

# PHYSICS



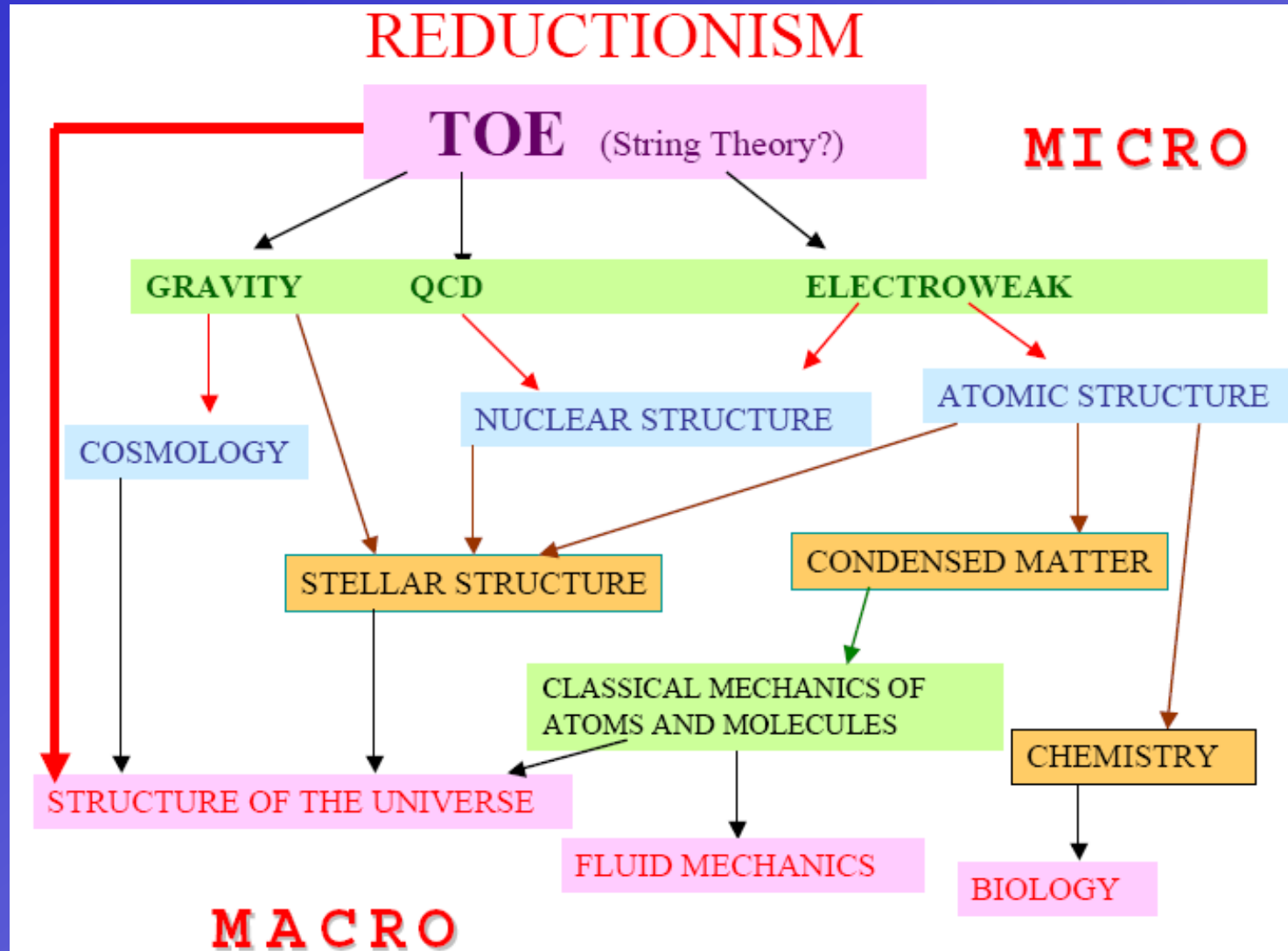
## Reference book:

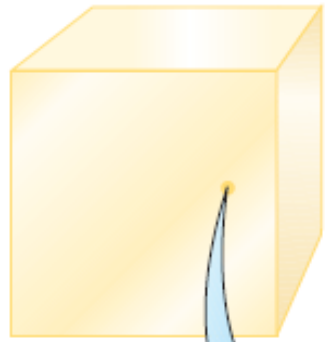
- 1 Physics : concepts and connections A.Hobson(物理学的概念与文化素养)
- 2 Physics and technology for future presidents Richard.A.muller (未来总统的物理课)
- 3 The Feynman lectures on physics R.Feynman (费曼物理学讲义)
- 4 物理学咬文嚼字 曹泽贤
- 5 The artful universe J.Barrow
- 6 Linked: The new science of network A.L.Barabaci
- 7 Physics of the impossible Kaku Michio
- 8 How to teach physics to your dog C. Orzel
- 9 Time travel and warp drive A.Averret and T.Roman

