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ROGER BACON, c. 1214-1294

BY

R. R. JAMES

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THAT great glory of English science, Roger Bacon, was born in or about the year 1214. This date is inferred from a passage in one of his works, written in 1267. "I have laboured much at sciences and languages, and it is now forty years since I first learnt the alphabet; and I was always studious; and except for two of those forty years I have always been *in studio*." Little⁽¹⁾ says that this probably means at a university; that "boys of ten or twelve years frequently began their education at Oxford, and it is likely that Bacon went there at an early age." In a footnote he disposes of the fiction, based on a foolish legend, that Bacon was educated at Brasenose or at Merton College. The latter of these "was not founded till Roger was advanced in years; Brasenose College was founded more than two centuries after his death. Historical fictions die hard."

No fewer than three places in England have been claimed for his birthplace. John Rous, *Hist. Regum Angl.*, quoted by Little, states that he was born in or near Ilchester in Dorsetshire. I suppose that this must be a slip of the pen, for there is no such place as Ilchester in Dorset; and the town of that name in Somerset is usually given the precedence.

In Collinson's *History of Somersetshire*, 1791, Vol. III, p. 314, is the following: "In the friary of Ivelchester was born A.D. 1214, that celebrated philosopher Roger Bacon, who was justly accounted the wonder of his age. His youthful education was had at Oxford,

from which university he returned to Ivelchester with great acquisitions of classical knowledge, and there took the habit of a Franciscan Friar. He then applied himself to the study of philosophy, in which he made so great a proficiency that he was invited over to Paris to assist in the transactions of that university. Here he was admired and envied, and known too much in an invidious and vulgar age to prosper. The ocular sciences to which he applied drew the attention of those who had not the understanding to weigh uncommon aspections in the true scale of reason and philosophy, and they accused him of dealing with the devil. His own fraternity also caballed against him, and he was sometime confined in prison as a magician and a sorcerer. When thence relieved he returned to Oxford, and there in the College of Franciscans spent the remainder of his days in study."

In John Argentein's *Loci Communes*, written c. 1476 (Ms. Ashmole, 1437, p. 155), quoted by Little, is this note: *Hic Rogerus fuit filius Fugardi, et creditur quod erat Rogerus Baconus natus apud Witnam juxta Oxoniam*: while Bisley in Gloucestershire also claims to have been the privileged spot. Sir Robert Atkyns⁽²⁾ states under Bisley as follows: "The first cloathing-mill in these parts was erected in Todgmore Bottom, in this parish, in which place Fryer Bacon was born. He was educated at St. Mary Chapel now St. Bury Mill on Stroud river in the parish of Hampton, wherein is a room at this day called Fryer Bacon's study. He dyed 1284. He was a very learned person, and wrote 80 books, and for his skill in mathematics was reputed a conjurer in those ignorant times." In the introduction to Bridges's⁽³⁾ edition of the *Opus Majus*, reprinted (1914) by H. Gordon Jones, F.I.C., F.C.S., an interesting table of facts relating to Bacon's life is given. Among contemporary events are noted in 1209 the condemnation of Aristotle's *Physics and Metaphysics* in Paris; in 1215 a confirmation of this by Papal Legate, and in 1231 the partial removal of this condemnation by Pope Gregory the Ninth. But he entirely omits what is to English people the most important contemporary event, the passing of *Magna Carta* in 1215, that *praesidium* or bulwark of our liberty wrested by the Barons from King John.

There is a story that Bacon preached at Oxford before the King, abusing the foreign favourites by whom Henry was surrounded. Two of the early chroniclers mention the fact, Roger of Wendover and Matthew Paris; the latter mentioning the preacher by name. The extract from Roger of Wendover is as follows: (English Historical Society, Vol. I, p. 268 of the chronicle.) *In hoc autem colloquio frater quidam de ordine Praedicatorum qui coram rege et quibusdam episcopis praesentibus verbum Dei praedicabit, libera voce regi patenter dixit, quod nunquam diuturna pace frueretur, nisi Petrum Wintoniensem Episcopum, et Petrum de Rivallis,*

Photo by Gillman & Co., Ltd., Oxford.

ROGER BACON, c. 1214—1294.

