

## The Role of Stereometry in Plato's *Republic*

It is in the *Republic* that stereometry is referred to as one of the mathematical subjects which constitute the prelude for philosophical dialectic. Plato provides stereometry with a number of remarks which need careful investigation. Some of these can be taken as eulogies on stereometry: its marvellous growth (*Rep.*528c3); its inherent charm (*Rep.*528c7); its usefulness for contemplating an unchanging reality (*Rep.*528c5-6). The other remarks, however, relate to stereometry's handicaps: its being dishonoured by cities (*Rep.*528b6); its difficulty as a subject (*Rep.*528b6); the lack of a director for the study of stereometry (*Rep.*528b7); the arrogant investigators of stereometry who do not want to obey the director's advice (*Rep.*528c1); its being held in contempt by the majority of people (*Rep.*528c4); its being inappropriately investigated by researchers who are unable to give an account of its usefulness (*Rep.*528c5-6). It is striking that Plato does not straightforwardly give stereometry the kind of eulogy that he usually bestows upon *mathemata*, (cf. 'the subject is essential, since it apparently forces the soul to rely purely on the intelligible and to aim for truth in itself'). Instead he ascribes to it a character less deserving of eulogy. Moreover, it seems worth noting here that Plato seldom provides such specific details concerning other particular branches of mathematics. Therefore, one of the attempts which will be made in this presentation is to investigate those puzzling points for clues as to a particular attitude Plato might have taken towards stereometry upon his encounter with it.

We also need to pay attention to the fact that Plato deliberately interpolates stereometry between geometry and astronomy, and emphasises both the independence of stereometry from geometry and the correlation of stereometry with astronomy. In the *Republic*, we see clearly that stereometry is restricted to the investigation into 'the third growth', or 'solid', or 'the growth into cubes and whatever shares in depth', while geometry is restricted in the passage to the study of 'the second growth' or 'plane'. Astronomy which follows stereometry is defined as the study of 'revolving solids'. Why does Plato distinguish stereometry from geometry? I shall try to specify what kind of rationale may lie behind the order of the *mathemata* (arithmetic, geometry, stereometry, astronomy and harmonics), and also consider what is implied by the rationale for the order of the *mathemata*.

Plato claims that apprehending the kinship of the *mathemata* is a necessary condition for becoming a philosopher-king (cf. *Rep.*531c9-d4, 537c1-7). I shall illustrate how the kinship of the *mathemata* correlates further with the essence of things and also with the generation of the universe. Stereometry dealing with the three-dimensional mathematical object has a particular significance for constructing the theory of the generation of the universe being three dimensional.

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