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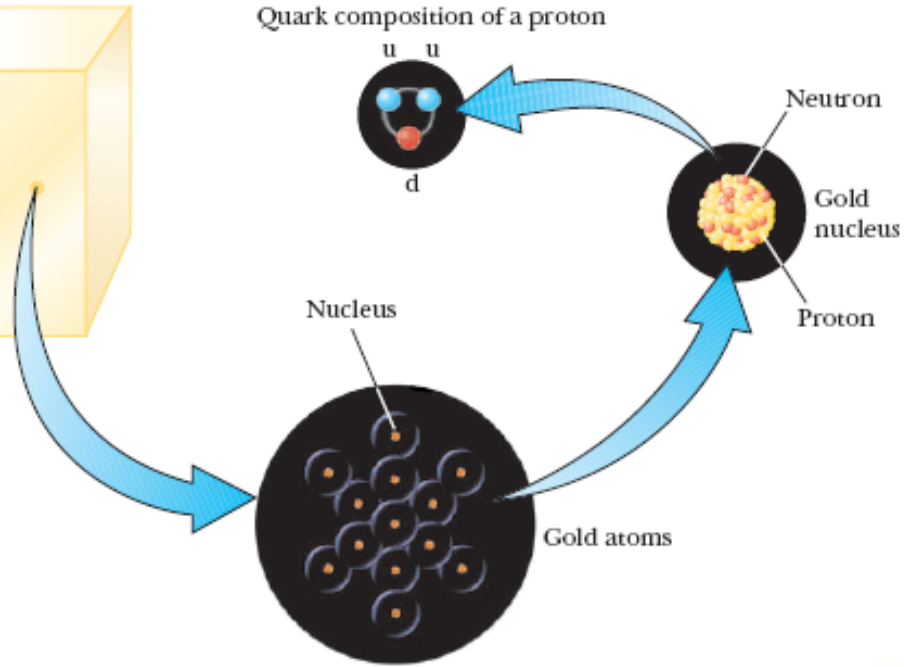
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# What is Physics



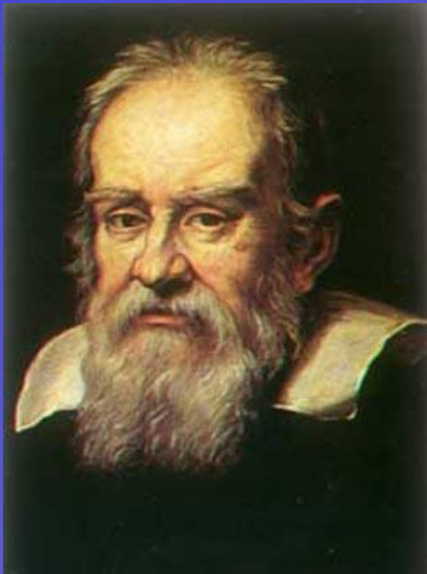


Gold cube



# How to find the truth of the physics?

1. Observe the Phenomena
2. Build the physical model
3. Calculation and predication
4. Experiment design and test



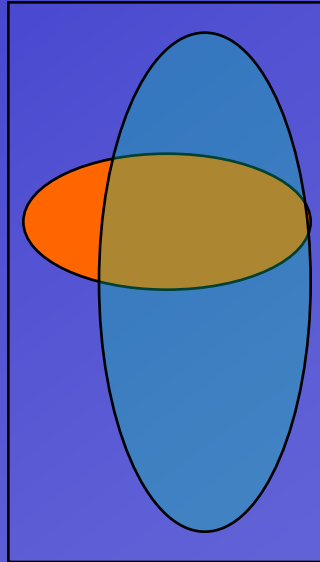
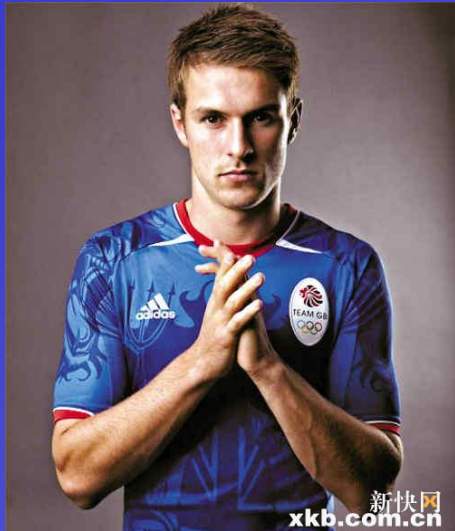
.....The other way draws axioms from the sense and particulars by climbing steadily and by degrees so that it reaches the ones of highest generality last of all; and this is the true but still untrodden way.



