culture tell more perhaps, about the Persian character and the nature of the country, than any account of her modernization, economics or form of government. But midst all this varied panorama, the change or the White Revolution, is being implemented by stages. 1973 will commence the fifth stage of the reform. Engaged in this gigantic endeavour, along with the Iranians, is the United Nations Development Programme. It is assisting and guiding, by bringing experts from all over the world; scientists, craftsmen, technicians, working in a wide variety of fields.

Socially, economically and spiritually, all is being marshalled to a particular Persian rhythm, in which its history, architecture and culture are being preserved. There are, however, other components than mosques, donkeys, carpets, tombs and new developments to be appreciated in Iran. Coming from North America one experiences the placid quality of life, which makes for great charm and a friendly atmosphere. There are the ancient and traditional ways of thought and practice that are still alive, seen and felt. Their presence gives the country its characteristic fascination and particular charm. Yet all is fused with the present. All is conducive to reflection, contemplation and relaxation, where one learns or relearns, "courtesy". There are many stories to tell. Each day and each adventure brings its special plot and colour. And still to us Persia is as difficult to describe as her plaintive music.

Throughout the year there are numerous colourful celebrations connected with religion and history. Therefore we have become accustomed to this enchanting Iranian portrayal of drama. But no doubt just as interesting to us is that here, in Iran, where 98% of the population is Moslem, Christmas is celebrated in one form or another. As Persians they celebrate their own New Year on March 21st, but some celebrate the western New Year and Christmas with fervour and enthusiasm.

Iran has greater reason than other middle east countries to observe Christmas. The story of the Three Wise Men is actually that of three Persian magi priests who travelled, by camel, from their home in eastern Persia to pay homage to One whom they believed was the great Messiah. For it was a thousand years earlier that the Persian prophet Zoroaster, had predicted the coming of the Zoroastrian Messiah whose arrival on earth would be heralded by a brilliant star in the heavens. From then, until the Three Wise Men of Sistan (Kaspar, Melchior and Balthazar) saw the star in the East the magi maintained their nightly vigil from the heights of Mount Ushida. Upon seeing the star, the three priests set out to follow the star, that led them to Bethlehem, bearing gifts of gold, frankincense and myrrh, which they placed at the feet of the Christ child in the manger. Their choice of gifts was by no means accidental. Gold denoted the traditional offering to Persian kings and Princes at that time. Frankincense was burned in honour of the Gods and myrrh signified humanity. Their homage completed, the Three Magi set out again for home, this time by a different route, in order to avoid the wrath of King Herod. No one is certain what happened to the three faithful priests after their pilgrimage. According to one legend they are buried in various parts of Iran one at Saveh, another in a Zoroastrian temple near Rezaiyeh and the other at Kashan. Another legend, however, maintains that their remains were removed under mysterious circumstances to Cologne cathedral in 1162 by Friedrich Barbarossa. Regardless of where they now rest the Three Wise Men are remembered every Christmas. Although Christmas is not a recognized or official holiday in Iran, it has close historical connections and the Christian prophets take their place in the Moslem Koran.

In the 19th Century a group of Protestant missionaries from the West rediscovered a small Christian group in the area of Kordestan and promptly proclaimed their church as the oldest in Christendom. Just before the crucifixion of Christ several apostles visited Persia, among them St. Thaddeus. Arriving here late in the first century, St. Thaddeus built a church, near Makoo, where he was buried after his martyrdom. His church is now the site of the annual feast of Saint Thaddeus.

While scholars continue to debate ancient legends, in Iran on Christmas Day, differences are forgotten and the spirit of Christmas fills many a home of Christians and non-Christians. When we recall that it was nearly twenty centuries ago that the Three Wise Men of the East set forth from Persia bearing the first of all Christmas gifts, today, lasting security and peace on earth would be the best of all Christmas gifts for humanity. But it will now take more than three wise men, from whatever part of the globe, to bring the gift of lasting peace to this troubled world.

Yours sincerely,

Keith & Nellie McLeod

From Persian Poetry:

a) Even though you tie a hundred knots – the string remains one.
(Rumi)

b) Deep in the sea are riches beyond compare,
But if you seek safety, it is on the shore
(Sa'adi)

c) The Ball no question makes of Ayes and Noes,
But Right or Left as strikes the Player goes;
And He that toss'd thee down into the Field,
He knows about it all – He knows – He knows!

