

Invisible Forces

Redux

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Etymology:

force (n.)

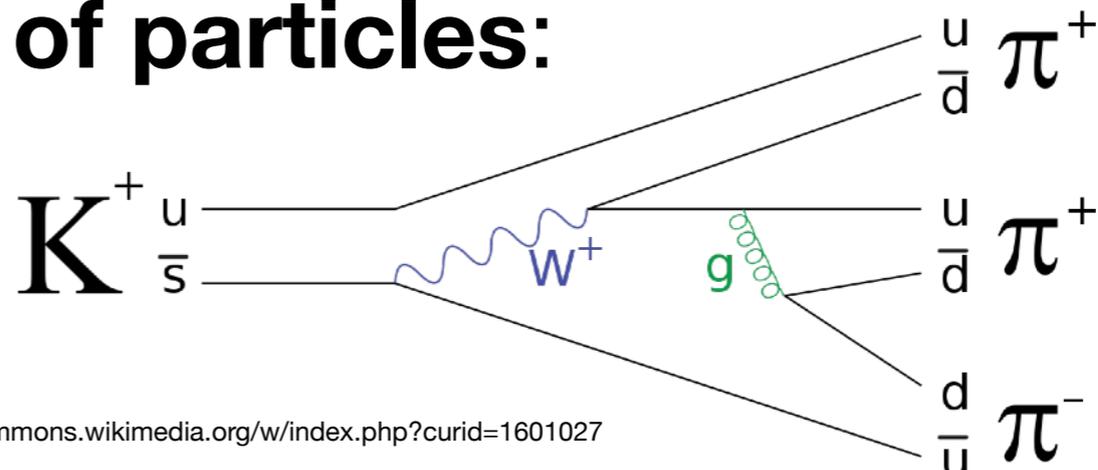
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Meanings “power to convince the mind” and “power exerted against will or consent” are from mid-14c. Meaning “body of armed men, a military organization” first recorded late 14c. (also in Old French). **Physics sense is from 1660s; *force field* attested by 1920.**

Related: *Forces*.

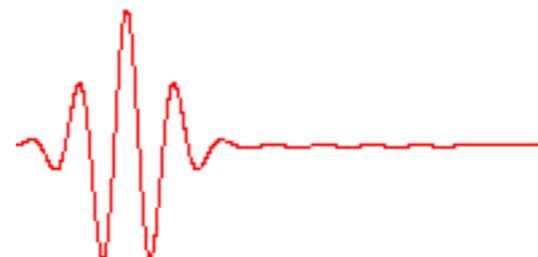
Standard Model “forces”

* *Mediated by exchange of particles:*

- Feynman Diagrams like 

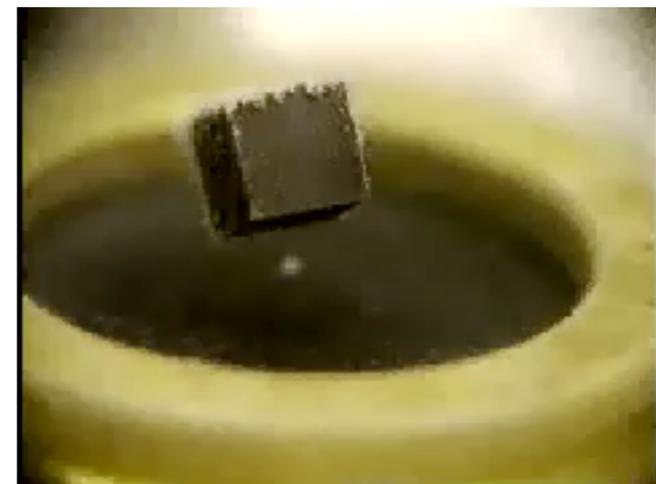
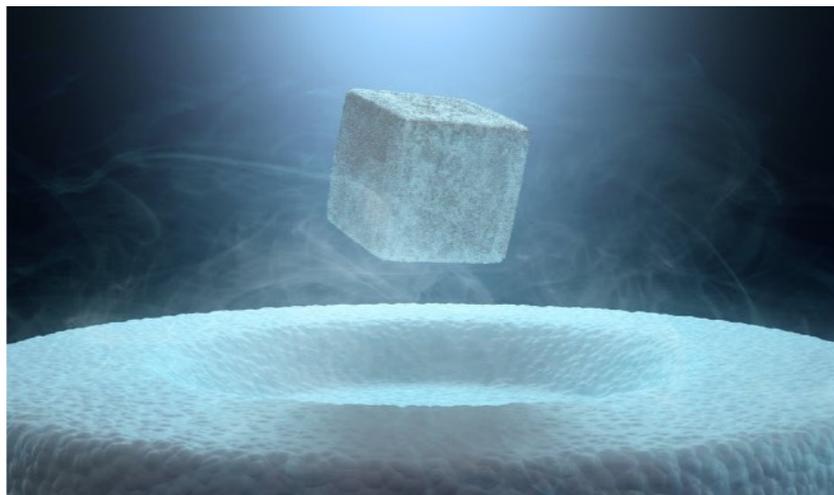
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- Too *Small* to see! (diameter \ll wavelength of light)
- **Blurry** Quantum Mechanical “Wavicles”!



Familiar(?) Examples that still seem Magical

- After use in dry air, a *hairbrush* will pick up bits of *lint*.
- A *magnet* underneath a table can move an iron object around on top of the table.
- Magnetic levitation of (or *by*) a *superconductor*.



Some “Visible” Forces

- Pushing against a person with your hand.
 - The ground pushing up on your feet.
 - A baseball being hit by a bat.
 - A cue hitting a billiard ball.
 - A boat floated by the displaced water.
- * Each of these is governed by “*invisible*” ***electrostatic*** “*action at a distance*” on (sub-) *microscopic* scales.

What *Makes* Forces “*Invisible*”?

1. Too *small* to see. (Subatomic Scales)
2. Too *blurry* to see. (Quantum Mechanics)
3. Too *fast* to see. (“Want to see it *again*?”)
4. Too *weird* to see. (The Uncanny)

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Invisible Forces *in other domains*

- *“Power to convince the mind”*

Art, Music, Poetry, Literature...

- *“Power exerted against will or consent”*

Abuses of Social Media, Bad Laws...

- *“Body of armed men, a military organization”*

Proud Boys, Oathkeepers, others still unknown...