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NEVADA AGRICULTURAL EXPERIMENT STATION
SAMUEL BRADFORD DOTEN, DIRECTOR

DEPARTMENT OF METEOROLOGY
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RENO, NEVADA, U. S. A.

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The accompanying memorandum was written two years ago when changes in this department were being considered, and contains practically all that need be said now, although plans for reorganization will have to be decided upon.

During the past two years, through improvements in equipment etc. the department has become better able than ever to undertake the study of problems having a practical bearing on agriculture. As stated elsewhere in this memorandum, judging by ordinary standards this department is an unusually strong one and no other station, and not even the Weather Bureau appears to be giving much attention to the problems of agricultural meteorology. In a conversation two years ago, Dr. Beals of the Office of Experiment stations referring to this condition of affairs said that this department had the field to itself and was in an unusually good position to do valuable work. Hence, having this exclusive field, good equipment and an increasing demand for such work it is particularly desirable for this department to be supported indefinitely, the chief need at present being that the workers should receive the same encouragement and moral support that are given to others, and they should be relieved of all worry concerning possible changes from without. No one can do good work under any other circumstances.

Abundant evidence can be supplied as to the value of such work, considered by the world's best authorities; and detailed statements

can be furnished, showing what studies are needed, both in the regions of "pure" science and applied or "practical" science. And here, it must be said, that while, at first, the connection between a piece of work and its application may seem to be remote, and that often a study has a negative result, researches in "pure" science are, after all, the most practical of studies. Frequently, some indirect result of a principal study has a practical value equal to that expected of the solution of the larger problem. The above is, in its simplest terms, a re-statement of the opinion held by all competent workers in science, and the final decision as to the value of the work of the department of meteorology ought to be based upon such authority.

Personally, after being with this department one year I had decided to return to Blue Hill Observatory but was strongly urged to remain here at Nevada by Dr. Church and Dr. Stubbs under better conditions. A professorship of meteorology in the University was offered me and a positive assurance given that the department was established and permanent; consequently I finally decided to accept. If the department is abolished, even after another year, this action will have the effect of increasing the distrust (already strong among scientific workers) and lack of confidence in State institutions, and it will be all the more difficult to secure competent investigators for the station

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staff. Positions in meteorological work are practically non-existent in this country, and the very good one which I left to come to Nevada is already occupied; so if this department is given up it means that after having spent a lifetime in meteorology and acquiring a fair understanding of the science and its problems and done good work, I shall have to discard all this as waste and work into some business.

S. P. Fergusson

May, 1913.

The Department of Meteorology

Understanding that in the administration of the Experiment Station, the advisability of reducing the appropriation for, and the staff of this Department, is being considered, and that information is desired concerning the purpose and work of the Department, I have prepared the following memorandum which is based not only upon personal experience, but also upon the experience of others in the conduct of similar work in this country and in Europe. To this I have also appended a brief historical sketch of the Department and the work attempted.

In this country, while much time and money have been expended upon the collection of climatic data and the distribution of forecasts, the attention given to research or to studies for the purpose of advancing the science of meteorology and extending its usefulness, particularly in its relation to agriculture, has been insignificant in comparison with similar work in other countries, particularly France and Germany, where agriculture has made its greatest progress. Since the beginning of Experiment Station work the value of meteorology in agriculture has been urged by prominent men such as Professor Harrington, first chief of the Weather Bureau, Dr. L. H. Bailey of Cornell, the present officers of the Bureau of Experiment Stations, and many others; and the increasing demand for such studies and bulletins as have been published within recent years, also indicates that interest in meteorological work is growing rapidly.

So far, few of the studies relating to agricultural meteorology in this country have been authoritative or have been the work of the most competent students; and in many instances the meteorologists of experiment stations are the officials of the local Weather Bureau stations. These men, while skilled in their official routine, are seldom competent investigators and usually their studies of agricultural problems are very superficial.

