



SPECIAL ENGLISH

高等学校专业英语教材

通信与信息工程

专业英语教程

(第2版)

☆ 陈杰美 主编 ☆ 刘洪盛 饶渐升 编 ☆



电子工业出版社

PUBLISHING HOUSE OF ELECTRONICS INDUSTRY

<http://www.phei.com.cn>

014037608

H31-43
142-2

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内容简介

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内 容 简 介

本书旨在培养和提高学生在通信专业方面的英语阅读、笔译能力,同时也有助于培养英语专业文章的写作能力和对专业问题的口头表达能力。本书简要介绍科技英语的基本知识和特点,课文精选自国外知名大学的通信工程教科书,涵盖现代电子通信的各个领域,系统性强,且行文流畅。各课皆附有生词表、难点注释和练习题。书后附有参考译文和参考文献。为方便教学,本书另配有电子教案和练习题参考答案,向采纳本书作为教材的教师免费提供。

本书可作为高校通信与信息工程专业英语教材,对相关专业的专科生、研究生和工程技术人员也有裨益。

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图书在版编目(CIP)数据

通信与信息工程专业英语教程 / 陈杰美主编. —2 版. —北京: 电子工业出版社, 2014. 4

高等学校专业英语教材

ISBN 978-7-121-22776-9

I. ①通… II. ①陈… III. ①通信工程-英语-高等学校-教材 ②信息工程-英语-高等学校-教材 IV. ①H31

中国版本图书馆 CIP 数据核字(2014)第 060307 号

策划编辑: 秦淑灵

责任编辑: 秦淑灵

印 刷: 北京京师印务有限公司

装 订: 北京京师印务有限公司

出版发行: 电子工业出版社

北京市海淀区万寿路 173 信箱 邮编 100036

开 本: 787×1092 1/16 印张: 19.25 字数: 611 千字

印 次: 2014 年 4 月第 1 次印刷

印 数: 4 000 册 定价: 39.00 元

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前 言

科技专业英语是大学英语教学的重要组成部分,是帮助和促进学生继续英语学习,并学以致用有效途径。本书旨在帮助通信与信息工程和相关专业的学生提高阅读、理解和笔译专业英语文献的能力,以及培养用英语书写科技文章及其摘要的能力,也有助于通过课堂教学和其他方式,培养用英语口语讨论专业问题的能力。

本书首先简要介绍科技英语的基本知识,说明科技英语的特点和学习科技专业英语应注意的问题,以有助于后续课程的学习和教学,这是本书的一个特点。随后分 20 课来展开通信专业英语的学习。书中课文均精选自国外知名大学近年编著的通信与信息工程教科书。之所以从教科书选材,是因为其行文流畅,概念准确,深入浅出,生僻词少,同时内容又紧跟科学技术的发展,最适于专业英语的学习。所选内容几乎涵盖了现代电子通信各个领域的基本知识,有助于把专业英语的学习与专业知识的学习结合起来,也有助于提高学生专业英语的兴趣,并学以致用。每课课文之后,均列出了该课文的生词及词意,以便学习时查阅。并给出课文中的难句、长句,以及难以理解的词组的解释。对一些专业知识背景做了说明,有利于对课文的正确、深入理解。每课均附有短小精悍的阅读材料,以便学生课后阅读。最后,笔者结合多年专业英语教学的经验,编撰了适量的、形式多样的练习题,以利于教与学的组织与开展,也便于学生自我检查。在本书书后附有各课课文(节选)的参考译文和参考文献,以便学生和教师查阅参考。

为了方便教学,本书另配有电子教案和练习题参考答案,向采纳本书作为教材的教师免费提供。(获取方式:登录电子工业出版社华信教育资源网 www.hxedu.com.cn 或电话联系 010-88254537 获得)。

本书第 0 课、第 1~6 课由陈杰美编写,第 7,10~12,17~19 课由刘洪盛编写,第 8,9,13~16,20 课由饶渐升编写。全书由陈杰美教授统稿,由刘洪盛整理,由饶渐升校核。在本书的编写过程中,杜江、杨乐、张红英和电子科技大学的其他同仁给予了热情的鼓励和帮助,在此对他们表示衷心的感谢。

