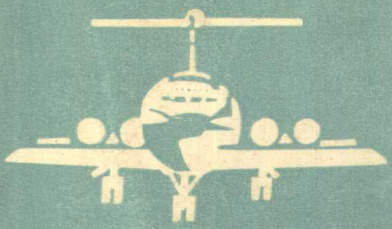
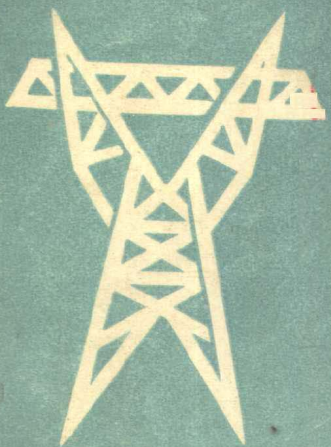


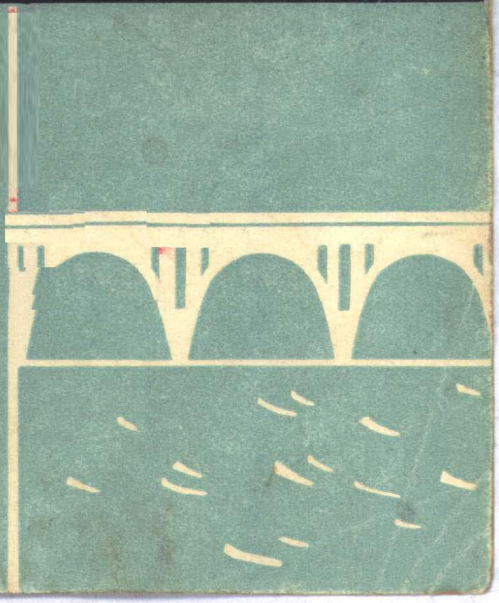
科普英语注释读物

FORCE AND ENERGY

力和能

西安交通大学外语教研室编





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Force and Energy

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商　务　印　书　馆
1979年·北京

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编者的话

为帮助高等院校理工科学生以及其他读者提高英语阅读能力，我们选编了这本阅读材料。

本书共收英语科普文章四十篇，内容侧重于物理学有关力和能方面的文章。为适合阅读起见，文中略有删节。

全书按内容编排，可分为1—26篇，27—34篇，35—40篇三个部分。每篇附有词汇和较为详细的语法和词汇注释。书后附有参考译文和词汇习语总表。我们解剖了十多本大专院校英语教科书，选出常用词汇500个，作为本书选编词汇的标准，其中300个随同各分课词汇列入书后词汇、习语总表，供查阅之用。

由于我们水平有限，错误、缺点在所难免，望读者批评指正。

西安交通大学外语教研室

1978.1

CONTENTS

1. Scope of Mechanics

When a collection of matter is acted on by a system of forces, this collection will in general induce resisting forces, internal stresses, deformation, and motion. The science of mechanics① consists of the study and analysis of these factors and their interrelationships.

The scope and range of topics normally considered within the province of mechanics is indeed broad.② The following list of topics and descriptive phrases is suggestive, but not all-inclusive, of the numerous classical subdivisions of mechanics:③

1. Statics — rigid bodies in equilibrium.
2. Dynamics — rigid bodies in motion.
3. Mechanics of materials — stresses and deformations in solids.
4. Fluid mechanics — behavior of liquids and gases at rest and in motion.
5. Vibrations — periodic and transient motion of machines structures, and systems.
6. Elasticity — mathematical analysis of stress and deformation in elastic systems.
7. Rheology — flow and deformation of materials.

Words

scope [skoup] *n.* 范围
mechanics [mi'kæniks] *n.* 力学
collection [kə'lekʃən] *n.* 收集；聚集在一起的东西
act [ækt] *v.* 行动；起作用
act on 对...起作用，作用于
system ['sistim] *n.* 系，系统，体系；制度

