

The numbers in column 22 show the weight in grains of a cubic foot of air, under the mean atmospheric pressure, temperature, and humidity of the air; the largest number was in January, decreasing to the smallest in July, then increasing to December.

In column 31 are given the numbers of days of rain in each month; the largest was 12 in November, and the next in order 11 in January. The total number in the year was 56. At Jerusalem rain fell on 63 days.

In column 32 the monthly fall of rain is given. The heaviest fall of rain on one day in the months from January to April was 1.45 inch, on January 1st; the next in order were 0.90 inch and 0.72 inch on March 22nd and 23rd respectively. No rain fell from May 3rd till October 29th, making a period of 178 consecutive days without rain; the fall of rain on November 26th was 1.62 inch, and on November 30th and December 1st 1.30 inch and 1.42 inch fell respectively. The heaviest monthly fall in the year was 6.67 inches, in November, and the next in order 3.93 inches, in January. The total fall for the year was 19.42 inches. At Jerusalem the total fall for the year was 31.23 inches.

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## A NEW TREATISE ON THE GEOLOGY OF THE HOLY LAND AND THE DEAD SEA.<sup>1</sup>

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WE welcome the treatise of Dr. Blanckenkorn on a subject which can never fail to interest those who make a study of the physical features of the globe, especially when represented by a region confessedly unique in its geological structure, and one which must necessarily afford fresh objects of investigation, and new methods of treatment, from successive observers. The Palestine Exploration Society of this country has its counterpart in Germany; and with both societies the investigation of the geological structure of the Holy Land, and the mode of formation of the Dead Sea and of the Jordan-Arabah depression, has been undertaken as an essential part of the objects for which each society was founded.

The treatise of Dr. Blanckenkorn deals with those physical changes of which the Dead Sea depression, and the deeply furrowed ridge of Western Palestine, together with the tablelands of Edom and Moab are the outcome. Those who are familiar with the work of previous observers will not find in the essay of Dr. Blanckenkorn much that is new; but it is gratifying to know that there is very little in which he

<sup>1</sup> "Entstehung und Geschichte des Todten Meeres," Von D. M. Blanckenkorn; "Zeit. d. Deutsch. Palestina-Vereins," ed. by Professor D. Hermann Guthe (Leipsig, 1896).

is not in agreement with them; and his essay will doubtless have the result of inducing German geologists and men of science to take a greater interest in the geology of Palestine and the origin of its physical features. We do not, however, forget that Germany, in the persons of Burckhardt, Fraas, Niebuhr, and Russigger, has taken its fair share in the exploration of Palestine.

The author treats the subject historically, commencing with the old foundation rocks (archaischen Grundgebirge) of supposed Archaean age which crop out along the base of the Moabite and Edomite range on the eastern margin of the Jordan-Arabah depression, and of which the Sinaitic mountains are also mainly composed. He then proceeds to describe the Permo-carboniferous sedimentary beds of Labrusch (Lebrusch), first discovered by the Geological Expedition of the P. E. F. (1883-4),<sup>1</sup> and the succeeding strata of Cretaceous age, beginning with the "Nubian Sandstone" (Russegger), and continuing onwards through the Cenomanian and Senonian stages of the series; the latter being characterised by numerous bands of flint. The author does not admit the presence of Eocene strata along the low grounds bordering the Mediterranean, and considers "the calcareous sandstone of Phillistia" as post-tertiary or diluvial. The terraces of the Jordan-Arabah depression are described at length; and an attempt is made to synchronise them with the stages of the Glacial period in Europe. To the earliest stage (Die erste Eiszeit oder Regenepoche), represented in Europe by the epoch of extreme cold and extension of existing glaciers, the author refers the formation of the highest terraces, of which those in the Arabah Valley, discovered by the members of the Expedition of 1883-4 at the springs of Abu Werideh, are the most remarkable examples; being at a level of nearly 1,400 English feet above the present surface of the Dead Sea. The numerous semi-fossil shells of the genera *Melania* and *Melinopsis*, which these terraces of marl and sand contain, leave no room for doubt but that the waters of the inland sea once stood at this level. Dr. Blanckenkorn throws out the suggestion that it is owing to the almost rainless character of the climate in this region that these strata have been preserved, while their representatives in the more northerly districts of the Jordan Valley, subjected as they have been to rains and torrential action, have been swept away, during the long period through which they have been exposed to the action of atmospheric agencies.

To the first Interglacial epoch, or period of drought (Troddenepoche), the author refers the formation of the salt-rock terrace of Jebel Usdum and the Lisan; and to the second Glacial stage the formation of the more conspicuous terraces, so well described by Tristram, which rise from 300 to 600 or 700 feet above the surface of the Dead Sea. The second Interglacial stage was characterised by the eruption of lavastreams and sheets of basalt, of the Yarmuck Valley, Moab, and the

<sup>1</sup> "Mount Seir," p. 120. Memoir on "The Physical Geology of Arabia Petraea, Palestine, and Adjoining Districts," p. 46 (1839).

region east of the Upper Jordan; while, lastly, the lower terraces of the plain of Jericho are referable to the third ice-epoch (die Dritte Eiszeit) of Europe. According to this view, it will be seen that the quaternary formations of the Jordan-Arabah are representative of physical changes of wide geographical extension, not of purely local origin; a view which must commend itself to all geographers. And it should here be stated that the author accepts for the whole Quaternary period in Palestine the term "Pluvial," applied to it in the memoir on "The Geology of Arabia Petrea and Palestine," as generally representative of the Glacial, or Post-pliocene, period of the European continent.

The account of the mode of formation of the great Jordan-Arabah depression given by the author does not materially differ from the views stated in the memoir above referred to, except that the author makes a slight mistake in stating that the great upheaval of the land and sinking of the Jordan depression along one or more lines of faulting took place at the close of the Tertiary period (Mit dem Schluss der Tertiärperiode), meaning the close of the Eocene period.

No fresh light is thrown in this essay on the geological structure of the Badiet-et-Tih, that great tract which stretches southwards from Southern Judæa to the border of the Sinaitic mountains. This district is less known physically than any other part of Palestine or Arabia, and much requires to be done in order to extend our, at present very limited, knowledge concerning its physical structure. The distant glimpses obtained from time to time along its margin during the progress of the Expedition of 1883-4 led to the belief that numerous points of structural interest remain to be worked out. The Badiet-et-Tih is not a featureless tableland of glistening limestone, as might be supposed on looking at the maps. The views referred to included well-defined ridges and terraces, sharp clefts and passes, all of which mean structural changes in the rocks. There remains also the determination of the approximate line of boundary between the Cretaceous and Eocene formations, which has never been attempted with any degree of accuracy. The fact is, that the Badiet-et-Tih is one of the most uninviting regions in the whole of Palestine and Arabia Petrea, and travellers whose time is necessarily limited are glad to escape from it into the more promising districts surrounding the Jordan and Dead Sea. But the rewards awaiting exploration may be greater than anticipated; and the difficulties and discomforts which might attend the enterprise should not deter geologists in these days of adventure and discovery—while, with proper precautions, no danger would arise from hostility on the part of the Bedawin inhabitants.

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