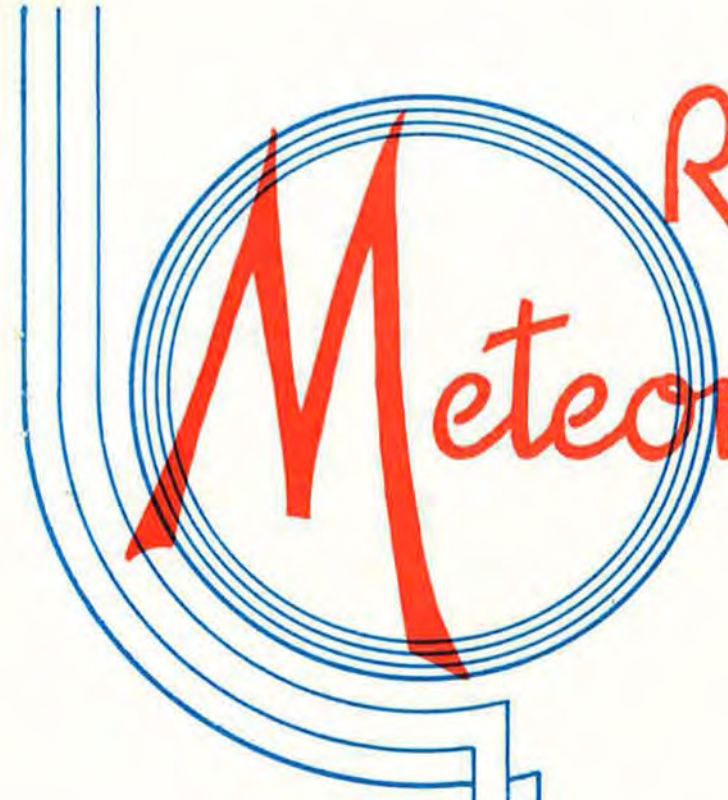

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WEATHER in the PUBLIC SERVICE

by
R. A. Hornstein - D. G. McCormick
K. T. McLeod

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"WEATHER IN THE PUBLIC SERVICE"

(A Symposium)

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The Public Weather Program in a Dominion Public Weather Office

R.A. Hornstein

Meteorologist-in-Charge

Dominion Public Weather Office, Halifax

II

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D.G. McCormick

Meteorologist-in-Charge
Hamilton Weather Office

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K.T. McLeod

Superintendent, Public Weather Services,

Meteorological Service of Canada

Presented at the regular monthly meeting of the Royal Meteorological Society, Canadian Branch, Toronto, Thursday, May 1, 1952.

PUBLIC WEATHER PROGRAM IN A DOMINION PUBLIC WEATHER OFFICE

R.A. Hornstein

That which I'm about to say during the next fifteen minutes is not likely to contain any new or startling or revolutionary ideas. Perhaps, therefore, it may fall far short of the target which was in mind when the request was made that I prepare a survey, from the District Public Weather Office point of view, of the public weather service which the Canadian Meteorological Division is providing, or should provide, to the citizens of this country. Nevertheless, it's not always necessary, or even desirable, to paint a new picture in broad, bold strokes; sometimes it's quite important simply to pause and to review what we have done ... to look back and, from our accomplishments and from our failures in the past, to try to find signposts which may point to a more fruitful road in the future. That, then, is what I propose to do ... to cast a contemplative eye backward upon the last six years to see if we have been properly discharging our duties to the taxpayers and, if not, to suggest how we might better fulfil our obligations.

FORECAST SERVICES

I believe that I'm substantially correct in saying that when a member of the Canadian public thinks of the Meteorological Division or, more popularly, of the weatherman, the product of our endeavours which leaps immediately into his consciousness is the weather forecast ... which he is more likely to call the "weather report" or the "probs" or, in a few isolated instances the "joke for today". In other words, meteorology and the weather forecast are considered to be synonomous terms. Well, this is something like the case of you and me strolling in bright red shirts across a field and meeting a bull; you know and I know that the bull won't attack us, but does the bull know it? Yes, you know and I know that there is much, much more to meteorology than a 25-word regional forecast, but Mr.Average Johnny Canuck doesn't know it ... and it's up to us to set him straight; I'll come back to this point in a moment, but first let's consider briefly our forecast program since it bulks so large in the popular mind.

Back in 1946 we divided the country into 75 inland forecast regions and our territorial and offshore waters into 31 marine forecast areas. These subdivisions were made more or less arbitrarily in the light of such information as we had at our disposal concerning more or less discrete climatic or synoptic regimes. Most of these ad hoc boundaries proved to be highly satisfactory; some were found to be unsuitable and had to be revised; perhaps there are others

which today should be amended to permit us to provide more satisfactory service. Criticisms of regional limits are sometimes offered by members of the Canadian community at large; we should be on the alert to grasp worthwhile suggestions which might cause us to rearrange some of our forecast units into more climatically homogeneous entities.