in general 大体上，一般说来
induce [in'dju:s] *v.* 引起，招致，导出；感应
internal [in'tə:nl] *a.* 内部的
stress [stres] *n.* 受力状态，应力
deformation [difɔ:'meiʃən] *n.* 变形
consist of 由……组成
analysis [ə'næləsis] (复数 analyses [ə'nælisi:z]) *n.* 分析
factor ['fæktə] *n.* 因素，要素
interrelationship [intəri'leiʃənʃip] *n.* 相互关系
range [reindʒ] *n.* 范围，区域
topic ['tɔpik] *n.* 题目
normally ['nɔ:məli] *ad.* 正常地；普通
consider [kən'sidə] *v.* 考虑，研究；认为，看做
province ['prɔvins] *n.* 省；领域，范围
indeed [in'di:d] *ad.* 实在地，的确
broad [brɔ:d] *a.* 宽的，宽阔的
following ['fɔlouiŋ] *a.* 下列的
list [list] *n.* 一览表，目录
descriptive [dis'kriptiv] *a.* 描述的，说明的
phrase [freiz] *n.* 措辞，成语，短语
suggestive [sə'dʒestiv] *a.* 示意的，暗示的；可作参考的
all-inclusive ['ɔ:lin'klu:siv] *a.* 包括一切的，一切计算在内的
numerous ['nju:mərəs] *a.* 许多的，大批的
classical ['klæsikəl] *a.* 古典的，经典的
subdivision ['sʌbdiviʒən] *n.* 细分；分部，小类
statics ['stætiks] *n.* 静力学
rigid ['ridʒid] *a.* 坚硬的，刚性的
equilibrium [i:kwi'libriəm] *n.* 平衡(状态)
dynamics [dai'næmiks] *n.* 动力学
solid ['sɔlid] *a. n.* 固体(的)
fluid ['flu:id] *a. n.* 流体(的)
behavior (behaviour) [bi'heivjə] *n.* 行为；特性，性能，特点
rest [rest] *n.* 静止
at rest 静止
vibration [vai'breiʃən] *n.* 振动
periodic [piəri'ɔdik] *a.* 周期的
transient ['trænziənt] *a.* 瞬变的，过渡的，暂时的
structure ['strʌktʃə] *n.* 结构
elasticity [elæs'tisiti] *n.* 弹性
mathematical [mæθi'mætikəl] *a.* 数学的
elastic [i'læstik] *a.* 弹性的
rheology [ri'ɔlədʒi] *n.* 流变学
flow [flou] *v. n.* 流，流动

Notes

① the science of mechanics 力学这一门科学

of mechanics 是 the science 的同位语。注意介词 of 在这里表示同位关系。

又如: We live in the city of Sian. (我们住在西安。)

This automobile is running at a speed of 40 miles an hour. (该汽车正以每小时 40 英里的速度行驶。)

② The scope and range of topics normally considered within the province of mechanics is indeed broad. 过去分词短语 normally considered within the province of mechanics 在句中作定语，说明 topics.

③ The following list of topics and descriptive phrases is suggestive, but not all-inclusive, of the numerous classical subdivisions of mechanics.

本句中的介词短语 of the numerous classical subdivisions of mechanics 作定语，说明 topics and descriptive phrases。这个定语之所以与它所说明的词分开，放在谓语之后，是为了保持句子的平衡，避免"头重脚轻"的现象。

2. Translation and Rotation

By translation is meant a displacement of a body from one position to another in such a manner that all points of the body traverse equal parallel paths.① A displacement of a body in such a manner that all points describe circular paths about② the same axis is called rotation. The axis of rotation may be outside the body or it may pass through the body.

Motion of translation is often called linear motion, and motion of rotation is often called angular motion.

Motions in opposite directions③ are distinguished by the signs plus and minus. In this book rotations in the direction of the hands of a clock are termed positive, and rotations in the counterclockwise direction are termed negative.④

Words

translation [træns'leiʃən] *n.* 平移，平动，直线运动
rotation [rou'teiʃən] *n.* 旋转，转动
displacement [dis'pleismənt] *n.* 位移，移动
manner ['mænə] *n.* 方法，方式，样式
in such a manner that ...以这样的方式，以致...
point [point] *n.* 点
traverse ['trævə:s] *v.* 通过
equal ['i:kwəl] *a.* 相等的 *v.* 等于
parallel ['pærəlel] *a.* 平行的
path [pɑ:θ] *n.* 路线，路径
describe [dis'kraib] *v.* 叙述，描述
circular ['sə:kjulə] *a.* 圆的，圆形的
axis ['æksis] (复数 axes ['æksi:z]) *n.* 轴，轴线
outside ['aut'said] *prep.* 在...外，['autsaid] *a.* 外面的，[aut-'said] *ad.* 在外面
pass through 通过

linear ['liniə] *a.* 线的，直线的，线性的
angular ['æŋgjulə] *a.* 角的
opposite ['ɔpəzit] *a.* 对立的，相反的
distinguish [dis'tiŋgwiʃ] *v.* 区别，辨别，识别
sign [sain] *n.* 符号，记号
plus [plʌs] *n.* 正号，加号 *prep.* 加，加上 *a.* 加的，正的
minus ['mainəs] *n.* 负号，减号 *prep.* 减，减去 *a.* 减的，负的
in the direction of ... 朝着...方向
clock [klɔk] *n.* 钟，时钟
term [tə:m] *v.* 把...叫做
counterclockwise ['kəuntə'klɔkwaiz] *a.* 反时针方向的

Notes

① By translation is meant a displacement of a body from one position to another in such a manner that all points of the body traverse equal parallel paths. 句中，by translation is meant ...意为"所谓平移指的是..."，by translation 置于句首为的是强调介词短语。这是一句倒装句，因此主语应为 a displacement。又如：By acceleration is meant the rate of change of velocity with time. (所谓加速度指的是速度的变化和时间的比率。) in such a manner that ... paths 用来说明 displacement；注意 that 引导的是结果状语从句，和 such 相呼应。这一用法在下文句中再次出现。

② about: 围绕。

③ 介词短语 in opposite directions 作定语，说明 motions。

④ In this book rotations in the direction of the hands of a clock are termed positive, and rotations in the counterclockwise direction are termed negative.

