

# 科技論文 英語寫作 上冊

---

English Scientific and Technical Writing

---

修訂版

方克濤 著  
梁韻兒 校



# 目錄

---

修訂版序 vii

序 ix

作者序 xi

導論 1

第一部分 文法規則 7

第一章 基本文法 9

1.1 句子 9

1.2 名詞 10

1.3 代名詞 11

1.4 動詞 12

1.5 修飾詞 13

1.6 具有連接功能的詞 14

1.7 動狀詞 18

1.8 片語 19

1.9 子句 20

1.10 基本句式 22

**第二章 冠詞 27**

2.1 不定冠詞 28

2.2 定冠詞 34

**第三章 動詞 51**

3.1 時態 51

3.2 主詞與動詞一致 64

3.3 語氣 71

**第四章 科技論文常犯的錯誤 74**

4.1 不完整句 74

4.2 散亂句 76

4.3 缺乏連接詞 78

4.4 主詞與動詞一致 83

4.5 時態 84

4.6 錯誤的動詞補語 86

4.7 誤用被動語態 91

4.8 隨意更換主詞或語態 100

4.9 孤立的修飾詞 101

4.10 修飾詞誤置 109

4.11 誤用冠詞 115

4.12 錯誤的複數名詞 116

4.13 含糊的代名詞 117

4.14 代名詞與前述詞一致 120

4.15 冗長或錯誤的複合名詞 124

4.16 模糊的比較 127

4.17 「主題與評論」句 129

**第五章 標點符號 132**

5.1 句尾標點符號 132

5.2 句內標點符號 136

- 5.3 大寫字母、斜體字及字詞的標點符號 153
- 5.4 方程式的標點符號 163
- 5.5 數字 164
- 5.6 複數 167
- 5.7 專業術語的縮寫 170
- 5.8 縮進排印 170
- 5.9 使用標點符號之常犯錯誤 171

## 第二部分 修辭原則 181

### 第六章 簡明的英文 183

- 6.1 句意要精確具體 184
- 6.2 省略贅詞 186
- 6.3 直接表達 191
- 6.4 避免堆砌名詞以及弱動詞 193
- 6.5 多用主動語態 200
- 6.6 正面表達 201
- 6.7 少用虛主詞 203
- 6.8 第一人稱句 207
- 6.9 避免偽術語 210
- 6.10 避免直接疑問句 212

### 第七章 通順的句子 214

- 7.1 善用不同的句子結構 214
- 7.2 避免散亂句 216
- 7.3 避免片斷句成篇 218
- 7.4 對稱法 222
- 7.5 善用對等與附屬結構 227

### 第八章 統一聯貫的段落 232

- 8.1 主題句 233
- 8.2 段落組織 239

## 第九章 易讀的論文 252

- 9.1 先舊後新 255
- 9.2 主題作主詞 258
- 9.3 被動語態 259
- 9.4 先短後長 260
- 9.5 縮短主動詞距離 266
- 9.6 動作以動詞表達 269
- 9.7 邏輯關係要清楚 274

## 第十章 字詞誤用 279

習題答案 338

註釋 378

參考書目 383

索引 385

# 修訂版序

---

《科技論文英語寫作上冊》爲一九九五年出版的《英文科技寫作》的修訂版。《英文科技寫作》初版廣受台灣理工界的學者與研究人員好評。能供這些研究人員作參考，我感到十分欣慰。現在對本書的讀者及選用本書爲教科書的大專教師，一併致謝。

九五年的初版成書倉卒，缺乏時間校對，書中難免出現許多錯別字，而部分的習題與例句亦未盡清晰。初版是由英文稿翻成中文的，所以初版最嚴重的問題是有太多硬翻的「英式中文」。而亦因英中翻譯之故，使不少段落出現模糊和累贅的字句。要在初版中找出違背書中的修辭原則的詞句，俯拾皆是，這點是要向讀者道歉的。

在完成初版後，我便開始投入別的研究工作，一直無暇修改，以補初版之缺失。初版自出版以來，訂購數目不斷增加。我雖然不再從事英文寫作教學，惟眼見研究人員對本書的需求愈來愈殷切，推出修訂版，自覺責無旁貸。

修訂版的主要目的是修正初版的一些錯誤、覆核部分例子和習

題，及修改初版的英式中文。為使主題更清晰突出，新版的書名改為《科技論文英語寫作上冊》。同時，新版亦修訂了書中某些標題，像第一部分已由「文法與標點符號」改為「文法規則」，第二部分則由「寫作風格與可讀性」改為「修辭原則」，目的是讓標題更鮮明醒目。此外，修訂版的另一變更是初版的第六章「撰寫論文的過程」以及附錄一「撰寫使用手冊的準則」皆已省略，而該部分將會於《科技論文英語寫作下冊》中出版。

《科技論文英語寫作下冊》為初版自序中所提及的姐妹篇《英文科技論文與會議簡報》，此書後來於一九九六年順利發行。現擬定該書的修訂版將於兩年內出版，並由《英文科技論文與會議簡報》改名為《科技論文英語寫作下冊》。該書詳細討論科技研究報告的結構與常用句式，且提供許多具體例子給讀者參考。

我特別感謝梁韻兒小姐細心校正全書，對本書內容提出意見，並作增刪。又得黃漢光先生為本書曾作七年的行銷工作，特此誌謝。

最後，我謹望本書能繼續幫助更多中文學界的讀者。

方克濤

二零零三年

香港中文大學



# 序

---

學術論文代表了自己的創見和心血，爲了將論文公諸於世，並與社會大眾分享研究成果，必須於論文中表達自己的研究心得，這通常需要遵循一定的格式，並注意用字遣詞。撰寫研究報告的人通常就是研究工作者，由於他已很清楚論文內容，常會誤以爲論文的讀者也具備相同的背景，因而輕忽了論文寫作應該注意的細節，雖然他的研究可能很不錯，但由於論文寫作不佳，因而使人不知所云，忽略了其研究的價值，這實在是件非常可惜的事。利用英文來發表論文的主要目的在強調世界性的學術交流；由於文化背景的不同、以及使用的不習慣，更增加了論文寫作的困難。如何不斷的增進自己的寫作能力，實在是一個研究人員應注意的事。

長久以來，系所教師同仁和研究生對如何寫好論文一直存在著疑惑。有感於論文撰寫技術的待加強，我們遂聯絡在本校擔任論文編輯多年的方克濤先生，請他在我們系裡開了一連串的密集論文寫作課程，這個課程已進行了兩年，受到大家的肯定，受益的師生也很多。

近聞方先生將其心得經驗集結成書，深覺爾後閱讀此書之人必當有福。

個人很仔細的看了這本書的初稿，也提供了一些意見給方先生作參考。由於個人也指導過一些研究生，批閱過一些論文，常存有一些困擾，相信一般用英文寫作的研究人員也有如此的經驗，方先生此書對我們常碰到的問題都提出了他的觀點和正確寫法，如果你想寫好一篇好論文，仔細的閱讀此書必有幫助。個人也曾研讀過一些此類的書，有一些心得，但也許是從小到大的閱讀習慣使然，深覺不易從原文書中取得深刻的印象，今閱讀此書，發覺要讀完一遍、把握一些重點其實並不困難。

方先生在臺居住了一段時間，對中文已有相當的造詣，由於他對中英文的精通，也由於他批改論文的豐富經驗，故能在此書中提出了很多國人常犯的毛病，並提出如何修改的建議，我相信所有讀過此書的人一定獲益良多。今囑為之序，特以最大的誠意來推薦之。

國立交通大學資訊工程系 教授兼系主任 李錫堅

中華民國 84 年 6 月 17 日

# 初版自序

---

幾年前，受國立交通大學推廣教育中心之託，筆者應邀為交大教授與研究生修改英文科技研究報告，以幫助他們以英文發表自己的研究成果。當初，我每週只收到個兩三篇論文，但不久以後，收到的篇數開始不斷地增加，到了後來，我每週幾乎都要修改十到十二篇論文。這時，我才發覺臺灣的理工學者對英文編輯服務的需求非常大，而這些學者要在臺灣找到專業的外國編輯幫助他們修改論文，卻是相當困難的。因此，我開始投入英文編輯技巧的研究，細心複習以前曾經學習的英文修辭原則，以增進自己修改論文的專業能力，並研究如何更有效地幫助論文作者表達出自己的研究結果。同時，我經常發現在修改論文中所看到的錯誤英文，有不少都是不同作者一再重複的幾種基本毛病，於是，我開始收集許多在修改論文的過程中所注意到的常犯錯誤。當時我認為，假若能編寫一本中文參考書，為需要撰寫英文研究報告的人詳細說明如何避免這些常犯的錯誤，對臺灣的理工學者一定會有很大的幫助。

從事修改論文的工作幾個月之後，我也開始教授英文科技論文寫作的課程。當初很幸運地在很短的時間內便找到了幾本不錯的英文教材，但是之後，由於學生在課堂上所提出的種種疑問，以及自己在修改論文時所觀察到的一些問題，我發現到雖然這些專書的說法既正確又清楚，但往往不夠完整，而且並不特別適合中國人的需求。因為臺灣的學術界很顯然需要這方面的中文書籍，所以我就著手列出本書的大綱，並開始準備相關資料。我本來並沒有想到本書的篇幅會這麼長，但是在寫作的過程中，愈寫愈發現還有問題需要討論，因此就不斷地增加了新的內容。經過兩三年的努力，本書在一九九五年暑假終於完成了。我出版此書，誠摯地希望能幫助臺灣的理工學者提升自己英文寫作的品質，並在國際學術界較順利發表其重要的研究成果。

本書分為「文法與標點符號」和「寫作風格與可讀性」兩個部分。根據原來的大綱，本書原來還要包括第三個部分，這部分的内容仔細討論科技研究報告的結構與常用句型，並提供許多樣本，以便研究生在撰寫英文報告時可以參考。後來，由於篇幅已經過長的緣故，所以決定把第三部分分開來，當作獨立的著作，期望明年能出版。

本書的完成得力於許多人的貢獻，我深深感激他們的幫助。

孔德文先生 (C. A. Carelli) 和石家祺先生 (Daniel Strychalski) 仔細閱讀了部分本書的英文初稿，並提供了很多寶貴的建議，這些建議大幅增進了書中說明的清晰度，也幫助我糾正初稿中的許多小毛病。此外，我在寫書的過程當中，多次和這兩位先生討論英文文法和用法的問題。我非常感謝他們所提供的忠告與鼓勵。

在撰寫本書的中文稿時，鄭光明先生提供了非常多的協助，使我受益良多。他翻譯了幾個章節的初稿，也細心修改了中文初稿的一些部分。他的幫助大幅提升了本書的可讀性和寫作品質。此外，

我非常感謝他的支持及耐心，他樂意回答我對中文語法以及相關雜事的極多煩瑣的問題，在此我深深感佩。此外，我也很感謝其他幫助我翻譯中文初稿的人，尤其是盧德瑤小姐和周秀娟小姐。

我非常感激李錫堅教授所撰寫的序言，也特別感謝他有關修改本書中文初稿的極多建議。李教授閱讀了整本書的中文初稿，並針對書的內容、組織以及一些重要專業術語的中文翻譯，提供了極多寶貴的建議。他的幫助大幅提昇了本書內容的清晰度和完整性。

李素瑛教授、吳龍庸教授、楊士偉先生以及郭曉潔小姐都參與了中文初稿的修改工作，他們幫助我大幅改善本書的中文，使得本書更清楚易懂，在此非常謝謝他們的協助。

在我撰寫本書的過程當中，不少人曾提供重要的支持和鼓勵。我特別感謝歐柔婉小姐的支持與耐心，也謝謝林正弘教授，在我開始打算寫此書時，他提出了一些很實用的想法。此外，我也很感謝何志青教授的友誼與支持，他對不少英文概念的中文翻譯，給予我寶貴的建議。

另外，我要感謝國立交通大學推廣教育中心的蘇正芬小姐與劉素梅小姐、資訊工程研究所所長黃書淵教授、控制工程研究所所長鄧清政教授、國立清華大學工學院院長陳文華教授、工業工程系主任王小璠教授以及工業工程研究所桑慧敏教授，在我撰寫此書的這段時間，他們都給予我重要的支持。還有，我也很感激楊丁元博士和張慶輝教授，他們提供列在本書封底的評語。

本書中引用了許多研究者的專業著作，在寫作的過程中我也曾參閱不少專家寫的英文參考書，在此我要感謝所有這些學者。書中所有引文的原作者，在註釋中都有指明，在此我也謝謝允許我引用這些著作的期刊和作者。此外，我很感激 G. Gopen, J. Swan, T. Huckin 以及 L. Olsen 這幾位學者，雖然本書沒有直接引用他們的著作，但是他們的著作提供了本書第九章其背後的許多基本概念，此外，本

書第二章部分的說明以及第六章關於關係子句的討論，都根基於 Huckin 及 Olsen 的著作。

最後，我要謝謝曾經上過本人在交通大學和清華大學所開過課的學生和教師，以及曾經請我修改研究論文的作者。他們給了我撰寫此書的動機，而他們的問題和意見更對本書的內容有多方面重要的貢獻。在此我把這本書獻給所有的這些研究者。

方克濤

一九九五年

台灣省新竹市

# 導論

---

現今理工學者皆需面對使用英文撰寫學術研究報告的挑戰。當代理工學者的學術成就，常取決於其研究報告有否經常刊登於國際專業期刊；大學教師必須出版一定數量的研究報告，才有機會升等；理工科系的研究生需於國際期刊上發表研究成果，才能獲得博士學位。而要在國際專業刊物發表研究報告得使用英文，所以理工學者必須具備撰寫專業英文研究報告的能力。

不過，坊間卻很難找到一本專門教人撰寫英文學術研究報告的中文書籍。較好的專書通常為英文本，但大多數的學生都不知這類書籍的存在，而就算知道，閱讀英文專書，學生亦會感到既吃力又耗時。還有，英文專書大多是針對以英文為母語的學生的需要而設計，並不特別適合中國學生。因此，一本詳盡討論英文科技論文寫作的中文專書，讓中國學生在撰寫論文時避免許多常犯錯誤，顯然非常重要。

本書便是針對這個需求而設計的。書中的內容皆為筆者過去豐富

的教學與編輯經驗所累積的心得，許多例子更爲筆者在編輯論文時所收集得來的：筆者過去在大學教授英文科技論文寫作的課程，也曾於多間著名高科技公司擔任編輯。工作期間，筆者修訂了數以百計的英文科技研究報告，累積了多年修改英語論文的經驗。本書討論不少學生常感頭痛的英文文法，也詳細介紹標準的英文修辭技巧。此外，本書包括的習題非常多，不僅可供自學之用，而且可作爲英文老師的教科書。

## 「只要內容有價值，無庸關心寫作素質？」

也許有些理工學生認爲論文的內容有價值便可，寫作素質並不是很重要。他們可能都忽略了一個重要的事實：如果一篇論文不知所云，根本不會有人注意到論文內容的價值。科技論文必須清楚易懂，讀者才能瞭解論文內容，從而注意到它的價值。千萬別相信只要論文內容本身有價值，不管寫得好或壞，讀者都會熱切去解讀。

事實上，一篇論文的價值，本來就端賴於寫作的素質。一方面，撰寫科技研究論文的主要目的，是與其他學者分享研究成果，一篇清晰簡要的論文可較有效地達到這個目的。另一方面，科技論文的價值不僅在於其所提供的數據，更重要的是作者對自己研究成果的分析與解釋。例如，作者必須指出研究的重要性，分析研究結果，並與其他學者的研究作比較。只有把論文寫得清楚聯貫，作者才可以爲自己的研究成果提出一個完整、合理和具說服力的分析與解釋。

即使一篇論文的文法稍有瑕疵，只要研究題材新穎有趣，亦有可能被專業期刊接受。然而，作者仍應盡量用字清楚，組織嚴謹，好讓讀者容易閱讀，從而明瞭其研究思路與結果。如果論文中夾雜錯誤英文，或內容艱澀難懂，讀者根本難以瞭解論文，更會有些讀者認爲英文如此糟透，就視如敝屣，不屑一顧。儘管這並不公允，但文筆拙劣的論文，讀者都會直覺地否定其內容的價值，故論文給讀者的第一印象尤其重要。



當研究者藉論文把自己的研究成果與他人分享時，作者和讀者都各有責任。讀者必須先具備某種背景知識，並細心閱讀，作者則應盡量表達得清楚而合符邏輯，好讓讀者能易於瞭解文意。科技論文的讀者一般為專業研究者，具備科技背景知識，通常都能迅速掌握新的研究報告的重點。一篇表達清楚、結構嚴謹的論文，對這班專業讀者而言，不可能構成問題。所以如果有讀者覺得論文難懂的話，這大概是因為作者沒有盡責。撰寫科技論文時，作者應不厭其煩地不斷修改，直到確定論點清楚而合符邏輯為止。一篇論文可修改兩、三次，甚至更多次。因為即使是天才或諾貝爾獎得主，也不可能一下子就能完成一篇完美無缺的論文。專業作家在論文出版前都會一再修改，以臻完善。

理工研究生需要瞭解，筆記本上的一大堆原始資料、數據，並不等於實驗或研究計畫的最後成果。如想成為專業科學家或工程師，還要對這些資料、數據作解釋與分析，然後提出一篇清楚簡潔而結構嚴謹的論文，否則研究計畫還不算完成。因此，撰寫研究論文本來就是研究活動中非常重要的部分，而非計畫完成後一項額外的工作。

用外語撰寫學術論文，的確非常艱巨，要寫得駕輕就熟，更不能一蹴即至。但幸好英文科技論文寫作實有標準格式可循，只要認識慣用的結構與詞句，並學會一些基本寫作技巧，就能寫出一篇符合基本要求的英文研究報告。如果讀者對撰寫論文的正確規則勤加練習，並模仿英語國家專業人士的寫作方式，定能寫出正確通順的英文。

想成為專業的科學家或工程師，光靠專業知識與技巧是不足夠的，溝通能力和專業知識同等重要。要清楚表達自己的論點，就必須學習清楚簡要的寫作技巧。一個人文章寫得清楚，表示這人頭腦也清楚。換句話說，增進寫作素質，等於同時訓練嚴謹準確的思考習慣。總而言之，增進寫作能力與溝通技巧，是培養自己成為專業科學家或工程師極為重要的一步。

## 本書組織

本書係專為理工學者撰寫論文時作參考之用，也可作為科技論文寫作課程的教材。本書分為兩大部分：「文法規則」與「修辭原則」。前五章屬於第一部分，旨在讓讀者重溫英文文法的基本概念，包括說明冠詞、動詞以及標點符號等正確的使用方式。但這裡不會徹底講解所有的文法規則，而只會針對一般科技論文作者最感疑惑的部分來討論。當中的第四章為介紹中國學生在撰寫英文科技論文時常犯錯誤。對希望能以正確英文來撰寫論文的讀者而言，此章非常重要。

第二部分「修辭原則」是本書的後五章。修辭原則和第一部分的文法規則有別，它們並非作者必須嚴格遵循的絕對規則，而是一般性的原則。若不遵循第二部分所介紹的英文修辭原則，未必表示寫法不正確；但貫徹這些原則，能使文章更清楚簡潔，讀者更易瞭解文意。第六章將介紹一些指導準則，有助於寫出較簡明的英文，第七章和第八章則解釋如何撰寫通順自然的句子以及合理聯貫的段落。對於希望掌握英文寫作的基本技巧的讀者而言，第六章至第八章極為重要。第九章陳述的一些準則，簡易而實用，遵從這些準則將能使論文內容的鋪排更符合讀者的期望，令論文更清晰易讀。末章會列出許多學生經常誤用的字詞與句子，並說明如何避免這些常見錯誤，讓讀者不會重蹈他人之覆轍。

本書是以作為科技寫作的參考書及教科書而設計，自學的讀者可依據自身需要而選讀某些章節。例如，想掌握英文基本文法的，可順本書次序閱讀。已有寫作研究論文經驗的，則可直接從第四章開始，且看自己有否曾犯該章所列出的錯誤。對於想瞭解英文寫作的基本原則，並要應用在自己文章中的讀者而言，第六章到第八章甚為關鍵。對有寫作經驗的讀者來說，認識第九章所介紹的可讀性準則，對寫作技巧將很有幫助。第十章則列出許多特定英文字詞與句子的正確使用法，讀者可順序一次看完，也可分數次閱讀。

本書所附的習題是為讀者自我練習之用，並非以測驗學生為目

的。當中有些習題非常困難，所以不要期望在讀過一、兩遍內容後就懂得回答所有習題。本書的附錄中，附有所有習題的完整答案。從這些答案中，應可瞭解英語國家的人如何把本書講授的原則應用在實際寫作上。



# 第一部分

---

## 文法規則



# 第一章

---

## 基本文法

本章將扼要陳述英文基本文法概念以及主要詞類，讓讀者可馬上重溫一些曾經學習過的英文文法。倘若讀者在本書的其餘章節遇到一些專門文法術語而不知所指的話，本章也可作為一索引。

### 1.1 句子

無論我們說話還是寫文章時，我們都是以不同的方式來組合字詞。例如，*The round table* 是一組字詞，我們會用以指稱某個物體，即一張圓桌子。*Early in the morning* 則是另外一組字詞，我們會用以指稱某段時間。不過，這兩組字詞都沒有陳述出一個完整意思：前一組字詞提到某個物體，卻沒有進一步提供關於該物體的資料；至於後一組字詞，則只提及某段時間，卻沒有道出該段時間內所發生的事情。

如果一組字詞表達一個完整意思，這組字詞稱為「句子」(sentence)。例如：*The method is efficient, Our aim is to solve this problem*。這兩組字詞都表達一個完整意思：前一組字詞交代某個方法的特性，

後一組字詞則陳述某位作者的目的。但這兩組字詞之所以為句子，並非由於它們比較長，而是它們都表達了一個完整意思。例如 *after we have described the design of the system* 比上面兩組字詞還要長，卻絕非句子。因為它只提到某段時間，並沒有陳述出一個完整意思。如果這組字詞要成為一個句子的話，那它得要和另外一組字詞結合而構成一個完整意思。例如：*After we have described the design of the system, we will analyze its effectiveness.*

同時，句子分為兩個主要部分——主詞 (subject) 和述詞或賓詞 (predicate)。主詞包含一個名詞片語，表示句子所敘述的人、地、物。述詞包含一個動詞，有時也會包含其他的字詞，用來陳述或詢問和主詞有關的事實。例如，在 *The method is efficient* 這句中，*the method* 是主詞，點出所要談論的對象；*is efficient* 則是述詞，以陳述和主詞有關的事實。一組字詞必須包含主詞和述詞，才稱得上是一個完整的句子。

（祈使句是例外：它表面上不包含主詞，卻還是道道地地的句子。它只是省略主詞「你」而已。詳見本章 1.10 節。）

下面將討論字詞的種類，以及能構成英文句子的字詞組合。

## 1.2 名詞

指稱人、地、物、行動、狀態和概念的字詞，稱為「名詞」(noun)，如 *Tom, computer, university, tennis, intelligence* 等。至於專有名詞 (proper noun)，則用以指稱某特定的人、地或物，而字首通常為大寫，如 *Aristotle, George Washington, New York* 及 *Oxford University* 等。普通名詞 (common noun) 則是指稱某人、地或物之總類底下的一個或一些個例，如 *woman, desk, island, laboratory* 等。

名詞可作句子主詞，或作動詞及介系詞的受詞（稍後會介紹動詞及介系詞）。名詞可以分為可數名詞 (countable or count noun)、不可數名詞 (uncountable or mass noun) 和集合名詞 (collective noun)。可數名詞可以在字尾加 *s* 或 *es* 而變成複數名詞 (*computer, computers*)，但有些可數



名詞的複數形式是不規則的 (*man, men; maximum, maxima*)。不可數名詞通常為無法計算的物體，如水 (*water*) 及地心引力 (*gravity*) 等，它們沒有任何複數形式。集合名詞雖是指稱一群人或事物所組成的單位，卻也有單數形式，如 *class, set* 及 *team* 等。(可數和不可數名詞的討論，詳見第二章。)

### 1.3 代名詞

顧名思義，代名詞 (pronouns) 就是代替名詞的字詞。與名詞一樣，代名詞既可作主詞，也可作動詞或介系詞的受詞。英語的代名詞共有八種：

人稱代名詞：

*I, you, he, she, it, we, they*  
*me, you, him, her, it, us, them*  
*my, your, his, hers, its, our, their*  
*mine, yours, his, hers, its, ours, theirs*

關係代名詞：*which, that, who, whom*

This is the book *that* I want.  
 That is the teacher *whom* I admire.

疑問代名詞：*what, who, which*

*What* is that?  
*Which* building are we going to?

指示代名詞：*this, that, these, those*

不定代名詞：*all, one, any, each, everyone, someone, etc.*

相互代名詞：*each other, one another*

加強語氣代名詞：*myself, yourself, himself, herself, ourselves, yourselves, themselves*

He *himself* will do the job. [*himself* 強調了 *he*。]

The student wrote the paper *herself*. [*herself* 強調了 *the student*。]

反身代名詞：*myself, yourself, himself, herself, ourselves, yourselves,*

*themselves*

He hurt *himself* while working in the lab. [*himself* 和 *he* 實指同一個人。]

To ensure she would not forget the appointment, she wrote *herself* a note. [*herself* 和 *she* 實指同一個人。]

一個代名詞所「代替」的那個名詞，稱為該代名詞的「前述詞」(antecedent)。使用代名詞可令作者在行文時非常方便，好處很多。但在使用時，作者必須要讓讀者清楚看出各代名詞的前述詞是甚麼，而不用猜測代名詞所指的人或事物——不定代名詞是例外，因為它根本不需前述詞。（第四章 4.13 節會再深入討論代名詞和前述詞。）

## 1.4 動詞

動詞 (verb) 是表示行爲、事件、時態、擁有或狀態的字詞（例如 *run, sit, have, are, become, seem* 等）。英文中，每個句子必須至少有一個動詞，否則不能算是一個完整句子。辭典裏所列出的動詞形式，稱為原形動詞或「不定詞」(infinitive)。（句中的不定詞之前通常需加上 *to*；這個 *to* 稱為「不定詞標記」(infinitive marker)。）除了原形之外，動詞也有其他形式，像用來表示過去的行爲或事件的「過去式」(past tense)。

表示某種動作的動詞稱為「動態動詞」(active verb)，這種動詞很多。下面例句中以斜體字標示的皆為動態動詞：

Cindy *wrote* quickly.

Karen didn't *eat* much.

The students are *working* on the project.

表示某種狀態的動詞稱為「靜態動詞」(stative verb)。下面例句中以斜體字標示的都是靜態動詞：

The doctor *believes* Sam is not badly injured.

She could *feel* that the weather was hot.

This graph *represents* the first group of data.

此外，還有一種動詞稱為「聯繫動詞」(linking verb)，它處於句子

的主詞與述詞名詞 (predicate noun) 之間，或在主詞與述詞形容詞 (predicate adjective) 之間，充當聯繫作用。常見的聯繫動詞有 *be, become, seem, appear*。表達感官知覺的聯繫動詞，則有 *look, smell, taste, feel, sound* 等。下面例句中，以斜體字標示的都是聯繫動詞。

He *is* the professor.

Sally *became* a neurosurgeon.

You *look* beautiful.

The soup *tastes* good.

區分雖然有三種，但事實上這三種動詞間並不互相排斥。有時一個動詞在某句中是動態動詞，但在另一句中卻會變成靜態動詞或聯繫動詞。下面的第一句中，*look* 是聯繫動詞；在第二句中，*look* 卻為動態動詞：

Jerry *looks* tired. [聯繫動詞]

Jerry *looked* around the room to see if his friends were there. [動態動詞]

動詞亦可與某些助動詞（如 *be, can, do, may, will* 及 *must* 等）連用，以表示特殊的意思。動詞不同的形式也可與某些助動詞連用，以表示不同的時間或語態關係（如：*have been working, will be going, might have gone*）。

此外，動詞也有主動、被動兩種語態。主詞是動詞的「施事者」(actor)，乃主動語態。如 *The car hit the bus* 這句中，主詞 *the car* 是施事者；但若「受事者」(receiver) 做主詞，則乃被動語態。例如，在句子 *The bus was hit by the car* 中，主詞 *the bus* 是動詞 *hit* 的受事者。

## 1.5 修飾詞

修飾詞 (modifier) 可以是單字，也可以是一組字詞，用以描述或修飾另一個或一組字詞。形容詞 (adjective) 與副詞 (adverb) 是單字的修飾詞，片語 (phrase) 則為充當形容詞或副詞的一組字詞。（有關片語，詳見 1.8 節。）

## 形容詞

形容詞係作修飾名詞及代名詞之用，也可用來表示某東西是何種事物。它們不是在其所修飾的詞之前，就是緊接在其所修飾的詞之後。這裏以斜體字標示的皆為形容詞：*good work, effective method, large animal, difficult problem, Chinese culture.*

## 副詞

副詞既可修飾動詞、形容詞及其他副詞，有時也可修飾整個句子。副詞在修飾形容詞或其他副詞時，常緊接在其所修飾的詞後面。副詞在修飾動詞時，也常緊接在其所修飾的動詞之後（但副詞有時也會在動詞前面，或在句首或在句尾）。副詞可用來表示時間、地點、原因、方式、順序或頻率。這裏以斜體字標示的皆是副詞：*talking quietly; playing happily; deeply unhappy; Strangely, he didn't notice the big dog running around the room.*

## 1.6 具有連接功能的詞

具有連接功能的詞，既可連接字和字，也可連接一組組字詞。具有連接功能的詞可用來清楚界定不同概念間的關係。具有連接功能的詞包括介系詞 (preposition)、連接詞 (conjunction) 和連接副詞 (conjunctive adverb)。

### 介系詞

介系詞的語法功能，是表示名詞或代名詞和另一個詞之間的關係，而這名詞或代名詞稱為介系詞的受詞。介系詞和其受詞結合而成的介系詞片語，係用來修飾和介系詞受詞有關聯的詞。例如，句子 *Tom ran down the hall* 中，介系詞 *down* 將名詞 *hall* 和動詞 *ran* 關聯起來，而 *down the hall* 這介系詞片語即修飾動詞 *ran*，並指出 Tom 跑到哪裏去。此外，有些單字的介系詞（如 *in, to, of* 等），也可以和其他詞結合而成為片語形式的介系詞 (phrasal preposition)，如 *by means of, in addition to,*

*such as* 等。

## 連接詞

連接詞的功能是將詞、片語或子句關聯起來，藉此指出它們之間的關係。連接詞有三種：對等連接詞 (coordinating conjunction)、相關連接詞 (correlative conjunction) 和附屬連接詞 (subordinating conjunction)。

### 對等連接詞

對等連接詞包括 *and, but, or, nor, for, so* 和 *yet*。此種連接詞可把對等的詞、片語或子句連接。

We played cards *and* chess. [連接詞 *and* 把 *cards* 和 *chess* 兩個詞連接。]

She wants to go to the movies *or* to a restaurant. [連接詞 *or* 把 *to the movies* 和 *to a restaurant* 兩個片語連接。]

He planned to graduate in December, *but* he didn't finish his thesis on time. [連接詞 *but* 把 *He planned...* 和 *he didn't finish...* 兩個子句連接。]

### 相關連接詞

相關連接詞準會一對成雙出現，這種連接詞包括 *both...and, either...or* 和 *neither...nor*。它們可把對等的詞、片語、子句或完整的句子連接。

*Neither* John *nor* Susan is coming to the dinner party. [連接兩個對等的詞。]

*Both* the basketball team *and* the football team won last weekend. [連接兩個對等的名詞片語。]

*Either* you do the job *or* I will do it. [連接兩個對等的獨立子句。]

### 附屬連接詞

對等連接詞和相關連接詞，皆可連接對等的詞、片語或子句。附屬連接詞則只能把子句和子句連接，且連接的都只能是不對等子句。

以附屬連接詞開首的子句，稱為「附屬子句」(或「從屬子句」) (subordinate or dependent clause)。附屬子句不是一個完整句子；它必須與

獨立子句（或主要子句）(independent or main clause) 連接，才能構成一個完整句。換句話說，附屬子句是依附於相關主要子句的。下面兩個句子中的第一個子句，都是以附屬連接詞開首的附屬子句：

*Because the traditional method is time-consuming, a new approach is needed.*

*If we set up the experiment in this way, we obtain some surprising results.*

在上面兩個例句中，主要子句表達了句子的主要意思 (*a new approach is needed; we obtain some surprising results*)，而附屬子句則支持、補充或說明了主要子句。故附屬子句的意思可說是附屬於主要子句的意思。

下面是英文科技論文中常用的附屬連接詞：

after	even though	so that	whenever
although	if	than	where
as	in order that	that	wherever
as if	instead of	though	whether
because	owing to	unless	while
before	rather than	until	
even if	since	when	

特別需要注意，*after, as, before, since, until* 這些字詞，也可作介系詞使用。試比較下列句子中的 *since*：

*Since he's not here yet, let's have a cup of coffee.* [附屬連接詞。]

Sally has been studying for her doctorate *since* 1990. [介系詞。]

## 連接副詞

顧名思義，連接副詞是具連接功能的副詞。下面是一些常用的連接副詞：

accordingly	furthermore	in most cases	on the other hand
also	further on	in other words	otherwise
as a result	generally	in particular	rather
as mentioned in	hence	in practice	second
as shown in	however	in principle	still
by contrast	i.e.	instead	that is

consequently	in addition	in summary	then
e.g.	in comparison	in theory	therefore
finally	in conclusion	later	thus
first	in contrast	moreover	to be sure
for example	indeed	namely	too
for instance	in fact	nevertheless	
for this reason	in general	on the contrary	

連接副詞與附屬連接詞在功能上差別很大。附屬連接詞表示同一個句子中的兩個子句（即主要子句與附屬子句）之間的關係；連接副詞則表示兩個獨立而完整的子句、甚至兩個段落之間的關係。連接副詞是很重要的轉接詞，高明的作者常能巧用它來闡明不同句子或子句間的邏輯關係，或是把段落中不同的概念關聯起來。下面以斜體字表示的都是連接副詞：

The conventional method is slow, complex, and inaccurate. *Consequently*, we believe a different method should be used.

