Physics-0

Introduction

Course Information

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- **Instructor:** 王晴睿

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Email: wangqr@mail.tsinghua.edu.cn

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Email: wangqr@mail.tsinghua.edu.cn
Office: 双清综合楼A座B522

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Email: wangqr@mail.tsinghua.edu.cn
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- **Teaching assistant:**

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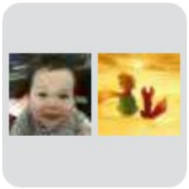
宝音夫，byf23@mails.tsinghua.edu.cn
陈默，will send alerts to students who have missed homework submissions or have been absent from classes



群聊：物理0 2025春

该二维码7天内(2月24日前)有效，重新进入将更新

Goal

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- Building a **global picture** about physics

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- Building a **global picture** about physics
- Getting more familiar with the way of **thinking** in physics

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- Q: What level of physics knowledge do you think you have?

Topics

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- Newtonian dynamics

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- Newtonian dynamics
- Electromagnetism and electrodynamics

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- Newtonian dynamics
- Electromagnetism and electrodynamics
- A visit to Tsinghua University Science Museum (?)

References

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1. Lecture notes on 网络学堂

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The latter two are too long to follow…

Gradings

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- Only homework and final exam
- The grading scheme will be decided by Qiuzhen admission office

- 作业：每周二课后在网络学堂布置作业，下周二24:00前提交到网络学堂（需拍照合并为一个pdf文件上传），助教网上批阅。

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- 高中：知道焦耳定律，所以会上课玩手机取暖，并且能完美躲开老师扔过来的粉笔头抛物线轨迹

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- “Physical science is that department of knowledge which relates to the order of nature, or, in other words, to the regular succession of events.” (Maxwell 1878)

Length scale of physics

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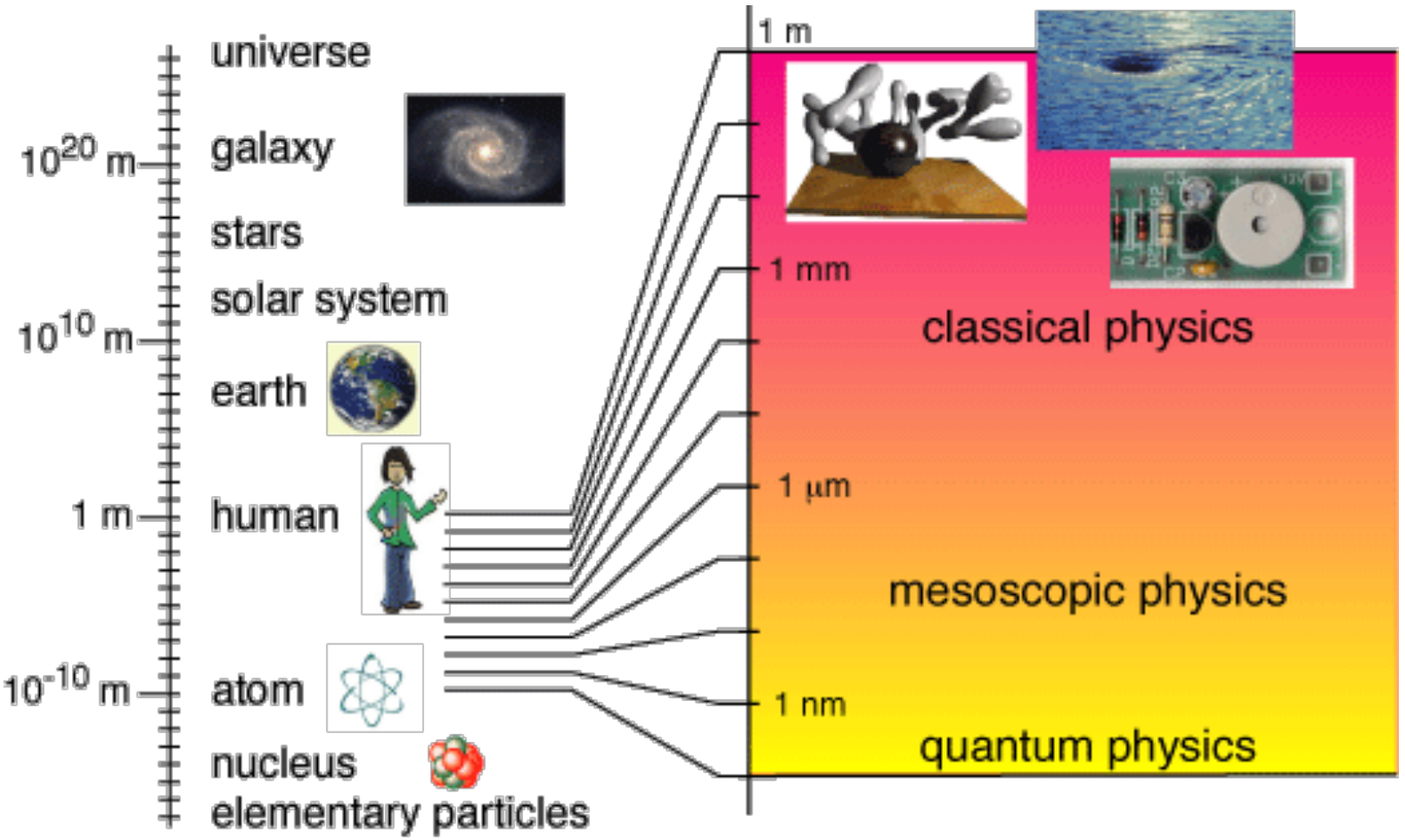