*"Virtus, repulsae nescia sordidae,
intaminatis fulget honoribus,"*

HOR., Carm. III, 2.

ejus filium, a suo consilio removeret. This is dated 1233. A footnote gives the name of *quidam frater* as Robert Bacon. Little gives Matthew Paris's version as follows: "A clerk of the court of a pleasant wit, namely, Roger Bacon, ventured to make this joke: 'My Lord King, what is most harmful to men crossing a strait, or what makes them most afraid?' The King replied, 'Those men know who occupy their business in great waters!' 'I will tell you,'" said the clerk, '*Petrae et Rupes.*'" Rocks and Stones form a subtle play upon the name of the Bishop of Winchester, Peter des Roches. I have not a copy of the works of Matthew Paris, and cannot decide between the Roger of the extract and the Robert of the footnote; and in any case it is not at all certain that the Bacon in question is the famous scientist. Little states that the name was not uncommon, and instances examples of it on the Patent Roll of 3 Edward the First. He might have cited the pipe rolls also, where the name of Bacon occurs frequently in the reign of Richard the First, and can be found earlier still in the rolls for the reign of Henry the Second. But, on the other hand, Roger was certainly at Oxford in 1233, for he states that Edmund Riche, who became Archbishop of Canterbury in that year, "lectured at Oxford in my time." His greatest tutor while at Oxford was undoubtedly Robert Grosseteste, later Bishop of Lincoln, of whom he said *novit scientias*; and it is likely that he was acquainted with Adam Marsh. To quote Little "it was doubtless his connection with these men that led Roger to enter the Franciscan order." It is not known at what date this occurred, but it is to be inferred from a passage in one of his works that he had reached years of discretion when he took this step.

He began his studies on positive science before 1250, and by 1267 he had spent more than 2,000 *librae* on books and experiments. From this statement it has been inferred that he came of a wealthy family;* Little states that his family espoused the Royal cause in

*It may be of interest to note that Planché in *The Conqueror and His Companions*, 1874, in dealing with William de Colombières, mentioned by Wace (Rom. de Rou), as having been present at the Battle of Hastings, states "the family of Colombières (Columbers, Columbels) . . . appears to have struck root in England, and had become an important baronial family in the reign of Henry II, in the 12th year of whose reign Philip de Columbers accounted for ten knights' fees 'de veteri feoffemento' and one 'de novo,' and in the 22nd year of the same reign paid twenty marks for trespassing in the King's forests." Dugdale's account only begins with this Philip, and he has not noticed that in a Plea Roll of Henry II,* Roger Bacon is set down as brother to Philip de Columbers, nor that a Gilbert de Columbers was a contemporary of Philip and settled in Berkshire (Liber Niger). A reference to the Liber Niger, Vol. I, p. 97, shows that Philip de Columbaries held ten knights' fees in Somersetshire, but Ilchester is not named as among them.

In the Red Book of the Exchequer, Vol. I, p. 306, Gilbertus de Columbariis held two knights' fees in Berkshire; and on page 377 he is credited with the fourth part of a knight's fee in Lincolnshire under William de Roumara. It would be interesting to know if Roger Bacon could claim that his ancestors came over with William the Conqueror.

*One must assume that this is an error for Henry III. As Roger Bacon had not been born at the time when Henry II died, he could hardly be found mentioned in a record of the second Henry's reign.

the Barons' war and suffered great losses. But the amount is staggering, for the Paris *libra* appears to have been worth at the time 20 *solidi* (shillings); and even if the lesser sum of between £600 and £700, which has been estimated, be accepted, the value of such a sum at present-day rates would be enormous, and all spent "on secret books and various experiments and languages and instruments and tables."

Roger left Oxford for Paris about 1245. He states that he had seen Alexander of Hales with his own eyes, and he heard William of Auvergne dispute before the whole university. The latter died in 1248. Rous, quoted by Little, states that he was made D.D. of Paris and that he was incorporated D.D. at Oxford. He is said to have returned to Oxford soon after 1250, and he was lecturing at about this time; he says himself that he won some fame. About 1256 Roger was exiled from England and kept under supervision in Paris for ten years. In 1263 he wrote an astronomical treatise, *Computus Naturalium*. Soon after this his name was mentioned to the Cardinal Bishop of Sabina, who was interested in his discoveries. In 1265 the Cardinal became Pope Clement the Fourth and on June 22, 1266, Clement wrote requesting Roger to send him a fair copy of the work of which he had heard; the letter runs as follows:

EPISTOLA CLEMENTIS PAPAE AD ROGERIUM BACONEM.