介词短语 in the direction of the hands of a clock 和 in the counterclockwise direction 均作定语，分别说明前面两个 rotations。hand 在这里作"指针"解。形容词 positive 和 negative 分别作为主语补足语。

3. The Wheel and Axle

The wheel and axle is really a sort of lever.① An example of such a machine is the device used in old-fashioned wells to hoist up the water bucket.② It consists of a wheel firmly fastened to an axle; the two rotate together as the wheel is turned by means of a handle near its circumference.③ Work is put into it at the handle. Work is done by the wheel as it winds the rope around the axle④, and the bucket is hoisted up.

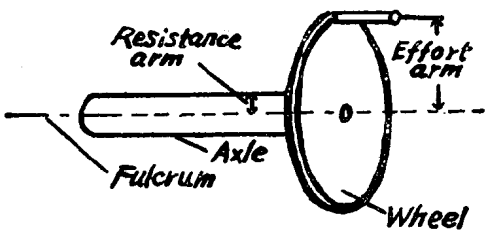

Fig. 1. Tye wheel and axle

You can see that the wheel and axle is really a lever if you examine the simplified⑤ diagram in Figure 1. If we consider the central axis common to both the wheel and the axle as the fulcrum,⑥ the effort arm then is the distance from this center to the handle and the resistance arm is the distance from the center to the circumference of the axle. The mechanical advantage of this machine may be found by dividing the effort-arm distance by the resistance-arm distance, just as in the case of the ordinary lever.⑦ You pay for the increase in force by applying the input force over a longer distance (the circumference of the

wheel) than the distance over which the output force is applied (the circumference of the axle).⑧

There are many applications of the wheel and axle. Some of the commonest are door knobs, screw-drivers, and bit braces.

Words

wheel [wi:l, hwi:l] *n.* 轮
axle ['æksl] *n.* 轴
the wheel and axle 轮轴
really ['riəli] *ad.* 真正地，确实地
lever ['li:və] *n.* 杠杆，杆
old-fashioned ['ould 'fæʃənd] *a.* 旧式的，过时的
hoist [hɔist] *v.* 扯起，绞起，升起
bucket ['bʌkit] *n.* 水桶，吊桶
firmly ['fə:mli] *ad.* 坚实地，牢固地
fasten ['fɑ:sn] *v.* 固定，拴在...上
rotate [rou'teit] *v.* 旋转，转动
together [tə'geðə] *ad.* 一同，一起；同时
means [mi:nz] *n.* 方法，手段，工具，设备，装置
by means of 用，通过，借助于
handle ['hændl] *n.* 把手，手柄
circumference [sə'kʌmfərəns] *n.* 圆周
wind [waind] (wound [waund], wound) *v.* 绕
rope [roup] *n.* 绳
examine [ig'zæmin] *v.* 调查，研究；试验，检验
simplify ['simplifai] *v.* 使简化
diagram ['daiəgrəm] *n.* 图
central ['séntrəl] *a.* 中央的，中心的
common to ... 对...是共同的，为...所共有的
both ... and ... ...和...都，既...又...
effort ['efət] *n.* 努力；力，作用力
advantage [əd'vɑ:ntidʒ] *n.* 优点，有利条件；利益
divide [di'vaid] *v.* 分，分配，除
divide ... by ... 将...除以...
just as 正象...一样
case [keis] *n.* 情况，事例
in the case of 就...而言，提到，关于
ordinary ['ɔ:dnri] *a.* 普通的，寻常的
pay [pei] (paid [peid], paid) *v.* 支，付
pay for 偿，付

input ['input] *n.* 输入；输入端
output ['autput] *n.* 输出；输出端
door [dɔ:] *n.* 门
bit [bit] *n.* 一点；钻头
brace [breis] *n.* 支撑(臂)
bit brace 曲臂钻

Notes

① The wheel and axle is really a sort of lever.

本句主语 the wheel and axle (轮轴)表示一个单一概念，故谓语动词用单数形式。

② An example of such a machine is the device used in old-fashioned wells to hoist up the water bucket. 过去分词短语 used in ... 作定语，说明 device，动词不定式短语 to hoist up the water bucket 作状语，说明 used，表示目的。

③ It consists of a wheel firmly fastened to an axle; the two rotate together as the wheel is turned by means of a handle near its circumference. 过去分词短语 firmly fastened to an axle 作定语，说明 wheel。the two 指的是 the wheel 和 the axle。as 引出时间状语从句，说明 rotate.