The argon process has a higher start-up cost than the oxygen process; *on the other hand*, the argon process is cleaner and more efficient.

*In theory*, this system can be represented by a simple model. *Nevertheless*, in practice the behavior of the system is difficult to predict.

連接副詞通常放在句首或子句的前面，但有時也可放在句子的中間或最後。同時，必須以逗點來區分連接副詞和句子的其他部分。如果連接副詞的位置在句子中間，則必須用兩個逗點把句子前後部分隔開。

The new system has many advantages. *However*, it also has several important disadvantages.

The new system has many advantages. It also, *however*, has several important disadvantages.

The new system has many advantages. It also has several important disadvantages, *however*.

如果要以連接副詞把兩個獨立子句連接而成一複合句，則必須在連接副詞前面加上分號，而在其後加上逗點：

The new system has many advantages; *however*, it also has several important disadvantages.

## 1.7 動狀詞

動狀詞 (verbal) 是動詞的變形，可作名詞或修飾詞使用。英文的動狀詞計有三種：不定詞 (infinitive)、分詞 (participle) 和動名詞 (gerund)。

### 不定詞

不定詞（即原形動詞）的典型特徵，是動詞前面有一個 *to*（如 *to be, to live*），但有時會給省略。不定詞可作名詞、形容詞或副詞使用。

*To win an Olympic gold medal is a difficult task.* [作名詞。]

*We are looking for a place to live.* [作修飾 *place* 的形容詞。]

*The secretary is ready to type the letter.* [作修飾 *ready* 的副詞。]

### 分詞

分詞有兩種形式：現在分詞 (*jumping, working, studying*) 與過去分詞 (*worked, eaten, tried*)。而分詞通常都會作形容詞使用。

*Looking toward the future, we are confident that we will achieve our goal.* [現在分詞 *looking* 修飾主詞 *we*。]

*Exhausted, she fell onto the sofa.* [過去分詞 *exhausted* 修飾主詞 *she*。]

### 動名詞

動名詞和現在分詞外表雖相同（兩者都有 *-ing* 字尾），功能卻有別。當動狀詞以 *-ing* 結尾，作形容詞使用（如上面第一個例句中的 *looking*），稱為「現在分詞」；當動狀詞以 *-ing* 字尾，則作名詞使用，稱為「動名詞」。

*Jennifer loves dancing.* [*Dancing* 為 *loves* 的受詞。]

*Studying all day long is boring.* [*Studying* 為 *is* 的主詞。]

動狀詞不能作句子的述詞使用，卻可以有受詞，並可受副詞修飾：

*Sam wants to marry Sandy.* [*Sandy* 為不定詞 *to marry* 的受詞。]

*Working quickly, Susan finished the test in less than an hour.* [副詞 *quickly* 修飾分詞 *working*。]



以上已介紹了英文科技寫作中常見的詞類。接著會介紹兩種重要的字詞組，即片語及子句。

## 1.8 片語

片語 (phrase) 是一組字詞，作單詞（如名詞或副詞）使用，但不能表達完整意思。英文的片語共可分成七大類：獨立片語、動名詞片語、不定詞片語、名詞片語、分詞片語、介系詞片語和動詞片語。

### 獨立片語

獨立片語 (absolute phrase) 包含一個當主詞的名詞（或代名詞）以及一個分詞。獨立片語和其他的片語不同，除了動狀詞之外，這種片語同時包含一個主詞。獨立片語並非修飾句子中的單字，而是整個句子，但這種片語在英文科技論文中並不常見。

*The experiment having been completed, we cleaned up the lab and went home.*

*Demand for its products growing steadily, the firm appeared likely to become a success.*

### 動名詞片語

動名詞片語 (gerund phrase) 包括一個動名詞和動名詞的修飾詞，有時還會包括動名詞的受詞。動名詞片語是作名詞使用的。

*Talking to students* sometimes helps teachers to clarify their own ideas.  
[動名詞片語為句子主詞。]

John prefers *working alone*. [動名詞片語為 *prefers* 的受詞。]

### 不定詞片語

不定詞片語 (infinitive phrase) 包含不定詞和不定詞的修飾詞，有時還可能包含不定詞的受詞。不定詞片語可作名詞、形容詞或副詞使用。

I prefer *to work alone*. [作名詞使用，即 *prefer* 的受詞。]

Do you have a book *to read on the plane*? [修飾 *book* 的形容詞。]

They were all ready *to begin the test*. [修飾 *ready* 的副詞。]

## 名詞片語

名詞片語 (noun phrase) 包含名詞及名詞的修飾詞，可作主詞或受詞使用。

*A beautiful new car was parked in the driveway.* [第一個名詞片語是句子主詞；第二個則為介系詞 *in* 的受詞。]

## 分詞片語

分詞片語 (participial phrase) 包含現在或過去分詞和分詞的修飾詞，有時還可會包含分詞的受詞（如果有的話）。分詞片語可作形容詞。分詞片語在外表上和動名詞片語完全一樣，在功能上卻有所不同：動名詞片語只能當名詞，而分詞片語則只能當形容詞。

*Our professor is the man talking to those students.* [修飾 *the man*。]  
*Staring at the blackboard, Julie suddenly thought of the answer.* [修飾 *Julie*。]

## 介系詞片語

介系詞片語 (prepositional phrase) 包含介系詞、介系詞的受詞以及介系詞受詞的任何修飾語。介系詞片語通常作形容詞或副詞使用，偶爾也可作名詞使用（但在科技論文中很少見）。

*We bought a gift for him.* [修飾 *gift* 的形容詞。]  
*The lecture began at 10 o'clock.* [修飾 *began* 的副詞。]  
*After class is a good time to meet.* [作名詞使用，即句子的主詞。]

## 動詞片語

動詞片語 (verb phrase) 包含動詞和修飾動詞的修飾詞或動詞的補語。

*We will be leaving early tomorrow morning, if you want to come along.*

## 1.9 子句

子句 (clause) 是包含一個主詞與述詞的字詞組。英文的子句可分成兩大

類：獨立（或主要）子句 (independent or main clause) 和附屬子句 (subordinate or dependent clause)。

## 獨立子句

獨立子句包含主詞和動詞，可作為一個完整獨立的句子。獨立子句不能作名詞或修飾詞，也不能以附屬連接詞開首。下面句子皆為獨立子句：

Education is important.

Mark bought a new computer.

## 附屬子句

附屬子句以附屬連接詞（參閱上面 1.6 節）或關係代名詞（即 *who*, *which* 或 *that*）開首。附屬子句並非完整句子，它必須與獨立子句結合，才能成為完整句。附屬子句表達的意思都是依附於主要子句上的。下面以斜體字標示的子句，都是附屬子句。

Education is important *if you wish to enjoy a rewarding career.*

*After his old one broke down,* Mark bought a new computer.

附屬子句可以分成三種：形容詞子句 (adjective clause)、副詞子句 (adverbial clauses) 和名詞子句 (noun clause)。

## 形容詞子句

形容詞子句是修飾名詞或代名詞的附屬子句，通常以關係代名詞（作子句的主詞或受詞）開首。（以關係代名詞開首的子句，稱為「關係子句」(relative clause)。）

We have developed a system *that can perform this task.* [附屬子句是修飾名詞 *system* 的形容詞子句；關係代名詞 *that* 是附屬子句的主詞。]

This is the system *that we developed.* [附屬子句是修飾名詞 *system* 的形容詞子句；關係代名詞 *that* 是附屬子句的受詞。]

## 副詞子句

副詞子句可修飾動詞、形容詞、副詞或整個主要子句，一般用以說明事件發生的時間、地點、原因、方式、始末或結果。

The machine stopped functioning *when I spilled my coffee on it*. [附屬子句是修飾動詞 *stopped* 的副詞子句。]

We'll try this plan first, *unless you have a better idea*. [附屬子句修飾整個主要子句。]

This program solves the problem more slowly *than that one does*. [附屬子句修飾副詞 *slowly*。]

## 名詞子句

名詞子句是作名詞使用的子句，並可作句子的主詞、述詞名詞或受詞。

*What I have been working on* is secret. [作句子主詞。]

This is *what I have been working on lately*. [作述詞名詞。]

Tell me *what you have been working on*. [作動詞 *tell* 的受詞。]

The experimental evidence suggests *that this hypothesis is incorrect*. [作動詞 *suggests* 的受詞。]

以上已介紹了大部分構成英文句子的詞類以及字詞組，接著將講解英文句子的基本句式。

## 1.10 基本句式

所有英文句子都是由幾個基本句式構成的。無論句子有多長、有多複雜，都可還原成一些基本句式。本節將會介紹一些常用句式。

### 句式一：主詞＋動詞

這是所有英文句子最簡單和最基本的句式。（本章 1.1 節經已說明，一組字詞必須至少包含一個主詞和動詞，才能為一個完整句。）

主詞	動詞
The class	began.

A dog	barked.
Morning	came.

## 句式二：主詞＋及物動詞＋直接受詞

此句式包含直接受詞 (direct object) (所謂直接受詞，即動詞行為對象的名詞、代名詞或作名詞的片語或子句)。能加上直接受詞的動詞稱為「及物動詞」(transitive verb)。

主詞	及物動詞	直接受詞
The children	enjoyed	the ice cream.
The girl	hit	the ball.
The teacher	taught	the class.

## 句式三：主詞＋及物動詞＋直接受詞＋受詞補語

某些動詞的直接受詞後面，可接修飾詞或另一個名詞，以賦予受詞另一個名稱或性質。這修飾詞或名詞稱為「受詞補語」(object complement)。

主詞	及物動詞	直接受詞	受詞補語
They	called	the child	Jill.
The students	elected	him	president.
Your remark	made	him	very happy.

## 句式四：主詞＋及物動詞＋間接受詞＋直接受詞

這類句式包含間接受詞 (indirect object)。間接受詞位於直接受詞之前，指「接受」直接受詞的人或事物。

主詞	及物動詞	間接受詞	直接受詞
I	bought	you	a gift.
Sharon	has found	herself	a good job.
The family	gave	the boy	some money.

### 句式五：主詞＋聯繫動詞＋述詞名詞或述詞形容詞

這種句式包含一個特殊的動詞——聯繫動詞。聯繫動詞的功能在於連結句子的主詞和述詞名詞或述詞形容詞（即聯繫動詞後面的名詞或形容詞）。常用的聯繫動詞包括 *to be, to become, to seem, to appear*。而如 *to feel, to taste, to smell, to look, to sound, to act* 及 *to grow* 等動詞，也可作聯繫動詞。緊接聯繫動詞後面的是主詞補語 (subject complement)，即形容主詞或主詞的另一個名稱。這種句式中，形容句子主詞的形容詞，稱為「述詞形容詞」；至於主詞另一個名稱的名詞，則稱為「述詞名詞」。

主詞	聯繫動詞	述詞名詞或述詞形容詞
Her brother	is	a pilot.
The apartment	was	bright.
The pie	tasted	sweet.

### 句式六：疑問句

英文的疑問句都是上面基本句式之變形。只要對調句中的主詞與動詞，就能造出疑問句：

直述句： *You are my cousin.*

疑問句： *Are you my cousin?*

此外，我們也可以把助動詞加在「主詞＋動詞」的基本句式前面：

直述句： *You live near your office.*

疑問句： *Do you live near your office?*

### 句式七：祈使句

祈使句是把直述句中的主詞省略而成的句子。

直述句： *You go home.*

祈使句： *Go home.*

直述句： *You do your homework.*

祈使句： *Do your homework.*

在祈使句中，省略的主詞通常是 *You*。

## 句式八：被動語態的句子

在被動語態的句子中，主詞不是動詞的「施事者」，而是動詞的「受事者」。要表示被動語態，可以在句子的主要動詞前加上一個助動詞。至於動詞的施事者，則可加上以 *by* 開首的片語來表示，或甚至可以省略。

主動句： *Lightning struck the house.*

被動句： *The house was struck by lightning.*

主動句： *The police arrested the thief yesterday.*

被動句： *The thief was arrested by the police yesterday.*

被動句： *The thief was arrested yesterday.*

當施事者身分不明或無關宏旨時，就可使用被動句。

## 句式九：虛主詞結構

在虛主詞結構 (expletive construction) 中，虛字 *there* 或 *it* 會擺在句首，而主詞則擺在動詞後面。

*There was a package lying on the table.*

*There are two lines in the graph.*

*It is clear that the reaction rate increases with temperature.*

要強調主詞，便可使用虛主詞結構，即把主詞擺在動詞後面。但在虛主詞結構中，虛字 (如 *there*) 通常不是句子的主詞，接在動詞後面的名詞片語或名詞子句才是句子的主詞。

## 根據子句結構作句子分類

英文句子可用句中所包含的子句結構作分類：

「簡單句」 (simple sentence)：只有一個主要子句的句子。

*Education is important.*

「複合句」(compound sentence)：含有兩個或以上主要子句的句子。

Education is important, but experience is also necessary.

「複句」(complex sentence)：含有一個主要子句以及一個或以上的附屬子句的句子。

If you want to find a good job, education is important.

「複合複句」(compound-complex sentence)：含有兩個或以上的主要子句以及一個或以上的附屬子句的句子。

If you want to find a good job, education is important, but experience is also necessary.



# 第二章

---

## 冠詞

要寫出漂亮的英文，必須瞭解定冠詞與不定冠詞 (*a, an, the*) 的正確用法，因為這些字能幫助釐清英文名詞及名詞片語的意思。本章將說明這些重要字詞的使用準則。

普通名詞 (*common noun*) 是用來指稱一般事物或概念的。(一個普通名詞若單獨出現，而不加其他修飾詞，則非某一特定人或物之名稱。專指某一特定人或物之名詞稱為「專有名詞」(*proper noun*)。) 一個普通名詞，可用來指稱某個事物或概念的總類中任何一個或某一個個例。例如，在 *A computer is a powerful tool* 這句中，*computer* 是一個普通名詞，所指為某個總類(所有的電腦)中的任何一個個例，。在 *A 586 computer is faster than a 486 model* 這句中，*computer* 這字詞也是指某個總類中的任何一個個例，但這時總類是指所有型號為 586 的電腦。雖然這個句子中所指的總類比第一個句子中 *computer* 所指的要小(586 電腦相對於所有的電腦而言)，但當中 *computer* 仍是指某個總類中的任何一個個例。

再來參考 *I really like the computer I bought last week* 這個句子。在這句中，*computer* 並非泛指一般電腦，而是特指某一臺電腦，是指我上星期買的那臺。正確的使用英文冠詞，先要能夠區分一個名詞何時是指某個總類中的任何一個或一些個例（如例子 *a computer* 所示），何時特指某個或某些事物（如例子 *the computer* 所示）。

## 2.1 不定冠詞

不定冠詞 (*a* 或 *an*) 是用來表示某個單數名詞，所指稱的事物是某個總類中的任何一個個例。英文不定冠詞的使用規則如下：

1. 如果一個普通名詞是用來指稱某類事物中的單數且可數的個例，則這名詞前面應加上不定冠詞 (*a* 或 *an*)。
2. 如果一個名詞是複數、不可數，或是特指某事物或概念，則前面不加不定冠詞。（這有兩種可能：加定冠詞或不加任何冠詞。）

在應用上述的規則前，需瞭解三個關鍵概念：一個名詞是單數或複數，是可數或不可數，是指某總類中的任何一個個例或是特指某事物。

### 單數與複數名詞

第一個概念很簡單：一個名詞單指某事物是單數，而如果它指一個以上的事物，則是複數。在英文中，複數名詞常會寫成特別的複數形式（在名詞後加上 *s* 或 *es*，或是整個字改頭換面，如 *child* 的複數形式是 *children*），很易辨認。由上述規則可得知，如果一個名詞是複數，則不加不定冠詞。

### 可數與不可數名詞

第二個概念稍微複雜些。有一些事物或概念沒有明確形狀，並通常不能被分解成最小的個別單位。在英文中，指稱這一類事物或概念的名

詞就是不可數名詞，例如 *water, salt, information, chemistry, anger* 等。不可數名詞一定不會有複數形式，且不會以 *a* 或 *an* 來修飾。例如，不會有人說 “three waters” 或 “one anger”。這點不難瞭解，但要記住哪些名詞是不可數卻不容易。

常見的不可數名詞包括以下幾種：

- 指涉沒有固定形狀的物質，如液體、汽體及粉狀的東西。例如 *water, oil, rice, sand, flour, air, oxygen*。
- 指涉抽象概念。例如 *anger, happiness, information, force, strength, power*。
- 指涉處理方法或過程。例如 *integration, photolithography, fabrication, pollution, etching, purification*。
- 指涉不同學術領域。例如 *physics, chemistry, economics, mathematics, engineering*。

下面的名詞都是科技論文常會出現的不可數名詞，請緊記使用時不能把它們寫成複數形式。

- research*    Much *research* has been published in this field.
- information*    Not much *information* is available on this phenomenon.
- equipment*    The new *equipment* has already been installed.
- software*    We are developing advanced *software* to complement our new line of workstations.
- hardware*    A company cannot rely only on advanced *hardware*.

此外，下列名詞在一般的文章中偶爾會作可數名詞使用，且可作為複數。不過，它們在科技論文中通常都是不可數的。

- literature*    In the *literature*, little attention has been devoted to this problem.

[這裏的 *literature* 是不可數名詞，指某一特定學術領域中所有已發表的文獻。當 *literature* 用來特指某一文學傳統時，則可變成複數，如 *Chinese literature and English literature are two of the world's great literatures*。]

*work* Recent *work* has overcome these drawbacks.

[這裏的 *work* 指的是工作或著作的整體，而非某一篇文章特定的報告或一項特定的研究工作，因此這裏的 *work* 是不可數的。]

*notation* The *notation* used in this paper is summarized below.

[這裏的 *notation* 是指由一些不同符號組成的一組符號。因為作者指的只是一組符號，而非一些個別的符號，所以 *notation* 是單數，且是不可數的。]

*terminology* In this paper, we employ standard *terminology*.

[這裏的 *terminology* 是指由一些不同術語組成的一組術語。因為作者指的只是一組術語，所以 *terminology* 是單數，且是不可數的。]

可數名詞則指稱可分解成個別單位的事物。可數名詞有複數形式且可用數字和數量詞來修飾，例如：*two computers, one office, a dozen flowers, three children, several techniques, many approaches* 等。有某些抽象名詞也是可數的，例如 *concept* 和 *idea*。（注意：一個可數名詞如果前面有數字或是像 *several* 或 *many* 這樣的數量詞，則當然不可加不定冠詞。）

在英語中，複數形式的可數名詞可直接用數字和數量詞來修飾。至於不可數名詞，則與漢語的名詞的情況相同，需要加上相應的量詞 (counters) 才可以用數字和數量詞來修飾。英語的不可數名詞通常是借一些度量衡單位或器物名稱作量詞使用。例如，*water* 這個名詞可使用的量詞包括 *cup, glass* 和 *liter* (a *cup* of water, a *glass* of water, a *liter* of water)。Equipment 所使用的量詞是 *piece* (a *piece* of equipment)。而量詞就像其他可數名詞一樣，可加上不定冠詞或用數字和數量詞來修飾。

### 一般指稱與特定指稱

最後一個要弄清的概念是：所指稱的事物究竟是某個總類中的任何一個個例，還是某個特定事物。可數名詞常用來指某個總類中的個例。例如，*A computer is a powerful tool, computer* 指的是一般的電腦，而整句

意思是「任何一臺電腦都是功能很強的工具」。這不僅指我書桌上的那臺、實驗室裏的或是圖書館裏的電腦，而是指任何一臺電腦。相反，*The computer on my desk is new*，*computer* 則指特定的一臺電腦：我書桌上的那臺。因為在 *A computer is a powerful tool* 這句中，*computer* 是單數且可數的，指一般電腦中的其中一臺，所以它前面會加不定冠詞 *a*。但在 *The computer on my desk is new* 這句中，*computer* 指的是特定的一臺電腦，所以它前面會加定冠詞。

很多人都會有相同的疑問：某個名詞事實上只指涉一事物，但它不是特指一個事物，那麼應否加上不定冠詞？例如，*There is a book on my desk* 這個存在句已清楚指出我桌上只有一本書。然而，句子沒有特指是哪一本書。假如我在書桌上放了一本字典，*There is a book on my desk* 這個句子便為真。就算我將書桌上的字典拿走，然後換上一本英文課本，這個句子仍然為真。只要我的書桌上有一本書，無論它是哪一本書，皆足以使這個句子為真。此句中的單數可數名詞 *book* 並未指一本特定的書，所以應該用不定冠詞。

在大部分的情況下，如果在一個中文的名詞前，可以加上「一種」、「任何一個」或「某一個」，則所指大概就是某個總類中的任何一個個例，而在對應的英文名詞前大概都要加上不定冠詞。

## A 和 An

英文有兩個不定冠詞——*a* 和 *an*，現在來重溫兩者不同的用法。某個名詞前應使用不定冠詞 *a* 還是 *an*，要視乎名詞第一個音節的發音而定。如果名詞第一個音節的發音是以子音開頭，則必須使用冠詞 *a*，即使這個字是以母音開始也不例外。

a machine	a blackboard	a universal joint
a union	a one-step method	a unique solution

上述例子中，有些字的拼法是以母音開頭，但它們第一個音節的發音是子音，所以都必使用冠詞 *a*。

相反，在以母音發音開頭的名詞前，應使用冠詞 *an*，即使它的第

一個字母是子音，也不例外。

an algorithm            an iteration            an SRAM chip  
 an X-ray machine    an RNA molecule

上述例子中，有些字詞的第一個字母是子音字母，但這些子音字母發的是母音，亦應使用冠詞 *an*。

如果一個加上不定冠詞的名詞前面有形容詞，應否使用 *a* 或 *an* 則視該形容詞的第一個音節發音而定。

a simple algorithm    a new element  
 an unusual machine    an interesting subject

## 兩用名詞

有些特別的英文名詞，在不同的文脈下，有時會作可數名詞，有時則會作不可數名詞。這一類名詞在科技寫作中十分常見，稱為「兩用名詞」(two-way noun)。大多數兩用名詞無論是在可數或不可數的時候，基本概念都相同。在多數情況下，兩用名詞都是不可數的，只有當要用來指該基本概念特定的個例時，才是可數的。

*Language* 就是兩用名詞的一個好例子。它可作不可數名詞，例如：

*Language is what sets humans apart from animals.*

但是，*language* 也可作可數名詞：

Professor Smith is fluent in four *languages*.

第一個例句的 *language* 是不可數名詞，所指為一般的語言溝通。而在第二個例句中，*four languages* 可解釋為 *four types of language*。（後者的 *language* 是取其不可數意義。）

有很多兩用名詞就像 *language* 這名詞一樣，可作可數名詞用來表示 *a type of x*，而這裏的 *x* 則是取其兩用名詞的不可數意義。這類兩用名詞包括：*metal, material, acid, noise, motion, force, friction*。

The door is made of *metal*. [不可數意義]

Gold, silver, and bronze are three different *metals*. [可數意義，指三種不同金屬]

兩用名詞當作可數時也常用來指 *an amount of x* 或 *a degree of x*。例如，*pressure* 這字詞通常是作不可數名詞，例如：

*Pressure varies proportionately with temperature.* [不可數意義]

它也可作可數名詞用來指 *an amount of pressure*，例如：

*In the second experiment, the reaction was carried out at a greater pressure than in the first.* [可數意義]

在這例子中，*a greater pressure* 的意思是 “a greater amount of pressure”。此外，其他可作可數名詞來指 *an amount of x* 的兩用名詞還有 *mass, force, velocity, acceleration*。

以上只是兩用名詞最常見的兩種解釋。英文中還有許多兩用名詞，且尚有其他不同解釋。但應注意：並非所有的不可數名詞皆可兩用。因此，在將一個不可數名詞視作兩用名詞使用前，最好先參考在同一學術領域內，以英文為母語的作者有否如此使用。

## 練習 2-1 可數與不可數名詞

請判斷下列名詞是可數還是不可數。

device	file
hydrogen	hydrochloric acid
substrate	deposition
telecommunications	system
equipment	liter of hydrochloric acid
research	concept
software	term
evidence	terminology
project	gold
information	rain
biology	kilogram
mass	efficiency

## 練習 2-2 兩用名詞

請指出下列畫線部分的名詞屬於可數還是不可數。

1. According to this law, force is the product of mass and acceleration. An object with a mass of 10 kilograms and an acceleration of one meter per second, will have a force of 10 newtons.
2. Much research effort has been devoted to this problem.
3. We wish to thank Professor Chen for his efforts over the years on behalf of our association.
4. A company must not overburden itself with debt. In the last 18 months before its collapse, Technocorp had taken on several unwise debts.
5. Voltage is the electrical pressure that exists between two points and produces a flow of current when a closed circuit is connected between the points. The unit of measurement of voltage is the volt. One volt is the difference in electric potential required to make a current of 1 ampere flow through a resistance of 1 ohm.
6. The feasibility of this production method requires further study.
7. The movement of the snake is produced by four mechanisms. Each of the animal's movements can be analyzed as the result of one or more of these mechanisms.
8. The solubility of these salts in water varies with their chemical structure. The first two samples, for instance, have different solubilities.

## 2.2 定冠詞

定冠詞 *the* 是用來指一特定的人、概念或事物。與不定冠詞有別，定冠詞可與單數或複數名詞合用，也可與可數或不可數名詞合用。它既可用以表示獨一無二及特定的概念或事物之名詞，也可用來表示特定的一組概念或事物的名詞。



「如果一個名詞指的是一個或一組特定的事物，則應加上定冠詞」。這項規則是每個曾經學過英文的人都知道的，但實際上它幫助不大。因為對母語非為英語的人來說，最大的問題在於如何分辨一個名詞在甚麼情況下是指某一特定的事物，而非某個總類中的任何一個個例。要判斷名詞或名詞片語 *N* 應否使用定冠詞，有一個粗略的方法：當閱讀名詞或名詞片語 *N* 時，就問自己：「作者所說的是哪個 *N*？」如果之前的句子或該句子本身已經提供明確的信息，以指定所說的是哪個 *N*，則這名詞 *N* 可加定冠詞。我們來參考：

I am working on a new research project.

我們可以問自己：「作者所說的是哪項研究計畫？」如果作者在此以前並未提到這項研究計畫（且我們也不知道這項計畫），則這個句子就無法提供一個明確的答案。倘若如此，這裏用不定冠詞 *a* 是正確的。相反：

The new research project that I am working on is very challenging.

當我們問：「作者所說的是哪項研究計畫？」，大家已明確地知悉，所說的就是他正在進行的那個研究計畫。倘若如此，這裏用定冠詞是正確的。

以下將提出一些說明在甚麼情況下會使用定冠詞的指導準則。但這裏必須講明：除了第一條準則之外，這些準則並非絕對的。撰寫科技論文的作者不能完全依賴這些準則，還是要自己考慮清楚，一個由某特定名詞所指涉的事物究竟是某個（或某組）特定的事物，還是某個總類中的任何一個（或一些）個例。

## 提及過之名詞

如果一個名詞或名詞片語所指涉的，與同篇文章中已提過的名詞或名詞片語所指涉的事物或概念相同，則通常應加上定冠詞 *the*。請看下面例子：

*A bus master* either oversees the transfer of data between devices or, more often, exchanges information with one or more slaves. *The bus*

*master* selects slaves by placing address information on the bus; each slave compares this information with its own address. If the addresses match, *the master* and slave establish a connection and the slave becomes a responder.

這段文字中，作者首次提及 *bus master* 這名詞時，*bus master* 並沒有特定的指稱，這時 *bus master* 可以是指任何一個 *bus master*，因此作者在這名詞前面使用不定冠詞 *a*。然而，第二和第三句中的 *bus master* 及 *master*，和第一句中的 *a bus master* 所指相同，故它們的前面應加上定冠詞 *the*。

當要確認一個名詞是否已在文章較前部分提及過，不能只檢視有否出現過相同字眼，更要判斷有否出現過所指的事物或概念。試看下面例子：

*A solar water heater* can be constructed as shown in Figure 2. At the top left of *the water heater* is a cold-water inlet, where water flows into *the apparatus*. The main portion of *the heater* consists of many coils of plastic pipe connected together in an accordion fashion....

在第二和第三句中的名詞片語都和作者第一句所使用的名詞片語不同。其中兩個名詞片語 (*the water heater* 和 *the heater*) 是第一句中的名詞片語 (*A solar water heater*) 的變形，而另一個名詞片語 (*the apparatus*) 的首語 (*apparatus*) 和第一句中的片語的首語完全不同。但實際上，第二和第三句中的三個名詞片語所指的，皆為第一句中提到的熱水器。因此，這三個名詞片語都應加上定冠詞 *the*。

## 接著限定子句或片語之名詞

如果一個名詞的後面接著一個子句或片語，用以說明或限定這個名詞所指為何，則這個名詞前面通常要加上定冠詞。這項準則最常見的例子，就是當一個名詞後面接著限定的關係子句：

This is *the network design that our firm is currently using*.

*The method proposed by Johnson and Smith* is the most efficient way to factor the logic terms.

第一個例句中，*that our firm is currently using* 這子句說明了句中所

指的網路為何。從這個子句以及作者使用定冠詞來看，讀者可推斷作者的公司目前只使用一種網路設計。同樣，第二個例句中 (*that was proposed by Johnson and Smith*) 這子句說明了句中所指的方法為何。從這個子句和作者使用定冠詞來看，讀者亦可推斷約翰生和斯密夫只提出了一個方法。

如名詞後面接有以 *of* 開首的介係詞片語，經常應在該名詞前面加上定冠詞。下面的句子中，介係詞片語就說明了作者所指的發明、理論以及速率為何：

Future historians will surely regard *the invention of the integrated circuit* as one of the most important technological developments of the twentieth century.

Some scholars have argued that Einstein's wife helped him to develop *the theory of relativity*.

*The rate of precipitation* was extremely rapid.

然而，「接著限定子句或片語之名詞」與「提及過之名詞」的準則不同，它無法自動判斷作者該用定冠詞還是不定冠詞。作者仍須自行判斷他用的名詞究竟是指某一個（或一組）特定事物，還是某個總類中的一個（或一些）個例。試比較下列兩句的意思：

This is *the network design* that our group recently developed.

This is *a network design* that our group recently developed.