Wherever possible, also, we chose names for our regions and areas which are self-explanatory. However, this procedure was not universally feasible and, accordingly, we run the risk that many folks don't know which regional forecast applies to their community. In an effort to overcome this potentially serious shortcoming, maps of the seven districts, each showing the boundaries of the regions and areas within the district, were prepared. These maps have gone through more than one printing and the current issue for most districts is both informative as to content and convenient as to format. But those maps are of no earthly use if they are allowed only to occupy shelf space in the Department's offices. They must be distributed to the Canadian public. There are several channels through which this distribution may be accomplished. They can be handed out to members of the audience when you present a weather talk to a club or a school group or any other organization. They can be enclosed with all correspondence that goes out from your office to residents of your district. They can be handed to all visitors to your office. They can be given away at fairs and exhibitions and air shows and even at permanent points of interest visited by the public, such as libraries, museums, historical sites, etc. They can be advertised over the radio in weather talks or farm broadcasts or in weather forecast broadcast periods. Perhaps it would be worth while to have them delivered to every home in Canada by the mailman in the same manner as are mail order catalogues. The salient point is that you can't tell the players without a program and you don't know where the forecast regions and areas have their limits without a map, so we must get the maps into the hands of the citizens; otherwise we're bound to be unjustly criticised for forecasts which are correct but which the public doesn't know are correct because they're using faulty terms of reference through the use of the wrong regional forecast.

Assuming that everyone knows which forecast is applicable to his community, there still remains the problem of having our forecasts properly understood. Again those maps just mentioned contain many helpful hints. In addition, each of us in the field has the responsibility for amplifying those hints and driving home by every available educational medium the meaning of our restricted list of forecast terms. As you well know, and as has been said for many, many years, everyone talks about the weather; the trouble is that so much nonsense is talked about it. Well, it's up to those of us

in the profession to get folks to talk about weather matters in a much more intelligent manner. Not, of course, about absolute vorticity or long waves in the westerlies, although that may come eventually, but about such everyday terms as drizzle and mist and overcast and blizzard. It's a slow task, to be sure, frequently a frustrating one, but nevertheless unless we take the offensive and try to help more people become properly versed in our terminology we're never going to overcome the uninformed criticism which makes us the butt of an over-abundance of very unfunny stock jokes. The most discouraging situation that I encounter is that of having had an unusually accurate forecast go out of our office only to have it considered incorrect because of misinterpretation.

But even granted a completely educated public, both as to knowledge of our regional boundaries and our forecast terminology, are we doing a complete job when we issue, for press and radio distribution, our daily quaternion of forecasts? There is no doubt in my mind that the answer must be in the negative. A simple review of developments in the last few months in as undeveloped a district, industry-wise, as the Halifax district, bears eloquent testimony to this contention. Those of you who are intimately associated with a public weather forecast office are aware of the large variety of organizations which require a personalized service over and above the routine forecasts disseminated through press and radio. These services are, in the main, secured today by two groups. There's the one group fortunately located where the weather office is located and thus able to procure the desired subsidiary information through the medium of a simple local telephone call. There's the second group fortunately unrestricted in the use of funds, such as one of our consumers, the Limestone Army Air Base in the State of Maine, which uses expensive long distance telephone facilities to secure our forecasts. But what about the important group which falls into neither of these categories? I believe that it's up to us to find them and to offer them, for example, telegraphic service; the cost to the subscriber for such service is not great and within the past two months we have added three out-of-town industries to the group receiving such service. One of these requires temperature values for a period further into the future than we normally forecast and the other two are content with telegraphic delivery of our routine forecasts once daily.

Then, too, we must be prepared to experiment, to strike out along paths which, to us at least, are unexplored. For two years now the Halifax Office has been co-operating with the Federal Department of Agriculture Experimental Farm by providing outlooks for from three to six days. Our methods are crude but our results are encouraging.

Most important, we're providing a service which in the opinion of the subscriber is useful. This year we're prepared to join the C.B.C. Farm Broadcast for the Maritimes in a new venture: the provision of qualitative haying forecasts. The project is purely experimental and will involve the cooperative efforts of the Farm Broadcast staff, the Federal Experimental Farms, the Provincial Illustration Stations and, perhaps, interested individual farmers. It may not be particularly successful in its exploratory stage but at least it should further solidify our improving relations with the public by demonstrating that we're awake to practical problems and that we're trying to do our level best to help solve them.

CLIMATOLOGICAL SERVICES

As I said earlier we're known more widely for our forecast program than for any other activity or, for that matter, for all other activities combined. Perhaps I've spent too much time discussing forecast services. For there are certainly others which are of vital importance to many industries and individuals. Among them our climatological service merits special attention. All our district offices now prepare and distribute a monthly climatological summary and most of them supplement this by an annual summary. These are of great assistance to a long list of subscribers. I have only two suggestions to offer in connection with these summaries. First, I submit that they should be in the mail each month no later than the fifth of the month, preferably earlier. It takes only a minimum organization and planning to adhere to this schedule. Second, the summaries should be prepared by many more stations than is now the case, at least by the Dependent Forecast Offices and the Aviation Forecast Offices and possibly even by observing stations manned exclusively by Meteorological Division staff. If the donkey work of stencilling cannot be carried out at the individual units possibly it can be arranged that the district offices type, duplicate and mail the summaries. In every case, however, it is imperative that the data be made available to the subscribers as early as possible and on approximately the same date each month. Subconsciously this will inevitably evoke in the subscriber's mind the realization that we have an efficient organization, a tribute which we well can afford to foster since we deserve it!