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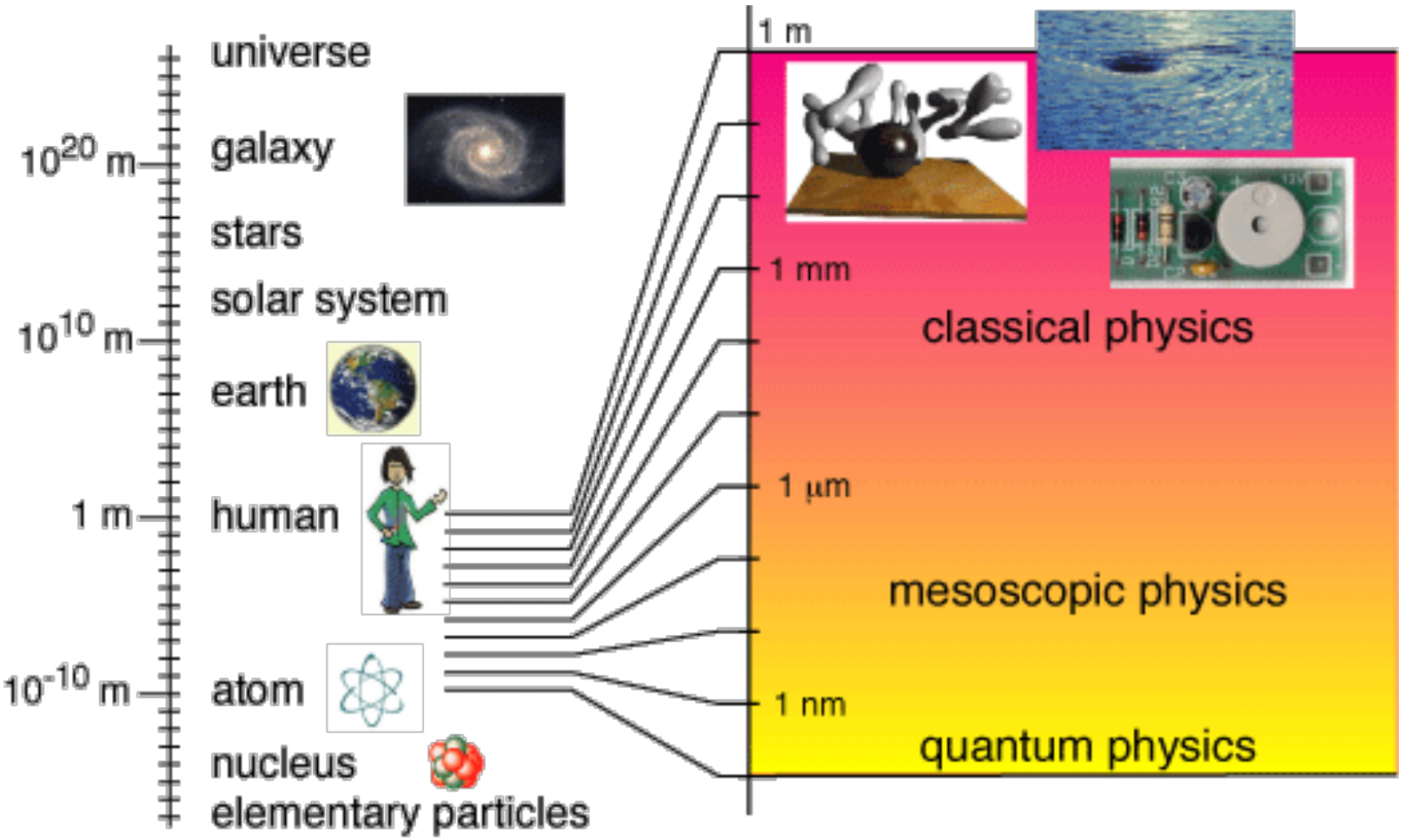

Planck length ~ 10^-35 m

Revolution = unification in physics

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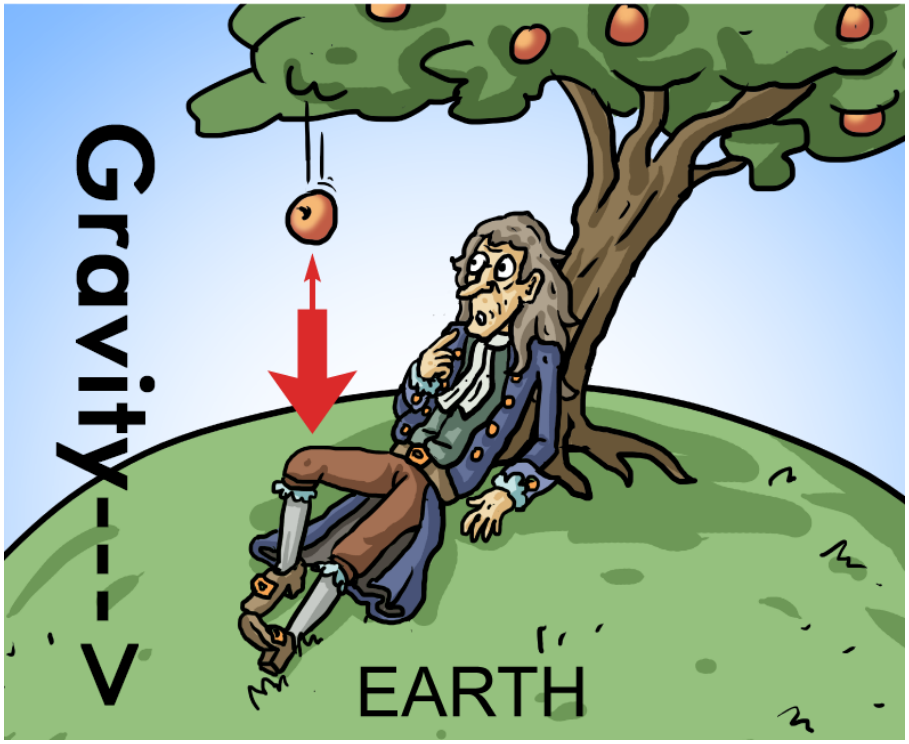

