

The Architectonic Frameworks in the History of Science.
Reading Sadi Carnot's Thermodynamics, Lazare Carnot's Mechanics and Newtonian Science

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Generally speaking, physical science makes use of observation/experiments to measure physical quantities: a unit of measurement is a standardised quantity of a physical property, used as a factor to express occurring quantities of that property. Any value of a physical quantity is expressed as a comparison to a unit of that quantity. In a mathematical physics structure one generally precedes by means of calculations; measurements seem to be not a priority in term of analytical solution within theoretical stream; e.g., see analytical theories (18th–19th) without necessarily specifying physical properties (relations between physical points, space–time–gravitational potential functions, vector fields etc.). Space and time are crucial physical magnitudes in Newtonian's mechanics, but they are also mathematical magnitudes (of a certain mathematical function) because they involve in derivative operations. If we should lose their mathematical–objective–sense, e.g., variation–in–time, we may lose the entirely mechanical Newtonian apparatus.

In the history and epistemology of science, generally speaking, a mathematical principle (i.e., in Newtonian *Principia*) can be considered the first element in the development of a scientific theory and it may not be mathematically confuted or experimentally demonstrated. The principle of inertia states (Newtonian mechanics) that rest and rectilinear uniform motion are equivalent. However, *what does equivalent mean in its physical conceptualization?* Newton's statement treats the two cases as if they were the same thing (“[...] at rest or in motion [...]). Lazare Carnot's mechanical conceptualization, provides it as a broken up into two parallel but distinct affirmations by means of physical *Hypothèses*.

The discursive part of Sadi Carnot's *Réflexions sur la puissance motrice du feu* of 1824 does not include any methodological principles but it presents cycles of arguing, *ad absurdum proofs*, and no mathematical/analytical structure. In this sense, the architectonic framework does not take the passage from statics to dynamics for granted: a change of dialectic arises. In effect, one can see several streams of approaches to conceive and define foundational *mechanical–physical objects* and their *mathematical interpretations* which change both in a physics mathematics domain and a physical one: mathematical–mental modelling of results of the experimental apparatus (experiments, data, errors and modelling) permits to enlarge the hypotheses and arrive to claim some theses.

In my talk, I will present a physics-mathematics relationship and conceptual bridges among thermodynamics (Sadi Carnot) and mechanics (Lazare Carnot vs Isaac Newton) theories. The different uses of conceptual streams in the physical and mathematical reasoning will be discussed.

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