

Three Post-Copernican Generations

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| Clavius | 1537-1612 | |
| Viète | 1540-1603 | (math) |
| Gilbert | 1544-1603 | |
| Tycho | 1546-1601 | |
| Stevin | 1548-1620 | |
| Mästlin | 1550-1631 | |
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| Bacon | 1561-1626 | (phil) |
| van Lansberge | 1561-1632 | |
| Longomontanus | 1562-1647 | |
| Galileo | 1564-1642 | |
| Kepler | 1571-1630 | |
| Mayr | 1573-1624 | |
| Scheiner | 1573-1650 | |
| Harvey | 1578-1657 | (bio) |
| Peiresc | 1580-1637 | |
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| Fontana | 1585-1656 | |
| Hobbes | 1588-1679 | (phil) |
| Beeckman | 1588-1637 | |
| Mersenne | 1588-1648 | |
| Snel | 1591-1626 | |
| Gassendi | 1592-1655 | |
| Desargues | 1593-1662 | (math) |
| Descartes | 1596-1650 | |
| Riccioli | 1598-1671 | |
| Roberval | 1602-1675 | |
| Hortensius | 1605-1639 | |
| Boulliau | 1605-1694 | |
| Torricelli | 1608-1647 | |
| Fermat | 1608-1665 | (math) |

The Galilean Mathematical Theory of Local Motion

Motion on and above a flat surface under the effects of uniform gravity acting on parallel lines perpendicular to that surface

- *All other contributions to the motion compound with motion produced by gravity*
- *The component of motion governed by gravity always involves equal increments (or decrements) of speed in equal increments of time*
- *Gravity affects all bodies in exactly the same way, regardless of their weight, shape, etc.*
- *Speed acquired (or lost) through gravity depends only on the height through which a body (descends) or (ascends), and not on the path described in the descent (or ascent)*

Galileo's *Two New Sciences* offers only a fragment of such a theory, for it fails to provide mathematical derivations for

- *Motions initiated by projection at an oblique angle to the flat surface (subsequently provided by Torricelli)*
- *Pendulum motions – that is, motions constrained by a hanging thread – including a solution for the center of oscillation problem identified by Mersenne*
- *Curvilinear motions in general beyond parabolic projection, including for example conical pendulum motions*
- *Loss of motion caused by resistance imposed by any medium through which the motion takes place*

Beyond Mere Conjecture? Limitations of the Empirical Grounds

Kepler's Mathematical Theory of Celestial Orbital Motion

Agreement to within (more or less) estimated observational accuracy for all the planets, though not for the moon, and the values of the elements (i.e. parameters) for some of the orbits appeared to be changing over time

***Limitation:* Not only the question of the motion of the earth around the sun, but also questions about the status – e.g., exact, “essentially exact,” or only approximate – of the claims made by the theory could not be addressed except through appeals to conjectures about the physics governing the motions**

Galileo's Mathematical Theory of Local Motion

Not disconfirmed by the (quasi-) quantitative results of experiments especially designed to test some striking consequences of the theory, with only limited effort made to determine precise values for any general parameters of the theory

***Limitation:* It remained unclear how to address questions about the relationship between the motions covered by the theory – with its various “abstractions” away from actual circumstances – and any motions that occur in the world, whether near the surface of the earth or otherwise**