Vacuum Experiments in Cartesian Context

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In the second half of the seventeenth century, many individuals and institutions were concerned with the production of vacuum. The air-pump became a 'philosophical' instrument, producing both wonder and rejection. However, the experimental approach to the problem of the composition of matter was pressing for any natural philosopher of the period.

If this empirical approach is commonly associated with the Royal Society, in my paper, I would like to focus on a different context. Namely, my aim is to discuss this problem in Cartesian philosophy. Descartes, in his celebrated Principles of Philosophy, denied the existence of vacuum. For him, the world is a plenum, composed of the different aggregations of the same res extensa. While he was not performing instrumentally-aided observations to support this view, Descartes, nevertheless, offered a thought experiment that was supposed to illuminate any inquiry into the nature of matter. According to this experiment, if God would have emptied all the air from a room, the walls will collide. There won't be any "empty space" left between the walls, as 'empty space' is itself a contradictory notion.

Both the theory about matter and the thought experiment were largely accepted among Descartes's followers. However, there is an interesting case of experimentation, to which I would like to focus. More precisely, the experimental physics of Jacques Rohault. One of the most famous Cartesians of his time, Rohault was a public figure in the second half of the seventeenth-century France. His house was hosting conferences, where participants were witnessing experiments and discussing various philosophical views. In this context, there are two important features of Rohault's natural philosophy that should draw the attention to any historian of philosophy of science. First, Rohault does experimental physics. Second, his treatise of physics, Traité de physique (1671), was quickly translated in Latin and English, becoming a textbook in various European universities. Regarding the later, it is most puzzling how this Cartesian physics has been adopted and discussed in England, especially in the context of the birth and dissemination of Newtonianism. While this aspect can be very illuminating from the HPS perspective (the problem of the relation between two competing paradigms, incommensurability, etc.), it also shades light to the problem mention in the beginning. Rohault defends Descartes's position that void is not possible. Yet, he performs experiments in order to prove this and even builds an air-pump. How does his explanation compare with the ones of Newtonians?

More questions pop up. What is the role of experiment in this particular case? If the Cartesian theory of matter is sufficient for claiming that void is a contradictory concept, what is the meaning of an empirical investigation in this sense? By this, it should not be understood that experience is disregarded by Cartesian natural philosophy (on the contrary, there are many passages in Descartes and his followers, where experiment and observation are praised), but building an instrument to testify that something does not exist seems like a useless effort. Rohault could have simply use Boyle's famous experiments with the air-pump and explain the outcome in Cartesian fashion. However, he chooses not to. What is the role of such empirical investigation in Rohault and how is this experiment linked to the previous mentioned thought experiment of the empty room? Moreover, Rohault offers very detailed reports of the observations performed with a "syringe." These are very revealing for us, as Rohault changes the initial conditions of the experiment. His trials follows the scientific methodology described in the preface to his famous treatise: experiments "are made in Consequence of some Reasoning in order to discover whether it was just or not" (Rohault, Traité, unpaginated preface). In the same programmatic preface, Rohault expresses against those experimenters that "deliberately and designedly make Tryal of any Thing, without knowing or foreseeing what will come to pass." How are his own experimental attempts different from these non-aimed trials? Do they express a different relation between theory and experiment?

My paper will try to provide answer to such questions, drawing attention to other possible uses of experimental practice in the early modern period. The selected case study of a Cartesian philosopher becomes very instructive from the perspective of HPS, forcing a more contextualized investigation of the period that has produced the Scientific Revolution. Besides the important resemblance with the scientific methodology developed by the Newtonians, I shall try to argue that Rohault's experimental practice displays a number of particularities that makes Cartesianism a strong contender in physics.