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SAMUEL DUCLOS' CRITIQUE OF ROBERT BOYLE'S CORPUSCULAR PHILOSOPHY: A CONTROVERSY ABOUT THE CONCEPT OF 'CHEMISTRY'*

Abstract. The seventeenth century witnessed the transition from qualitative to quantitative physics. The very process was not easy and obvious and it consisted of discussions in many fields. One of them was the question about the nature of chemistry which was at the time undergoing some changes towards the form we know now. The main argument concerned the explanatory principles one should invoke to understand properly certain outcomes of chemical experiments. The present paper is a presentation of such an (indirect) argument between R. Boyle, a prominent proponent of corpuscular, quantitative principles and S. Duclos, an al-chymist and a proponent of paracelsian, qualitative ones. What is interesting, Duclos knew *The Sceptical Chymist*, Boyle's main work which contained a severe critique of paracelsian chemistry, and attempted to point out some weaknesses of Boyle's own position. Duclos scrutinized Boyle's experiments described in his *Certain Physiological Essays* and other works and argued for certain shortcomings of Boyle's laboratory skills, his failure to indicate some literature sources and, first of all, insufficiency of Boyle's arguments for the corpuscular thesis. According to Duclos, Boyle did not follow in laboratory certain procedures recommended by himself, using unclear notions and applying the corpuscular principles without proper justification. What is more, Duclos argued also in favour of paracelsian chymistry presenting some qualitative explanations in experiments in which Boyle failed to give quantitative ones. Knowing the further development of natural philosophy, it seems interesting to realize how complex it was. The present paper shows also how much irremovable from scientific research is the theoretical component.

Keywords: Boyle; Duclos; theory of matter; chemistry; experimental method

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1. INTRODUCTION

The question concerning the nature of the material world determined one of the main areas of disputes that accompanied the transformation of philosophy in the 17th century. As it is commonly known, the rejection of Aristotle's hylomorphism forced modern philosophers to seek another theory explaining observed changes taking place in the material world. The long discussions and search for the new methods of practising philosophy, and the natural philosophy in their framework, resulted in the widespread adoption of the atomic concept of matter, but this happened long after the end of the 17th century. The 17th century itself is the time of birth and maturation of corpuscular concepts, and, above all, the time of searching for arguments that would indicate their accuracy[1]. The latter process took place in the fire of polemics conducted with supporters of competing theories. The disputes between atomists and Aristotelians are well known, but in the arena of the 17th-century philosophy of nature there were also supporters of the lesser-known, and then very influential, chemical philosophy[2]. It was a philosophy of nature and human, its beginning was given by Paracelsus (approx. 1491-1541), and it was developed by his many followers. Like atomists, Paracelians rejected the Aristotelian philosophy of nature, criticizing primarily its overly discursive character. Obviously, the key field of research in that current of natural philosophy was "chemistry"[3], as new observations and experiments, which allow us

1 Cf. C. Meinel, *Early Seventeenth-Century Atomism: Theory, Epistemology, and the Insufficiency of Experiment*, Isis 79(1988), 68–104.

2 The term was proposed by A. Debus. The "chemical philosophy" in this approach consists of elements of alchemy, paracelsian and neoplatonic theories, natural magic and J. B. van Helmont's concept. Cf. A. Debus, *Chemical Philosophy*, Dover Publications, New York 2002.

3 The use of this term should be explained at the outset. The literature points to serious problems occurring here. Only two terms, "alchemy" and "chemistry", are commonly used, but they are not enough to describe the extremely complex processes involved in changes in natural philosophy area and ultimately leading to modern chemistry. The term "alchemy" has pejorative connotations (pseudoscience), which is why English

to discover how components of solid bodies separate from each other and merge, play a fundamental role in it. They believed that this was the only way to discover final components of matter.

An interesting fragment of the then disputes about the nature of the material world was a discussion between representatives of chemical philosophy and one of the main advocates of corpuscular philosophy, Robert Boyle. In this case, both sides of the conflict referred to the results of their experiments to demonstrate the validity of their theories. Hence, they are on the same side of another, widely discussed at that time, a dispute over the usefulness of an experimental method in philosophical and natural research[4]. Although today we know that history agreed with Boyle, some of the details of that dispute concern issues whose topicality have not become outdated to this day. This article is about the (indirect) discussion between Robert Boyle and a much lesser-known "chemist", Samuel Duclos[5].

literature uses the seventeenth-century term *chymistry* to refer to a field represented by supporters of chemical philosophy, operating in the seventeenth century. It is emphasized in this way that it is a transition phase between ancient and medieval alchemy and modern chemistry. Cf. W. Newman, L. Principe, *Alchemy vs. Chemistry: The Etymological Origins of Historiographic Mistake*, Early Science and Medicine 3(1998), 32–65. In this text, the term *chymistry* is indicated by the word "chemistry" in quotation marks.

