Evolution of knowledge: history of materials – the case of saltpeter

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In this presentation we will discuss aspects of the research we've been conducting for several years at our centre concerning a number of macrohistorical studies of definite materials and their transit. The reason is that "by charting the voyage of materials procured from the three kingdoms of nature, historians can establish correlations between theoretical concepts developed to account for their chemical actions and properties, their practical uses, and the laboratory processes associated with them." By 'voyage' we do not only allude to literal geographic displacement, but also to the travel of the associated concepts, theories, methods and practices over time. Here we will focus especially on the transit of saltpetre and on historiographical aspects relevant for the history and philosophy of science as emerging from this case study.

Saltpetre had a historical crucial role for having long been one of the main components of gunpowder; its relevance much increased starting in the 17th century following its inclusion into agriculture. Moreover, its history is signalled by strong controversy. Along many centuries, saltpetre was hermetically kept as a trade (and even state) secret, causing much fascination, but also much uncertainty and misunderstandings. For instance, whether the material known as sal petrae, sal-nitro or saltpetre from early modern times onwards corresponds or not to some of the salts known as niter, haloniter, afroniter, etc. since ancient times. Then saltpetre remained at the centre of enormous discussions until the 19th century, which only ended together with the earliest – and ill succeeded – modern attempts to elucidate such complex historical puzzle.

As of lately, previous conceptions on the identification, obtainment and use of nitrogen compounds are being revised. While several scholars asserted that materials such as nitrates and ammonium salts were not known in Antiquity, recent studies showed that formularies and recipe books for craftsman practice written as early as by Mesopotamian cultures strongly point to the use of this class of materials. Indeed, new trends in analysis suggest that understanding recipes kept as trade secrets does not depend on listening to the 'voice' of the material evidences only, but also and mainly to the tone, variations and reasons of the 'voice' that created them. And while the voice of ancient Mesopotamian cultures was silenced, learned societies like the Hellenic ones or practical ones like the Roman were not able to recognise the applications, not even the existence of saltpetre. Yet, the ancient knowledge reached the medieval Arabic world possibly via Persian routes, earning a place in Hermetic, alchemical, mineralogical and medical treatises, while previous or contemporary Greek works do not contain any hint of these compounds. Perhaps here is the origin of the idea that nitrogen materials were not known in Antiquity, an idea quite justified within the continuist view suggested by George Sarton for the history of science at the beginning of the 20th century.

The challenges posed by saltpetre are not restricted to older times. Issues related with nomenclature, identification, and thus, with the very recognition of saltpetre remained constant until the 19th century. In addition – or perhaps for this very reason – the studies on the subject lent us a few loose threads and endless exercises of doxa.

Our analysis indicates that the origin of the historical-philosophical problem is in the earliest modern attempts to write the history of saltpetre from a Hellenocentric perspective. Surprisingly, even reputed 19th and early 20th century Arabists followed in this path – their silence on saltpetre being more than

eloquent. Yet one should bear in mind that all these scholars were first and foremost proficient chemists – and thus were thoroughly acquainted with the problems associated with the nomenclature and identification of saltpetre even in their own time.

As a result, the attention of scholars was mainly attracted to the 'miraculous discoveries' of the 13th century, such as nitric acid and aqua regia, and also explosives, for which knowledge of saltpetre was mandatory. Yet, not all scholars were convinced of these alleged 'miracles', and given the lack of ancient Greek sources, some of them shifted to the early modern times – or even more recent periods – for effective knowledge of saltpetre according to modern standards. Yet the contradictions inherent to this argument are rather patent: subtle differences in language contrast with the anachronistic idea that only modern standards allow for true knowledge on saltpetre. Once again, this implies a continuist and progressivist perspective of history. In addition to anachronism and the intrinsic scientificism of such view, quite prevalent until not too long ago, it does not make room for different ways of knowing of different scholars in different times and places – all of them certainly different from ours, but even so valid within their own context.

Starting in the 15th century, the production of saltpetre – necessary to manufacture gunpowder and aqua fortis – intensified in Europe until becoming a major enterprise in the 1700s. The corresponding historical studies developed in the 20th century tended to focus on discontinuities, like the break brought in by the formulation of mechanistic ideas starting in the 1600s.

However, neither the discontinuist approach succeeded in solving agelong debates, such as the one opposing the natural and the artificial, nor did it prove to be adequate to account for the permanence of practices recorded in ancient recipe books and conceptions on matter mainly based on the notions of qualities. These limitations of the discontinuist view are evident in studies on 17th-century ideas on nitrous compounds.

In the past decades these issues had been approached from a new historiographical perspective which seeks to place the sciences of matter within a frame that considers the relationship between breaks and permanence and respects the complexity of historical documents. Such perspective allows understanding the oscillating relationship between the traditional and modern chemistry as visible in relevant historical documents. Applied to saltpetre as case study, this approach yielded satisfactory results, by allowing one to follow up and map the development of the ideas on the composition of matter and their transformation, as well as the ubiquituous discussions on the origin (mineral, plant or animal) of this material over a quite long period of time.