

EARLY MAGNETICAL SCIENCE.—II.

William Gilbert of Colchester, physician of London, on the Loadstone and Magnetic Bodies and on the great Magnet, the Earth; A New Physiology, demonstrated with many Arguments and Experiments. A translation by P. Fleury Mottelay. John Wiley & Sons. 1893.

THE immediate success of Gilbert's book on the lodestone was surprising. No doubt it astonished the author. He had said in his preface, *paucis philosophandum censuimus*, "we have resolved to philosophize for a few" (which Mr. Mottelay translates, We have held that philosophy is for the few), and it is said that the first edition consisted of but a small number of copies. Yet a burst of the most valuable admiration followed the publication. Kepler refers to it twice in his *magnum opus*, and in many other places, with the highest praise. Galileo said it excited his envy. Even Descartes, with his French indisposition to build up any other man's reputation, referred to it with approval. It is true, as might have been expected, that Descartes was able very much to improve upon Gilbert's conceptions. All this applause was somewhat more than the work really deserved. Those from whom it came were not acquainted with Peregrinus, and did not know that, notwithstanding his reclamationary asterisks, much of what so delighted them was not original with Gilbert. Still, today, with all the facts before us, we cannot but admit that the book displays a wonderful Faradayesque power of carrying along experimentation and cerebration, hand in hand. If we ask what positive new principle Gilbert defined, we must admit that there is nothing except that of induction at a distance; but that is a good deal. He also has a vague conception of curved lines of force, which, imperfect as it is, is of inestimable value. Furthermore, he is the author of the theory that the earth is a magnet. His apparatus consisted of spherical lodestones imitated from Peregrinus, and also of the versorium, or small compass-needle, of which Peregrinus made no use. Gilbert's discoveries were inevitable consequences of his improved apparatus. When he has gone successfully as far as his apparatus will carry him, he begins to theorize in a way that merits Bacon's strictures. He wishes to account for the invariability of the direction of the earth's axis and for the rotation of the earth, by magnetism. He thinks that magnetic polarity is an essential character of the pure chemical element, earth. That is almost as unscientific as Peregrinus, towards whose vagaries Gilbert betrays some leaning.

Although Dr. Gilbert had the honor of giving its name to electricity (that is, he invented the adjective *electric*, from which the abstract noun followed as a matter of course), yet his electrical experiments are contemptible. The reason was that he made no electroscope, but used only an unmagnetic versorium. The consequence was that almost everything escaped him, even to electrical polarity, and even to repulsion, which one does not clearly see how he could help noticing. In short, he left electricity just about where the ancients left magnetism.

Celebrated and lauded as the 'De Magnete' always has been throughout Europe, it is singular that it has been printed only twice. The first edition is in folio. Twenty years ago, for an exceptionally fine copy, the exorbitant Quafitch would make a man pay 25 shillings, and now the multiplication of rich electricians has made \$25 cheap for it. The second edition,

which first appeared in 1633, is in quarto. It bears the imprint, "Excusss Sedini typis Gotzianis." Mr. Mottelay easily concludes that the town meant is Stettin; indeed, he might have pointed out that the volume contains some laudatory verses signed "Gregorius Westphal super. Dicaster. Pomeranus, Advocatus et Schabinatus Sedinensis Assessor." Here is plainly a Sedinum in Pomerania; and it would be extravagant to doubt that it is the Sedinum of the title-page. Some copies of a quarto edition printed at the same place bear the date 1633. One of these is in our hands. The horizontal water-lines in the first sheet are distant from one another 24 millimetres; in all the rest of the book their distance is 32 millimetres. In short, the paper of the first sheet is different, and the printing of it (including, of course, the title-page) was presumably executed at a different time from the rest. On the whole, it seems probable that this is nothing but the edition of 1628 with a new first sheet substituted, a common bookseller's device. If any person owning a copy bearing the date 1628 will look at page 219, tenth line from the bottom, he can verify or overthrow this surmise. That line, in the edition of 1633 reads: "verint] in contrariam sopphantium quorundam stupor, qui cum," from which some words have clearly dropped out. The quarto text is somewhat more accurate than that of the folio; many of the illustrations are incomparably finer; it has the advantage of an index of 23 pages, and it can be had for a reasonable price. The only objection to it is that it omits the asterisks of two sizes which Gilbert put in his margin to draw attention to matter which he claimed as original. But these can now readily be supplied from Mr. Mottelay's translation. A new edition of the Latin, accompanied by a translation and full annotations, is a desideratum. It requires for the execution of it a competent acquaintance with mediæval and Paracelsian philosophy and with the writings of the medical men of the sixteenth century.