(Omar Khayyam)

RETIREMENT – H.C. (CHRIS) CHRISTENSEN

H.C. "Chris" Christensen, the Regional Supervisor, Surface Inspection for the Atmospheric Environment Service, Pacific Region, retired on July 7, 1973, after 37 years of Government Service.

Chris had a short period of employment with the Canadian Army in the mid thirties. However, his service of more than 35 years with the Meteorological Service (latterly the Atmospheric Environment Service) commenced in Lethbridge in 1937. He moved northward to Edmonton in 1943, to assume new duties as Senior Meteorological Assistant at the Edmonton Forecast office and then later to the office of the DCAS in Edmonton as

Administrative Assistant. Chris was on the move again in 1956 when he accepted the Assistant Meteorological Inspector position in Vancouver. In 1972, he was promoted to the position from which he has just retired.

To mark his retirement a number of his friends, as well as his daughter and son-in-law gathered for dinner at Stanley Park Pavilion on July 5, 1973. Messages were read from a number who could not attend this special occasion. A wrist watch and a pair of binoculars were presented to him on behalf of his many friends and associates. Mr. J.R. Hamilton, Regional Supervisor, Station Operations acted as Master of Ceremonies.



Presentation by Mr. W.H. Mackie (right) to Mr. H.C. Christensen (left).

Photo by Allan F. McQuarrie

THE CLIMATE OF THE MACKENZIE VALLEY BEAUFORT SEA

The Climate of the Mackenzie Valley – Beaufort Sea is, a report prepared by B.M. Burns of the Arctic Meteorology Section, Central Services Directorate as a support document to the Environmental Social Program, Northern Pipelines. The basic objective is to draw together climatological information pertinent to all types of transportation, communications, engineering design and environmental quality.

The study presents a broad overview of climatic factors pertinent to this region and the emphasis is on probability estimates of extremes of precipitation, temperature and winds, as well as duration of critical weather types. Energy exchange, snow cover, wind chill, inversion frequencies and elements which individually or in combination are important in the resolution of heat flow and environmental quality problems are treated as completely as time and data permitted.

The material is presented in two volumes of 227 and 237 pages at a cost of \$6.00 per volume. Multi-colour printing is employed for both illustrative and space conservation purposes. Volume 1 may be currently purchased from either Information Canada or Atmospheric Environment Service Headquarters. Volume 2 is now being printed.

SPRUCE BUDWORM MOTH DISPERSAL

During the early part of July, the Biometeorological Research Division, AES, participated in a major study by the Canadian Forestry Service on Spruce budworm moth dispersal in central New Brunswick. Spruce budworm outbreaks cause serious damage to the forests of northeastern North America, particularly to stands of Balsam fir, but there has been a lack of understanding on how these outbreaks develop. The study this year was initiated to evaluate the role of moth dispersal in the spreading of outbreaks and to examine the feasibility of inflight spraying of moths to control spruce budworm populations. For this study, the Canadian Forestry Service in addition to their own resources employed two teams of specialists from the U.K. A radar team used a specially adapted radar to follow the flights of individual moths and to observe the patterns of the general migration. The other British team investigated the windfield around the study area using an aircraft equipped with Doppler radar. This team hoped to determine the role of low level convergence in concentrating moths for mass migrations. In addition to these observations, entomologists from the Canadian Forestry Service collected information on moth activity by observing moth flights from a tree-top platform and by catching moths in an aircraft-borne net and in ground-level light traps. Wind profiles for the lower few thousand feet of the atmosphere were provided by the AES team. Preliminary results indicate the success of the radar as a means of observing moth flight-patterns and show a consistency between the observations of the various teams. Further analysis of this years data will lead to improved understanding of Spruce budworm moth dispersal and its role in outbreak dynamics.

AES ADVISORY COMMITTEE ON STRATOSPHERIC POLLUTION

The committee was convened to advise AES on its response to problems of stratospheric pollution and to give help in coordinating Canadian research work in the area.

