教育部大学英语教改示范点建设项目成果
大学专业基础英语系列教材

编◎蒙兴灿

Mechanical Basic English

机械基础英语

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前言

Preamble

《大学英语课程教学要求》指出“将综合英语类、语言技能类、语言应用类、语言文化类和专业英语类等必修课程和选修课程有机结合，以确保不同层次的学生在英语应用能力方面得到充分的训练和提高；既要保证学生在整个大学期间的英语语言水平稳步提高，又要有利于学生个性化的学习，以满足他们各自不同专业的发展要求”。为适应人才培养的需求，浙江理工大学依托教育部大学英语教学改革示范点建设项目，组织编写了本套大学专业英语系列教材。

本系列教材共6册，即《纺织基础英语》、《服装基础英语》、《机械基础英语》、《建工基础英语》、《商务基础英语》、《生物基础英语》。本系列教材在内容上突出基础性，强调专业性与应用性的有机结合，适合本科二、三、四年级非英语专业学生在完成基础英语学习之后，了解和掌握本专业的相关英语术语及知识。

本册教材《机械基础英语》介绍了机械方面的基础知识，旨在培养机械专业学生的英语能力，共分8个单元，精选了24篇相关文章，内容涉及机械学的历史演变、著名机械师和经典发明、机械性能、机械装置、机床、机械加工工艺、CAD/CAM与数控技术、机器人等诸方面。本书的主要特色有：

1. 选题新颖，实用性强。选材大部分来自世界著名英语报纸、杂志、网站，语言贴近现实，既涵盖了经典的机械学基础理论，又把握了前沿的机械学发展动态，内容生动、深入浅出、通俗易懂，并配以大量的精美图片辅助说明，是机械制造专业的入门普及教材，也可供机械类专业的科技人员参考使用。

2. 设计严谨，特色鲜明。每单元材料均围绕同一主题展开，听、说、读、写、译并重。本教材的听力和视频是一大特色，以情境为基础，以任务为主线，递进式地展开教学，有助于激发学生的课堂学习兴趣，调动学生学习的主动性，形成互动式的教学氛围。

3. 以人为本，注重实效。本书从自主学习角度设计，以学生为主体，以应用为目标，精心构建每个单元。为方便学生自主学习，每个单元都设计了话题讨论、相关机械词汇学习、篇章阅读、视听、翻译练习，并穿插形式多样的任务活动，最终提高学生语言能力。

本书能够顺利出版，得益于浙江理工大学外国语学院和浙江大学出版社的大力支持，也得益于编写组全体成员的通力合作和辛勤劳动，在此深表谢意。由于编者水平有限，本教材的疏漏和错误之处在所难免，欢迎大家批评指正。

编　者

2012年6月

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Unit 1

Ancient Mechanics and Mechanists

PART ONE

Warming-up Activities

1. Getting to know simple machines

Task: Get to know simple machines by reading the following paragraphs, and give some other examples of simple machines.

One of the most striking differences between humans and other animals is the human use of machines. Trains, cars and airplanes enable travel over great distances. Gigantic construction machines help to build enormous buildings and bridges. Subtle complicated machines like clocks keep track of time. Human lives in almost every way either depend upon or involve interacting with machines. Yet despite their great variety, all of these different machines are just different combinations of the six simple machines.

The lever is a simple bar attached to a pivot point that it is able to rest on. The see-saw is an example of a lever, as is the crowbar. The inclined plane, a scientific term for a ramp, is another simple machine. The wedge is basically a moving inclined plane. It is a hunk of strong material thick at one end and thin at the other. Axes, knives and doorstops are all wedges. A screw is a sort of circular inclined plane. It is a plane that spirals around a cylinder. Screws are often used to hold wooden objects in place. Wheels are simple machines. Pulleys are wheels with ropes around their rims.