4 Cf. e.g.: S. Shapin, S. Schaffer, *Leviathan and the air-pump. Hobbes, Boyle, and the experimental life*, Princeton University Press, Princeton and Guildford 1985; P. R. Anstey, *Experimental versus speculative natural philosophy*, in: *The Science of Nature in the Seventeenth Century*, eds. P. R. Anstey, J. A. Schuster, Springer, Dordrecht 2005, 215-242.

5 Samuel Cottereau Duclos (1598-1685), a French philosopher and al-"chemist", was mentioned for the first time in historical sources in 1666 as one of the founding members of the French Royal Academy of Sciences. As one of the two "chemists" in that group, he was highly respected because of his extensive knowledge and particular skills in experimental practice. As part of the research carried out by the Academy, Duclos established a chemical laboratory and was the director of the work carried out there. He only published two works: *Observations of the Mineral Waters of France* (1675) and *Dissertations on the Principles of Natural Mixts* (1680), however, we can learn a great deal about his views from his manuscripts and the minutes of weekly meetings of the Academy members.

2. BOYLE'S EXPERIMENTAL PROGRAMME *VERSUS* CHEMICAL PHILOSOPHY

An important context for the dispute in question is provided by Boyle's views on the above-mentioned chemical philosophy, which he expressed, among others, in his most famous work *The Sceptical Chymist* of 1661. As an advocate of corpuscular philosophy, Boyle criticizes Peripatetic philosophy that is dominant at universities, primarily rejecting its theory of matter referring to four elements. However, it seems that he is much more severe in his assessment of *tria prima* theory, which is put forward and defended by "chemists" (*chymists*). The hypostatic principles, i.e. underlying all material objects, they called salt, sulfur and mercury. These are the ones that should be referred to in the search for explanations of phenomena taking place in the material world. As far as Boyle treats Peripatetics with some respect, recognizing some value of *a priori* analyses in natural philosophy, he takes a strongly critical attitude towards "chemists", i.e. supporters of Paracelsian solutions. He presents them as philosophers whose "eyes and minds are obscured by the smoke from their furnaces", who, "not being able to even understand the Peripatetic theory, pretend to be the creators of a new one, and call the earth salt, fire – sulfur, and fumes – mercury (*mercurius*)". Their writings are "dark, ambiguous and enigmatic", "they use names in a completely arbitrary way", which results in the fact that it is not known what is their designator, they do not give clear and distinct concepts of elements. Boyle criticizes most the experiments carried out by "chemists". In this case, certainly, the allegations could not relate to the practical side, after all, those were people who were perfectly familiar with the secrets of laboratory work. After all, Boyle himself began his adventure with natural philosophy from alchemical interests, so he knew the skills of his adversaries. Thus, Boyle's criticism was not directed at the practical side of experiments, but at the interpretation of results obtained. In his opinion, "chemists" are somehow doomed to draw such conclusions because they look at the results achieved through the prism of the *tria prima* theory accepted at the starting point. The validity of a theory depends on

the accuracy of conclusions[6]. In general, Boyle accused "chemists" of interpreting experiments using "too few and narrow rules". Their mistake was that they only indicated the material factor causing changes, but neglected to explain how this factor had worked. It was supposed to be the advantage of corpuscular philosophy, obviously, that on its grounds, according to Boyle, the way of affecting was explained[7]. As Boyle himself says: "there is a big difference between the ability to conduct experiments and the ability to give a philosophical explanation"[8].

Criticism of chemical philosophy was to highlight the advantages of the experimental programme proposed by Boyle. It was to serve primarily to provide arguments in favour of corpuscular philosophy, an essential part of which was the theory of matter, defining the final components of solid bodies as indivisible particles – atoms endowed only with shape, size and movement. This objective was likely to be achieved by "appropriate" interpretation of the results of conducted experiments, which was to justify the corpuscular thesis. Boyle devoted a lot of effort and attention to this programme, defending it from all sorts of accusations[9].