Gilbert treats every part of his subject historically. Thus, in his first chapter, he refers to fifty, sixty, or more authors. The reader naturally wishes to know who these were, in a general way, at least, and something of their characteristics; and the passages referred to should be put before him. Mr. Mottelay supplies a few notes which sometimes contain welcome information. But really it was not needful for him to state who Thomas Aquinas was, nor to offer a judgment upon him; nor are we particular to be referred to the page of Webster's, or Worcester's, or Ogilvie's dictionary where some term of ancient astronomy may be found defined, for better or for worse. It is no use telling us to "consult" works of which not half-a-dozen copies exist, and those in another quarter of the globe. Nor do we see the value of such references as this: "Beati Alb. Magni, Ratisboniensis, . . . lib. viii., Lugduni, 1651," where the name of the book is omitted apparently to make room for the long name of the archbishopric. When we are advised to "consult Vincentii Burgundi, *Spec. Mat.*," as we are several times, we understand that the writer usually called Vincentius Bellovacensis is meant. At least a dozen times, Brown's 'Pseudodoxia Epidemica' is quoted, instead of 'Pseudodoxia.'

We notice only a small proportion of the faults which have chanced to catch our eye. On p. 4, several authors' names are wrongly given, as Brasevolus instead of Brasevolus, Hermolans Barbatus instead of Barbarus, Hannibal Roscius Calaber instead of Roscius; while Attius of Amida is omitted. For Hali Abbas the trans-

lator writes "Abollah (Hali Abbas)" in several places. Now Hali Abbas is the usual designation of a very famous physician, Ali-ibn-al-Abbas, and Abollah is no part of his name. On the other hand, on p. 76, where the Latin does read Abollah, we have in the translation (it is the word *carab*, meaning amber, that is under discussion):

"In Arabic *carab* means oblation, not *rapens paleas* (snatching chaff), as Scaliger would have it, quoting from the Arabic or Persian of Abollah (Hali Abbas)."

The fact that Gilbert does not know whether the language is Arabic or Persian shows that he does not know who it is that Scaliger (J. C., of course) means by Abollah. The "Hali Abbas" is Mr. Mottelay's gloss. But the writer Scaliger meant was no other than *Abu-Al-Hasan-ibn-Abdallah-ibn-Sina*, usually called Avicenna. For in this physician's Canon, Lib. II., tr. ii., cap. 364, we read, in the translation of Gerhardus Carmonensis: "*Karaba*, scilicet, *rapens paleas Persice*." The translator sometimes writes names in their Latin forms, sometimes in the vernacular, without any rule. Thus, Pietro d'Abano is twice so called, and once, Petrus Apponensis. When we read of "Marbodæus, a Frenchman," we have no idea who is meant; but when we see the name written "Marbodæus Gallus," we recall that eleventh century poet, surnamed Peliciarius. Looking out Marco Polo, in the index, we are referred to p. 11, where we read of Baptista Porta learning some obvious properties of the lodestone "from Messer Paolo, the Venetian." Now, the original has (in the ablative) "R. M. Paulo Veneto"; and the "R. M." or *Reverend Master*, might have sufficed to show that Marco Polo was not meant. Besides, that traveller, in the text used by Yule, says never a word about the lodestone. Turning, however, to the preface to the seventh book of Porta's 'Natural Magic,' the book treating of magnetism, we read:

"At Venice we knew intent upon the same study 'R. M. Paulum Venetum,' at that time provincial of the order of Servite monks, now the very worthy procurator, from whom far from blushing to have learned some things, we glory in it; for we have never come across a man more learned nor more intelligent than he, born for the Encyclopedia, the splendor and ornament not of the city of Venice only, nor of Italy, but of the world."

This description suits Sarpi alone, who, though his baptismal name was Pietro, was *Fra Paolo* in religion, and who was elected provincial of the Servites in 1579, and was appointed procurator in 1588.

