

CHAPTER V.

FROM GENESIS TO GEOLOGY.

I. GROWTH OF THEOLOGICAL EXPLANATIONS

AMONG the philosophers of Greece we find, even at an early period, germs of geological truth, and, what is of vast importance, an atmosphere in which such germs could grow. These germs were transmitted to Roman thought; an atmosphere of tolerance continued; there was nothing which forbade unfettered reasoning regarding either the earth's strata or the remains of former life found in them, and under the Roman Empire a period of fruitful observation seemed sure to begin.

But, as Christianity took control of the world, there came a great change. The earliest attitude of the Church toward geology and its kindred sciences was indifferent, and even contemptuous. According to the prevailing belief, the earth was a "fallen world," and was soon to be destroyed. Why, then, should it be studied? Why, indeed, give a thought to it? The scorn which Lactantius and St. Augustine had cast upon the study of astronomy was extended largely to other sciences.*

But the germs of scientific knowledge and thought developed in the ancient world could be entirely smothered neither by eloquence nor by logic; some little scientific ob-

* For a compact and admirable statement as to the dawn of geological conceptions in Greece and Rome, see Mr. Lester Ward's essay on paleobotany in the *Fifth Annual Report of the United States Geological Survey*, for 1883-'84. As to the reasons why Greek philosophers did comparatively so little for geology, see D'Archiac, *Géologie*, p. 18. For the contempt felt by Lactantius and St. Augustine toward astronomical science, see foregoing chapters on Astronomy and Geography.

servation must be allowed, though all close reasoning upon it was fettered by theology. Thus it was that St. Jerome insisted that the broken and twisted crust of the earth exhibits the wrath of God against sin, and Tertullian asserted that fossils resulted from the flood of Noah.

To keep all such observation and reasoning within orthodox limits, St. Augustine, about the beginning of the fifth century, began an effort to develop from these germs a growth in science which should be sacred and safe. With this intent he prepared his great commentary on the work of creation, as depicted in Genesis, besides dwelling upon the subject in other writings. Once engaged in this work, he gave himself to it more earnestly than any other of the earlier fathers ever did; but his vast powers of research and thought were not directed to actual observation or reasoning upon observation. The keynote of his whole method is seen in his famous phrase, "Nothing is to be accepted save on the authority of Scripture, since greater is that authority than all the powers of the human mind." All his thought was given to studying the letter of the sacred text, and to making it explain natural phenomena by methods purely theological.*

Among the many questions he then raised and discussed may be mentioned such as these: "What caused the creation of the stars on the fourth day?" "Were beasts of prey and venomous animals created before, or after, the fall of Adam? If before, how can their creation be reconciled with God's goodness; if afterward, how can their creation be reconciled to the letter of God's Word?" "Why were only beasts and birds brought before Adam to be named, and not fishes and marine animals?" "Why did the Creator not say, 'Be fruitful and multiply,' to plants as well as to animals?" †

Sundry answers to these and similar questions formed the main contributions of the greatest of the Latin fathers to

* For citations and authorities on these points, see the chapter on Meteorology.

† See Augustine, *De Genesi*, ii, 13; iii, 13, 15 *et seq.*; ix, 12 *et seq.* For the reference to St. Jerome, see Shields, *Final Philosophy*, p. 119; also Lyell, *Introduction to Geology*, vol. i, chap. ii.

the scientific knowledge of the world, after a most thorough study of the biblical text and a most profound application of theological reasoning. The results of these contributions were most important. In this, as in so many other fields, Augustine gave direction to the main current of thought in western Europe, Catholic and Protestant, for nearly thirteen centuries.

In the ages that succeeded, the vast majority of prominent scholars followed him implicitly. Even so strong a man as Pope Gregory the Great yielded to his influence, and such leaders of thought as St. Isidore, in the seventh century, and the Venerable Bede, in the eighth, planting themselves upon Augustine's premises, only ventured timidly to extend their conclusions upon lines he had laid down.

In his great work on *Etymologies*, Isidore took up Augustine's attempt to bring the creation into satisfactory relations with the book of Genesis, and, as to fossil remains, he, like Tertullian, thought that they resulted from the Flood of Noah. In the following century Bede developed the same orthodox traditions.*

The best guess, in a geological sense, among the followers of St. Augustine was made by an Irish monkish scholar, who, in order to diminish the difficulty arising from the distribution of animals, especially in view of the fact that the same animals are found in Ireland as in England, held that various lands now separated were once connected. But, alas! the exigencies of theology forced him to place their separation later than the Flood. Happily for him, such facts were not yet known as that the kangaroo is found only on an island in the South Pacific, and must therefore, according to his theory, have migrated thither with all his progeny, and along a causeway so curiously constructed that none of the beasts of prey, who were his fellow-voyagers in the ark, could follow him.

These general lines of thought upon geology and its kindred science of zoölogy were followed by St. Thomas Aqu-

* For Isidore, see the *Etymologia*, xi, 4, xiii, 22. For Bede, see the *Hexameron*, i, ii, in Migne, tome xci.

nas and by the whole body of mediæval theologians, so far as they gave any attention to such subjects.

The next development of geology, mainly under Church guidance, was by means of the scholastic theology. Phrase-making was substituted for investigation. Without the Church and within it wonderful contributions were thus made. In the eleventh century Avicenna accounted for the fossils by suggesting a "stone-making force";* in the thirteenth, Albert the Great attributed them to a "formative quality;"† in the following centuries some philosophers ventured the idea that they grew from seed; and the Aristotelian doctrine of spontaneous generation was constantly used to prove that these stony fossils possessed powers of reproduction like plants and animals. ‡

Still, at various times and places, germs implanted by Greek and Roman thought were warmed into life. The Arabian schools seem to have been less fettered by the letter of the Koran than the contemporary Christian scholars by the letter of the Bible; and to Avicenna belongs the credit of first announcing substantially the modern geological theory of changes in the earth's surface. ||

The direct influence of the Reformation was at first unfavourable to scientific progress, for nothing could be more at variance with any scientific theory of the development of the universe than the ideas of the Protestant leaders. That strict adherence to the text of Scripture which made Luther and Melanchthon denounce the idea that the planets revolve about the sun, was naturally extended to every other scientific statement at variance with the sacred text. There is much reason to believe that the fetters upon scientific thought were closer under the strict interpretation of Scripture by the early Protestants than they had been under the older Church. The dominant spirit among the Reformers is shown by the declaration of Peter Martyr to the effect that, if a wrong opinion should obtain regarding the creation as described in Genesis, "all the promises of Christ

* *Vis lapidifica.*

† *Virtus formativa.*

‡ See authorities given in Mr. Ward's essay, as above.

|| For Avicenna, see Lyell and D'Archiac.