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6 Cf. V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, in: *Science in the Age of Baroque*, eds. O. Gal, R. Chen-Morris, Springer, Dordrecht 2013, 260–261. Quoted from: *Sceptical Chymist: An Introductory Preface*, (no pagination) (http://www.gutenberg.org/files/22914/22914-h/22914-h.htm), [accessed on: 08/2015].

7 Cf. R.-M. Sargent, *Learning from experience: Boyle's construction of an experimental philosophy*, in: *Robert Boyle reconsidered*, ed. M. Hunter, Cambridge University Press, Cambridge 1994, 63.

8 R. Boyle, *The Sceptical Chymist*, in: *The Works of Robert Boyle*, eds. M. Hunter, E. Davis, vol. 5, Pickering and Chatto, London 1999–2000, 294.

9 The comprehensive stage of Boyle's experimental philosophy – see R.-M. Sargent, *The Diffident Naturalist. Robert Boyle and the Philosophy of Experiment*, The University of Chicago Press, Chicago – London 1995. One of the most frequently cited experiments in the literature to speak in favour of corpuscular philosophy was the process of melting and redistributing silver and gold samples. The possibility of decomposing the mixture of gold and silver into its original components was supposed to prove that these substances consist of particles that retain their identity in the mixture. Most likely, Boyle knew about this experiment from works of Daniel Sennert, an alchemist from Wittenberg. It is worth noting that Sennert, unlike Boyle, understood atoms qualitatively (i.e. that atoms

It is not easy to clearly assess Boyle's attitude to "chemists". The above-mentioned criticism of their views does not contradict the fact that Boyle's own position was strongly influenced by al-"chemical" works. What is more, Boyle allowed some al-"chemists" to be accepted in the community of experimental philosophers. He acknowledged their proficiency in the art of laboratory tests and did not question the facts they discovered. However, he strongly required from them that they must abandon the hermetic language in which they describe experiments and renounce their theories with which they interpret the phenomena they discover. Boyle was likely to take such a position because he considered that the link between the language of facts and the language of the theory was not necessary, but only casual. Thus the price of joining philosophers–experimenters was the resignation from the mystery that covers research as well as the approval for interpretation of phenomena in categories accepted by this community of researchers[10].

3. "CHEMIST" *VERSUS* BOYLE'S EXPERIMENTS

This is the context in which Samuel Duclos' speech occurs. In 1667–1669, he led meetings for members of the Academy, analyzing, above all, Boyle's work *Certain Physiological Essays* of 1661 and formulating his critical remarks on him. Importantly, Duclos knew Boyle's views on chemical philosophy and expressed them in his flagship work *The Sceptical Chymist*[11].

In its *Report* of 26 March 1667, he refers to some experiment that Boyle describes in *The Origins of Forms and Qualities*. The idea was to

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are endowed with an attribute of a given substance, e.g. atoms of gold are "gold", atoms of silver are "silver"). Cf. E. Michael, *Daniel Sennert on Matter and Form. At the Junction of the Old and the New*, Early Science and Medicine 2(1997), 286–287.

10 Cf. S. Shapin, S. Schaffer, *Leviathan and the air-pump. Hobbes, Boyle, and the experimental life*, op. cit., 69-71.

11 Cf. V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, op. cit., 258. R. Boyle, *Certain Physiological Essays*, (http://quod.lib.umich.edu/e/eebo/a28944.0001.001/2:A28944.0001.001?page=root;size=125;vid=63094;view=-text), [accessed on: 08/2015].

obtain, using complex chemical operations, sweet salt crystals from salt material, tart and sour ones. Interestingly, in no way can it be said that Boyle, contrary to the principles he postulated, describes this experiment clearly and transparently. He gives only a few characteristics of the salt obtained, describes them as (*anomalous*) and then declares that he cannot give details of the operations carried out or even the type of material from which he obtained those sweet crystals. Besides, he cites advice concerning the experiment, given to him by a mysterious, outstanding "chemist", about whom he says nothing closer[12].