由于编者水平有限,书中疏漏或不妥之处在所难免,敬请读者指正。

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编 者

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CONTENTS

Lesson 0	科技英语的基础知识	(1)
0.1	科技英语中的几个关键问题 (Some Key Problems in Scientific and Technical English)	(1)
0.1.1	词汇(Vocabularies or Words)	(1)
0.1.2	虚义词(Form Words)	(4)
0.1.3	长句(Long Sentences)	(5)
0.2	翻译的准则(Criteria of Translation)	(7)
0.3	翻译中的变换(Changes in Translation)	(8)
0.3.1	词类的变换(Changes Between Word Classes)	(8)
0.3.2	词序的变换(Changes in Word Order)	(8)
0.3.3	省略(Ellipsis)	(9)
0.3.4	补充(Supplements)	(10)
0.3.5	引申(Extensions)	(10)
0.4	关于数量(Numbers and Quantities)	(11)
0.4.1	数制(Number Systems)	(11)
0.4.2	量词的缩写(Abbreviations about Numbers)	(11)
0.4.3	关于数量的增减(About Increase and Decrease)	(12)
0.5	数学符号与数学式(Mathematic Symbols and Expressions)	(12)
0.5.1	常用数学符号(Mathematic Symbols)	(12)
0.5.2	常用希腊字母(Grecian Letters)	(13)
0.5.3	常用数学式(Mathematic Expressions)	(13)
0.6	论文标题与摘要的写作(How to Write a Thesis)	(13)
0.6.1	论文标题(How to Write the Title)	(13)
0.6.2	论文摘要(How to Write the Abstract)	(13)
0.6.3	论文摘要的常用句型(Some Useful Patterns Used in the Abstract)	(14)
0.6.4	例子(Examples)	(14)
Lesson 1	Introduction to Electronic Communications	(16)
1.1	Historical Perspective	(16)
1.2	Electronic Communications Systems	(18)
1.3	The Electromagnetic Spectrum	(19)
1.4	Bandwidth and Information Capacity	(21)
	Reading Material	(26)
Lesson 2	Information Sources	(28)
2.1	Speech and Music	(28)
2.2	Pictures	(29)
2.3	Computer Data	(31)

2.4	Noise	(33)
	Reading Material	(40)
Lesson 3	Information Systems	(42)
3.1	Information and Data	(42)
3.2	Information System	(44)
3.3	Computer-based Information System	(46)
3.4	Business Information Systems	(47)
	Reading Material	(53)
Lesson 4	Signal Generation	(55)
4.1	LC Circuits	(55)
4.2	Oscillators	(57)
4.3	Integrated-Circuit Waveform Generation	(60)
4.4	Digital Waveform Generation	(61)
	Reading Material	(65)
Lesson 5	Random Processes	(67)
5.1	Introduction	(67)
5.2	Mathematical Definition of a Random Process	(67)
5.3	Stationary Process	(68)
5.4	Mean, Correlation, and Covariance Functions	(69)
5.5	Ergodic Processes	(71)
5.6	Gaussian Process	(71)
	Reading Material	(76)
Lesson 6	Amplitude Modulation Transmission	(77)
6.1	Principles of Amplitude Modulation	(77)
6.2	Single-side Band Modulation	(81)
6.3	Generation of SSB Waves	(83)
6.4	Weaver SSB frequency shifting technique	(85)
	Reading Material	(90)
Lesson 7	Angle Modulation	(92)
7.1	Representation of PM and FM Signals	(92)
7.2	Spectra of Angle-Modulated Signals	(94)
7.3	Narrowband Angle Modulation	(95)
7.4	Wideband Frequency Modulation	(96)
7.5	Preemphasis and Deemphasis in Angle-Modulated Systems	(97)
	Reading Material	(102)
Lesson 8	Video Communications	(103)
8.1	Overview of Video communication	(103)
8.2	Typical Video applications	(104)