Francis Bacon (1561-1626)

## Idols of the Tribe

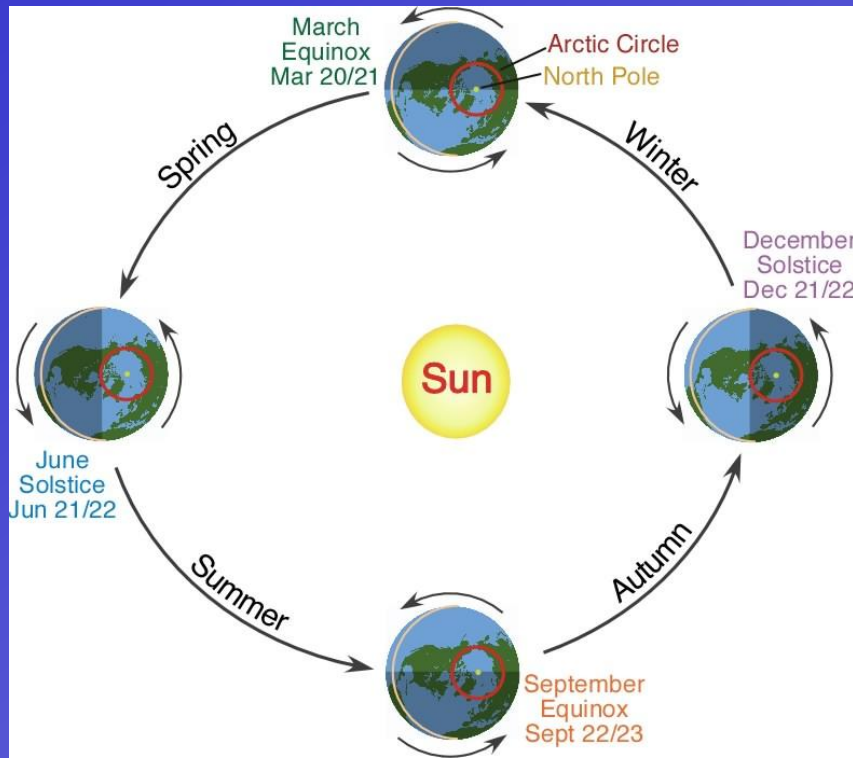
tendency to perceive more order and regularity in systems than truly exists, and is due to people following their preconceived ideas about things.



**Aaron James Ramsey** (1990--- )

# Idols of the Cave

personal weaknesses in reasoning due to particular personalities, likes and dislikes.





## Idols of the Marketplace

to confusions in the use of language and taking some words in science to have a different meaning than their common usage

## Idols of the Theatre

This is the following of authorities and not asking questions about the world

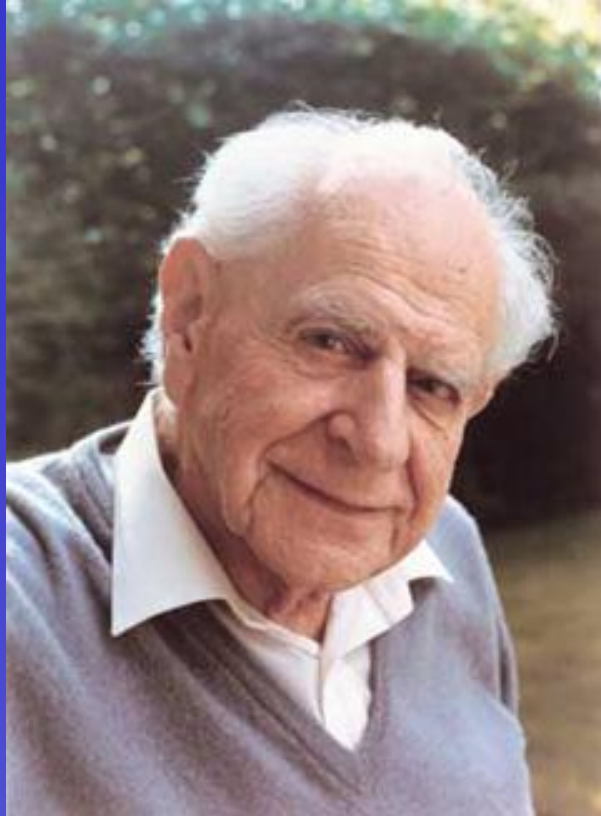


David Hume (1711-1776)

Shall we rest contented with these two relations of contiguity and succession, as affording a complete idea of causation? By no means ... there is a *necessary connection* to be taken into consideration.



No matter how many instances of white swans we may have observed, this does not justify the conclusion that *all* swans are white.