2. Skateboard

Glossary

blunt /blʌnt/ *n.* 起跳后边缘降落，为滑板的一个动作
deck /dek/ *n.* 板面
griptape /'grɪpteɪp/ *n.* 砂
nollie /'nɒliː/ *n.* 带板倒跳
ollie /'ɒliː/ *n.* 带板腾空
skateboard /'skeɪtbɔːd/ *n.* 滑板
truck /trʌk/ *n.* 滑板的板桥

ramp /ræmp/ *n.* 斜面；斜坡；坡道

BMX（全称 Bicycle Motocross）小轮车


Task 1: What are the three main ways that simple machines make the work easier? Answer the question after watching the video.

Task 2: Watch the video again, and fill in the blanks.

The modern skateboard has an upturned area on the nose (or front) of the board, as well as on the tail (or back) of the board. The upturned kick 1) ____________ for the rider and helps to lessen the force exerted by the rider while performing tricks on ramps, in the street or on the flat ground. The lever action of a skateboard allows a rider to 2) ____________ the board and to make tricks easier to do. The lever on a skateboard allows the rider to perform ollies, nollies, tail slides and blunts to name a few choice tricks. The place where the trucks of the skateboard and the deck come together is 3) ____________, or a fixed point around which 4) ____________. The fulcrum action allows the rider to control the movement of a trick by 5) ____________ pressure to the fulcrum point.

3. Simple Machines

Task: Watch the video and fill in the blanks.

Glossary

cylinder /ˈsɪlɪndə/ *n.* 圆柱

hydraulics /haɪˈdrɔːlɪks/ *n.* 液压

joule /dʒuːl/ *n.* 焦耳（功或能的单位）

magnitude /ˈmægnɪtjuːd/ *n.* 量级；强度

wedge /wedʒ/ *n.* 楔子；三角木

inclined plane 斜面

wheel and axle 轮轴

1) Machine is any device that uses ________ to do work.

2) Work is, in science, defined as a force exerted over a ________.

3) A ________ machine is actually made up of much simpler parts.

4) The general list of 6 simple machines in the work of Da Vinci, are some of the earliest ________ of machines.

5) A definition for a simple machine is any mechanical device that changes the direction or the ________ of a force.

6) A ________ is simply a detailed example of a wheel and axle.

7) Hydraulics allows us to ________ forces, so we should include that in the list of simple machines.

8) A wedge is simply two inclined planes, and a screw is an inclined plane ________ about a cylinder.

9) The parts of the lever are going to be the arm and the ________.

10) There is an old ________ that says "if I had a lever long enough and a place to rest it, I can lift the world."

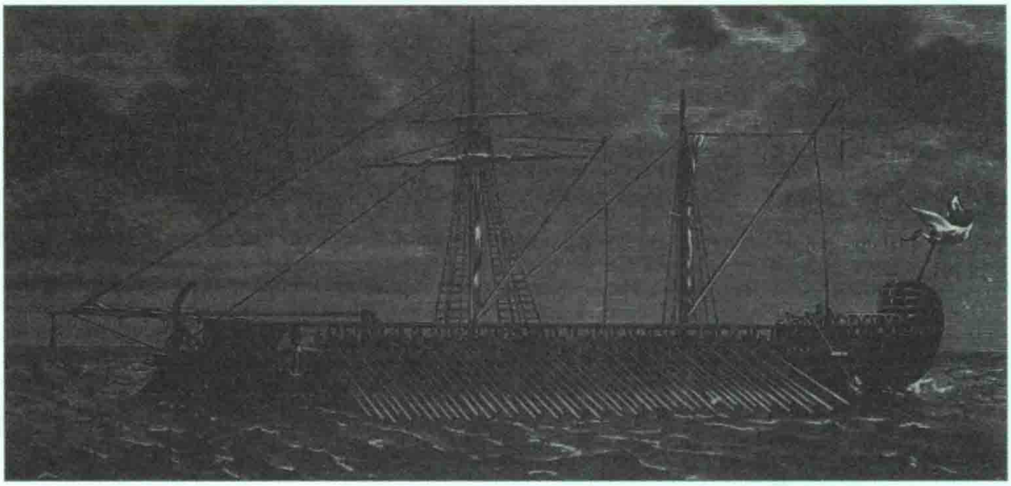
PART TWO

Reading Activities

Passage 1 Ancient Mechanics[1]

Guy Gugliotta

Consider the galley slave, clad in rags, chained to a hardwood bench and clinging to an oar as long as a three-story flagpole. A burly man with a whip walks back and forth shouting encouragement. You've seen the movie.



