A SKETCH OF THE GEOLOGY OF FIFE AND THE LOTHIANS, INCLUDING DETAILED DESCRIPTIONS OF ARTHUR'S SEAT AND PENTLAND HILLS

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ARTHUR'S SEAT AND PENTLAND HILLS.

BY

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PREFACE.

The original object of this work was to describe the structure of Arthur's Seat and the Pentland Hills ; but as it seemed desirable to shew the connections of these with the formations of the adjoining country, a geological sketch of the district between the Ochil and the Lammermuir Hills, constituting the lower basin of the Forth, was prepared and is inserted.

To the description of the rocks has been added a brief account of the older and newer alluvium, and a summary of the evidence from which a rise in the bed of the Firth of Forth has been inferred. Since this part of the work was written, an excellent memoir on the subject has been published in the Edinburgh Philosophical Journal by Mr Smith of Jordanhill, of which I would have been happy to avail myself of it had it appeared a little earlier. Mr David Milne, advocate, read, in the Royal Society, last winter, two able papers on the Mid-Lothian coal-field, and the superficial deposits of the basin of the Forth, from both of which, had they been printed, I would have derived much valuable information. Owing to indisposition I was not present when the former was submitted to the Society, and though I heard the latter read, I did not consider myself entitled to make use of Mr Milne's researches before he had given them to the public. My remarks on these deposits were written in the summer of 1837, and have only received some small additions and corrections from observations of my own subsequently made.

Mr R. J. H. Cunningham has published, in the Memoirs of the Wernerian Society, an elaborate paper on the Geology of the Lothians, for which he received a prize. Besides adding greatly

to our knowledge of the extent and limits of the different formations, by his carefully prepared map, Mr Cunningham has thrown out many original and valuable remarks, and has given beautiful and accurate sections of some of the most interesting geological phenomena in the district. I did not see his memoir till the last sheets of this work were in the press, and I do not think it necessary to advert to the differences between his descriptions of the rocks and mine. They are to a great extent differences of method and arrangement.

In extenuation of the many errors and imperfections which will doubtless be found in this work, I might justly plead the difficulty of the subject, and the very limited amount of information previously accessible. These, however, are but a part of the disadvantages under which I laboured. My avocations did not permit me to devote more than a few days of each summer to the necessary surveys; and as the most ample written notes comprehend but a fraction of what the newly-stored memory retains, it happened, unavoidably, that much of the information collected in one season was forgotten before the next arrived, and researches, which might have been completed in three or four months, were extended over seven years, to the prejudice, no doubt, of their accuracy and consistency. The composition of the work has also been executed by short snatches, and amidst continual interruptions. If I were to say, that it has been as often dropped and resumed as it contains pages, I would not overstep the truth.

Though many of the descriptions given will have little interest except to professed geologists, my aim throughout has been to render the work intelligible to persons who have never studied the science, and various details and illustrations have been introduced for this purpose.

I am indebted to Mr Jardine, civil engineer, and Mr Bald, mining engineer, for several valuable communications; but my greatest obligations are to Professor Jameson, and his nephew

Mr William Jameson, assistant-surgeon in the service of the East India Company. All who have examined the porphyries of the Pentlands are aware of the perplexing variety of aspects they assume, of the difficulty of discriminating the species, and even, in some cases, of separating the igneous rocks from the sedimentary. The Professor, with his usual kindness to an old pupil, most obligingly resolved my doubts as often as I applied to him; and, when delicacy forbade me to encroach too far on his time, I was generally assisted by his nephew, who has rendered himself a most accomplished geologist and naturalist, at an early age, by enthusiastic study. I must not, however, make my friendly instructor responsible for errors which are mine. I was obliged to rely on my own judgment in many cases; and even when guided by the Professor's superior skill, the descriptive language employed being my own, no doubt sometimes involves inaccuracies and mistakes.

The theoretical view of the structure of Arthur's Seat is substantially the same with that which I published about five years ago, in a series of articles in the *Scotsman* newspaper. The descriptive part, which was then very faulty, will I hope now be found correct.

Some will blame me for indulging so much in speculation. I can only plead in my defence, that geological researches would be uninteresting to those who conduct them, and still more to those who read the results, if they were confined to a detail of facts, and separated from the study of causes. To this study, the science, it may be truly said, constantly invites, and though many of the processes which Nature employs still remain mysteries, enough is known respecting the origin of the igneous and sedimentary rocks, to afford elucidations and suggestions which the reader generally moulds into theories for himself, if the writer, who ought to be better informed, does not take the task out of his hands. In geological books, it is rather the abuse than the use of speculations which should be guarded against. Hypothe-

ses founded on gratuitous assumptions, such as Burnet's central abyss of waters, or Whiston's shock of a comet, serve only to divert men's minds from the legitimate paths of investigation, but theories which take their departure from admitted facts or principles, such as the originally fused state of the igneous rocks, the gradual deposition of the sedimentary, the disturbing influence of upheaving forces, and the denuding action of water—such theories, followed out with moderation, and proposed as conjectural or probable explanations of phenomena, of which we have not a full and perfect knowledge, are not only admissible, but advantageous. They afford incentives to study, by bestowing an interest on details which would otherwise be intolerably dry, and become clues to minute and accurate observation, by indicating the points to which inquiry and research should be directed.

I have explained, at p. 69, the motives which led me to introduce the term "calciferous sandstones." It was not done from any love of innovation. On the contrary, I was most anxious to adhere to the nomenclature of the English geologists, but could not contrive any means of reconciling it with the order in which the formations present themselves in this part of the country. If the conglomerates of the Pentlands could have been transferred to another class, such as Mr Murchison's "Silurians," the words "Calciferous and Red Sandstones" would have better expressed the idea I wished to convey, namely, that these rocks blended the characters of the Mountain Limestone and old Red Sandstone of the English geologists; but I had no authority to make such a transference of the conglomerates. As the classification I have adopted does not satisfy myself, I cannot expect that it will satisfy others. I wish it, however, to be distinctly understood, that it is not proposed for general acceptance, but merely as a temporary expedient to elude difficulties which I was unable to solve, and I shall most cheerfully adopt any better arrangement which others may bring forward.

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