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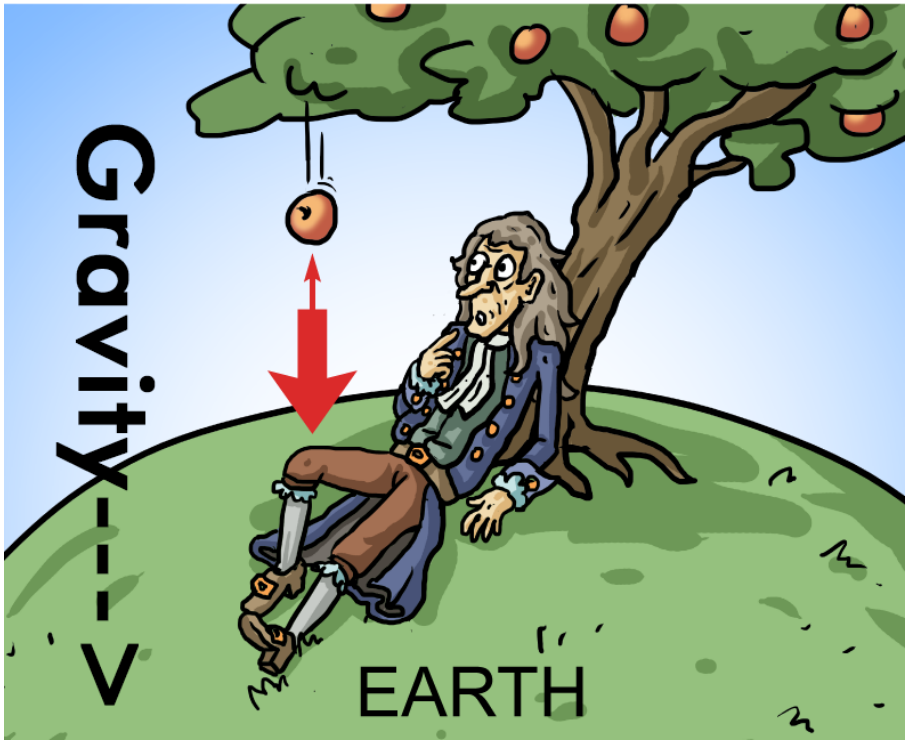

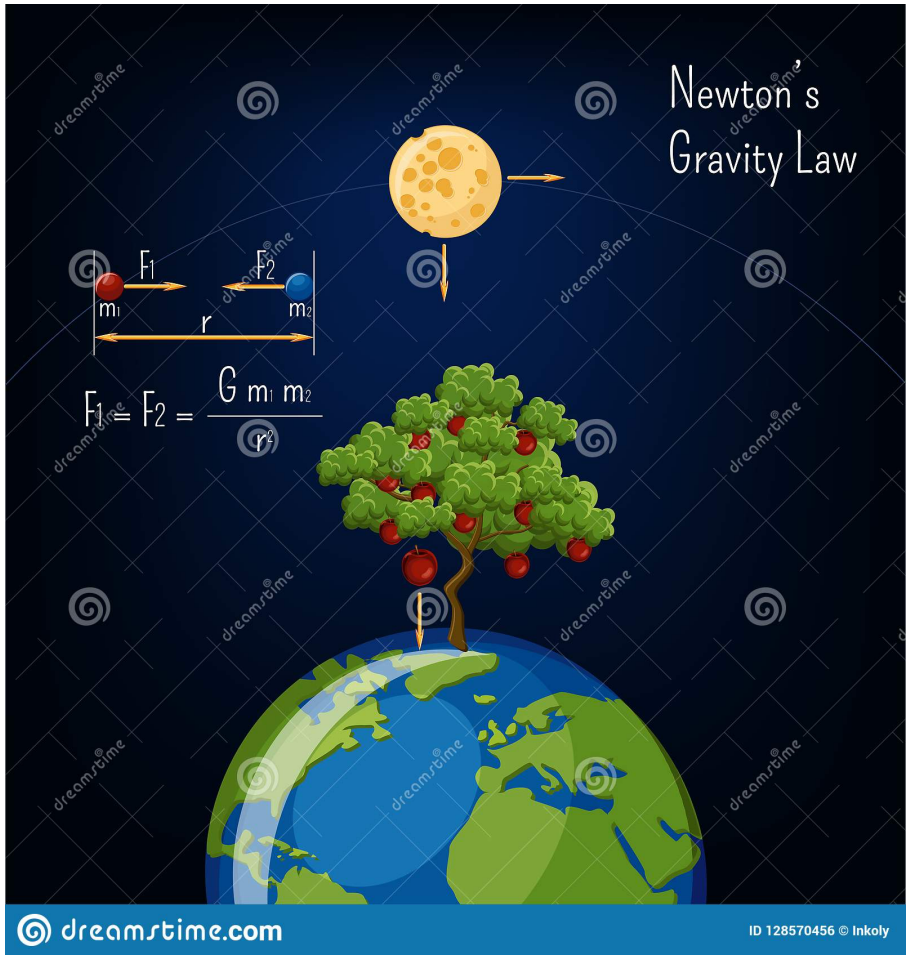

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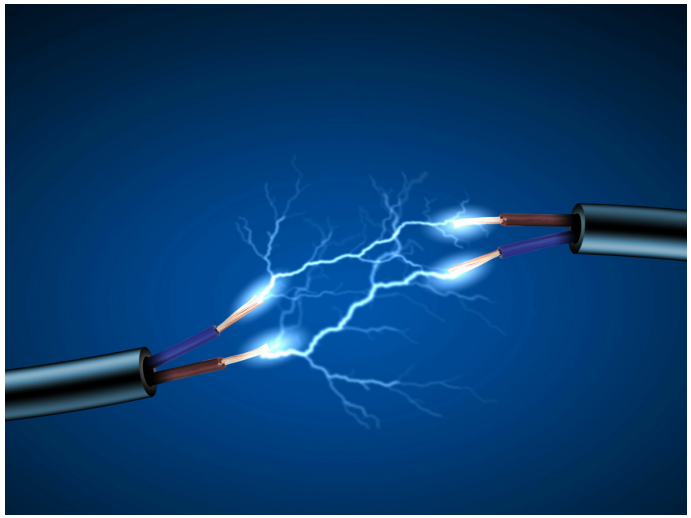

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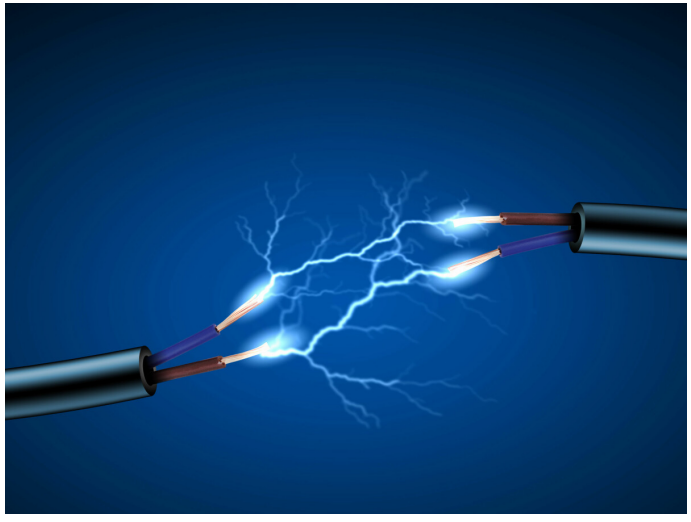