If I may continue in this vein for a moment, I'd like to mention that we receive a large volume of requests for specific weather information from lawyers, from salvage companies, from construction firms, from civic and provincial departments, from a hundred and one organizations. In most cases this information is required rapidly; in many cases the client is not sure just what he does need.

In every case we should make sure that the requirement is thoroughly and completely fulfilled, and without delay. I know from experience that one of our most effective means for securing goodwill is to answer today a letter written yesterday so that the client may receive his reply tomorrow. This is especially true where the query requires an answer containing a considerable quantity of material, perhaps with comparisons either of other localities or of remote times. Very often the reply will give the appearance of having required extensive research even though it has actually involved only reference to records which you have readily available. So much the better; we don't have to let the client in on all of our trade secrets! Carefully prepared local climatological data, together with a thorough knowledge of where to find pertinent records in the publications issued by Headquarters, available within arm's reach, will in the long run pay off handsomely on the time and effort spent in putting the records into convenient form. This is equally true in replies to telephonic requests. Besides providing an excellent service, there is a rewarding feeling of satisfaction on our own part when we can supply in a minute information which our caller fears may take him several days to secure.

Incidentally, speaking of telephone contacts, they are our most usual medium of direct association with the public and we should maintain a uniformly high standard of courtesy and efficiency. It's a relatively easy matter to impress this fact upon staff members and the results are gratifying. In the Halifax office I've received both verbal and written compliments in connection with the courteous and able manner in which all echelons of personnel have efficiently provided requested information. Now, I don't hoodwink myself; I realize full well that there is a fair number of cases in which our forecast information is unavoidably inaccurate; nevertheless I'm confident that gracious direct communication with the public goes far towards overcoming prejudices which might otherwise reach ugly proportions and I commend a policy of consciously setting out to impress each caller with the thought that our Division exists to serve him.... almost to the point where he feels that we're devoted to serving only him. I grant that this results in a modicum of wasted time with the occasional crackpot, but even they can be eased away without unduly strained relations.

PUBLIC RELATIONS

All of which leads me fairly naturally into the third main section of this paper. The public weather sphere of action is inextricably linked with a public relations program. Over the years the weatherman has come to be an object of, shall I say, derision. Perhaps that term is a little bit harsh, but it's not far from the mark. Today we've the means to combat that attitude and we must not let slip any opportunity to present ourselves in a much more favourable light. For reasons already outlined it's not politic for us to maintain a lofty attitude of reserved detachment in the expectation that our product will speak for itself by its self-evident superior quality. This is an age of hucksters and we shall do ourselves no good by running counter to the trend.

On our roster of personnel we've any number of individuals who have the ability and the training to prepare and present informative and educational papers and talks. We are favoured with a universally popular topic; this asset must be exploited.

Perhaps among some of us there's the feeling that we're lowering ourselves, that we're prostituting science by speaking the common language. I can't agree with that viewpoint. Many weather factors, some simple, some still so complex that we ourselves are far from understanding them, are discussed between citizen and citizen and much misinformation is thus passed along by word of mouth and even in popular publications. It's far better for us to present a a truth in sugar-coating than to permit untruths to continue to be propogated unchallenged.

As you all know service clubs, home and school associations, church groups, mens' and womens' groups, etc., etc., are forever desperately looking for speakers. Make yourselves available to them and get out and address them. Your influence can be much greater than you would suspect; for as one of the Halifax forecasters has said in another connection, if you know 10 people well enough to pass the time of day with them and to comment casually on the current state of the weather, it's highly probable that each of those 10 knows at least 10 other mutually exclusive people, and each of those in turn knows 10 others, and so on; as the weatherman you're at least a minor type of celebrity and your opinions are repeated; thus it doesn't take long before the utterance of a weatherman to a small group is spread far and wide through much of the total population. And although it may be thought that only unfavourable comments travel rapidly, I'm certain that favourable ones move almost as quickly and you can soon develop a loyal band of defenders of the meteorological faith.

Then, too, articles can be written for various types of periodicals. These can be a fruitful source of good public relations. Even the few minutes required to dash off a press release on an unusual weather situation are well spent when you consider the number of individuals who thus have the weather office brought to their attention as a source of interesting factual news.

As for the medium of radio I feel that I'm qualified to report that it can turn us into real living personalities in our communities. The work involved in preparing talks for radio broadcasts is certainly justified when it results in your being immediately recognized as a respected and valued member of your district when you walk into any hamlet, town or city in your district and announce, by way of introduction,: "I'm your weatherman". With the advent of television I'm confident that we shall have an even more fruitful field of public relations thrown open to us and we should exploit it to the utmost.

CONCLUSION

In summary, then, those of us in the public weather field should always keep in mind that we're working in the public service and that we're fulfilling our duties and responsibilities only when we provide the citizens of Canada, within the natural limitations of our immature science, with the weather service which they require and demand.