Karl popper  
(1902-1994)



# Contents

- 1.Mechanics (力学)
- 2.Thermodynamics (热力学)
- 3.Electricity and Magnetism  
(电磁学)
- 4.Optics (光学)
- 5.Modern Physics (近代物理)

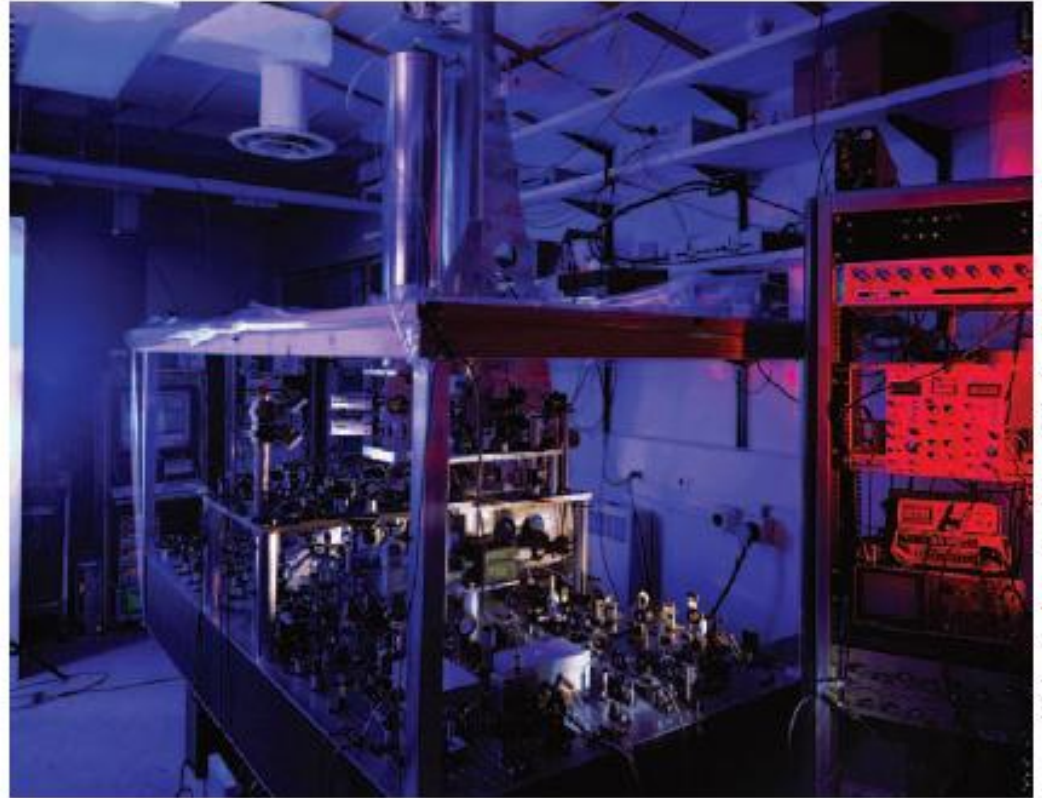
# Requirement

1. homework (15%):
2. Attendance (5%)
3. Midterm (20%)
4. Final Exam(60%)

# Measurement



# SI (système international)



## Unit in SI system

Mass (kilogram)

length (meter)

time (second)

current (Ampere)

Temperature (Kelvin)

Other system :