Hence, it is easy to predict in which direction Duclos' criticism goes – Boyle does not act according to the standards set by him. Instead of clarity and transparency, we have a puzzle to solve – from where is the sweetness in a tart and sour material? Moreover, according to Duclos, this puzzle had long been solved by Paracelsian Joseph Duchesne (+1609), which was in turn described by Johann Schröder in the work *Quercetanus redivivus, hoc est, Ars medica dogmatico-hermetica* (1638). Duclos gives a very detailed description of this experiment, including all the information needed to carry it out. They will be useful only for those who have appropriate knowledge of "chemistry", and only they will be able to understand what these procedures are about. Duchesne also gives information about other than sweetness characteristics of the crystals obtained, e.g. extremely effective dissolution of gold or the ability to restore freshness to wilted flowers. Boyle, on the other hand, although he mentions some other characteristics of the salt obtained, does not give any further information on this subject ("because this is not the right place to deal with these matters")[13].

12 Cf. *Académie Royale de Sciences Procès-Verbal de séance*, Paris, France 1, 93–94 (description of the Duclos' *reports* that he presented to the members of the Academy is given as follows: V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, op. cit., 262–263).

13 Cf. V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, op. cit., 261–264. Quote from R. Boyle, *Origins of Forms and Qualities*, in: *The Works of Robert Boyle*, eds. M. Hunter, E. Davis, vol. 5, Pickering and Chatto, London 1999–2000, 407.

The analysis of Boyle's and Duchesne's texts leads Duclos to the conclusion that they must be about the same thing – sweet crystals obtained through complex chemical operations, made of salty and sour materials. Duclos further rejects *de facto* validity of Boyle's theses concerning the observed phenomena. For Boyle, both the biggest problem and mystery was the difference between the sweetness of the crystals obtained and the characteristics of components from which they were obtained. Duclos points out that there is no mystery here if we simply refer to components used in the experiment, which "materially cooperate" in the formation of these crystals. And these are, according to Duchesne, sea salt, honey vinegar and acid. There is no need to refer to the corpuscular hypothesis to know the cause of the formation of these crystals. The explanation is the quality of materials used in the experiment[14].

Duclos' discussion with Boyle is essentially a dispute over the nature of chemistry. Duclos rejects the project of transforming chemistry into physico-chemistry, which is ultimately Boyle's postulate, and wants to demonstrate weaknesses of the program itself as well as the incompetence of his adversary. To that purpose, he undermines Boyle's credibility as a chemist. If crystals from Boyle's and Duchesne's experiments are the same (and this is even obvious), then either Boyle did not know Duchesne's work, and this undermines his knowledge of important works from the scope of chemistry, or worse – he does not mention sources he uses, aspiring to originality (and Boyle writes that he came across such salt for the first time).

The weaknesses of the very idea of transforming chemistry into a physico-like field are more clearly demonstrated by Duclos when analyzing the experiments that Boyle described in *Physico-Chymical Essay Containing An Experiment with some Considerations touching the differing Parts and Redintegration of Salt-Petre*[15]. It was about

14 Cf. Ibid, 266–268. *Sprawozdania* Duclosa [Duclos' *reports*] cf. *Académie Royale* 1, 97–103.

15 Cf. R. Boyle, *Physico-Chymical Essay Containing An Experiment with some Considerations touching the differing Parts and Redintegration of Salt-Petre*, in: Idem, *Certain*

experiments with potassium saltpeter (potassium nitrate). Its significance was, among other things, that it is commonly found as a component of many different bodies, from minerals to animals. Hence, it deserves to be tested carefully (however, Boyle, from the outset, points out that due to "big things" there is no time for such very thorough exploration). Boyle is especially interested in inflammableness of saltpeter, so he wants to explain what that feature is about. He immediately comes to the conclusion that it is the result of the very rapid movement of particles which it consists of. These particles "shake violently one another, as if the heat was nothing else but a fast movement of the smallest particles of the body". In response to this suggestion, Duclos notes that although one can agree that it is movement that causes heat, Boyle does not answer the fundamental question – what the cause of this movement is, because he "would probably not attribute it to shapes and positions of the particles". This brings us to the core of the dispute. Duclos believes that the reference to "shape and arrangement" of particles of matter to explain phenomena cannot be a valid explanation in terms of chemical research. Here, one has to refer to other rules. Duclos explains the inflammableness of nitrate. It is based on numerous experiments in which this feature was tested in various combinations of saltpeter with other substances. According to these experiments, saltpeter burns only in combination with substances which, in chemical terms, contain much sulfur salt. Its inflammableness actually concerns the "stormy movement" which is caused by "mutual interaction of salts of different properties"[16].