The first meeting was held at DOE headquarters in Hull on May 10th. The various government departments with interests in the area (DOE/AES, MOT, DRB, NRC, MOSST) were represented on the committee as were the universities by Professors A.W. Brewer (U of T) and H.I. Schiff (York University). In attendance from AES were W.L. Godson who took the chair, B.W. Boville, W.F.J. Evans and D.I. Wardle.

The roles of each government agency were outlined - that of AES being the lead agency in developing a Canadian research program and of MOT, because of its responsibility for flight operations over Canada, requiring the best available information on the environmental effects of supersonic aircraft flights.

The current AES submission to Treasury Board for a stratospheric pollution program was reviewed by Dr. Boville and Dr. Evans. This received unanimous support from the committee. In addition, a workshop on stratospheric chemistry was proposed with the aim of promoting a concerted effort by the many expert chemists in Canadian universities and government towards the chemistry of stratospheric pollution.

FOLLOW-UP TO: AUTOMOBILE EMISSION CONTROL, APCA, APRIL 16

Since the Ontario APCA Meeting in April, EPA has suspended the proposed automobile emission standards for nitrogen oxides. The main reason for this change was that the methods that have been used in the past to measure NO and NO₂ were shown to be subject to large errors. Hence, they have resulted in the specification of standards for nitrogen oxides which are far more stringent than required to maintain reasonable air quality.

Technological changes have also occurred which, it is predicted, will make achievement of the 1975 CO and hydrocarbon standards feasible and at the same time achieve a greatly improved fuel economy. Engelhard Industries Ltd. of New Jersey have developed a catalytic converter which they say overcomes most of the drawbacks of other catalytic converter systems developed to-date. Their particular device is mounted in a compartment which is an integral part of the engine block. It is far less fragile than previously-tested devices and is expected to be able to meet the 1975 emission standards for the full 50,000 mile durability test. Engelhard thinks that fuel consumption with their device will be equivalent to that of pre-1968 vehicles. The total cost to the consumer for addition

of this device would be about \$75. Vehicles incorporating this device would of course require low lead fuel (0.05 g lead per U.S. gallon) which would entail an extra cost to the consumer.

Conclusion

Engelhard, therefore, appears to have a good alternative for controlling CO and hydrocarbons and at the same time improving fuel economy. They haven't solved the nitrogen oxide problem. Nor have they said what is the nature of the catalyst. The most important questions that must be answered before such a system is used on a large scale are:

- a) Will the catalyst be emitted as yet another pollutant?
- b) If it is, what is its toxicity?

CLOUD PHYSICS COLD CHAMBER FACILITY

by Robert S. Schemenauer

A walk-in cold chamber for cloud physics experiments became operational in June of this year. The chamber, located in room 4S100 of AES headquarters, will be used for hail physics, fog modification, ice fog and ice nuclei experiments.

The cold chamber has a stainless steel interior and exterior, 12.5cm foamed-in-place walls and interior dimensions of approximately 2m x 2.75m x 2.5m high. Access to the chamber is gained through a door which opens into the cloud physics clean room. A 0.3m x 0.6m window in the same wall as the door allows the cold room to be observed during experiments.

Room temperature can be continuously varied by means of a dial thermostat from +20C to -50C the temperature being read on dial thermometers located at various points on the cold chamber walls. The two heat exchangers used in the chamber are provided with override controls for the fans. This allows delicate experiments to be performed with a minimum of disturbance from air movement; however, this of necessity results in reduced temperature stability. A major advantage of having two heat exchangers is that they can be defrosted alternately by the hot gas system. This minimizes the temperature bump during defrost cycles. The hot gas defrost system and the moisture and explosion-proof electrical outlets, switches and lights provide added safety when one is doing fog experiments or working with volatile chemicals. The room is cooled by a Copeland 5H.P. water cooled two stage condensing unit.

Air, gas and vacuum lines plus an intercom have still to be added to the room.

Presently the cold chamber is being used for photography, microscopic examination and thin sectioning of graupels and hailstones.