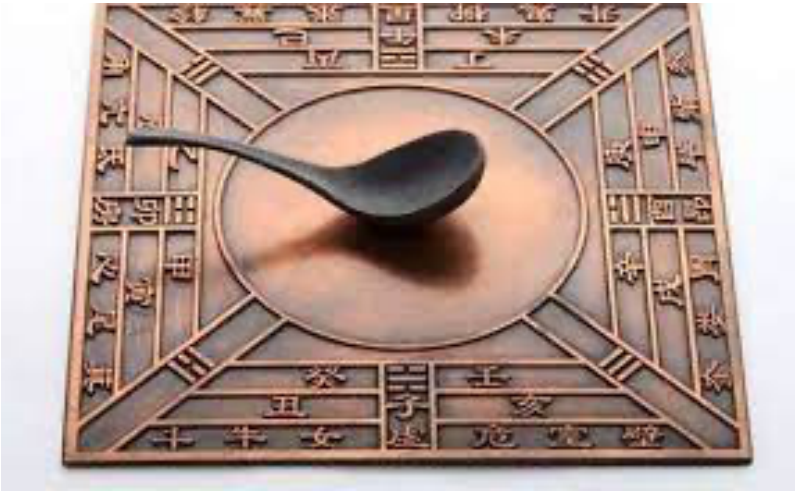

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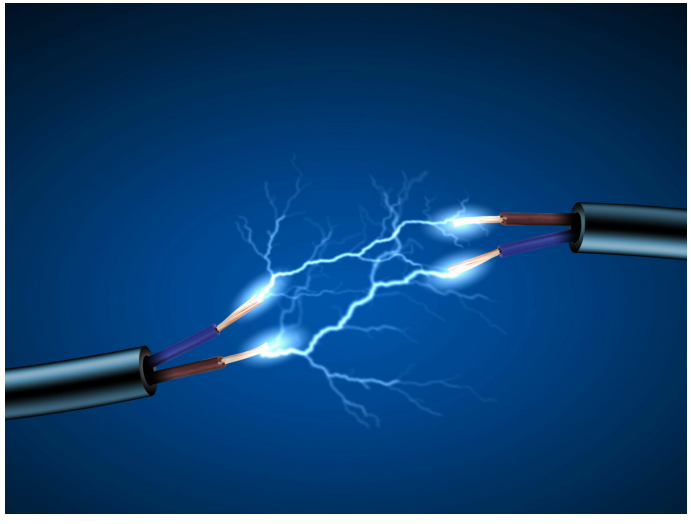

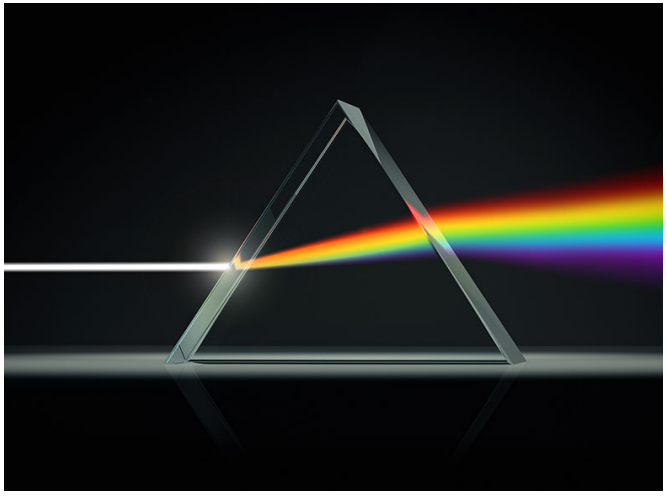

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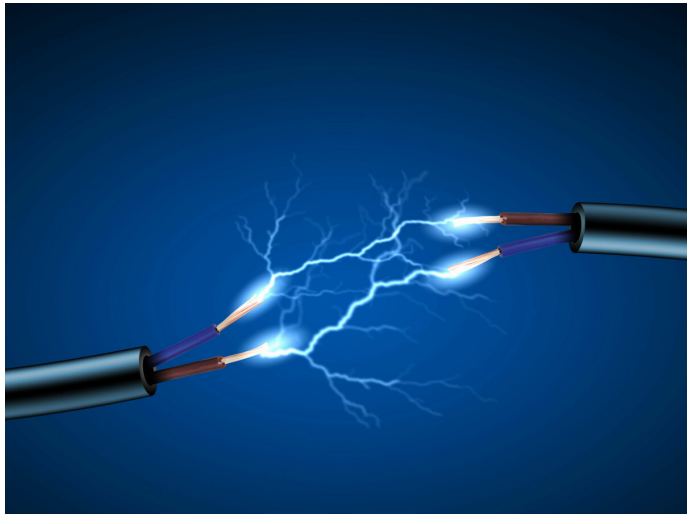

