

Table of Contents

Introduction	p.	3
1. Problems of chronology.....	»	7
1.1 1599-1602: gravitational mass, inertial mass, collisions	»	7
1.2 Difficulty in dating the discoveries.....	»	15
2. Around 1590: The dynamics of the <i>De motu</i>	»	19
2.1 The pendulum, an exact measurer of time	»	20
2.2 Natural motion (uniform velocity)	»	28
2.3 Early experiments in water	»	35
2.4 What did Galileo see while he studied motion in water?	»	51
2.5 Bodies that stay atop water, or move in it	»	59
2.6 The experiment with the « inverted tumbler»	»	75
2.7 Measuring adhesion with water	»	78
2.8 Violent motion (non uniform velocity)	»	86
2.9 The fundamental theorem of the inclined plane	»	92
2.10 Some problems regarding motion on the inclined plane	»	98
2.11 The first ever formulation of the force of inertia	»	103
2.12 The first ever formulation of the principle of action and reaction ...	»	107
3. <i>Le Mecaniche</i> (1592-1600)	»	109
4. 1592-1610: «The best eighteen years of my life»	»	119
5. 1602: The theorem of chords and the isochronicity of pendulums. The letter to Guidobaldo del Monte	»	127
6. Before 1604: The law for falling bodies. Experimental results	»	135
7. Folio 107v: The experimental confirmation of the law of motion	»	141
7.1 Analysis of the document	»	145
7.2 Reconstruction of the experiment of Folio 107v	»	146
8. Why «100 <i>braccia</i> in 5 seconds»?	»	155

9. Before 1607: Parabolic trajectories	p.	163
10. Before 1610: The velocity acquired in descent is proportional to the square of the height	»	169
11. Before 1610: Launching from the inclined plane without a straightener	»	175
12. The time taken to descend along inclined planes of equal height and the theorem of final velocity	»	181
13. Another comparison between two motions: free fall and descent along a plane. Difficulties due to the rolling of the sphere	»	189
14. Before 1606: experiments on a ship in uniform motion. Long before 1623: Galileo's principle of relativity	»	195
15. The laws of motion: Galileo announces them in the <i>Dialogo</i> (1632) and presents them in the <i>Discorsi</i> (1638)	»	201
16. Before 1610: The constant-flow chronograph	»	211
17. Galileo overcame the difficulty due to rolling by carrying out experiments with a new machine	»	215
18. The conception of Galilei's machine: The "vertical plane"	»	227
19. A description of Galilei's machine and of the experiments that can be carried out on it	»	231
19.1 First experiment: verification of the law of inertia	»	233
19.2 Second experiment: measurement of $g \approx 9.4 \text{ ms}^{-2}$	»	236
19.3 Third experiment: conservation of momentum at the instant of wrenching (equal masses)	»	240
19.4 Fourth experiment: conservation of momentum at the instant of wrenching (different masses)	»	244
20. Marin Mersenne: A man who «wants to turn everything topsy-turvy» ..	»	247
20.1 The laws of motion (1628-1633)	»	247
20.2 Experiments on motion and on the pendulum (1634-1644)	»	252
20.3 The experiments with the inclined plane and with the sieve (1635-1636) ..	»	256
20.4 Experiments on vertical fall (1634-1644)	»	260
20.5 1710: Hauksbee's and Newton's experiment in St. Paul's church in London	»	264
20.6 Final comment	»	268
21. Conclusion	»	273

Appendix A: Solution to Newton’s equation for motion with resistance
prportional to velocity p. 277

Appendix B: The theory of violent motion according to Galileo » 279

Appendix C: A body is faster than another when it travels the same space
in less time » 285

Appendix D: Study of the effect of rolling along a guide channel » 289

Acknowledgements and thanks » 291

Grants for reproductions » 292