The translator's English is certainly very graceful. Perhaps it might, here and there, be advantageously brought nearer to the author's meaning. When Gilbert writes "*nil præter errores et caligines in tam excellenti cognitione commune*," would it not be better to render this, "he suggests nothing in this lofty inquiry but errors and obscurities," instead of "he does but add errors and obscurities to his otherwise excellent treatise"? On p. 17, we read: "hence one loadstone is male, another female." The Latin is: "*mas num sit an femina*," which seems to ask, "Is it then male or female?" *Plumbum album* is constantly translated "zinc," but it is certain that George Agricola meant tin by *plumbum candidum*, and we do not see how zinc will answer. It is not white, to begin with. It is easy to suppose that Gilbert, like many writers, meant by *stannum* pewter or some alloy. On p. 47, the translator speaks of things "arranged according to artificial conditions." The Latin is "*artificiosæ*," better translated

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"scientifically." On p. 58, by way of antidote to poisoning by iron, the translator represents Avicenna as recommending "a drachm of loadstone taken in a draught of the juice of dog's mercury." Gilbert says *mercurialis*, by which he must have understood the French mercury, not the poisonous dog's mercury. But we cannot find that Avicenna really made any such recommendation. He proposes that lodestone should be mixed with iron filings when they are prescribed, and should be taken in "mell-cratum," or mead, not *mercurialis*. Is there not some clerical error? Page 63, Mottelay: "loadstone is chiefly earthy." The Latin is *maxime*, and should certainly be translated "in the highest degree."

On page 64, the translation reads, "So, too, a dry body does not run to the dry rim of a vessel containing water; but, on the contrary, a wet object does." The Latin is: "Ita nec ad limbum vasis siccum appellit humidum, sed humidum petit limbum," which may be rendered, "So a wet object does not approach the dry side of a vessel but seeks the wet side." On p. 87, *gemma Vincentii* is translated "vincentina," but what is that? On p. 97, the translation is: "Electric bodies attract the electric only, and the body attracted undergoes no modification through its own native force, but is drawn freely under impulsion in the ratio of its matter (composition)." The Latin is: "Electrica corpora alliciunt tantum, allectum non immutatur insita vi, sed materie ratione sponte appulsum incumbit." Perhaps this might be rendered; "Electric bodies only attract; the attracted body is not changed in its native force, but by reason of matter, being invoked, willingly exerts itself." Gilbert certainly thinks the excited amber by something very like human persuasion induces things to come to it. On p. 123, the translation reads, "And as light—so the opticians tell us—arrives instantly, in the same way with far greater instantaneousness the magnetic energy is present within the limits of its forces." The words we have italicized are, in the original, *multo magis*, "much more." That is, we have much more reason to think magnetic induction is instantaneous. Mr. Mottelay's translation would make Gilbert deny the absolute instantaneousness of illumination, which he never dreamed of doing. The phrase *multo magis* is often used in the sense of a *fortiori*. On p. 169 occurs the word *halinitro*; but this is not English. It would be better to speak either of "halinitrum (carbonate of soda)" or of "mineral alkali."

We could easily multiply the number of such criticisms by ten; but the general rationale of the course of experimentation is not affected by such slips. We wish, however, before closing this notice, to make some remarks upon some ruling practices of the translator. *Manifestus* is almost everywhere rendered by "manifest." Now, we have no objection at all to an effort to so turn the meaning of the English word; only the peculiar acception should be explained. *Manifestus*, in the language of physicists, means open to direct observation after making the appropriate experiment. It does not imply that the thing is evident unless the experiment is made. For instance, on p. 217: "Here we must express wonder at a manifest error of Baptista Porta, . . . to wit, that iron rubbed with diamond turns to the north." Even when the translator selects a different word, he fails to convey the peculiar meaning of *manifestum*. Thus, on p. 212: "It is plain (*manifestum*) that all the bars so hammered out toward the north and so laid down while cooling will rotate round their

centres, and when afloat will move about in water, and will point north." It is not plain that they will behave so; but if the experiment be made, it will become plain that they do so behave.

An admiring translator of an old author very naturally and almost excusably falls unaware into a way of slurring over his author's cruder conceptions, and of representing him as more modern in his ideas than he really was. We have seen how Mr. Mottelay, by a most forced rendering, would lead his reader to think that Gilbert believed in the finite velocity of light. Gilbert's ignorance of forces was profound. At a time before Galileo's achievements were known, Gilbert could not be expected to have a knowledge of dynamics, but one might suppose that so perspicacious a mind would have a not altogether erroneous instinctive idea of force. If we compare Gilbert with Dr. John Dee, whose period of activity antedates the 'De Magnete' by thirty or forty years, we find the older man, for whom posterity has had only contempt, to be far better equipped with conceptions of mechanics than the younger. Gilbert comes, in the course of his book, into conflict with each one of the three laws of motion, but most frequently with the law of action and reaction.