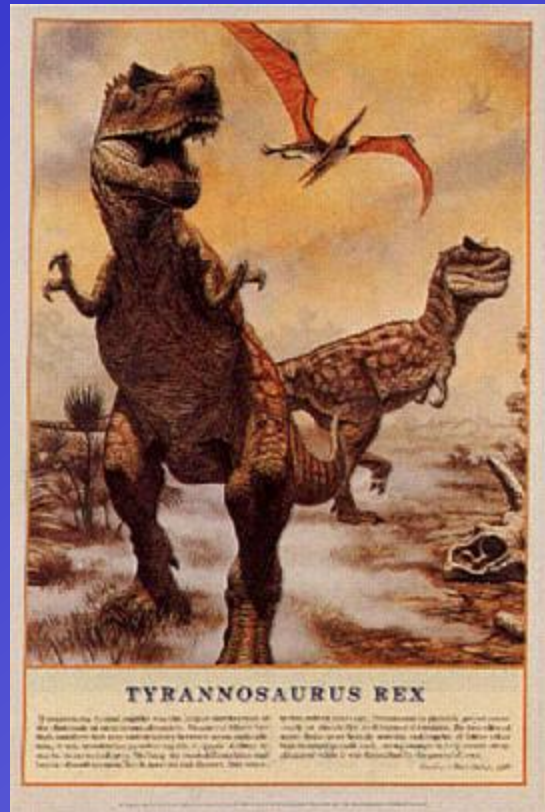
1 inch =2.54cm

1 pound=0.45kg

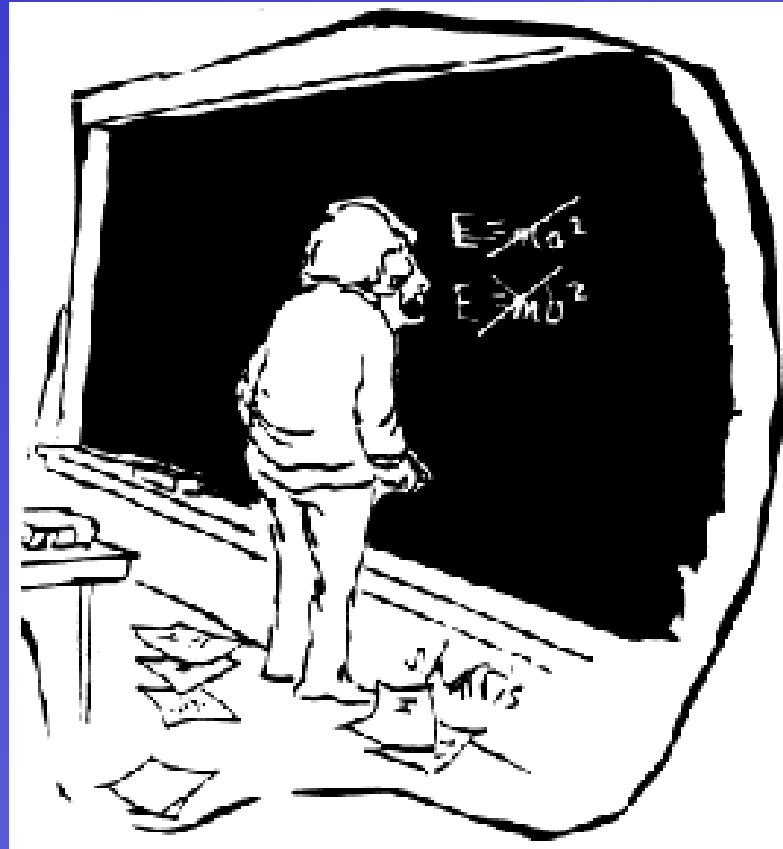


Scientific notation:

Order of magnitude:



# Dimensions (量纲)



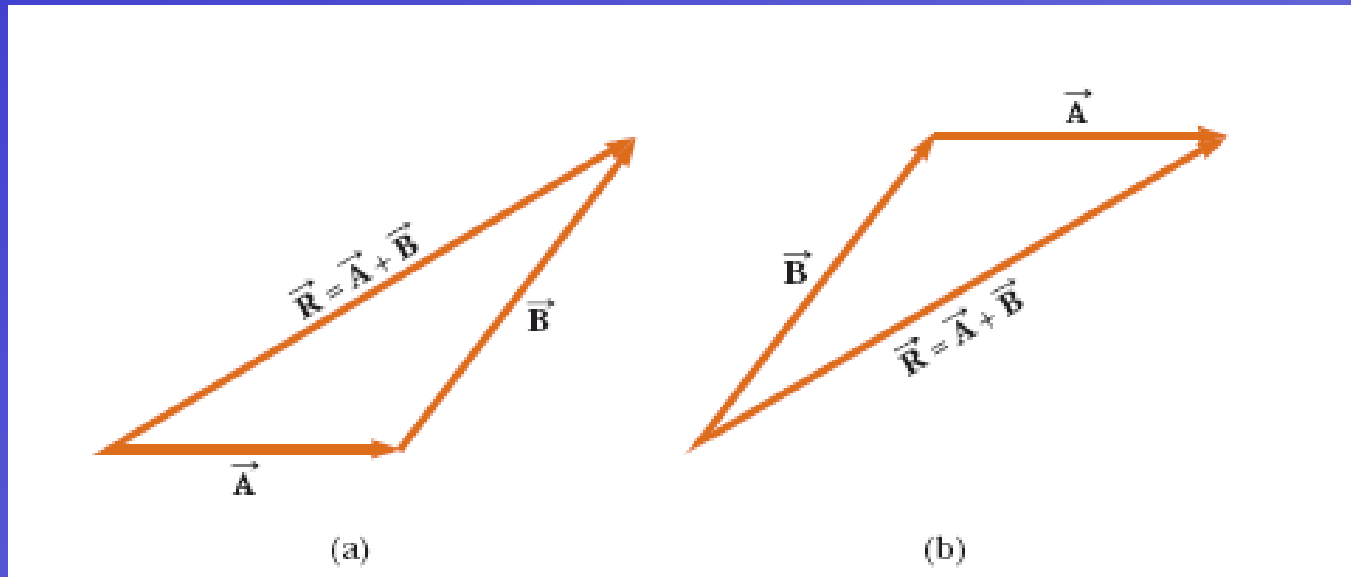
$$\begin{aligned}
 1. t' &= \frac{t - \frac{x}{c^2} u^2}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} & 2. t' &= \frac{t - \frac{x}{c} u}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} \\
 3. t' &= \frac{t - \frac{1}{c^2} u^2}{\sqrt{1 - \left(\frac{u}{c}\right)^2}} & 4. t' &= \frac{t - \frac{x}{c^2} u}{\sqrt{1 - \left(\frac{u}{c}\right)^2}}
 \end{aligned}$$