Another phenomenon – "selective" inflammableness of saltpeter – was related to this, the explanation of which caused Boyle much trouble. The point was that this feature was only present in some of

Physiological Essays, op. cit., 129-158.

16 Cf.: R. Franckowiak, *Du Clos and the Mechanization of Chemical Philosophy*, in: *The Mechanization of Natural Philosophy*, eds. D. Garber and S. Roux, Springer, Dordrecht 2013, 289–290. V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, op. cit., 273. Quotes from: *Sprawozdania* Duclosa [Duclos' *reports*], see *Académie Royale* 6, 1.

the circumstances created in the laboratory. It burnt every time it came into contact with live coals, but when placed e.g. in a hot melting pot, "this strange salt melts, but does not ignite". Boyle, based on corpuscular assumptions, could not find any satisfactory explanation. Duclos, in turn, does not see anything mysterious about this phenomenon. Again, referring to numerous experiments, he states that saltpeter will never light up from the flame of a candle, burning oil, melted lead, silver or gold. It will ignite and explode only if it comes into contact with hot flammable materials such as coal, sulfur, sulfurous minerals, molten tin or red-hot iron. The principle is that the more sulfuric salt the material contains, the easier it is to ignite saltpeter. Coal contains large amounts of sulfuric salt (we find out about this by investigating the ash remaining after burning the coal), that is why saltpeter ignites after contact with hot coal as well. Lastly, Duclos argues – contrary to Boyle – that saltpeter is not flammable. It ignites and explodes "only as a result of the opposite reaction of the air it contains and the fire which ignites the materials with which saltpeter is mixed"[17].

As one can see, Duclos in his discussion with Boyle attempts, above all, to show the weaknesses of his adversary's argumentation. Thus, he shows with some success that his knowledge of *arcana* of work in the chemical laboratory is certainly not worse than Boyle's, and moreover, he is able to conduct experiments with much greater meticulousness and systematicity. Duclos proves that Boyle does not know enough about the literature he deals with. Mainly, however, he adopts erroneous interpretative categories of observed phenomena – referring only to the size and arrangement of particles of matter cannot be sufficient to explain chemical reactions. That is why Boyle so often confesses to failures when trying to explain the phenomena investigated.

We are dealing here with a fundamental difference between Duclos' and Boyle's views – they were advocates of two different concepts of "chemistry". Boyle's atomist concept is widely known,

17 Ibid, 271-273. Quotes from: *Sprawozdania* Duclosa [Duclos' *reports*], see *Académie Royale* 6, 1.

but it must be stressed here that Duclos also saw a need to modernize the field. In no way did he accept all the theories of matter that emerged over time in the Paracelsian current. For instance, he rejected the theory of five principles – phlegm, earth, spirit, oil and salt – believing that it was the result of inaccurate distillation. He also rejected hermetic tradition and *tria prima* theory which sees salt, sulfur and mercury as final elements of matter. Duclos himself was a supporter of the views of Jan Baptista van Helmont, considered to be the most modern of "chemists"[18]. Just like Boyle was inspired by Bacon, Duclos was inspired by Jan Baptista van Helmont.

What field should chemistry be then? First of all, the explanation of phenomena takes place in chemistry on three levels, to which three types of principles – body, spirit and soul – correspond. The first corresponds to what is purely physical, and Duclos emphasizes that at this level it is necessary to sensory capture the phenomena studied. Like van Helmont, he assumes that water is first matter at this level. Only it remains after complete distillation of all other substances. However, it cannot be ruled out that there is some causative factor in water which is not accessible to the senses and which can produce new forms in it – salt, sulfur and mercury. Duclos calls this factor a "transforming spirit" and its resulting forms – "accidental". There is also a third, highest level, made up of "ideal mixtures", at which the effect of the "spirit", as well as salts, sulfur and mercury produced by it, cannot provide a definitive explanation. It is about, as we would say today, living matter. Its "mercury, salts and sulfur are so varied that they cannot be created from the transforming spirit alone"; it is necessary to accept the existence of a third, "more dynamic and even less corporeal than the spirit" principle, which is the soul. It is the one who acts in ideal mixtures.

