OHIO'S CONTRIBUTION TO METEOROLOGY, A BRIEF HISTORICAL RESUME

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Occasions such as this One-hundred-fiftieth Anniversary of Ohio University provide much needed cause to pause in our daily pursuits and renew our perspectives. I should like briefly to review with you the background structure of modern meteorology on this particular occasion because of two somewhat irrelevant but nonetheless interesting facts, i.e., (a) the science of meteorology has experienced practically all of its growth since Ohio University was founded and (b) Ohio and Ohioans had a particularly prominent part in the early development of meteorology in the United States.

In 1804, meteorology was still very much wrapped with the swaddling clothes in which Aristotle presented it to the world. Although he, in the fourth century B. C., strongly fostered the view that the weather was a physically, not a spiritually, controlled complex of phenomena, in 1804 weather was still something for which deities were blamed or praised, beseeched or propitiated by a large proportion of the earth's population.

The weather map with which we television viewers of America have become familiar in the last decade had not yet been invented one hundred and fifty years ago. Professor Heinrich Wilhelm Brandes of the University of Breslau constructed the first known series of daily weather charts about 1820, but the virtues of the synoptic map remained undeveloped for over thirty years.

A war, and a great naval catastrophe provided the impetus which was needed. In 1854 the French fleet, led by the battleship *Henri IV* was preparing to launch a massive attack upon Sevastopol when a violent storm struck the Black Sea, decimating the fleet and damaging the *Henri IV* very seriously. At about this time, M. U. J. J. Le Verrier of the Paris Astronomical Observatory had sprung suddenly into world prominence by correctly predicting, publicly, the existence and location of the planet Neptune. Emperor Napoleon III, judged that a scientist who could discover a new planet so beautifully should be a good man to devise the means for predicting the weather. As a result, Le Verrier was assigned this difficult problem. He assembled all of the data he could find in observatories and universities and, by plotting them synoptically on maps, showed *post facto* that the Black Sea storm had developed and moved regularly in time, so that a simple free hand extrapolation of the wind and pressure patterns would have predicted its arrival. This, to my mind, represents the beginning of modern meteorology, just about a century ago.

By definition, the synoptic method of Le Verrier requires that simultaneous observations from broadly distributed stations be assembled promptly at some point. If forecasts of the weather are to be made, the period between observation and forecast must be a minimum, and the obvious bottle neck is communication. For various well-known historical and practical reasons, therefore, it is not surprising that application of the method in the United States was delayed until 1868, and that then it was launched under the auspices of the Western Union Telegraph Company. It was the idea of Mr. Frank A. Armstrong, manager of the Cincinnati office of Western Union, to collect and publish daily the Weather reports from a number of cities. Soon after Mr. Armstrong started this pro-

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gram, Professor Cleveland Abbe of the Cincinnati Observatory recognized that these data could be used by the application of Le Verrier's method to make weather forecasts. He proceeded to enlist the support of the Cincinnati Chamber of Commerce and the cooperation of the Associated Press with a proposal to "—— enter these observations upon an appropriate manuscript chart—send the daily digest of the weather to the Associated Press—(and) accompany it with such general predictions of the weather for the next two days as—(the Cincinnati Observatory staff)—may seem authorized to venture upon." The proposal goes further by offering the daily digest and weather predictions to the AP and other cooperating institutions gratis.

On February 2, 1869, the first current weather map for the United States was issued for publication by Professor Abbe and Mr. Armstrong. Largely as a result of this effort, and that of Mr. I. A. Lapham of Milwaukee, the Congress enacted a law charging the Signal Service of the United States Army with the duty of providing national weather service. In the autumn of 1870 the weather map publication of Abbe and Armstrong was succeeded by the Tri-Daily Government Weather Map, and in 1871 Abbe joined the federal weather service. Thus after two years, the efforts of these two Cincinnatians led quite directly to the establishment of the first United States Weather Service.

Another prominent Ohioan, Dr. T. C. Mendenhall of the Ohio State University was also active in the promotion of weather science in this country. Through his efforts, combined with those of General W. B. Hazen, Chief Signal Officer, U. S. Army, a meteorological Bureau for the State of Ohio was established by act of the General Assembly in April, 1882. The Ohio Bureau, under the directorship of Professor Mendenhall, chairman, Mr. W. I. Chamberlain (State Board of Agriculture), and Mr. George H. Twiss, issued monthly reports for the state from October, 1882, to April, 1896, when all its functions were given over to the U. S. Weather Bureau.

Since 1896 Ohio has not been particularly prominent as a center for meteorological developments, although some important experiments have been conducted in the state. The Muskingum watershed study set up under WPA auspices and directed by Dr. C. W. Thornthwaite provided an unprecedented store of information on rainfall and flood patterns of that area. The thunderstorm research sponsored by the military and conducted at Wilmington, Ohio, during and following World War II yielded much new information about the processes and characteristics of thunderstorms. Unfortunately Ohio's part in these contributions was almost purely a matter of geography rather than talent.

At the present time a small program of teaching and research in meteorology has developed at the Ohio State University under the Department of Physics and Astronomy. We have awarded several degrees carrying a major in Meteorology, including among these three Master of Science Degrees and we are this year, announcing a curriculum leading to the Bachelor of Science Degree in Meteorology. The researches have ranged from cooperative projects with the Department of Zoology and Entomology and the Mapping and Charting Research Laboratory to relatively specialized problems within the fields of meteorology and physics. Among active research problems at present are the study of natural and artificial precipitation physics, the computation of the exchange of carbon dioxide between the atmosphere and the oceans, and the analysis of the changes of climate which have occurred within the period for which we have adequate records.

It does not seem likely that these studies will serve in the immediate future to distinguish Ohio particularly, but there is one field in which our state is definitely interested and in which she might again engage in a pioneering effort. I am referring to the practical application of modern weather modification and control techniques for the maximum benefit of the public.