THE ROLE OF THE HAMILTON WEATHER OFFICE

D.G. McCormick

Before the end of the War, there had been a certain amount of agitation for a special weather office in Hamilton. Several strong requests were forwarded not only to Met. Headquarters, but direct to Ottawa. The requests were presented by several of the Grower's organizations, and particularly by the Hamilton Spectator. After 1945, the requests became a bit louder and more frequent. As a result, the establishment of a Weather Office in Hamilton was authorized in 1948. Owing to staff shortage, it was not until January 1 of 1951 that a meteorologist was available for the position.

Hamilton with a population of 258,000 lies within the heart of the Niagara Peninsula, which is one of the most intensive fruit growing districts in Canada. Its reputation as an industrial city is well known. This environment provides a perfect potential market for practical meteorology.

This was a new venture for the Canadian Meteorological Service. There were no precedents to follow, and the future of the office was to say the least "obscure". It was an interesting threshold to be on, and certainly one that presented a challenge. Now that the office has been open for 16 months, the challenge is bigger than ever; the future is perhaps a bit less "obscure". Judging from what I read in the Presidential address to the Royal Met. Society of three months ago, the Hamilton Weather Office has had a most successful year. I feel, at least, that the door has been opened sufficiently to let us see some of the merits of personalized weather service.

This type of weather office is, without a doubt, the most dependent forecast office in the service. Any forecast issued is only as good as the forecast which is received from the parent DPWO. Much credit is due to Mr. Turnbull and the staff of the Malton office for their whole hearted co-operation during the year. I appreciate, in particular, the assistance which has been given by Mr. Turnbull and Mr. McLeod, and other members of the HQ staff. It seemed that every month, there was new ground to be broken. These two men in particular, listened with great patience to my problems. Their advice and assistance has been invaluable.

If the DPWO says "Rain tomorrow afternoon," that is my forecast. If it rains, the people of Hamilton think that I am a good meteorologist. If it doesn't, my stock falls proportionately. On occasions when the forecast has gone sour, experience has proven that you must have the explanation ready...and a good one. This is a situation where

"personalized service" puts you definitely on the spot. It is my feeling, however, that it pays off. If the Press and Radio are told why the forecast went sour, the public are appeased to a certain extent, and are not so apt to cram it down your throat as a complete "bust forecast".

In January of 1951, the type of programme was visualized in general outline only. As special requests arose, they were discussed with Headquarters and with Mr. Turnbull. Once the principle of the operation was approved, it was left with the Hamilton Office to look after the organization and the implementation of the particular service desired.

PRESS AND RADIO

Relations with the Press have been excellent. The fact that there is only one major newspaper in Hamilton has simplified the situation. The Hamilton Spectator is most weather conscious. This is indicated by the large number of items which they have carried during the past year. Although they are not yet carrying a daily weather map, serious consideration is being given to it.

Their standard of weather reporting has been extremely high. The number of "misquotes" which have occurred is practically nil. In my opinion, this is due to the fortunate circumstance of having one meteorologist talk to one reporter. It is a case of "mutual benefit" to the newspaper and to the Weather Office, to have the facts reported accurately. It has paid dividends for both of us.

Both of the radio stations in Hamilton are privately owned. Needless to say, they do not speak to each other, but they both are great friends of The Weatherman. They can't afford not to be. Both are eager to carry any weather item.

AGRICULTURE

The demand for special service to Agriculture has been large; to such an extent that I am convinced that the term "City Weather Office" is a misnomer. I would say that at least 75% of my time is taken up with work for agricultural interests. There is another reason, and a good one, for objection to the nomenclature "City Weather Office". The news editor of the Spectator summed it up neatly as follows: People think that you belong to "that City Hall gang". Their next question is "Who is McCormick? Is he an alderman who was defeated at the last election?" This is an example of public reaction, and I feel we would be wiser to use a term such as Hamilton Regional Office or perhaps simply Hamilton Weather Office.

A special Fruit-Spray Forecast is issued twice daily from April 1 to Sept 30 for Fruit Growers in the Hamilton-Niagara District. The value of an accurate forecast in spraying operations is well known, as are also the problems of providing the desired type of forecast. Growers are vitally concerned with the frequency and the duration of "wetting periods". This includes rain, showers, fog, drizzle and dew. It is during such periods that scab infections take place. The temperature is also important since the time necessary for infection varies inversely in proportion to the mean temperature. Wind directions, too, are extremely important in assisting the grower in planning his spraying operations.

There is an intensive vegetable growing area just east of Hamilton on the north shore of Lake Ontario. These growers are particularly interested in weather conditions for the transplanting of young plants from green houses or cold frames to the field. A forecast of screen minimum temperatures is not adequate for their requirements, since temperatures at 2-3" above the ground, could well be 5-10 degrees colder. An attempt is therefore made to forecast "grass minimum temperature" for three stations throughout this area.

Three growers in the district were enrolled as coluntary observers, and provided with grass min. thermometers, along with regular Max and Min thermometers and a rain gauge. During the frost season, spring and fall, reports from these three stations are phoned daily to the Hamilton office. They are, of course, vital in preparing the forecast for the coming night.