Stefano Bianchetti/Corbis

LAW OF THE LEVER On triremes, the midships oarsmen were the most effective.

That galley slave would have known that the rowing stations in the middle of the ship were best, although he might not have known why. That took scholars to figure out. "Think of the oar as a lever," Prof. Mark Schiefsky of the Harvard classics department said. "Think of the oarlock as a fulcrum, and think of the sea as the weight."

The longer the lever arm on the rower's side of the fulcrum, the easier to move the weight. In the middle of the ship, as the rowers knew, the distance from hands to oarlock was the longest.

This explanation is given in Problem 4 of the classical Greek treatise "Mechanical Problems," from the 3rd century BC, the first known text on the science of mechanics and the first to explain how a lever works. It preceded, by at least a generation, Archimedes' "On the Equilibrium of Plane Figures," which presented the first formal proof of the law of the lever.

Dr. Schiefsky teaches Greek and Latin as his day job and reads Thucydides [2]and Sophocles[3] in ancient Greek for fun. He also majored in astronomy as an undergraduate, and about nine

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years ago he joined a multinational research team called the Archimedes Project, based in Berlin.

The Archimedes team studies the history of mechanics, how people thought about simple machines like the lever, the wheel and axle, the balance, the pulley, the wedge and the screw and how they turned their thoughts into theories and principles.

The textual record begins with "Mechanical Problems," moves to Rome and then through the medieval Islamic world[4] to the Renaissance[5]. It ends, finally, with Newton[6], who described many of the basic laws of mechanics in the 18th century.

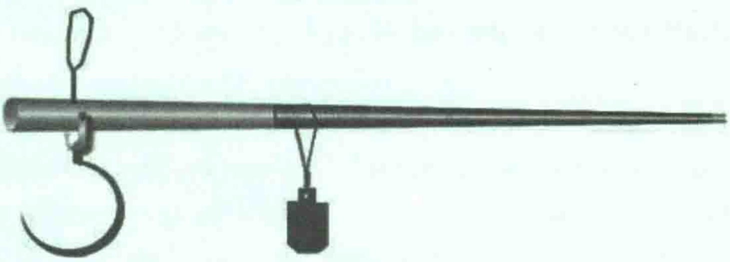
There are a surprising number of old, and extremely old, scientific texts that have survived the ravages of time in one form or another. The Archimedes Web site lists far more than 100, including Euclid[7]'s geometry, Hero of Alexandria[8]'s Roman-era technical manual on crossbows and catapults, medieval treatises on algebra and mechanics by Jordanus de Nemore[9] and Galileo[10]'s 17th-century defense of a heliocentric solar system.

The nice thing for Dr. Schiefsky is that hardly anyone reads the stuff. Scientists generally are not into ancient Greek or Latin, let alone Arabic, and most of Dr. Schiefsky's colleagues work on literature, philosophy, philology or archaeology. In fact, Dr. Schiefsky suggests "about 100 people" worldwide work on both science and the classics.

By following the historical record, the Archimedes researchers have discovered that the evolution of physics — or, at least, mechanics — is based on an interplay between practice and theory. The practical use comes first, theory second. Artisans build machines and use them but do not think about why they work. Theorists explain the machines and then derive principles that can be used to construct more complex machines.

The Archimedes researchers say that by studying this dialectic they can better understand what people knew about the natural world at a given time and how that knowledge may have affected their lives.

"What do you do when you want to weigh a 100-pound piece of meat and you don't have a 100-pound counterweight?" Dr. Schiefsky asked. "You use an unequal-armed balance, with a small weight on the long arm and the meat on the short arm." The uneven balance, known as a steelyard (see the illustration below), is a kind of lever.