The present need, therefore, is for work of a better quality than has been possible heretofore; but, before rapid progress may be expected, the conditions for performing such work must be made so favorable as to attract men whose ability is at least equal to that of the heads of other departments such as chemistry, biology, etc. In the interests of efficiency and to avoid unnecessary duplication with limited funds, it is best so to order the work that:

(1) It may be of practical benefit to the country or the State as well as have the general purpose of advancing knowledge.

(2) If work done elsewhere is duplicated it must be of better quality.

Also, if a department is unusually strong in equipment or personnel or both it is very desirable to make its work prominent, especially if similar departments in neighboring stations are relatively weak or lacking.

In January last, during a visit to Washington, I discussed these matters with Drs. True, Allen, Evans, and Beals, of the

Office of Experiment Stations and was assured that the office would heartily encourage advances in meteorology along the lines mentioned and that plans for cooperation ~~on~~ with other institutions would be approved and supported as far as practicable. At the present time the policy of the Office is more and more to restrict the use of the Hatch and Adams Funds to research, and this policy will be followed more rigidly when (as seems certain within a year) Congress ~~xixi~~ makes appropriation for University Extension work in Agriculture. This, very probably, will relieve the Hatch Fund of the burden of such work so that it may be used, as stated, to further research. The Office of Experiment Stations gives preference to researches having a general or universal application rather than those of purely local interest.

I have been a student and worker in meteorology since 1881 and for twenty-three years was a member of the staff of the most important observatory in this country. A large portion of my time has been occupied with the methods and mechanism of research and frequently this special knowledge has been of practical use in establishing new work in other institutions; of which may be mentioned several arctic expeditions, long-period apparatus for the Harvard Stations in Peru, an aeronautical equipment for the Argentine Weather Bureau and many smaller projects. The three instruments forming the Mt. Rose equipment were designed by me three years before I was invited to undertake meteorological work here.

At the time I came here there were projects already in operation sufficient to require the time of a well equipped department indefinitely; and being assured that this department and its work would be a permanent part of the station, I finally decided to remain, with the understanding that my time should be given particularly to the purely meteorological studies and that the labor and field work would be otherwise provided for.

Like most new departments, this one lacked many essentials without which it would have been useless to continue it. There was much shop work necessary to repair and construct apparatus, and no shop nor tools, even of an ordinary kind; and no mechanician skilled in such unusual work. Also, there was hardly the beginning or nucleus of a working technical library - an absolute necessity in any department whose work is research. The great distance of the Nevada station from sources of supply, laboratories and other workers in science is also a great obstacle to efficiency, and altogether, it must be admitted that the conditions for establishing a new department of research were not very inviting. I have spent most of my spare time in remedying these deficiencies, and in the instance of the library have been unexpectedly successful. I received two personal gifts of books and duplicate publications from the Director of Blue Hill Observatory and from the estate of a friend; these, comprising several hundred titles, added to a small collection of my own and to a similar collection from the estate of Chas. W. Friend, form a fairly good reference library. Exchanges

of publications with leading institutions and workers here and abroad have been arranged and a card catalogue of the library has been undertaken by Mrs. Fergusson without cost to the station. Regarding repair-shop and laboratory, I have used an equipment of small special tools purchased at different times for my private work and have cooperated with the department of physics in maintaining a shop for our joint use. No charge has been made the station for the use of these tools except for those broken in doing department work.

The attempt was made to do without a laboratory equipment at the University, but it has been found impossible; and there being no funds to spare for this purpose I have undertaken to construct the instruments needed, which, it may be said, are particularly adapted to research and demonstration and are in no sense duplicates of the common types. So far the material and labor have been supplied without cost to the University. This work is now nearly completed and before the opening of the next term this department will be the best equipped of its kind west of the Mississippi.

My time during the past three years has been occupied with the routine work of the projects already in operation, for the reason that it seemed best to complete these as they were planned before making radical changes or attempting new work. Last year (1912) and during the present fiscal year some important parts of the work were seriously retarded because of the very small appropriation available; and had this condition been foreseen I should have given more time to a study of the material already accumulated, instead of to shop-work and instrument making.

