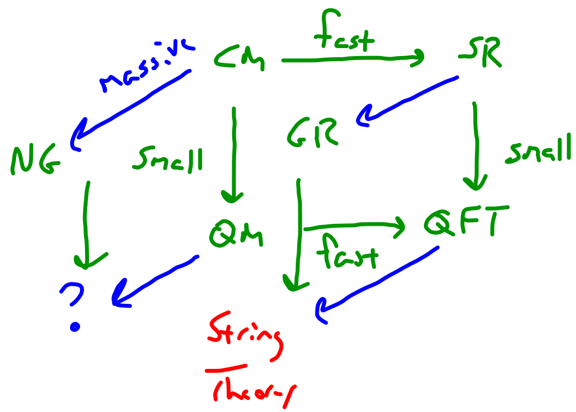
Sections 1.1, 1.2

Perspective

Theories	Frameworks
M-theory	CM, QM, QFT (misnomer)
E+M	
Newton's Gravity	

Domain	Encounter	Examples
CM	CP, CF	Newt. Gravity, E+M
QM	QP, CF	Bohr Model, Hydrogen
QFT	{QP, QF} ∈ QF	SM



1.1

$$m\frac{d^2x}{dt^2} = -\frac{\partial V}{\partial x}$$

position function

Classical Program: E.O.M. (diff. eqns.) + b.c.'s $\overset{\text{solve}}{\Rightarrow} \vec{x}(t)$

Maxwell's eqns. $\overset{\text{solve}}{\Rightarrow} \phi(x,t)$ field config.

Quantum Program: E.O.M. (diff. eqns.) + b.c.'s $\overset{\text{solve}}{\Longrightarrow} \psi(x,t)$ wave function

$$i\hbar\frac{\partial\psi}{\partial t} = -\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2} + V\psi$$

CM: $\vec{x}(t)$ Particle location at time t ⇒ velocity, momentum, energy

CFT: $\phi(x,t)$ Field conf. at x at time t ⇒ velocity, momentum, energy

QM: $\psi(x,t)$ Probability Amplitude ⇒ expectation values of observables (momentum, energy, etc.)

$\vec{x}(t)$ deterministic

$\psi(x,t)$ probabilistic or indeterministic

Formulations:
- Bohr
- Wave
- Matrix
- Abstract
- Path Integral

} State of a system $\psi(x,t)$

$$\psi_{state}(x,t) = a_1\psi_1 + a_2\psi_2 + a_3\psi_3 + \cdots$$

basis states (ψ_1, ψ_2)

exp. coefficients (a_1, a_2)