Where  $u$  is the relative speed of two reference systems  
 $c$  is the speed of light,  $(x, t)$  and  $(x', t')$  are coordinates  
 observed within the two different reference system

# Vector and Scalar (矢量与标量)

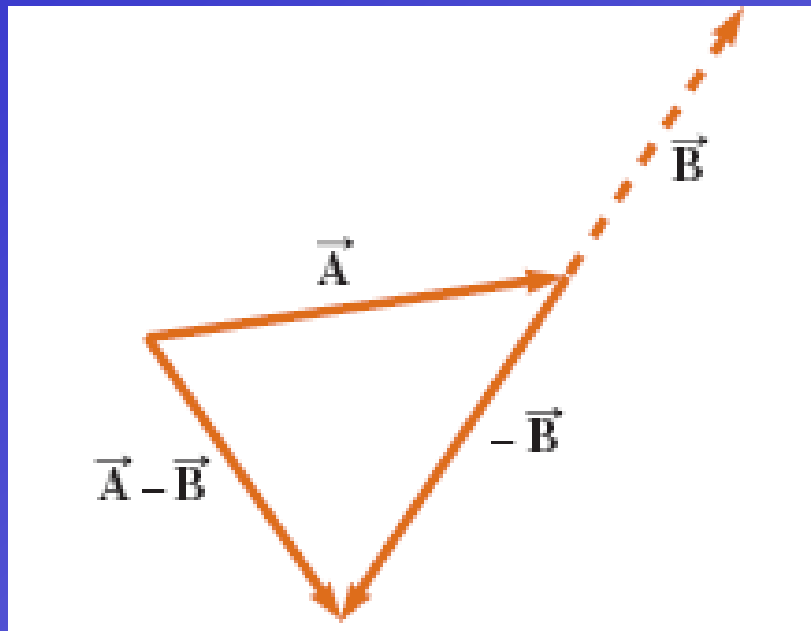
## Addition and Subtraction of Vectors

### 矢量的加减



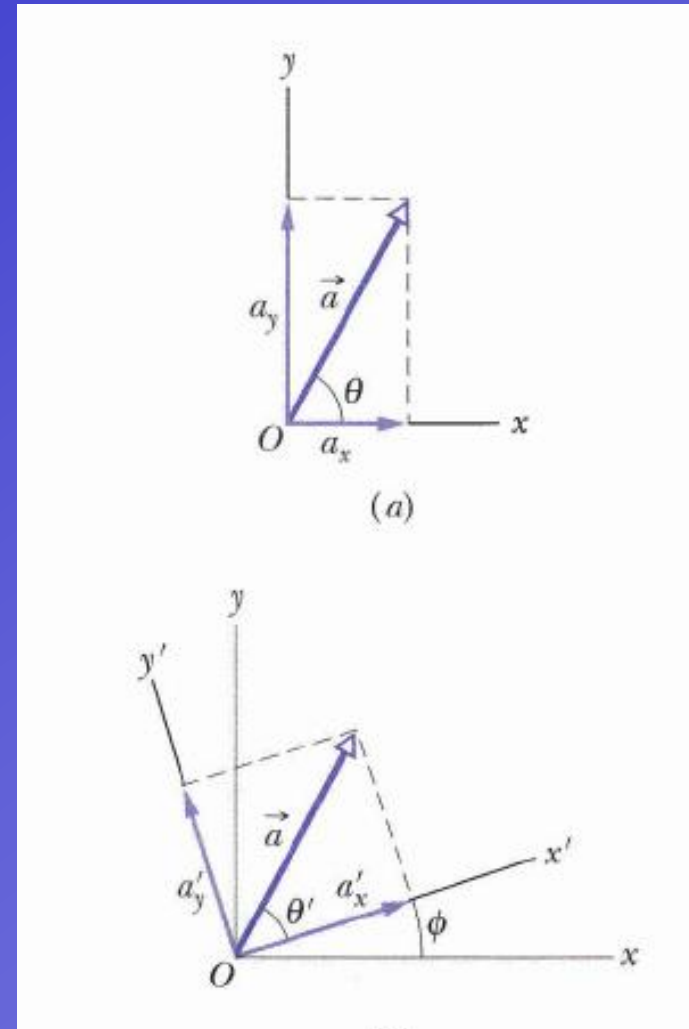
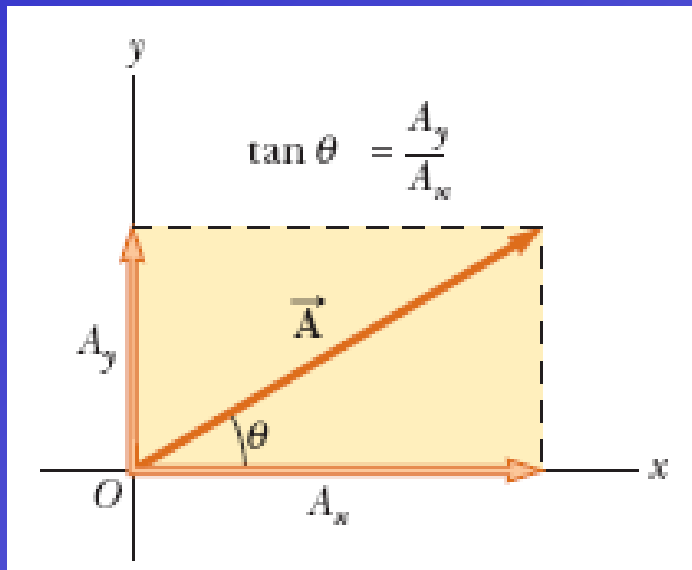
**commutative law of addition**