Dilecto filio, Fratri Rogerio dicto Bacon, Ordinis Fratrum Minorum.

Tuae devotionis litteras gratenter recipimus: sed et verba notavimus diligenter quae ad explanationem carum dilectus filius G. dictus Bonecor, Miles, viva voce nobis proposuit, tam fideliter quam prudenter.

Sane ut melius nobis liqueat quid intendas, volumus, et tibi per Apostolica scripta praecipiendo mandamus, quatenus, non obstante praecepto Praelati cujuscumque contrario, vel tui Ordinis constitutione quacunque, opus illud, quod te dilecto filio Raymundo de Lauduno communicare rogavimus in minori officio constituti, scriptum de bona littera nobis mittere quam citius poteris non omittas; et per tuas nobis declares litteras quae tibi videntur adhibenda remedia circa illa, quae nuper occasione tanti discriminis intimasti: et hoc quanto secretius poteris facias indilatae.

Datum Viterbii, X Cal. Julii, anno II.

The friar was to do this, in spite of any constitution of his order to the contrary, secretly and without delay. The Pope supposed that the work was already written, but this was not the case, for Bacon wrote to the Pope as follows: "When your Holiness wrote to me, on the last occasion, the writings you demanded were not yet composed, although you supposed they were. For whilst I was in a different state of life (*i.e.*, before he entered the Franciscan Order), I had written nothing on science; nor in my present condition had I ever been required to do so by my superiors; nay, a strict prohibition had been passed to the contrary, under penalty of forfeiture of the book, and many days fasting on bread and water, if any work written by me, or belonging to my house,

should be communicated to strangers. Nor could I get a fair copy made (*littera bona*) except by employing transcribers unconnected with our order; and then they would have copied my works to serve themselves or others, without any regard to my wishes; as authors' works are often pirated by the knavery of the transcribers at Paris. And certainly, if it had been in my power to have communicated my discoveries freely, I should have composed many things for my brother the scholar, and for others, my most intimate friends. But as I despaired of the means of communicating my thoughts, I forebore to commit them to writing. When, therefore, I professed to you my readiness, you must understand that it was for writings to be composed not for such as had been composed already. And, therefore, your chaplain, Raymond of Laon, was altogether mistaken when he made mention of me to your Holiness. For although I had at various times put together, in a hasty manner, some few chapters on different subjects, at the entreaty of my friends, there was nothing noteworthy in these writings; nothing of such a nature as I could think of presenting to your wisdom. They were such as I myself hold in no estimation, as being deficient in continuity and perfection."

Brewer points out that it is to Clement's credit that in an age of great political disorder, when the storm was still muttering, which had shaken mediaeval society to its basis, he retained his regard for philosophy. "He remembered in his exaltation the forgotten votary of science, labouring noiselessly at his thankless task. Nine-tenths of the world were perfectly content with the gross ignorance in which they were shrouded. . . . In his endeavour to comply with Clement's command, Roger Bacon had to contend with neglect from one side and opposition on the other. . . . His own superiors violently opposed him: Why could he not be content to do as others did? Why trouble himself and the world about matters of which the world knew enough already? It enjoyed too much light. Philosophy had already reached its perfection." Bacon turned to friends of the Pope, the noble and wealthy; he writes: "I told them there was a certain business of yours to be done which I must needs get finished for you in France, and the execution of it would require a large sum of money. But how often I was looked upon as an importunate beggar (*improbis*); how often I was repulsed; how often I was put off; what confusion I suffered within myself, I cannot express to you. Distressed above all that can be imagined, I compelled my friends, even those who were in necessitous circumstances, to contribute what they had, to sell much of their property, to pawn the rest, to raise money at interest (*ad usuras*). And yet by reason of their poverty I frequently abandoned the work, frequently I gave it up in despair and forebore to proceed."

Yet within eighteen months, in spite of the jealousy of his superiors "who kept me on bread and water, suffering no one to have access to me, fearful lest my writings should be divulged to any others than the Pope and themselves" the *Opus Majus*, the *Opus Minus*, and the *Opus Tertium* were written and sent to the Pope. A feat, says Brewer, unparalleled in the annals of literature.

