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Sophie Roux, *L'Essai de logique de Mariotte. Archéologie des idées d'un savant ordinaire*, Paris, Classiques Garnier Paris, 2011.

Few scholars are able to understand and innovate the actual methodology of historical studies, fruitfully applying their innovation to underestimated subjects of studies, and making these relevant for the overall history of thought. With her analysis of the *Essay on Logic* (1678) of Edme Mariotte (1620-1684), Sophie Roux achieves all these goals. With her survey, she succeeds in defining the specificity of a thinker who cannot be numbered among the major characters of the history of early modern philosophy, rather, as an “ordinary savant”: accordingly, in questioning the very methodology of current historiography of science and philosophy, concerned with ground-breaking theories of “grand authors”, whose works are linked via controversies or filiations.¹

Roux solves the problem of studying the work of an ordinary savant, who cannot be regarded as innovative or original, by developing an “archeology of ideas”. Inspired by Foucault's method, the object of Roux's archaeology is the heterogeneity of statements circulating among different texts and theories. This approach seems to particularly fit the case of Mariotte, whose *Essay* was likely plagiarized, in the first part, from a manuscript of Roberval.² Therefore, Roux carries on her analysis of Mariotte's *Essay* by a comparison with similar works, allowing the definition of its “horizon d'attente” (p. 30). Such horizon is defined with regard to Mariotte's idea of method (chapter I). Through a comparison with Arnauld's *Port Royal Logic*, Roux manages to unravel a first specificity of Mariotte's approach: whereas *Port Royal Logic* had a normative function, guiding mind in its operations, Mariotte's logic is descriptive and aimed at a naturalization of the method. Interested in practice, Mariotte develops an *a posteriori* consideration over his method; accordingly, he can be considered as a scientist in the modern sense of the word. Roux's study, therefore, is pioneering not only with regard to the study of ordinary savants, but also to the notion of “scientist”, whose heuristic value results to be vindicated by her survey.

This is not the only merit of Roux, who shows a clear, systematic approach in addressing the problem of the function of experience in Mariotte's methodology, unveiling the reasons of its

1 See Ferdinand Alquié, *Le cartésianisme de Malebranche*, Paris: Vrin, 1974, pp. 9-11.

2 See Alan Gabbey, *Mariotte et Roberval, son collaborateur involontaire*, in Centre Alexandre Koyré (ed.), *Mariotte, savant et philosophe (†1684): analyse d'une renommée*, Paris: Vrin, 1986, pp. 204-244.

conjectural character (chapter II), put at stake in its methodological and metaphysical entailments in the rest of the book. This enables Roux to show the actual positions of Mariotte in respect to the Aristotelian, Cartesian and even Newtonian philosophy and science. Roux's analysis follows a twofold strand: epistemological and ontological. From an epistemological point of view, the focus of Roux is on the notion of principle of experience. Mariotte distinguishes between 1) universal intellectual propositions; 2) particular sensory propositions, provided by induction or observation itself; 3) universal sensory propositions, i.e. the principles of experience drawn from particular sensory propositions and grounding Mariotte's physics. Roux unveils the emergence of two problems related to this threefold scheme, entailing Mariotte's moderate scepticism: a) the impossibility of drawing a universal proposition from particular ones, since singular observations cannot be translated into a universal proposition (i.e., Mariotte's nominalism), and one counter-fact can invalidate a universal proposition (i.e., the classic problem of induction); b) the unreliability of sense organs in providing us with right information on things. Accordingly, universal scientific principles are just conjectural. Such conjectural status is highlighted by an ontological analysis, carried on by a comparative method and leading to consistent theoretical and historical achievements. In fact, besides confirming the conjectural status of Mariotte's physics,³ Roux's analysis of his ontological assumptions reveals the specificity of his approach to “certaines structures de savoir aristotéliennes” (p. 75), which are reinterpreted in order to develop a physics based on principles of experience. This is the case, for instance, of Mariotte's notion of causality: he claims that the knowledge of first causes is impossible, since phenomena are determined by countless causes. Therefore, instead of first or absolute causes, relative causes are to be discovered. Moreover, he reconsiders the Aristotelian notion of individual substance. Substances are support of the qualities perceived by senses, that is, are just bundles of perceptions. Accordingly, substances are no more subjects of qualities, but notions of common sense. So far, the difference between essential, accidental and proper qualities is merely nominal. In fact, Roux is not immediately clear on the epistemological consequences of the eradication of individual substances from nature. The relevance of these ontological considerations, however, assumes consistent weight in the light of her later considerations on Mariotte's methodology, as Roux compares, in the last section of the third chapter, the approach of Mariotte with Boyle's. Boyle called for intermediate causes rather than for absolute or first ones, still maintaining corpuscularianism as an ontological assumption – whereas Mariotte shows no ontological commitment on the nature of the world. So far, Roux can unravel the peculiarity of his approach in interpreting the philosophical tradition: rather than

³ “Qu'on parte de l'épistémologie ou qu'on parte de l'ontologie, la conclusion sera la même, à savoir que les propositions de la physique sont seulement vraisemblables”, p. 75.

accepting or rejecting it, Mariotte assumes such tradition in accordance with his interests, and avoids any speculation on the constitution of the world that can endanger the very practice of discovery.