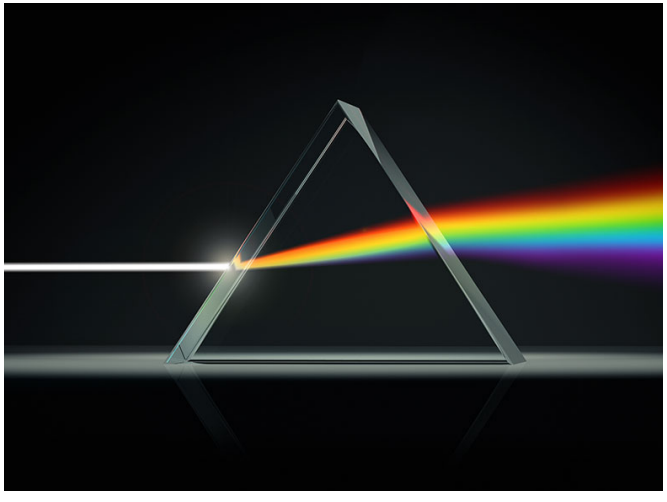

Revolution = unification in physics

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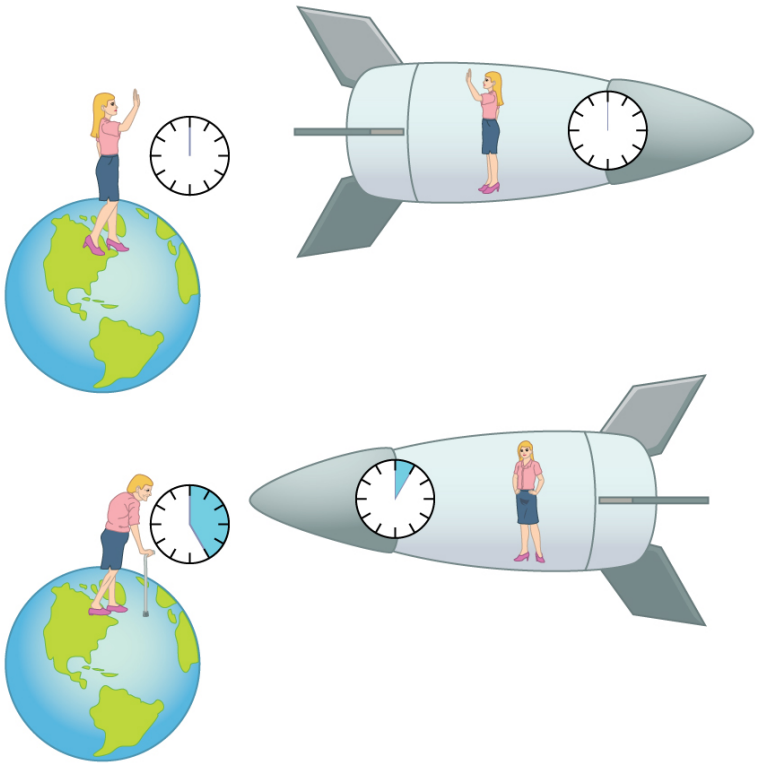

spacetime

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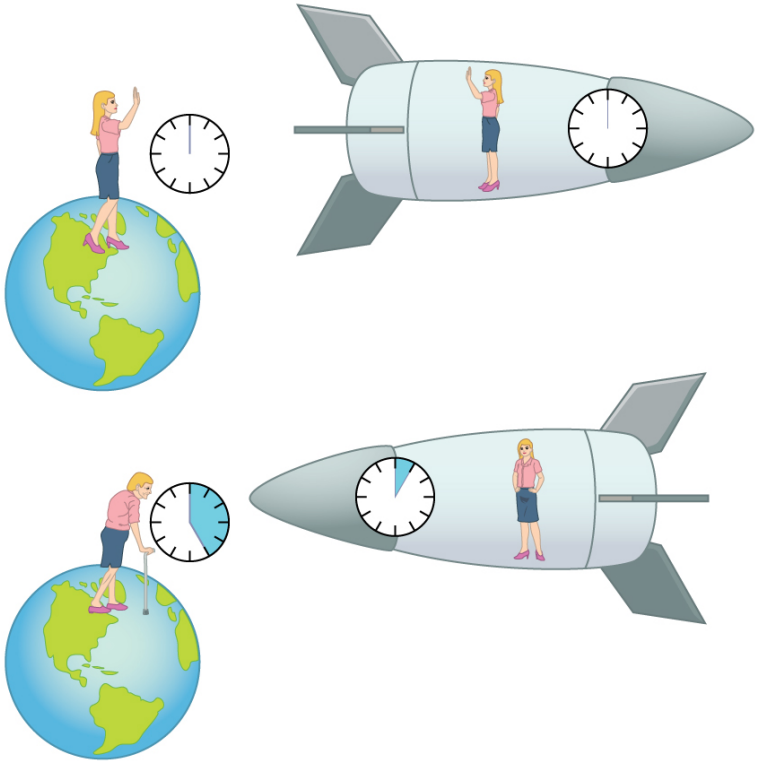

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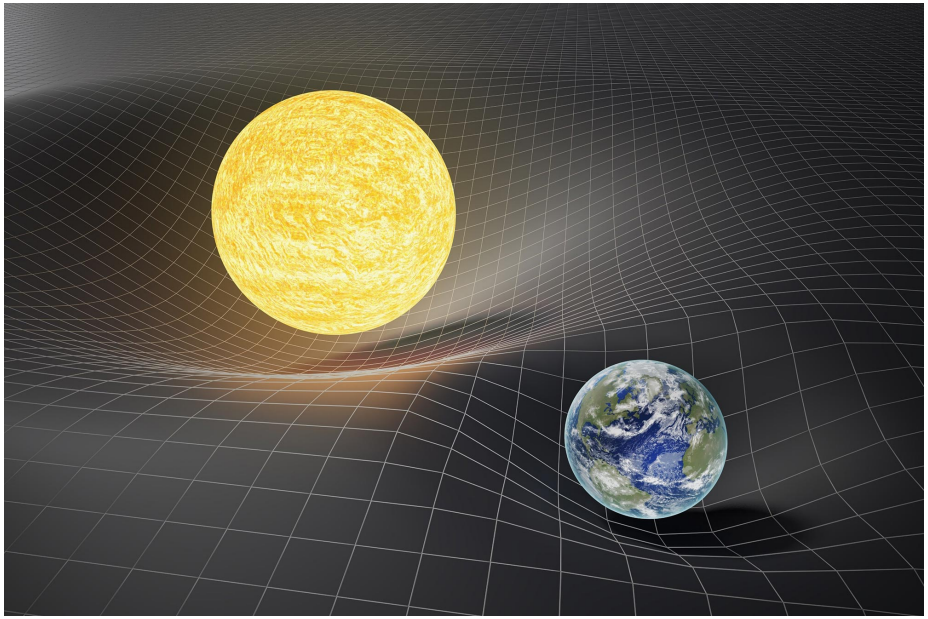