Little states that "Clement probably used his influence on behalf of Roger, as the latter seems to have returned to England about this time and to have been freed from annoyance. The works sent to the Pope, Bacon regarded merely as handbooks; at the same time that he was writing them he was engaged on a larger work which was to embrace the whole range of sciences as then understood. He was working at this in 1271. His attacks on all classes, including his own order, became even more violent than hitherto. In 1277 and 1278 synods were held at Paris and Oxford to condemn erroneous doctrines. The repressive movement extended to the Franciscans; in 1278 Jerome of Arcoli, the Minister General, held a chapter at Paris and among other friars, Roger Bacon was condemned (*propter quasdam novitates*). He is believed to have remained in prison for fourteen years. Jerome of Arcoli, who became Pope Nicholas IV in 1288, died in 1292. Raymond Gaufredi, a man of more liberal views, was elected General in 1289, and released many friars who had been imprisoned by his predecessors. In 1292 he held a general chapter at Paris, and it is probable that among the friars there set free was Roger Bacon. It is certain that the last work of his of which we have any notice *Compendium Studii Theologiae*, was written in 1292." The date usually assigned for his death (1294) is a pure conjecture. John Rous says that he was buried among the Friars Minors at Oxford.

Armed with the Papal authority Bacon "with the alacrity of a neglected scholar set to work to obey Clement's command; he was devoutly thankful for the opportunity of putting the results of his researches on record, and says as much in very extravagant and high-flown language."

He began with the *Opus Majus*, which work is divided into seven parts as follow: Part 1.—On the four causes of human ignorance: authority, custom, popular opinion, and the pride of supposed knowledge. Part 2.—On the causes of perfect wisdom in the Sacred Scripture. Part 3.—On the usefulness of grammar. Part 4.—On the usefulness of mathematics. This section is subdivided into four parts as follow: (a) The necessity of mathematics in human things. (b) The necessity of mathematics in divine things. This study has occupied holy men. Geography, chronology; cycles, the golden number, etc.; natural phenomena, as the rainbow; arithmetic; music. (c) The necessity of mathematics

in ecclesiastical things; the certification of faith; the correction of the calendar. (d) The necessity of mathematics in the state; climates; of hydrography; geography; astrology. Part 5.—On perspective (optics): (a) the organs of vision; (b) vision in straight lines; (c) vision, reflected and refracted; (d) *De Multiplicatione Speciarum* (on the propagation of the impressions of light, heat, etc.). Part 6.—On experimental science. I am at a loss to account for the seventh part in the above list, which is that printed by Brewer in the preface to his edition of the *Opus Minus*. It may have been on ethics, I cannot quite make out.

Having finished the *Opus Majus*, Bacon proceeded to the *Opus Minus*, which in substance followed the same order as the *Opus Majus*. It entered more fully than had been attempted in the *Opus Majus* into the examination of the state of scholasticism; it exposed the detriments to learning and philosophy occasioned by the exaggerated respect paid to Alexander ab Hales and a contemporary but unnamed professor. The *Opus Tertium*, though written last, was intended by its author to form a preamble to the *Opus Majus* and *Minus*. Brewer states that though it is "inferior to its predecessors in the importance of its scientific details and the illustration it supplies of Bacon's philosophy, it is more interesting than either, for the insight it affords of his labours, and of the numerous obstacles he had to contend with in the execution of the work. The first twenty chapters detail various anecdotes of Bacon's personal history, his opinions on the state of education, the impediments thrown in his way by the ignorance, the prejudices, the contempt, the carelessness, and the indifference of his contemporaries. From the twentieth chapter to the close of the volume he pursues the thread of the *Opus Majus*, supplying what he had there omitted, correcting and explaining what had been less clearly or correctly expressed, in that or in the *Opus Minus*. In Chap. 52 he apologizes for diverging from the strict line he had originally marked out, by inserting in the ten preceding chapters his opinions on three abstruse subjects: vacuum, motion, and space, mainly in regard to their spiritual significance. 'As these questions,' he says, 'are very perplexing and difficult, I thought I would record what I had to say about them, in some one of my works. In the *Opus Majus* and *Opus Minus* I had not studied them sufficiently to prevail on myself to commit my thoughts about them to writing; and I was glad to omit them, owing to the length of those works, and because I was much hurried in their composition.' From the fifty-second chapter to the close of the volume he adheres to his subject without further digression, but with so much vigour of thought and freshness of observation that, like the *Opus Minus*, the *Opus Tertium* may be fairly considered an independent work."