這兩句都是正確英文，而應選用哪個句子則需視乎上下文關係而定。使用定冠詞的句子，暗示作者的研究小組最近只研發出一種新的網路設計。如果作者認為讀者知道此設計的發展，則他會用第一句。反過來說，假使作者認為讀者對他的研究小組及工作內容完全不熟悉，或者這研究小組最近完成了幾種不同的設計，而句中所指的只是其中一個，則他會選用第二句。

再來看另一個例子：

Smith presented *a detailed analysis of the process*.

*The analysis of the process that Smith presented* was very clear.

第一個句子中，作者之所以選用不定冠詞 *a* 是因為斯密夫對這過程所提出的只是其中一個分析，而別人或斯密夫自己仍然可能有別的分析。但若作者把 *a* 改為 *the*，意思就迥然不同了。這表示可行的分析只有一個，且就是斯密夫的那一個。而在第二個句子中，作者選用定冠詞 *the*，暗示斯密夫只提出了一個特定的分析。

上面網路設計的例子顯示出，即使一個名詞後面接有一個限定或說明的子句或片語，要選擇用定冠詞或不定冠詞，有時還是要取決於讀者對主題瞭解的程度。

### 共有和專業的知識

當作者認為讀者都瞭解某個名詞具有特定的指稱時，通常會在這個名詞前加上定冠詞。在這種情況下，即使這個名詞在文章較前部分未曾提及過，也可用定冠詞。試看下面例子：

*The Chernobyl accident drew attention to the dangers presented by poorly designed, inadequately maintained nuclear reactors.*

這個例子中，作者在 *The Chernobyl accident* 這名詞片語中用定冠詞 *the*，因為他假設讀者都知道 1986 年在車諾比爾核電廠發生的重大意外事件。然而，這個假設是否恰當要視作者預設的讀者群而定。在 1986 年任何一位看得懂報紙或電視新聞節目的人都知道這宗意外。因此如果作者預設的讀者群是三十歲以上的成人，則他的假設完全成立，而用定冠詞是恰當的。相反，如果作者的文章是針對那些在 1986 年只是幼童的人而寫的，則假設便不成立。他或許應該使用 *an accident* 來改寫：

*An accident that occurred at Chernobyl in 1986 drew attention to the dangers presented by poorly designed, inadequately maintained nuclear reactors.*

由此可見，在決定是否在一個特定的名詞前加上定冠詞時，作者不但要考慮這個名詞有否特定的指稱，還要考慮到讀者群是否同樣已知有此特定指稱。同一個名詞，在對象是專業讀者的論文中會使用

定冠詞；但在另一篇以普羅大眾為對象的論文中，很可能需要用不定冠詞。例如，在一篇對象為專業研究人員的論文中，作者會這樣寫：

To study the roots of linguistic meaning, we can consider *the process called radical interpretation*.

這裏作者在 *process* 前加定冠詞，因為他確信看這篇文章的讀者都知道「徹底詮釋」的意思，且肯定在他們的學術領域中只有一種分析法叫做“radical interpretation”。這種情況就是作者與他的讀者都共同擁有一種「專業知識」。相反，如果作者的寫作對象是一般普羅大眾，他們都不瞭解何謂徹底詮釋，則作者就該用不定冠詞：

To study the roots of linguistic meaning, we can consider *a process called radical interpretation*.

再舉另一個例子，請參考下面句子中定冠詞的用法：

Sandy jumped into a taxi and said, “Take me to *the train station*.”

句子中選用定冠詞的理由，就是作者與讀者對城市與火車站都有一些共同的想法，。一般人皆知道，大多數的城市裏都只會有一個火車站，所以在 *the train station* 這名詞片語前面用定冠詞，讀者會認為是很自然的。相反，假如 Sandy 要求司機載她到“a train station”去的話，句子就會顯得十分奇怪——司機甚至可能會把她載到另一個城市的火車站！

如要採用一些用以指涉所有人都知道之特定事物的名詞，使用定冠詞是正確的。這一類的名詞包括 *the world, the sun, the moon, the sky, the earth, the ground, the north pole* 等等。（但有兩個特別的情況：名詞 *space* 的前面不會用定冠詞；還有，在口語中，以英文為母語者習慣說“on earth”。）而專有名詞像 *the United States*（或 *the U.S.A.*）、*the United Kingdom*（或 *the U.K.*）、*the Republic of China*（或 *the R.O.C.*）以及 *the People's Republic of China*（或 *the P.R.C.*），此類名詞都要加上定冠詞（地址除外）。此外，指稱一段時間的名詞，一定要加上 *the*，如：*the past, the present, the future, the 1990s, the twentieth century* 等。

有些專有名詞的前面必須加定冠詞，特別是它的首語 (head noun)

本身是個普通名詞（在英文中，首語通常是名詞片語中最右邊的名詞）。這類專有名詞包括國家名稱，例如 *the United States*，和某些廣大的地理環境名稱，例如 *the Nile River*, *the Pacific Ocean*, *the Atlantic Ocean*, *the Alps* 和 *the Himalaya Mountains*。

然而，很多首語為普通名詞的專有名詞，並不會加上定冠詞。例如個別的山的名稱前通常不加定冠詞 (*Taiping Mountain*)，湖泊名稱前亦通常不加定冠詞 (*Sun Moon Lake*)。只有當某一地理環境真的非常廣大時，才會特別為它的名稱加定冠詞。

特定的歷史事件名稱前通常要加定冠詞，例如 *the chemical revolution* 和 *the industrial revolution*。還有，特定的科學理論或定律的名稱，如 *the phlogiston theory* 和 *the uncertainty principle*，也要用定冠詞。如果一個名詞指的是某個研究領域的總稱，而非某一特定理論，則不需加冠詞：*set theory*, *game theory*, *psychoanalytic theory*。

## 特殊的形容詞

有些用來修飾名詞的形容詞，能使名詞清清楚楚地特指某個事物。例如，最高級形容詞將所修飾的名詞，限定其僅指涉一件事物。像 *largest*, *oldest*, *fastest*, *leftmost*, *most expensive* 這樣的形容詞，只看形式便可知它們指涉的事物是獨一無二的。所以這些形容詞修飾的名詞都一定要加定冠詞：

His family owns *the oldest house* in the city.

序數形容詞 (*first*, *second*, *nth*, *last*) 亦是一種將名詞限定為只有一個指涉對象的形容詞。任何一組事物，從第一個到最後一個組成分子，每個皆是獨立的個殊。因此，用序數形容詞修飾的名詞幾乎都要加定冠詞：

*The first batter* hit *the third pitch* out of the park.

然而，有些特殊情況，序數形容詞前面也會加不定冠詞。例如：*A second approach to the problem is to use a Markov model*。在這裏，“second”

的意思不是「第二個」，而是「另一個」。

此外，有一些形容詞也會使它所修飾的名詞有唯一的指稱，例如 *only*。在 *This is the only road to Kalamazoo* 這句中，形容詞 *only* 將 *road* 這名詞的指稱限定為一條特定的路。這類形容詞還包括 *sole, exact, ideal, present, same, following*：

*The sole way to find the exact solution for the ideal case is by using the following method, which is the same method as that used in our earlier paper.*

當然，即使有這些標記，作者在加上定冠詞 *the* 之前，仍需確定這個名詞所指的是否為一特定的事物。再看下面的例子：

*This is an exact method for finding the exact solution.*

這裏 *an exact method* 指的是一個精密的方法（可能還有好幾個精密的方法），而 *the exact solution* 指的是某個獨一無二、正確可行的解救方法。

## 總稱

定冠詞有時可用來賦予某個單數且可數的名詞一個「總稱」意義，用來代表該名詞所指為某個總類的事物，而非某個特定的事物。這類總稱的名詞片語最常用於指稱某種特別的設備、機器或動物。以下是幾個例子：

*The integrated circuit* is one of the most important inventions of the twentieth century.

Because of rampant poaching, today *the tiger* is in danger of becoming extinct.

*The computer* has changed the way business is conducted in many industries.

複數名詞當然也可用來指某個總類中的一些個例，因此上述句子中斜體字部分的單數名詞，和不加定冠詞的複數名詞的意思十分相近。例如，上述第二句和 *Because of rampant poaching, today tigers are in danger of becoming extinct* 的意思並沒甚不同。同樣，上述第三句和

*Computers have changed the way business is conducted in many industries* 的意思也沒多大差別。

## 隱含的獨特性

有時作者爲了暗示某個名詞只有一個指涉對象，即使讀者可能不瞭解某個名詞有唯一的指涉，作者還是會在這個名詞前加上定冠詞。這個做法是希望讀者能由此推斷出這個名詞事實上只有唯一的指涉。這種情形最常出現在作者描述某種設備或機器時。試看以下例子：

...The jumper is on the bottom of the modem, near the back panel. To set up the modem as the answering side, remove *the plastic jumper cap* from the jumper.

這段是從一本教人安裝數據機的技術手冊中節錄下來的。在這段落之前，作者已提過數據機、jumper 及 answering side，而他並沒提過 plastic jumper cap。但作者在這裏仍加上定冠詞，顯然是暗示它是唯一的。因此，即使讀者不怎麼瞭解甚麼是數據機、jumper 或 jumper cap，仍然可立刻從這段落推斷出，作者所指的 jumper 只有一個 plastic jumper cap。

再參考另一個例子。下面的文字是從一本教人安裝雷射印表機碳粉匣的說明書中節錄下來的：

...Remove the new toner cartridge from its bag.... Grasp the tab of *the sealing tape* and firmly pull the tape out of the cartridge. Insert the cartridge into the printer, taking care not to touch *the photoconductive drum*.

在這段文章之前，作者已先提到碳粉匣，但並沒提到密封帶或感光鼓。但只要讀者一看到作者在這兩個名詞片語前面用定冠詞，自然就能推斷出這裏只有一條密封帶和一個感光鼓。

## 常犯錯誤

以下是中國作者在科技論文中，使用定冠詞時常犯的兩個錯誤。

1. 經常會用一個普通名詞和數字組成的專有名詞，來指稱報告中的某一章節，或報告中提出的方程式或定理。試看幾個例子：



equation (9) section 4 chapter 3 theorem 2.1

這些專有名詞是不能加定冠詞的。下列句子都是錯誤的寫法：

誤：The solution will be presented in *the* section 4.

誤：We can derive the solution from *the* equation (9).

正確寫法如下：

正：The solution will be presented in section 4.

正：We can derive the solution from equation (9).

2. 在科學、工程學或數學中，有很多廣為人知的定理、方程式及公式，都是以發現者的名字來命名的。有些定理或方程式的名稱必須加上定冠詞，有些則只要在發現者的名字後面加上屬格（或稱「所有格」，即加上's）便可。試看這兩個例子：

Shannon's theorem          the Riccati equation

要學習這些定理或方程式之名稱的正確寫法，最好參考在同一學術領域內以英文為母語的專家的寫法。此外，要緊記一項準則——如果發現者的名字加了屬格，則不可用定冠詞 *the*；反過來說，如果已經加了定冠詞，就不可在人名後面再加屬格。

誤：the Newton's laws

正：Newton's laws

誤：the Barcan's formula

正：the Barcan formula

## 練習 2-3 定冠詞與不定冠詞

在下列的空格內填上 *a*, *an* 或 *the*，有些可能不需填寫。並請說明理由。

### 1. Laser Printers

In the late 1970s, \_\_\_\_\_ laser printer had just arrived on \_\_\_\_\_ market. It used \_\_\_\_\_ complex and expensive optical system to scan \_\_\_\_\_ diode laser

beam in straight lines across \_\_\_ photoconductive drum. This optical system consisted of \_\_\_ rotary polygonal-mirror scanner and \_\_\_ special focusing lenses. \_\_\_ laser beam is simultaneously modulated and deflected by \_\_\_ rotating mirror so that it repeatedly scans straight lines, forming \_\_\_ electrically charged image on \_\_\_ photoconductive drum. This image is then transformed into \_\_\_ visible image on paper by \_\_\_ electrophotoconductive process of \_\_\_ kind used by photocopiers.

Vital to \_\_\_ optical system of \_\_\_ early laser printer was \_\_\_ high-precision, mirror-scanner motor, needed to minimize fluctuations in \_\_\_ placement and straightness of \_\_\_ scanning lines. In laser printers, about 10 scanning lines are generated per rotation. Each line must scan exactly \_\_\_ same position on \_\_\_ photoconductive drum. If \_\_\_ shaft of \_\_\_ motor rotating \_\_\_ scanner wobbles, \_\_\_ scanning line also will deflect. \_\_\_ permissible runout angle for motor shafts of \_\_\_ mirror scanners is about 5 arc seconds, depending on \_\_\_ system. In \_\_\_ typical scanner, \_\_\_ placement error should be less than 25 micrometers, which usually corresponds to \_\_\_ deflection angle change of less than 10 arc seconds. \_\_\_ line produced by \_\_\_ laser printers may curve no more than  $\pm 0.1$  millimeter over \_\_\_ entire scanning range of about 260 mm. To correct placement errors due to mirror wobble, cylindrical lenses often are used.<sup>1</sup>

## 2. Using Fusion for Power

Thermonuclear fusion is \_\_\_ process through which light nuclei—such as hydrogen and its isotopes, deuterium and tritium—fuse at \_\_\_ extremely high temperatures to produce heavier elements. It is \_\_\_ fundamental source of energy in \_\_\_ universe, providing \_\_\_ power for \_\_\_ sun and all other stars. Ultimately, all forms of energy used on Earth—including \_\_\_ fossil fuels, \_\_\_ hydroelectric power, and \_\_\_ solar power—derive from \_\_\_ fusion energy. Even \_\_\_ energy stored in uranium was originally \_\_\_ product of fusion reactions in \_\_\_ nearby supernova.

Since \_\_\_ nuclei are all positively charged, very high temperatures—over 100 million Kelvin—are required to give them sufficient energy to overcome coulomb electrical repulsion and to react. \_\_\_ basic problem of controlled fusion reactions is, therefore, to produce these high temperatures and simultaneously to confine \_\_\_ resulting plasma long enough and at

sufficient density for \_\_\_\_ release of \_\_\_\_ economically significant energy.

There are two main approaches to \_\_\_\_ use of \_\_\_\_ fusion for \_\_\_\_ power generation: inertial confinement and magnetic confinement. Of these two, \_\_\_\_ magnetic confinement has yielded \_\_\_\_ best results so far. Magnetic confinement makes use of \_\_\_\_ fact that \_\_\_\_ charged ions and electrons that make up \_\_\_\_ thermonuclear plasma tend to spiral around magnetic lines of force rather than move across them. With good design, therefore, magnetic “bottles” can be devised to contain \_\_\_\_ plasma even at \_\_\_\_ very high temperatures, while \_\_\_\_ combination of \_\_\_\_ magnetic field compression and other methods can be used for heating.<sup>2</sup>

### 3. Progress in Computer Technology

Early computers required \_\_\_\_ special environment, with raised floors to carry \_\_\_\_ interconnecting cables and large air-conditioning units to remove \_\_\_\_ dissipated heat; \_\_\_\_ maintenance man had to be summoned frequently. At \_\_\_\_ cost of over \_\_\_\_ dollar for either \_\_\_\_ discrete transistor or \_\_\_\_ bit of memory, \_\_\_\_ price of early computer systems generally came to \_\_\_\_ few million dollars. \_\_\_\_ high cost forced compromises on computer designers, such as \_\_\_\_ use of \_\_\_\_ single accumulator register as \_\_\_\_ source of one argument in every operation of computer logic or arithmetic. This simplified \_\_\_\_ control structure but generally necessitated time-consuming transfers of data that were extraneous to \_\_\_\_ intended calculation.

Since that time, \_\_\_\_ speed, cost, reliability, and size of computer circuitry have changed beyond recognition. \_\_\_\_ cost of \_\_\_\_ single transistor or bit of memory is less than \_\_\_\_ hundredth of \_\_\_\_ cent, \_\_\_\_ circuits operate for thousands of hours without failing, and \_\_\_\_ computing unit that far exceeds \_\_\_\_ capabilities of \_\_\_\_ ENIAC measures about \_\_\_\_ centimeter on \_\_\_\_ side, consumes \_\_\_\_ fraction of \_\_\_\_ watt, and can be bought for only \_\_\_\_ few dollars. This has been brought about, on \_\_\_\_ supply side, by \_\_\_\_ remarkably diverse body of new technology and, on \_\_\_\_ demand side, by \_\_\_\_ emergence of new, massive, and diverse applications of \_\_\_\_ computational resources, which for \_\_\_\_ most part bear little resemblance to those for which \_\_\_\_ general-purpose computer was originally intended.<sup>3</sup>

## 4. Radio Astronomy

Radio astronomy—the measurement of radio frequencies emitted by interstellar molecules—is \_\_\_ chief method for observing how stars form from \_\_\_ interstellar clouds of gas and dust, or die and release such clouds. We live about 30,000 light years from \_\_\_ center of our galaxy, but interstellar dust blocks most of \_\_\_ distance from view by optical telescopes. However, radio waves travel through \_\_\_ dust and can be recorded by special receivers, since \_\_\_ wavelengths are much longer than \_\_\_ size of \_\_\_ dust grains.

Radio telescopes are somewhat similar to optical telescopes. Radio waves from interstellar space are reflected off \_\_\_ antenna—a bowl-shaped mirror—onto \_\_\_ secondary mirror. \_\_\_ waves are reflected down to \_\_\_ center of \_\_\_ bowl, where they enter \_\_\_ radio receiver, or radiometer. \_\_\_ signal is then amplified, filtered, and processed by \_\_\_ detector with \_\_\_ short integration time—about 0.1 ms, or \_\_\_ response time suitable for \_\_\_ loudspeaker.

In making \_\_\_ observation, \_\_\_ astronomer typically steers \_\_\_ antenna toward \_\_\_ radio source, such as \_\_\_ nebula. \_\_\_ signals from various species of molecules—at least 40 have been identified so far—are measured by tuning \_\_\_ receiver to \_\_\_ wavelength characteristic of each species. \_\_\_ observed peak output power of many regions of \_\_\_ interstellar cloud can be plotted as \_\_\_ map with isophotes.<sup>4</sup>

## 5. Computers and Speech Recognition

\_\_\_ computers would seem much friendlier if it were possible to verbally ask them for \_\_\_ information or command them to carry out \_\_\_ task, and if they could respond by talking in \_\_\_ natural, conversational English. However, \_\_\_ prospects for automatic recognition of fluent, continuous speech in \_\_\_ near future are not encouraging, in part because of \_\_\_ complexity of \_\_\_ task and in part because of inadequate research support.

\_\_\_ fundamental question in automatic speech recognition by computers is how much information is contained in \_\_\_ acoustic wave patterns that make up \_\_\_ words and sentences used in communicating by

voice. In other words, can \_\_\_ machine decipher \_\_\_ voice command and act on it simply by decoding \_\_\_ wave pattern, or does it need to "know" certain additional information? In all cases, \_\_\_ answer seems to be that \_\_\_ extra knowledge must be programmed into \_\_\_ computer.

\_\_\_ speech recognition by \_\_\_ computer comprises two operations. \_\_\_ first is \_\_\_ decomposition of acoustic wave patterns into \_\_\_ basic sounds or elements of speech, called phonemes. \_\_\_ existing speech recognition machines do this job with no more than 65 percent accuracy, in part because \_\_\_ wave patterns corresponding to neighboring phonemes tend to overlap. \_\_\_ second operation is to arrange \_\_\_ phonemes into words and \_\_\_ words into sentences, taking into account that \_\_\_ substantial fraction of \_\_\_ phonemes may be misidentified, and it is here that \_\_\_ need for linguistic and contextual knowledge arises.<sup>5</sup>

#### 6. Chemical Reactions in Combustion

The molecules of most fuels have far too many atoms for combustion to proceed as \_\_\_ concerted event. Imagine \_\_\_ tangle that would arise if \_\_\_ eight carbon atoms and \_\_\_ 18 hydrogen atoms of \_\_\_ octane molecule ( $C_8H_{18}$ ) were to disengage from one another and combine all at once with \_\_\_ surrounding molecules of diatomic oxygen ( $O_2$ ), forming \_\_\_ new chemical bonds of carbon dioxide ( $CO_2$ ) and water ( $H_2O$ ). No fuel burns that way. Instead \_\_\_ breakdown of fuel molecules and \_\_\_ formation of \_\_\_ combustion products proceed in long sequences of steps; each step involves only \_\_\_ small rearrangement of chemical bonds.

\_\_\_ step of this type is termed \_\_\_ elementary reaction; \_\_\_ various molecules created along \_\_\_ way are called reactive intermediates, and \_\_\_ set of all elementary reactions that together account for \_\_\_ net chemical transformation is \_\_\_ reaction mechanism. \_\_\_ equation describing \_\_\_ overall chemical reaction that takes place in \_\_\_ flame gives no hint of what \_\_\_ individual molecular changes are; \_\_\_ equations describing elementary reactions, however, do represent real chemical events at \_\_\_ molecular level. Only when all \_\_\_ important elementary reactions are known can \_\_\_ path from fuel to combustion products be accurately described in terms of \_\_\_ rearrangements of atoms in molecules.<sup>6</sup>

## 7. A Special Kind of Atom

As far as chemists and biologists are concerned, \_\_\_\_ basic building blocks of matter are \_\_\_\_ atoms and molecules, combinations of atoms that are bound together electrically. \_\_\_\_ atom consists of \_\_\_\_ nucleus, which has \_\_\_\_ positive electric charge, surrounded by one or more electrons that are negatively charged. \_\_\_\_ electrons are over \_\_\_\_ thousand times less massive than \_\_\_\_ nucleus, but they usually occupy \_\_\_\_ volume with \_\_\_\_ diameter more than ten thousand times that of \_\_\_\_ nucleus. Thus, to all intents and purposes, \_\_\_\_ size of \_\_\_\_ atom is determined by its electrons.

Since oppositely charged particles attract one another, electrons in \_\_\_\_ atom tend to stay as close to \_\_\_\_ nucleus as possible. If one of \_\_\_\_ electrons is given additional energy, however, \_\_\_\_ force binding that electron to \_\_\_\_ nucleus is partially or totally overcome. When \_\_\_\_ compensation is partial, we speak of \_\_\_\_ process of excitation; when total, of ionization.

The more \_\_\_\_ attractive force within \_\_\_\_ atom is counterbalanced, \_\_\_\_ greater \_\_\_\_ separation of \_\_\_\_ excited electron and \_\_\_\_ nucleus. If one electron in \_\_\_\_ atom is at \_\_\_\_ much greater distance from \_\_\_\_ nucleus than all \_\_\_\_ others, \_\_\_\_ atom is called \_\_\_\_ Rydberg atom, \_\_\_\_ highly excited electron \_\_\_\_ Rydberg electron, and \_\_\_\_ rest of \_\_\_\_ atom (\_\_\_\_ nucleus plus \_\_\_\_ less distant electrons) \_\_\_\_ core of \_\_\_\_ Rydberg atom.<sup>7</sup>

## 8. Successful Integrated Circuits

More complex circuits are generally more specialized in their functions and thus are less in demand. \_\_\_\_ efforts of integrated circuit designers have focused on developing \_\_\_\_ commercially viable products using integrated circuits in \_\_\_\_ face of this and other constraints.

Undoubtedly \_\_\_\_ most successful such product has been \_\_\_\_ memory circuit, which makes \_\_\_\_ large data bases practical; \_\_\_\_ second most successful class of devices has been \_\_\_\_ microprocessor and its successor \_\_\_\_ microcomputer, which is, literally, \_\_\_\_ computer on \_\_\_\_ chip. \_\_\_\_ programming of microcomputers often involves \_\_\_\_ program written permanently into \_\_\_\_ special read-only memory (ROM) on \_\_\_\_ chip

during \_\_\_\_ manufacturing process, which makes it possible to use this class of circuits in \_\_\_\_ wide variety of ways.<sup>8</sup>

### 9. The Expansion of the Universe

The expansion of \_\_\_\_ universe was discovered when it was found that \_\_\_\_ cosmic objects move away from us with speeds that are higher \_\_\_\_ farther away \_\_\_\_ object is located. \_\_\_\_ speed at which objects move away from us increases by about 15 km/sec for every 106 light years distance from us. \_\_\_\_ expansion must be imagined not as \_\_\_\_ penetration of \_\_\_\_ limited amount of \_\_\_\_ matter into empty space surrounding it, but as \_\_\_\_ increasing dilution of matter everywhere in \_\_\_\_ universe. Each point can be considered \_\_\_\_ center of this dilution. Indeed, regardless of his location in \_\_\_\_ universe, \_\_\_\_ observer would see exactly \_\_\_\_ same thing with respect to \_\_\_\_ objects around him; that is, objects would recede from him at \_\_\_\_ rate of 15 km/sec/106 light years. \_\_\_\_ expansion of \_\_\_\_ universe does not distinguish any point and is \_\_\_\_ same all over space.

This expansion leads to \_\_\_\_ remarkable conclusion when we try to extrapolate it toward \_\_\_\_ past: one can easily calculate that about 18 billion years ago \_\_\_\_ density of matter must have been infinite. Thus we can indeed calculate approximately \_\_\_\_ date of \_\_\_\_ Primal Bang.

It is important to keep in mind that \_\_\_\_ Primal Bang is not \_\_\_\_ local phenomenon. \_\_\_\_ descriptions of it in \_\_\_\_ popular literature are often grossly misleading; it is wrong to imagine that \_\_\_\_ Primal Bang occurred at \_\_\_\_ given point in \_\_\_\_ space, matter being expelled in all directions. Actually, \_\_\_\_ Primal Bang was \_\_\_\_ beginning of \_\_\_\_ decompression of \_\_\_\_ infinite universe. This means that \_\_\_\_ whole universe, \_\_\_\_ infinite space, was filled with \_\_\_\_ infinite density of matter at time zero. Immediately afterward \_\_\_\_ density became finite though still very high. With \_\_\_\_ passage of time \_\_\_\_ density decreased further until it reached \_\_\_\_ present value.<sup>9</sup>

### 10. How a Bus Works

The function of \_\_\_\_ bus is to transfer information in \_\_\_\_ form of electric signals between \_\_\_\_ different parts of \_\_\_\_ electronic system. \_\_\_\_ ge-

neric term for system components connected by \_\_\_\_ bus is devices. \_\_\_\_ group of devices is connected to \_\_\_\_ bus segment.

Only one device, \_\_\_\_ bus master, is allowed to control \_\_\_\_ bus and initiate data transfers at any one time. Several masters may be present on \_\_\_\_ bus, so contention between them must be resolved using \_\_\_\_ arbitration rules.

\_\_\_\_ bus master either oversees \_\_\_\_ transfer of \_\_\_\_ data between \_\_\_\_ devices or, more often, exchanges information with one or more slaves. \_\_\_\_ bus master selects slaves by placing \_\_\_\_ address information on \_\_\_\_ bus; each slave compares this information with its own address. If the addresses match, \_\_\_\_ master and slave establish \_\_\_\_ connection and \_\_\_\_ slave becomes \_\_\_\_ responder. Addresses that identify more than one slave are called \_\_\_\_ broadcast addresses. \_\_\_\_ particular device may act as both master and slave, but not at \_\_\_\_ same time.

Once \_\_\_\_ slaves are connected, \_\_\_\_ bus master exchanges data with them over \_\_\_\_ bus. \_\_\_\_ master breaks \_\_\_\_ connection with its responders after all \_\_\_\_ data have been transferred. This sequence of actions—making \_\_\_\_ connection, transferring data, breaking \_\_\_\_ connection—is called \_\_\_\_ transaction. The master may either relinquish bus mastership after \_\_\_\_ transaction or continue with other transactions.<sup>10</sup>



# 第三章

---

## 動詞

本章將討論動詞的三個用法：一、時態要統一，二、主詞與動詞必須一致，三、動詞的語氣。

### 3.1 時態

英文研究報告中動詞時態 (tense) 的用法，有很清楚的使用準則，但這些準則卻相當複雜。這裏只打算介紹最基本的動詞時態的使用原則。英文科技寫作最常用的時態，計有簡單現在式、簡單過去式、現在完成式、現在進行式以及未來式（即語態助動詞 *will* 加上原形動詞）五種。本節將分述前四種時態的用法。

#### 簡單現在式

簡單現在式 (simple present tense) 是用來陳述不受時間影響的普遍事實。當研究報告作者要指出某個科學的事實時，就可用現在式來陳述，例如：

*Water boils at 100 degrees centigrade.*

A junction diode *permits* current to flow through in only one direction.  
Whales *are* aquatic mammals.

上面句子所指為普遍的科學事實，無論任何時候，這些事實皆恆常為真。

簡單現在式也可用來指出現時為真、將來亦會一直為真的事實。雖然將來情況可能有變而使句子不再為真，但就目前而言，它們都陳述大可能會持續不變的事實。像下面的例子：

The factors that control this process *are* poorly understood.  
Modeling this type of fluid flow *is* extremely difficult.  
Few tigers *can be found* in China today.  
AIDS *is* a lethal illness.

簡單現在式也可用來陳述作者或他人的信念、解釋及想法。這些信念、解釋及想法皆為他們目前的心理狀態，而且將來可能會一直為真：

Doctors *believe* that if this condition is detected early, major surgery can be avoided. [這信念將來大概不會改變。]  
We *propose* an alternative mechanism to explain this reaction. [論文的作者將來很可能一直認為這說明是合理的。]  
We *recommend* that the batch-means technique be used for these cases. [作者將來很可能一直認為這建議是恰當的。]  
This paper *presents* a new method for finding the optimal solution. [這篇論文提出一個新方法，這事實將來會一直為真。]

簡單現在式也可用來表示數學上的演算、分析或定義：

To obtain the solution, we *can now integrate* expression (12) over the interval from 0 to 1.  
The relationship between these parameters *is defined* by equation (5).

由於科技寫作中常需要指出普遍事實或表示學者的想法，所以簡單現在式是其中一個最常用的時態。

## 簡單過去式

簡單過去式 (simple past tense) 是用來指出過去曾發生或存在，但現在已

不再發生或存在的事物。例如，當研究報告的作者想在研究報告的方法章節裏，描述曾經做過的實驗，就可以用過去式：

To test the model, we *ran* a series of simulations.

The samples *were then placed* in the test chamber and the temperature *was increased*.

作者要敘述實驗的結果，可用過去式來表達：

When water *was added* to the solution, the deposition rate *increased*.

Our method *found* the solution faster than Wheaton's method in nine of ten trials.

作者想敘述其他研究人員的發現（如在研究報告的文獻回顧部分），也可用過去式來表達：

Johnson (1987) *found* that raising the temperature of the substrate increased the deposition rate.

Stewart (1974) *was* the first to study this phenomenon. He *reported* that it occurred throughout the population.

如果句子中提到過去某個特定的時間，則必須用過去式來表達：

Professor Chen *returned* to Taiwan from the United States in 1989.

Our company *began* manufacturing the new memory chip last month.

在科技研究報告中，有時作者也會用過去進行式，例如：

As the solution *was being stirred*, silica powder was gradually added to it.

但一般而言，如果可以用簡單過去式，就不要用過去進行式：

As the solution *was stirred*, silica powder was gradually added to it.

## 現在完成式

現在完成式 (present perfect tense) 是用來描述過去已開始存在，而且現在仍然一直存在的行動或狀態。撰寫研究報告的人在文獻回顧中，常會使用現在完成式來描述過去一直持續到現在的某種趨勢，例如：

Neural networks *have attracted* much attention in recent years.

Several researchers *have studied* the relationship between sunspots and weather.

第一句表示神經網路在過去已受到廣泛的注意，而且情況將會持續。第二句則表示從以前到現在，不少科學家曾經研究太陽黑子和氣候之間的關係，還可預見科學家會一直研究下去。

此外，千萬不要把現在完成式和過去式混淆，因為這兩種時態各代表不同的意義。過去式是用來指稱過去已完成的狀態或行爲，現在完成式卻是用來指稱過去已開始存在，而且現在仍然一直存在的狀態或行爲。舉個例說，當科技論文作者引用某個研究者或研究小組已出版的研究報告時，通常會用過去式，因為研究計畫早已完成：

Williams (1998) *applied* fuzzy logic to control the movement of a robot limb.

相反，如果作者要概論一個研究趨勢，就得用現在完成式。當作者用現在完成式時，可指出所描述的不是過去孤立的研究個案，而是從過去持續到現時，並由眾多學者造成的研究趨勢。

Williams (1998), Gregg (1999), Kirk (2001), and others *have developed* a wide range of new applications of neural networks.