gravity = geometry

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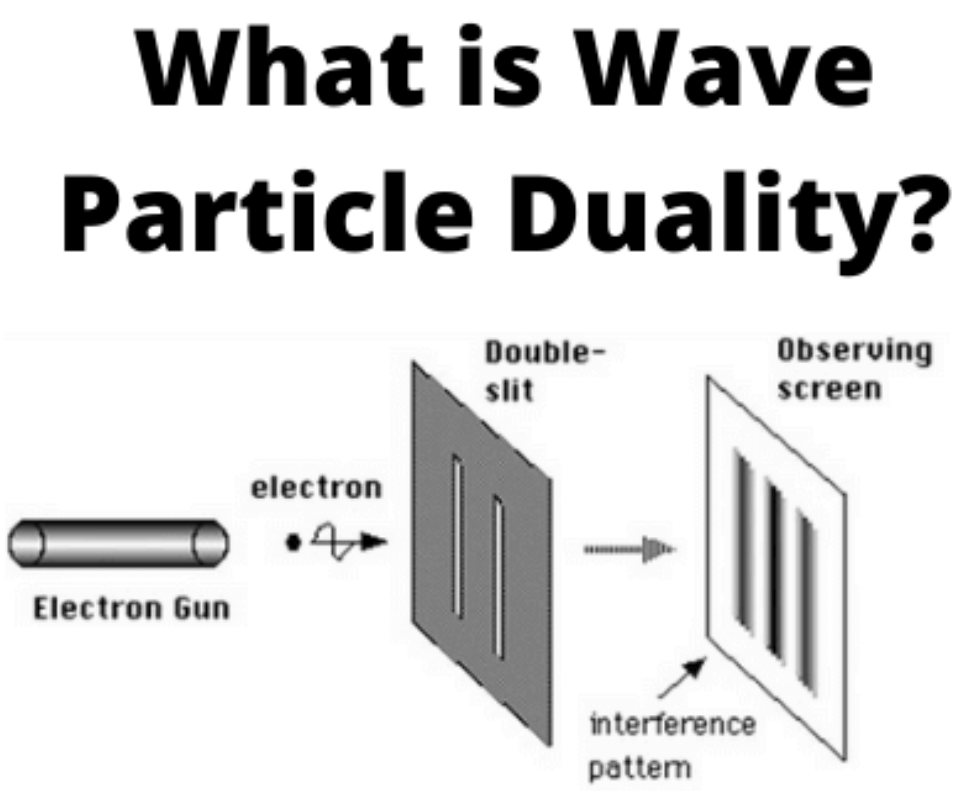

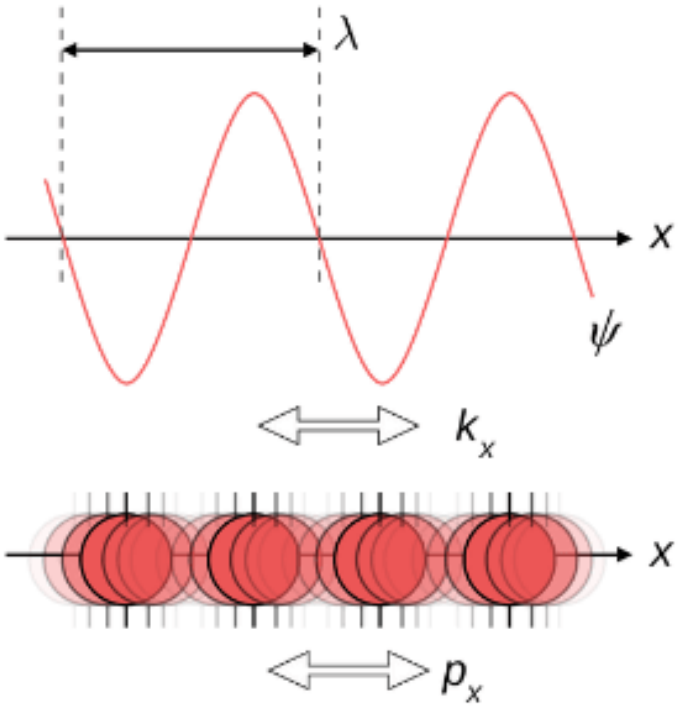

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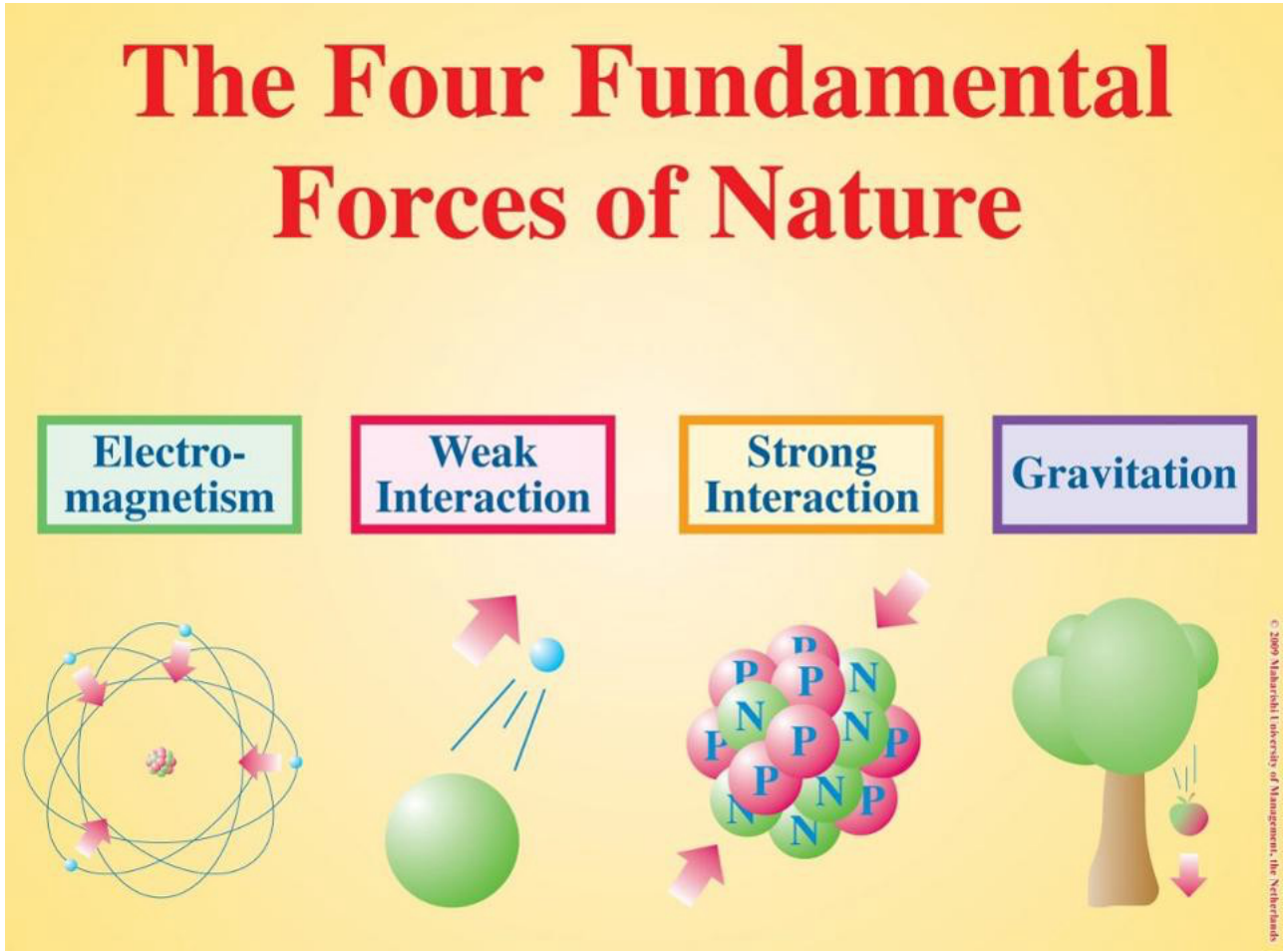