VERSATILE NEW COMPUTER FOR FORECAST RESEARCH

A new and 'latest-generation' computer system for forecast research has completed its shakedown period with the Meteorological Services Research Branch. The system is already being used in the development and testing of automated systems and techniques applicable to large weather offices. It takes over this function from MSRB's PDP 15 mini-computer now functioning exclusively to power a sophisticated experimental data acquisition system. Techniques now being tested include RUM (the Regional Update Model) and associated data handling routines. Techniques or models being developed include a Planetary Boundary Layer Model, weather element forecasts, radar echo prediction and various display programs. Together with RUM they will form a prototype regional updating and forecasting system.

The computer is a Varian 73 with 32 thousand words of memory and 4.5 million words on disc. Two magnetic tape drives are used for off-line storage. Three teletype circuits from the Meteorological Communications Systems are interfaced directly to the computer and pertinent traffic is automatically recognized, decoded and stored. A high speed electrostatic printer/plotter is used for output. An A-D capability is also present. An alphanumeric CRT terminal and a card reader are to be added in the near future. This system will enable a variety of computerized techniques to be developed and evaluated before implementation.

Development of the entire Regional Update System has now been transferred to the new computer and will now permit accelerated and more effective program development, testing and evaluation.

AIR POLLUTION CONTROL ASSOCIATION

66TH ANNUAL MEETING CHICAGO

JUNE 24-28, 1973

UNITED STATES SECONDARY STANDARDS FOR SULPHUR DIOXIDE

The highlight of the Agriculture and Forestry session was a critical examination of the basis for the U.S. Secondary Ambient Air Quality Standards for Sulphur Dioxide.

Dr. S.N. Linzon, Chief of the Phytotoxicology Section of the Ontario Air Management Branch critically reviewed the U.S. Standards in a paper entitled: "Sulphur Dioxide Air Quality Standards for Vegetation". The essence of his review is as follows:

On April 30, 1970, EPA set the following standards for SO₂ :

0.02 ppm (60 ug/m ³)	--	Annual Arithmetic Mean
0.10 ppm (260 ug/m ³)	--	Maximum 24 hour Average
0.50 ppm (1300 ug/m ³)	--	Maximum 3 hour Average

In February, 1972, the annual mean standard of 0.02 ppm SO₂ was challenged as being too stringent.

On May 12, 1972, after a detailed re-examination of the criteria, EPA stated that there was sufficient evidence to support the annual mean standard.

In May, 1973, EPA decided to rescind the annual mean standard of 0.02 ppm SO₂ because of insufficient evidence for long term chronic effects on vegetation.

Dr. Linzon concluded that long-term studies on the effects of SO₂ on forests and epiphytic lichens conducted in Ontario and in Europe provide ample evidence to support an annual mean standard of 0.02 ppm SO₂. He went on to say that there is little support for the 0.10 ppm/24 hour standard when SO₂ is the only pollutant present. However, mixtures of 0.1 ppm SO₂ with either NO₂ or O₃ cause damage to vegetation in 4 hours. He also stated that the standard of 0.50 ppm SO₂ for 3 hours is not adequate to protect vegetation from harm and quoted direct examples from his own observations in the Sudbury area to support this statement. He recommended that the 3 hour standard be replaced by a 1 hour standard.

This paper was followed by a general discussion of the U.S. Standards. There was a considerable diversity of opinion as to whether the present standards were adequate, too stringent, or not stringent enough. However, some very important points were made.

- 1) The effects of mixtures of SO₂ with other pollutants such as NO₂, O₃, and heavy metals should be considered.
- 2) The long term standards (i.e. annual averages) should take into account the fact that SO₂ is ultimately converted to H₂ SO₄ and is removed from the atmosphere in precipitation. These "acid rains" bring about acidification of natural waters, leaching of cations from poorly buffered soils and ultimately, the disruption of the soil and water ecosystems.
- 3) If we wait until we have absolute proof of an effect on the ecosystem before setting standards, it may be too late – irreversible damage to the ecosystem may have already occurred.