On August 24, a request was received from tobacco growers in the Tillsonburg area for a Frost Forecast to commence immediately, if not sooner. Furthermore, they wanted it disseminated in such a manner as to be available to every grower in that district. The growing of tobacco is a $60,000,000 business to the growers in that district. It is even a bigger business to Mr. Douglas Abbott, since the excise tax from tobacco brings a revenue of $225,000,000 per annum.

The justification for such a special frost forecast depends of course on what protective action the grower can take, if frost is forecast. By re-allocating their staff, and concentrating all available manpower to cutting of tobacco, each grower can harvest an additional $1,000 worth of leaves, given 12 to 18 hours notice of a killing frost. With 4,000 growers in the district, the potential saving in one night could be $4,000,000.

There are three climatological stations in this area of 650 square miles. Reports are phoned to Hamilton each morning, before 0600 hours in order that the forecast can be prepared and carried on the 0700 o'clock news broadcast. The forecast is carried twice daily by six radio stations in order to reach every grower.

We had a reasonably successful season last year. The only serious frost occurred on the night of September 7, when the temperature fell to 36 at Delhi and 34 at Simcoe. Heavy losses were reported south of that district, amounting to $1,5000,000 worth of tobacco, according to an Imperial Tobacco survey.

Arrangements are now being made for 8 additional voluntary observers in this important area. With the aid of these reports, it will be possible to provide a much more detailed Frost Forecast. The accuracy will depend upon the regional forecast issued by Malton and on my knowledge of local conditions.

AGRICULTURAL METEOROLOGY

I would like to quote a paragraph from Mr. Lawrence Drakes's address to the American Meteorological Society, September 1947:

"There has never been any question about the overwhelming importance of meteorological and climatological information to successful farming. Nevertheless, in the critical meteorological area which makes, and will continue to make, the difference between empirical farming and scientific farming, the meteorologist, to this day, is still largely content with playing the role of Town Crier, with modern sound effects. And yet we all know that we cannot hope to have a scientific agriculture without a highly developed and successfully applied agricultural meteorology and climatology. Meteorology has shown no strong tendency in that direction. It would be very unrealistic for the profession, facing this gap, to take the view that what is involved is a simple evolutionary problem, certain to take care of itself in the course of time."

In his most excellent Presidential address, Mr. F.W. Benum quoted Sir Robert Watson Watt as follows: "The aviators are to be congratulated on their persistence and their success in obtaining these facilities; the non-aviators are to be condemned rather than commiserated with on having been less successful because less demanding."

Far be it from me to quarrel with two such authorities, but I do feel that an examination of the facts, on behalf of the farmer, will present a different light on the above quotation. Meteorology is vital

to aviation; we all claim that it is vital to agriculture. In the former case, much time and energy is devoted to the special needs of one group; let us not forget that these demands have been presented by the Airlines and by National Defence. Their representatives are given thorough training courses not only in the application of meteorology to flying, but in the theory of Met., which gives them a better understanding of the limitations of the science.

What about the farmer and his needs for special weather service? Who is to present his demands, and apply the pressure which is required? As an individual he hasn't a chance. Farm organizations could make themselves heard, if they knew what was available. But the Weatherman is 100 miles, and perhaps 500 miles, distant; he knows little of their particular problems. Agricultural representatives could lead the way; they, however, are given but a smattering of weather and climate in their college courses. If weather is so vital to agriculture, they should have at least as much training in meteorology and climatology as the airline dispatcher has.

I do not agree that the non-aviators should be condemned for being less successful because less demanding. The circumstances are entirely different and do not form a fair basis for comparison. It is as if one compares the demands of a large chain store, having branches in every major city, with those of a merchant in a small village, who represents thousands of similar merchants across Canada.

The establishment of an office in Hamilton has at least placed a meteorologist within reach of the farmers in that District. He is, accordingly, in a position, to learn more about their activities and to apply the knowledge of the science to their problems.

INDUSTRIAL METEOROLOGY

The demands for service to industry in Hamilton have not been great, but they are increasing. The Steel Company of Canada has, for example, received a special forecast for the past two winters. They are vitally concerned with a snowfall of 5 inches or more. Their operation is a continuous one, and is dependent upon the continual maintenance of approximately 25 miles of railway lines within their yard. When a snowfall of 5" or more is predicted, they will keep as many as 30-35 men on duty in order to assure that the vital lines and switches are kept open.

Contractors are making extensive use of the forecast service available. Other industries such as Dominion Foundries, C.I.L., Westinghouse and Firestone have requested advice from time to time.

There is a great need in this field for educational work. It is true that the business man or industrialist is generally quite ignorant of the potentialities and limitations of meteorology. At the same time, we must admit that as meteorologist, we are equally ignorant of the weather losses which are experienced in business and industry. The business man is inclined to think that the only way we can assist him is by providing a 5 or 10 day forecast. In his paper to the A.M.S., Mr. Drake says: "There are 1001 ways in which meteorology can be applied to Business without involving forecasting". If one of these can be utilized by a business man, he becomes, in effect, one of our salesmen.

