

Beyond Perrault's experiments: Repeatability, didactics and complexity

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The studies conducted in the second half of the Sixteenth Century were crucial both for the birth of the modern hydrological science and for the modern epistemology. Thanks to the new experiment-based scientific approach, and to quantitative observation, the Sun was about to be fully recognized as the engine of the hydrological cycle, instead of an endogenous engine within the Earth, originally conjectured by Aristotle to explain the water supply of great rivers.

In 1663 Schott published his opus *Anatomia physico-hydrostatica fontium ac fluminum* in which the opinions of ancient and modern authors about the origin of springs and rivers are carefully reviewed and discussed. Schott's opus, which remarks Aristotelian conjectures on the endogenous origin of the main rivers, shows the traditional structure of an *opiniones* book, based on the ancient humanistic and dialectical method.

In this book, Schott reports about some observations recently made about the capability of the water to rise within a soil column, to which Perrault will refer as a starting point to design the experiments reported in his classical opus *De l'origine des fontaines* (1674). In it, after reviewing previous authors' opinions and stating his own hypotheses, Perrault reports about a set of experiments which he performed to test three main questions related to basic soil-hydrological problems.

Only few pages are devoted to the experiments and they are placed at a turning point of the book, after which the results are thoroughly discussed in comparison with quantitative observations made by other authors, also involving observations about the catchment behaviour in a general sense. With this approach he places himself in the perspective of a deeply renewed epistemology: only a decade passed between the publication of Schott's opus and Perrault's one, but their perspective is radically different.

Moreover, at the same time, the questions posed on the hydrological cycle and on the soil hydrology, which are hardly reproducible by means of a controlled laboratory model, severely tested this modern scientific approach at its beginning. Perrault seems to be aware of such difficulties and his choice to move the point of view from the scale of the laboratory model, to that of the catchment, makes him a progenitor of the contemporary epistemology of complexity, which is framed both on laboratory analysis and on cases study. Thus even if Perrault's conclusions went in the direction of the ancient opinion, his work is not only seminal for hydrology, but also it helps to enlighten some intricate features of scientific revolution.

Aiming at contributing to understand the importance of Perrault's opus, we will discuss his epistemological importance through the lens of the repeatability of the experiments, of the intriguing didactic aspects which, starting from his experiments, may arise for modern understanding of hydrology, and of his attitude to face the complexity of the hydrological processes.