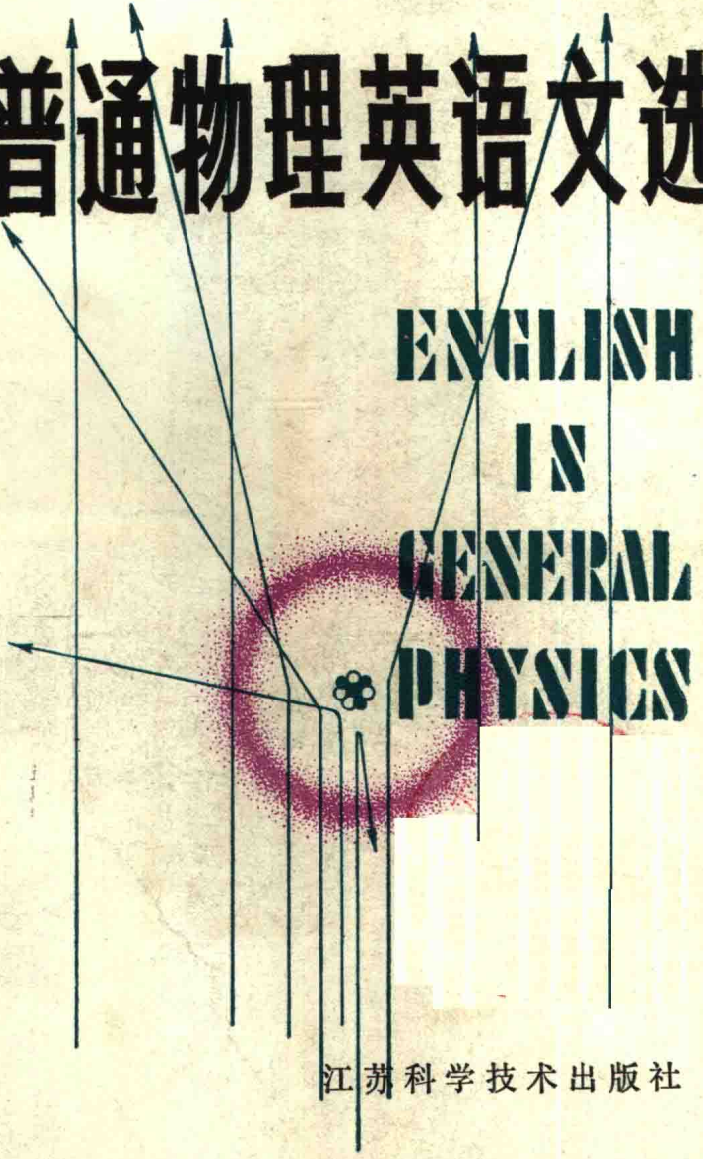
普通物理英语文选

ENGLISH IN GENERAL PHYSICS



江苏科学技术出版社

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（英汉对照）

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前　言

为了满足具有一定英语基础的读者学习专业英语的需要，我们编选并译注了《普通物理英语文选》。本书从最近几年出版的国外物理教科书中选编了五十一篇材料，其内容包括：力学、热学、声学、电学、光学、原子物理、半导体和电子学等。取材时，着眼于使读者接触和掌握较多的专业词汇，同时兼顾到普通物理内容的完整性和系统性。

书中课文逐段有译文对照，并对少数难句进行了简单的语法分析，其目的是方便自学。读者学完本书，不仅能够掌握较多的物理专业词汇，而且还可提高英语的阅读和笔译能力。

本书也可作为大专院校理、工科低年级学生的课外读物。

本书承蒙李庆贤教授和徐立宏同志校订。在编写过程中，袁荣生先生也对编者给予过帮助，在此表示感谢。

编　者

1983年3月13日

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Lesson One

The Velocity

速　度

Mechanics deals with the relations of force, matter, and motion. Motion may be defined as a continuous change of position. In most actual motions, different points in a body move along different paths. The complete motion is known if we know how each point in the body moves, so to begin we consider only a moving point, or a very small body called a particle.

力学所论述的是力、物质和运动的关系.运动可以定义为位置的连续变化.在大多数实际的运动中,物体内不同的点沿着不同的路径运动.如果我们知道物体内每一点的运动情况,则整个物体的运动也就清楚了,因而我们先考虑一个运动的点,即称为质点的极小物体.

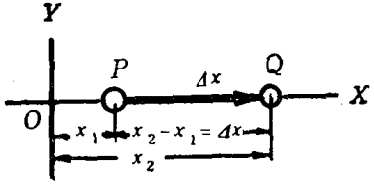

图1-1

Consider a particle moving along the x-axis,as in Fig.1-1. At a time t_1 the particle is at point P, where its coordinate is x_1, and at a later time t_2 it is at point Q, whose coordinate is x_2.

假定一质点沿 x 轴运动，如图 1-1 所示. 在时刻 t_1，该质点位于 P 点,坐标为 x_1,在随后的时刻 t_2,质点到达 Q 点,坐标为 x_2.