If we are to sell industrial meteorology, we must let the potential consumers know what can be and is being done. Unless we take the initiative and go to them, progress in this field, will be just as slow as it has been in the past.

CONCLUSION

If it is our wish to promote the practical application of meteorology and climatology to agriculture, to industry, and for the general public, those engaged in promoting or "selling" must first of all have the material available for deliver. The following is considered essential:

1. A good library. Knowledge of what has been, and is being done in our Service and in other Services throughout the World. Examples: Geiger: Climate Near the Ground; Drake: Paper on Industrial Meteorology; Jacobs: Monograph on Wartime Developments in Applied Climatology.

2. Propaganda. Special pamphlets, designed specifically to meet the needs of potential consumers.

3. Visual Aids. for Public Educational Work: Films, Slides, etc.

4. Delivery of the product to be sold. If the value of the commodity you are selling is known, and your competition is nil, you can sit in your office and the customer will come to you as had been the case in Aviation Meteorology. The value of the commodity we wish to sell is not known to the consumer; that is our first problem.

These are the opinions, based on one year's experience in a City Weather Office. There is, without a doubt, a need for other offices of this type in many other cities. Already a number of petitions

have been submitted from the London District for the establishment of a similar office there.

In the past year, the programme of the Hamilton office has grown steadily in response to the need for service. The aim has been to pass on to the consumer the maximum amount of weather knowledge applicable to his business. Unless this is done, the gap between what is known and what is done in meteorology will increase.

THE PUBLIC WEATHER SERVICE OF CANADA

K.T. McLeod

One hundred years ago, weather observing in Canada was in its infancy. Observations were made every two hours at the main camp, a 17 by 22 foot log cabin on the University of Toronto campus, and at seven guard-houses elsewhere, as often as persuasion by Lieut. Lefrory and local drunkenness would allow.

Fifty years later in 1902 there were 338 observing stations, mostly voluntary, and two forecast offices at Toronto and Victoria. Twice daily, the 8 a.m. and 8 p.m. observations were telegraphed from 32 stations, and these, together with 54 from the United States, provided what was termed a very comprehensive chart for forecast purposes.

Today there are 1,294 observing stations, of which 244 are regular synoptic reporting stations; there are 41 forecast offices, and over 22,000 miles of leased teletype lines.

Meteorological progress in Canada has accelerated rapidly in the last century, and particularly in the last few decades. For several thousand years man has been conscious of the weather, but only in the last hundred does it seem that science has really begun to probe into Nature's secrets.

THE PAST

It is not easy to estimate when man first began to study climate and weather. Probably it started with the regular July flooding of the Nile, which became the first climatological statistic, and which in turn fostered the science of astronomy, so that the flood-time could be anticipated and irrigation regulated. Elsewhere, the Euphrates of Babylon and the Hwang-Ho of China attracted the nomadic tribes, who lived on flesh and raw fruits and vegetables, into a more settled food-producing community. Soon the select learned priesthood, with its magic, its secrets and its knowledge, cast a cloak of astrology over the basic sciences of astronomy, meteorology and medicine. It's been a slow, painstaking task to clear away the mysticism so closely associated with these three sciences; and meteorology seems to have resisted exposure the most of the three. Weather Lore, which grew up in the nature studies of the farmer, the fisherman and the shepherd, was destined to lead an harassed life.

It is perhaps unfortunate that the mysteries of Nature are expounded, and theories fashioned, when knowledge and data are meagre. Such attempts to explain phenomena should not be criticized, for these

efforts, together with repeated corrections with the growth of knowledge, mark the normal course of all progress. Unfortunately, later modifications rob the original theories of all their pleasing simplicity. Resentment of change, plus an innate conservatism that accepts the oft-repeated statement as truth, preserve lame theories and mistaken reasoning for correction by future generations.

Aristotle, the undisputed weather authority for two thousand years, prevented meteorological progress. Visual observations alone were the basis for all weather knowledge until the invention, in the 16th century, of the barometer by Torricelli, and the development of the thermometer and windvane. What a triumph it must have been for Otto Von Guericke when he demonstrated before the Emperor in Germany the magic of the two evacuated hemispheres. The hollow halves of a two-foot copper hemisphere were placed together, then the air pumped out and eight horses hitched to each cup. The 16 horses failed to pull them apart.—That was headline scientific news for an astonished audience, nation and civilization.

And so we passed from the purely visual to the instrumental observing era,— and later in 1844, because of Morse and his magic telegraph key — to networks of weather stations and the first warnings of approaching storms.

But man is a traditionalist, and no one more so than the farmer, who, by the very nature of his occupation, must wait and watch the slow unfolding of his seeds and harvest. His occupation is the oldest known to civilization, perhaps resulting in his apparently reserved individualism and cool attitude to the advance of the sciences, as they outline his dependence on new theories. But it is certain that in the coming years the greatest advance of all will, and must, come when agriculture is tied in with the new weather knowledge and learns the advantages of applied meteorology.