④ as it winds the rope around the axle 是时间状语从句，说明主句中的谓语 is done.

⑤ simplified 意为"被简化了的"，作定语，说明 diagram。

⑥ If we consider the central axis common to both the wheel and the axle as the fulcrum ... common to both the wheel and the axle 是形容词短语，作定语，修饰 axis。consider ... as ... (把...看作...)是常用的结构，"as ..." 可看成为宾语补足语。在这种结构中也可以没有 as。

⑦ The mechanical advantage of this machine may be found by dividing the effort-arm distance by the resistance-arm distance, just as in the case of the ordinary lever. 句中，第一个 by，后接动名词短语表示方式方法，可译为 "用...", "通过

...”。第二个 by 和 divide 连用，意为“将…除以 …”。just as 引出方式状语从句，译为“正如…”，句中省略了某些成份，可补充完整如下：just as it may be found in the case of the ordinary lever.

⑧ You pay for the increase in force by applying the input force over a longer distance (the circumference of the wheel) than the distance over which the output force is applied (the circumference of the axle). 这里，by applying … 用作方式状语，修饰谓语 pay。在 than 引导的比较状语从句中带出一句“介词 over + which”引导的定语从句，which 在这里表示 the distance。

4. The Lever

The lever is one of the simplest devices used as machines.① A seesaw is a familiar example of a lever. In order to balance a person heavier than yourself you have to sit farther from the center of a seesaw than he does.② If he weighs twice as much as you do,③ you must sit twice as far from the center as he does. Any sort of bar can be a lever, if there is a fulcrum.

The lever shown in Figure 2 is a meter stick supported at its center, which is therefore the fulcrum.④ Two weights are hanging from the meter stick. They exert forces, f and F. If F is twice as large as f, the small force f must act twice as far from the fulcrum as the large force F, in order to balance the meter stick. But suppose F is not twice as large as f but still not the same as f, what is the general rule for getting balance?⑤ By experiment we find that the rule is simple.⑥ The distances of the weights from the fulcrum are inversely proportional to the weights themselves, that is,

$$\frac{f}{F}=\frac{d}{D} \quad or \quad fD = Fd$$

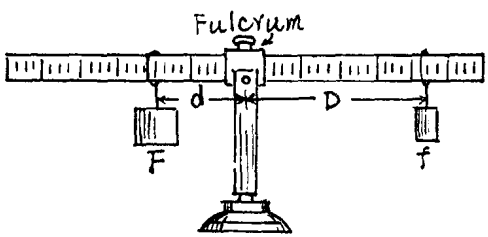

Fig. 2. The smaller weight must be farther from the fulcrum in order to balance.

For example, if the large force is 150 grams, the small force, 50 grams, and the distance *d*, 10 centimeters, then the distance *D* must be 30 centimeters, since

$$150 \times 10 = 50 \times 30.$$ ⑦

Words

seesaw ['si:'sɔ:] *n.* 跷跷板
familiar [fə'miljə] *a.* 熟悉的
order ['ɔ:də] *n.* 命令；次序
in order to 为了，以便
balance ['bæləns] *v.* 平衡，抵销 *n.* 平衡；天平，秤
have to (+动词原形)必须，不得不
person ['pə:sn] *n.* 人
farther ['fɑ:ðə] (far 的比较级) *ad.* 更远
center ['sentə] *n.* 中心，中央
weigh [wei] *v.* 称；重…
twice [twais] *ad.* 两倍；两次
as … as … 和…一样…
sort [sɔ:t] *n.* 种类
bar [bɑ:] *n.* 棒，杆
fulcrum ['fʌlkrəm] (复数 fulcra ['fʌlkrə]) *n.* 支点，支轴
figure ['figə] *n.* 图，图形；数字
stick [stik] *n.* 棍，杆
support [sə'pɔ:t] *v.* 支撑，支持
weight [weit] *n.* 重量，砝码
hang [hæŋ] (hung [hʌŋ], hung) *v.* 悬，挂，吊
exert [ig'zə:t] *v.* 施加，行使，尽(力)
suppose [sə'pouz] *v.* 假定
rule [ru:l] *n.* 规则，法则
inversely [in'və:sli] *ad.* 相反地
proportional [prə'pɔ:ʃnl] *a.* 比例的
be inversely proportional to 和……成反比
that is 就是说，即
gram [græm] *n.* 克
centimeter ['sentimi:tə] *n.* 厘米

Notes

① The lever is one of the simplest devices used as machines. 句中，"one of +复数名词"意为"…中之一"，介词 of 在这里表示部分和全体的关系。used as machines 是过去分词短语作定语，修饰 devices。