The interconnected analysis of epistemological and ontological topics has a further positive consequence. Focusing on Mariotte's notions of possibility, Roux distinguishes between a) intellectual possibility, or the classic logical possibility, b) natural possibility, or the determinacy by natural causes, c) possibility according to the order of nature, i.e. actual connections of causes and effects. Hence, she hypothesizes that intellectual possibility is expressed by intellectual propositions, natural possibilities by sensory universal propositions, and possibility according to the order of nature by sensory particular propositions. The hypothesis is fruitful, since by bridging ontological and epistemological issues it allows Roux to reveal the object of Mariotte's physics: this does not concern the actual chains of causes and effects in the world, rather, natural possibilities expressed by sensory universal propositions defining the powers of bodies, ascertained on the basis of the similarities observed in different singular experiences. Accordingly, Roux has the further merit of unravelling Mariotte's standpoint on the ontology of physics despite his scarce ontological commitment. Moreover, having disclosed the fundamentals of Mariotte's ontology and epistemology, Roux can successfully address the methodological problems entailed by the discovery of such principles, based on induction or observation itself, and to assess Mariotte's position in the metaphysical debates on the origin of ideas.

Mariotte's notion of induction is clarified by Roux through further comparisons, as with Pietro Sforza Pallavicino and Francis Bacon. Regardless of Mariotte's actual acquaintance of their thought, this comparison sheds light on Mariotte's moderate scepticism and on his naturalization of the method, confirming his peculiarities in seventeenth century history of ideas. In his *Four books on good* (1644) Sforza put at stake some argument drawn from classic scepticism, rejecting the scientific value of induction: such as that 1) past is different from future, 2) a single counter-fact refutes a principle of experience, 3) principles of experience cannot be discovered by scientific syllogisms. However, Sforza attempts to refute such arguments by justifying the value of experience by means of innate principles, which do not rely on experience itself. Mariotte could support the arguments of the sceptics: still, he admits that we are naturally able to make valid inductions, whose philosophical justification is not required. The comparison with Bacon confirms such naturalization of the method, whose exactness is not guaranteed by a protocol or precise methodology, as for Bacon, but by the actual practices of artisans and engineers, whose work provides the very criteria for making valid inductions, i.e., those allowing deductions of phenomena

from their causes.

Roux can finally apply the results of her analysis of Mariotte's principles of experience to his scientific method. As she has pointed out, Mariotte is a nominalist: according to him there is not any identity between different particular sensory propositions, therefore, generalization is not a sufficient condition to formulate a scientific principle, which relies on the formulation of a hypothesis consistent with singular particular sensory propositions. In other terms, Roux introduces the problem of retroduction, enabling her to outline a further specificity of Mariotte's approach, as he rejects the speculative point of view of Cartesians but also the fictitious hypotheses of alchemists and of Newton himself, who neglected some experience in maintaining his hypothesis that colours are essential to sunlight. Moreover, by focusing on his nominalism Roux can define the very limits of Mariotte's scientific methodology, that is, his descriptive approach: as a result, Roux can explain its lack of reception. Either by considering mathematics as an epistemic model or the actual backbone of physics, Mariotte's physics cannot be regarded as deductive *more geometrico*. Analysing the actual scientific practice of Mariotte – through his *Treatise on Percussion* and in *Treatise on the Movements of Waters* –, Roux demonstrates that mathematics has a descriptive function, namely, that Mariotte is not able to unveil the mathematical structure of reality and to provide deductions and anticipations of phenomena, but only approximative quantifications: in fact, the recourse to experience as the only source of scientific knowledge breaks the purely rational intelligibility of nature. As a result, Mariotte's proving the validity of sensory universal propositions is made by the citation of different singular sensory propositions,⁴ which cannot be rendered into an inter-subjective scientific model but by practical suggestions on how to describe with exactness singular phenomena.