THE PRESENT

It is widely recognized that great strides have been made in meteorology because of the demands of the aviators. New instruments and new techniques are constantly being designed to meet the ever-changing needs of this fast growing and demanding infant. Perhaps it's become an adult for commercial aviation is now less demanding. There are indications that the growing-pains stage is pretty well over, that procedures have steadied down, and that more of our attention should now be directed to the other members of our nation's economic family. Certainly it is true that aviation has been the squeaky wheel that's been demanding and getting an out-of-proportion share of our attention and of the meteorological tax dollar.

The farmer, the architect, the manufacturer and the artisan deserve, and can all be provided with, just as efficient a weather service. Three processes must be studied, and suitable procedures fashioned and followed. First, it is a fundamental necessity that forecasters be equally as familiar with the special needs of these other professions, and be willing and able to apply the same intelligent cooperation and understanding as they do to flying problems; second, on their part, the citizens, or consumers of our public forecasts and advice, should acquire a knowledge of modern meteorology, similar in standard to that of a member of an aircrew. Thirdly, we must find the best means of getting scientific weather knowledge and the citizen together so that maximum benefit may result.

These three concepts or processes are far from realization. It is safe to say that our potential economic value to Canada will depend, in large measure, on our ability to meet the challenge before us and bridge the widening gap between the science and the citizen. I say "widening" because, while industry and private enterprise forge ahead, expanding and modernizing themselves, we are not making am equivalent advance in the provision of increased weather service to meet their basic and changing needs. Far from it, we're falling farther behind.

One is inclined to wonder if the onus is on the meteorologist and the organization to foster the ideas and fashion the bridge to span that gap. Yet, in aviation, the onus for providing the necessary instruction has fallen on the weathermen and the weather service.

Since these processes are fundamental problems facing our public weather service, let us see what could be done to effect maximum progress with the available resources.

First, let us study our citizen. He is in general confused over many aspects of weather science. The reputation of the science suffers time and again as its imperfections come to light through the shortcomings of the forecast. He has inherited bits and pieces of folk lore, many of which he clings to doggedly, for want of a provable theory and explanation he can understand.

Our citizen is often virgin soil, weedy and seedy, but usually willing. He needs education. He needs to be cultivated, and reseeded with correct basic weather concepts, and weeded, gently and gradually, of misinformation. More people should know more about the scientific basis of meteorology. Our most fruitful results will show in education in the schools, in the development of the first thinking

as the right thinking. This means an increasing tempo of publications, visual aids, films, film strips and slides. The recent contract assigned to the National Film Board for a film strip on weather maps for schools is now in the planning stage. It's a small start, but none the less an extremely important forward step in school weather education. All too few teachers are capable of teaching weather; reference material is scant or nonexistent in most Canadian schools. The hurried revamping to Canadian style of the weather sections of U.S. science reference texts in the past year is very real evidence of the awakening of provincial Boards of Education to the need for more reference material on weather.

Talks to clubs, to school classes, to church groups, to scout groups and air cadets, and even to the neighbour over the back fence, all help. The wider approaches, through the radio talk, the daily newspaper weather map, the articles in the press, in the popular and industrial magazines, are powerful influences on public thinking, opinion and education.

Every such contact helps to span the gap between the science and the public, and will assist in bringing about the smooth flow and interchange of problems on which meteorology will thrive.

The progressive and practical approach of the British Meteorological Service through its hourly Airmet broadcast, was a crowning achievement. By providing the forecasts, the warnings and the actual raw data, the interest of the listener was caught, and personal contact with meteorology was established. Individuals were encouraged to — and in large numbers actually did — plot their own personal maps, learned to follow the weather and quibble with the reasoning of the official met. man. Sir Robert Watson-Watt gave a touching epilogue to the death of Airmet in his presidential speech, which might be renamed "The Lost Broadcast -- a Weatherman's Lament".

Great progress in educating the public will be made in the next few years. We are on the threshold of an era of unfolding weather knowledge.

Some of our industries are aware of the advantages that may result when weather services are realised and applied. The Davis Rafts, with their millions of board feet of lumber, are sent on their perilous trips over open water when the Vancouver DPWO gives the green light. All across the prairies, oil companies, grain elevators and ranchers are awakening to the economic pay-off in savings when current temperatures, forecasts and warnings are put to work.

Storms on the Great Lakes — the seaman's peril — are well nigh beaten. The no-ship-or-sailor loss in the great storm of November 1950 was dramatic evidence when stacked against the near-identical November 11th storm of 1913 that took a toll of 11 ships down and 244 lives lost. In the Maritimes, thousands of dollars are won on a spraying forecast. Profit or loss means placing your bet on the weather service, and it's paying off handsomely.

And more uses are to come, many of which will surprise us. Two hundred thousand acres of New Brunswick forest are to be sprayed for treatment of the spruce-budworm in a single month this summer. Canadian pilots are to be trained and used, if possible, but there are less than twenty trained in the technique. According to Charles F. Horne, Administrator of U.S. Civil Aeronautics, agricultural flying is one of the biggest potential aviation activities in sight today. Five thousand planes were employed solely for agricultural purposes in 1951 in the United States. One million acres in Texas alone were sprayed with chemicals to kill sagebrush and mesquite. 6,400 pilots are active in dusting and spraying, almost equal to the total airline pilot figure of 7,300. The techniques of spraying and dusting require very critical conditions of wind and weather.