Relation to Mathematics

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Three examples:

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- Newtonian mechanics and calculus

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- Einstein's general relativity and Riemannian geometry

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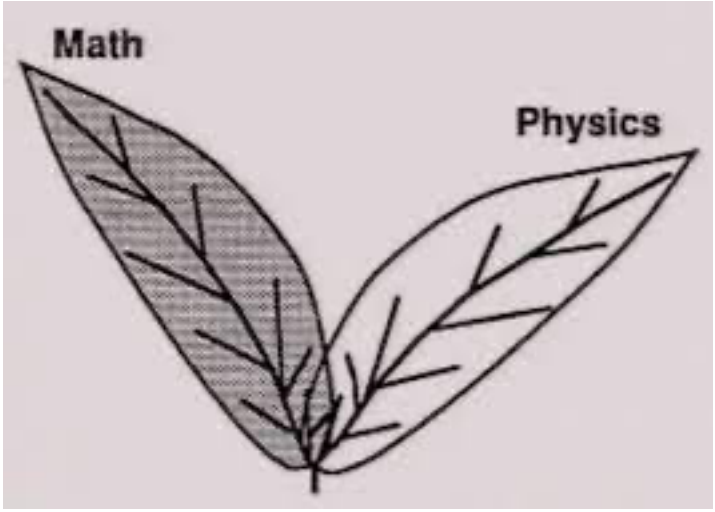

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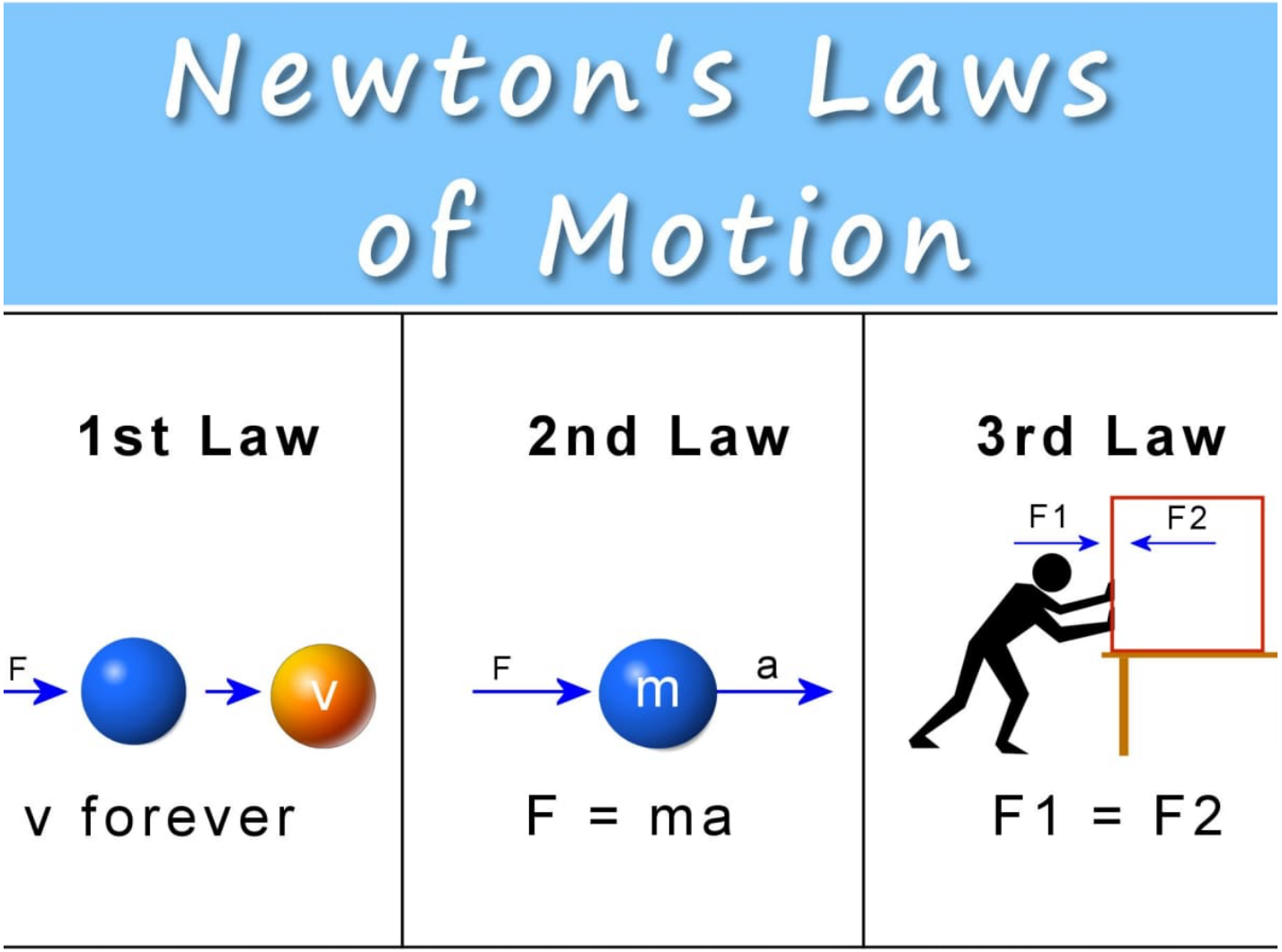