One reason why Archimedes scholars find mechanics so attractive is that devices like the steelyard and lever have such long histories. "Practitioners knew about the lever long before the development of scientific theory, pretty much since the origin of civilization" Dr. Schiefsky said.

"Mechanical Problems" arrived in the modern world along with Aristotle's works. In fact, it was thought for centuries that Aristotle wrote it. "Most scholars discount that now," Dr. Schiefsky said. Aristotle cast wide theoretical nets, he added, while "Mechanical Problems" "is much more focused."

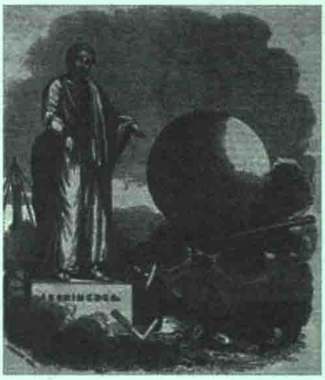
The author of "Mechanical Problems," Dr. Schiefsky said, clearly knew about Aristotle and adopted his matter-of-factness to describe a seemingly intractable dilemma in neat, practical terms. Problem 3 describes the lever's property.

"For it seems strange that a great weight is moved by a small force," the author wrote. "For the very same weight, which a man cannot move without a lever, he quickly moves by taking in addition the weight of the lever."

Problem 4 is the oarsmen, demonstrating the principle in a different context. The oarsmen sit in a row from stern to bow. The oars are the same length, but the distance between hands and oarlock, the lever arm, is longer amidships, because the ship is wider there. The midships oarsmen exert less force than their bow or stern co-rowers to move the same weight of water. Conversely, if the midships oarsmen row as hard as the others, they will move a greater weight of water and contribute more to the ship's movement.

Although the author of "Mechanical Problems" certainly understood how a lever worked, it was Archimedes who described the precise relationship between the weights and their distances from the fulcrum.

"He made this into a fundamental principle of theoretical mechanical knowledge that could be used by practitioners," Dr. Schiefsky said. Classical tradition credits Archimedes as having said, "Give me a place to stand on, and I will move the Earth."



EARTHMOVER Archimedes said he could move the Earth if given a place to stand.

"And the principle," Dr. Schiefsky added, "is that there is a proportionality between the force and the load, no matter how big the load. This is an intellectual transformation."

In the Middle Ages, the Arab world was a source for new scientific knowledge, as well as the custodian for much classical tradition, translated from Greek into Arabic beginning in the ninth century. By the 13th century, Western scholastics translated Aristotle from Arabic into Latin.

"Mechanical Problems" arrived later in the Renaissance, along with Greek copies of

Aristotle's works, rediscovered in libraries, monasteries and other Middle East repositories. It inspired many commentaries by Renaissance scholars and was read by Galileo and other theorists. Indeed, "Mechanical Problems" is in many respects as useful today as it was 2,500 years ago, as anyone who has twiddled the weights on a health club scale can attest.

Or consider the New York Athletic Club rowing coach, Vincent Ventura, a close student of Problem 4, even though he has never read it: "It's different for our people, because the length of the oar to the oarlock is the same no matter where you sit in the boat. Everybody pulls the same weight," he said in a telephone interview. Still, "once in a while we might shorten oar for a guy who's not as big as the others."

(1204 words)