PERSONNEL

The following transfers took place:

B.W. Bowkett	From: CFB Cold Lake To: Weather Office Edmonton
W.F. Ganong	From: Directorate of Meteorology and Oceanography, Ottawa To: Chief of Ice Division, CSD AES HQ Downsview
L.T. Millar	From: METOC Centre Halifax To: CFB Summerside
L.D. O'Quinn	From: Directorate of Meteorology and Oceanography, Ottawa To: Saclant, Norfolk Virginia
D.F. Green	From: CFB Winnipeg To: Weather Office, Goose Bay
W.G. Lumsden	From: Weather Office, Goose Bay To: METOC Centre Halifax
B.D. Brodie	From: 22NRWC North Bay To: METOC Centre Halifax
J. Pelto	From: CFB Trenton To: Weather Office Goose Bay
W.L. Ranahan	From: CFB Summerside To: Weather Office Churchill
W.D. Hogg	From: M.Sc. U. of Alberta To: ARD AES HQ Downsview
P.C. Haering	From: Weather Office Goose Bay To: SSU Atlantic Region Headquarters

The following have accepted positions as a result of recent competitions

73-DOE-ONT-INV-950-328	Meteorology MT11 Regional Director Ontario Region R.C. Graham
73-DOE-ONT-CC-97	Meteorology MT8 Chief Meteorologist WO Vancouver L.E. Parent

73-DOE-TOR-CC-115	Meteorology MT7 Regional Supt. Obsv. Services Atlantic Region HQ Moncton A.D. Dow
73-DOE-ONT-CC-45	Meteorology MT8 Head Network Planning and Documentation Section CSD AES HQ R.G. Stark
73-DOE-ONT-CC-29	Meteorology MT4 Duty Forecaster METOC Centre Halifax E. Oja

The following are on temporary duty or project assignment

B.P. Marois	From: Weather Office Goose Bay To: ASTS Ottawa
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Retirements:	D.A. Van Volkenburg Regional Climate Data Processor AES Western Region
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Deceased:	R.K. Holbrook OIC Calgary Weather Office (July 30, 1973)
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TRIVIA

Prattle of a Pension Prisoner

With apologies to the original author, who, by now is probably checking with his lawyers to see if he can sue us for around five million — the following:

Id dever raids id suddu Dova Scotia
Is what I'b tellin you.
Id dever raids id suddu Dova Scotia
Bud whad a lodda dew!
The liquid sud keeps pourin' dowd
Id shides where e'er you fload,
Ad the scedery is terrific
If you owd a glass-bottom boad
Bud id dever raids id suddu Dova Scotia
I herd some people say
That id dever raids id suddu Dova Scotia,
As they floadad past me oud of the valley
The other day.
Yesterday I had a garded growid fresh ad greed
This mornid I looked oud and saw a submaride!
But id dever raids id suddu Dova Scotia
The sud shides all the a-a-a-a-CHOOO tibe.

“It is better to ask some of the questions than to know all of the answers”

“He who dares to be a fool, has taken the first step in the direction of wisdom”

“UNE AFFAIRE EN OR”

Monsieur St-Jean (détective) venait tout juste de commander un verre au bar de l'hotel Rieno de Las Vegas. Un jeune home étranger à la chevelure d'or et aux joues basanées vient s'asseoir sur le tabouret voisin.

Après avoir demandé un gin, le jeune homme à la peau bronzée déclare en regardant la table de jeu: “Je m'appelle Pierre Fontaine, c'est plaisant de revenir à la civilisation et d'entendre à nouveau le bruit de la monnaie.”

Le fameux détective engage la conversation à son tour: — J'imagine que vous venez tout juste d'arriver du désert? — Je suis de retour depuis hier dit Fontaine. J'avais pas mal de sable dans les oreilles; ma barbe et mes cheveux, après 7 mois de relâche ont dû être coupés par le barbier. Puis j'ai renouvelé au complet ma garde-robe en me servant de ma carte de crédit. Tout ce que j'ai eu à montrer c'est le rapport de l'analyse.

- Tu as trouvé de l'or?

- En plein ça, tout un filon.

Fontaine se mit à réfléchir tout en frottant son menton bruni par le soleil. Il baisse la voix et déclare confidentiellement: "Ecoute, si tu peux trouver quelqu'un pour me seconder, on ferait assez d'argent pour acheter dix palais comme celui-ci. Bien sûr, je ne cherche pas à vous intéresser dans l'affaire, mais si vous connaissez un gars qui veut conclure un bon marché . . . Je suis dans la chambre 230. Je ne peux pas vous donner plus de détails ici vous comprenez les murs one des oreilles . . . Je comprends dit St-Jean, mais si tu veux convaincre quelqu'un tu devrais améliorer ton histoire.