現在完成式的另一種功能是可表達過去曾發生，而現在仍然有效的行爲。例如：

*We have invited* Dr. Holmes to lecture here next Friday afternoon.

雖然邀請荷姆斯博士這行爲在過去已經完成，但現在這項邀請仍然有效（下星期五還未到，荷姆斯博士一直是在受邀請中），所以應使用現在完成式。

科技論文作者當要描述自己過去的某項研究時，有時會用現在完成式而不用過去式，因為他們想表達自己過去的行爲仍然「有效」。例如：

The proposed algorithm *has been implemented* on a workstation in C.

在這例中，作者要指出自己根據演算法所開發的電腦程式仍然有用，而將來還打算再使用這套程式，所以用現在完成式。然而，作者的研究已在過去完成，改成過去式亦屬正確。事實上，像這類型的句子，

對母語不是英文的人來說，還是用過去式較好，因為這可使自己習慣以過去式去表達過去已完成的行為：

The proposed algorithm *was implemented* on a workstation in C.

請切記在這種情況中，絕對不可以用現在式來表達：

誤：The proposed algorithm *is implemented* on a workstation in C.

要強調某行為是最近才完成的，也可用現在完成式：

We *have just developed* a new memory circuit.

Morton *has recently published* a survey of work in this area.

在文法上，這些句子都沒有錯誤，但在科技論文中，尤其在文獻回顧中，不論事件是否最近發生，還是應一律用過去式來表達過去發生的事件。

Morton *recently published* a survey of work in this area.

此外，請注意現在完成式是 *have* 的現在式（即 *have* 或 *has*）加上過去分詞，不要混淆現在完成式和過去完成式，因為它們各自代表不同的意思。請看下面例句：

現在完成式：Chiptech *has developed* a new memory chip.

過去完成式：Chiptech *had developed* a new memory chip.

現在完成式是用來表示最近才剛完成的行為或狀態，或用來表示過去已經開始，而現在仍然持續發生的行為或狀態。相反，過去完成式卻是用來表示在一個過去的特定時間前已完成的行為，這種時態很少出現在科技寫作中。

Chiptech *has recently developed* a new memory chip, which the company will begin offering for sale next month. [現在完成式]

By the mid-1980s, when personal computer sales began to grow, Chiptech *had already developed* its first memory chip. [過去完成式]

## 現在進行式

現在進行式 (present progressive tense) 是用來描述目前正在發生的行為，在科技論文中較少用到。因為科技論文的內容不是和普遍的事實，就

是和過去的行爲有關。儘管如此，科技論文的作者有時也可用現在進行式，表達當下正在進行的行爲或研究趨勢：

*We are currently developing an advanced RISC processor.*  
*Digital signal processing is becoming more and more widely used.*

讀者應留意現在進行式和現在完成式的差別。如果作者想強調數碼訊號處理的進展是當下發生的，會用現在進行式表達：

*Digital signal processing is becoming more and more widely used.*

但如果要強調數碼訊號處理已發展了一段時間，則作者就應該用現在完成式表達：

*Digital signal processing has become more and more widely used over the past five years.*

實際上，這兩句的意思非常接近。唯一的分別是第一個句子特別強調行爲是當下發生的，而第二句則強調事態於近五年來一直發生。

大多數的英文動詞都表示某個動作，這類動詞稱爲「動態動詞」，例如 *study, read, walk, investigate, speak* 等。有些動詞並非表示某個動作，而是表示事物的狀態，這類動詞稱爲「靜態動詞」，例如 *appear, be, correspond, know, represent, seem* 等。靜態動詞沒有進行式，因爲這些動詞皆爲指稱事物的狀態，而並不像動作般有開始、經過以至結尾的過程。現在進行式是表示動作在進行中，故此一個現在進行式的動詞，只能是動態動詞，而不能是靜態動詞。

動詞 *develop* 是動態動詞，所以下面句子是正確的：

*New semiconductor manufacturing processes are being developed at a rapid rate.*

相反，下列句子的動詞是靜態動詞，所以這些句子都是錯誤的：

誤：This network structure *is corresponding* to the first graph in Figure 1.

誤：In equation (3), the letter F *is representing* force.

這兩個例句中的動詞，必須改成簡單現在式：

正：This network structure *corresponds* to the first graph in Figure 1.

正： In equation (3), the letter *F* *represents* force.

下面是科技論文中常用的靜態動詞，使用時不可用進行式：

appear	constitute	involve	represent
be	contain	know	satisfy
believe	correspond	mean	seem
concern	differ	need	understand
consist of	exist	possess	yield

## 練習 3-1 動詞時態

請選出最適合的動詞時態。（第四章練習 4-5 中有更多習題。）

### 1. Antarctic Fishes

In February of 1899 the British ship Southern Cross put (put / has put / had put) 10 men ashore at Cape Adare in Antarctica, thus beginning the first expedition to endure a year on the world's southernmost continent. Today many zoologists \_\_\_\_\_ (credit / credited / have credited) the expedition, which ushered in the "heroic" era of Antarctic exploration, with a discovery that \_\_\_\_\_ (intrigue / intrigued / has intrigued) them for almost a century: the coldest marine habitat in the world \_\_\_\_\_ (is / was / has been) actually alive with fishes. The team's zoologist, Nicholai Hanson, \_\_\_\_\_ (does / did / has) not \_\_\_\_\_ (survive / survived) the year on the icy land, but before his death he \_\_\_\_\_ (collect / collected / has collected) examples of previously unknown fish species.

Almost a century later investigators \_\_\_\_\_ (are / were / have been) still trying to understand the adaptations that \_\_\_\_\_ (enable / enabled / have enabled) fish to survive in a region once thought to be virtually uninhabitable. Of particular interest \_\_\_\_\_ (are / were / have been) the evolutionary adaptations of the suborder Notothenioidei, a group of teleosts, or advanced bony fishes, that \_\_\_\_\_ (are / were / have been) related to the perchlike fishes common in virtually all marine habitats. This suborder of between 90 and 100 species \_\_\_\_\_ (is / was / has been) primarily confined to the Antarctic region; there it \_\_\_\_\_ (dominates / dominated / has dominated), accounting for an estimated two thirds of the fish species and 90 percent of the individual fish in the area.<sup>1</sup>

## 2. From the results section of an experimental report:

Figure 2 \_\_\_\_\_ (shows / showed / has shown) the current-voltage (I-V) characteristics of aluminum contacts on boron-doped polycrystalline diamond films deposited from gas mixtures with different concentrations of boron. The I-V characteristics \_\_\_\_\_ (are / were / have been) determined by applying a voltage to the Al contact on the diamond film surface while grounding the rear of the Si substrate. Poor rectifying characteristics \_\_\_\_\_ (are / were / have been) obtained as a result of excess reverse leakage current. When the boron concentration \_\_\_\_\_ (increases / increased / has increased), the forward current \_\_\_\_\_ (decreases / decreased / has decreased). This decrease in the forward current \_\_\_\_\_ (may be / was / has been) attributed to impurity scattering on the diamond film. For a given temperature, the mobility \_\_\_\_\_ (decreases / decreased / has decreased) with increasing impurity concentration because of enhanced impurity scattering. The smaller forward current \_\_\_\_\_ (is / was / has been) due mainly to the smaller hole and electron mobility.

Figure 3 \_\_\_\_\_ (shows / showed / has shown) the I-V characteristics of diamond films deposited with various boron concentrations and annealed at a constant temperature in helium ambient at 900° C for 30 min. After the annealing treatment, there \_\_\_\_\_ (is / was / has been) no deterioration in the I-V characteristics of the undoped films. In the boron-doped films, the leakage current for the 10V forward voltage \_\_\_\_\_ (doubles / doubled / has doubled) and deterioration in the rectifying characteristics \_\_\_\_\_ (is / was / has been) observed.<sup>2</sup>

## 3. From the introduction to a scientific report:

The amplification of ultrashort pulses in erbium-doped fiber amplifiers (EDFAs) \_\_\_\_\_ (is / was / has been) intensively studied both theoretically and experimentally. Several theoretical models \_\_\_\_\_ (are / were / have been) proposed that \_\_\_\_\_ (use / used / have used) different gain descriptions for the pumped erbium ions [2–6]. Numerical studies \_\_\_\_\_ (are showing / have shown / had shown) that an accurate analysis \_\_\_\_\_ (requires / required / has required) the use of the Maxwell-Bloch equations with all the higher-order dispersive and nonlinear terms [7]. However, previous studies all \_\_\_\_\_ (are / were / have been) concerned with the amplification in an EDFA of a single ultrashort pulse with negligible gain saturation. For this



case, our previous work \_\_\_\_\_ (is showing / has shown / had shown) that solving the Bloch equations for the pumped erbium ions \_\_\_\_\_ (is / was / has been) equivalent to using a complex Lorentzian gain profile [9]. Here we \_\_\_\_\_ (extend / extended / have extended) our previous results to include the important phenomenon of gain saturation, which \_\_\_\_\_ (occurs / occurred / has occurred) in the amplification of the pulse train in the amplifier.

This paper \_\_\_\_\_ (presents / presented / has presented) a model that fully \_\_\_\_\_ (characterizes / characterized / has characterized) the amplification of an ultrashort soliton pulse train in an EDFA. This model \_\_\_\_\_ (employs / employed / has employed) the general formalism of a two-level system to treat the coupled set of Maxwell-Bloch equations. The model \_\_\_\_\_ (provides / provided / has provided) a general expression for the propagation of the pulse train in the amplifier. The population relaxation time in the Bloch equation \_\_\_\_\_ (is / was / has been) modified to include the pumping rate, and the pump absorption \_\_\_\_\_ (is / was / has been) taken into account by solving the pump intensity evolution equation. This approach \_\_\_\_\_ (allows / allowed / has allowed) us to estimate the range of pulse widths in cases in which the simpler rate-equation approximation [8] \_\_\_\_\_ (is / was / has been) valid. The paper also \_\_\_\_\_ (discusses / discussed / has discussed) the problem of the nonlinear nonreciprocity of soliton transmission in EDFAs with different pumping configurations.<sup>3</sup>

#### 4. Observing Jupiter's Moons

For three and a half centuries after their discovery, the Galilean satellites of Jupiter \_\_\_\_\_ (are / were / have been) studied through telescopes. Then, on 20 August 1977, the first of two Voyager spacecraft \_\_\_\_\_ (has been / was / had been) launched from Kennedy Space Center. A year and a half later, the two spacecraft \_\_\_\_\_ (pass / passed / have passed) through the Jupiter system, and in a few days the Galilean satellites \_\_\_\_\_ (are / were / have been) transformed from small points of light into four separate worlds that could be mapped and studied in great detail. Hundreds of high quality images of the two largest moons, Ganymede and Callisto, \_\_\_\_\_ (are / were / have been) obtained. These objects \_\_\_\_\_ (are / were / have been) of great interest not only because of their great size—Ganymede \_\_\_\_\_ (is / was / has been) larger than the planet Mercury, Callisto only slightly smaller—but also because of their composition. All the planets and moons

studied in detail prior to Voyager \_\_\_\_\_ (are / were / have been) composed of rock and, in some cases, metal. Ganymede and Callisto, however, \_\_\_\_\_ (have / had / have had) densities so low—1.9 and 1.9 g/cm<sup>3</sup>—that roughly half their mass must \_\_\_\_\_ (be / had been / have been) ice. There \_\_\_\_\_ (are / were / have been) many other icy bodies in the solar system, including the planet Pluto and most of the moons of Saturn, Uranus, and Neptune. Ganymede and Callisto \_\_\_\_\_ (provide / provided / have provided) the first look at this previously unexplored class of planetary objects.<sup>4</sup>

5. From the introduction to a research paper:

For many years now, kinship \_\_\_\_\_ (is / was / has been) recognized as an important factor in human social behavior, and recent studies \_\_\_\_\_ (are demonstrating / have demonstrated / had demonstrated) that kinship \_\_\_\_\_ (influences / influenced / has influenced) the social behavior of many other species as well. The widespread occurrence of nepotism, or favoritism shown to genetic relatives, and the rarity of close inbreeding among free-living animals \_\_\_\_\_ (imply / implied / have implied) that most animals \_\_\_\_\_ (possess / possessed / have possessed) mechanisms for distinguishing relatives from nonrelatives and close from distant kin.

However, until the last few years little attention \_\_\_\_\_ (is / was ) paid to mechanisms of kin identification. In this paper, we \_\_\_\_\_ (consider / considered / have considered) some of the theoretical and empirical issues relevant to animal kin recognition, \_\_\_\_\_ (describe / described / have described) recent work on this topic, and \_\_\_\_\_ (outline / outlined / have outlined) several mechanisms by which kin might be identified. Finally, we \_\_\_\_\_ (summarize / summarized / have summarized) the results of our four-year laboratory and field investigation of kin recognition using ground squirrels.<sup>5</sup>

6. The Origin of Stars

The origin of stars \_\_\_\_\_ (represents / represented / has represented) one of the most fundamental unsolved problems of contemporary astrophysics. Stars \_\_\_\_\_ (are / were / have been) the basic objects of the universe. Indeed, the discovery of the nature of most stars as hydrogen-burning thermonuclear reactors and the subsequent development of the theory of stellar evolution \_\_\_\_\_ (rank / ranked / had ranked) among the greatest triumphs

of twentieth-century science. Deciphering stellar genesis, on the other hand, \_\_\_\_\_ (proves / proved / has proven) to be a formidable challenge for astronomers. Until a quarter of a century ago, only a rudimentary understanding of the subject \_\_\_\_\_ (exists / existed / has existed). This state of comparative ignorance \_\_\_\_\_ (prevails / prevailed / had prevailed) because no substantive body of empirical data \_\_\_\_\_ (exists / existed / had existed) that could be used to critically test even the most basic hypotheses concerning stellar origins.

In our galaxy, stars \_\_\_\_\_ (form / formed / have formed) within the dust-enshrouded dense cores of molecular clouds. The obscuration provided by the solid grains that permeate the clouds \_\_\_\_\_ (renders / rendered / has rendered) newly forming stars (protostars) completely invisible at optical and shorter wavelengths. Moreover, the molecular gas that gives birth to young stars \_\_\_\_\_ (is / was / has been) itself extremely cold (10 to 20 K) and, with a few exceptions, \_\_\_\_\_ (can be / could be / has been able to be) observed in emission only in the submillimeter and millimeter regime, a spectral window opened by radio astronomers only in the 1970s.

During the last two decades, impressive advances in technology \_\_\_\_\_ (provide / provided / have provided) astronomers with the ability to observe star-forming regions in considerable detail at infrared, millimeter, and submillimeter wavelengths. With this new instrumental capability, a direct assault on the star-formation problem \_\_\_\_\_ (becomes / became / had become) possible. Indeed, over the last few years, observations with filled-aperture telescopes and interferometric arrays \_\_\_\_\_ (produce / produced / have produced) a series of remarkable, exciting, and unexpected discoveries that \_\_\_\_\_ (begin / began / have begun) to remove the veil of mystery that surrounds the star-formation process in our galaxy. As a result of these discoveries, now we \_\_\_\_\_ (are / were / have been) beginning to understand the processes of star formation and early stellar evolution and \_\_\_\_\_ (are / were / have been) developing the foundation for a coherent theory of star formation.<sup>6</sup>

7. From the method section of a scientific report:

The experimental apparatus used \_\_\_\_\_ (is / was / has been) shown in Fig. 3. The reactant gas pressure \_\_\_\_\_ (is / was / had been) set at 3.3 kPa (25 Torr). An optical pyrometer \_\_\_\_\_ (is / was / has been) used to monitor

the substrate temperature, which \_\_\_\_\_ (is / was / had been) maintained at about 820° C by keeping the microwave power at 450 W. CH<sub>4</sub>-CO<sub>2</sub> gas mixtures without additional H<sub>2</sub> gas \_\_\_\_\_ (are / were / have been) used. The flow rate of CO<sub>2</sub> \_\_\_\_\_ (is / was / has been) fixed at 30 sccm and the flow rate of CH<sub>4</sub> \_\_\_\_\_ (is / was / has been) varied from 19.2 to 20 sccm. Then the silicon substrates \_\_\_\_\_ (are / were / have been) prepared for diamond deposition by carrying out the following steps.<sup>7</sup>

#### 8. Africanized Bees

As Figure 1 \_\_\_\_\_ (shows / showed / has shown), Africanized honeybees \_\_\_\_\_ (are / were / have been) nearly indistinguishable in appearance from the bees familiar in North America and Europe, and sting for sting they \_\_\_\_\_ (are / were / have been) no worse than our own honeybees. What \_\_\_\_\_ (earns / earned / has earned) the Africanized bees the undeserved notoriety as killer bees \_\_\_\_\_ (is / was / has been) their extreme aggressiveness. Numerous studies \_\_\_\_\_ (document / documented / have documented) the fierce defensive behavior of this bee (Michener 1972; Collins et al. 1982; Rinderer 1986; Boreham and Roubik 1987). Many \_\_\_\_\_ (report / reported / have reported) that a particularly dangerous attribute of the bees \_\_\_\_\_ (is / was / has been) their aggressiveness after slight jarring or vibration of the hive. Africanized bees \_\_\_\_\_ (can react / could react / have reacted) to an intruder three times faster than do European bees, \_\_\_\_\_ (can inflict / could inflict / have inflicted) ten times as many stings, and \_\_\_\_\_ (pursue / have pursued / will pursue) their aggressors over much longer distances, up to a kilometer. However, some evidence \_\_\_\_\_ (suggests / suggested / has suggested) that climate \_\_\_\_\_ (has / had / has had) more influence on aggressiveness than racial differences and that Africanized bees \_\_\_\_\_ (are / were / have been) more aggressive under warmer conditions (Brandenburg et al. 1977).<sup>8</sup>

#### 9. Mutation and DNA

In recent years an extraordinary increase \_\_\_\_\_ (occur / occurred / has occurred) in the attention, both popular and scientific, that \_\_\_\_\_ (is / was / has been) paid to mutation and its consequences. The sources of this interest \_\_\_\_\_ (are / were / had been) the recognition that components of our environment \_\_\_\_\_ (pose / posed / have posed) a largely unevaluated threat to

the conservation of genetic material and the realization that mutations frequently \_\_\_\_\_ (have / had / have had) serious consequences for human health that encompass, at the least, birth defects and cancer. The resulting research effort \_\_\_\_\_ (improves / improved / has improved) our understanding of the fundamental genetic substance, DNA, and of the intricacies of its metabolism and organization into genes.

Contemporary investigations into the mutation process \_\_\_\_\_ (involve / involved / have involved) the structure of DNA and all the processes that \_\_\_\_\_ (affect / affected / have affected) it. Inherent in the now-classical description of DNA structure by Watson and Crick in 1953, and immediately recognized by them, \_\_\_\_\_ (is / was / has been) the notion that variations in the electronic structures of the DNA bases \_\_\_\_\_ (can / could / has been able to) cause incorrect base pairings, and hence mutations. In the early models, however, DNA \_\_\_\_\_ (is / was / has been) viewed as structurally static when not undergoing replication. More recently, the identification of numerous families of alternative structures \_\_\_\_\_ (leads / led / has led) to an expanded view of DNA as far more variable in form. Some of these structures \_\_\_\_\_ (provide / provided / had provided) explanations for mutational events that \_\_\_\_\_ (are / were / have been) previously mysterious, and others \_\_\_\_\_ (offer / offered / had offered) intriguing hints for future exploration.<sup>9</sup>

#### 10. Maps and Computers

Maps \_\_\_\_\_ (are / were / have been) one of the oldest forms of written communication. Land boundary maps on clay tablets \_\_\_\_\_ (are being / were being / had been being) used in Babylonia as early as 2200 B.C. Through the centuries various materials \_\_\_\_\_ (are / were / have been) used for maps. The ancient Egyptians \_\_\_\_\_ (use / used / had used) sheets of papyrus, the Chinese \_\_\_\_\_ (use / used / had used) pieces of silk, Eskimos \_\_\_\_\_ (make / made / had made) maps on seal skins, and Polynesians \_\_\_\_\_ (use / used / had used) a network of bamboo canes, with each crossing point indicating an island. Today printed maps \_\_\_\_\_ (pervade / pervaded / have pervaded) our lives, ranging from sketch or location maps in newspapers and advertisements, to parcel maps showing property boundaries, to small-scale maps in atlases.

The techniques used to produce maps \_\_\_\_\_ (change / changed / have

changed) dramatically over the past fifty years, in a transition from field workers and mule trains to jet aircraft, satellites, and computers. Before World War II, the predominant method for creating maps \_\_\_\_\_ (is / was / has been) field surveying. After World War II, map-making methods \_\_\_\_\_ (begin / began / have begun) to include manual photogrammetry (measurement from photographs). Although manual photogrammetry \_\_\_\_\_ (is / was / has been) still used today, it \_\_\_\_\_ (is being / was being / had been) supplanted by digital cartography, and computers \_\_\_\_\_ (are / were / had been) becoming the hub of the mapping process.

Soon after their introduction in the 1950s, digital computers \_\_\_\_\_ (are / were / have been) used for various phases of the mapping process, especially for trigonometric calculations of survey data and for orientation of aerial photographs on map manuscripts. In addition, computer-controlled plotters \_\_\_\_\_ (are / were / have been) used to draw simple outline maps. The process of collecting data for the plotters \_\_\_\_\_ (is / was / has been) slow and expensive, and the drawings \_\_\_\_\_ (are / were / had been) not as precise as those produced by the best manual cartography. Only in the last ten to fifteen years \_\_\_\_\_ (does / did / has) it become technologically feasible and cost-effective to assemble and use the data required to automate the mapping process.<sup>10</sup>

### 3.2 主詞與動詞一致

本節將強調一個重要的文法規則——主詞和動詞必須一致地使用同一個數的形式 (subject-verb agreement)。這即是說，如果主詞是單數，則動詞也必須是單數；如果主詞是複數，則動詞也必須是複數。漢語沒有像英語般複雜的語法形態變化，所以不少中國作者在書寫英文時，偶爾會不自覺地忽略句子中主語和動詞都有單、複數的變化，結果未必每次都能使兩者配合。

複數主詞和以 *and* 連接而成的複合主詞（即由兩個以上名詞組成的主詞）必須用複數動詞。尤其要注意的是倒裝句，倒裝句的主詞都放在後面，所以遇到倒裝句時，就要確定主詞是否複數主詞。

The R&D director and sales manager *are* both at the meeting.

On the agenda *were* incoming orders, production planning, and delivery schedule.

動詞的數應配合的，不是句中述詞名詞或其他名詞的數，而是主詞的數。下面首個例句中，動詞之後雖然緊接著兩個名詞，但單數主詞 *field* 才是整句的主詞，故動詞仍應為單數。第二個例句中，動詞之後雖然緊接著一個單數名詞，但複數主詞 *systems* 才是整句的主詞，故動詞仍應為複數。

His field of research *is* molecular biology and neurology.

Computer-aided design systems *are* an important type of tool used in the product development process.

在虛主詞結構 *there is* 或 *there are* 中，動詞的數應與緊接其後的主詞的數一致。（第一章 1.10 節已說明過虛主詞結構。）

There *is* a unique solution to this equation. [主詞是 *solution*。]

There *are* several ways to approach this problem. [主詞是 *ways*。]

兩個單數主詞之間出現 *or* 或 *nor* 時，必須用單數動詞；兩個複數主詞之間出現 *or* 或 *nor* 時，必須用複數動詞。而如果句子中出現由單數主詞和複數主詞以 *or* 或 *nor* 連接而成的複合主詞，則動詞的數應與之最接近的主詞的數配合。

Raising the temperature or increasing the flow of hydrogen *causes* the reaction rate to increase.

Neither the experimental results nor the theoretical results *are* valid.

Either the experimental results or the theoretical analysis *is* invalid.

第三個例句用了單數動詞。有些作者認為這雖合符文法，卻不太自然，他們寧可對調組成複合主詞的兩個名詞片語，再使用複數的動詞：

Either the theoretical analysis or the experimental results *are* invalid.

凡加上 *every*, *each* 或 *no* 的單數主詞，必須配合單數動詞，即使句中的主詞是由兩個或以上的單數主詞組成。

No student *graduates* without having submitted an acceptable thesis.

Every paper, thesis, and letter *is stored* in this computer.

以 *-one, -body, -thing* 結尾的不定代名詞(如 *everyone, something*)，必須用單數動詞。此外，*another, each, either, neither, one* 這些不定代名詞也必須用單數動詞。

Another simplified design *is* that proposed by Thomson (1987).

代名詞 *all, any, most, more, some*，單、複數動詞皆可連接，這要看代名詞所指稱的，究竟是單數名詞(通常是不可數的)還是複數名詞而定。

Most of the salt *dissolved* when the solution was stirred. [*Most* 指稱 *salt* 這單數(不可數)名詞。“Most of the salt”表示「大部分的鹽」。這句回答了「How much 鹽溶解了?」。]

Most of the trials *were* successful. [*Most* 指稱 *trials* 這複數名詞。“Most of the trials”表示「大多數的試驗」。這句回答了「How many 試驗成功?」。]

不定代名詞 *none* 與 *all, most, some* 一樣，通常也可用單數或複數動詞，這完全視乎它所指稱的名詞而定。然而，當 *none* 表示“not one”的意思時，儘管它表面上似是指稱複數的前述詞，但仍然必須用單數動詞。

None of the students *have* arrived. [*None* 指稱複數的 *students*。這句是表示：“No students have arrived.”]

None of the methods *is* efficient enough to be used for real-time processing. [*None* 表示“not one”方法，所以用單數動詞。這句是表示：“Not one of the methods is efficient enough.”]

當關係代名詞 *who, which, that* 作關係子句的主詞時，子句動詞的數必須與關係代名詞的前述詞的數一致。

The project that *has drawn* the most funding has yet to produce any concrete results. [關係子句是 *that has drawn the most funding*。這裏必須使用單數動詞，因為動詞的數必須和關係代名詞 *that* 的前述詞(即 *project*)的數一致。]

The projects that *have been* the most successful have all been relatively inexpensive. [關係子句是 *that have been the most successful*。這裏必須使用複數動詞，因為動詞的數必須和關係代名詞 *that* 的前



述詞（即 *projects*）的數一致。]

Those of you who *study* diligently are likely to do well on the test. [關係子句是 *who study diligently*。這裏必須使用複數動詞，因為動詞的數必須和關係代名詞 *who* 的前述詞（即 *those*）的數一致。]

緊接著以 *one of* 開首的片語的關係子句，當中動詞的數必須和關係代名詞的前述詞的數一致。

Joanie is the only one of the students who *has* not turned in her paper. [ *Who* 指稱 *one*，而非 *students*。這裏可省略 *of the students* 而無改句意。]

She is one of those people who never *finish* their work on time. [ *Who* 指稱 *people*，這句的意思是：有些人經常不如期完成工作，而她是其中一個。這裏 *of those people* 不能省略，否則會改變句意。]

就第二個例句而言，如果不確定句中的動詞（*finish*）應否用複數，則只要先把它暫時改寫成下列形式，就可以看出動詞正確的數：

Those people never *finish* their work on time. She is one of them.

單數主詞的後面，即使緊接著以 *as well as, together with, along with, in addition to* 等類似字詞開首的片語，動詞仍然是單數。

The growth in the economy together with the stable political situation *has* led to a significant increase in GDP. [句子主詞 *growth* 是單數名詞。]

The computer hardware as well as the software programs *is* outdated. [句子主詞 *computer hardware* 是單數名詞。]

單數主詞和其動詞之間，儘管出現複數的字詞或片語，動詞亦不會變成複數。

One of the advantages of the new computers *is* that they are easy to use. [句子主詞是 *one*，而非 *advantages* 或 *computers*，故動詞是單數。]

在集合名詞中，如果集合的成員行動一致，則用單數動詞；如果成員行動不一致，則用複數動詞。（集合名詞是單數名詞，因為它們即使是指一群人或事物，但仍然同屬一個較大的整體，如 *band, class,*

*committee, crowd, family, faculty, majority, team, variety* 等。)

The team *is* playing well today. [球隊成員行動一致。]

The team *are* already on their way home. [各自回家，行動不一致。]

A variety of factors *have contributed* to this growing problem. [不同的原因都各自對問題構成影響。]

The committee *was surprised* by the news. [委員會成員反應一致。]

A total of 25 samples *were collected*. [分別收集了二十五個樣本。]

For men, the total number of correct answers was 43. For women, the total *was* 56. [*The total* 指稱一個數字。]

A series of six experiments *were conducted*. [分別進行了六個實驗。]

有一點值得大家留意：英語國家的人常對這些規則的應用方式有不同看法，亦有很多人根本不遵循這些規則。英國人經常不管集合名詞中成員行動是否一致，亦一律使用複數動詞。因此，有些英國人可能會說 *The team are playing well*。有些美國人又總是把集合名詞配以單數動詞，會說 *A variety of factors has led to this problem*。

為避免使用上的混淆，最好還是不要把集合名詞（如 *variety, total, series* 等）當成句子的主詞。如果句中的主詞是集合名詞，其實非常容易以別的字詞代替，因為集合名詞常是累贅的。例如：

原句： *A variety of factors have contributed to this growing problem.*

修正： *Many factors have contributed to this growing problem.*

原句： *A total of 25 samples were collected.*

修正： *Twenty-five samples were collected.*

原句： *A series of six experiments were conducted.*

修正： *Six experiments were conducted.*

指稱特定範疇的學科或知識的名詞（如 *physics, economics, mathematics* 等），表面上是複數形式，但動詞卻必須為單數。另外，如 *politics, statistics, athletics* 這些名詞，則可用單數或複數動詞，這要看它們

究竟是指單數還是複數的概念。在正式寫作中，*data*會當作複數名詞。

Economics *is* often referred to as “the dismal science.”

Statistics *is* taught in the Sociology Department at our university. [*Statistics* 是單數名詞，因為它是指一門學科。]

Statistics *show* that special educational programs and psychological therapy are more effective than incarceration in preventing recidivism among juveniles. [*Statistics* 是複數名詞，因為它指的是不同研究中的不同統計數據。]

The experimental data *agree* with the predictions derived from the theoretical model.

表示固定數量（如金錢、時間、數量等）的名詞片語，可以是單數名詞，也可以是複數名詞，這取決於它們指的是一個整體（單數名詞），還是整體的個別部分（複數名詞）：

Thirty thousand dollars *is* a good price for that car. [一個整體]

Forty percent of the budget *has been spent* already. [一個整體]

The majority in the parliament *is* Liberal. [一個整體]

The majority of these algorithms *are* unsuitable for VLSI implementation. [個別的演算法]

Only sixty percent of the students *were* in class today. [個別的學生]

有少數特殊的複合主詞或複數主詞，所指實際上是單一的整體，因此必須用單數動詞：

Spaghetti and meatballs *is* his favorite dish.

Roberts & Sons *is* a dependable paper supplier.

Research and development *has* always been one of Chiptech's strong points.

R&D *is* an important aspect of the company's operations.

表示數學演算關係的複合主詞，既可以是單數名詞，又可以是複數名詞。不過較多人把它視為單數名詞：

Two plus two *equals* four. [較常用]

Two plus two *equal* four.