8.3	Communication Networks	(106)
	Reading Material	(113)
Lesson 9	Transmission Lines	(115)
9.1	Types of Transmission Lines	(115)
9.2	Transmission-line Wave Propagation	(117)
9.3	Time-domain Reflectometry	(119)
	Reading Material	(124)
Lesson 10	Electromagnetic Wave Propagation	(127)
10.1	Introduction	(127)
10.2	Optical Properties of Radio Waves	(128)
10.3	Terrestrial Propagation of Electromagnetic Waves	(130)
	Reading Material	(135)
Lesson 11	Antennas and Waveguides	(137)
11.1	Introduction	(137)
11.2	Antenna Terminology and Definitions	(138)
11.3	Antenna Arrays and Array Antenna ^[14]	(141)
11.4	Waveguides	(142)
	Reading Material	(146)
Lesson 12	Optical fiber communications	(148)
12.1	Fibers in communications	(148)
12.2	Fiber-Optic Communication Equipment	(149)
12.3	Transmitter's Operational Considerations	(151)
12.4	WDM Systems	(153)
	Reading Material	(158)
Lesson 13	Digital Modulation	(160)
13.1	Introduction	(160)
13.2	Factors That Influence the Choice of Digital Modulation	(160)
13.3	Binary Modulated Bandpass Signaling	(161)
13.4	Multilevel Modulated Bandpass Signaling	(165)
	Reading Material	(171)
Lesson 14	Data Communications, Codes Error Control	(173)
14.1	Introduction	(173)
14.2	Data Communications Circuits	(173)
14.3	Data Communications Codes	(176)
14.4	Error Control	(177)
	Reading Material	(184)
Lesson 15	Communication Networks	(186)
15.1	Telephone Networks	(186)

15.2	Computer Networks	(188)
15.3	Cable Television Networks	(190)
15.4	Wireless Networks	(191)
	Reading Material	(198)
Lesson 16	Software Radio	(200)
16.1	Introduction	(200)
16.2	Characters of a Software Radio	(202)
16.3	The RF Front-End	(203)
16.4	Smart Antennas	(204)
16.5	Digital Generation of Signals	(206)
	Reading Material	(210)
Lesson 17	Microwave Radio Communications	(212)
17.1	Introduction	(212)
17.2	Frequency-Modulated Microwave Radio System	(213)
17.3	Digital Radio Systems	(214)
	Reading Material	(219)
Lesson 18	Satellite Communication Systems	(221)
18.1	Introduction	(221)
18.2	Design of the Satellite Link	(222)
18.3	Network Architecture	(223)
18.4	Geostationary Satellite Systems	(225)
	Reading Material	(230)
Lesson 19	Multiple Accessing	(233)
19.1	Introduction	(233)
19.2	Frequency Division Multiple Access	(234)
19.3	Time Division Multiple Access and ALOHA	(234)
19.4	Code Division Multiple Access	(237)
	Reading Material	(243)
Lesson 20	Mobile Telephone Service	(245)
20.1	Introduction	(245)
20.2	Basic Cellular Telephone Concepts	(246)
20.3	Digital Cellular Telephone	(247)
20.4	Code-division Multiple Accessing	(248)
	Reading Material	(253)
	参考译文	(255)
	参考文献	(298)

Lesson 0 科技英语的基础知识 (The Basic Knowledge of Scientific and Technical English)

0.1 科技英语中的几个关键问题(Some Key Problems in Scientific and Technical English)

0.1.1 词汇(Vocabularies or Words)

词汇是语言的基础。科技英语中的词汇可分为四类:普通词汇、专业词汇、专业缩写词汇和转意词汇。

(1) 普通词汇:科技英语作为英语的一个分支,当然要大量地使用普通词汇,尤其是普通词汇中的冠词、动词、副词、介词、形容词、数词、连接词,也部分地使用普通词汇中的名词、代词,但很少使用感叹词。下面是一些例子。

冠词: a, an, the

动词: be, do, take, have, get, give, find, form, increase, obtain, show, work, operate, perform, carry, account

副词: all, more, ago, already, before, finally, immediately, nearly, usually, never, frequently, actually, so, slowly

形容词: all, great, high, large, more, small, good, big, round, square, hard, little, simple, complex, basic, common, internal, external, usual

介词: about, above, after, among, at, behind, beside, between, beyond, by, except, for, from, in, into, of, off, on, over, up, upon, to, by means of, toward

数词: naught, one, two, ten, twenty-eight, hundred, thousand, million, billion, trillion, first, second, third, one half, two third, a quarter, seven per cent

连接词: and, as, as if, as well as, both...and, either...or, but, not only...but also, for, if, even if, or, yet, while

名词: energy, form, material, line, process, time, result, unit, value, area, field, method, effect, distance, limit, period, direction

