# Chapter 28

**(Oechslin: 10.2)**

# Seige's wood orrery fragment in Prague (c1785?)

This chapter is a work in progress and is not yet finalized. See the details in the introduction. It can be read independently from the other chapters, but for the notations, the general introduction should be read first. Newer versions will be put online from time to time.

## 28.1 Introduction

The orrery fragment described here was constructed by Engelbert Seige (1737-1811),[1] probably around 1785. It features Uranus which was discovered in 1781. This fragment is in wood.[2]

Unfortunately, many parts are incomplete, and it is not totally clear how they all fitted together. We can however get a general idea of this machine. The left part seems to have been the going work and provided a base motion. The upper part was to be an orrery showing the motions of the planets Mercury to Uranus. The right part seems to be meant to display a partial orrery, perhaps only for Mercury to Mars, but it is incomplete. Oechslin made a complete drawing, but he only figured out the motions of the upper orrery. We are not doing better, but it is probably possible to find out more about the functions of this fragment.

## 28.2 The base period

We can see that the motion of arbor 6 is directly transferred to that of the Earth. It must therefore have been meant to make a turn in one tropical year. Assuming this to be about 365.2422 days, we can move backwards to arbor 18

[1]For some biographical information on Seige, see the chapter devoted to Seige's metal fragment.

[2]A description of this fragment was given by Oechslin, see [8, p. 34].

which should make one turn in two days. Assuming this to be the case

$$\mathrm{V}_{18}^{0} = -\frac{1}{2} \tag{28.1}$$

we obtain

$$\mathrm{V}_{6}^{0} = \mathrm{V}_{18}^{0} \times \left(-\frac{12}{60}\right) \times \left(-\frac{10}{60}\right) \times \frac{12}{73} = \mathrm{V}_{18}^{0} \times \frac{2}{365} = -\frac{1}{365} \tag{28.2}$$

It seems therefore that arbor 6 was meant to make one turn clockwise (seen from above) in 365 days. This is also the period given by Oechslin. The Earth itself is on tube 9 and its velocity is

$$\mathrm{V}_{9}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{48}{48}\right) = \frac{1}{365} \tag{28.3}$$

$$\mathrm{P}_{9}^{0} = 365 \text{ days} \tag{28.4}$$

## 28.3 The planets of the upper orrery

For the other planets, we then have

$$\mathrm{V}_{7}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{87}{21}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{87}{21}\right) = \frac{29}{2555} \tag{28.5}$$

$$\mathrm{P}_{7}^{0} = \frac{2555}{29} = 88.1034\ldots \text{ days (Mercury)} \tag{28.6}$$

$$\mathrm{V}_{8}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{60}{37}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{60}{37}\right) = \frac{12}{2701} \tag{28.7}$$

$$\mathrm{P}_{8}^{0} = \frac{2701}{12} = 225.0833\ldots \text{ days (Venus)} \tag{28.8}$$

$$\mathrm{V}_{10}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{34}{64}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{34}{64}\right) = \frac{17}{11680} \tag{28.9}$$

$$\mathrm{P}_{10}^{0} = \frac{11680}{17} = 687.0588\ldots \text{ days (Mars)} \tag{28.10}$$

$$\mathrm{V}_{11}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{7}{83}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{7}{83}\right) = \frac{7}{30295} \tag{28.11}$$

$$\mathrm{P}_{11}^{0} = \frac{30295}{7} = 4327.8571\ldots \text{ days (Jupiter)} \tag{28.12}$$

$$\mathrm{V}_{14}^{0} = \mathrm{V}_{6}^{0} \times \left(-\frac{36}{36}\right) \times \left(-\frac{8}{40}\right) \times \left(-\frac{10}{59}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{2}{59}\right) \tag{28.13}$$

$$= \frac{2}{21535} \tag{28.14}$$

$$\mathrm{P}_{14}^{0} = \frac{21535}{2} = 10767.5 \text{ days (Saturn)} \tag{28.15}$$

$$V^0_{17} = V^0_6 \times \left(-\frac{20}{40}\right) \times \left(-\frac{10}{50}\right) \times \left(-\frac{10}{83}\right) = \left(-\frac{1}{365}\right) \times \left(-\frac{1}{83}\right) \quad (28.16)$$

$$= \frac{1}{30295} \quad (28.17)$$

$$P^0_{17} = 30295 \text{ days (about 83 years) (Uranus)} \quad (28.18)$$

Oechslin has put a question mark after the 83-teeth wheel of Uranus, and it isn't clear why, because this wheel does not seem missing. The same periods are given by Oechslin, except for Uranus, where Oechslin used the teeth count 48 instead of 40 in his computations and found therefore the wrong period of 36354 days. I am assuming that the correct value is the one given in Oechslin's drawing.

Given that caveat, the periods obtained by Seige are acceptable, but they are not very accurate.

## 28.4 References

[1] *Album Ossecense, oder Verzeichnis der Mitglieder des Cistercienser-Stiftes Ossegg vom Jahre 1645-1896.* Verlag des Cistercienser-Stiftes Ossegg, 1896.

[2] Friedrich Böttcher. Die Cistercienser und ihre in Böhmen und Sachsen noch bestehenden Stifter. *Zeitschrift für die historische Theologie*, 17:269–335, 1847. [see p. 331 for Seige].

[3] T. E. Faber. Ein Blick nach Böhmen. *Ueberlieferungen zur Geschichte, Literatur und Kunst der Vor- und Mitwelt*, 2:1–24, 1827.

[4] Lucie Hrůšová. *Astronomické funkce a uměleckohistorická analýza planetária P. Engelberta Seige (1791) ve sbírkách Národního technického muzea v Praze.* Master's thesis, Astronomical Institute of Charles University, Prague, 2020. [Astronomical functions and art historical analysis of the planetarium of P. Engelbert Seige (1791) in the collections of the National Technical Museum in Prague].

[5] Radko Kynčl. *Hodiny a hodinky.* Prag: Aventinum, 2001.

[6] Radko Kynčl. *Measuring of Time — Catalogue of the Exhibition.* Prague: National Technical Museum, 2018. [not seen].

[7] Jaroslav Nový. Restaurátorská zpráva k opravě a rekonstrukci Seigeho planetária, 2011. [not seen].

[8] Ludwig Oechslin. *Astronomische Uhren und Welt-Modelle der Priestermechaniker im 18. Jahrhundert.* Neuchâtel: Antoine Simonin, 1996. [2 volumes and portfolio of plates].