

ical basis, and by the calling forth of phenomena by the process of experiment, Roger Bacon, the cotemporary of Albertus of Bollstädt, may be regarded as the most important and influential man of the Middle Ages. These two men occupy almost the whole of the thirteenth century; but to Roger Bacon belongs the merit that the influence which he exercised on the form of the mode of treating the study of nature has been more beneficial and lasting than the various discoveries which, with more or less justice, have been ascribed to him. Stimulating the mind to independence of thought, he severely condemned the blind faith attached to the authority of the schools, yet, far from neglecting the investigations of the ancient Greeks, he directed his attention simultaneously to philological researches,* and the application of mathematics and of the *Scientia experimentalis*, to which last he devoted a special section of the *Opus Majus*.† Protected and favored by one pope (Clement IV.), and accused of magic and imprisoned by two others (Nicholas III. and IV.), he experienced the changes of fortune common to great minds in all ages. He was acquainted with the *Optics* of Ptolemy,‡ and with

* So many passages of the *Opus Majus* show the respect which Roger Bacon entertained for Grecian antiquity, that, as Jourdain has already remarked (p. 429), we can only interpret the wish expressed by him in a letter to Pope Clement IV., "to burn the works of Aristotle, in order to stop the diffusion of error among the scholars," as referring to the bad Latin translations from the Arabic.

† "Scientia experimentalis a vulgo studentium penitus ignorata; duo tamen sunt modi cognoscendi, scilicet per argumentum et experientiam (the ideal path, and the path of experiment). Sine experientia nihil sufficienter sciri potest. Argumentum concludit, sed non certificat, neque removet duditationem; et quiescat animus in intuita veritatis, nisi eam inveniat via experientiae." (*Opus Majus*, pars vi., cap. I.) I have collected all the passages relating to Roger Bacon's physical knowledge, and to his proposals for various inventions, in the *Examen Crit. de l'Hist. de la Geogr.*, t. ii., p. 295-299. Compare, also, Whewell, *Philosophy of the Inductive Sciences*, vol. ii., p. 323-337.

‡ See *ante*, p. 194. I find Ptolemy's *Optics* cited in the *Opus Majus* (ed. Jebb, Lond., 1733), p. 79, 288, and 404. It has been justly denied (Wilde, *Geschichte der Optik*, th. i., s. 92-96) that the knowledge derived from Alhazen, of the magnifying power of segments of spheres, was actually the means of leading Bacon to construct spectacles. This invention would appear to have been known as early as 1299, or to belong to the Florentine Salvino degli Armati, who was buried in 1317 in the Church of Santa Maria Maggiore at Florence. If Roger Bacon, who completed his *Opus Majus* in 1267, speaks of instruments by means of which small letters appear large, "utiles senibus habentibus oculos debiles," his words prove, as do also the practically erroneous considerations which he subjoins, that he can not himself have executed that which obscurely floated before his mind as possible.