代词: other, such, that, this, their, these, which, it, its, itself

这些词汇在科技英语中的意义和用法与在普通英语中基本上是一致的,因此读者一般不会有太大困难。

(2) 专业词汇:在科学技术的各个领域都有大量各自特有的专业词汇。下面列举一些在通信技术中常用的专业词汇。

electron, diode, transistor, field-effect transistor, oscillator, oscilloscope, radio, anode, cathode, Ohm's law, amplifier, microprocessor, varactor, impedance, electromagnetic wave, resonant frequency, pilot frequency, LC tank circuit, phase-shift keying, voltage, modem, codec,

preemphasis network, Carson's rule, Thevenin's theorem, Smith chart, Gray code, Nyquist rate, Rayleigh fading, transceiver, intersymbol, serial data transmission

专业词汇数量庞大,常令初涉专业英语的读者胆寒。但是我们稍加仔细观察就会发现,专业词汇绝大部分是名词或名词词组,以及少量形容词。且词意单一,罕有歧义,用法简单。只要注意积累,掌握一定数量的专业词汇(例如 1000 个以上)并不是太困难的事。

(3) 专业缩写词汇:在专业英语文献中,还常出现一些专业缩写词汇。尤其是通信技术和电子信息技术中的专业缩写词汇很多,且新的缩写词汇仍不断涌现。更有一些缩写词汇从不同的原文缩写而成,故有多义。掌握一定数量的专业缩写词汇(例如 200 ~ 500 个)是顺利阅读专业文献所必需的。以下列举一些在通信技术中常见的专业缩写词汇。

KVL	— Kirchhoff's voltage law
LTI	— linear time-invariant
FET	— field-effect transistor
MOS	— metal-oxide-semiconductor
IC	— integrated circuit
CCCS	— current-controlled current source
VCVS	— voltage-controlled voltage source
AM	— amplitude modulation
FM	— frequency modulation, Foreign Ministry
DM	— delta modulation
PCM	— pulse code modulation
SSB	— single-side band
QPSK	— quadrature phase-shift keying
RADAR	— radio detection and ranging
LASER	— light amplification by stimulated emission of radiation
PAL	— phase alternation by line
IEEE	— Institute of Electrical and Electronic Engineers
IEC	— International Electrotechnic Commission
ITU	— International Telecommunications Union
CATV	— cable television, community antenna television
ASCII	— American Standard Code for Information Interchange
DOS	— disk operating system
LAN	— local area network
WWW	— world wide web
ISDN	— integrated services digital network
ATM	— asynchronous transfer mode
FDDI	— fiber distributed data interface
HTML	— hyper-text marked language
CAD	— computer-aided design
FFT	— fast Fourier transform

C ³	— command, control, communication
3A	— office automation, building automation, advanced communications
LC oscillator	
pp.	— pages
Fig.	— Figure
vv.	— vice versa
Vol.	— volume
Ltd.	— limited
Q. E. D., QED	— quod erat demonstrandum
Iff	— if and if only
IEEE-488	— General Purpose Interface Bus
IEEE-802	— LAN standards
AC, ac	— alternating current, adaptive control, accumulator, account, acid
DC, dc	— direct current, direct-coupled, data channel, double contact, distribution control
CRT	— cathode ray tube, Chinese remainder theorem
LU factorization	— lower and upper triangular matrix factorization
A/D, ADC	— analog-to-digital converter
μP	— microprocessor
PC	— personal computer, personal communication
CPU	— central processing unit
DSP	— digital signal processing, digital signal processor

(4) 转意词汇:科技英语中还有不少词汇是从普通词汇中借用、移植过来的,并赋予它们不同于普通应用时的专门含义。但它们也可能以普通词汇的意义出现在专业英语文献中,这就是所谓的转意词汇。它们的数量虽不及前两类词汇多,但因其多义性和转意性,故是较难掌握的,尤其是对专业不很熟悉的读者更感困惑。下面列举一些在通信技术中常见的转意词。

