专业科技英语阅读教程

郭长铭　编译

Reading Materials of Science English in Mechanics and Mechanical Engineering

中国科学技术大学出版社

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内 容 简 介

本书是近20年来在中国科学技术大学力学和机械工程系开设科技英语课程的基础上整理而成的。全书分为专业科技文章、国际学术交流(包括投稿须知和国际学术会议征文的撰稿格式等)、计算机英语、其他科技英语(包括大学简介、学术调研和科普文章)和科技英语中常用的构词法5部分,共选用不同类型、有代表性的科技文章18篇。每篇文章均对重点或疑难词汇做了详注,并附有相应的参考译文。可作为理工科院校科技英语课程或进修班教材。

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前　言

目前不少大专院校的学生在达到大学英语4级要求后，直接阅读英语科技资料仍有许多困难；一些具有中等英语水平的工程师、科技人员和大专院校的教师也存在类似的问题。具体表现为不熟悉大量的专业词汇，不能确切理解文字的含义，阅读速度太慢等等。这当然影响他们对英语文献资料的掌握和运用。造成这一状况的主要原因是，目前大学英语教材着重日常生活英语(Everyday English)和文学英语(Literature English)的训练，虽然在教材中也包含了一些科普文章，但训练的强度远不能满足阅读科技英语资料的要求。随着改革开放的日益深入，科技领域的国际交流更加频繁，要求人们阅读英语科技资料，确切理解文字的含义，甚至进行英译汉或汉译英的文字翻译工作。为了适应这方面的要求，现在不少高等院校要求学生在校学习期间外语训练不断线，即在通过4级考试后仍以各种方式继续进行外语训练，包括开设科技英语、第二外语课程等。

根据作者多年的教学经验，科技英语往往是学生继续接受英语训练的首选课程。目前很多大专院校开设了这门课程，但是相应的教材建设不能满足实际的需求。有的就选一本英语教科书作教材，阅读范围狭窄，有的自编了教材，但内容陈旧，风格单调，不能适应当前的教学要求。事实上，很难有一本现成的教材能适应各校科技英语课程的要求。因此建设该课程高水平教材的任务只能自行解决。本书的编写就是为了满足这一需求而进行的一种尝试。

中国科学技术大学力学和机械工程系自20世纪80年代初就开设了科技英语课程，强化阅读机电工程类的英语科技资料。近20年来，先后自编了3本讲义，获得了较好的教学效果。现在不仅本系的学生踊跃选修科技英语课程，不少其他系的学生也来选修这门课。因此在教学和教材的编写上积累了比较丰富的经验。

本书以具有中等英语水平的读者为对象，以培养借助词典独立阅读英语科技资料的能力为目的。作者直接从各类英语科技文章中选取材料(包括科技论文、教科书、研究报告、大学简介、国际学术会议征文通知、国外学术刊物投稿须知、科技记者报道文章等)，不加删减或简写，对常用的科技词汇和科技文章中常见的语法现象做出注释，指导读者阅读。通过接触各种不同类型的科技文章，增强读者在实际工作和学习中应对英语资料的能力。书中选取文章的内容新颖，覆盖面广(涉及机电、力学、材料、计算机、气象等领域)。书后附有阅读材料的参考译文，以帮助读者确切理解原文；附录中收录了大量科技词汇的前缀和后缀以及例词，以帮助读者通过熟悉构词方法掌握更多的科技词汇。本书可作为大专院校机械工程类专业高年级学生60学时课程的教科书，也可作为具有中等英语水平的工程技术人员和