Question: Qu'est-ce qui ne va pas avec l'histoire de Fontaine?

SOURDOUGH THERMOMETER

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by Diane Newell Macdougall,

Historian, National Historic Sites Service.

MANY TALES HAVE BECOME PART of the folklore of the Klondike gold rush, and one such legend is the story of a "sourdough" thermometer.

Yukon cabins often had a bottle of quicksilver hanging outside the door, but while this common device was a practical one, it is the more elaborate thermometer which is of particular interest.

According to an old sourdough's account an efficient cold-weather thermometer was improvised when it was learned that it would take up to two years to bring steel thermometers in for sale at the trading post located at the junction of the Fortymile and Yukon Rivers. In the early 1890's the trader, Leroy McQuesten, was persuaded to empty a number of pill bottles; these were used as containers for the thermometer ingredients. Quicksilver (mercury) would freeze at -40°F ; coal oil, at -50°F ; and Jamaica ginger (a ginger extract used for flavouring) at -60°F . Perry Davis' Painkiller turned white at -60°F , crystallized at -70°F and froze solid at -75°F . St. Jacob's Oil (a liniment, also known as St. Jakob's Oel) would not freeze even in the coldest weather. These items were all available to Yukon prospectors in those early days. A teaspoon of each was placed in separate glass containers and arranged appropriately on a rack.

St. Jacob's Oil was a 19th century liniment which consisted mainly of water, ether, alcohol, turpentine, and a small proportion of aconite with red colouring matter. The Perry Davis' Painkiller appears to have been used extensively throughout the Northwest.

Glass bottle fragments found on sites of fur-trade posts dating after 1840 usually include pieces of the Painkiller bottle. The Lower Fort Garry sales shop inventory of 1871 lists:

American Goods, Perry Davis' Painkiller
3¼ doz. at 8/6 per dozen for a total of £1.78

The Painkiller, first introduced in 1839, is still available in Canadian drug stores. The 1839 batch contained the following ingredients:

gum myrrh	—	2¼ pounds
capsicum	—	10 oz.
gum opium	—	8 oz.
gum benzoin	—	6 oz.
gum suaiaic	—	3 oz.
alcohol	—	5 gallons

The sourdough thermometer was recently put to the test when D. Lawlor of the National Research Council offered to calibrate the liquids used as thermometer substances. St. Jacob's Oil is no longer available but Mr. Lawlor pointed out that ether, one of the ingredients, has a water freezing point of -175°F — which would account for the liniment not freezing in the coldest weather.

The other "thermometer" liquids react in essentially the manner described by the old sourdough. In particular:

"Perry Davis" Painkiller was observed in a stirred alcohol bath between 70°F (room temperature) and -75°F with the following results: As the temperature approaches 32°F (freezing point) the liquid commences to become cloudy and continues to change colour to approximately -60°F where it becomes almost white, and remains in this state until -65°F . Between -65°F and -70°F frozen crystals form throughout the liquid and at approximately -75°F it becomes a solid".

Now that the accuracy of the thermometer has been scientifically confirmed, what was simply an interesting sourdough tale has been added to the growing accumulation of factual information on pioneer life in the Yukon.

More Trivia

On July 22nd, Kelowna Regatta Officials staged a "Sacrifice" of a 3 spine stickle back fish to "Ogopogo" just off the Aquatic in Okanagan Lake, with the OIC of the Kelowna Weather Office attending. A legend had been fabricated to suggest that if a 3 spine stickle back fish were sacrificed to Ogopogo and it did not reappear, fine weather for the Regatta would be ensured. The presence of a local weather official was requested to add a touch of authenticity to the skit. A few words as to what the weather was actually expected during the Regatta as compared to the weather promised by the sacrifice was provided by the local weather representative in attendance.

The 3 spine stickle back fish did not resurface (due mainly to nearly 50 pounds of weight), the outlook provided by the local A.E.S. man promised fair weather, and the weather in fact was excellent. Their legend was firmly established, and the credibility of the local weather office enhanced.