转意词	普通含义	专业含义
resistance	阻力,抵抗,敌对	电阻(值)
active resistance	积极抵抗	有功电阻
current	水流,气流,趋势,当前的	电流
charge	装载,起诉,负责,载荷	电荷,充电
circuit	周围,巡回,绕行	电路
relay	接转,接力	继电器,中继器,中转站
field	田野,场地,范围	(电,磁)场
admittance	准入,接纳	导纳
antenna	触须	天线
coherent	一致的,连贯的	相干的,相关的
filter	过滤器,漏斗	滤波器
burst	爆炸,胀裂	脉冲
envelope	封套,信封	包络,包迹

转意词	普通含义	专业含义
network	网,网状组织	网络
spectrum	范围,光谱	频谱
rectifier	修正者	整流器
regulator	调整者	稳压器
modulator	调节者	调制器
flip-flop	翻斛斗	触发器
potential	潜在的,潜力	电位
carrier	运载,工具	载波,载流子
determinant	确定的,决定因素	行列式
line	线,管	电线,电网,市电

0.1.2 虚义词 (Form Words)

根据是否具有实际意义,英语词汇可分为实义词和虚义词。尽管虚义词本身没有确切的实际意义,但在句中起着连接、引导、转承、变换、伴随、比较、让步、时序等多种作用,所以对整个句子的含义有着决定性的影响。这就要求读者仔细观察整个句子,甚至相关的上下文。然后才可能对虚词在句中的作用做出正确判断。对不很熟悉专业的读者来说,要做出正确判断显然不是容易的事情。虚义词的数量虽不多,但其使用频率很高。下面举一些例子。

- (1) The most fundamental noise performance used is known as the signal-to-noise ratio.
众所周知,信噪比是最基本的噪声性能。(as 引导主语补语。)
- (2) The electrons, as shown in Fig. 5, are very light.
如图 5 所示,电子非常轻。(as 引导主语定语。)
- (3) See the answers as given at the end of this book.
请参阅本书末尾给出的答案。(as 引导宾语定语。)
- (4) As electricity can do work, it is a form of energy.
电是一种能量,因为它能做功。(as 引导原因从句。)
- (5) The new device is designed as an alternative for the old one.
这个新器件是为取代那个旧的而设计的。(as 表示目的,for 指明对象。)
- (6) Small as atoms are, electrons are still smaller.
原子虽然很小,但电子更小。(as 引导让步从句。)
- (7) As the FM stereo system was being devised there was, and still is, a requirement that the stereo signal should be compatible with any existing monophonic receivers.
当初开发调频立体声系统时,就要求立体声信号兼容各种已有的单声收音机,这一要求现在仍是需要的。(as 引导时间从句。)
- (8) The current increases as the voltage does.
电流随电压的增大而增大。(as 表示伴随。)
或:电流就像电压那样增大。(as 表示比较。)
(as 引导伴随或比较从句,具体应选择哪一种,须参考上下文来判断。)
- (9) A voltmeter is an instrument for measuring voltage.
电压表是测量电压的仪器。(for 表示目的。)

- (10) The insulator was burned for overheating.
该绝缘体因过热而烧毁。(for 表示原因。)
- (11) The input-output square-law relationship of FETs allows for lower distortion level.
场效应晶体管的平方律输入-输出关系可以减小失真。(for 表示结果。)
- (12) This coupling network keeps the RF amplifier from self-oscillation without the need for a neutralizing capacitor.
这个耦合电路使得该射频放大器免于自激而又无须中和电容。(for 表示需求。)
- (13) For many more details about symmetry relationships for the bispectrum, see Nikias [25], and for trispectrum, see Dalle Molle [6].
关于二维谱和三维谱的对称性的更多的详细资料可分别参阅 Nikias 的文章[25] 和 Dalle Molle 的文章[6]。(前一个 for 表示目的,后两个 for 指明对象)
- (14) For all its great size, the machine moves noiselessly.
尽管体积大,该机器的运转噪声很小。(for 引导让步短语。)
- (15) The body possesses a definite store of energy while it is in the elevated position.
把物体举高时,它具有一定的位能。(while 引导时间状语从句。)
- (16) While energy is the capacity to do work, power is the quantity of work done in unit time.
能量是做功的能力,而功率则是单位时间内所做的功。(while 引导并列从句,表示比较。)
- (17) The circuit, while it contains some nonlinear devices, can be considered linear.
尽管这个电路包含一些非线性器件,它仍可看成线性的。(while 引导让步从句。)

0.1.3 长句 (Long Sentences)

为了客观、具体、准确,科技英语中常使用长句,这会使读者理解困难。长句可用两种方法使之简化,以便正确理解。① 依据谓语动词把复合句分解为一组简单句。② 依据关键词简化各词组。下面举例说明。

(1) For direct current and low-frequency alternating current (up to a few thousand cycles per second) the resistance is reversely proportional to the cross-sectional area of the path the current must travel; that is, given two conductors of the same material and having same length, but differing in cross-sectional area, the one with larger area will have the lower resistance.