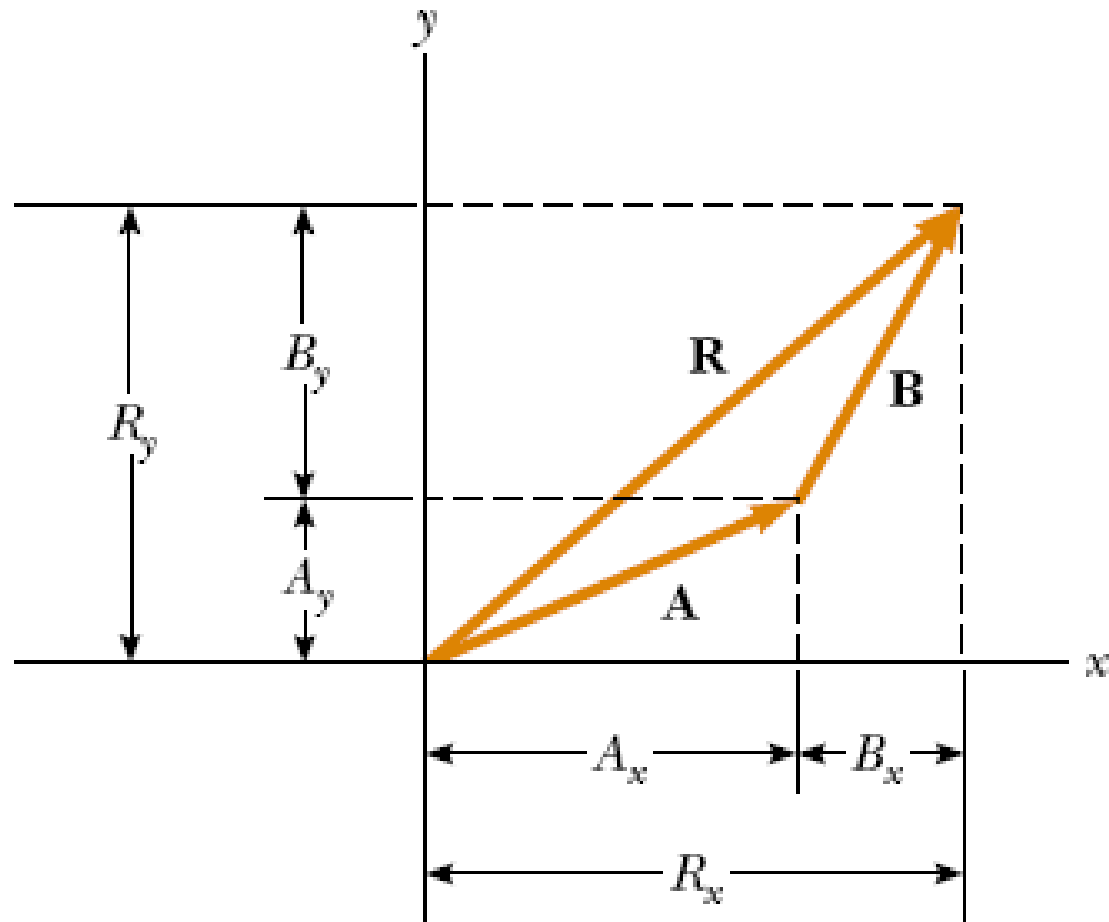
# Subtract vectors



# Component Vectors

(分矢量)





