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Prospectus

Of an Edition of 300 numbered copies
(150 for America) of

The Earliest Work of
Experimental Science:

The Epistle of Pierre Pelerin de
Maricourt to Sygur de Foucau-
court, Soldier, On the Lodestone.

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Prospectus.

The Treatise of Petrus Peregrinus on the Lodestone: Latin Text, English Version, and Notes. With an Introductory History of Experimental Science in the Middle Ages. By C. S. Peirce. Printed in two colors on hand-made paper. Bound in full Persian Morocco, hand-tooled. 140 pages.

THE brief treatise on the lodestone by Petrus Peregrinus, dated 1269, occupies a unique position in the history of the human mind, being without exception the earliest work of experimental science that has come down to us. Nor can we learn that anything of this sort had been written earlier. No doubt experiments had been made earlier. The medical papyrus contains a prescription said to have been given for the mother of King Thoth; and something had been accomplished in optics. But no ancient experi-

ments can be considered as scientific, for several reasons. First, they were not made for the simple purpose of learning the truth, but with a *partis*, except where they were merely accidental. In the second place, in no single case was a piece of apparatus devised by any person before Peregrinus—at least there is no evidence of such a thing—for the purpose of obtaining an experimental answer to a question. Now, with instruments already existing we may make casual observations; but unless they are much more complicated than those of the ancients were, we can hardly make with them genuine experiments. At any rate, the total absence of experiments made with apparatus devised for the purpose, betrays a complete absence of the spirit of experimental inquiry. The quintessence of science, however, consists precisely in, and its success depends upon, the spirit with which it is prosecuted. In the third place, no law or general proposition of ancient science was consciously based upon experiment. In the fourth place, no ancient experiments were ever conducted in one connected series, each one after the first based on the truth the previous one had established. The work of Petrus is absolutely

the first that fulfils a single one of the conditions here indicated; and it fulfils them all. The sole direct purpose of his experiments was evidently the analysis of the properties of the lodestone and the ascertainment of their laws. His experiments are made with several distinct pieces of apparatus constructed and devised for no other end. Upon his experiments he bases a general theory of the lodestone, which, though in part not correct, yet remains in error only because, as he virtually confesses, he had not sufficient mechanical skill to construct an apparatus described by him and proposed for the purpose of making the crucial experiment which, had it been made, would have corrected his error. His experiments all do follow in sequence, each reposing on the result of the one that went before. Not only does Peregrinus in practice follow these four conditions, but he is fully alive to the importance of each one of them. Thus, on the whole, this little book must be considered as one of the most important monuments of human progress. The experimentation of Gilbert, who has often been considered as the founder of magnetical science, is in large part downright plagiarism upon Peregrinus; and though his real

merits are far from inconsiderable, yet he is not at all upon the plane of importance of the earlier writer, even without making allowance for the more advanced state of civilization of his century.

Time was when educated people could imagine that the idea of inductive science could spring full grown from the brain of Francis Bacon; but in our days we have learned better the natural course of development of ideas. Thoughts of that comprehensive kind do not start up in the mushroom-beds of individual brains. They require the broader fields of societies; and generations must pass by before they can acquire any maturity of strength. There is plenty of testimony both of Peregrinus and of his pupil, Roger Bacon, from which we may securely infer that they were acquainted with older physicists, although those elders may perhaps not have committed their experiments to writing. But whether it will be possible ever to make out with any plausibility the earlier history of experimental science, previous and preclusive to the work of Peregrinus, time alone can show. Certain it is that the early school of physicists, of which Peregrinus and Roger Bacon remain for us the only

representatives, was shortly overwhelmed by the rising tide of theology, between which on the one side and popular superstition on the other, no place was left for it. Was the flame of scientific inquiry, then, utterly quenched, or did a spark remain alive from which, in historical fact, the sacred fire was rekindled in the sixteenth century? To the solution of this problem the introduction of this volume will offer some contributions.

The text of the treatise here presented is substantially that of a contemporary MS. in the Paris Library.* All deviations from that authority are noted. Three other important texts have, however, been carefully collated, together with several that are incomplete. The work, though much written about, has, it is believed, never been printed, except at Augsburg in 1558, and that edition is of the extremest rarity. True, Libri, in his valuable work on the history of the mathematical sciences in Italy, did attempt a transcription of the very MS. here used; but, owing to its extreme illegibility, though he invoked the aid of the most expert paleographers, he has hardly been able to make perfect sense out of a single sentence,

* MSS. latins 7378.

not to speak of places where his text suggests a wrong meaning, nor of innumerable lesser errors.