科研人员提高专业英语水平的自学教材。

全书包含5部分。第一部分是专业科技文章的阅读，一共选用了6篇文章。有2篇是书的前言，一篇是教科书前言，另一篇是学术专著前言。从某种意义上说，前言是一本英文书最难读的部分。正文部分往往有公式、图表、照片等材料帮助读者了解文字的含义，在基本掌握了专业词汇后一般就能比较顺畅地阅读。而前言部分完全依赖对文字的理解，并且其内容往往并不局限在专业内容上。在作者看来，能够阅读一本书的前言，也就具备阅读该书正文的能力。当然，在强调前言重要性的同时，并不排斥正文的阅读。所以选用了2篇教科书的正文。一篇是材料力学领域的应力应变分析。从专业内容来看，它是工科院校学生都比较熟悉的，阅读时不会有专业背景知识方面的困难；从文章风格来看，它偏重于定义、定理、定律和概念的阐述，读者可以熟悉这些措词严谨的文字在英语中的表达方式。还有一篇是介绍机械加工制造的基本知识，让读者熟悉各种加工工艺的专业词汇，这恰是目前我们的学生所十分欠缺的地方。除此之外，还选用了一篇关于冲击载荷的论文和一篇生物力学方面的研究简报。在冲击载荷这篇论文中，读者可以看到如何用英语来描述和分析复杂的实验现象，这样的文字在科技文献中是十分典型的。这6篇文章基本涵盖了各种不同类型的专业科技文章。

第二部分涉及国际学术交流所需要的英语，主要由两类资料构成。一是刊登在国外学术刊物上的作者投稿须知。随着中国科学技术整体水平的不断提高，国际学术交流的加强，越来越多的研究成果将在国外学术刊物上发表。向国外学术刊物投稿时，论文本身的学术水平和确切的英语表达固然是决定稿件是否被录用的主要因素，但是论文的格式是否符合该刊物的要求也是一个不可忽视的因素。根据作者的经验，学术地位越高的刊物对格式的要求越严格。有的刊物甚至对修改文章所使用的符号都有自己的一套规定。“燃烧与火焰”是国际燃烧学会的会刊，是国际上公认的最有影响力的高品位学术刊物之一。它所发表的论文均被SCI(高影响因子区)和EI两大权威检索系统收录。该刊物在很多方面都与众不同、独树一帜。熟悉和掌握了它对稿件格式的要求，其他刊物的格式要求也就一目了然了。归入这一类的还有稿件录用后编辑部的通知，转让论文版权的声明，稿件清样的修改，论文在编发过程中的查询以及抽印本的预订等，一共5篇文章。另一类是国际学术会议征文通知。每年有许多国际学术会议在国内外举行，参加学术会议同样是了解某领域的研究进展和趋势，结识国外同行的好机会。征文通知上不仅有学术方面的规定和要求，往往还有与会议有关的交通、住宿、旅游和费用的说明。了解这些情况对于顺利参加会议也是很有必要的。

第三部分涉及计算机应用的文字资料。因为要适应不同文化层次的用户，计算机应用的英语比较容易阅读，一般不使用生涩的词汇。但是它有大量的专业词汇。熟悉这些词汇对上网浏览和学习使用尚未汉化的计算机软件很有帮助。这里

选用了3篇文章。一是计算机和信息扫盲，讲述计算机最基本的原理、分类等，二是计算机多媒体输入设备，三是计算机行业发展的历史。其中发展历史一文从第一台真空管计算机的诞生讲起，记录了半个多世纪来计算机硬件和软件技术进步的重大事件，也是一分颇有价值的文献资料。