Between the words *potestas*, *dominium*, *potentia*, *vis*, *virtus*, *robur*, *vigor*, he draws no clear distinction, as can be seen in book ii., chapter xxix., first paragraph, where all these words occur in the same sense. Yet Mr. Mottelay throws a garb of modernness over his translation by an incessant use of the word "energy." Take, for example, the following definition. The original reads, "Verticitas, vigor polaris, non *περιστροφος*, sed *περιελκυστικος* δυναμις: non vertex aut *πδλος*, sed virtus convertens." The obvious translation is, "Verticity, polar vigor, not a rotation, but a tendency to rotation; not a pole, but a property of turning." But Mr. Mottelay translates as follows: "Verticity. Polar strength—activity (or what in Gilbert's day was understood as energy); not gyrating, vortiginous, but turning power; nor is it polar revolution, but a directing virtue, an innate turning vigor."

Where, in the original, does he find anything about its being innate? It is difficult to understand the clause in parenthesis. If Mr. Mottelay means to say that in Elizabethan English the word *energy* was used to translate *vigor*, he is mistaken. The word *energy* was not in use at all, except in the sense of liveliness in writing. The reason it was not used was that the Greek word was perfectly translated by the Latin *actus* and English *act*. As Sir William Hamilton well says, "Energy, act, operation, are convertible terms." Everybody knows that "energy" was the precise contrary to *δυναμις*, the word which Gilbert selects to express what his verticity is; so that energy is particularly adapted for avoidance in translating it. But if Mr. Mottelay means that the word *energy* will convey to electricians and other modern readers the conception in Gilbert's mind, we venture again to dissent. We admit that the converse is true. If one wanted to give a single word which should convey in Latin to the prescientific man the nearest idea possible to that of our energy, *vigor* might perhaps be the best choice. But when, on the contrary, the purpose is to put the modern man into the state of mind of the prescientific man—the Gilbert—the word "vigor," if it be at fault, is so because it conveys a too scientific idea. "Energy" ought not to be thought of for an instant. Mr. Mottelay seems really to be at some pains to con-

ceal a thing which it should have been one of his chief concerns to bring to light, the contrast between Gilbert's conceptions of magnetic action and those of any scientific man of our time. Nevertheless, we are very much obliged to him for the translation. The book is more than amply worth its price.

The History of Illinois and Louisiana under the French Rule, embracing a general view of the French Dominion in North America, with some account of the English occupation of Illinois. By Joseph Wallace, counsellor at law, etc. Cincinnati: Robert Clarke & Co. 1893.

MR. PARKMAN is quoted by name in this book twelve times. The occasions on which he is the real authority must be twelve times twelve. Many incidents in the narrative have also been gleaned from the collections of State historical societies, or monographs on counties and towns, and some from public archives. Still, a volume like this of Mr. Wallace's was needed to bring the history of the Mississippi Valley during its first century within the reach of the great mass of students. In his work there is much to commend. The details are well selected, related, and grouped. We trace with growing interest the progress, decade after decade, of discovery, exploration, and occupation. The obstacles to advancement, owing to the face of the country, climate, conflicts with savages or between civilized nations, and blunders in economics, are fairly presented. The careers of Marquette, with many other missionaries as self-sacrificing—of Joliet, La Salle, Tonty, Iberville, Bienville, and later of several English and Spanish leaders—give a continuity to the historic chain. Everything is set forth from a Western or Mississippi Valley standpoint. The primitive geography at every point possible is brought in touch with that of the living present. Popular errors on this matter are corrected, as where Kaskaskia is shown to have been at first not at its present location, but far up the Illinois River and near Starved Rock.

The two chief lessons, however, of Mr. Wallace's book seem to be these: first, the inferiority of the French settlers of the West to the English who settled the Atlantic slope. The latter were largely a sort of martyrs who had dared dissent from opinions prevalent where they were born, and had pluck enough to suffer for the faith that was in them. The former were not of this class; no Huguenots were allowed among them. The second lesson is that French colonization, even though it had been tolerant of Huguenots and had brought over a half a million of them, must have been a failure. It furnished no school of self-government like New England town-meetings, nothing analogous to the intellectual discipline afforded by Puritan common schools. Hence, at best, it could have developed only a lower type of civilization than that, formed at the East, which overflowed the Alleghenies and fertilized the West. Anglo-Saxon predominance in the great valley is a clear survival of the fittest.

Mr. Wallace's index of seventeen pages is not a mere list of names, but it explains in most cases what those names indicate. The title of his book is too long. Titles and epigraphs cannot be too short. His vocabulary inclines to be verbose and grandiose. His book would be more readable if various documents and statements were either greatly condensed or relegated to an appendix. He seems to know just enough French to misquote, for he

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