The number of copies of this edition will be strictly limited to that of the subscribers plus 2, and in no case will exceed 300. The editor hopes to close the list and go to press January 1, 1894. Every copy will bear its number, and a list of the subscribers, with the respective ordinal numbers of their copies, will be included in the volume. The copyright will be vested in the subscribers. Thus it is pretty sure that the work will never be printed again until some other person once more undertakes the difficult task of deciphering the MS.

In the printing Mr. De Vinne has drawn without stint upon all the resources of his skill to reproduce the artistic style of the early typography. The paper is hand-made, imitating that of the incunabula. The type used has all been cast from ancient dies,—the black letter from dies of the sixteenth century, and the Roman from those of the celebrated Caslon. The old process of printing, too, has been imitated to some extent. The binding will likewise be found appropriate.

ROGER BACON'S OPINION OF PETRUS PEREGRINUS.

Roger Bacon, in his *Opus Tertium*, written two years before this treatise on the magnet, in speaking of his project of setting on foot an extensive investigation into nature says (cap. xi.)

Oportere habere mathematicos optimos, qui non solum scirent ea quæ translata sunt et facta, sed addere ad opera, quod est facile bonis mathematicis. Non sunt enim nisi duo perfecti: scilicet Magister Jo: London. et Magister Petrus de Maharicuria Picardus.

It would be requisite to gain the best mathematicians, who should not only know the things that have been transmitted to us and done, but should be capable of adding to those performances. This would be difficult; for there are but two that are thoroughly accomplished, to wit, Master John of London, and Master Peter of Maricourt, the Picard.

The only printed text reads *Maharnecuria*; but that I have changed as a manifest error of a copyist; for there is no such place in Picardy. But throughout the 13th century *Maharicourt* was much the most usual form

of the name of the village of Maricourt.* The Picard termination *court* was very commonly latinized to *curia*; although such early forms as *Mehericurt* (A. D. 1135) and *Fulcocurt* (A. D. 1184) show that it is derived, not from *curia*, but from *curtis*, the classical *cohors*, a fenced manor. If it be asked why Bacon does not use the designation "Peregrinus," we must consider what the significance of that word is. Peter cannot possibly have been a monk; for no monk would have been allowed to devote himself to natural science; nor could a monk have defrayed the expense of the experiments; so that the various monastic meanings of the word *peregrinus* are excluded. It might mean that Peter was a crusader; or that he lived outside the inclosed part of Maricourt. But there are no other examples of the word being thus incorporated into a person's name. It seems more probable that Peregrinus is simply the family name, *Pellerin*. The family of Joseph Pellerin, the numismatician, had

* It is a place of about 500 inhabitants on the right bank of the Somme, in the Canton of Comblès, the arrondissement of Péronne, and department of the Somme. It lies 8 kilometers from Comblès, 14 from Péronne, and 40 from Amiens. Foucaucourt, sometimes called Foucaucourt-en-Santerre, to distinguish it from a hamlet called Foucaucourt-sur-Nesle, is a place of about 600 inhabitants, due south of Maricourt, in the canton of Chaulnes and arrondissement of Péronne. It is 8 kilometers from Chaulnes, 15 from Péronne, and 35 due east on a straight road from Amiens. Foucaucourt belongs to the diocese of Amiens, while Maricourt belongs to that of Noyon.

estates in Picardy.* If this explanation of the "Peregrinus" be admitted, it is clear that Bacon omits this surname from the same motive from which he omits that of John Peckham (?) of London, his other mathematical adept, whatever that motive may have been — probably, to impart a more learned and clerical style to the names.

In chapter xiii, speaking of "*scientia experimentalis*," Bacon says:

Ostendo ibi [i.e. in sexta parte Operis Majoris] maximam potestatem quam habet hæc scientia super alias certificandas. Naturales quidem in libris Meteorologicorum Aristotelis et perspectivi negotiantur circa hæc certificanda, sed in vanum; quia sola experientia certificat hic et non argumentum. Et ideo pono radices experientiarum circa ista quas nullus Latinorum potest intelligere nisi unus, scilicet Magister Petrus.