为了适当扩大阅读范围，作者安排了第四部分。这里选用了3篇文章。一篇是美国一所大学的简介。现在不少本科生毕业后选择出国留学的道路。对这些人来说，了解国外大学的情况无疑是十分重要的。而阅读大学简介，了解某大学的历史、特色、专业设置、课程安排以及费用和奖学金等，是一个十分重要的手段。选择史蒂文斯工学院不仅是取其名气，也因为其课程设置与我系十分接近。另一篇是科技记者的报道性文章，是从著名的“国家地理”(National Geographic)杂志上筛选的。这是另一种类型的科技文章，我们在报刊杂志(如“参考消息”)上看到的科技进展和最新研究成果报道，基本属于这一类。它一般不要求读者有较深的专业知识，但涉及的问题范围广阔。近年来，气候的变化越来引起人类的共同关心。这是作者所看到的最全面和深入探讨厄尔尼诺和拉尼娜现象的非专业性文章。虽然气象问题不属于工程技术的专业范畴，但是对于一位科技人员和在校大学生来说，能够阅读“国家地理”一类的杂志无疑是有益于扩大视野，提高英语阅读能力的。还有一篇是调查问卷。Elsevier是全球享有盛誉的科技书刊出版集团，它所出版的高品位书刊以反映信息迅速及时，学术水平高，印刷精良著称。它有一项目前国内任何一家学术刊物编辑部都未曾采取过的措施，即在文章发表后要求作者匿名填写的一份调查问卷。该项调查罗列了很多问题，但核心问题是作者是否将近期最优秀的研究成果发表在它麾下的刊物上。这恐怕是它的良苦用心所在。同时，这也许是刊物能长久保持高学术地位的惟一途径。

第五部分收录了科技词汇中常用的构词成分。一般来说，各行各业都有自己的术语或行话，不懂得这些术语也就很难与之沟通。科技词汇的最大特点是数量巨大，而且不断出现新的词汇。如何掌握科技词汇是每个人所面临的问题。应该说，通过分析构词成分来理解一个单词的意义是一条捷径。作者在教学过程中要求学生遇到生词后尽量不要立即查词典，首先从构词成分来“猜测”生词的意义。掌握的构词成分多了往往能猜个八九不离十。词典不是不用了，但它的作用变成确认自己“猜测”的正确程度以及了解该术语在各专业领域中的确切译名。举一个例子来说明，superconductivity是一个较长的单词，死记硬背可能还不容易记忆。从构词成分来看该词可以分成三部分：一是前缀super-，表示在…之上，超，极，过等意思，二是词干conduct，有指引，传热，导电等意思，三是后缀-ity，构成抽象名词，表示“性质”、“状态”等意思。三者结合起来可知该词的大概意思为超级传导(电)性能。查阅词典，知道它在物理学科规范的术语是“超导(电)性”。掌握了这个单词，其他如superalloy、supercritical、supersonic、supervision等以super-为前缀

的单词的记忆也就迎刃而解了。由于篇幅有限，本书的收录以力学和机械工程专业为主，考虑到学科的交叉，也适当兼顾其他领域。但是大量涉及生物、医学、化学、宗教等领域的构词成分并未收录。有的构词成分具有多种意义，本书往往只收录其与力学和机械工程领域有关的用法和含义。

附录中列出了国际单位制中用以表示十进制倍数的词头及符号。

尽管作者做出了很大的努力，在浩如烟海的科技文献资料中筛选出上述一些文章编译成书，仍然只是一种尝试。读者也不能指望通过看这本书就能掌握所有的专业词汇，就能流畅地阅读本专业的任何英语科技资料。如果本书对于读者阅读英语科技资料能提供帮助，则是作者最大的欣慰。

最后，作者谨向对编写本书做出贡献的几位同仁表示衷心的感谢！邵玉琴教授和鄢德平编辑为本书提供了大量科技文献，其中不少被采用；汤天锡博士阅读了大部分译文并亲自进行修改；博士生王昌建仔细审阅并验证了书中的计算机程序；储炜老师担负了将手稿输入计算机的繁重工作。

郭 长 铭

2003 年 8 月

于中国科学技术大学

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PART I: READING MATERIALS OF SPECIALIZED SCIENCE ENGLISH

1. Preface to "Classical Mechanics"*

This book is the product of teaching classical mechanics on both the undergraduate and the graduate levels intermittently[1] over the past 20 years. It covers mechanics in a unified fashion from the foundations, through elementary and intermediate mechanics, to a moderately advanced graduate level. Knowledge of calculus is presumed. Any other mathematics needed is provided in the appendices.