New Words

algebra /'ældʒɪbrə/ *n.* 代数
amidships /ə'mɪdʃɪps/ *adv.* 在船中部
artisan /ɑːtɪ'zæn/ *n.* 工匠，技工
attest /ə'test/ *vt.* 证实,证明
bow /bəʊ/ *n.* 船头,艄
burly /'bɜːlɪ/ *adj.* 魁梧的，强壮的，粗鲁的
catapult /'kætəpʌlt/ *n.* (古代的)石弩，投石机
clad /klæd/ *adj.* 穿……衣服的；被……覆盖的
conversely /kən'vɜːslɪ/ *adv.* 相反地，反之
crossbow /'krɔːsbəʊ/ *n.* 石弓，弩
commentary /'kɒmənˌtərɪ/ *n.* 评论，(对某一著作)系统的注释(或评注)
counterweight /'kaʊntəˌweɪt/ *n.* 砝码，秤砣
custodian /kʌs'təʊdɪən/ *n.* 看守人，保管人，监护人
dialectic /ˌdaɪə'lektɪk/ *n.* 辩证法
dilemma /dɪ'lemə/ *n.* 困境，进退两难
discount /'dɪskaʊnt/ *vt.* 不全相信，怀疑地看待
equilibrium /iːkwɪ'lɪbrɪəm/ *n.* 相称，平衡，均衡
fulcrum /'fʌlkrəm/ *n.*(杠杆)支点，转动中心
galley /'gælɪ/ *n.* 单层甲板大帆船，大划桨船
geometry /dʒɪ'ɒmɪtrɪ/ *n.* 几何学，几何图形
heliocentric /ˌhiːlɪəʊ'sentrɪk/ *adj.* 日心的，以太阳为中心的
intellectual /ˌɪntɪl'ektʃʊəl/ *adj.* 智力的,理智的
interplay/'ɪntəpleɪ/ *n.* 相互影响，相互作用
intractable /ɪn'træktəbl/ *adj.* 棘手的,难处理的
Islamic /ɪz'læmɪk/ *adj.* 伊斯兰教的，穆斯林的

lever /'levə/ *n.* 杠杆
medieval /medɪ'iːvəl/ *adj.* 中世纪的，中古(时代)的
monastery /'mɒnəsˌterɪ/ *n.* 修道院，僧院
oar /ɔː/ *n.* 桨
oarlock /'ɔːlɒk/ *n.* 桨托，桨架
philology /fɪ'lɒlədʒɪ/ *n.* 语文学
practitioner /præk'tɪʃənə/ *n.* 从事者，实践者
precede /priː'siːd/ *vt.* 领先，先于，在……之前
proportionality /prəʊˌpɔːʃə'nælɪtɪ/ *n.* 比例(性)，均衡(性)
pulley /'pʊlɪ/ *n.*(皮带)轮，滑轮
ravage /'rævɪdʒ/ *n.* 劫掠后的残迹，灾害，灾难 [the plural][(+of)]
Renaissance /rɪ'neɪsns/ *n.* 文艺复兴
repository /rɪ'pɒzɪˌtərɪ/ *n.* 贮藏处，宝库；博物馆，陈列室
scholastic /skə'læstɪk/ *n.* 经院哲学家；学究
screw /skruː/ *n.* 螺钉，螺丝钉
steelyard /'stiːljɑːd/ *n.* 提秤，杆秤
stern /stɜːn/ *n.* 船尾
surplus /'sɜːpləs/ *adj.* 过剩的，剩余的
transformation /ˌtrænsfə'meɪʃən/ *n.* 变换，转变，变形
treatise /'triːtɪs/*n.* 论文，专著
twiddle /'twɪdl/ *vt.* 抚弄，转动
wedge /wedʒ/ *n.* 楔子，楔形物

Phrases and Expressions

back and forth	(前后)来回地，反复地
cling to	抓紧，紧握不放；坚持
in rags	衣衫褴褛，穿破衣服
let alone	更不用说，更别提
wheel and axle	辘轳，轮轴

Notes

1. excerpted from The New York Times issued on April 1, 2008
2. Thucydides (English pronunciation:/θju:'sididi:z/, c. 460 BC—c. 395 BC) was a Greek historian remembered for his history of the Peloponnesian War.
3. Sophocles (English pronunciation:/ ˊsɔfəkli:z /c. 496 BC—c. 406 BC) was one of the three great ancient Greek tragedians .
4. During the historical period between the 8th and 16th centuries, scientists and engineers of the Islamic world are credited with great contributions to science and civilization, by developing earlier traditions and by making relatively rapid and marked innovations.