I show in the sixth part of my *Opus Majus* the supreme power of this science over all others that have to be made certain. Students of natural philosophy, commenting upon Aristotle's Meteorologics, and students of perspective busy themselves with making these things certain, but in vain; for experience alone here makes certain and not argument. Accordingly, I require abundance of experiments about those things; and the business of experimenting no one in Western Europe understands, save only Master Peter.

* They bore arms "d'azur à la fasces d'or accompagnée de trois coquilles de même en chef."

Further on, still speaking of the art of experimenting, he says:

Paucissimi sunt dediti huic scientiæ propter defectum expensarum. Non enim cognosco nisi unum qui laudem potest habere in operibus hujus scientiæ: nam ipse non curat de sermonibus et pugnis verborum, sed persequitur opera sapientiæ et in illis quiescit. Et ideo quod alii cæcutientes nituntur videre ut vesperilio lucem solis in crepusculo, ipse in pleno fulgore contemplatur propter hoc quod est dominus experimentorum. Et ideo scit naturalia per experientiam et medicinalia et alkimistica et omnia tam cælestia quam inferiora. Immo verecundatur si aliqua laicus vel vetula vel miles vel rusticus de rure sciat quæ ipse ignorat. Unde omnia opera fundentium metalla et quæ operantur auro et argento et cæteris

Very few are devoted to this science owing to lack of means. Indeed, I know but one man who merits praise in the works of this science. That man is not of those who care for talk and wars of words: he prosecutes the works of wisdom and is quiet in them. What others, therefore, in their blindness strive to make out as a bat does the light of the sun in the dusk, this man scrutinizes in its full glory; because he is the lord of experiments. Hence, he knows natural philosophy by experience, and medicine, and chemistry, and all things both in the heavens and beneath. Why, he is ashamed if any common person, whether witch or soldier or husbandman knows anything about the country that he does not. Thus he has made a thorough study of all the operations of metal-foundry, and of everything that

metallis et omnibus mineralibus ipse rimatus est: et omnia quæ ad militiam et ad arma et ad venationes ipse novit: omnia quæ ad agriculturam et ad measuras terrarum et opera rusticorum examinavit: etiam experimenta vetularum et sortilegia et carmina earum et omnium magicorum consideravit; et similiter omnium jocularum illusiones et ingenia; ut nihil quod sciri debeat lateat ipsum et quatenus omnia falsa et magica sciat reprobare.

is done with gold, silver, and other metals, and minerals of all kinds; he knows everything that pertains to the art of war, and to weapons, and to venery; he has examined all that belongs to agriculture, and surveying, and other rural arts; he has studied the experiments of witches and sorcery, and their charms, and those of all the magicians, and likewise the deceptions and contrivances of all the jugglers; so that nothing that is fit to be known may be hidden from him, and so that he may know how to reprove all things that are either false or magical.

Epistola Petri Peregrini de Maricourt ad
Sygerum de Houcaucourt militem de magnete.

Iste tractatus de magnete 2 partes
continet, quarum prima 10 capitulis completur
et tribus secunda. Primum capitulum prime partis
est de operis incurfione: secundum vero qualis debeat
esse huius operis artifex: tertium de cognitione
lapidis: quartum de scientia inuentionis lapidis
parcium: 5^m de scientia inuentionis polorum in lapide,
quis eorum sit septentrionalis et quis meridionalis:
6^m qualiter magnes attrahat magnetem. 7^m qualiter
ferrium tactum cum magnete ad polos mundi
uertatur: 8^m qualiter magnes ferrium attrahat: 9^m
qualiter pars septentrionalis meridiionalem attrahat:
10^m de inquisitione unde magnes virtutem naturalem quam
habet recipit vel recipiat. Ista sunt capitula partis secunde:
Primum capitulum, de compositione instrumenti quo scitur
azimut solis et lune et cuiuslibet stelle in ori-
zonte: secundum de compositione alterius instrumenti melioris
eiusdem officij: tertium de rote artificio compositionis
perpetui motus.