*The number of* 用單數動詞，但 *a number of* 卻必須用複數動詞。

*The number of new accounts opened has increased each year since 1987.*  
[ *The number of* 指一個數字。 ]

*A number of researchers have investigated this problem.* [ *A number of* 的意思是「許多」。 ]

## 練習 3-2 主詞與動詞一致

請填入正確的動詞形式。（第四章練習 4-4 中提供更多的習題。）

1. Physics \_\_\_\_\_ (is / are) a subject that has fascinated him since high school.
2. Smith's approach as well as Turner's \_\_\_\_\_ (has / have) several serious shortcomings, which \_\_\_\_\_ (render / renders) it unsuitable for practical applications.
3. The on-chip RAM and two I/O ports \_\_\_\_\_ (is / are) an important part of the chip.
4. Each of the samples \_\_\_\_\_ (was / were) annealed for 20 minutes.
5. The number of passengers using the airport \_\_\_\_\_ (has / have) increased each year since 1984.
6. After the members of the examination committee and the department chairman \_\_\_\_\_ (approves / approve) the plan, it should be submitted to the Dean's Office.
7. After the members of the examination committee or the department chairman \_\_\_\_\_ (approves / approve) the plan, it should be submitted to the Dean's Office.
8. The increase in the number of free hydrogen atoms along with the higher temperature \_\_\_\_\_ (cause / causes) the reaction rate to increase.
9. Be careful how your research team \_\_\_\_\_ (interpret / interprets) those figures. Statistics \_\_\_\_\_ (is / are) sometimes highly misleading.
10. An attribute name or a class name \_\_\_\_\_ (is / are) entered in this dialog box.
11. Also of interest \_\_\_\_\_ (is / are) why samples immersed in solution A exhibited a higher growth rate.
12. The automatic power-saving function \_\_\_\_\_ (is / are) just one of the many

- features that \_\_\_\_\_ (makes / make) the Droog 2000 the most cost-effective system on the market today.
13. All of the authors \_\_\_\_\_ (has / have) sent in their papers and every paper \_\_\_\_\_ (has / have) been received.
14. A number of samples \_\_\_\_\_ (was / were) collected from a different geographical region to see whether the phenomenon occurred there as well.
15. Included in the search \_\_\_\_\_ (is / are) all child nodes on the right-hand side of the node of interest.
16. A major problem with this type of system \_\_\_\_\_ (is / are) the many errors that occur in the acceleration stage.

### 3.3 語氣

英文有三種語氣 (mood)：直述語氣 (indicative)、祈使語氣 (imperative) 以及假設語氣 (subjunctive)。直述語氣係用來陳述及詢問問題；祈使語氣作指使或懇求他人之用；假設語氣則會用在條件句中，表示反事實 (counterfactual) 的狀態，又或是用於緊接著某些動詞後面的子句中。

直述語氣： The weather *is* warm.  
Is the weather warm?

祈使語氣： *Let*  $F_r$  represent the force in the radial direction.  
*Note* that we neglect the effects of friction.

假設語氣： Users require that there *be* sufficient bandwidth to handle all of the requests.  
If I *were* healthy, I would not need to see a doctor.

英文的祈使句前面是不需要加上 *please* 的。例如，一般的使用手冊裏，祈使語氣句都不會加上 *please*，*Connect the device to the communication port*，不會寫成 *Please connect the device to the communication port*。

假設語氣句中，大部分動詞形式都是最簡單的動詞原形，即省略 *to* (不加上 *s*)。 *To be* 的假設語氣是例外，這種句式的動詞皆為 *were* 或 *be*，而非 *am*, *is*, *are* 或 *was*。在假設語氣的條件句中，表示條件的子句

使用假設語氣，表示結果的子句則使用語態助動詞 *would* 加上動詞原形（如：*would have, would go, would be* 等等）。

If I *were* the leader of the United Nations, I *would stop* the war.

If she *were* rich, she *would still be* unhappy.

在科技寫作中，使用假設語氣有兩種可能情況：

1. 假設語氣可用來表示反事實的狀態、表示可能性、也可用以提出假設或推測。

If the children *were* already grown up, we *wouldn't have* these financial problems. [反事實]

If I *were* you, I *would accept* the job offer. [反事實]

If the fuel *were* cleaner, it *would burn* more efficiently. [假設]

If the system *were to incorporate* more processors, this performance bottleneck *would vanish*. [假設]

上面的句子都表示反事實的狀態。事實上，小孩還沒長大、我不可能是你、燃料並不乾淨、系統也沒有更多的處理器。

然而，以 *if* 開首的子句，並非所有都表示反事實的狀態。相反，有些這類子句還可用以表示指稱的狀態有可能在未來達成。

If this new product *is* a success, the company *will earn* a lot of money this year.

在這句中，以 *if* 開首的子句並非表示反事實的狀態，而是陳述一個條件，如果條件得到滿足，則會達成主要子句所陳述的結果。

2. 在某些表示請求、要求、建議、命令或期望的動詞後面，都會加上以 *that* 開首的名詞子句，這種子句必須使用假設語氣。這些動詞包括 *ask, command, order, recommend, request, require, stipulate, suggest, wish* 等。

誤：We suggest that the user *to try* to run the program again.

誤：We suggest that the user *tries* to run the program again.

正：We suggest that the user *try* to run the program again.

誤：The manufacturer recommends that the unit *to be placed* at least three meters away from a radio or television.

誤：The manufacturer recommends that the unit *is* placed at least three meters away from a radio or television.

正：The manufacturer recommends that the unit *be* placed at least three meters away from a radio or television.

假如作者不想使用假設語氣，則可使用意思近似的直述句代替：

假設語氣：The manufacturer recommends that the unit *be* placed at least three meters away from a radio or television.

直述語氣：The unit *should be* placed at least three meters away from a radio or television.

假設語氣：The president asked that *she* attend the meeting.

直述語氣：The president asked *her to* attend the meeting.

假設語氣：She wishes that she *were* a movie star.

直述語氣：She wishes that she *could be* a movie star.

假設語氣：The judge ordered that the policeman *remove* the unruly man from the courtroom.

直述語氣：The judge ordered the policeman *to remove* the unruly man from the courtroom.

諸如 *suggest, recommend, stipulate* 或 *require* 之類的動詞，後面加上以 *that* 開首的名詞子句，動詞必須使用假設語氣。請留意這類句式於科技論文中相當常見：

假設語氣：This constraint stipulates that the distance between the poles *exceed* the size of the air gap.

假設語氣：We require that T *be* perpendicular to the gradient of the function in Equation (3).

作者如果不想使用假設語氣，或是不確定應否使用，則可以考慮使用下面較簡單的句子：

直述語氣：This constraint states that the distance between the poles *must exceed* the size of the air gap.

直述語氣：T *must be* perpendicular to the gradient of the function in Equation (3).

# 第四章

## 科技論文中常見錯誤

---

科技論文中的英文必須通順正確，讀者才能瞭解以至接受論文的觀點。論文若不遵循標準的文法規則，讀者可能要反覆參看上下文，才可推斷出文意。這樣的文章會讓讀者感到非常吃力，儘管吃力，有時可能還是不知其所云。最嚴重的情況是，若論文中出現太多文法錯誤，論文內容乃至作者的專業能力都會受到質疑。

本章將討論中國人撰寫英文科技研究報告時常犯的文法及造句錯誤。讀者如果多注意以下的英文文法準則，則可避免許多錯誤。

### 4.1 不完整句

別以為一個句子只是一連串由大寫開首、以句點結尾的字詞。正式的英文文章裏，每個句子必須表達一個完整的意思，及必須至少包括一個含有主詞、動詞的獨立子句。如果不能滿足這兩個要求，造出來的就是不完整句。許多作者時常將一組尚未包含至少一個獨立子句的字詞當為一個句子。這些不完整句必須和其他字詞合併，構成至少一個獨立子句，並表達一個完整意思，方可成為一個完整句子。



常見的一種不完整句是一個孤離的附屬子句。(附屬子句係由附屬連接詞開首，例如：*after, although, because, before, if, since, when* 或 *while*。詳見第一章。)這種不完整句通常可與前後的獨立子句結合。

不完整：*Although a preprocessing stage is required and the proposed method is slower. Our method is much more accurate than the traditional approach.*

修正句：*Although the proposed method requires a preprocessing stage and is slower than the traditional approach, it is much more accurate.*

不完整：*The technology was adopted quickly and successfully. Because the technology was highly mature and trained technicians were available.*

修正句：*The technology was adopted quickly and successfully, because it was highly mature and trained technicians were available.*

某些情況中，亦可省略附屬連接詞，把附屬子句修改成完整句。

不完整：*Whereas many nodes in the network contain incompletely specified functions of the primary inputs.*

修正句：*Many nodes in the network contain incompletely specified functions of the primary inputs.*

另一種不完整句是作者把複合述詞中的第二個述詞分割出來。在這種情況下，分割出來的述詞應併入之前的句子。

不完整：*Section 4 presents the results of simulations conducted to test the effectiveness of the proposed approach. And compares its performance with that of previous methods.*

完整：*Section 4 presents the results of simulations conducted to test the effectiveness of the proposed approach and compares its performance with that of previous methods.*

經常造成不完整句的原因，就是孤立使用介系詞片語、動狀詞片語、名詞片語或同位語。這類不完整句通常可以併入前後的完整句中。

不完整：*For this reason. Logic optimization techniques have been introduced.*

修正句：*For this reason, logic optimization techniques have been in-*

troduced.

不完整：Designers apply logic optimization techniques. *Reducing the chip area.*

修正句：Designers apply logic optimization techniques *to reduce the chip area.*

請注意：祈使句雖然在形式上缺少主語，但並非為不完整句。如下所示的祈使句都是完整的英文句子，句子的主詞讀者早已理解，就是“you”。

Turn on the computer. [*You turn on the computer.*]

Let  $x=3$  and  $y=5$ . [*You let  $x=3$  and  $y=5$ .*]

Assume that the system is at equilibrium. [*You assume that the system is at equilibrium.*]

## 4.2 散亂句

在英文中，一個句子不僅必須表達完整的意思，長度還必須適切。撰寫論文時，作者應該使用各種不同長度的句子：以短的作強調之用；以較長的來表達較複雜的意思（關於句子種類的詳細說明，請參閱第八章 8.1 節）。寫作論文時，其實不應企圖同時表達太多的意思而令句子過於冗長，使讀者難以瞭解。過於冗長或複雜的句子，我們稱之為「散亂句」(rambling sentence)。散亂句可以分成兩大類：一類是由多個雜亂附屬子句和主要子句所構成的複雜句子。另一類是用 *and* 或 *but* 連接一長串簡單子句的散亂句子。

下面的例子就是第一種散亂句。這個句子是以兩個附屬子句開首，再接一個獨立子句和另一個附屬子句，最後還有三個獨立子句，而且其中一個是複合述詞。這個句子相當冗長而複雜，必定無法表達一個清楚的意思，實在令人難以閱讀。

散亂句：*Because there is still a great deal of material in this field that I have yet to study, and because my desire to obtain a doctoral degree is strong, moreover, my institute also has agreed to provide expenses for me to travel abroad to study, therefore, if your graduate institute accepts my application, I*

hope to begin my studies there in the fall of next year, *and* plan to complete my degree objectives in four years, *and* then I will return to my country and work for the research institute here again.

要修正這個散亂句，必須把它分成幾個短句，讓每個句子都分別表達一個清楚特定的意思。以下是一種修正方法：

修正： There is still a great deal of material in this field that I wish to study, and I am highly motivated to pursue a doctoral degree. Moreover, the research institute where I work has agreed to provide funds for me to study abroad. If admitted to your graduate institute, I plan to begin my studies there next fall. I hope to complete my degree in four years; after graduating, I will return to my country to continue my work at the research institute here.

修正後的段落把原句分成四個獨立句子，每一句陳述一、兩個清楚的意思。修正後句子的意思較清楚，中心更突出，易讀得多。

下面的句子則是第二種散亂句。相對上例，這個句子的結構比較簡單：句子大部分都是由一連串用 *and* 連接的子句組成。

散亂句： None of the proposed object-oriented or object-based specification languages is completely satisfactory, *because* the language of PROTOB incorporates standard programming languages to specify object behavior, *and* the language of OBSERV does not provide any mechanism for specifying inheritance relationships and system functions, *and* the language proposed by Lee cannot specify classes or relationships between objects, *and* the language of ENVISAGER does not provide any mechanism for specifying system functions or a large-scale model partitioning structure.

這個散亂句中的第一個子句陳述了一個清楚的中心意思，而其餘的子句則提供支持這個中心意思的例子。因此，要修正這個例子，可以把原句分成三個或以上不同的句子，並以首句陳述整段文字的重點：

修正： None of the proposed object-oriented or object-based specification languages is completely satisfactory. For example, the language used in PROTOB relies on standard programming languages to specify object behavior, *and* the language proposed by Lee cannot specify classes and relationships

between objects. On the other hand, the language of OBSERV fails to provide a mechanism for specifying inheritance relationships and system functions, and that of ENVISAGER provides neither a mechanism for specifying system functions nor a large-scale model partitioning structure.

修正過後，首句是一個把主要意思陳述清楚的短句，接著的兩句則分別作支持主要意思的例子。這樣便能讓讀者易於閱讀與瞭解。

### 4.3 缺乏連接詞

只用逗點來連接兩個獨立子句，而缺乏任何連接詞的，是錯誤的句子。例如：

缺乏連接詞： A significant learning cost is involved in transferring a technology from the R&D stage to the production stage, part of this cost should be defrayed by the government research institute that developed the technology.

缺乏連接詞和不完整句一樣，都會令讀者混淆，但原因正好相反。這兩類句子表面上都表達一個完整的意思，但實際上不完整句沒有表達一個完整的意思，而缺乏連接詞的句子，卻不只表達一個意思。

先看以下例句：

缺乏連接詞： The samples were dipped into the etching solution, they were then washed with a chemical cleanser.

缺乏連接詞的句子，有四種不同的修正方法：

- 把逗點改成句號（切記把逗點後的第一個字母改回大寫）：

The samples were dipped in the etching solution. They were then washed with a chemical cleanser.

- 把逗點改成分號：

The samples were dipped in the etching solution; they were then washed with a chemical cleanser.

- 在逗點後面加上對等連接詞 (*and, but, for, or, nor, so, yet*)：

The samples were dipped in the etching solution, and then they were

washed with a chemical cleanser.

- 把其中一個獨立子句改成附屬子句：

After the samples were dipped in the etching solution, they were washed with a chemical cleanser.

在這個例子中，第四種修正方式大概最恰當，因為最能清楚表達兩個子句之間的關係。但在修改原本缺乏連接詞的句子時要特別注意，不能只把 *then* 移到 *they* 前面，例如：

誤：The samples were dipped into the etching solution, then they were washed with a chemical cleanser.

*Then* 不是對等連接詞，而是連接副詞，所以這句仍然缺乏連接詞。

連接副詞 (*also, consequently, furthermore, however, moreover, otherwise, then, therefore, thus*) 的前面，和連接兩個獨立子句的轉接片語 (*for example, in contrast, in fact, on the other hand*) 的前面，都必須加上句號或分號。這類字詞的後面通常都會緊接著一個逗點，但當後面的子句非常短時，*hence, otherwise, then, therefore, thus* 這些字則可以不接逗點。

誤：Assume the system can be modeled by equation (10), then we obtain the following expression for the equilibrium state.

正：Assume the system can be modeled by equation (10). Then we obtain the following expression for the equilibrium state.

正：Assume the system can be modeled by equation (10); then we obtain the following expression for the equilibrium state.

正：If we assume the system can be modeled by equation (10), then we obtain the following expression for the equilibrium state.

誤：The value of this variable must be greater than zero, otherwise we obtain a contradiction.

正：The value of this variable must be greater than zero. Otherwise, we obtain a contradiction.

正：The value of this variable must be greater than zero; otherwise, we obtain a contradiction.

當然，如果兩個子句之間沒有任何標點符號，也是錯誤的。所以必須加上適當的標點符號，清楚表示第一個子句的結尾以及第二個子

句的開始。

誤：The samples were dipped in the etching solution then they were washed with a chemical cleanser.

正：The samples were dipped in the etching solution, and then they were washed with a chemical cleanser.

## 練習 4-1 不完整句

請找出不完整句，並與前後的句子合併。（提示：修改某些句子時，必須改寫句子的標點符號，並要注意更改大小寫。）

1. Given an input rate  $r$ . We can obtain the solution using equation (3). If  $r$  is unknown but  $T$  is known. We can apply equation (5).
2. The amount of fluorine incorporated into the film on the substrate surface can be controlled. By reducing the amount of water added to the immersing solution. When there is less water, more fluorine atoms are released. As shown in the reaction equation above. Because of the increase in free fluorine atoms in the solution. A greater amount of fluorine is incorporated into the film.
3. While there are at least a dozen major different designs for devices that use magnetic fields to control thermonuclear fusion. The best results to date have been achieved with the tokamak. Which was developed in the 1960s by Soviet scientists seeking to overcome the inherent instability of earlier magnetic confinement schemes. After the announcement in 1969 of results showing much longer confinement of the plasma under fusion conditions. The United States redirected its fusion program to emphasize tokamak research, and today major tokamak projects are being conducted by the U.S.,

the European Economic community, Japan. And China.<sup>1</sup>

4. Although physics has made monumental strides in the last hundred years. Theoretical descriptions of complex phenomena such as turbulent flow in fluids have remained outstanding unsolved problems. The difficulty lies in the nonlinear character of the mathematical equations which model the physical systems. The Navier-Stokes equations for fluid flows and Newton's equations for three or more interacting particles. Since these equations do not generally admit closed-form analytical solutions. It has proved extremely difficult to construct useful theories that would predict, for example, the drag on the wing of an airplane. Or the range of validity of statistical mechanics. However, in the last ten years, considerable progress has been made. Using a unique synthesis of numerical simulation and analytical approximation.

The key to recent progress has been the use of high-speed digital computers. In particular, high-resolution computer graphics. These tools have enabled the "experimental" mathematician to identify and explore ordered patterns which would otherwise be buried in reams of computer output. In many cases the persistence of order in irregular behavior was totally unexpected; the discovery of these regularities has led to the development of new analytical methods and approximations. Which have improved our understanding of complex nonlinear phenomena.<sup>2</sup>

## 練習 4-2 散亂句

下面都是由一些冗贅的散亂句所構成的段落。試將這些段落分成幾個

長度適切的句子，換上正確的標點符號，並把贅詞刪除。（提示：正確的修正方式並非只有一種。）

1. A communication network can be modeled as a graph, and a network under attack or with other sources of failure can be modeled as a random graph, regarding which, for the purpose of clarification, a graph, in the sense used here, consists of vertices (or points) and edges, of which each vertex corresponds to a command center or other node in a communication network and each edge represents a two-way communication link between two command centers—in a random graph, an edge may fail, leaving intact the vertices connected by the edge, or a vertex may fail, destroying all the edges connected to the vertex.<sup>3</sup>
2. Slime molds reproduce by means of spores, each of which is an independent, one-celled organism, however, the cells originating from spores divide repeatedly, and eventually the offspring swarm together in a heap to form a common amoeboid mass, and then the original cell boundaries sometimes disappear, and the once-independent cells take on specialized functions, somewhat like organs in a larger animal, and the creeping mass of protoplasm, in some cases as large as 30 cm in diameter, is difficult to classify as plant or animal or, indeed, as either a collection of individuals or a larger, single organism, but at any rate, it is one of the most curious examples of self-organization in all biology.<sup>4</sup>

### 練習 4-3 缺乏連接詞

下面的句子都缺乏連接詞。請修改句子的標點符號，或在必要時加上連接詞。



1. Let  $X$  be the Cartesian product of these sets,  $A$  is their union.
2. Consider the circuit shown in Figure 2, we can draw its Norton-equivalent circuit as shown in Figure 3.
3. Assume the input power of port 1 is  $P_1$  and the output power of port 2 is  $P_2$ , then we have the following equation.
4. Suppose  $C$  can be factored into a product of  $D$  and a cube  $q$ , then we replace  $C$  in the above expression by  $q$ .
5. The samples were fabricated by a standard chemical vapor deposition process, N-type Si (100) substrates were scratched using diamond powder to enhance the nucleation density of the deposits.
6. Rearrange the above equation, we obtain the solution.

#### 4.4 主詞與動詞一致

在英文中，動詞的單複數必須和相對應的主詞的單複數一致。在句意上，主詞與動詞一致極為重要。因為如果動詞的數和主詞的數不一致，則讀者就不能確定作者所談論的是一個，還是很多事物：

誤：Methods has been introduced to solve this problem.

作者的意思究竟是「有些學者曾提出幾種不同的方法」，還是「有一個學者曾提出一個方法」？讀者必須猜測句意，且可能會猜錯。

這個錯誤顯然是作者疏忽所致。但許多主詞和動詞不一致的情形，並非疏忽所致，而是作者無法確定句中的動詞應該是單數還是複數。第三章裏已討論過主詞和動詞的一致，所以這裏將只討論幾種容易犯錯的字詞。

由 *every*, *each* 或 *no* 所引介的單數主詞必須配合單數動詞，即使主詞不只一個，也要配合單數動詞。此外，不定代名詞 *another*, *each*, *either*, *neither*, *one* 也是應該配合單數動詞的。

*ther, neither, one* 也是應該配合單數動詞的。

Every paper, report, and letter *is* stored in this computer.

Neither of these methods *is* truly effective.

即使單數主詞後面緊接著以 *as well as, together with, along with, in addition to* 開首的片語，而當中還包含其他名詞，單數主詞仍是單數：

The growth in the economy together with the stable political situation *has* led to a significant increase in GDP. [主詞是 *growth*。]

One of the advantages of this approach *is* that it is extremely simple. [主詞是 *one*。]

動詞的數必須配合主詞的數，然而與補語的數無關。像下面的句子，補語是複數，但主詞 *sensitivity* 仍是單數。

誤：The nominal sensitivity *were* 200 and 270 mV/mil for 4140 steel and stainless steel, respectively.

正：The nominal sensitivity *was* 200 mV/mil for 4140 steel and 270 mV/mil for stainless steel.

## 4.5 時態

英文動詞的時態有十二種，而只有五種是科技寫作中常用的：

- 現在式：表達不受時間影響的普遍科學事實，以及論文作者的意見和建議。
- 過去式：記錄過去已完成的行為，如實驗中的步驟或電腦模擬。
- 現在完成式：（一）用來描述行動或狀態在過去已開始存在，而現在仍然一直持續。（二）用來表達行為在過去曾發生，而現在仍然有效。（三）用來表達行為「最近」才完成。
- 現在進行式：用來描述行為當下正在發生而尚未完成。
- 未來式：用來描述將來會發生的行為。

當要考慮句子應使用哪種動詞時態時，可參考下列重點：

不要用現在完成式來描述過去的事件。雖然它亦可用來描述事件在過去已開始存在，但已在過去完成了的事件是應該使用過去式來表

達的。所以，下面句子都有文法錯誤：

誤： Greenspan *has presented* an ingenious graph reduction technique in 1982.

誤： *At the conference*, we *have introduced* our new memory chip.

這兩個句子都提到過去一個特定的時間 (“in 1982,” “at the conference”)，事件大概已完成了，所以必須使用過去式。

正： Greenspan *presented* an ingenious graph reduction technique in 1982.

正： *At the conference*, we *introduced* our new memory chip.

千萬不要把現在完成式和過去完成式混淆。現在完成式是助動詞 *has* 或 *have* 加上主要動詞的過去分詞；過去完成式則是過去式的助動詞 *had* 加上主要動詞的過去分詞。過去完成式是用來表示一個行為已在過去一特定事件之前完成：

By the time his mother came home, he *had cleaned* all of the windows.

這句提及了兩個過去的事件：「男孩的母親回到家裏」和「男孩洗窗戶」。動詞之所以使用過去完成式，是由於第二個過去的事件在第一個事件之前發生。

在科技寫作中，需要使用過去完成式的機會微乎其微，所以這裏不詳加討論。但現在完成式與過去完成式都是表示發生的事件已經過去了，故不要把兩者混淆，尤其在使用現在完成式時，應避免把 *has* 或 *have* 誤寫成 *had*。

靜態動詞是沒有進行式的。現在進行式表示當下進行的動作，靜態動詞是描述主詞狀態而非動作的動詞，因而不會有進行式。靜態動詞包括：*appear, be, believe, concern, consist of, constitute, contain, correspond, exist, know, mean, need, possess, represent, result in, satisfy, seem, understand, yield* 等等。下面句子都有文法錯誤：

誤： Solubility *is appearing* to increase with temperature.

誤： This case *is corresponding* to equation (6)

這些句子都應該修正為簡單現在式：

正：Solubility *appears* to increase with temperature.

正：This case *corresponds* to equation (6).

若要查閱動詞時態用法的詳細說明，可參考第三章。

## 4.6 錯誤的動詞補語

除了動詞的修飾詞之外，動詞補語 (verb complement) 亦是能對動詞作補充說明的字詞，而常以動詞的直接受詞或間接受詞形式出現。在科技論文中的動詞，其後大多數會加上 *to* 或 *that* 開首的補語，看下面的例子：

We intend *to propose* a new method. [動詞後面緊接著以 *to* 開首的補語，這個補語是動詞的直接受詞。]

The experimental results show *that the new method is feasible*. [動詞後面緊接著以 *that* 開首的補語，這個補語是動詞的直接受詞。]

然而，有些動詞（例如 *try*）是使用 *-ing* 形的補語（*try* 也可用 *to* 開首的補語）：

Smith tried *using multivariate analysis*.

Smith tried *to use multivariate analysis*.

有些動詞（特別是 *make* 和 *let*）的補語則為動詞原形。

Raising the temperature makes the water *boil* off more rapidly. [補語沒有以 *to boil* 開首，而只以 *boil* 一個字詞開首。]

Let F *represent* force and E *represent* energy. [補語沒有以 *to represent* 開首，而只以 *represent* 一個字詞開首。]

Let there *be* six individuals in the domain. [不寫 *to be*，而只寫 *be*。]

Let it *be*. [不寫 “Let it to be”，而只寫 “Let it be”。]

研究報告的作者尤其應注意下列動詞，其補語必須為動詞原形或 *-ing* 形。

<i>make, let:</i>	動詞原形
<i>suggest, recommend:</i>	<i>-ing</i> 形或 <i>that</i> 開首的補語
<i>discuss, consider,</i> <i>depend on, result in:</i>	<i>-ing</i> 形

簡而言之，動詞應配合正確的補語。請參考下列的例句：

誤：The author should consider *to give* a more detailed proof.

正：The author should consider *giving* a more detailed proof.

誤：I suggest *to include* a more detailed proof.

正：I suggest *including* a more detailed proof.

## 練習 4-4 主詞與動詞一致

請找出主詞與動詞不一致的地方，並加以改正（第三章中練習 3-2 提供更多練習）。

A centralized compression service are economical, but it hampers creativity when developers want to experiment with applications and data. Accordingly, digital video interactive (DVI) technology offer another kind of compression: edit-level video, done on the developer's DVI system in real time. Edit-level video are lower in quality than the presentation-level video made by centralized compression but are adequate for software development.

The user employ edit-level video to develop and test new software. When the user have made his choices and polished the program, he send the final analog video through the centralized compression service. When the presentation-level compressed video come back, the user substitute it for the edit-level files. The newly developed software run just as it did in testing, but now with higher-quality video.

The heart of the DVI video display processor is two chips: one for processing images stored in memory, the other for displaying the processed images. Each chip are a CMOS chip containing about 132,500 transistors. The set can connect to almost any computer, as long as it have the requisite

computing speed and data transfer and width—usually this mean a 16-bit or 32-bit processor that operate at a clock speed of 6 megahertz or higher.<sup>5</sup>

## 練習 4-5 時態

請找出錯誤的動詞時態，並加以改正。（提示：有些動詞是正確的。）

1. When researchers a few years ago had uncovered a strong link between the sunspot cycle and weather patterns on Earth, many atmospheric scientists have been intrigued. Indeed, the correlation was seeming so convincing that a few meteorologists even began to plug solar activity into official long-range forecasts. But the whole notion takes a battering recently, and it may have a tough time recovering.

Many skeptics, in fact, are always saying that the postulated correlation was not as firm as it seemed. For starters, they had pointed out that it could be traced back only about 40 years, which struck them as too short a record to be convincing. On top of that, solar activity was seeming to affect weather patterns one way when winds in the stratosphere above the equator were blowing in a westerly direction and another way when they were easterly; statistically speaking, that effectively cut in half an already short record. And most disturbing was the absence of any physical mechanism to explain such behavior. But the skeptics nevertheless are having a hard time disproving the link, which had withstood every statistical test—until the winter of 1989.<sup>6</sup>

2. Chain-propagating steps alone are being insufficient to account for flames. It is recognized in the 1930s that chain-initiating, chain-terminating, and

chain-branching steps are being also necessary. The 1956 Nobel prize in chemistry had been awarded jointly to Cyril N. Hinshelwood of the University of Oxford and Nikolai N. Semenov of the Institute of Chemical Physics in Moscow for their leading roles in showing how the main features of oxidation reactions could explain in terms of branched-chain reaction mechanisms. (At the time of their research chemists have had only provisional ideas about what the actual elementary reactions might be and almost no information at all about the values of the rate coefficients.)<sup>7</sup>

3. While scientists and engineers are agree that fusion can be working, there is no general agreement on what will be the most economical and desirable type of fusion reactor. To date, the best results had been achieved with the tokamak, a doughnut-shaped machine with powerful magnetic coils, and the optimism that a viable reactor can be built is being primarily based on the tokamak's performance. Although it now is appearing probable that tokamak reactors will one day produce energy at a cost around that of petroleum and below the cost of solar energy, many scientists are thinking that alternative magnetic fusion devices could produce energy even more cheaply.<sup>8</sup>
4. The sun produced the heating and confinement needed for atomic fusion through its immense gravitational fields. On earth, large-scale fusion reactions are being achieved for 30 years in thermonuclear weapons, where the temperature has been provided by a plutonium bomb explosion and the confinement is simply by inertia—that is, the reaction is going so fast that the fusion fuel, lithium deutride, does not have time to disperse. Inertial confinement is being one of the two principal approaches to the use of fusion

for power generation. Inertial fusion reactors would use lasers, electron beams, or ion beams to compress and heat pellets of fuel, allowing them to explode in chambers and thereby drive energy generation equipment.<sup>9</sup>

## 練習 4-6 動詞補語

請修正下面句子中錯誤的補語。

1. The aim of this paper is propose a new simulation method that dramatically reduces the time needed carry out the simulations.
2. Increasing the annealing temperature beyond 900° C causes the samples become brittle.
3. Adding more oxygen makes the deposition rate to increase significantly.
4. Let N represents the number of customers and t represents the time.
5. Assume that half of the customers to exit the system at the same time.
6. Let there are 10 processors in the network.
7. The author should consider to prove theorems I and II instead of only to state the theorems.
8. We suggest to solve the problem by using a Fourier transform.
9. The referee recommends to accept the paper for publication.
10. The success of this method depends on to solve equation (5) quickly.
11. Let X is the desired recognition accuracy and S is the desired recognition speed.
12. We discussed to treat practical applications of the new technique in the paper, but we decided doing so would make the paper too long.



## 4.7 誤用被動語態

被動語態常出現在科技論文中，尤其當作者需要描述某種方法、過程或因果關係，而不知道行為的施事者是何人何物，或是該人或事物是無關重要的。例如，在研究報告的方法章節中，作者往往以 *The samples were placed in the reaction chamber* 這樣的被動句子取代主動句子 *We placed the samples in the reaction chamber*。這裏所討論的焦點是樣本，而不是研究者，並且從上文下理讀者已可知行為之施事者就是研究者。因此，這句使用被動語態是很恰當的。

有時在科技論文中使用被動語態是適當的，可是有些作者往往都過度或錯誤使用被動語態。所以使用時，應記住以下事項：

假若使用被動語態來指涉自己的行為，便要清楚表示自己就是該行為的施事者。當研究報告的作者使用被動語態來描述自己的行為、陳述自己的研究目的或提出建議、主張，務必讓讀者清楚知道作者本身就是該行為的施事者。例如，在研究報告中的方法章節裏，就大可放心使用被動語態。因為從文章的脈絡，讀者已經可以清楚知道行為的施事者就是作者。相反，如果科技研究報告的文獻回顧中出現這樣的句子：

不清楚：*It is suggested that the stability of the film deteriorates at high temperatures.*

這句未能清楚表明那個建議到底是作者的，還是別人的。英文中，*it has been suggested/proposed/found that X* 這種句式的意思是「曾經有人建議/提出/發現 X」。當作者想強調緊接著動詞後面建議或發現的內容，而不用理會是誰建議或發現，便可使用這種句式。因此，讀者看到上面的句子時，自然會猜測建議是別的學者曾提出的，但作者卻又誤用了現在式(現在完成式才正確)。要修正上面的句子，作者就應清楚表示建議是自己的。其中一種修正方式是以代名詞 *we* 做句子的主詞：

清楚：*We suggest that the stability of the film deteriorates at high temperatures.*

另一種修正方式就是省略動詞 *suggest*，然後再使用語態助動詞或試探性動詞，以表示作者正在提出建議：

清楚：The stability of the film *may deteriorate* at high temperatures.

