CHAPTER 9

Progress in the Sciences: Astronomy and Hipparchus

*Klaus Geus*

Introduction

Geography in modern times is a term which covers several sub-disciplines like ecology, human geography, economic history, volcanology etc., which all concern themselves with “space” or “environment”. In ancient times, the definition of geography was much more limited. Geography aimed at the production of a map of the *oikoumene*, a geographer was basically a cartographer. The famous scientist Ptolemy defined geography in the first sentence of his *Geographical handbook* (*Geog*. 1.1.1) as “imitation through drafting of the entire known part of the earth, including the things which are, generally speaking, connected with it”. In contrast to chorography, geography uses purely “lines and label in order to show the positions of places and general configurations” (*Geog*. 1.1.5). Therefore, according to Ptolemy, a geographer needs a μέθοδος μαθεματική, ability and competence in mathematical sciences, most prominently astronomy, in order to fulfil his task of drafting a map of the *oikoumene*.

Given this close connection between geography and astronomy, it is not by default that nearly all ancient “geographers” (in the limited sense of the term) stood out also as astronomers and mathematicians: Among them Anaximander, Eudoxus, Eratosthenes, Hipparchus, Poseidonius and Ptolemy are the most illustrious.

Apart from certain topics like latitudes, meridians, polar circles etc., ancient geography also took over from astronomy some methods like the determination of the size of the earth or of celestial and terrestrial distances.1 The mentioned geographers Anaximander, Eudoxus, Hipparchus, Poseidonius and Ptolemy even constructed instruments for measuring, observing and calculating like the gnomon, sundials, *skaphe*, astrolabe or the meteoroscope.2

---

1 *E.g.*, Ptolemy (*Geog*. 1.3.1–2) mentions an “old” method of determining the circumference of the earth by observing "points", i.e. stars culminating in the zenith. For a possible connection to Hipparchus see Geus, and Tupikova 2013.

This kind of “astronomical” or “cartographical” geography is to be distinguished from the “descriptive” geography which was pursued by authors like Strabo, Pomponius Mela or Dionysius of Alexandria and which was often called “chorography” in ancient times (e.g., by Ptolemy, as we have just seen).

Between geography and chorography (or between astronomical and descriptive or between geography in the ancient and modern sense) there were not only differences between the requirements like some basic knowledge of mathematics but also in terms of aim, content, method and implementation.

Such differences are very hard to define in detail for the astronomical geography, since the “cartographical” works of Anaximandros, Eudoxus, Eratosthenes, Hipparchus and Poseidonius which would shed some light on this matter, are nearly completely lost. Some doxographical notions and fragments are preserved, but the narrative and historical contexts are normally missing. What’s more, authors like Strabo, Mela or Pliny who have transmitted the bulk of information on astronomical geography, did not have a mathematical background. Hence, they often misunderstood and misrepresented the arguments and results of their “astronomical” counterparts or presented them only as “distillates” from second-hand accounts.

Especially controversial is the case of Hipparchus. His geographical treatise, preserved in nearly 70 fragments and entitled Against the “Geography” of Eratosthenes refers to another geographical work, preserved also solely in

3 Cf. also the titles of the works of Pomponius Mela and Pappus of Alexandria. Recently, the term “chorography” was interpreted differently as either “regional geography” or “picturesque geography”. See, e.g., Marcotte 2007; 2011; Rathmann 2013; Streng 2013, 33; Simon 2014.

4 Strabo’s Geography is an exception only at first sight. Even Strabo could not deny that the geographer needs to have astronomical and mathematical knowledge, though he tried to play it down. Cf. Strabo. 2.1.41; see also 8.1.1 et al.

5 The fact that only Ptolemy’s Geographical handbook has survived as the sole specimen of “mathematical” or “astronomical” geography, would suggest that we need a different categorization of ancient geographical literature. The Berlin TOPOI group has thus proposed the concept of “Common Sense Geography” which classifies spatial literature according to the degree of rationalization the phenomena into “naive”, “canonical” and “(fully) reasoned” geography (see Dan, Geus, and Guckelsberger 2014). For the purpose of this article the traditional distinction suffices.

6 In the authoritative edition of Dicks a fragment transmitted in the “long version” of the Armenian “world-view” (Ašxarhac’oyc’, 1.5) of Mowses of Khoren (according to Hewsen 1992: Ananias of Shirak) and coming from Pappus’ Chorographia oikoumenike is missing. Hipparchus seems to have discussed there the famous lunar eclipse at Arbela 331 BC. See Geus (forthcoming) and below, note 27. Also, we should discard F 41 Dicks (= Ptol., Alm. 1.67.22), since Hipparchus is not commenting on Eratosthenes’ Geographika, but on his treatise About the measuring of the earth here. Cf. Geus 2002, 245–6. Some fragments in Dicks are