Duclos stresses that these principles must be closely linked to the results of experiments – "it may take rather a long time to check these things, and in order to investigate, discuss and acquire this

18 Cf. e.g. S. Ducheyne, *Joan Baptista van Helmont and the question of experimental modernism*, Physis, Rivista Internazionale di Storia della Scienza 42(2005), 305–332.

knowledge we will have to make many observations and experiments". Chemistry should be based primarily on advanced experimental practice, which will reflect chemists' unique abilities as well as deep and extensive knowledge of substances, circumstances of their emergence and their behaviour[19]. Chemistry is to be qualitative. Duclos believed that any attempt to give up "sensory quality for the sake of austerity *matter* in motion" was an unjustified and dangerous reduction. He pointed out that attempts at corpuscular interpretation of chemical experiments are as "dark, ambiguous and almost enigmatic" as criticised "chemists" theories for Boyle. Therefore, according to Duclos, true chemistry must refer in proposed explanations to categories available to sensory cognition. On a material level, it was an operational epistemology in which all causative explanations had to be based on available by senses experimental data. There was no room in it for hypothetical particles of matter[20].

4. CONCLUSIONS

The discussion presented above makes us aware of how complex the process of transformation of natural philosophy in the 17th century was. In this case, it is primarily about the formation of a modern, quantitative form of science. Its ultimate success was preceded by a long stage of disputes with supporters of other concepts for research concerning the material world. They include, as we have seen, representatives of the Paracelsian, qualitative (vitalist) current of chemical philosophy. Interestingly, they based their theories on extensive experimental research, showed great proficiency in them, and considered the obtained results

19 Duclos was an advocate of decomposition of the tested substances by means of solvents (*alkahest*); he pointed to weaknesses of the method of decomposition of substances by means of fire (gradual heating). Cf. V. D. Boantza, *Alkahest and Fire: Debating Matter, Chymistry and Natural History at the Early Parisian Academy of Sciences*, in: *The Body as Object and Instrument of Knowledge. Embodied Empiricism in Early Modern Science*, eds. Ch. Wolfe, O. Gal, Springer, Dordrecht 2010, 78–84.

20 Cf. V. D. Boantza, *Chemical Philosophy and Boyle's Incongruous Philosophical Chymistry*, op. cit., 275–277 (with quotations).

as proof of the correctness of the adopted interpretative categories. It can be said that at the methodological level they were "modern", but ultimately they opted for a "nonmodern", qualitative theory of matter. However, in discussions they were a completely different adversary than supporters of the Aristotelian philosophy of nature.

From the point of view of philosophy of science, the above-mentioned discussion also points to a problem that remains valid even today – every experiment brings theoretical assumptions with it. They are concerned with the very selection of tools and materials used, and they show their nature most fully in the interpretation of results. That truth about the experiment can be clearly seen in Duclos' discussion. In fact, t is a reaction to Boyle's declarations about the need, or even the necessity, to apply a corpuscular hypothesis to interpret the results of experiments. However, in the light of the polemics presented, the question arises here – does Boyle pre-establish the whole discussion in such a way as to make a corpuscular hypothesis the model and only appropriate way of interpreting the results of experiments, actually making the same mistake of which he accused his adversaries accepting the qualitative interpretation?

Or is it what Catherine Wilson claims that the supporters of atomism could not show that their theory explained observed phenomena better than competitive theories? It seems that Boyle himself did not so much derive corpuscularism from his experiments as he simply interpreted their results according to this theory. Moreover, if we put the discussion concerning atomism in a broader context, Boyle's reference to the atomism of the ancients can be interpreted as an attempt to find a respectable philosophical theory for conducted experiments. This was supposed to protect the experimental method from the label of "mechanical practice" and introduce it to the group of respected research areas[21]. With Robert Boyle's enormous contribution, it finally worked. As we all know, corpuscular and experimental philosophy has removed

21 Although Boyle saw that Epicurean atomism, interpreted in an atheistic spirit, could pose a threat to religion, he believed that this could be prevented by developing and promoting natural theology. Cf. M. Johnson, C. Wilson, *Lucretius and the history of science*, in: *The Cambridge Companion to Lucretius*, eds. S. Gillespie, P. Hardie, Cambridge University Press, Cambridge 2007, 139–140.

or even forgotten competing concepts concerning the essence of philosophy or natural philosophy. However, it was certainly not an easy success, and the 17th-century disputes about the very foundations of acquiring knowledge about nature and its interpretation are a good illustration of this long-lasting process.

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