# Peter Damerow and Jürgen Renn

# The Equilibrium Controversy

#### **1 Introduction**

- 1.1 On this book
- 1.2 A first glimpse at a new document
- 1.3 Scientific controversies and challenging objects
- 1.4 The physical background of the equilibrium controversy
- 1.5 Editorial remarks

### 2 The Authors and their Critic

- 2.1 The author Jordanus de Nemore
- 2.2 The author Giovanni Battista Benedetti
- 2.3 The critic Guidobaldo del Monte

### 3 The Context

- 3.1 The long-term transmission of mechanical knowledge
- 3.2 The ancient roots of mechanics
- 3.3 Preclassical mechanics
- 3.4 The ancient and medieval origins of the equilibrium controversy
- 3.5 Jordanus' approach to positional heaviness
- 3.6 Tartaglia's approach to positional heaviness
- 3.7 Cardano's approach to positional heaviness
- 3.8 Guidobaldo's approach to positional heaviness
- 3.9 Benedetti's approach to positional heaviness
- 3.10 Benedetti, Guidobaldo, and Galileo
- 3.11 Theoretical excursus: mental models in the transmission of knowledge

### 4 Jordanus' Treatise De ponderibus Edited by Petrus Apianus

- 4.1 The prologue
- 4.2 The postulates
- 4.3 The first theorem on the proportion of descents and ascents of heavy bodies
- 4.4 The second theorem on the equilibrium position of a balance
- 4.5 The third theorem on the irrelevance of the lengths of the pendants
- 4.6 The fourth theorem on the decrease of positional heaviness
- 4.7 The fifth theorem on the descent of the longer arm
- 4.8 The sixth theorem on the bent lever

4.9 The seventh theorem on the freely swinging pendant

4.10 The eighth theorem on the law of the lever

4.11 The ninth theorem on the equal positional heaviness of bodies in different positions

4.12 The four theorems of the De canonio

#### 5 Guidobaldo's Marginal Notes in Jordanus' Book

- 5.1 Second theorem: rejecting Jordanus' stance in the equilibrium controversy
- 5.2 Fourth theorem: the neglect of the cosmological context
- 5.3 Fifth theorem: failure to recognize the authority of Archimedes in mechanics
- 5.4 Seventh theorem: on the erroneous treatment of an equilibrium problem
- 5.5 Eighth theorem: rejecting Jordanus' proof of the law of the lever
- 5.6 Ninth theorem: the problematic attribution to Euclid

#### <u>6 The Treatise De Mechanicis in Benedetti's Book</u>

- 6.1 The oblique position of the beam of a balance
- 6.2 Benedetti's criticism of Tartaglia and Jordanus
- 6.3 Benedetti's criticism of Aristotle

#### 7 Guidobaldo's Marginal Notes in Benedetti's Book

- 7.1 First chapter: the general charge of plagiarism
- 7.2 Second chapter: the neglect of the cosmological context
- 7.3 Third chapter: the pitfalls of determining positional heaviness
- 7.4 Fourth chapter: on the problem of the material beam
- 7.5 Fifth chapter: on the problem of the material lever
- 7.6 Seventh chapter: on the core question of the equilibrium controversy
- 7.7 Eighth chapter: on plagiarizing the criticism of Jordanus and Tartaglia
- 7.8 Tenth chapter: on Aristotle and the composition of motions
- 7.9 Twelfth chapter: saving Aristotle in the equilibrium controversy
- 7.10 Fourteenth chapter: Aristotle's wheel and the problem of infinite limits
- 7.11 Sixteenth chapter: on Aristotle's empty balance
- 7.12 Twentieth chapter: on reducing the wedge to the lever
- 7.13 Twenty-first chapter: the plagiarized pulley
- 7.14 Letter to Pizzamano: simplifying the solution of a geometrical problem
- 7.15 Letter to Mercato: rejecting an attempt to improve on Archimedes

## 8 Conclusion

### <u>9 Timeline</u>

#### 10 Online sources

<u>10.1 The first editions of Benedetti's</u> *Diversarum speculationum mathematicarum et physicarum liber* <u>and of Guidobaldo del Monte's</u> *Mechanicorum liber* 

10.2 Early modern printed treatises on mechanics

10.3 Other printed Renaissance sources

10.4 Renaissance manuscript sources

### <u>11 Appendix: Analyses of iron gall inks by means of X-ray fluorescence</u> <u>analysis</u> *Oliver Hahn* <u>and</u> *Timo Wolff*

11.1 Introduction

11.2 Iron gall ink

11.3 The archaeometric fingerprint method

11.4 Experimental set-up

11.5 Results

12 Bibliography