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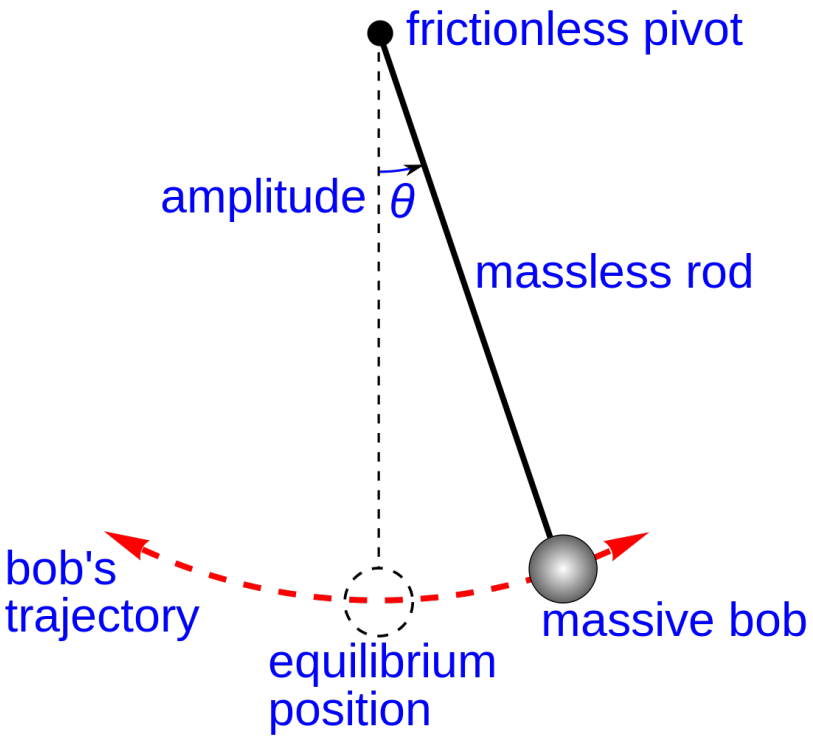

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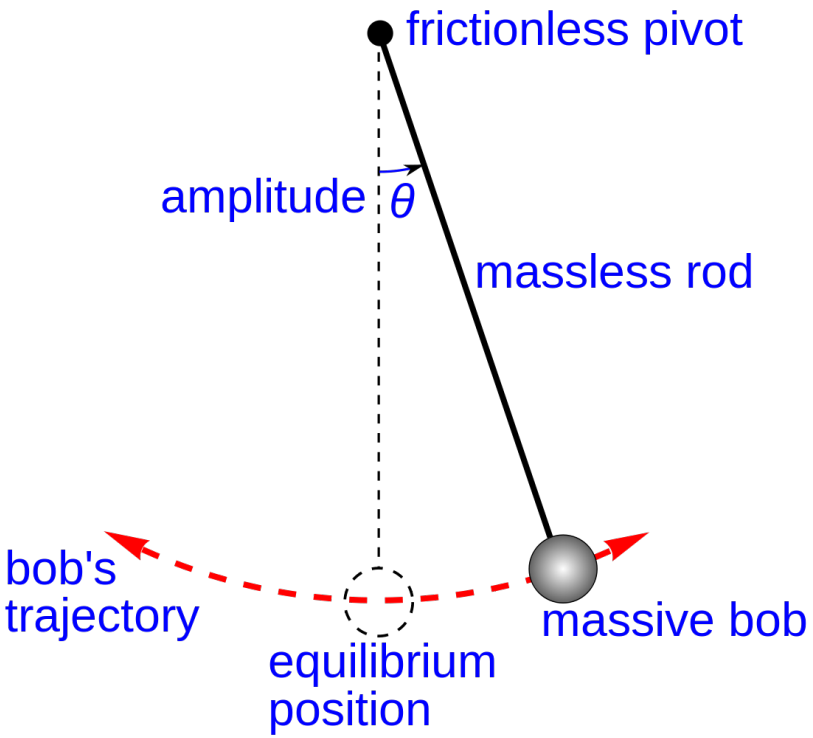

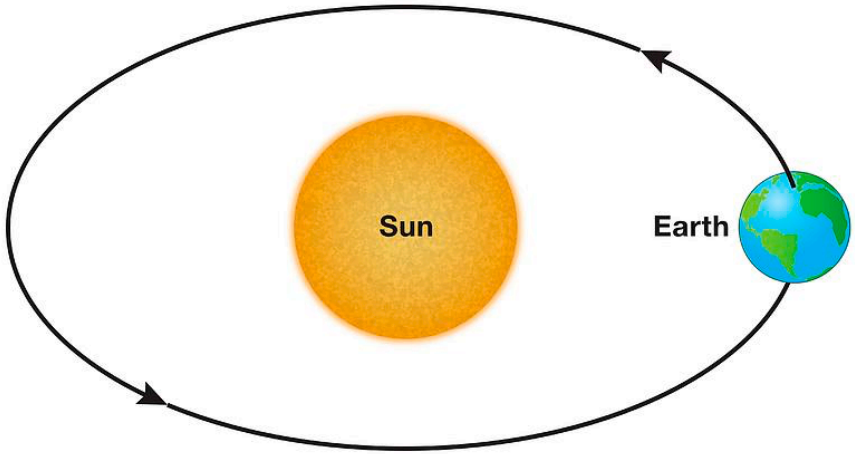

2. Electromagnetism and electrodynamics

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$\nabla \cdot \mathbf{D} = \rho$	(1)	Gauss' Law
$\nabla \cdot \mathbf{B} = 0$	(2)	Gauss' Law for magnetism
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$\nabla \times \mathbf{H} = \frac{\partial \mathbf{D}}{\partial t} + \mathbf{J}$	(4)	Ampère-Maxwell Law

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$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$	(3)	Faraday's Law
$\nabla \times \mathbf{H} = \frac{\partial \mathbf{D}}{\partial t} + \mathbf{J}$	(4)	Ampère-Maxwell Law

$$dF = 0$$
$$d * F = J$$

2. Electromagnetism and electrodynamics

$\nabla \cdot \mathbf{D} = \rho$	(1)	Gauss' Law
$\nabla \cdot \mathbf{B} = 0$	(2)	Gauss' Law for magnetism
$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$	(3)	Faraday's Law
$\nabla \times \mathbf{H} = \frac{\partial \mathbf{D}}{\partial t} + \mathbf{J}$	(4)	Ampère-Maxwell Law

$$dF = 0$$
$$d * F = J$$