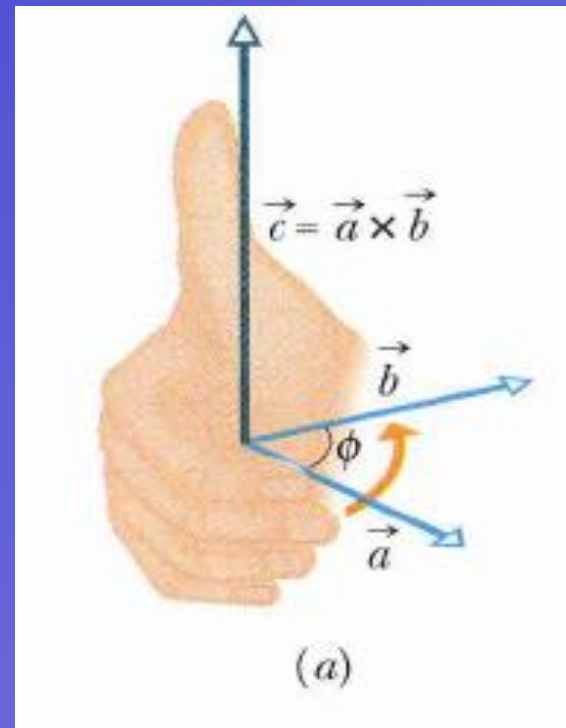
# Production of two vectors

## 1. Scalar product (标积)

$$\vec{A} \cdot \vec{B} = |\vec{A}| \cdot |\vec{B}| \cos \theta$$

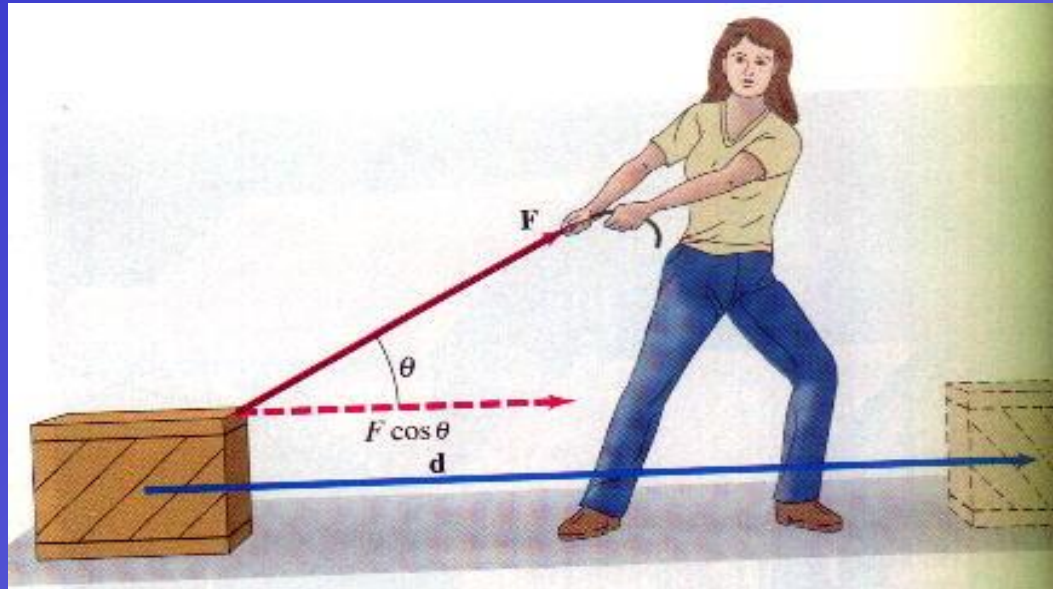
## 2. Vector product (矢积)

$$|\vec{A} \times \vec{B}| = |\vec{A}| \cdot |\vec{B}| \sin \theta$$

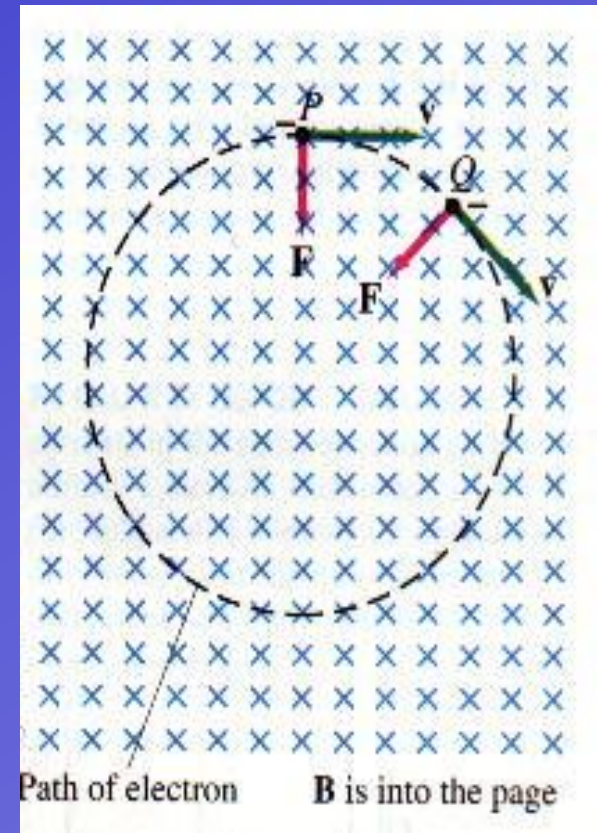




Work :  $dW = \vec{F} \cdot d\vec{s}$



# Lorentz Force:



$$\vec{F} = q\vec{v} \times \vec{B}$$