此句可先简化为: resistance is reversely proportional to area,
that is,
one will have the lower resistance.

这三个分句的意义是易于理解的,且知 that is 把前后两分句并列连接。然后再把其他的辅助修饰成分逐一补充回去,则可得全句完整而准确的含义为:直流与低频交流(几千赫兹以内)电阻反比于电流通路的截面积;这就是说,两个材料相同、长度相等但截面积不同的导体,截面积较大的那一个具有较小的电阻。

(2) Thus, if a given requirement calls for p-channel units with channel length so short that yield is too small, more than sufficient speed and good yield could be obtained with n-channel units and slightly larger channel length.

此句可先简化为: requirement calls for units,

yield is too small,

speed and yield could be obtained with units.

这几个分句的意义是一目了然的,且前面两个分句组成带结果从句的复合句,再与第三个分句并列。然后把辅助成分补充回去,可把全句译为:因此,如果给定的指标要求 p 沟道器件的沟道长度过短,致使成品率太低,那么采用 n 沟道器件和略长一点的沟道,就能获得很满意的速度和较高的成品率。

(3) The ratio of capacitance with some material other than air between the plates, to the capacitance of the same capacitor with air insulation, is called the dielectric constant of that particular material.

这个句子虽然较长,但却是一个简单句。依据各词组的关键词可得一个很简短的句子:

ratio is called constant.

这个句子的意义当然是明显的。再把其他修饰成分补充回去,可把此句译为:电容器极板间充以非空气的某种材料时的电容与该电容器充以空气时的电容之比称为该绝缘材料的介电常数。

(4) This electron beam sweeps across each line at a uniform rate, then flies back to scan another line directly below the previous one and so on, until the horizontal lines into which it is desired to break or split the picture have been scanned in the desired sequence.

此句可先分解和简化为如下的简单句:

beam sweeps each line,

then flies back to scan another line,

it is desired to break picture into lines in desired sequence.

这些分句的意义是不难理解的。然后把它们有机地组合起来,并恢复其他辅助成分,则可把全句译为:电子束以均匀的速率扫描每一行,然后飞速返回去扫描下一行,直到把被扫描的图像按所希望的顺序分割成行。

(5) When these fast moving radio waves strike some other conductor placed in their path at a distant point, they produce in the second conductor weak currents of the same nature as the original current which produced these radio waves.

此句可先简化为: waves strike conductor,

they (waves) produce currents,

which (original current) produced waves.

全句可译为:当这些快速传播的无线电波碰到位于其路径远端的某一导体时,就会在该导体内感应微弱的电流。该电流与产生无线电波的原电流具有相同的属性。

(6) The technical possibilities could well exist, therefore, of nation-wide integrated transmission network of high capacity, controlled by computers, interconnected globally by satellite and submarine cable, providing speedy and reliable communications throughout the world.

此句虽长,但仍是一个简单句。依据词组的关键词简化后,可得该句的骨架:

possibilities of network exist.

分析出了句子的骨架,就可正确把握句子的主题,进而理解整句的含义。该句可译为:因此,在技术上完全可能实现全国性的集成发送网络。这种网络容量大,由计算机控制,并能通过卫星和海底电缆实现全球互联,提供世界范围的高速、可靠的通信。

(7) We must therefore conclude that when the distance between the molecules is very small, there are forces of repulsion and that these forces increase rapidly as the distance between the molecules decreases.

