officers of this corps devoted themselves entirely to geodesy and topography. Thus occupied they came to have a lively appreciation of the relation between internal structure and external form. Truly, geology was at that time but little advanced, but this productive combination of two orders of studies must have been of mutual advantage, had not an always regrettable decision caused the suppression of the corps of geographical engineers, and the transfer of their duties to the officers of the army staff. Certainly there was no lack of capacity among the latter, but it was nevertheless a capital mistake to entrust a service essentially civil, and even scientific, to military officers who could not devote themselves exclusively to it. Consequently, even though the maps have been well made, there has been a slow advance of what may be called appreciation of topographique form (*l' intelligence du terrain*). Certain of the more sagacious geologists in vain showed how the meaning of topographic form is illuminated when it is studied in relation to internal structure ; the divorce of 1830 continued to exercise its unlucky influence, and all the more because other nations, following the example of France, have for the most part identified topographical work with that of the national defense. But a reaction has gradually set in, and to this none have contributed more effectively than the Americans ; and here the author goes on to pay a high tribute to the scientific results of our western surveys.

Accepting the correctness of the principles stated by de Lapparent, it follows that our topographers can succeed in their great work only when imbued with a truly scientific spirit. There is small likelihood of this spirit being generally attained so long as engineering schools give so little attention as at present to the study of the great subject on which their topographic art is to be exercised. For this reason, such works as Gannett's Manual are particularly welcome.

W. M. DAVIS.

HARVARD UNIVERSITY.

THE NEEDS OF METEOROLOGY.

To state a problem clearly is to contribute much towards its solution ; to realize one's wants and make them known may bring the needed help ; therefore I accept with pleasure an invitation to speak of the needs of meteorology.

Considered as a source of climatological statistics bearing on every branch of human activity, on land and sea, meteorology has been handsomely supported for a century by all governments and scientific organizations. This feature of our work is now carried on by the U. S. Weather Bureau and the State Weather Services with increasing thoroughness from year to year.

Considered as a system for the prediction of storms andweather for a day or two in advance, meteorology has received enthusiastic support by our own and all other nations. We are now doing about all that can be done by the mere utilization of the telegraph and weather map and the cautious application of general average rules, but we are still powerless in the presence of any unusual movement of the atmosphere. Indeed, I do not see that even our West Indian hurricanes are predicted any better to-day than they were in my ' Probabilities ' of August, 1871.

Meteorologists can never be satisfied until they have a deeper insight into the mechanics of the atmosphere. Something more is needed than the most perfect organization for observing, reporting and publishing the latest news from the atmosphere. It is not enough to know what the conditions have been and are, but we must know what they will be, and *why so*. We must have a deductive treatise on the laws governing the atmosphere as

complete and rigorous as the 'Celestial Mechanics' of La Place, and this will necessarily be a treatise on the application to the atmosphere of the general laws of force, or what is technically known as the dynamics and thermo-dynamics of gases and vapors. Such a work cannot be written now, nor when written can it be studied successfully unless accompanied by an introductory 'Laboratory manual of physics and hydro-dynamics.'

But the preparation of this latter work demands appropriate laboratory arrangements. I will, therefore, invert the order and say that further progress in meteorology demands a laboratory and the consecration of the physicist and the mathematician to this science. Something like this was started in 1881, by General Hazen, in establishing a 'Study Room,' but it was ruled out by the report of a committee of Congress, and since that day meteorology has more than ever looked to the universities for its higher development. The applications of climatology to geology, physiography, hygiene, irrigation and other matters have been developed, but meteorology itself, the most important and the most complex of all the physical sciences, still remains to be provided for.

The crying need of this science is a *home*, a domicile, a meteorological laboratory, and full recognition as a course in university study.

Without experimentation there is no true progress in the physical sciences.

Cleveland Abbe.

Washington.

CORRESPONDENCE.

A CARD CATALOGUE OF SCIENTIFIC LITERATURE.

Editor of Science, *Dear Sir:* The efforts which students of the Natural Sciences are constantly making to provide themselves with more complete summaries of the literature of their various departments all testify to the existence of a wide-spread feeling of dissatisfaction with the existing methods of cataloguing scientific papers and reporting upon the results of scientific research. That this dissatisfaction is felt by none more keenly than by those engaged in the work is shown by the appeal made last spring by the Royal Society to various universities and learned societies for advice as to the feasibility of maintaining by international coöperation a complete catalogue of current scientific literature.

The following circular of the Society, together with the reply of Harvard University to the same, will doubtless be of interest to your readers, and by opening the columns of your journal to a discussion of the subject you will not fail to elicit valuable suggestions with regard to the details of the plan.

In adopting the recommendations of the committee as printed below, the University Council voted "that the Secretary of the Council be instructed to transmit to the Royal Society a letter stating the opinion of this Council, that the expression 'scientific literature' as used in the above recommendation ought to receive a very broad interpretation."

Yours very truly,

H. P. Bowditch.

LETTER FROM THE SECRETARIES OF THE ROYAL SOCIETY.

The Royal Society,
Burlington House, March 22, 1894.

Sir: The Royal Society of London, as you are probably aware, has published nine quarto volumes of 'The Catalogue of Scientific Papers,' the first volume of the decade 1874–83 having been issued last year.

This Catalogue is limited to periodical scientific literature, *i. e.*, to papers published in the Transactions, etc., of Societies, and in Journals; it takes no account whatever of