

# QM1 big picture

## Relationship between Reality and Modelling

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## What you learnt

- Postulates
- Bras, Kets, Operators
- Wave Mechanics

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└─What you learnt

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- Postulates
- Bras, Kets, Operators
- Wave Mechanics

What you learnt abstractly:

- Things you have to accept:
- Let's play with it

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└─What you learnt abstractly:

- What you learnt abstractly:
- Things you have to accept:
  - Let's play with it

- Definitions and axioms
- Theorems and proofs

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└ Math

1. which are basically what you play with once you have the definitions and axioms. So the way we are taught is different from classical physics

- Definitions and axioms
- Theorems and proofs

- Phenomena
- (Relatively simple) Math

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└ Classical Physics

1. you always start off with some reasonable phenomena

Classical Physics

- Phenomena
- (Relatively simple) Math

- EM: an electric charge  $\rightarrow$  Vec Calc
- CM: force, acceleration  $\rightarrow$  calculus
- Optics: Rays  $\rightarrow$  simple matrices

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└ Classical Physics: Examples

Classical Physics: Examples

- EM: an electric charge  $\rightarrow$  Vec Calc
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## Philosophical differences

- Fundamental unknowability: realism vs scientific antirealism

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### └ Philosophical differences

1. Why is QM so different then?
2. All these contributes to a very unintuitive theory

Philosophical differences

- Fundamental unknowability: realism vs scientific antirealism

## Philosophical differences

- Fundamental unknowability: realism vs scientific antirealism
- Example: localised CoM vs wavefunction

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- Example: Dynamical Quantities vs Operators

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- What questions CAN'T we ask?

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└ Operational differences

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# What is Quantum Mechanics?

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- Why should we expect that any theory is intuitive?

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What is Quantum Mechanics?

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- Why should we expect that any theory is intuitive?

- Fundamental Uncertainty
- Entanglement
- Superposition of states

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└ Quantum Phenomena

1. It necessitates a certain structure to explain all of these

- Fundamental Uncertainty
- Entanglement
- Superposition of states



# The Problem



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└ The Problem

The Problem



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STAY STRONG KIDS

Thank you

Q&A

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└ Thank you

Thank you

Q&A

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