清楚：The stability of the film *appears to deteriorate* at high temperatures.

模糊而不自然的被動句子結構中，經常會出現這些動詞：*argue, assume, believe, desire, present, propose, recommend, suggest, suppose*。例如：

不清楚：Previous techniques for solving this problem all have serious drawbacks. Hence a new method *is proposed*.

外國讀者看到這句的被動動詞 *is proposed* 時，會立刻追問句中的方法是誰人在何時提出的。首句指出了其他研究者所提出的技術。第二句則是作者想藉被動語態句來表達自己打算提出一個新方法。但對讀者而言，這並非明顯易見的。所以，作者應重寫第二句，好讓讀者清楚看出新方法是誰提出的。下面有三種修改方式，各修正句中都加上一個字詞或片語，以清楚表達作者的意思：

清楚：Hence *in this paper* a new method *is proposed*.

清楚：Hence in this paper *we propose* a new method.

清楚：Hence *this paper presents* a new method.

下面是另一個意思含糊及語氣不自然的被動語態句：

不自然：Therefore, *it is desired* to define event types using independent variables.

在這句中，*it is desired* 是非常生硬的寫法。擬使用獨立變數來定義事件種類的人是誰？難道是所有人嗎？大多數人根本不會瞭解作者的討論，也不在乎作者如何定義事件的種類。下列有四種修改方法：

自然：Therefore, *we need* to define event types using independent variables.

自然：Therefore, *event types should be defined* using independent variables.

自然：Therefore, *it would be desirable* to define event types using independent variables.

自然： Therefore, *it would be best* to define event types using independent variables. [或可使用更精確的形容詞，如 *it would be more effective* 或 *it would be simpler*。]

修改過的句子，意義都稍有不同。前兩句都暗示使用獨立變數來定義事件種類是可能的。第一句表示需要用這種方式做定義；第二句則表示應該用這種方式做定義。相較之下，第三和第四句則暗示作者還不太確定是否真的有辦法用獨立變數來定義事件種類。（這可能是個有價值的目標，但未必能達成。）有些資深的作者會認為第三句過於冗長，會避免使用。第四句的意思和第三句大致相同，但寫作風格較口語化。

當作者根據自己研究結果提出假設或結論時，切忌使用加上像 *believe* 這種動詞的被動語態。

含糊： Hence *it is believed* that annealing improves the electrical characteristics of the films.

在這句中，使用被動語態是不適當的。因為使用 *it is believed* 來表示「我們認為」的意思，既生硬又模糊。這句應修改成主動語態，或換上如 *appear* 之類的試探性動詞：

清楚： Hence *we believe* that annealing improves the electrical characteristics of the films.

清楚： Hence annealing *appears* to improve the electrical characteristics of the films.

清楚： Hence *it appears* that annealing improves the electrical characteristics of the films.

一般來說，如果以英文為母語的作者把如 *believe* 之類的動詞寫成被動語態，又不明確表示該信念是誰抱持的，則意思並非「我們認為」，而是表示該信念是普遍（或幾乎普遍）的信念。例如：

Legionnaires' disease *is believed* to be caused by bacteria.

Sunspot activity *is believed* to vary according to a cyclic pattern.

這類句子中，被動動詞 *is believed* 並非表示「我們這樣認為」或「我個人這樣認為」，而是意味著「絕大多數專家都這樣認為」。因此，當英

語國家的人閱讀上面第一個例句時，他們會理解為「絕大多數的醫生、醫學研究人員以及其他的專家都認為，外籍兵團症係細菌感染所致」。而當讀到第二個例句時，他們則會理解為，「大多數的天文學專家都認為，太陽黑子活動係以周期的模式變化」。同樣，當以英文為母語的人看到 *Only high-speed SRAMs are recommended for use with this computer system* 時，他們會想作者的意思是「對這個電腦系統瞭如指掌的人（尤其是電腦系統的製造廠商）都會一致建議，這系統只應配以高速靜態隨機存取記憶體」。

另一個例子：

含糊：*Two examples are employed to illustrate the fringe effect.*

科技論文中使用這句來介紹所指的兩個例子，既含糊又不自然。下面三個句子都比上面的好得多。

清楚：*Two examples will be employed below to illustrate the fringe effect.*

清楚：*Two examples will be employed here to illustrate the fringe effect.*

清楚：*The following examples illustrate the fringe effect.*

前面兩個修正句都仍然使用被動語態，但它們均指明了動作發生的地點（“below,” “here”），因此讀者可清楚看出作者便是動作的施事者。這裏可推而廣之成爲一普遍的準則：假如句子本身已指明了動作的發生地點，則可以使用被動語態，因爲讀者已能清楚瞭解施事者是誰。例如：

*In section 4, two examples are employed to illustrate the fringe effect.*

*In this paper, two examples are employed to illustrate the fringe effect.*

*In Russell's paper, two examples were employed to illustrate the fringe effect.*

這些都是自然的英文句子，它們都清楚指出句中的施事者：在前兩句中，施事者是該篇論文的作者，而第三句的施事者是羅素這個人。下面是另一篇科技研究報告的摘要節錄：

This paper presents a new method for modeling the fringe effect at the edges of an air gap in a magnetic bearing. The accuracy of the proposed model *is demonstrated* by means of two examples.

在這例中，只看第二句並不會獲知誰是施事者，但首句有清楚表示論文作者將會提出新的模型。因此，第二句使用被動語態是恰當的。

總而言之，當要使用被動語態來指涉自己的動作時，必須確定讀者能夠清楚看出，作者自己正是該行動的施事者。如果不能的話，就需修改句子。

被動語態所陳述的事件必須符合事實。以英文為母語的作者也會使用被動語態的現在式動詞來陳述普遍的事實。經驗豐富的作者亦常會使用被動語態的現在式動詞去描述某種標準的做法或程序。因為無論是誰在任何特定情形下實行這種做法或程序，這種作法或程序的正確描述都是真實的。請看下面的例子：

Deuterium *is obtained* from sea water.

In indirect scanning, a small beam of light *is moved* across the subject and then reflected to a battery of phototubes.

The solution to this problem *is usually obtained* by applying a Fourier transform.

上面首例使用被動語態是正確的，因為這句所陳述的是一個普遍事實——氘（重氫）都自海水中獲得。在第二和第三例中，使用被動語態也是正確的，因為它們都正確地描述某種標準的做法或程序。這些句子所指涉的行為都是標準程序，故句中的描述皆不受作者寫作時的特定情形影響。

使用被動語態的現在式動詞來指出某件事情，或做某種觀察時，都應注意被動語態的句子必須表達一個普遍事實。下面卻是一反例：

不自然： It *is seen* from the figure that the two systems perform equally well.

這個句子非常不自然，它其實是“it is seen (by everyone) that...”，意即「每個人都能看出兩個系統皆運作良好」，但事實並非如此。很多人根本沒有看到句中所指出的圖表，所以並非每個人都知道兩個系統運作

良好。如果要把這句修改成符合事實，有這樣一個方法：

自然： *It can be seen from the figure that the two systems perform equally well.*

在被動動詞前面加上語態助動詞 *can*，句子所陳述的內容就變得具有普遍的真實性，這才是正確的英文。事實上，任何受過專業訓練的人，一旦看過這圖表，就可看出這兩個系統皆運作良好。另一個更直接的修改方式，是將句子改寫成主動語態，以 *the figure* 作主詞：

修正句： *The figure shows that the two systems perform equally well.*

試看另一個類似的例子：

不自然： *It is observed that steps 2 and 3 of the algorithm are repeated several times.*

修正句： *It can be observed that steps 2 and 3 of the algorithm are repeated several times.*

修正句： *Observe [或 Note] that steps 2 and 3 of the algorithm are repeated several times.*

本節曾引用過這個例子：

*The solution to this problem is usually obtained by applying a Fourier transform.*

這裏使用被動語態來描述某種標準程序是正確的。因為這裏要陳述的是一個普遍的事實——事實上，作者討論的方案都是利用傅立葉轉換而得。相反，下面是一個有問題的句子：

*From equation (12),  $x = \theta/2$  and  $y = \rho$ . Equation (9) is now rewritten as follows.*

如果在作者的研究領域中，用作者所指的方式來改寫方程式 (9) 是標準的做法，則此句使用被動語態或許是正確的（但其實作者亦應把 *now* 這個字改成 *then*）。然而，這句似乎並非真的描述了某種通用的做法，反而是指作者自己的建議。這句也許要表達「現在我已經得到了  $x = \theta/2$  和  $y = \rho$ ，所以我能將方程式 (9) 改寫成下列的形式」。如果作者本來是要指涉自己的建議，則應改寫成：

修正句： *From equation (12),  $x = \theta/2$  and  $y = \rho$ . Equation (9) can*

now be rewritten as follows.

修正句的陳述明顯合符事實，意思比原句清晰得多。任何人只要由已得出的  $x = \theta/2$  與  $y = \rho$ ，便能如作者所說，重新改寫方程式 (9)。另一個修改方法是使用主動語態：

修正句：From equation (12),  $x = \theta/2$  and  $y = \rho$ . We can now rewrite equation (9) as follows.

上面兩個修正句都比原句更清楚暢達。

要決定不定詞應使用主動抑或被動語態，先要確定它暗示的主詞為何。如果主詞是不定詞所指行為的施事者，則應使用主動語態；相反，如果主詞是行為的「受事者」，則應該使用被動語態。下面是典型的錯誤：

誤：The parameters are difficult to be measured directly.

在原本文章的脈絡中，這句決非表示「參數正在被計算」，而是表示「直接計算參數是一件很困難的工作」。這個意思可使用不定詞表達：

正：It is difficult to measure the parameters directly.

原句中的 *to measure* 所暗示的主詞並非「參數」，而是如「研究者」、「我們」或「任何人」之類的主詞。為了方便澄清這點，應將暗示的主詞「研究者」插入句中：

正：It is difficult [for researchers] to measure the parameters directly.

然後將這句改寫成和原本例句相同的句式：

正：The parameters are difficult [for researchers] to measure directly.

由於不定詞 *to measure* 所暗示的主詞是產生不定詞所指行為的「研究者」，因此不定詞應該使用主動語態。現在將不定詞所暗示的主詞「研究者」刪除，以得出最後的修正句。

誤：The parameters are difficult to be measured directly.

正：The parameters are difficult to measure directly.

下列的例句則正好相反，不定詞所暗示的主詞是句子的主詞：

正：Sally felt happy to be measured for her wedding dress.

正：The circuit design is expected *to be completed* by July.

首句意思是莎莉為結婚禮服度身，她為此而感到高興。由於莎莉是不定詞「度身」所暗示的主詞，且也是不定詞所指行為的受事者（施事者為裁縫師），所以使用被動不定詞 *to be measured* 是正確的。第二句的意思則是某些人期望線路設計在七月前完成。由於線路設計是不定詞「完成」所暗示的主詞，也是不定詞所指行為的受事者（施事者則為一組工程師），所以使用被動不定詞 *to be completed* 是正確的。

在以下兩個簡單的例句中，不定詞都應用主動語態：

誤：This kind of sensor is easy *to be installed*.

正：This kind of sensor is easy *to install*.

誤：This problem is difficult *to be solved*.

正：This problem is difficult *to solve*.

確定動作的施事者是誰，以免混淆主動與被動語態。很多人在描述實驗方法或陳述實驗結果時，都會把被動語態和主動語態的意思混淆。要表達某些方法或結果時請注意：被動語態是表示某個行為由研究者所產生；主動語態則表示某個行為或事件是自己產生，或是另一個行為或事件的結果，而非由研究者的某個直接行為所致。比較下列句子：

After the samples were placed in the reaction chamber, the temperature *was increased* gradually from 100° C to 250° C.

As the chemical reaction proceeded, the temperature *increased* gradually from 100° C to 250° C.

首個例句中，被動動詞 *was increased* 表示所描述的行為是由研究者所產生的。研究者將樣本置於反應槽中，然後增加槽內溫度。第二個例句中，主動動詞 *increased* 表示溫度增加純粹是化學反應的結果而並非研究者做出任何動作去導致溫度增加。

不及物動詞不可使用被動語態。許多英文動詞本來就沒有被動形式。例如不及物動詞的後面從不接直接受詞，所以根本不可能有被動



形式。像動詞 *proceed* 就無法使用被動語態。

誤：The experiment *was proceeded* by the researchers.

正：The experiment was performed by the researchers.

正：The experiment was carried out by the researchers.

下列動詞在科技論文中很常見，它們皆沒有被動形式：

appear	correspond	occur	tend
arise	depend on	proceed	work
be	exist	remain	yield
become	happen	result in	
come	have	rise	
consist of	let	seem	

避免過度使用被動語態。在科技寫作中，不應該濫用被動語態。因為這會使論文變得笨拙而生硬，還常會產生不自然或難以理解的句子。此外，濫用被動語態也會導致孤立修飾詞（詳見 4.9 節），這亦是英文科技寫作中最常犯的錯誤。當然，在研究報告中被動語態的句子還是可以使用，尤其在論述實驗方法時。但若被動語態佔了全篇論句子的百分之二十五以上，則可能是過度使用了。

## 練習 4-7 被動語態

下面的句子都是不自然或錯誤的被動語態結構。請使用主動語態或較自然的被動語態結構來修改。

1. From these figures it is seen that the classification accuracy increases as the size of  $i$  and  $j$  increases.
2. It is believed that the annealing treatment improved the electrical characteristics of the films.
3. The difference between the two curves is attributed to the different values of  $\beta$  used in the two cases.

4. Now that the method has been modified, it is used to analyze the oscillator.
5. The following example is considered.
6. It is desired that the country's economy improve quickly.
7. From these data it is seen that the phase modulation and the frequency shift are enhanced by forward pumping.
8. Coding of coefficients is difficult to be accomplished in real time.
9. The appearance of C-H bonds is attributed to the large number of non-equilibrium hydrogen atoms in the plasma.
10. Now these values are substituted into the equations of motion and the solution is obtained.
11. The arrival rate is assumed in this example to be able to be modeled as a Poisson process.
12. The theoretical model is indicated from Figure 6 to predict the experimental values accurately.

## 4.8 隨意更換主詞或語態

在英文科技論文中，句中的主詞以及主動與被動語態應避免不必要的更換。這樣會使得句子的焦點不明確，就像是作者本人亦不能確認自己想表達的主題，更別說要讓讀者瞭解句子的重點。請看以下例子：

When we carried out the second trial, the following results were obtained.

這句的文法是正確的，但因為第一個子句與第二個子句的主詞、語態都不同，使得整句很不自然，且焦點欠清晰。第一個子句採用主動語態，主詞是 *we*；第二個子句則採用被動語態，主詞是 *the results*。假如

統一兩個子句的主詞和語態，句子就會變得較自然暢達：

*When we carried out the second trial, we obtained the following results.*

修改過的句子好多了，可是要求較高的作者不會就此滿意。這個主動句強調了研究者的行為，但作者真正的意思似乎是要提出一組實驗結果，所以把兩個子句都改成被動語態是較為達意的：

*When the second trial was carried out, the following results were obtained.*

這句似乎比第一個修改句子恰當。試驗及結果是句子的主要意思，故即使主詞由第一個子句的 *trial* 轉為第二個子句的 *results* 仍是正確的。再者，把這兩個名詞各自成為兩個子句的主詞，更可統一地使用被動語態。在某些文章脈絡中，這句甚至可進一步修改，用一個較簡短的介系詞片語來取代前面的引導附屬子句。

*In the second trial, the following results were obtained.*

*The results of the second trial were the following.*

有時候更換動詞語態是恰當的，但必須要根據上下文的結構或句意，方可更換。以下便是一個正確的例子：

*As soon as the samples were exposed to the gas, they began to deteriorate.*

在這句中，動詞語態從第一個子句的被動語態，更換為第二個子句的主動語態。這是因為作者希望將焦點集中在「那些樣本」上，而它們剛好是兩個子句的主詞。

概括而言，科技論文作者應該格外小心，句中的主詞或主被動語態有可能在不知不覺間轉換。這些轉換亦常會令句子出現孤立的修飾詞（請參閱下一節）。

## 4.9 孤立的修飾詞

孤立的修飾詞（*dangling modifier*，也可譯為「邊垂的修飾詞」）是指句子中沒有任何合理修飾對象的修飾詞。以下例句的 *after reading this book*

就是一個孤立的修飾詞：

*After reading this book, some common errors can be avoided.*

在英文中，如果像 *after reading this book* 這修飾詞在句首出現，則通常是用以修飾句中的主詞。然而，這裏 *after reading this book* 卻不能合理修飾句子的主詞 *some common errors*。這句的意思為「常犯錯誤」能看懂這本書。但「常犯錯誤」怎能看書？因此，這句根本語意不通。

以上例句產生孤立修飾詞的原因，是作者在句中將主動語態更換成被動語態。這個句子若以主動語態開始，則主詞應是某個正在閱讀的人。然而，當了解到這個主詞和動詞時，卻發現作者突然轉用被動語態，把 *some common errors* 當作主詞。如要把它修改成合理的句子，必須提供一個主詞，能受 *after reading this book* 這片語合理修飾，並一貫使用主動語態。以下是一種修改方式：

*After reading this book, students may be able to avoid some common errors.*

正如此例，孤立的修飾詞經常是由於作者在句子中將主動語態更換為被動語態所致。因此，當句中有被動的主要動詞時，科技論文作者應特別小心，不要造成孤立的修飾詞。

孤立修飾詞種類很多，最常見的包括有孤立的分詞片語、動名詞片語、省略子句以及不定詞片語，這些都常出現在中國人撰寫的科技論文中。以下是各種孤立的修飾詞的例子，例句將會顯示出，孤立的修飾詞常出現在句首。根據文法原則，它們應修飾句子的主詞，但它們卻無法合理地修飾主詞，使句子變得毫無意義。

## 孤立的分詞片語

分詞片語包含一個分詞（即 *-ed* 或 *-ing* 形的動詞）、分詞的受詞、修飾分詞及修飾分詞的受詞。出現在句首的分詞片語應修飾句子主詞，若不能修飾句子主詞，便要修改句子，刪除孤立的片語。

誤：*Examining this problem, the following fact can be observed.*

正：*Examining this problem, we observe the following fact.*

正：Concerning this problem, the following fact should be observed.

誤：Turning now to the second case, it can be seen that it is much simpler than the first.

正：Turning now to the second case, we see that it is much simpler than the first.

正：The second case, on the other hand, is much simpler than the first.

誤：Running the second trial, an unusual problem occurred.

正：When the second trial was run, an unusual problem occurred.

正：In the second trial, an unusual problem occurred.

在以上錯誤的例句中，分詞片語在表面上修飾句子的主詞，但主詞卻無法合理產生分詞片語所指稱的動作。第一和第二個例子的首個修正句，均提供了另一個能讓分詞片語合理修飾的主詞（“we”）。在修改第三個錯誤例句時，則用一個附屬子句或一個介系詞片語，取代孤立的分詞片語。

在英文中，有少數介系詞（如 *concerning*, *considering* 和 *regarding*）及附屬連接詞（*providing*），本身即為 *-ing* 形。以這類字詞開首的片語或子句並不算是孤立的修飾詞。

## 包含動名詞的孤立片語

動名詞是動詞的 *-ing* 形，作名詞使用。在一個帶有動名詞的孤立片語中，動名詞通常作介系詞的受詞使用。

誤：After substituting this term for  $y$  in Equation (3), the equation can be rewritten as follows.

嚴格來說，介系詞片語 *After substituting...* 應修飾句子的主詞。然而，主詞是 *the equation*，一個方程式不可能做出「以某詞項取代  $y$ 」這個行為。

這例子中出現孤立的修飾詞的原因，與本節曾提及的原因相同：作者以 *After substituting...* 開首，似乎有意撰寫一個主動語態的句子，但後來卻寫出一個被動的動詞。原句至少可用三種方式修改，這些修改方式的共同點是取消由主動語態轉為被動語態。

第一個修改的辦法是插入一個主詞，能受 *after substituting...* 合理修飾，並讓句子貫徹使用主動語態：

正： *After substituting this term for y in Equation (3), we can rewrite the equation as follows.*

另一個修改方法是把孤立的片語改成附屬子句，並以被動語態改寫：

正： *If this term is substituted for y in Equation (3), the equation can be rewritten as follows.*

第三個修改方法是省略 *after* 這字詞，直接用 *substituting* 這動名詞來作句子主詞，並使用主動語態。

正： *Substituting this term for y in Equation (3) yields the following equation.*

正： *Substituting this term for y in Equation (3) gives the following equation.*

此外，有時句首會出現包含動名詞的介系詞片語，而該介系詞片語表面上是可以合理修飾句子的動詞。以下是一範例：

原句： *By focusing the scene to be imaged on the photocathode of the tube, the image is intensified.*

有些作者可能會認為介系詞片語 *By focusing...* 不是一個孤立的片語，因為它可合理修飾句子的動詞（它說明了增強影像的明暗度的方法）。然而，這個片語顯然是錯置的。假如把這個片語移到句尾，句子就通順得多，讀者也會清楚這個片語係用來修飾動詞：

修正句： *The image is intensified by focusing the scene to be imaged on the photocathode of the tube.*

其實原句的結構較接近中文句子結構，但就英文而言，修正句是較為自然的。

## 孤立的省略子句

所謂省略子句是指一個省略主詞的附屬子句。作者省略一個主詞，是因為該主詞與主要子句的主詞相同。然而，若不小心把與主要子句的主詞不相同的主詞省略，省略子句就會頓成孤立的修飾詞。要修改孤

立的省略子句，可在省略子句中加入適當的主詞，或重新改寫這個省略子句，使該子句能合理修飾句子主詞。

誤： *When attempting to integrate this term*, the following problem is encountered.

正： When attempting to integrate this term, we encounter the following problem.

正： When this term is integrated, the following problem arises.

誤： *While constructing the menu hierarchy*, subfunctions and services invoked by the system functions are not used.

正： While constructing the menu hierarchy, programmers do not need to use subfunctions and services invoked by the system functions.

正： When the menu hierarchy is constructed, subfunctions and services invoked by the system functions are not used.

誤： *When simple*, we can solve this type of problem quickly using the direct method.

正： When simple, this type of problem can be solved quickly using the direct method.

第一和第二個錯誤例句中的孤立修飾詞，都是因作者混用了主動語態和被動語態而造成的。故修正句都一律使用主動語態或被動語態來貫穿整句。

### 孤立的不定詞片語

不定詞片語包含不定詞、不定詞的受詞以及任何修飾不定詞或其受詞的字詞。一般來說，位於句首的不定詞片語應修飾句子主詞；如果它沒有修飾句子主詞，亦很可能是孤立的修飾詞。

誤： *To design an effective system*, information about users' needs should be collected first.

正： *To design an effective system*, programmers must first collect information about users' needs.

誤： *To write a good paper*, much research is necessary.

正： To write a good paper, a student must do much research.

在錯誤的例句中，句首的不定詞片語都不能合理修飾句子主詞（「資料」不能設計系統，「研究」也不能寫文章）。因此，修正句都插入適當的主詞，能讓不定詞片語修飾。

在科技論文中，如果句首的不定詞片語不能修飾句子主詞，但只要句子不會因此變得毫無意義，或閱讀起來不會不自然，有時也能為專業的作者和編輯接受。作者有時會認為這種以不定詞片語開首開首的句子，表達得最為簡潔，且會認為有時即使不定詞片語不能合理修飾主詞，但它可修飾句子的主要動詞。但像以上兩例使用的不定詞片語，專業的作者都會反對。因為 *to design* 和 *to write* 無論是用來修飾句子主詞或主要動詞，都很怪誕。相比之下，以下句子中的不定詞片語就比較自然，這是因為不定詞片語可合理修飾句子的動詞：

*To resolve this performance bottleneck, a small, fast memory buffer was placed between the central processor and main memory.*

許多以英文為母語的作者會認為這句把不定詞片語 *To resolve...* 擺在句首，是無可厚非的。然而，有些資深的作者卻會認為以下的修正句更達意：

*This performance bottleneck was resolved by placing a small, fast memory buffer between the central processor and main memory.*

此外，有些作者會認為以下句中不定詞片語的位置並無不妥，因為該不定詞片語可合理修飾句子的動詞：

*To determine how the parameters vary over time, the experimental data were analyzed using a computer model.*

然而，有些專業編輯會認為以下的句子比原句來得通順：

*To determine how the parameters vary over time, we analyzed the experimental data using a computer model.*

面對這類例子，科技論文作者必須自行決定，讀者能否接受句子以不定詞片語開首。



## 練習 4-8 隨意更換主詞或語態

請修改下列句子，刪除不必要的主詞或動詞語態更換。

1. When we tested the system, excellent performance was obtained.
2. If users plan to carry out complex calculations, purchase of a high-performance workstation is recommended.
3. This type of network is insensitive to differences in scale, translation, and rotation, but an unusually large number of processing elements and connections are required.
4. If we attempt to solve the equation in this form, several difficulties are encountered.
5. This algorithm provides accurate results, but a great deal of processing time is required for the algorithm.
6. The sensors detect errors quickly, and information about the errors is fed from the sensors to the controller.

## 練習 4-9 孤立的修飾詞

請修改下列句子，刪去孤立或誤置的修飾詞。

1. After determining the mapping of  $A_i$  from  $L_1$  to  $L_p$ , the next array dimension can be processed in the same way.
2. When applying Smith's method in our simulations, the modeled objects had an unrealistic shape.
3. By choosing an appropriate reference plant model and robustness filter, the IMC structure will produce a controller of the desired order.

4. By further decreasing the input pulse width, pulse splitting due to SFS is observed.
5. After performing the simulations, the following results were obtained.
6. To write effective software programs for banks, training in both computer science and finance is necessary.
7. By verifying the prototype at this stage, specification errors can be detected and corrected earlier.
8. Using an NPN bipolar junction transistor as an example, there are three parts: the collector, base, and emitter.
9. Comparing Chen's method with ours, the difference between them is that we don't use external forces to join the panels in the model together.
10. By applying the finite difference method, the elastic force for an  $M \times N$  grid of points in vector form is the following.
11. Each cluster contains a different number of spectral vectors after performing the iterative procedure for producing the codebook.
12. To develop a high-performance bicycle, it is important to use lightweight materials.
13. Before discussing the design of the damper, the main design factors must be identified.
14. By applying the proposed load compensation technique, the results indicate that system performance improves significantly.
15. To directly apply this analysis to the present case, two difficulties arise.

## 4.10 修飾詞誤置

英文句子裏，字詞或字詞組的位置，可顯現出其與句子中其他字詞間的相互關係。如果具有修飾功能的字詞位置不當，文章就會變得令人費解。

### 程度副詞

程度副詞（如 *only*, *nearly*, *almost*, *even* 以及其它類似的字詞）應直接擺在其修飾的字詞前面。撰寫英文文章時，應注意這些副詞在句中的正確位置，通常與中文句子的位置不同。

誤置句：The system *only needs* three iterations to find the solution.

修正句：The system needs *only three* iterations to find the solution.

誤置句：The computation took two seconds *approximately*.

修正句：The computation took *approximately two* seconds.

在第一個例子中，*only* 不是用來修飾 *needs*，而是 *three*。在第二個例子中，*approximately* 應放在 *two* 前面。

注意以下兩個句子的差別：

The calculations are *nearly all* completed.

The calculations are all *nearly completed*.

在首句中，*nearly* 這字詞用來修飾 *all*，這句指出「大部分計算都已完成，但有些還沒有」。在第二句中，*nearly* 修飾的是 *completed*，所以意思是「沒有一個計算是完成的，但所有的計算都會快將完成」。

以下展示了一個很有意思的情形，同一個句子，整句意思會隨 *only* 位置的改變而改變。（底線是標明 *only* 所修飾的字詞。）

Only Arnold said that he ate his apple. [其他人都沒這麼說。]

Arnold only said that he ate his apple. [他只是說這件事，沒做甚麼。]

Arnold said only that he ate his apple. [他除了說出這件事，沒有說別的了。]

Arnold said that only he ate his apple. [吃了這蘋果的只有他。]

Arnold said that he only ate his apple. [他只吃了蘋果，沒做過別的事。]

Arnold said that he ate only his apple. [他只吃了自己的蘋果，沒有吃其他屬於自己或別人的東西。]

Arnold said that he ate his only apple. [他吃掉自己僅有的蘋果。]

Arnold said that he ate his apple only. [他只吃了自己的蘋果，沒有吃其他屬於自己或別人的東西。]

## 其他副詞

請注意副詞 *easily* 的位置：

The solution can be *easily* found by using the following method.

這句在文法上是正確的，但以英文為母語的作者都會認為，若將副詞 *easily* 置於助動詞 *can* 和 *be* 之間，整句會較自然。

The solution can *easily* be found by using the following method.

副詞在修飾一個動詞時，通常是放在該動詞的前後。但在某些情況下，假如將副詞放在句尾，則會使句子更通順。尤其是當作者有意強調某個副詞，或當副詞片語很長時，則可把副詞放在句尾。試比較下列句子：

The new algorithm *quickly and accurately* finds the solution.

The new algorithm finds the solution *quickly and accurately*.

兩句同是文法正確的英文，但第二句就要比第一句來得通順自然。在第二句中，動詞直接放在主詞後面，會使句子比較易讀，同時，把副詞放在句尾，亦較能強調副詞的意義。

## 避免不明確的修飾詞

作者在寫作時應要明確表示修飾詞所修飾的特定字詞。有時候，修飾詞的位置不當，會使讀者不瞭解哪個是受修飾的字詞。請注意以下句中 *often* 這字詞的位置。

不清楚：The professor encouraged the class *often* to do extra homework.

讀者實在難以看出這裏 *often* 修飾的是 *encouraged*，還是 *to do*？作者應表明 *often* 修飾的究竟是哪個動詞，再在下列修正句中任擇其一。

修正句：The professor *often encouraged* the class to do extra homework.

修正句：The professor encouraged the class *to do* extra homework *often*.

## 片語

修飾名詞的片語應直接放在它修飾的名詞後面，否則句子會令人非常費解。試看下面例句：

誤置句：Stuart bought a new computer system from a discount store *with a scanner and a printer*.

修正句：Stuart bought a new computer system *with a scanner and a printer* from a discount store.

片語 *with a scanner and a printer* 似乎是修飾名詞 *store*，但事實上它卻應修飾 *system*。

副詞片語可直接放在其所修飾的字詞後面，也可放在句首或句尾。當選擇副詞片語的位置時，句意必須要很清楚。試參考下面的例子：

誤置句：Then a new design is proposed for the system *in the second section*.

修正句：Then, *in the second section*, a new design is proposed for the system.

修正句：Then a new design for the system is proposed *in the second section*.

在原句中，*in the second section* 這片語是用來修飾名詞 *system*。然而，作者原本是想說：新設計將在論文某個章節中提出。同樣，以下例子裏，*on paper* 這片語似乎是修飾 *system*；但事實上它卻修飾了 *reproduces*。

誤置句：The facsimile recorder reproduces the image transmitted by the facsimile system *on paper*.

修正句：The facsimile recorder reproduces *on paper* the image trans-

mitted by the facsimile system.

## 關係子句

關係子句通常應緊接著它所修飾的字詞。下面的「誤置句」，是句中關係子句位置出了錯，令人不知其所云。在第一個誤置句中，關係子句應修飾 *drive*，而非 *device*；在第二個誤置句中，關係子句應修飾 *information*，而非 *memory*。

誤置句：A laser disk drive is used in the CD-ROM device *that is the same size as a traditional 5.25-inch drive*.

修正句：A laser disk drive *that is the same size as a traditional 5.25-inch drive* is used in the CD-ROM device.

修正句：The CD-ROM device has a laser disk drive *that is the same size as a traditional 5.25-inch drive*.

誤置句：Information can be loaded into memory *that is stored on a CD-ROM* and then displayed or printed.

修正句：Information *that is stored on a CD-ROM* can be loaded into memory and then displayed or printed.

上述準則有個例外：假如關係子句太長，而直接放在它所修飾的名詞後面，就會令句子變得笨拙。所以應把關係子句移到較恰當的位置（譬如，把子句放在句尾）。在下列句子中，假如關係子句放在動詞後面，便會較通順。（請參閱第九章 9.4 和 9.5 節。）

不通順：A design *that prevents slow master modules from being handicapped in their attempts to gain control of the bus while permitting faster modules to transfer data at high speed via the same bus* has been developed.

