

1. Newton's achievements:

- ① Principia ^(一、二、三) 著作 ② Mathematics: Differential & Integral calculus & Binomial theorem & Newton-Raphson method ^{近似求解}
③ Optics (光学): Color analysis: color 是反射而非自发产生的 / white light 多种光混合而成 / Reflecting telescope. 反射型望远镜
④ Motion: Celestial mechanics & Gravitation.

2. 关于 celestial motion:

Galileo: 未把力与天体运动联系

Copernicus: No significant insight.

Kepler: 提出太阳/卫星间 magnetic interaction. 三定律

Hooke: 对 Newtonian dynamics & gravitation's laws 有贡献

△ 有趣的证明天体运动规律的故事:

Hooke/Halley/Wren 问何神力支撑天体椭圆转?

↓ 理论分析 无 mathematical proof.

↓ 牛顿认为必须 prove mathematically. → 未 grant Hooke credits 的原因.

↓ Halley 提出 $F \propto \frac{1}{r^2}$ 找牛顿要 perfect demonstration.

↓ Newton 2 ways to prove

3. Thought Experiment (prove $\frac{F_1}{a_1} = \frac{F_2}{a_2} = \dots = m_i$)

如何比较 mass? Newton: Move them up & down \Rightarrow 看 which moves easily

Newton's cannonball / Projectile motion

4. 对于物理/数学态度

→ 未提出 law of inertia 的原因: "too much a physicist"

Galileo: 注重 sensory experience 应用. (real world)

Newton: 划清数理界线 have a clear separation between physics & mathematics. \rightarrow 但仍为 philosophy.

△ physicist 注重 experience / mathematician 注重理想化.

* Modern science = Mathematization + Experimentation

* 对天体运动: 牛顿认为是惯性运动 \rightarrow 证明 God 存在. (inertial)

对圆周运动 (circular motion): Galileo 认为是惯性 / Newton 认为是加速的. (向心力). ^{pure} ^{accelerated}

Galileo "Two New Sciences" 只包括于自然能证明的数学条件 / Newton 的 "principia" 包含数学原理和 "natural philosophy".
(mathematical conditions exemplified in nature) (理想化的)

My note:

Science is a collective and cumulative activity and

we may find in it the measure of the influence of an individual genius on the future of a cooperative scientific effort.