5. Renaissance, literally "rebirth," refers to the revival of art and literature under the influence of classical models in the 14th-16th centuries.
6. Newton (1643—1727) was an English physicist and mathematician, considered by many to be the greatest and most influential scientist who ever lived. In Mathematical Principle of Natural Philosophy (1687), which lays the foundations for most of classical mechanics, Newton described universal gravitation and the three laws of motion, which dominated the scientific view of the physical universe for the next three centuries.
7. Euclid (English pronunciation:/'ju:klid/,c.300 BC) was a Greek mathematician, often referred to as the "Father of Geometry".
8. Hero of Alexandria, (c. 10—70 AD), was a Greek mathematician and engineer. His surviving works are important as a source for ancient practical mathematics and mechanics.
9. Jordanus de Nemore was a 13th-century European mathematician who wrote treatises on at least 6 different important mathematical subjects: the science of weights; "algorismi" treatises on practical arithmetic; pure arithmetic; algebra; geometry; and stereographic projection.
10. Galileo(1564—1642)was an Italian physicist, mathematician, astronomer, and philosopher who played a major role in the Scientific Revolution, called the "Father of Modern Science".

Post-Reading

Discussion

Directions: Read the text and answer the following questions.

1. What is the reason that the rowing stations in the middle of the ship were best?
2. What is the first known text on the science of mechanics and the first to explain how a lever works?
3. What does the Archimedes Project do?
4. What is the dialectic for the Archimedes researchers?
5. If the stern oarsmen row as hard as the others, can they make the same contribution to the ship's movement?

Vocabulary

1. **Directions:** Fill in the blanks with the words provided from the text.

natural	strange	attractive	useful	big
precise	stand	easier	basic	fundamental

1) The longer the lever arm on the rower's side of the fulcrum, the __________ to move the weight.

2) By studying this dialectic they can better understand what people knew about the ________ world at a given time and how that knowledge may have affected their lives.

3) One reason why Archimedes scholars find mechanics so __________ is that devices like the steelyard and lever have such long histories.

4) It seems __________ that a great weight is moved by a small force.

5) He made this into a __________ principle of theoretical mechanical knowledge that could be used by practitioners.

6) "Give me a place to __________ on, and I will move the Earth."

7) The principle is that there is a proportionality between the force and the load, no matter how __________ the load.

8) Indeed, "Mechanical Problems" is in many respects as __________ today as it was 2, 500 years ago.

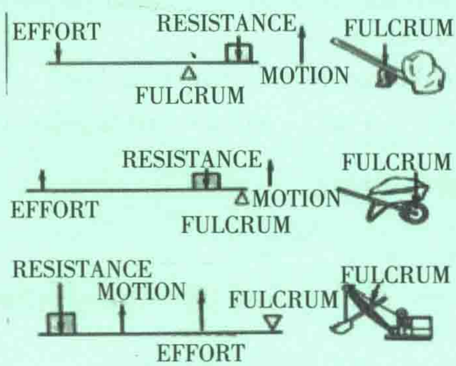
9) It was Archimedes who described the _________ relationship between the weights and their distances from the fulcrum.

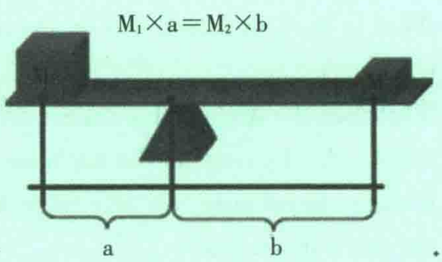
10) It ends, finally, with Newton, who described many of the__________ laws of mechanics in the 18th century.

● Cloze

Directions: Fill in the following blanks with a suitable form of each word provided. Some of the words can be used twice.

call	identify	resist	locate	apply	give	prove	amplify	reduce





Levers are classified by the relative positions of the fulcrum and the input and output forces. It is common to 1)__________ the input force the effort and the output force the load or the resistance. This allows the 2)__________ of three classes of levers by the relative locations of the fulcrum, the resistance and the effort:

Class 1 Fulcrum in the middle: the effort is applied on one side of the fulcrum and the 3)__________ on the other side, for example, a crowbar or a pair of scissors.

Class 2 Resistance in the middle: the effort is applied on one side of the resistance and the fulcrum is 4)__________ on the other side, for example, a wheelbarrow or a nutcracker or a

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