The displacement of the particle as it moves from point P

of its path to point Q is defined as the vector drawn from P to Q. Thus in Fig. 1-1 the vector PQ, of magnitude $x_2 - x_1 = \Delta x$, is the displacement. The average velocity of the particle is defined as the ratio of its displacement to the time interval $t_2 - t_1 = \Delta t$. We shall represent its average velocity by the symbol $\bar{v}$ (the bar over the symbol v signifies an average value):

$$\bar{v} = \frac{\text{the displacement}}{\text{the time interval}}$$

当一质点从路径上的 P 点运动到 Q 点时，其位移定义为从 P 到 Q 所画的矢量．因此，在图 1-1 中大小为 $x_2 - x_1 = \Delta x$ 的矢量 PQ 就是位移．质点的平均速度定义为位移与时间间隔($t_2 - t_1 = \Delta t$)的比率，我们用符号 $\bar{v}$(字母 v 上面的一横指平均值)表示平均速度，即

$$\bar{v} = \frac{\text{位　移}}{\text{时间间隔}}$$

Average velocity is a vector, since the ratio of a vector to a scalar is it self a vector.Its direction is the same as that of the displacement vector The magnitude of the average velocity is therefore

$$\bar{v} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t} \qquad (1\text{-}1)$$

因为矢量与标量的比率为矢量，所以平均速度也是矢量，它的方向与位移矢量方向相同，大小为

$$\bar{v} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t} \qquad (1\text{-}1)$$

The velocity of a particle at some one instant of time,

or at some one point of its path, is called its instantaneous velocity.

质点在某一时刻或在其路径的某一点的速度，称为瞬时速度.

Suppose we wish to find the instantaneous velocity of the particle in Fig. 1-1. at the point P. The average velocity between point P and Q is associated with the entire displacement Δx, and with the entire time interval Δt. Imagine the second point Q to be taken closer and closer to the first point P, and let the average velocity be computed over these shorter and shorter displacements and time intervals. The instantaneous velocity at the first point can then be defined as the limiting value of the average velocity when the second point is taken closer and closer to the first. Although the displacement then becomes extremely small,the time interval by which it must be divided becomes small also and the quotient therefore is not necessarily a small quantity.

假定我们想求图 1-1 中的质点在 P 点的瞬时速度. P 和 Q 两点之间的平均速度，与总位移 Δx 和总时间间隔 Δt 有关.设想第二点 Q 越来越接近第一点 P，平均速度是在这些越来越短的位移和时间间隔内计算的. 那么，质点在第一点的瞬时速度，就定义为当第二点越来越趋近第一点时的平均速度的极限值.虽然这时位移变得极小，但相应的作为除数的时间间隔也变得很小，因此其商就不一定很小.

In the notation of calculus, the limiting value of $\Delta x/\Delta t$, as Δt approaches zero, is written as dx/dt and is called the derivative of x with respect to t.

Then if v represents the instantaneous velocity, its magnitude is

$$v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt} \qquad (1\text{-}2)$$

在微积分的符号中，当 Δt 接近于零时，$\Delta x/\Delta t$(的极限值)可写成 dx/dt，称为 x 对 t 的导数.

如果用 v 代表瞬时速度，则它的大小为

$$v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt} \qquad (1\text{-}2)$$

Instantaneous velocity is also a vector, whose direction is the limiting direction of the displacement vector. Since Δt is necessarily positive, it follows that v has the same algebraic sign as the displacement. Hence a positive velocity indicates motion toward the right along the x-axis, if we use the usual convention of signs.

瞬时速度也是矢量，其方向为位移矢量的极限方向. 由于 Δt 必须为正，因此 v 与位移有相同的代数符号. 因而，如果我们采用通常的符号规定，那么，正速度表示沿 x 轴向右的运动.

In the SI system[1], we express distance in meters and time in seconds, thus the unit of velocity is expressed in meters per second (ms^{-1}).

在国际单位制中，用米表示距离，用秒表示时间，所以速度的单位用米每秒表示(ms^{-1})

New Words(生词)

velocity [vi'ɔsiti] *n*. 速度
mechanics [mi'kæniks] *n*. 力学
relation [ri'leiʃən] *n*. 关系
motion['mouʃən] *n*. 运动

define [di'fain] *vt*. 给……下定义
position [pə'ziʃən] *n*.位置
path ['pɑ:θ] *n*. 路径
particle ['pɑ:tikl] *n*. 质点，粒子
displacement [dis'pleismənt] *n*. 位移
magnitude ['mægnitju:d] *n*. 大小，(数)值
ratio ['reiʃiou] *n*. 比率，比
average ['ævəridʒ] *n*. 平均，平均数
interval ['intəvəl] *n*. (时间的)间隔
represent [ˌrepri'zent] *vt*.表示，表达
symbol ['simbəl] *n*. 符号，记号
signify ['signifai] *vt*. 表明，意味着
vector ['vektə] *n*. 矢量
instantaneous [ˌinstən'teinjəs] *a*. 即时的，瞬时发生的
entire [in'taiə] *a*. 全体的，整个的
associate [ə'souʃieit] *vt*. 联合，使发生关系
imagine [i'mædʒin] *vt*. 想象，设想
derivative [di'rivətiv] *a*. 导出的；*n*. 导数
compute [kəm'pju:t] *vt*. 计算
quotient ['kwouʃənt] *n*. 商
quantity ['kwəntiti] *n*. 量，数量，大小
notation [nou'teiʃən] *n*. 记号，符号
calculus ['kælkjuləs] *n*. 微积分
limiting ['limitiŋ] *a*. 极限的
approach [ə'proutʃ] *vt*. 接近，逼近
convention [kən'venʃən] n. 习惯，惯例；协定

