SOUTH KENSINGTON MUSEUM

CONFERENCES

HELD IN CONNECTION WITH

THE

SPECIAL LOAN COLLECTION OF SCIENTIFIC APPARATUS.

1876.

CHEMISTRY, BIOLOGY, PHYSICAL GEOGRAPHY, GEOLOGY, MINERALOGY, AND METEOROLOGY.

Published for the Lords of the Committee of Council on Education

BY

CHAPMAN AND HALL, 193, PICCADILLY.

The PRESIDENT: Ladies and Gentlemen, I am sure you will all return your thanks to Baron Ferdinand von Wrangell for this very interesting communication with regard to the self-registering tide gauge, which appears to be of great simplicity, and at the same time of great value. I hardly know which we shall admire most, the simplicity, and ingenuity of the apparatus, or the admirable manner in which a foreigner has been able to place it before an English audience. It is of considerable interest, and I shall be glad to hear any remarks upon the subject. I am afraid that owing to some misunderstanding and partly to a loss which has been sustained by Mr. Clements Markham, the members of the Geographical Society who have to read papers have not been apprised of the time at which their papers would be brought before the Conference, but I hope we shall see some of them here very shortly. As Mr. Galton has some ingenious devices to bring before the Conference I will ask him to be good enough to do so.

ON MEANS OF COMBINING VARIOUS DATA IN MAPS AND DIAGRAMS.

Mr. F. GALTON, F.R.S.: Geographers want above all things an improvement in their methods of combining various data upon the same maps. The whole object of geography is to show the physical features of the ground in combination with the facts of which those features are the stages, but this cannot as yet be effected without a great confusion of lines and tints. The limits of applicability of shading and colouring, are very soon reached. I show you here a most beautiful specimen of shading; it is as perfect as can be, being taken by a simple photograph from a relief model. But beautiful as it is, it shows hardly anything more than the mountains; the shades are so dark that what is written and engraved in the shaded parts is barely legible, and if we added such colours as geologists use, the shading would be still further interfered with, and there would be great confusion. I don't propose to enter into questions as to how far data may be superimposed upon the surface of the same map by means either of shading or of colouring, but I wish to speak of two other methods of combining data which appeal to quite different faculties

One is by the use of stereoscopic maps. In using the stereoscope, the notion of relief depends upon the varying convergence of the optical axes of the eyes to the different parts of the picture. In this beautiful model of Mont Cenis the eyes converge more nearly to the peaks near the eye than to the depressions farther removed from them. As you are perfectly aware, a stereoscopic picture consists of a pair of photographs taken from two slightly different points of view, corresponding to the distance between the two eyes, and upon which the eyes are made to converge through the interposition of the ordinary stereoscope. I proposed this method of stereoscopic maps eleven years ago before the Geographical Society, and a small paper which I then read is published in their proceedings. The plan has not been adopted, but I think I may venture to suggest it again to geographers, because there are yearly increasing means of obtaining stereoscopic pictures. We want, first of all, good models, and every year increases the number of them. Those of you who were at the French Geographical Exposition will have noticed how large was the number of topographical models, and from any of those photographs might be taken. The Royal Engineers attached to this Loan Exhibition have taken for me some photographs of various models which perfectly illustrate what I desire to show. Models require a table to stand upon, they are of great weight and are very costly; but a stereoscopic picture taken from a model gives nearly all that the model can shew, and costs only a few pence.