Bacon's name and works were anathema during the Middle Ages. Leland is quoted as having said that it is easier to collect the leaves of the Sibyl than the titles of the works written by Roger Bacon. Little states that many of those which have survived at all have reached us in a fragmentary state. In a footnote he refers to Twyne's statement that the friars at Oxford fastened all his works with long nails to the shelves of their library and let them rot there. Jebb, *Opus Majus*, ed. 1750, questions the accuracy of this statement; but it was not until about sixty years ago that any order was brought into the subject of Bacon's bibliography by the labours of Mr. Brewer and M. Charles. The references in Little⁽¹⁾ to works accepted or attributed to Bacon with comments on the same, occupy about 14 8vo. pages.

In an ophthalmic journal it would be out of place to refer at length to the major part of Bacon's writings and it must suffice if excerpts from his work on optics are reprinted here. As will be conceded by all who have read any account of him, his writings ranged over a very wide field, and the most remarkable thing about them is that he is always insisting on the practical rather than on the theoretical side of most questions. Bridges states: "No part of Bacon's work was more frequently translated than his *Perspectiva*. Based as it was upon the great work of Alhazen, which was itself a development of the *Optica* of Euclid and Ptolemy, and claiming indeed to be but an abridgment or condensation of the truths laid down by his predecessors with wearisome copiousness, it was in fact much more than this. It selected from a mass of propositions, many of them mere displays of geometrical ingenuity, precisely those which aimed at the interpretation of nature, and at the adaptation of the laws of luminous radiation to human purposes. He was aware of what was unknown to Ptolemy and Alhazen, the concentration of parallel rays from reflecting surfaces formed by revolutions of a conic section. . . . Of the magnifying powers of convex lenses Bacon had a clear comprehension. He imagined, and was within measurable distance of effecting the combination of lenses which was to bring far things near, but which was not to be realized till the time of Galileo."

The following paragraphs are taken by kind permission of the author, Dr. Charles Singer, from his article on the invention of the first optical apparatus, in Vol. II of "Studies in the History and Method of Science," 1921 :

"The following passages will serve to indicate the stage he had reached in optical knowledge. It will be observed that in the first of the passages Bacon figures and refers to the *object* as though it were itself in the denser medium of which the lens is composed. He thus confuses the optical action of the lens with

that of a liquid in which an object is immersed. Perhaps he is led to do this by his knowledge that the optical results of immersion in a liquid had been investigated by his predecessors, or perhaps by their descriptions of the process of vision as taking place within the supposed central crystalline sphere of the eye. It is also apparent that he does not realize the refractive action of the *plane* surface of his plano-convex lenses.

"If anyone examine letters or other minute objects through the medium of crystal or glass or other transparent substance, if it

FIG. 4.

be shaped like the lesser segment of a sphere, with the convex side towards the eye, and the eye being in the air, he will see the letters far better, and they will seem larger to him. For according to our canon (Fig. 4) concerning a spherical medium beneath which the object is placed, the centre being beyond the object, the convexity being towards the eye, all causes agree to increase the size, for the angle in which it is seen is greater, the image is greater, and the position of the image is nearer, because the object is between the eye and the centre. *For this reason such an instrument is useful to old persons and to those with weak eyes, for they can see any letter, however small, if magnified enough.* But if a larger segment of a sphere be employed, then, according to our canon (Fig. 5) the size of the angle is increased, and also the size of the image, but propinquity is lost because the position of the image is beyond the object, the reason being that the centre of the,

sphere is between the eye and the object seen. Therefore such an instrument is not of so much use as the smaller portion of a sphere.

