

## 'New wine in old bottles': replicating alchemical experiments

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Medieval alchemical recipes often begin with standard, recognisable procedures, such as the manufacture of mineral acids or metal acetates. Yet they go on to describe marvellous effects – the transmutation of base metals into gold and silver, or the production of elixirs capable of greatly prolonging life. Alchemists, well aware of the astonishing nature of their claims, could cite a popular aphorism: "If I had not seen it, I would never have believed." What was it, however, that these alchemists saw?

Some historians of alchemy have tried to answer this question by restaging alchemical experiments in modern laboratories. Despite the challenges associated with reproducing early modern apparatus and materials, such replications can be useful in a variety of ways. They can help us assess whether our reading of a source is correct, by comparing it to our experimental observations. In cases where the original instructions are terse or obscure regarding the duration of a process, or the method of preparing initial ingredients, historical replication can increase our understanding of past science by filling in the blanks in earlier accounts. By revealing the genuine chemical processes that underlie many outwardly fanciful or allegorical descriptions, they also throw new light on the demarcation problems of pre-modern science.

Replication has attracted increasing attention from historians and philosophers of the exact sciences in recent years. In this context, alchemy raises a unique set of problems. The first concerns hermeneutics. As with any technical literature, alchemical writing assumes tacit knowledge of procedures and familiarity with a body of essential works, which historians can painstakingly attempt to acquire. Beyond that, however, alchemical recipes are often deliberately encoded: their essential ingredients and processes disguised using 'cover names', or Decknamen. Some of these – such as the use of planetary symbols to denote metallic bodies – remained stable over long periods. Others changed over time, as readings of alchemical texts reflected shifts in theory and practice. For instance, in the midfourteenth century the Franciscan tertiary John of Rupescissa equated spirit of wine (distilled alcohol) with a universal 'quintessence' capable of healing bodies, transmuting metals, and prolonging life. This innovation was incorporated into many fifteenth-century alchemical texts and recipes, which retained their prestige even as the novelty of alcohol as a panacea wore off. Yet the life of these texts was itself prolonged by new readings. Just as 'mercury' once disguised the use of wine, so later readers interpreted 'wine' as a mask for mineral products. For the alchemist, 'mercury' seldom denoted common quicksilver, except in its capriciousness, but might refer to liquors drawn from virtually any body in the animal, vegetable or mineral kingdoms.

This semantic instability raises problems for experimental replication. In order to decipher their processes, modern readers must employ similar techniques to those used by their early modern predecessors: a combination of textual source criticism and practical experience, in which text and practice continually inform one other, in a kind of 'practical exegesis'. In one important sense, however, historians do not behave like alchemists – no modern scholar (presumably) expects to be able to make the philosophers' stone. This raises a fresh difficulty for alchemical replication: given that the outcomes described in alchemical texts are not achievable according to the principles of modern science, how far can experimental replication take us in this field? At what point did alchemical authors cease to describe their own observations and fall back on earlier (impossible) accounts? And in a practical setting, how do

we know when we have reached it? Under such circumstances, a replication experiment may easily end up departing from the text entirely, and striking out in new directions – an inadvertent application of the practice that Hasok Chang has described as ‘extension’ of historical experiments.

These issues have informed my own attempts to replicate a particular strand of alchemical practice: the manufacture of an elixir called the ‘vegetable stone’. This strand, a staple of fifteenth-century alchemy, begins with a substance called ‘sericon’: a metallic body that must be dissolved in strong wine vinegar to produce a gum. When distilled, the gum yields a vapour, which is condensed to form a liquid, which is then subjected to further procedures. Owing to the circumstances of its manufacture, the vegetable stone was originally regarded as combining both mineral and vegetable qualities, and was therefore safe to use for medicinal purposes, as well as transmuting metals. In England, this ‘sericonian’ approach was commonly associated with the famous alchemist George Ripley (d. ca. 1490), who interpreted sericon as red lead (minium).

By following Ripley’s recipes, it is possible not only to recover tacit knowledge of chemical practices (from the best way to distil vinegar to the identity of ‘red lead’), but also to trace the tortuous routes by which late medieval and early modern practitioners created and refined their knowledge of processes and materials. To do so required them to be creatively anachronistic in reading their own authoritative sources. Finding Rupescissa’s spirit of wine an inadequate solvent for metals, but convinced of the wisdom of his sources, Ripley decided that ‘wine’ must denote something else, and therefore substituted other products. Ripley’s own sixteenth-century disciples, sceptical about the value of lead, increasingly reinterpreted sericon as other substances, including tartar and antimony. Ripley and his successors were therefore engaged in a hermeneutical as well as a practical enterprise. In the very process of recovering the ‘lost’ knowledge of their authorities, each generation had the opportunity to replace it with something new.