Amicorum intime! Quondam
magnetis lapidis occultā naturā a te interpellatus
rudi narratione referabo vsquequaque.
Nichil enim apud philosophos absq; noticijs participio est
iocundum, et in tenebris orbitat et offuscatur
honorum natura, donec in communis deditionis radium
erigatur. Amore tui conscribam sermone plano
que vulgo studentium penitus sunt ignota. Attamen
non nisi de manifestis huius lapidis in hac epistola trade-
mus scientiā, eo quod hec traditio pars erit tractatus in quo
docebitur phisica componere instrumenta. De
occultis huius lapidis tractare spectat ad artem
lapidis sculpture, et licet opera quibus quesiuisti
appellem manifesta, erunt tam inestimabilia, q; vulgo
quasi illusiones et fantasmata, et ideo quo ad
vulgum secreta sunt: astrologis autem et naturalibus satis
erunt manifesta: et ipsis erunt solatium et pro bectis
viatoribus erunt non modici iuvamenti.
Et hijs ergo colligatur huius operis incurfio. [cap. 2.] Scito
vero prime q; oportet huius operis artificē scire rerū naturas,
nec inscium ipsum esse oportet motū celestium: sed op'z ipsū
esse industriosum in opere manuum, ad hoc quod ostenderit
per opus eius effectus mirabiles: nam per suam
industriam ex modico poterit errorem corrigere

CHAPTER I.

INMOST of friends! Formerly having been questioned by thee concerning the occult nature of the lodestone, I will in a rude narration make it public. Indeed, among philosophers nothing is delightful without participation of knowledge;¹ and the nature of good things wanders in darkness and is dimmed, until it is set up into the light of mutual surrender.² For the love of thee I will set down in plain speech things that to the mass of students are utterly unknown. Still, it is only of properties of this stone that are quite manifest³ that we shall treat in this epistle; which⁴ is merely a part of a treatise in which we are to teach how to make physical instruments.⁵ To treat of the occult properties⁶ of this stone depends upon the art of stone-cutting.

Although the matters, concerning which you have inquired, are, as I say, manifest, yet they will be of priceless value. Moreover, for the vulgar they are as illusions and fancies;⁷ so that in respect to the vulgar they are secrets. Yet to astrologers and to students of nature⁸ they will be manifest enough. To them these things will be a solace, and for sailors no slight aid. Thus is seen the intention⁹ of this work.

CHAPTER II.

BUT first be it known¹⁰ that the artist in this business ought to know the natures of things. Nor should he be ignorant of the celestial motions. But above all he ought to be assiduous in handiwork, to the end that he may by his performances bring wonderful results to light. For by such labors he will be able in a short time to correct his errors, which by his natural powers, though seconded by mathematics, he would not be able to do in all

Specimen of the Notes.

¹*Nihil enim apud philosophos absque notitiae participio est iocundum.* Libri reads the MS. here as follows: "nihil enim apud physicos, absque . . . principio est rotundum," which is a fair specimen of the manner in which he fails to make sense of the greater part of the text. The sentiment expressed is the sincere desire to find out truth and to share it with others which marks the genuine scientific man, and which insures the ultimate success of his inquiries. The existence of a sentiment so untheological in the middle of the thirteenth century is interesting and significant.

²*Donec in communis deductionis radium erigatur.* This barely makes sense, and here the MS. is not legible with certainty. The *donec* and the *radium* are the only words beyond doubt. The words read *in communis* are written thus: *ing*⁵. Libri here leaves a blank. The word read *deductionis* might be *deductionis* or *dedicationis*. The word read *erigatur* is perhaps *erigantur*, or possibly *eligatur* or *eligantur*.

³*Non nisi de manifestis hujus lapidis in hac epistola trademus scien-*

tiam. The word *manifestus* is here used in the same peculiar sense in which it is found in the physicists of the 17th century, namely, for that which is open to direct observation. The use of the word in this sense here shows that there were enough physicists at that time to have developed a vocabulary of their own. The use of it in the same sense centuries later shows that there was some continuity of tradition between the students of physics of the 13th and of the 17th centuries.

⁴*Traditio.* Perhaps the MS. reads *tractatio*. Libri has *tradito*.

⁵A work on experimental apparatus certainly implies more cultivation of science at that time than any works that are preserved would demonstrate.

"An "occult property" is a property which is only brought to light by experiment. "Occult Science" means, therefore, precisely experimental science. The reason these properties were called occult was that they could not be deduced after the manner of Aristotle from the prime qualities hot and cold, moist and dry.

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