修正句：A design has been developed *that prevents slow master modules from being handicapped in their attempts to gain control of the bus while permitting faster modules to transfer data at high speed via the same bus*.

以 *based on* 開首的片語不應擺在句首。

不通順：Based on the simulation results, the second algorithm is faster and requires less memory.

這例中的分詞片語 *based on the simulation results* 並沒任何合理修飾對象，因此是孤立的修飾詞。作者真正的想法是：

The second algorithm is faster and requires less memory. This conclusion is *based on the simulation results*.

但這修正法卻太冗長間接。以下任何一個修正句都比原句達意，尤其第三個修正句特別簡潔直接：

修正句：*On the basis of the simulation results, we can conclude that the second algorithm is faster and requires less memory.*

修正句：*From the simulation results, we can conclude that the second algorithm is faster and requires less memory.*

修正句：*The simulation results show that the second algorithm is faster and requires less memory.*

在正式的文章中，假如關係代名詞是介系詞的受詞，則介系詞通常應是關係子句中的首個字詞。

不自然：*The speed which the reaction occurred at surprised us.*

修正句：*The speed at which the reaction occurred surprised us.*

但這也有例外。為使句子較自然，資深的作者有時會把介系詞放在子句的結尾。下面的例子很著名（據說是前任英國總理邱吉爾提出的）：

不自然：*This is something with which we will not put up.*

修正句：*This is something we will not put up with.* [這是一件我們無法忍耐的事。]

當關係代名詞之後緊接著動詞 *to be* 時，關係代名詞以及動詞有時是可省略的。請參考下面的例子：

The results *that were* obtained are shown in Figure 1.

這個句子可簡化成這樣：

The results obtained are shown in Figure 1.

這裏 *obtained* 表示一個縮短的關係子句，所以應把 *obtained* 放在它所修飾的名詞後面。中國人寫英文文章時，有時會顛倒名詞和修飾詞的次序：

The *obtained results* are shown in Figure 1.

雖然以上句子並非不正確，但聽起來就有點不對勁，因為 *the results obtained* 始終要比 *the obtained results* 自然得多。

## 副詞子句

以 *although, because, since, until, after* 等字詞開首的副詞子句，可放在其所修飾的字後面，或放在句首或句尾。在選擇副詞子句的位置時，作者應確定句意清楚明確。例如：

誤置句：The samples were used in the experiments *after they were doped with boron*.

修正句：*After they were doped with boron*, the samples were used in the experiments.

副詞子句的意思是「實驗本身灌入了硼」。但作者原意是「樣本被灌入了硼」。因此，我們應該把副詞片語移到句首。如此一來，子句中的 *they* 很清楚是指稱樣本，而非實驗本身。

中國的作者應留意代名詞 *they* 在以上修正句中的位置。在中文裏，比較自然的寫法是先提及名詞，才使用代名詞。所以，中國作者可能會認為，應該先提及名詞 *samples*，才使用代名詞 *they*：*After the samples were doped with boron, they were used in the experiments*。但在英文中，先用代名詞、然後才用名詞的 *After they were doped with boron, the samples were used in the experiments*，亦同樣正確。

## 練習 4-10 修飾詞誤置

指出下列句子中誤置的修飾詞，並加以修正。

1. In this case, it would only be necessary to search for the largest subset template.
2. The samples were placed in an oven wrapped in foil.
3. Based on the two parameter studies, the appropriate parameters for the rec-



ognition system are  $N = 12$ ,  $M = 4$ , and  $T = 18$ .

4. We can assume that the applied force is always in the +y direction without loss of generality.
5. Based on the mathematical model presented above, a computer program was developed to generate the complete tooth profile.
6. The technique only partitions a data set into two subsets.
7. Generally, an observer-based scheme for generating residuals is depicted in Figure 2.
8. The system can be divided into two parts basically.
9. This is a problem in classical physics of great complexity.
10. The parameters were used to test the model measured in the experiment.

## 4.11 誤用冠詞

冠詞是英文中最難以掌握的詞類之一，許多非以英文為母語的人都難以決定甚麼名詞該用甚麼冠詞。如第二章討論過的，為正確使用冠詞，作者必須知道如何分辨某個名詞是指稱一個總類中的任何一個個例，或是指稱一個特定事物。

中國作者使用英文冠詞常犯的錯誤，就是當要以單數且可數的名詞來指稱一個總類的任何一個個例時，卻省略了不定冠詞 *a*。

誤：In this paper, we propose mechanism to explain this phenomenon. 顯然，作者是想提出 *a mechanism* 來說明這現象。在這裏不定冠詞是必要的，因為 *mechanism* 是一個單數且可數的名詞，且是指稱一個總類中的某一個個例。這裏不定冠詞之所以必要，是由於作者打算從多種可能的說明中提出一個。即使作者提出的是唯一正確的說明，但這仍不是唯一可能的說明。（若在同一個段落或章節中再需要提到時，就會

寫成 *the mechanism* 而非 *a mechanism*。）

另一個常犯錯誤是當有必要使用定冠詞 *the* 時，卻將它省略。如以下例句所示，當缺少了定冠詞時，句子就變得難以理解。

誤：Range of low frequencies passed by low-pass filter within a specified limit is called pass band of filter. Point considered to be upper end of pass band is at critical frequency,  $f_c$ , which is frequency at which filter's output voltage is 70.7% of maximum.

加上適當的定冠詞後，句子遂變得比較清楚。

正：The range of low frequencies passed by a low-pass filter within a specified limit is called the pass band of the filter. The point considered to be the upper end of the pass band is at the critical frequency,  $f_c$ , which is the frequency at which the filter's output voltage is 70.7% of the maximum.

然而，有些作者卻犯了相反的錯誤，即使應使用不定冠詞或沒有必要使用任何冠詞時，也一律在每個名詞前面加上 *the*。

誤：The ordered binary decision diagram is the directed acyclic graph with the fixed variable ordering that represents the Boolean functions. The graph includes two kinds of the nodes, the non-terminal and the terminal, as stipulated by the Shannon's theorem.

正：An ordered binary decision diagram is a directed acyclic graph with a fixed variable ordering that represents Boolean functions. The graph includes two kinds of nodes, non-terminal and terminal, as stipulated by Shannon's theorem.

在“Shannon's theorem”之前不必加上 *the*，因為接著「屬格」（又稱「所有格」）的名詞不需要加上任何冠詞。方程式的名稱（如“equation (9)”）以及論文中的章節或小節（“chapter 6,” “section II”），也不需要冠詞。

要重溫冠詞更詳細用法，請參閱第二章。

## 4.12 錯誤的複數名詞

有時造成主詞和動詞不一致，並非作者不懂文法規則，而是忘記把複

數主詞寫成複數形式之故。當要修改英文研究報告初稿時，一定要留心複數形式的用法。如果名詞是複數的話，就不要忽略名詞的複數形式。此外，千萬別要把單數名詞寫成複數形式，尤其不可把不可數名詞寫成複數形式。中國人撰寫英文科技論文時，就經常把下列不可數名詞誤以複數形式表示：

literature	research	work
notation	terminology	information
equipment	software	hardware

其他不能寫成複數形式的名詞還包括任何加上 *every, each, no, another, either, neither, one* 等字的名詞。例如，下面兩句的主詞都應是單數：

Every *product* undergoes two phases of quality testing.

No *student* may leave the room during the test.

若一個單位之前有一數字，除非數字剛好為 1，否則應是複數形式。

This event lasts only 1 second.

The launch was aborted just 1.8 seconds before lift off.

Valid data must be present for a minimum of 0.5 microseconds before and after the strobe pulse.

Integrated circuits are now manufactured with line widths of less than 0.001 millimeters.

### 4.13 含糊的代名詞

每個代名詞必須有一個清晰的前述詞（前述詞是代名詞所指稱代替的名詞）。假如一個代名詞的前述詞會讓讀者覺得不夠明確（尤其是較不熟悉文章內容的讀者），代名詞就應改成名詞或名詞片語。例如：

含糊： There are several differences between static memory and dynamic memory. First, because *it* does not lose its contents as long as power is applied, *it* eliminates the need for periodic refresh cycles.

第二句的代名詞 *it* 是指哪種記憶體？有電子知識背景的讀者也許能猜中，但這本來並非他們的責任。作者應讓讀者能清楚看出代名詞的前述詞，他可用名詞取代這代名詞：

修正：There are several differences between static memory and dynamic memory. First, because *static memory* does not lose its contents as long as power is applied, *it* eliminates the need for periodic refresh cycles.

撰寫英文文章時，應避免在同一句中使用代名詞 *it* 來表達兩個或三個不同的意思。例如，如果使用 *it* 作虛主詞，則不應在同一句中再使用它來指稱一特定的前述詞。請參考以下例句：

模糊：If a diode fails the quality test, *it* is necessary to replace *it*.

清楚：If a diode fails the quality test, *it* must be replaced.

清楚：Any diode that fails the quality test must be replaced.

模糊：When *it* is important for a system to handle complex data, *it* is difficult to design *it* so that *it* also finds solutions quickly.

清楚：*It* is difficult to design a system that both handles complex data and finds solutions quickly.

如果要使用一個代名詞來指稱前一句的意思，則不可使用代名詞 *it*。在這種情形中，使用代名詞 *this* 較為適合。

誤：Fax machines allow documents to be transmitted to remote locations quickly and conveniently. *It* is one reason they are so popular.

正：Fax machines allow documents to be transmitted to remote locations quickly and conveniently. *This* is one reason they are so popular. [第二句沒有文法錯誤，但句意模糊。]

誤：A conventional MVC application is composed of several fixed subwindows that share the same model, and each subwindow works through a view and a controller. *It* is sufficient when a window application is simple.

正：A conventional MVC application is composed of several fixed subwindows that share the same model, and each subwindow has a view and a controller. *This* is sufficient when a window application is simple. [第二個句子沒有文法錯誤，但句意模糊。]

但一般而言，除非代名詞所指意思已非常清楚，否則作者應盡量避免使用 *this*, *that* 或 *which* 來指稱整個句子或子句的意思。若是以代名詞來指稱的意思不夠清晰，不如乾脆刪除代名詞，並將句子重新改寫，或加入能夠澄清句意的名詞。例如：

模糊：Fax machines allow documents to be transmitted to remote locations quickly and conveniently. *This* is one reason they are so popular.

清楚：Fax machines allow documents to be transmitted to remote locations quickly and conveniently. *This capability* is one reason they are so popular.

清楚：One reason fax machines are so popular is that they allow documents to be transmitted to remote locations quickly and conveniently.

模糊：The maximum number of generalizations is related only to the number of attributes, *which* is consistent with the points in section 2.

清楚：The maximum number of generalizations is related only to the number of attributes. *This relationship* [或 *this property*] is consistent with the points in section 2.

模糊：A conventional MVC application is composed of several fixed subwindows that share the same model, and each subwindow has a view and a controller. *This* is sufficient when a window application is simple.

清楚：A conventional MVC application is composed of several fixed subwindows that share the same model, and each subwindow has a view and a controller. *This design* is sufficient when a window application is simple.

同時也應避免使用不必要的代名詞。

誤：For a program with  $n$  iterations, there are  $n$  iterations in *its* corresponding DFG.

正：For a program with  $n$  iterations, there are  $n$  iterations in the corresponding DFG.

正：A program with  $n$  iterations has  $n$  iterations in its DFG.

誤：We can now extend the uniform case to a general distribution,

which we view *it* as the prior distribution of U in Bayesian statistics.

正：We can now extend the uniform case to a general distribution, which we view as the prior distribution of U in Bayesian statistics.

在第二個錯誤的例子中，關係子句中出現了不必要的代名詞。因為這個代名詞與關係代名詞 *which* 是指同一個對象，即 “a general distribution”，故可以說，這代名詞是累贅的。假如 *We view it as the prior distribution of U in Bayesian statistics* 這個子句是一個獨立子句的話，則把代名詞 *it* 放在動詞後面是正確的。然而，當這個子句以關係子句出現時，關係代名詞 *which* 就取代了代名詞 *it*，因此應該省略後者。

#### 4.14 代名詞與前述詞一致

除了前述詞必須交代清楚之外，代名詞的數必須符合其前述詞的數。請注意下列各項：

- 指稱不定前述詞 *any, each, either, neither, person* 和 *-one, -body, -thing (everyone, anybody, something)* 結尾的字詞時，必須使用單數代名詞。
- 如果前述詞是由兩個以上單數的名詞組成，並以 *and* 連接的話，就應使用複數代名詞。
- 如果前述詞是由兩個以上單數的名詞組成，並以 *or* 或 *nor* 連接的話，則應使用單數代名詞。
- 假如前述詞是由一個複數名詞與一個單數名詞組成，並以 *or* 或 *nor* 連接的話，那代名詞則應與它所在位置最接近之前述詞名詞的數一致。

傳統上，陽性單數代名詞 *he, him, his* 皆可指涉男性或女性的單數前述詞，如 *someone, everyone, person, student, user, reader* 這些字詞。然而，現今許多讀者卻反對以陽性代名詞兼稱兩性。這裏倒有些折衷的辦法。請看下面的例子：

*Any author who wishes to present a paper at the conference should*

submit *his* paper before April 30.

如果像這句中的代名詞只出現一次，則作者就可用 *he or she* 來代替 *he*，並以 *his or her* 來代替 *his*：

*Any author who wishes to present a paper at the conference should submit his or her paper before April 30.*

然而，如果代名詞在句子中多次出現，即一直重複使用 *he or she*，句子將會變得冗長笨拙。另一個不錯的解決辦法，就是將句中的單數代名詞與相應的前述詞都改寫成複數。

*Authors who wish to present a paper at the conference should submit their papers before April 30.*

第三個方法則是刪除句中所有代名詞：

*Any author who wishes to present a paper at the conference should submit the paper before April 30.*

十九世紀以來，一般英文文法參考書都表示，在正式文章中，用複數代名詞 *they, them, their* 指稱單數前述詞是錯誤的。但近年有學者指出，英文文學史上許多著名的作者（如莎士比亞）都慣用第三人稱複數代名詞指稱單數不定前述詞，因此這應亦為正確。

*Anyone who wishes to present a paper at the conference should submit their paper before April 30.*

然而，很多期刊的編輯仍不容許此用法，所以本書建議使用以上介紹的方法，避免這種單複數形之混合使用。

在正式文章中，不應將代名詞合併使用，如 *his/her* 與 *s/he*。

劣：*Any author who wishes to present a paper at the conference should submit his/her paper before April 30.*

指示形容詞 (*this, that, these, those*) 的數必須符合其所修飾名詞的數。尤其是指示形容詞後面接著 *kind of* 或 *type of* 這類字詞時，應與 *kind of* 或 *type of* 後面所接的名詞的數一致。

正：This type of method [*this, type, method* 皆為單數。]

正：These types of processors [*these, types, processors* 皆為複數。]

正：This kind of book

正： These kinds of instruments

誤： This type of computers [*This type* 是單數，*computers* 卻是複數。]

誤： These types of design [*These types* 是複數，*design* 卻是單數。]

使用關係代名詞時：*who* 指稱人，*which* 指稱事物，*that* 則指稱事物或人。而當 *which* 與介系詞連用時，會使句子顯得不自然，則屬格 *whose* 亦可用來指稱事物。

不自然： The least squares method is used to simplify a piecewise multivariate polynomial regression model *the regression function of which* must satisfy certain continuity conditions.

修正句： The least squares method is used to simplify a piecewise multivariate polynomial regression model *whose regression function* must satisfy certain continuity conditions.

在這裏，關係子句 *whose regression function must satisfy...* 要比 *the regression function of which must satisfy...* 來得自然。

關係代名詞 *that* 只可用在限定關係子句中。限定關係子句是指對句意不可或缺的子句，而且不能用逗點將它與句子其他部分隔開。相反，非限定子句是指對句意可有可無的子句，而且可以逗點把它與句子其他部分隔開。（參考第五章 5.2 節的詳細說明。）*Which* 可用在限定子句或非限定子句。爲了清楚起見，許多英文寫作參考書會建議作者在限定子句中使用 *that*，而 *which* 只用在非限定子句中。但這準則也有個例外的情形，如在同一句中，過度使用 *that* 的話，則不妨可交替使用 *which*。

## 練習 4-11 代名詞與前述詞

找出不清楚的代名詞，或與前述詞的數不一致的代名詞。試修改這些句子，使得每個代名詞都有一個清楚的前述詞，且兩者的數都相符合。

1. When a formal financing system does not exist, a pre-selling system is es-



tablished to make the market more effective. It can be found in a number of Asian countries.

2. A centralized compression service is economical, but they hamper creativity when developers want to experiment with applications and data. Accordingly, digital video interactive (DVI) technology offers another kind of compression: edit-level video, done on the developer's DVI system in real time. Edit-level video is lower in quality than that made by centralized compression but is adequate for software development. Users employ it to develop and test new software. When they have made their choices and polished the program, they send the final analog video through it. When the presentation-level compressed video comes back to them, they substitute it for the edit-level files. Their newly developed software runs just as they did in testing, but now with higher-quality video.<sup>10</sup>
3. The solar water heater used in the experiment is shown in Figure 2. At its top left is a cold-water inlet, where water flows into it. Its main portion consists of many coils of plastic pipe connected together in an accordion fashion and covered with a sheet of heat-absorbing plastic. The water flows through them, absorbing heat from the sun, and then exits the heating apparatus through the outlet at the lower right of the heater. From the outlet it flows into an insulated storage tank in the basement of the house, from which hot water is drawn when needed.
4. While scientists and engineers agree that fusion can work, there is no general agreement on what will be the most economical and desirable type of fusion reactor. To date, the best results have been achieved with the toka-

mak, a doughnut-shaped machine with powerful magnetic coils, and the optimism that a viable one can be built is primarily based on its performance. Although it now appears probable that they will one day produce energy at a cost around that of petroleum and below the cost of solar energy, many of them think that alternative magnetic fusion devices could produce it even more cheaply.<sup>11</sup>

## 4.15 冗長或錯誤的複合名詞

複合名詞 (noun compound) 是指由兩個以上名詞組成的名詞片語，例如：*a research paper, the electronics laboratory, mathematics textbooks*。英文複合名詞中，最右邊的名詞叫「首語」(head noun)，首語前面的名詞則是作修飾詞之用。例如，在 *mathematics textbooks* 這個複合名詞中，*textbooks* 是首語，*mathematics* 則是用來修飾 *textbooks*，以告訴讀者教本種類。

複合名詞非常重要，它可以幫助作者簡潔地表達一些複雜的意思。然而，中國人撰寫英文科技論文時，千萬別造出不自然或錯誤的複合名詞。想確保所寫的複合名詞是清楚正確的英文，應記住以下的重點。

使用複合名詞時，最重要的原則是複合名詞要簡短。一個複合名詞的組合若是超過三個名詞，個別名詞之間的關係必定是模糊的，會令讀者費解。當讀者遇到如 *computer simulation test program analysis method* 的複合名詞時，根本不可能清楚了解作者的意思。這裏所指至少有三個可能：

- 一、用以分析電腦模擬測試的程式的方法 (a method for analyzing programs used in computer simulation tests)。
- 二、用以分析電腦模擬程式的試驗性方法 (a test method for analyzing programs used in computer simulations)。

三、使用電腦模擬來分析測試程式的方法 (a method that uses computer simulations to analyze the effectiveness of test programs)。

故此，假如發覺自己使用了超過三個字詞組成的複合名詞，趕緊用介系詞或關係子句把這個複合名詞分成兩個或兩個以上的部分。例如，冗長的複合名詞 *a new power plant control system design approach*，可修改成 *a new approach to designing control systems for power plants*，這樣便清楚得多。尤其當一個名詞片語在文章中首次出現時，應如後者般清楚交代該名詞片語所指的意思。在介紹這名詞片語過後，才可把它縮短為一個複合名詞。

在撰寫複合名詞時，必須正確使用複數形式。一般而言，只有首語（複合名詞中最右邊的名詞）才可以為複數形式。修飾首語的名詞皆須為單數形式，即使這名詞可能表達複數意思。舉個例說，*circuit designer* 這複合名詞，即使某位線路設計者可能會設計出很多不同線路，但 *circuit* 仍是單數。又例如在複合名詞 *computer science* 中，即使電腦科學家研究多種不同的電腦，*computer* 仍是單數。假如將這些複合名詞寫成 *circuits designer* 與 *computers science*，對以英文為母語的人來說，都是光怪陸離的寫法。

但這些規則還是有例外，對非以英文為母語者的確造成很多麻煩。例如在複合名詞 *systems technology*, *communications satellite* 及 *teachers college* 中，修飾首語的名詞都要寫成複數。對這些例外的複合名詞，只有死背一途了。

在中文的名詞片語中，我們常用「的」字來類比為英文介系詞 *of*。中文的「的」字也可用來表示名詞的屬格，而英文的屬格則用 *'s* 來表示。因此有些人便誤以為可用 *'s* 來翻譯所有中文的「的」字，結果常將複合名詞誤當成屬格來使用。例如，他們會將 *a laser printer controller*, *a home entertainment center*, *an IBM personal computer* 誤寫成 *a laser printer's controller*, *a home's entertainment center*, *an IBM's personal computer*。但複合名詞的首語之前的名詞是修飾詞，而決非屬格。當要

表達一家名為 Technocorp 的公司的商業合約時，應寫成 “the Technocorp contract”，而非 “the Technocorp’s contract”。（相反，如果要提到某些屬於 Technocorp 的事物，則應使用屬格，如 “Technocorp’s organizational structure”。）

同樣，「不使用名詞的屬格」這項規則也有例外，其中一個就是寫科技論文的人可能會遇到的 *user’s guide*。縱然與規則有所抵觸，但這已經是一種約定俗成的標準說法。這種例外的情形，作者除了牢記，亦別無他法。

複合名詞就是由一個或以上的名詞修飾另外一個名詞。在英文中，如果可以用一個恰當的形容詞來修飾一個名詞，便不應用名詞來修飾。例如，作者應使用 *computational complexity* 來代替複合名詞 *computation complexity*，用 *industrial technology* 來代替 *industry technology*，或用 *Fast, precise operation is required* 這句來代替不自然的 *Fast and precision operation is required*。

## 練習 4-12 複合名詞

請修改下列含糊或錯誤的複合名詞。

1. In this paper we introduce a new actuator location selection method.
2. To achieve realistic modeling, we need to develop an object penetration avoidance method.
3. We will now discuss architecture implementation issues.
4. Next, we will find the service time for cycle  $k$  using the random numbers stream  $R_j$ .
5. Section 3 presents our feedback gain matrix computation method.
6. Existing network bandwidth assignment methods are not suitable for this

case.

7. Mitchell [4] described an efficient distributed operating system file transfer technique.
8. The government has enacted new technology investment stimulation legislation.
9. The company has developed a new integrated circuit production machinery operator training program.
10. This document is a government research institute technology development guidance model proposal.

## 4.16 模糊的比較

當比較兩個項目時，一定要合理而完整，而項與項之間定要是可比較的。還有，必須把比較的項目陳述清楚，避免模稜兩可。下列「不合理」的例句，就是把兩個不同種類的項目做比較：

不合理： The flexibility of joint 1 is greater than joint 2. [把關節的彈性與關節本身做比較。]

合理： The flexibility of joint 1 is greater than *that of* joint 2.

合理： Joint 1 is more flexible than joint 2.

不合理： The performance of our algorithm is better than the conventional algorithm. [把一個演算法的性能與另一個演算法做比較。]

合理： The performance of our algorithm is better than *that of* the conventional algorithm.

合理： Our algorithm outperforms the conventional algorithm.

不完整的比較常出現於有字詞 *similar* 的句子中。以下的例句中，作者並沒有指出與論證做比較的是甚麼。

錯誤句： To prove this, we can use *a similar argument as in* [5].

這句既不合理，又不正確，因為 *similar* 所接的介系詞應該是 *to*，而非 *as*。作者應這樣修改句子：

修正句：To prove this, we can use *an argument similar to that* in [5].

在 *Sarah reads faster than her sister does* 這句中，*does* 是可省略的。因為 *Sarah reads faster than her sister*，既不影響句意，也不會造成歧義。但在某些例子中，省略助動詞、介系詞或其他字詞，句中的比較對象就會變得模糊。

模糊：Jeffrey likes Mary more than her husband. [這句的意思是：Jeffrey 喜歡 Mary 多於他喜歡 Mary 的丈夫？還是 Jeffrey 喜歡 Mary 多於 Mary 的丈夫喜歡 Mary？]

清楚：Jeffrey likes Mary more than *he likes* her husband.

清楚：Jeffrey likes Mary more than her husband *does*.

模糊：The optimum absorber damping is less sensitive to the damping level of the system than the optimum tuning frequency.

清楚：The optimum absorber damping is less sensitive to the damping level of the system than the optimum tuning frequency *is*.

模糊：The overall performance depends more on the bus speed than the memory access time.

清楚：The overall performance depends more on the bus speed than *it does on* the memory access time.

清楚：The overall performance depends more on the bus speed than *on* the memory access time.

## 練習 4-13 模糊的比較

請修正以下句中錯誤或模糊的比較對象。

1. The alignment problem is simpler in imperative languages than the functional language Alpha.
2. The cost function and alignment algorithm are also similar to [11].
3. The cost of the filter is about half of the approach in (Wason, 1990).

4. Compare the voltage drop between node 1 and node 2 and node 3 and node 2.
5. Lane developed an alternative approach with performance similar to (Long, 1992).
6. The accuracy of the new robot arm is greater than the conventional one.
7. Machine recognition of handwritten Chinese characters is more difficult than handwritten English letters.
8. This strategy yields a greater variance reduction than [3].
9. These results are consistent with Rogers et al. (1985).
10. Low-frequency noise is filtered out more effectively by the AGC than the limiter.

#### 4.17 「主題與評論」句

在中文裏，作者為求強調句子的主題，經常會在句首的片語中開門見山地點出主題，而通常又會在這片語後，接著一個對該主題做評論或描述的子句。這種把主題放在句首的方式，稱為「主題化」(topicalization)，有人稱這種句式為「主題與評論」句(topic-comment pattern)。在「主題與評論」句中，句首所提到的主題時常會在其後「評論」子句中再次出現，且有時會以代名詞來指涉：

在自動化技術方面，近幾年已開發出多種新的技術。

至於第二種方法，最大的優點是這方法成本比較低。

雖然在英文裏，這樣的句子結構或可接受，但還是不夠自然簡潔。以下是把上面兩個中文句子，未經修飾而直接翻譯成英文：

不自然： In regard to automation technology, in recent years many new technologies have been developed.

不自然：As to the second method, the most important advantage is that the cost of this method is lower.

這些句子都沒有文法錯誤，可是卻嫌不夠通順。如果省略這兩句的引導片語，直接陳述重點，句子就醒目得多了。引導片語的意思通常可輕易地併入句子的主詞片語中，或改為動詞的受詞。例如：

修正句：In recent years *many new types of automation technology* have been developed. [或：In recent years we have developed many new types of automation technology.]

修正句：*The most important advantage of the second method* is that it has a much lower cost. [或：“...it costs much less.”]

以下的「不自然」句都是「主題與評論」句，而它們的結構明顯是直接從中文翻過來的英文，所以都應予以修改。但這兩句的結構實在太過不自然，根本不能清楚表達作者的真正意思。因此，這裏只好盡量猜測作者的意思而嘗試修改：

不自然：*Regarding the overload condition of the destination gateway*, it is assumed to have a traffic intensity of greater than one.

修正句：We assume that the destination gateway is overloaded whenever it has a traffic intensity of greater than one.

修正句：The destination gateway is overloaded whenever it has a traffic intensity of greater than one.

修正句：Overload of the destination gateway occurs whenever the traffic intensity of the gateway is greater than one.

不自然：*Concerning rotor flux detection*, the indirect control method has been used because it offers the advantage of no flux sensor installation and ease of operation at low speeds compared with the direct vector control scheme.

修正句：One effective method for detecting rotor flux is the indirect control method, which eliminates the need for flux sensors and is easier to use at low speeds than the direct vector control scheme.

撰寫英文科技研究報告時，中國的作者應格外留意以 *as for, as to, concerning, considering, for, in respect to, in the area of, regarding* 等這類字



詞開首的句子，可能就是不通順的「主題與評論」句。刪除這種句子的引導片語，直接陳述重點，這樣的句子才鮮明易讀。

## 練習 4-14 「主題與評論」句

請修改以下的句子，刪除不必要的引導片語或字詞。

1. As for Smith [15], he gave a parametric solution for the eigenvalue assignment.
2. For SPS, it is an extensible operating system for creating system services.
3. Regarding Lee's algorithm, it can be divided into two parts for discussion.
4. In application aspects, many applications of fuzzy neural networks have been reported.
5. Concerning this problem, the following approach was adopted to solve it.
6. For each character image, it is identified as belonging to a set of  $m$  candidate characters.
7. Comparing the differences between Lee's approach and our approach, the main difference between them is that our method is much simpler to use.
8. As to the history of the institute, it has been in operation for twenty years.
9. For some I/O devices, software written for them can program the devices so that interrupts can be shared with other devices.
10. Regarding the effect of the Rayleigh number on the wall temperature of the inner cylinder, it is illustrated in Figure 4(a).

# 第五章

---

## 標點符號

標點符號是用來表示句子結構與意思的重要工具。中文的標點符號使用原則頗寬鬆，不像英文有很明確的使用規則。在英文中，儘管不同作家偶爾會對同一句有不同標點方式，但一般來說，凡受過訓練的英文作者對標點符號的正確用法，看法都相當一致。

本章將討論英文標點符號和數字的基本使用規則，並指出中國研究人員在撰寫英文科技論文時的常犯錯誤。讀者若想對英文標點符號的用法有更深入的認識，可參考一些其他的英文工具書，例如 *The Chicago Manual of Style* (University of Chicago Press) 及 *Webster's Standard American Style Manual* (Merriam-Webster)。此外，完備的英文字典也會有一個章節，特別討論標點符號的用法。

### 5.1 句尾標點符號

句尾標點符號表示英文句子的完結，包括句點、問號和感嘆號。在這三種標點符號中，常在科技論文出現的只有句點。

## 句點 (Period)

1. 用在直述句、祈使句或間接問句的句尾。

The higher temperature resulted in a higher reaction rate.

Increase the temperature.

We investigated whether a higher temperature would increase the rate of the reaction.

2. 用於名字的縮寫字母或縮寫字的小寫字母後面。

L.Y. Li    J. C. Smith    Dr.    Ms.    etc.    et al.

3. 大寫字母的縮寫字或政府機關名稱的縮寫，常會省略句點。

PC    UN    GDP    CPU    CIA    GATT

用於學位的縮寫。（注意：字母之間沒有空格。）

Ph.D.    M.S.    B.A.    M.D.

亦可用於國家名稱的縮寫，但這些縮寫字的後面通常不須標點。

USA 或 U.S.A.    UK 或 U.K.

4. 縮寫的測量單位後面通常沒有句點，但英語國家的傳統單位如英里、分、秒等字的縮寫後面卻會使用。

20 cm    25 km    10 m    10 mi.    20 min.    12 sec.

5. 如果句尾是帶有句點的縮寫字，則不可以再標上句點。

誤： The name on the door was Sandra Jones, M.D..

正： The name on the door was Sandra Jones, M.D.

6. 用於大綱或垂直式一覽表的字母、羅馬數字或阿拉伯數字後面。

Advantages:

1. Low cost
2. High speed
3. Simple design

但不可以在這種目錄式標點中同時使用句點與括號。以下幾種標示方式都是錯誤的：

Advantages:	Advantages:
(1.) Low cost	(1). Low cost
(2.) High speed	(2). High speed
(3.) Simple design	(3). Simple design

7. 句點總是置於引號內，即使它不是用以標示引號內的資料。這是標準的美式用法。而英式的用法是，只有當句點是用以標示引號內的資料時，句點才置於引號內。

People call Chicago “the Windy City” and New York “the Big Apple.”  
[美式]

People call Chicago ‘the Windy City’ and New York ‘the Big Apple’.  
[英式]

His paper is entitled “Recent Developments in Parallel Processor Architecture.” [美式]

His paper is entitled ‘Recent Developments in Parallel Processor Architecture’. [英式]

8. 一個置身括號內的獨立句子，其句點應標於括號裏。但若括號內的句子、子句或片語是屬於其前後句子的一部份，則必須省略括號內的句點。

The Siberian tiger still has a good chance of survival. (In contrast, the South China tiger may already be doomed.) Several strategies for saving this tiger have been adopted. [括號內是獨立句子。]

The first of Hunt’s articles was published in 1974 (the others were published soon afterward). Yamamoto’s work, on the other hand, was not published until five years later. [括號內是首句的一部份。]

9. 傳統的打字稿中，每句的句點後面都會留兩個空格（如果句點後面有一閉引號或閉括號的話，則會留兩個空格於此引號或括號後面），印刷資料中的句點後則只須留一個空格。現今多數作者在使用先進的文字處理設備或桌上型印刷設備時，句點後面都只留一個空格。

在縮寫字中，字與字間的句點之前後，不須留空格。

i.e. e.g. a.m. p.m. Ph.D.