Phrases and Expressions(短语和词组)

deal with 论及，论述

be defined as　　定义为
average velocity　平均速度
instantaneous velocity　瞬时速度
(be) associated with　与……有关，涉及
derivative of M with respect to N　　M 对 N 的导数

Notes to the Text
课 文 注 释

[1] the SI system 是 the International System of Units 的缩写.

Lesson Two

The Acceleration

加 速 度

When the velocity of a moving body changes continuously as the motion proceeds, the body is said to move with accelerated motion.

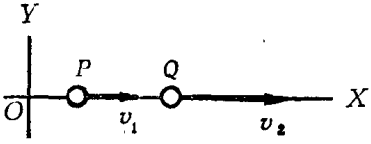

图2—1

Fig. 2-1 shows a particle moving along the x-axis. The vector v_1 represents its instantaneous volocity at point P, and the vector v_2 represents its instantaneous velocity at point Q.

当运动物体的速度在其运动过程中不断地变化时，我们说该物体在作加速运动。

图 2-1 表示一质点沿 x 轴运动。矢量 v_1 代表它在 P 点的瞬时速度，矢量 v_2 代表它在 Q 点的瞬时速度。

The average acceleration of the particle as it moves from P to Q is defined as the ratio of the change in velocity to the elapsed time

$$\bar{a} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t} \qquad (2\text{-}1)$$

质点由 P 点运动到 Q 点的平均加速度，定义为速度的变化与所经历的时间的比率，即

$$\bar{a} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t} \qquad (2\text{-}1)$$

where t_1 and t_2 are the times corresponding to the velocity v_1 and v_2. Since v_1 and v_2 are vectors, the quantity $v_2 - v_1$ is a vector difference. Since in rectilinear motion both vector lie in the same straight line, the magnitude of the vector difference in this special case equals the difference between the magnitudes of the vectors.

式中 t_1 和 t_2 对应于速度为 v_1 和 v_2 的时刻. 因为 v_1 和 v_2 均为矢量, $v_2 - v_1$ 为矢量差. 在直线运动中, 这两个矢量都位于同一条直线, 在此特殊情况下, 矢量差的大小即为两个矢量大小之差.

The instantaneous acceleration of a body, that is its acceleration at some one instant of time or at some one point of its path, is defined in the same way as instantaneous velocity. Let the second point Q in Fig. 2-1 be taken closer and closer to the first point P, and let the average acceleration be computed over shorter and shorter intervals of time. The instantaneous acceleration at the first point P is then defined as the limiting value of the average acceleration when the second point Q is taken closer and closer to the first P:

$$a = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta v} = \frac{dv}{dt} \qquad (2\text{-}2)$$

某一物体的瞬时加速度, 即物体在某一时刻或在其路径上某一点的加速度, 可用定义瞬时速度的同样方法来定义. 令图 2-1 中的第二点 Q 越来越趋近于第一点 P, 并在越来越短的时间间隔内计算其平均加速度, 则第一点的瞬时加速度就定义为当第二点越来越趋近第一点时的平均加速度的极限值:

$$a = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} \qquad (2\text{-}2)$$

The direction of the instantaneous acceleration is the limiting direction of the vector change in velocity, Δv.

Instantaneous acceleration plays an important part in the laws of mechanics. From now on when the term "acceleration" is used we shall understand it to mean "instantaneous acceleration".

In the SI system, the unit of acceleration is expressed in meters per second squared (ms^{-2}).

瞬时加速度的方向为速度矢量变化 Δv 的极限方向.

瞬时加速度在力学定律中的地位很重要.从现在起,凡提到"加速度"这个词时,我们指的就是"瞬时加速度".

在国际单位制中,加速度的单位是:米每秒平方($m \cdot s^{-2}$).

New Words

acceleration [ækselə'reiʃən] *n*. 加速度
continuously [kən'tiŋjuəsli] *ad*. 连续不断地
proceed [prə'si:d] *vi*. 进行
proceeds *n*. 所致,结果
elapsed [i'læpst] elapse 的过去分词,经过的
corresponding [ˌkəris'pɔndiŋ] *a*. 相应的,对应的
rectilinear ['rekti'liniə] *a*. 直线的
lie [lai] (lay, lain, lying) *vi*. 躺,位
special ['speʃəl] *a*. 特别的,专门的
square [skwɛə] n. 平方

Phrases and Expressions

lie in 位于,在于