Volume 1 can be used as a text for undergraduate course. Volume 2 can be used as a text for graduate course. By judicious[2] deletion[3] of material, courses of almost any length can be accommodated. The breadth and detail of the coverage is such that the book can also be used by students wanting to learn mechanics on their own, or by instructors wanting to direct students through self-paced[4] programs. All the topics customarily found in an undergraduate or graduate text are covered, though frequently, in greater depth or detail, or from a slightly different point of view. In addition there are many interesting and useful topics that are seldom found in the standard texts. Hence this book can also serve as a source book for an instructor in mechanics, or as an aid to a researcher whose need for mechanics exceeds what is provided by the usual text.

Much material is covered, but no attempt has been made to write an encyclopedic[5] text on classical mechanics, rather, the subject is arranged in such a way that additional material can be inserted easily and naturally.

Knowledge of mechanics that will continue to mature beyond the termination of a formal

* This article is adopted from the textbook "Classical Mechanics", written by Edward A. Desloge, published by Wiley Interscience Publication, New York, 1982.

course requires a clear and accurate grasp of the organization of the subject. Throughout this book, I have tried to stress organization, clarity and accuracy. This emphasis may sometimes appear to result in an approach that is overly stiff, detailed and formal. The niceties of charm, elegance and warmth, where lacking, can be supplied by a good instructor. A weakness in organization is almost impossible to repair.

One of the most crucial stages in the exposition of any subject in physics is the choice of notation. A good notation is comprehensive[6]; that is, it carries all the information that is required to avoid misinterpretation, and yet it is simple. Slight differences are often quite significant. For example, it is both more meaningful and more useful to express the components of a vector $\boldsymbol{A}$ with respect to a frame S' as $A_{i'}$ rather than A'_i. I have thought a great deal about the notation. If I have erred, it is more often than not in using notation that is somewhat overloaded. The appearance of many of the discussions and derivations could be improved by stripping the notation of some of its appendages. The loss however would generally outweigh the gain. For example, the appearance of arguments involving partial derivatives such as $(\partial f/\partial x)_y$ or equivalently $\partial f(x,y)/\partial x$ could be improved by writing such terms simply $\partial f/\partial x$. I have at times done this myself. However, anyone who has taught a course in thermodynamics will verify that the consequences can be disastrous, if one is not careful.

In writing this book, I have used a number of organizational and pedagogical[7] devices that I have found over the years to be particularly helpful.

(1) The material is highly subdivided, to give emphasis to the organization and to facilitate reorganization.

(2) The chapters are short, to make assimilation[8] easier and to aid in the addition, deletion or rearrangement of material.

(3) Formal definitions, postulates and theorems are frequently used, to emphasize and clarify important concepts and to foster[9] exactness.

(4) Most chapters contain one or more examples designed to illustrate an idea, or to provide general techniques for solution of problems, rather than to serve as models to be slavishly imitated.

(5) There are a large number of problems, since the ability to systematically solve a wide variety of problems is one of the goals of a course in mechanics.

(6) All mathematics development needed is provided in appendices. In this way the continuity of a physical argument is not broken, and yet the mathematical tools are readily available.

A number of benefits, other than problem solving, can be derived from a course in classical mechanics. Three in particular have influenced me strongly in writing this book.