"Objects are greater when the vision is refracted; for it easily appears by the above-mentioned canons that very large objects may seem to be very small and conversely, and those at a great distance away may seem very near and conversely. For we can so form glasses and so arrange them with regard to our sight and to objects that the rays are refracted and deflected to any place we wish, so that we see the object near at hand or far away beneath

FIG. 5.

whatever angle we desire. And so we can read the smallest letters or count grains of sand or dust from an incredible distance owing to the magnitude of the angle beneath which we see them, and again the largest objects close at hand might be scarcely visible owing to the smallness of the angle beneath which we view them; for it is on the size of the angle on which this kind of vision depends, and it is independent of distance save per accidens. So a boy can appear a giant, a man seem a mountain, and in any size of angle whatever, for we can see a man under as large an angle as though he were a mountain and make him appear as near as we desire. So a small army might seem very large, and though far away appear near, and conversely: so, too, we could make sun, moon, and stars apparently descend here below, and similarly appear above the heads of our enemies, and many other similar marvels could be brought to pass, that the ignorant mortal mind could not endure the truth." (*Opus Majus*, Part 5.)

"As to double refraction, what is causally manifest with regard to it we can verify in many ways by the results of experiment. For if anyone holds a crystal ball or a round urinal flask filled with water in the strong rays of the sun, standing by a window in face of the rays, he will find a point in the air between himself and the flask at which point, if any easily combustible substance is placed, it will catch fire and burn, which would be impossible unless we suppose a double refraction. For a ray of the sun coming from a point in the sun through the centre of the flask is not refracted, because it falls perpendicularly on flask, water, and air passing through the centre of each (Fig. 6). . . . But all the other rays given forth at the same point in the sun from which this perpendicular ray comes are necessarily refracted in the body of the flask,

FIG. 6.

because they fall at oblique angles, and since the flask is denser than air, the refraction passes between the straight path and the perpendicular drawn from the point of refraction to the centre of the flask. And when it passes out again into the air, then, since it comes upon a less dense body, the straight path passes between the refraction and the perpendicular drawn from the point of refraction, so that the refracted ray may fall upon the first perpendicular which comes without refraction from the sun. Now since an infinite number of rays are given off from the same point of the sun, and one only falls perpendicularly on the flask, all the others are refracted and meet at one point on the perpendicular ray which is given off along with them from the sun, and this point is the point of combustion. On it are collected an infinite number of rays, and the concentration of light causes combustion. But this concentration would not take place except by double refraction, as shown in the diagram." (*Opus Majus*, Part 7.)

"Glâsses (*perspicua*) can be so constructed that objects at a very great distance appear to be quite close at hand, and conversely. Thus we read the smallest letters from an incredible distance, number objects however small, and make the stars appear as near

as we wish. . . . Also objects can be made to appear so that the greatest seems the least, and conversely ; what are high appear low and short, and conversely ; and what is hidden appears manifest. . . . But among the more subtle powers of construction is this of directing and concentrating rays by means of (instruments of) different forms and reflections at any distance we wish, where whatever is subjected to them is burned. . . . But greater than any such design or purpose is that the heavens might be portrayed in all their length and breadth on a corporeal figure moving with their diurnal motion, and this would be worth a whole kingdom to a wise man. Let this, then, be sufficient as an example, although an infinite number of other marvels could be set forth." (*De Secretis Operibus Artis et Naturae.*)

Dr. Singer states in a footnote that the above passages are translated from Dr. J. H. Bridges's the *Opus Majus* of Roger Bacon, Oxford, 1897, and J. S. Brewer's *Fratri Rogeri Baconi opera quaedam hactenus inedita*, London, 1859.

Bacon's Philology

Bridges states that Bacon stood nearly alone in urging that the comparative study of language should form part of the university curriculum, although he gives credit to those, and particularly to Grosseteste, who had promoted the translation of Greek books into Latin ; but it does not appear that before him, anyone had proposed to carry the study of language, as such, beyond the routine of grammar presented in the Trivium ;* the Latin accident and syntax of Priscian or old Donatus.† Bacon proposed a systematic and comparative study of Hebrew, Arabic, and Greek, with the dialects belonging to each. Bridges states that so far as he knew no work of Bacon's affords evidence of knowledge of Arabic ; but Steele, in Fasc. 5 of the *Opera hactenus inedita Rogeri Baconi*, 1920, prints the text of the *Secretum Secretorum*, edited by Roger Bacon, with his introductory treatise and glosses. In the same volume is incorporated a literal translation of the original Arabic "to serve as a key to the Latin, and at the same time to show the remarkable accuracy of the original translation and the variation it has undergone." If Bacon was able to edit this work of Aristotle he must have had a working knowledge of Arabic, unless of course he had access to a copy in Greek, which as far as I can make out seems unlikely. That he knew Greek is evident from the elementary Greek grammar written by him.