Two million daffodils were shipped by air from Victoria to Toronto for the Easter weekend. Growers received weather advice hourly from our Victoria office, as the critical harvesting time drew near.

THE FUTURE

The DPWO and the meteorologist have a vital role to play, and a very real responsibility towards the preservation of the individual, industrial and national economy of Canada. As Rube Hornstein has so aptly outlined, there are endless opportunities for a broadening of our impact on production and for the protection of our national resources.

The nearly new fields now being explored by our specialists in forestry, agriculture, smoke pollution, cloud physics and other fields, can and will each play an important part. They are main girders of our bridge that can link us with the problems, the secrets and sciences of the industries, and point the way to improved weather service. They will tie their findings in with the DPWO through reports and recommendations, and make a further very real contribution by preparation of simplified interesting weather publications for industry inself.

The extensive rainmaking project in operation last summer over the St. John and Shawinigan watersheds using the latest silver iodide generators, emphasises industry's keen interest in matters meteorological and a readiness to put large funds into the game.

But, you may say, we are now overworked, understaffed, and hampered by inadequate facilities, and insufficient research. Our ability to provide the services depends on the employee and the organization. It depends on our individual outlook, the impact on the public of each forecaster, and on our capacity for adjustment to meet the changes and expansion in our weather service. It is in our own hands to develop with the changing trends. Unfortunately, our capacity to expand is an indeterminate variable — now in our grasp, now floating elusively away just out of reach. It may even prove productive to explore the possibility that our contact with, and dependence on, the selective trend of thinking of the Air Services Branch, has served its purpose. Our future growth could well be far more industrial than aeronautical. A benevolent, understanding and cooperative link with the government proper is essential if the Meteorological Division is to serve Canada to advantage.

I mentioned earlier the widening gulf between meteorological science and the citizen. I like to keep in mind the balance between our weather observation input and our forecast output, and the adequacy of each. Hundreds of synoptic stations report precisely on local weather. The detail of each report serves its purpose by blending into the broad-scale picture of the averaged weather, which in turn leads to the public forecast, extended over space and time. These regional forecasts give back to the localities of our observers weather forecasts smoothed out over hundreds of square miles. The vital link now much needed is the further breakdown of the regional forecast, the application of the local phenomenon and topography factors, that will put meteorology on its feet for the individual, make it a recognized science and a local and national asset.

There are two ways in which we can give this extra local detail and colour to the forecasts:

First, the small dependent weather offices, in cities, in industrial areas, in whatever areas and walks of life they can best serve the economy of our country. Our start at Hamilton and Victoria shows what can be done. And they are still organizing. When they really get rolling, as Don McCormick has so aptly suggested, such offices will be powerful links in our service to the public.

Secondly, a great deal of specialized education must be directed at the individual citizen to bring to his attention the features of what we call 'local weather'. He must be made as fully aware as possible of the effects of open water, of hills, of the real story of the birth, life and death of the diurnal shower cloud. Of these two approaches to better service, the first, the smaller specialized weather office, is temporarily out of stock, but the demand is heavy, and it is my hope that they will be functioning in places of greatest effectiveness as soon and as fast, as the funds can be found.

There is a third minor link of service to the public, not at present operating in Canada, but popular in the United States and undoubtedly due in Canada at some time in the not too distant future. I mean the industrial meteorologist, specializing in the problems of the particular industry that employs him. When the Public Weather Service cannot meet the demands of industry, the industrial forecaster will follow in due course, and will serve his purpose.

Higher speed teletype, the CAO and Fax will all bring changes in our present procedures. We must follow them carefully, adjusting to their possibilities, getting the most from them, while avoiding that feeling of being smothered with new developments.

Looking ahead, one visualizes many developments in the science of weather and its applications. I sincerely hope that within a few years we will be using specially designed radar sets at many offices. They can be particularly useful at our forecast offices. I hope to see their real value recognized and a suitable priority assigned.

In a few years the aerocar will be popular, and the suburbanite will fly across country on air highways, with aerial traffic cops and perhaps stop lights and hand signals. Weather for the air commuter will be more important than icing to the aviator, or slippery pavement to the motorist of today. In the future, a local ground net of special air substations may well probe the atmosphere and provide an almost instantaneous record of the conditions aloft. With this net of surface and upper air observations and our new complicated computing machines, the time will come when we can give a sure-fire, short-range forecast so essential for open-air entertainment and the like.

Our control of climate and weather is growing daily. We have passed from the cave dweller to coal heating stage, to smoke pots for frost, to windbreaks, air conditioning, to the present Russian project of reforestation of 2 million square miles and creation of a

lake equal in area to the Caspian Sea, on to the glossy tales of new developments with large-scale rainmaking, and control of the weather by atomic energy.

The recognized demand for weather control on a large scale will ensure experiment and research that may yield startling developments in the next few years.

Remarkable progress has been made since the first public forecast was issued in Canada just 75 years ago. I hope we'll all live to appreciate and experience the advances in meteorological science and its application, which will creep steadily in on us, and which we will have a part in fashioning in the last half of the Twentieth Century.