这个句子虽然不是特别长,但主句带两个并列的宾语从句,而这两个宾语从句又各带一个时间从句,出现从句套从句的复杂语法现象。我们在简化复合句时,要特别注意各简单句之间的相互关系。此句可译为:因此我们必然得出结论:当分子之间的距离很小时,就产生斥力;并且这种斥力随着分子间距离的减小而迅速增大。

0.2 翻译的准则(Criteria of Translation)

语言间的翻译应满足信、达、雅三项准则,科技英语的翻译更注意前两项准则。

信(True):译文须忠实于原文的含义,并尽可能保留原文的风格。

达(Smooth):译文须通顺流畅,符合汉语规范习惯。

雅(Refined):在保证前两项准则的基础上,译文应优美、雅致、简明。

译文首先必须满足“信”的准则,这就要求正确理解原文的含义。为此,不但要解决前一节所说的三个关键问题,还要注意英语词汇相对于汉语的不同用法。下面举例说明一些易犯的错误。

(1) In semiconductor devices, an electrode is an electric and mechanical contact to a region of the device.

译文 1:半导体器件的电极是通向该器件某一区域的电气触点和机械触点。

译文 2:半导体器件的电极是通向该器件某一区域的电气兼机械触点。

译文 1 是有误的,因为原文中的 contact 的形容词是 electric and mechanical,而原文并非 electric contact and mechanical contact.

(2) The importance of the laser can not be overestimated in that it can provide extremely high capacity for communications.

译文 1:在提供极大的通信容量方面,对激光的重要性不能估计过高。

译文 2:在提供极大的通信容量方面,对激光的重要性不可能估计过高。

译文 1 是错误的,因为 can not 表示 overestimated 在逻辑上是不会出现的,而不是对 overestimated 的否定。

(3) In the AND circuit, “1” signals on all inputs give an “1” output; output is “0”, if all inputs are not “1”.

译文 1:在“与”电路中,若所有输入端为“1”信号,则输出“1”;若所有输入不是“1”,则输出“0”。

译文 2:在“与”电路中,若所有输入端为“1”信号,则输出“1”;若输入不全为“1”,则输出“0”。

译文 1 是错误的,因为 all...not 是部分否定。

多义词(如以下例句中的 operate)的含义选择常是正确翻译的难点。须注意观察上下文,

以做出符合专业逻辑的正确判断。

(4) Transit time is the primary factor which limits the ability of a transistor to operate at high frequency.

渡越时间是限制晶体管高频工作能力的主要因素。

(5) In a transistor the output current depends upon the input current, hence it is a current-operated device.

晶体管的输出电流取决于输入电流,因此它是电流控制器件。

(6) The relay is operated by a current of several milliamperes.

这个继电器由几毫安的电流启动。

(7) The hearing aids are operated from batteries.

这些助听器由电池供电。

0.3 翻译中的变换(Changes in Translation)

不同的语言有一定的共性,更有不同的语法规则和习惯,因此忌讳逐字逐句式的硬译。而须在正确理解原文的基础上,做适当的变换以符合汉语的规范和习惯,才能使译文满足“达”的要求。

0.3.1 词类的变换(Changes Between Word Classes)

汉语中动词的使用远比英语多,用法也更为灵活。英语有冠词,而汉语则没有。英语中大量地使用介词,而汉语中却用得不多。两种语言之间的这些区别就需要在翻译中适当变换词类。下面举例说明。

(1) Digital computers are essentially machines for recording numbers, operating with numbers and giving the result in numerical forms.

数字计算机本质上是记录数字、运算数字和给出数字形式的结果的机器。(译文把原文中的动名词变换成了动词)

(2) A continuous increase in temperature of a gas in a container will lead to a continuous increase in the internal pressure within the gas.

不断提高密闭容器内的气体温度,会使气体的内部压力不断增大。(译文把原文中的名词变换成了动词)

(3) Noise-figure is minimized by a parametric amplifier.

利用参量放大器把噪声系数降到最小。(译文把原文中的介词变换成了动词)

(4) The miniature receiving antenna was developed as an alternative to that large one.

这种小型天线是为取代那种大型天线而研制的。(译文把原文中的名词变换成了动词)

(5) Gases differ from solids in that the former have greater compressibility than the latter.

气体与固体的区别在于前者较后者有更大的可压缩性。(有些时候,英语中的一些动词不便于译成汉语动词,而宜改译成名词或其他词类。本句译文把原文动词 differ 变换成了名词)

0.3.2 词序的变换(Changes in Word Order)

汉语主要用词序来表示句中各词间的逻辑关系,而英语除用词序外,还常用介词、分词、副