The other method which I am going to bring before your notice is one I have not hitherto described. It is a plan of utilising the element of time by presenting different data that we desire to superimpose in rapid succession before the eye. Most of you are acquainted with the old fashioned instrument used for accomplishing this object; there used to be, and perhaps is now, one at the Polytechnic. By turning round a disc, separate pictures of the object, but in different positions, were brought in quick succession into the field of view, and the object of the picture seemed to move. For example, a wheel was drawn in several consecutive positions; these were rapidly brought in succession before the eye and the effect was that the axis of the wheel appeared stationary while the wheel itself appeared to revolve round that axis. But the instrument did not act well, it produced an unpleasant jerking

effect, and it has never come into general use. The late Sir Charles Wheatstone gave great attention to the subject, and Professor Clerk Maxwell has also devised an instrument, but none of these "Wheels of Life" as they have sometimes been called, have come into use, either from being too cumbrous or from some other cause. The plan I propose is a very simple one—it is like a dissolving view; each picture fades into the next one, and there is no reason why a perfectly continuous change of appearance might not be produced by it. If you look through an ordinary telescope (not an opera glass), and cover half of the object glass, you still see the same objects as before, the only difference being that a certain quantity of light is cut off and the objects are less bright. If instead of covering a part of the object glass by the hand or a card, you use an inclined mirror, then on looking through the telescope you will see two images superimposed on one another, namely the image of the object in front of the telescope seen through the open portion of the object glass, and that of whatever may be seen reflected in the mirror. In short, by means of a telescope we are able to superimpose two or even more separate pictures on the same field of view. This is the first of the principles used in the arrangement I am about to explain. The second is this: suppose that we have a small carriage running on a tramway to and fro, and that we fix a lens into the roof of the carriage and a picture of the same size as the lens, on the floor below it at its exact focal distance. Then if we fix a telescope vertically above the tramway, looking down upon it, and bring the lens exactly below the telescope, we shall see the picture through it just as though it were an extremely distant object. Now let us push the carriage a little, so that the lens and picture cease to be immediately below the telescope, then the only alteration in the image as seen through the telescope will be a diminution in its brightness. As we push the carriage further, the image will wane more and more in intensity until it wholly disappears, but it will never alter its position, which is absolutely stationary. In the apparatus about to be described, the two principles just mentioned are used in combination. I have here a carriage on a tramway, moving to and fro beneath a fixed telescope. In the roof of the carriage is a row of six similar lenses side by side, and below them on the floor of the carriage at the focal distance of those lenses is a row of six pictures, one picture below

each lens. When No. 1 lens is brought below the telescope the picture No. 1 comes into view just as if it was an extremely distant object. Now let us push the carriage until only a portion of No. 1 remains below the telescope while a portion of No. 2 has come under it. We shall see, on looking through the telescope, that the image of No. 1 has faded and that of No. 2 has been superimposed on it. Push the carriage still further and No. 1 will gradually fade into extinction while No. 2 grows to its fullest brightness. Continue pushing, and just the same will take place in respect to Nos. 2 and 3 that has been described in respect to Nos. 1 and 2, and so on for all the lenses in succession. By this means a series of geographical data printed in maps may be successively superimposed. It affords a peculiarly suitable method for picturing changes, whether in physical or political geography. I will not describe the mechanism by which complex and powerful instruments of this kind might be constructed; where the images should be thrown by a lime light on a screen, and a string of perhaps only three large achromatic collimators should serve for an indefinite number of pictures. I think this is all I need now to say to you upon the subject. My present object is merely to explain a general principle and to show it in action on a small scale. The method of putting the idea into a good practical shape has still to be worked out, and I hope some gentleman will try to do so, for it appears to me to be one that has many important consequences.

The PRESIDENT: Ladies and Gentlemen, I am sure you will all return your thanks to Mr. Galton for his interesting account of a method by which you may see three or four things through one glass. I am sure you are all glad to have heard his remarks. I will now call upon Professor von Oettingen to give us a description of his Anemometer which we were obliged to postpone on Tuesday.

Professor Von Oettingen entered into a detailed explanation of his ingenious and elaborate apparatus for recording the action and force of the wind. It would, however, be impossible to give a report which would be intelligible except in presence of the machine itself, or with the aid of numerous diagrams.

The PRESIDENT: I am sure we all feel grateful to Professor von Oettingen for the description of his exceedingly interesting and complicated apparatus for marking the action and the force of the wind.