1. Since physics as we know it today had its origins in classical mechanics, the very[10] structure and language of physics is permeated[11] by ideas that come from classical mechanics; hence a knowledge of the foundations of mechanics can provide a student with a deeper grasp of all of physics. I have therefore devoted considerable effort to developing the foundation of classical mechanics.
2. A course in classical mechanics is not only a course in physics but also a course in applied mathematics. The inclusion of certain topics, and the extensive mathematical appendices in this book, reflect this aspect of mechanics. As much consideration has been given to the writing of the appendices as to the text proper[12]. Though relegated[13] to appendices, the mathematical topics are an integral part of the text.
3. The human brain contains two hemispheres whose characters have been shown to be different but complementary. In most individuals, the right hemisphere, which is associated directly with the left hand, the left field of vision and so forth, is superior in handling geometrical concepts, and the left hemisphere, which is associated directly with right hand, the right field of vision and so forth, is superior in handling formal analytical concepts. Learning physics involves an interesting interplay between these two abilities. The left hemisphere provides the analytical map that takes us from one point to another, while the right hemisphere provides the geometrical vision necessary to see the goal and landmarks along the way. A course in classical mechanics offers a marvelous vehicle for developing and integrating both the geometrical and the analytical powers of the brain. The Newtonian approach to mechanics is strongly geometrical, whereas the Lagrangian and Hamiltonian approaches are strongly analytical. It follows that a course designed to exercise both sides of the brain should, as this text does, include a thorough foundation in Newtonian mechanics before proceeding to Lagrangian and Hamiltonian mechanics. Too many modern courses in classical mechanics are built on a weak foundation of Newtonian mechanics, with the resultant complaint by instructors that a particular student is good at mathematics but does not seem have any physical intuition[14].

To make volume 1 adequate for an undergraduate course and volume 2 adequate for a graduate course, certain topics are covered in both volumes. Central force motion, the differential scattering cross section and small oscillations are introduced in volume 1, and reviewed and extended in volume 2. Rigid body motion is covered in great detail from the Newtonian point of view in volume 1, and briefly reviewed and treated from the Lagrangian and Hamiltonian point of view in volume 2. An introduction to Lagrangian and Hamiltonian mechanics is given in volume 1, to prepare the students for the full treatment in volume 2.

To conclude this preface, I point out some aspects of the book that are unique or are, in my opinion, treated better or more thoroughly here than elsewhere.

In Chapters 1 -4,85 and 86 the basic principles of Newtonian and relativistic kinematics are derived starting from the assumption of the existence and equivalence of inertial frames of reference. With this assumption, the law of transformation between inertial frames arises naturally and contains only one undetermined parameter, which is identified as the upper speed with which a particle can move with respect to an inertial frame. By choosing this parameter to be infinite we obtain the Galilean transformation, and by choosing it to be finite we obtain the Lorentz transformation.

In Chapters 8,9,88 and 89 an investigation of quantities that might be conserved in a collision leads naturally to the momentum conservation laws of Newtonian and relativistic mechanics, and from these laws to the definitions of force in both Newtonian and relativistic mechanics.

The treatment of the foundations of Newtonian and relativistic mechanics contained in the two above-mentioned sets of chapters clearly brings out the close relation between Newtonian and relativistic mechanics, and the primacy of the law of conservation of momentum over Newton's equation of motion and its counterpart[15] in relativistic mechanics. It is the most thorough treatment that can be found anywhere. Many of the details are new and unique.

Chapter 6 presents very carefully and thoroughly the definition and properties of the angular velocity of one coordinate system with respect to another. By starting with the analytical definition of angular velocity rather than the geometrical definition, as is customarily done, many of the difficulties associated with this concept are avoided. Even though a good grasp of this concept is a prerequisite to an ability to express the laws of motion in rotating frames, and to an understanding of the kinematics and dynamics of rigid bodies, it is amazing to me how many of standard texts are weak on this subject, and frequently contain spurious[16] definitions of angular velocity.

Chapter 23 contains one of the simplest and most organized treatments of central force motion of which I am aware.

Chapters 24, 26, 60 and 61 contain a very complete treatment of the differential scattering cross section. Chapter 61 derives the relationship between the center of mass and laboratory cross-sections for a collision, which is inelastic and the product particles differ from the incident particles. No other text that I know of contains this complete result.

The treatment of rigid body motion in Chapters 34 - 40, with the possible addition of Chapters 41,63 and 64, is sufficiently complete and detailed to form a course by itself.

