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Abstract

There are four extant treatises of Archimedes that involve weight, as well as traces of other works on the balance preserved in these works and in Heron's *Mechanica*, Pappus' *Collectio VIII*, and the medieval *Liber de Canonio*. All the extant treatises employ the notion of a barycenter, yet two of the extant treatises also explicitly introduce a balance into the proofs (*Quadrature of the Parabola* and the *Method*), and two do not (*On Plane Equilibria* and *Floating Bodies*), although the proofs of all depend on the notion of magnitudes on a line inclining, given a fixed point on the line. This might seem to be at least an implicit balance, or as some have described it, a generalized balance. In fact, the formal features of an analysis by barycenter and by balance are quite different. For example, Archimedes assumes that every body or collection of bodies given in position has a unique barycenter. This is not an idle existence assumption, but lies at the core of the principal theorems of PE I and II, e.g., his assumption of the barycenter in two parabolic segments in order to find it in another. So one might well suspect that Archimedes can use barycenters to avoid the explicit balance. In contrast, PE introduces a horizon and, furthermore, assumes a principle that it makes no difference whether a barycenter is on a beam or the weight hangs from the same point on the beam. Where is the horizon in the theorems of PE? Similarly, FB introduces a spherical liquid earth for Book 1 of FB, but quietly drops it for the intricate work of Book 2. In other words, Archimedes seems to play with the more and the less physical or concrete, with PE, "cast in a highly abstract form," as Knorr put it. I shall look at how mechanical structures are conceived differently in these works and how this affects their logical structure, especially in PE and QB.