

The form of atoms in antiquity: A case of synaesthesia

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One of the most striking merits of the ancient atomistic school, from Leucippus and Democritus through Epicurus down to Lucretius, is that of having attempted with systematic consistency to reduce quality to quantity. Qualitative traits of sensory experience (particularly of taste and smell, but to a greater or lesser extent of any item of information provided by the senses) were seen as the result of actions performed by atoms on the organism, itself made up of atoms. In this way the qualitative aspects of experience dissolved into 'atoms and void' - the void in which the atoms toss about incessantly. Within this frame of reference, the differences between perceptible qualities were reduced to the geometric forms of atoms and atom aggregates, classified according to structure and position in space.

Of course, nobody had ever seen atoms. Scientific imagination invented them for the purpose of finding geometrical forms suitable for the various sensations. This invention must have had some measure of plausibility. But what type of plausibility?

The hypothesis from which my collaborator Dr. Paola Silli and I started, is that at the basis of the reduction of qualities to quantities, there is some form of synaesthesia. In this case sensations are associated spontaneously with visualizable properties, or impressions of taste and smell are spontaneously traced back to tactile impressions. The ancient authors report that bitter is angular and multi-faceted; that water is made up of rounded atoms, whereas the atoms of a sour taste are endowed with hooks; oil atoms are rounded like those of water, but are larger and slower in their movements.

Our research started from a careful analysis of the descriptive adjectives used for atoms in the texts of atomists of every age - from Leucippus to Lucretius. We started off using recognized translations and then went on to work on the Greek texts themselves with the aid of specialized dictionaries.

Using these adjectives and with the help of dictionaries of antonyms, we built up a certain number of semantic differential scales. The values on these scales were supposed to be the dependent variable on an independent variable represented by qualitative adjectives such as 'sweet', 'bitter', 'sour', etc. and by nouns, such as 'water', 'oil', etc. The subjects (120) were, as usual, expected to evaluate these substances or these sensations on the scales assigned; moreover in addition to the scales made up using adjectives from ancient authors, there was one drawn from the semantic differential tradition.

Dr. Silli undertook the laborious task of carrying out the research and developing all the necessary statistical analyses, a job in which I could not help her, nor even supervise, given my lack of familiarity with such procedures.

It turned out quite clearly that the adjectives used by the ancients for the various types of atoms scored highest on the evaluation scales, consistently with the type of

quality or substance proposed. This consistency was without exception. Well, there was one exception: 'bitter'. In this case the results are unclear and contradictory. But, as chance would have it, even in the classical texts 'bitter' has contradictory qualifications, for Democritus attributes a smooth structure to 'bitter' atoms, whereas according to Lucretius, they are rough and hooked.

Of the various curiosities that emerged from our research, one is worth mentioning. One block of evaluations was carried out using scales constructed from the adjectives used by the Italian translators of the Greek texts. A second block was created using the Greek adjectives themselves with the help of appropriate philological techniques.

The good results achieved when applying the first test became excellent on application of the second, except, of course for 'bitter'. The qualities investigated were 'sweet', 'bitter', 'salty'; substances were 'water', 'wine', 'oil' and 'honey'.

We added a supplementary test to our research. Using a kind of plastic material, Dr. Silli constructed a certain number of sample atoms for 'sweet', 'sour', 'water' and 'honey'. She hung them with black threads from four small turning trees, in such a way as to simulate their motion, as described by the ancients. She then filmed them against a black background, so that they appeared to be suspended in the void.

The subjects' task this time was to assign the correct label ('honey' 'water' 'sour' 'sweet') to these clusters of atoms set in motion in the dark void of the visible space on the screen.