The analysis of induction allows Roux to complete her survey with the assessment of Mariotte's metaphysical commitment, and to advance a historical hypothesis on a comparative basis: therefore, to demonstrate that her archaeology of ideas can enhance historical studies.⁵ As the comparison with Sforza has shown, Mariotte stands for a moderate scepticism. Moreover, some

4 “Lorsque les propositions sensibles douteuses sont éloignées des principes d’expérience, et des autres propositions qui peuvent servir à les prouver, il faut prouver les dernières par la citation des premières, de la mesme maniere qu’on prouve celles de geometrie et d’arithmetique. [...] ais les experiences sur lesquelles sont fondées les principes ou regles de la nature, ne peuvent estre mises sur le papier, comme on y met les lignes et les figures de geometrie, et on a souvent beaucoup de peine à concevoir comment elles ont esté faites ; mesme il y en a, qu’un seul homme ne peut faire”, p. 154-155, from Edme Mariotte, *Essai de logique*, ed. by Alan Gabbey and Guy Picolet, Paris: Fayard, 1992, p. 127.

5 “La proximité manifeste de Mariotte et de Foucher pourrait expliquer que le premier ait eu connaissance de certaines thèses de la Recherche de la vérité par le second, ce qui donnerait un début de réponse à l’historien qui demanderait quelle connaissance un savant comme Mariotte pouvait avoir de la philosophie de Malebranche”, p. 202.

historical evidence can be provided with regard to the contacts of Mariotte and Foucher.⁶ Accordingly, some thesis of Mariotte's *Essay on Logic* can be read as an answer to Malebranche's *Search after Truth*, criticized by Foucher in his *Critique of the Search after Truth* (1675). According to Roux, the coincidences between Mariotte, Foucher and Malebranche's thought concerns two main points, declared by Foucher to Leibniz in 1678. Foucher states that Malebranche, in the third tome (1678) of his *Search after Truth*, finally admitted two points previously addressed by Foucher: A) the thesis of the obscurity of the knowledge of the soul, as Malebranche maintains that we have only an indirect knowledge of the soul; in similar terms, Mariotte states that *cogito* testifies the existence, but not the essence of the soul, criticizing the foundational metaphysics of Descartes, leading to his speculative physics; B) the thesis of radical scepticism: that is, if one – as Malebranche – admits that i) “nous connaissons par idées”, (p. 207), ii) ideas are only modifications of the soul, and iii) soul is immaterial, the knowledge of body is not possible, because representation is resemblance between ideas and things. Accordingly, Malebranche offers a radical interpretation of Cartesian philosophy, leading to a radical, modern scepticism. On the other hand, Mariotte embraces a regulative scepticism, signalling the limits of knowledge and the very possibility of physics. Mariotte, moreover, avoids any metaphysical discussion on how ideas represent things, whereas Foucher attacks Malebranche on a metaphysical terrain.

Eventually, Roux's assessment of Mariotte's position in seventeenth century metaphysical debates allows to understand two ways in interpreting Cartesianism, that is, according to a moderate or a radical scepticism. Moreover, it enables to define the specific standpoint of a scientist interested in the recognition of his methodology but refusing metaphysical considerations that could endanger or divert from the discovery of scientific principles. In conclusion, her analysis opens a new interpretative category on the history of early modern ideas. According to Roux, her study has not the goal of vindicating the importance of an unknown author, but to test the possibility of a history of ideas.⁷ According to me, this study can highlight the existence of an entire category of

6 “Il chercha également à perfectionner des dispositifs hygrométriques et, en 1672, il entra en contact avec Mariotte par ce biais ; il devait les années suivantes lui envoyer, pour transmission à l’Académie des sciences, différentes contributions sous forme de lettres, toutes reprises et complétées par de nouveaux articles dans son *Traité des hygromètres ou machines pour mesurer la secheresse et l’humidité de l’air*, publié en 1686 chez Étienne Michallet, avec l’approbation de Jean-Baptiste Duhamel, alors secrétaire de l’Académie. La correspondance de Leibniz témoigne elle aussi de la proximité de Foucher et Mariotte, réunis sous le patronage d’un troisième dijonnais, Jean-Baptiste Lantin. Le *De la végétation des plantes* de Mariotte, qui constitue un des quatre *Essais de physique* publiés en 1679-1681, se présentait initialement sous la forme d’une *Lettre écrite à Mr. Lantin* (1676). En 1692, Foucher et Lantin polémiquent par lettres dans le *Journal des sçavans* quant à la question de savoir si Épicure et Carnéade étaient contemporains. Dans les quelques lettres qu’il adresse à Lantin dans les années soixante-dix, Mariotte l’informe de l’actualité de l’Académie des sciences”, p. 202.

7 “Travailler sur des auteurs mineurs et énigmatiques comme Mariotte, sans prétendre trouver dans leur œuvre quelque chose de radicalement nouveau ou d’irréductiblement spécifique, ni entreprendre de les réhabiliter contre

thinkers: therefore, to set a new methodology in facing seventeenth century history of ideas, and an agenda for an interdisciplinary survey in history of philosophy and science.

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une tradition qui les aurait injustement méconnus, mais en mettant en série leurs idées avec d'autres idées, ou en faisant coexister des dernières dans les mêmes voisinages, c'est donc manifester la possibilité d'une histoire des idées", p. 227.