*Grammar, rhetoric and dialectic in contradistinction to the Quadrivium, which comprised arithmetic, geometry, music, and astronomy.

†Donatus, on the eight parts of speech.

Bridges raises an interesting point as follows: "A point of interest presents itself as to Bacon's pronunciation of Greek. Much attention is given to the transliteration of the Greek alphabet into its Latin equivalents. The Lord's Prayer, the Salutation to the Virgin, and the Apostles' Creed are written out in Latin, underlined first with the Greek words in Roman characters, and secondly with the same words in Greek. The second of these is given as an example :

Ave Maria graciosa dominus cum tui benedicta
xere Maria kecharitomeni o kirios meta su eulogimeni
χαῖρε μαρία κεχάριτωμένη ὁ κύριος μετὰ σοῦ ευλογημένη

tu in mulieribus et benedictus fructus ventris tui
si en ginexi ke eulogimenos o karpos tis kilias su
σύ ἐν γυναιξὶ καὶ ευλογούμενος ὁ καρπὸς τῆς κοιλίας σου

amen.

amin.

ἀμήν."

In urging so strongly the study of language Bacon had two main purposes in his mind: (a) an improved text of the Bible; (b) an intelligible translation of the works of Aristotle.

One of the first, if not the first, of Bacon's works to be translated into English was his "Cure of old age, and preservation of youth," which was published by Dr. Richard Browne in 1683. Chapter I, of the causes of old age begins as follows: "As the world waxeth old men grow old with it: not by reason of the age of the world, but because of the great increase of living creatures which infest the very air, that every way encompasseth us, and through our negligence in ordering our lives, and that great ignorance of the properties which are in things conducing to health, which might help a disordered way of living, and might supply the defect of due government.

"From these three things, namely, *infection, negligence, and ignorance* the natural heat, after the time of manhood is past, begins to diminish, and its diminution and intemperature doth more and more hasten on. Whence the heat by little and little decreasing, the accidents of old age come on, which accidents in the very flower of age may be taken away; and after that time may be retarded; as also may that swift course, which hurries a man from manhood to age, from age to old age, from old age to the broken strength of decrepit age, be restrained."

No one can begin to read much about Bacon without at once realizing the fact that he is apt to repeat himself. The preamble,

the *Opus Tertium*, was the last of the three works to be written for the Pope. Steele, in his edition of the *Metaphysica Fratris Rogeri, Opera hactenus inedita Rogeri Baconi*, speaks of Bacon's inveterate habit of using his material two or three times over.

I do not intend to give the impression that I have studied the works of Bacon, save superficially, for the purpose of this memoir; I am sure that the superficiality of my knowledge will be patent to all deep Baconian students, and hope that ophthalmologists who may read this paper will not give me credit for more learning than I possess. I believe the facts given here are accurate as far as they go; they are all *copied* from published sources of information.

Eheu! Rogere, Alas! Roger, the ways of a scientific minded man were indeed hard in the thirteenth century. The bare-footed friar (the Franciscans first appeared in this country in 1224) wore a coarse grey gown with a rope round his middle, while his feet were entirely unshod. His order was addicted to penury, but so far as I am aware, the dietary, though simple was abundant, and he was not condemned to silence. If in spite of these corporeal disadvantages the friar showed any sign of having thoughts out of the usual, he was promptly accused of having dealings with the evil one and clapp'd into prison for his pains. It is a pleasing thought that in spite of neglect, of obloquy, and hardship, Roger Bacon refused to be muzzled, and that he went on to the end of his long life, writing, always writing and thinking about three centuries ahead of his time; one of those who

*inventas aut qui vitam excoluere per artis,
quique sui memores aliquos fecere merendo :*

VIRG. AEN. VI.

In conclusion I must state that in addition to the references mentioned in the text I have quoted freely from Brewer's edition of the *Opus Minus* in the Rolls Series, 1859.

The frontispiece, Roger Bacon's statue in the University Museum, at Oxford, by Mr. Hope Pinker, is reproduced, by permission, from a photo supplied by Messrs. Gillman & Co., Oxford.

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