Chapter 38 is a thorough treatment of the inertia tensor from both the analytical and the geometrical points of view. Chapter 39 contains an extremely detailed treatment of Euler angles, and the kinematics of rigid body motion. The expression in Chapter 39 of the equations of transformation between different reference frames and the relative angular velocities between these frames in terms of Euler angles is a very useful aid to anyone interested in solving rigid body motion problems.

Chapters 47 -54 give a thorough treatment of Lagrange's equations of motion and include a detailed treatment of constraints[17] both holonomic[18] and anholonomic[19]. Since most undergraduate courses do not have the time for such a complete treatment, an introductory abbreviated treatment appears in Chapters 42 - 44.

The treatment of small vibration in Chapters 45 and 65 contains a number of results that cannot be found elsewhere.

The material in Chapter 66 together with the material in Appendices 28 -30 represents a complete introduction to group theory and its application to symmetrical vibrating systems. Although the complexity of the notation makes the going[20] a little tedious[21] at times, the text contains none of the gaps and guesswork that seem to mar the treatment I have found elsewhere.

Quasi-coordinates and the Gibbs-Appel equations of motion covered in Chapters 67 - 70 are probably unknown to most physicists. There are only a few mechanics books in which they are even mentioned. Because I think they deserve more attention and are quite useful in solving certain problems, I have included them.

The treatment of Hamilton's equations of motion, canonical[22] transformation and Hamilton-Jacobi theory in Chapters 71 - 78 is quite unusual, in that no use is made of the calculus of variations[23]. Although this results in many of the proofs being a little longer than usual, I feel that it provides a more secure foundation in the subject, since most students who are encountering this subject for the first time are not completely sure of themselves in the use of the calculus of variations. This unsureness is usually compounded by the casual[24] and sometimes erroneous use of the calculus of variations by some authors.

Although I prefer not to use the calculus of variations in a student's first encounter with Hamiltonian mechanics, I certainly believe it to be an extremely useful tool, hence have devoted Part 8 and Appendix 32 to this subject. The initial separation of the calculus of variations from Hamiltonian mechanics has the added organizational advantage of allowing the instructor who so desires to pursue the subject beyond and apart from what is required in

Hamiltonian mechanics.

The presentation of the foundation and basic principles of relativistic mechanics in Part 9 is, I believe, one of the most logical and straightforward to be found anywhere. Though some of the proofs are little ponderous[25], the general flow of concepts does not require an extraordinary distortion of a student's imagination. As a consequence relativistic mechanics seems almost inevitable.

The nature and importance of constants of the motion is stressed time and again throughout the text, starting with Chapter 17 and proceeding through Chapters 33, 46, 56, 71 and 81. Chapter 56 considers in detail the relationship between constants of the motion and the invariance of the Lagrangian under certain transformations, and Noether's theorem is presented without making use of variational techniques as is usually done in those few sources where this theorem can be found.

The subject of impulse[26], which usually causes students a great deal of unnecessary grief, is developed in detail in Chapters 18, 41 and 57.

Many of the appendices are quite useful in themselves, apart from their value in the body of the text. However since this book is intended primarily as a mechanics text, and only secondarily as a course in applied mathematics, many theorems in the appendices are stated without proofs. Proofs that particularly pertinent[27] or cannot easily be found elsewhere are given.

In appendices 4 -6 and 23, the reader is led systematically from the geometric concept of a vector as a directed line segment to the highly analytical concept of general tensors. With a little amplification and completion of proofs, the material would make a good course in vectors and tensors.

Similarly, the material in Appendices 12 and 24 - 26 with the possible addition of the materiel on quadratic forms in Appendix 27 forms a good outline for a course in matrices.

Appendix 32 provides an excellent introduction to the calculus of variations.

Appendices 11, 15, 19 and 22 cover a number of topics very important to classical mechanics in a manner that is both simpler and clearer than can be found elsewhere.