(Nearly all the new instruments and repairs on old apparatus have been made without outside assistance.)

The projects or investigations now in hand are very important, and the results obtained have received the commendation of scientific men here and in Europe, as well as the endorsement of the Office of Experiment Stations, as already stated. To discontinue any part of the work at present would result in the waste of the money and labor already expended; but if the cost of maintaining the department must eventually be reduced time should be allowed to complete the larger pieces of work and publish the results.

My plan, at present, is to spend as much time as possible upon the preparation of the earlier work for publication and to analyze the new material as it accumulates so that there may exist no longer the feeling that there is a long interval between the beginning of a project and the appearance of preliminary results. Abundant references to published work done elsewhere can be quoted, all showing the value of a Department of Meteorology; and if the present staff can have the assurance that their work is permanent and that it may be pursued under favorable conditions, I feel sure that this Department will more than justify its claim for consideration.

A. P. Ferguson

SPF

Associate Meteorologist of the Experiment Station,
Professor of Meteorology, University of Nevada.

History of the Department

Since the opening of the Nevada Experiment Station more or less attention has been given to Meteorology and Climatology, the earlier work consisting of a record of the principal elements of the weather in this vicinity. Until 1905 this work formed part of the duties of Professor S. B. Doten, who, in that year published two bulletins giving the climatic conditions prevailing during the preceding decade.

In 1905 Dr. J. E. Church began observations of temperature on Mt. Rose, making frequent ascents of the mountain for this purpose at his own expense. It was considered that these records might be of permanent interest and of possible value in forecasting, accordingly in 1906 appropriations from the newly established Adams Fund were granted by the station for the erection of a small building and an instrument shelter on the summit. A barograph and a thermograph were placed in operation during this and the year following, and in 1908 an instrument specially constructed to record for a month without attention was installed. For the purpose of studying the vertical changes of the weather two similar instruments were established at Truckee and Fallon. These long-period instruments have reduced very materially the labor of obtaining the records, for in the early days of the station the bi-weekly ascents of the mountain were sometimes made under conditions such as are encountered by Arctic expeditions and called for exertions that very properly have been termed heroic. To lessen the danger from exposure a refuge camp was established 1800 feet below the summit and in 1910 this was enlarged and made more comfortable.

In August 1910 S. P. Fergusson was engaged for one year to aid in the routine work of the Department and begin an analysis of the records. At the end of this time he was given permanent appointments of associate Meteorologist of the station and professor of Meteorology in the University.

By January 1911 the three Mt. Rose stations were in full working order and have continued so, with the exception of the station on the summit where the instruments have been interrupted more or less by severe storms. These records form a very valuable mass of material for the study of vertical changes of weather conditions and the mountain observatory has the distinction of being the highest in North America. The records now accumulating ought to be, with some modifications, sufficient to decide in a practical way the problem of forecasting from elevated or mountain stations.

Three problems, all of great importance are now being studied (1) The forecasting of frost from mountain summits, (2) The relation of forests to the conservation of snow, and (3) a temperature survey of the state to determine the regions most suitable for fruit-growing. Bulletins on the work of Mt. Rose Observatory and the Avoidance and Prevention of Frost have been issued and have been favorably received; also a number of papers have appeared in scientific magazines.

The establishment of this work and the progress that has been made are due to the enthusiasm and energy of Dr. Church who has contributed liberally from his own means ~~in the support of the~~

to the support of the various projects and has worked untiringly in their interest. Particularly is this true of the study of the relation of forests to snowfall in which the collection of data has required long and exhausting snow-shoe trips through the high Sierras. A partial reward for this has come with the adoption by the Weather Bureau in its work, of the instruments devised by Dr. Church for the measurement of snow, and the work has received favorable comment both here and abroad.