While writing this book, I have not had in mind a hypothetical audience, but rather have written as if I were to be the reader. The book is in a sense a reflection of myself. Its

exposure to numerous students over the years has sharpened rather than altered this reflection. I suspect that this is how most texts are written. Interestingly, I am dominantly a right hemisphere thinker—that is I think in terms of pictures—but the first impression readers gain of the text is that it is dominantly analytical. The probable explanation of this apparent anomaly[28] is that one tends to emphasize the things that are personally difficult while at the same time ignoring what comes easily, with the result that the material is more analogous to a photographic negative than to a positive print. In any case the success of this book will depend on how many others share the difficulties, problems, loves and hates that I experienced in learning classical mechanics. I hope that there are many, and that through this book they will derive some of the pleasure I have found in my encounter with classical mechanics.

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ANNOTATION

[1] intermittently *adv.* 断断续续地，间歇式地。**相关词汇**：intermittent *adj.* 断断续续的，间歇式的。**例词**：intermittent current 间歇电流；intermittent fever 间歇（发）热；intermittent spring 间歇喷泉

[2] judicious *adj.* 明智的，有判断力的，有见识的

[3] deletion *n.* 删除

[4] self-paced *adj.* 自己掌握步速的，自己控制进度的

[5] encyclopedic *adj.* 百科全书式的

[6] comprehensive *adj.* 综合性的

[7] pedagogical *adj.* pedagogy 的形容词，等同于 pedagogic；教学法的

[8] assimilation *n.* 消化

[9] foster *v.* 培养，抚育

[10] very *adj.* [加强语气]正是，就是。**例句**：That is the ～ thing that I have been looking for. 那正是我一直在寻找的东西。

[11] permeate *v.* 渗透，散布

[12] proper *adj.* 适当的，正确的，固有的，严格意义上的

[13] relegate *v.* 降级，归入

[14] intuition *n.* 直觉

[15] counterpart *n.* 对等的人或物

[16] spurious *adj.* 假的，错误的

[17] constraint *n*. 逼迫，勉强；约束
[18] holonomic *adj*. 完全的，完整的
[19] anholonomic *adj*. 非完全的，非完整的
[20] going *n*. 离去，(地面或道路的)状况，工作情况
[21] tedious *adj*. 冗长乏味的
[22] canonical *adj*. 依照教规的，审定的，正规的；正则的
[23] calculus of variations 变分运算，变分法
[24] casual *adj*. 漫不经心的，随心所欲的，临时的，疏忽大意的
[25] ponderous *adj*. 沉闷的，艰涩的
[26] impulse *adj*. 冲动的，冲击的
[27] pertinent *adj*. 有关的，中肯的
[28] anomaly *n*. 反常之事物，异物

2. Stress and Strain Analysis*

NORMAL[4] STRESS

If a plane cuts through a body subject[5] to external[6] loading[7], and the portion of the body to one side of the plane is removed, then a free-body[8] diagram of the remaining portion must show a force acting on the cutting plane. This force represents the action of the portion of the body that has been removed. The component[9] of this force perpendicular[10] to the plane is called the ***normal component*** or ***normal force***. Dividing the magnitude of the normal force by the area over which it acts yields[11] the ***normal stress*** σ. (See Problem 8.1)

SHEARING[12] STRESS

The force acting on the cutting plane as defined above usually also has component in the direction of the plane itself (i.e., lying in the plane). This component is called the ***shearing force***. Dividing the magnitude of the shearing force by the area over which it acts yields the ***shearing stress*** τ. (See Problem 8.1)

GENERAL STATE OF STRESS AT A POINT

If a three-dimensional[13] rectangular[14] block of very small size is considered to be removed from a body subject to external loads, there will be one normal stress and two shearing stresses on each of its six faces, as shown in Fig. 8-1. However, these stresses have only six distinct[15] values at the point represented by this block. (See Problem 8.1.)

* This article is adopted from the textbook "Theory and Problems of Statics[1] and Mechanics of Materials", written by William A. Nash, published by McGraw-Hill Companies, Inc., 1991. "Stress[2] and Strain[3] Analysis" is the eighth chapter of the book.