傳統上，名字字首的句點後面須留一個空格。然而，許多作者在使用具有自動邊界線的文字處理軟體時，爲了使名字的首兩個字皆能位於文章的同一行，因而省略了兩個字之間的空格（但名字和姓氏之間必須要有空格）。

正： Mr. C. Y. Chang      J. P. Morgan

正： Mr. C.Y. Chang      J.P. Morgan

劣： Among those at the meeting was Mr. W.

H. Wang, who is the company's sales manager.

佳： Among those at the meeting was Mr. W.H. Wang,  
who is the company's sales manager.

10. 英文文章中，句尾的句點前面絕對不可以加空格。

## 問號 (Question Mark)

1. 用於直接疑問句的後面。

What is the purpose of this project?

When will the new product be released?

Are you the project leader?

直接問句常以疑問代名詞如 *what, when, who* 等字詞開首，並且常是動詞（或助動詞）在主詞前面的倒裝句。間接問句並不直接詢問問題，而是一種隱含或指涉問題的陳述。英文的間接問句並不會使用問號。

The purpose of the experiment was to determine whether the deposition rate could be increased by adding water to the solution.

Another important problem is how to improve the educational system.

正式的科技寫作中很少出現直接問句，反而常會使用間接問句。

直接問句： The purpose of this research is to answer the following question: Does this equation have a unique solution?  
[不常見]

間接問句： The purpose of this research is to determine whether this equation has a unique solution. [常見]

2. 當問號標示的只是引號內的資料而非整個句子時，問號應置於閉引號內。當所標示的是整個句子時，問號應置於閉引號之外。

The teacher asked, "Have you all done the homework?" [標示的是老師的問題。]

Can you explain to me why New York is called "the Big Apple"? [標示的是整個句子。]

3. 傳統的打字稿中，每句的問號後面都會留兩個空格（如果問號後面有閉引號，則兩個空格須加於此引號後面），印刷資料上的問號後面則只須留一個空格。與句號相同，現今多數作者在使用先進的文字處理設備或桌上型印刷設備時，句中的問號後面都只留一個空格。

## 感嘆號 (Exclamation Point)

1. 在感歎語詞或表示驚嘆的句子後面，會使用感嘆號。

Help! Fire! Follow me! You can't be serious!

2. 感嘆號的使用規則和問號大致相同。在正式英文文章中，感嘆或驚嘆語氣詞句後面不能使用兩個或以上的感嘆號，即不要在句尾後面使用一連串的感嘆號。

誤： He broke the record!!!

正： He broke the record!

3. 正式的英文科技寫作中幾乎不會使用感嘆號。

## 5.2 句內標點符號

句內標點符號係用來表示句中各組成部分之間的關係，共有五種：逗點、分號、冒號、破折號和括號。

### 逗點 (Comma)

英文的逗點有特定的使用規則。標示逗點並非只為讀者在閱讀時提供一個停頓處而已，故不可任意在英文句子中標示逗點。

1. 可隔開對等連接詞 *and, but, or, nor, for, so* 或 *yet* 所連接的主要子句。

The samples were soaked for thirty minutes, and then they were washed with a chemical cleanser.

This is a challenging problem, but recent engineering breakthroughs have enabled us to solve it.

在包含三個或以上子句的句子中，可用逗點或分號來隔開子句。如果子句很短或子句內沒任何標點符號，則通常使用逗點來隔開幾個不同的子句；如果子句很長或子句內有標點符號，則通常使用分號來把句中的子句隔開。

The economy is shrinking, the unemployment rate is up, and a major political shake-up seems likely.

The economy is shrinking, with no prospects for growth in sight; unemployment is up, as foreign manufacturers close their doors and the largest domestic employers continue to lay off workers; and a major political shake-up seems likely, if only to placate the armed forces.

逗點通常不會用來隔開只有兩個述詞的複合述詞。（所謂複合述詞，是指一個句子中有兩個或以上的動詞，且它們都是對應同一個主詞。）例如，下列句子並不需要任何逗點：

The samples were soaked for thirty minutes and then washed with a chemical cleanser. [*The samples* 是 *were soaked* 和 *washed* 的主詞。]

We examined the device but failed to discover the source of the problem. [*We* 是 *examined* 和 *failed* 的主詞。]

如果複合述詞內的各部分都很長，某些作者會用逗點來隔開當中的述詞（即在連接詞 *and, but, or* 等前面加上逗點）。此外，有些作者如要強調兩個述詞間的轉折關係，亦會在連接詞 *but* 前面加逗點。

We hoped to collect some interesting results, but did not expect to refute the theory.

2. 主要子句前面的附屬子句或片語後面，通常都會標示逗點。

Before we present the new algorithm, let us first review recent developments in this field.

To further understand the mechanism, we repeated the experiment us-

ing different initial conditions.

In the second experiment, we used a different solvent.

當引介性的子句或片語很短，且在不影響句意的情況下，可省略逗點。

In 1987 our second factory opened.

After school he went home to face his father.

3. 逗點必須將句中的非限定修飾詞隔開，但千萬不要在限定修飾詞前後使用。限定修飾詞 (restrictive modifier) 是用來定義或限定它所修飾的詞句的意義，而它可以是子句、片語或字詞。限定修飾詞一經省略，句子的基本意思即會隨之而改變，因此不可省略。相反，非限定修飾詞 (nonrestrictive modifier) 的內容都只是補充作用的，因此就算省略亦無改句子基本意義。參閱下列句子：

限定的： No student *who has failed more than three courses* will be permitted to graduate.

非限定的： Dana, *who is a diligent student*, will graduate near the top of the class.

在第一個例句中，如果省略關係子句 *who has failed more than three courses*，即 *No student will be permitted to graduate*，則整個句意已全然不同。因此原句中的子句 *who has failed more than three courses* 是限定修飾詞（在此例中是限定的關係子句），故不使用逗點。在第二個例句中，如果省略子句 *who is a diligent student*，即 *Dana will graduate near the top of the class*，則句子的主要意思仍然不變。因此子句 *who is a diligent student* 是非限定關係子句，故需要以逗點隔開。除非非限定子句是位於句首或句尾，否則都需要兩個逗點一前一後的分隔開來。

同樣的規則亦適用於同位語 (appositive)：非限定同位語應以逗點把句子的其餘部分隔開，限定同位語則不需加逗點。（同位語是一名詞片語，它給予在它前面的名詞片語一個不同的名稱，例如句子 *John, my brother, is tall* 中的字詞 *my brother* 就是同位語。）非限定同



位語是指省略而無改句意的同位語。

下面例句中的名詞片語 *the famous physicist* 是非限定同位語，因此以逗點將它與句子的其餘部分隔開。（省略 *the famous physicist* 並無改整句的基本意思。）

非限定的： Albert Einstein, the famous physicist, was never fully satisfied with the theory of quantum mechanics.

相反，下面例句中的名詞片語 *classical logic* 是限定同位語，因此不能以逗點隔開。（如省略 *classical logic*，整句會變得毫無意義。）

限定的： In this text the term *classical logic* refers to a logic in which there are only two truth values.

4. 如果在主要子句後面的附屬子句或片語的內容，是非限定而具補充作用的，則應使用逗點隔開；如果它的內容是限定的，則不用逗點。

We will accept this paper for publication if you make the following minor revisions. [限定的：省略 *if* 開首的子句會改變句意。]

He is not in his office because he has a class at 1:30. [限定的]

This is an excellent paper, although I don't completely agree with the conclusion. [非限定的：省略 *although* 開首的子句而句意不變。]

He is not in his office, because his answering machine is on. [非限定的]

第一和第二個例句中的附屬子句的內容是限定的。第一個例句的附屬子句是指出論文接受出版的必要條件，第二個例句的附屬子句則陳述了某人不在辦公室這事實的特定原因。第三和第四個例句中的附屬子句的內容是附加而非限定的。第三個例句的附屬子句是作者補充自己對主要子句的看法，第四個例句的附屬子句則提供支持主要子句為真的證據。簡而言之，限定的附屬子句是指它與主要子句關係密不可分，非限定的則不然。

片語 *as follows* 是一範例，它常以限定或非限定意義在科技論文

中出現（片語 *as shown below* 亦同樣）。

By substituting this expression into equation (3), we obtain a concise formulation of the equations of motion, as follows. [非限定的]

The initial conditions are as follows. [限定的]

The solution can then be derived as follows. [限定的]

第一個例句中，片語 *as follows* 是非限定的，它並非構成句子主要意思的必要部分，原則上可以省略。因此可加上逗點將 *as follows* 和句子的其餘部分隔開。相反，第二個例句中的 *as follows* 有限定意義，是句子主要意思的一部分，因此句中的 *as follows* 不能加上逗點。同樣，第三個例句中的 *as follows* 也有限定意義，因為它所引介的內容（即字詞 *as follows* 後面的方程式）正是獲得解答的方法。這裏作者的意思並非只是“the solution can be derived”，而是“the solution can be derived in the following way”。因此句中的 *as follows* 不能加上逗點。

5. 獨立片語和主要子句總是以逗點隔開。（有關獨立片語的說明，請參閱第一章 1.8 節。）

The lecture over, the students left the room.

The conviction having been overturned, the defendant was free to go.

6. 逗點可把插入語和句子的其餘部分隔開。插入語包括：轉接字詞或片語，例如 *moreover, in contrast, indeed, finally* 等；引導例句的字詞或片語，例如 *for example, e.g., that is, i.e., namely* 等；還有 *respectively*。

The second approach, on the other hand, is faster but far more costly.

This function has a constant value, namely, 1.

The recognition rates for the first and second algorithms were 92% and 97%, respectively.

Failure to control such a plant effectively could be disastrous; indeed, it could result in catastrophic loss of human life.

如插入語位於句子中間，必須用兩個逗點一前一後地分隔開來。

誤： In the high temperature trials, however there was a discrepancy

between the predictions and the experimental results.

正： In the high temperature trials, however, there was a discrepancy between the predictions and the experimental results.

連接副詞 *hence, otherwise, then, therefore, thus* 的後面有時並不加逗點，尤其是副詞後面接著很短的子句時。

Failure to control such a plant effectively could be disastrous. Hence an accurate and reliable control algorithm is needed.

另外，像 *indeed* 或 *finally* 之類的字詞在用法上並非總是轉接詞，當這些字詞非作轉接之用時，則不須加逗點。

Our work was finally finished.

We predicted that conductivity could be improved by boron doping, and the experimental results show that this is indeed true.

7. 逗點可用來做分項，把包括三個或以上的對等字詞、片語或子句分成數項，而分項的形式有如 *a, b, and c* 或 *a, b, or c*。

Our method is faster, cheaper, and more accurate than the conventional method.

The new building will include a manufacturing plant, warehouse, and laboratory.

在 *a, b, and c* 或 *a, b, or c* 這種形式中，當中 *and* 之前的逗點稱為「系列逗點」(serial comma)。某些作者會省略系列逗點（這是報紙或新聞雜誌的標準慣例）。但許多時，系列逗點都能幫助澄清句子意思，所以許多英文寫作指南，都會建議作者一致使用系列逗點。例如：

The new building will include a manufacturing plant, a laboratory with complete testing equipment and offices.

這句中沒系列逗點，閱讀時著實較困難。事實上，有些讀者首次閱讀這句子時，總難以看出辦公室究竟是實驗室的一部分，還是整個建築物的另一部分。但在使用系列逗點後，句子就清楚得多：

The new building will include a manufacturing plant, a laboratory with complete testing equipment, and offices.

為使行文清晰一致，這裏亦建議作者養成使用系列逗點的習慣。

8. 逗點可用來區分三個或以上的對等形容詞。對等形容詞是指對同一個名詞作個別修飾的幾個形容詞。

We have developed a *fast, inexpensive, accurate* method.

相反，累積形容詞則各自修飾隨後的字詞。例如，在下面句子中，*first* 修飾 *direct numerical method*，*direct* 則修飾 *numerical method*，而 *numerical* 修飾 *method*。

Ours is the *first direct numerical* method to be introduced.

在要決定形容詞是對等形容詞或累積形容詞時，可看是否能將 *and* 插入這些形容詞之間。例如，在首個例句中，如果用 *and* 取代逗點，則所得句子仍然合理，所以是對等形容詞；在第二個例句中，如果將 *and* 插入形容詞之間，則句子會變得沒有意義，所以是累積形容詞。

9. 逗點可用來隔開直接引言和指示說話者的片語或子句。

“You will find this course challenging,” said Professor Zane.

Professor Zane said, “You will find this course challenging.”

但當句中的引言是句意的一部分時，引言的前後不須加任何逗點：

“Novel and thorough” was the reviewer’s response to Jack’s paper.

當所引述的片語或句子有限定意義時，不須以逗點作分隔。如前所述，限定片語一經省略，句意會隨即改變，故是不可省略的。下面第一個例句中的引述字詞具有限定片語功能；第二個例句中的引述字詞則為非限定片語。

Enclosed is a paper entitled “Regeneration of Forelimbs in Amphibians.”

Did you read the paper I published last spring, “Genetic Algorithms and Machine Learning”?

間接敘述句不須使用逗點。

He told me that the class had just started.

10. 逗點可用來引介直接問句。即使問句前後沒有加上引號，或問句的

第一個字非大寫，也需要使用逗點。

The question is, How do we improve the system?

11. 逗點可用來劃分句子中的對比語辭。

They invited Professor Wang, not Professor Lin.

This interesting, though unpersuasive, argument ought to be developed further.

We expect the yield to increase, but only by about 10%.

但當以 *but* 或 *or* 連接兩個形容詞而它們都共同修飾一個名詞時，*but* 或 *or* 前面不需要加逗點。

These interesting but incomplete results should be supplemented by further research.

12. 當對稱子句之間存在對照或比較關係，兩個子句間必須以逗點隔開（除非子句非常短）。

The greater the amount of water added to the solution, the slower the reaction rate becomes.

13. 當一前一後的兩個字詞可以有兩種解讀時，逗點可用以避免誤解。

To Jane, Frederick was the brother she had never had. [如果省略逗點，讀者可能會將“Jane Frederick”誤解為一個人的名字。]

在只有兩個項目的一覽表中，首個項後面通常不用逗點。

There are two types of three-terminal semiconductor devices: bipolar junction transistors and field-effect transistors.

在必須防止誤解的情況下，可加逗點。例如，下述句子如果省略字詞 *clauses* 後面的逗點，則可能會使句意不清。

Rambling sentences may be divided into two types: excessively complex sentences with many subordinate clauses and independent clauses, and sentences formed of a long string of simple independent clauses joined together by coordinating conjunctions.

14. 如果日期是以月、日、年的順序書寫，則須在日與年之間加逗點。如果句子中使用這種記載形式的日期，則通常在年的後面也會加逗點。

January 3, 1990

They were married on October 12, 1983, and left for their honeymoon the next day.

如果只標示月、年，則月與年之間及年的後面都不用逗點。

He was hired in August 1987 and was promoted less than a year later.

如果日期書寫形式是日、月、年，則不用逗點。

4 July 1776

15. 可用逗點來隔開名字與頭銜。

The guest lecturer will be Robert Jones, Ph.D.

Robert Jones, Ph.D., will join the faculty in September.

16. 可用逗點來隔開地址的內容或地理名詞。

Their address is 125 Elm Street, Waltham, Massachusetts.

He visited his sister in Osaka, Japan, for three weeks.

但書寫信封格式的地址，每行的結尾處皆不用逗點。

Professor J. C. Chang  
Department of Physics  
City University  
555 Main Street  
Metropolis, NY  
U.S.A.

17. 在大數目中使用逗點以顯示千位數。

125,000      42,500      1,375      1,235,983

然而，在表示年份的數字中不應該用逗點來顯示。

Cynthia joined the department in 1993.

18. 逗點後面都要留一個空格（表示千位數的逗點例外）。此外，在逗點前面千萬不要留空格。

## 分號 (Semicolon)

1. 分號用於隔開關係密切但沒有對等連接詞（*and, but, or, nor, for, so, yet* 等）相連的主要子句。利用分號暗示兩個獨立子句之間的緊密

關係，可令句子較為簡潔。如以下的句子中，句子的前後部分都有一種因果或對比的關係。（但如果這些子句中前後沒有密切的關係，則應使用句點而非分號。）

Today is Tuesday; I don't think we can complete the project by Thursday.

Some of these methods scan the rows from top to bottom; others scan from right to left.

作者也可偶爾不用逗點而使用分號，以隔開以對等連接詞連接的長獨立子句。

He criticizes many aspects of civilization and scorns the scheming and striving of the members of the elite class; yet his ideal of leading mankind back to a more primitive state of existence is itself the conscious scheme of a member of the elite.

2. 分號可用來隔開由連接副詞連接的主要子句。連接副詞包括 *consequently, for example, furthermore, however, in contrast, indeed, moreover, nevertheless, on the other hand, otherwise* 等字詞。（第一章有更詳細的連接副詞表。）連接副詞通常必須以逗點和句子的其餘部分隔開。

Plastic film capacitors are generally more reliable and smaller than paper capacitors; however, they are also more expensive.

要隔開連接副詞和對等連接詞、附屬連接詞等相關字詞相當容易。連接副詞的不同，在於它可放在子句中不同的位置，而不會改變子句的意義。以下三個例句都是正確的英文（雖然許多作者會認為第二個例句不太自然）：

Plastic film capacitors are generally smaller and more reliable than paper capacitors; however, they are also more expensive.

Plastic film capacitors are generally smaller and more reliable than paper capacitors; they are also, however, more expensive.

Plastic film capacitors are generally smaller and more reliable than paper capacitors; they are also more expensive, however.

3. 一連串的項目中，個別項目本身有內在標點符號時，應用分號來隔

開這些項目。

At the meeting were John Smith, the general manager; Michael Thompson, from the Sales Division; Peter Watson, a production engineer; and Robert Black, the project leader.

分號使讀者能較易認清序列項目中的個別項目。如果以逗點取代上述例句中的分號，則讀者閱讀時會出現困難，甚至可能根本不知道作者所提到的是四個人還是六個人。

4. 分號的後面必須留一個空格，前面則不應該留。

## 冒號 (Colon)

1. 當一些子句、片語、字詞組或單字詞都是說明、闡述、強調或重述主要子句的意思時，可用冒號來隔開它們與主要子句。

In this lecture we shall discuss the most complex parallel processor in existence: the human brain.

The personal computer is a truly versatile device: it can be used to design an automobile, to write a great novel, to compose a symphony, to send messages around the world, and to play solitaire when one can't think of anything else to do.

2. 可以在 *as follows* 或 *the following* 後面加上冒號，以引介連串的數個項目。

Commonly used capacitors include the following: paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

冒號前面應為完整句子，故這些例句都不應使用冒號。

誤：In this chapter, we will describe several common types of capacitors, such as: paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

誤：In this chapter, we will describe several common types of capacitors, including: paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

修改上述兩句有三種方法：第一，省略冒號；第二，省略 *such as*, *including*；第三，於 *such as*, *including* 後面加上字詞 *the following*。



正： In this chapter, we will describe several common types of capacitors, such as paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

正： In this chapter, we will describe several common types of capacitors: paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

正： In this chapter, we will describe several common types of capacitors, including the following: paper capacitors, plastic film capacitors, mica capacitors, ceramic capacitors, and electrolytic capacitors.

3. 冒號可用來把方程式或例子隔開，但冒號前面必須是完整句子。

We now obtain the following equation:

$$x = y + z.$$

4. 要指稱書名時，就算該書封面上的書名沒有冒號，引述時亦可加上冒號來隔開書名的主標題與次標題。

Her newest book is *What Machines Can't Understand: A Critique of Artificial Intelligence*.

5. 商務信件的提稱語後面應使用冒號。

Professor Gregory:                      Dear Ms. Wilson:

6. 傳統打字稿中，冒號後面要留兩個空格，排版稿件則留一個。如同句號和問號的用法一樣，許多作者在使用先進的文字處理設備或桌上型印刷設備時，只會在冒號後面留一個空格。此外，冒號的前面和和在數學比例中所使用的冒號後面（例如：3:5），也絕對不可以留空格。

## 破折號 (Dash)

英文的破折號有兩種：長破折號與短破折號。長破折號的作用是把插入的字詞、說明、例子或其他字句，從句子的主要意思中劃分出來。

（長破折號在英語中稱為“em dash”，因為它的長度和小寫字母“m”相同。）括號亦有這樣的功能，但破折號則更強調劃分出來的插入字句。此外，逗點也可用以劃分諸如非限定子句的插入字句，但卻只用於劃

分和句子主旨非常密切的插入字句。

如插入字句是在句子的中間，則必須使用兩個破折號，一前一後地把字句隔開來；如插入的字句在句末，則只需在字句前面加上一個破折號。

短破折號通常只會被置於兩個數字之間，用以表示「至」的意思。（短破折號在英語中稱為“en dash”，因為它的長度和小寫字母“n”相同。）

破折號與連字號 (hyphen) 是不同的。長破折號是較長的橫線（“—”），短破折號是較短的橫線（“-”），而連字號是最短的（“-”）。破折號是無法在標準英文鍵盤上找到的特殊記號。一般文字處理設備都有特殊的長短破折號符號，作者可參看附於軟體的說明，學習輸入這些符號。例如，使用者可以設定微軟公司的 Word™ 軟件，自動將連字號格式化，造出短破折號及長破折號。如果所使用的文字處理軟體沒有破折號，則可用兩個中間及兩邊皆沒有空格的連字號（“-”）代替長破折號，以連字號（“-”）代替短破折號。

1. 長破折號用於表示句子結構的突然轉變或中斷。

Our new microprocessor—as well as several other exciting products—is scheduled to be introduced in March.

2. 長破折號可用來劃分非限定同位語或需要強調的插入字句。

Tantalum capacitors—a commonly used type of electrolytic capacitor—are known for their large capacitance value.

3. 短破折號是用來表示「至」的意思。

The data are presented on pp. 22–26 of the paper.

Few people know that Isaac Newton (1642–1727) wrote more about alchemy and astrology than he did about physics.

## 括號 (Parentheses)

1. 括號可括著句子中非必要的資料、說明或評論。

Theorem 1 leads directly to the equation shown below (the details of the derivation are given in the Appendix).

2. 括號可括著標示項目的數字或字母，使數字或字母更見清晰。

Installing the modem involves three simple steps: (1) selecting a communication port setting; (2) installing the modem in an expansion slot on the host computer; and (3) connecting the telephone line to the line jack on the back of the modem.

左右括號應同時使用，而不能單使用右括號。

3. 括號與被括著的資料或其後的標點符號之間不能有空格。如果括號在句子中間，開括號（即左括號）前面必須留一個空格；如果閉括號（即右括號）後面沒有標點符號，則其後也須留一個空格。下面例句中，開括號前面沒留一個空格，是錯誤的用法：

誤：Do not use parentheses like this(there should be a space before the left parenthesis).

開括號後面不能有空格；閉括號前面亦不能有空格。例如：

誤：This is an example of incorrect usage ( do not leave a space between parentheses and the words inside them ).

正：This example (of how to use parentheses) is correct.

4. 在某些編輯格式中，括號可用來援引參考作品或參考頁碼：

Russell (1985, p. 32) described the structure of several types of neural networks.

Several authors (Russell 1985, Henson 1987, Hardwick 1988) have studied the application of neural networks to traffic control.

不同的專業期刊使用不同的引文格式，但所有的期刊都會定期印發論文格式的詳細指導規章，以供作者投稿之用。因此，想知道該使用何種格式的參考引文，可參閱期刊規章。

## 引號 (Quotation Marks)

在美式文章中，雙引號（“...”）用於標示引言。（英式文章則通常使用單引號（‘...’））。

1. 如要在一個句子中加上引言，除了必須使用引號作引述之外，通常亦要在開引號之前加一個逗點。但如果引言很短或引言之前的文字

和引言的內容密切相關的話，則常會省略此逗點。

The professor said, "She is one of the finest students I have had in fifteen years of teaching."

I shouted "Stop, thief!" and began to run after the man.

Jane's professor said that she was "one of the finest students ever to graduate from this university."

2. 引號可用於引述文章標題或較長著作內各文章的標題（即它們並非獨立的書或著作）。同時，在演講稿、詩詞、短篇故事、書中章節、歌曲、收音機和電視節目中，亦可用引號以括著當中的標題。

His paper was entitled "An Analysis of Chordal Graphs."

Richard's recently published article, "Water: The Twenty-First Century's Most Important Liquid," has received much attention in the media.

3. 要劃分開啓式引言與句子的其他部分，可加上逗點；但如果引言是以問號或感嘆號結束，則會省略逗點。

"That's all for today," the doctor said.

"Is that all?" asked the patient.

4. 在美式文章中，逗點和句點應在引號以內，分號和冒號則應在引號之外。除非問號和感歎號是引言的一部分，才置於引號內，否則會置於引號外。（英式的逗點和句點，除非是引言的一部分，才會放在引號內，否則應放在引號外。）

The doctor said, "That's all for today."

The patient asked, "Is that all?"

What is "fool's gold"?

但上述規則有一例外：當一個字詞在句中的功能，非用以表達一個意思，而只作為一個字詞來討論。這種情形主要在語言學、邏輯學和哲學中出現。在這種情況中，應該使用單引號，而且句點或逗點應置於閉引號後。例如：

There are five letters in the name 'Tully'.

I know how to spell 'potato'.

以上兩例中的引用字詞皆非字義上的使用，而是純當作字詞來使用。第一個例句中，引號內的字詞並非指叫 Tully 的那個人，而是指 *Tully* 這個字詞（叫 Tully 的那個人並非由五個字母構成，但字詞 *Tully* 本身就是）。同樣，第二個例句中，引號內的字詞 *potato* 並非指一個馬鈴薯，而是指 *potato* 這個字詞。在這句中，說話者說他知道如何拼出 *potato* 這個字詞，而不是如何拼出馬鈴薯這個植物。

上述例句中的引號亦可省略，而把字體改以斜體字表示：

There are five letters in the name *Tully*.

I know how to spell *potato*.

應用斜體字是一種較簡單的方式，及可避免句點應置於引號內還是引號外的疑問。（參閱本章 5.3 節「斜體字」的規則 2。）但使用斜體字時，應注意不可同時使用引號：

誤： There are five letters in the name “*Tully*.”

5. 引言內的引言應該用單引號來引述。

John said, “I know why New York is called ‘the Big Apple.’”

## 方括號 (Brackets)

1. 方括號 “[...]” 可用來括著評論、校正或其他附加資料，尤其是插入引言的補充資料。

The Senator said, “I fully supported his [President Clinton’s] health care plan.”

這段文字中，上下文可能都沒有清楚表明代名詞 “his” 是誰，而作者插入字詞 “President Clinton’s” 就可避免可能的誤解。

In his statement to the press, the Senator claimed that his own “many years of effort” had “establish[ed] a blueprint for this program.”

在這例句中，作者利用方括號去標明自己更改了引言中動詞的時態。原來引言的動詞 *establish* 可能是 *establishing*，或是 *establishes*，它們都跟文章句子的時態不配合。作者遂加上 “[ed]” 把引言的時態改成過去式，從而使引言能跟正在撰寫的句子文法一致。

作者要自行改變引言的一些字詞的時態或大小寫，以配合行文  
的文法。只要沒有破壞引言的原意，這種做法是沒有問題的，但必  
須加以註明。這時便應使用方括號來表示。

2. 在數學方程式或化學公式中，方括號和括號合用，可顯示出複雜的  
內含關係：

$$32y+5x[(3x+2y)(2y+3x)]$$

3. 在某些編輯格式中，方括號用於引用參考資料。下列句子中，方括  
號內的數字，是指於論文結尾的參考資料中，第四和第五項論文或  
書籍。

For examples of this type of neural network, see [4] and [5].

不同專業期刊使用不同的引文格式，想知道該使用何種格式，可參  
閱各期刊的規章。

### 省略號 (Ellipsis Points)

1. 省略號是由三個句點 (...) 組成的，用來表示省略的資料。在學術著  
作中，如果要引用某段文字，並省略原文的部分文字，則必須插入  
省略號以表示省略部分。如果要省略的部分在句尾，應使用四個句  
點，一個表示句子結束，另外三個則表示省略部分。如果句尾的省  
略號接著加上括號的頁碼，則應在頁碼前置入省略號，並且將句子  
的句點置於閉括號後面。

Wind power is nonpolluting...and in principle it is fairly easy to turn  
wind into electricity. The problem, however, lies in producing electric-  
ity from wind at a price competitive with that of electricity produced by  
burning fossil fuels.... This is a problem the wind power industry has  
yet to fully overcome... (p. 120).

省略號必定是由三個句點組成，其他所有的標示方法都是錯誤的。

2. 省略號可用於方程式或數學式中，代表沒有列出的項目。

$$T_i \text{ where } i = 1, 2, 3, \dots, n$$

$$A_V = V_{on} / V_{il} = A_{v1} * A_{v2} * A_{v3} * \dots * A_{vn}$$

$$\text{var}(x_1) = \text{var}(x_2) = \dots = \text{var}(x_n)$$

如以上首例所示，省略號通常是在本文字行行底，即與句點或逗點同等的位置。然而，當省略號的前後接有像加號（“+”）或等號（“=”）等數學符號時，如以上第二和第三個例子所示，則常會將省略號提高至和前後符號同等的位置。

同時，省略號的前後，必須是對等的標點或數學符號：

正：  $x_3, \dots, x_n$

誤：  $x_3, \dots x_n$

誤：  $x_3 \dots, x_n$

即使是用以省略一系列項目，省略號亦必須為三個句點，切勿使用少於或多於三個句點。

誤：  $T_i$ , where  $i = 1, 2, 3, \dots, n$

誤：  $T_i$ , where  $i = 1, 2, 3, \dots, \dots, n$

## 5.3 大寫字母、斜體字及字詞的標點符號

在英文中，大寫字母、斜體字、粗體字、屬格符號和連字號，都用於顯示句中字詞的特殊用法或功能。本節將介紹大寫字母、斜體字、粗體字及字詞標點符號的標準用法和規則。

### 大寫字母 (Capitalization)

字詞大寫，即一字詞的首個字母是大寫字母 (capital or uppercase letter)，而其他字母則仍用小寫字母 (small or lowercase letters)。

1. 舉凡句子、直接引言（甚至它在句法上不是另一個句子）或括號或方括號內的完整句子，首個字詞都必須大寫：

We shall argue that the received view is mistaken.

To each of the reporters' questions, the police spokesman replied, "We have no comment on that at this time."

The reaction rate increased when the temperature was increased, but it decreased when water was added to the solution. (See Figure 2.)

句子中的直接問句，首個字詞都應大寫。

The question we now need to consider is, How can this process be made more efficient?

2. 如果接於冒號後的獨立子句，不僅強調或闡明冒號前面的子句，還陳述新信息的話，則有些作者會將此獨立子句的首字大寫。

Our first reason for rejecting instrumentalism is simple: The arguments its proponents advance in support of their position are invalid.

但若冒號後面的獨立子句只是重述或說明前面的子句，則不必大寫。

Competitors' products have become popular because of their low price and high quality: they offer quality comparable to that of our product at only half its price.

3. 專有名詞必須大寫，如人名、族名、國家名、語言名稱和地名。以下是某些專有名詞的通用寫法：

Nelson Mandela	Michael Jordan	John Lennon
Chinese	African	Turkish
Israeli	Thai	French
Cantonese	Beijing	Hong Kong
Okinawa	Kuala Lumpur	Shanghai

以顏色來命名的名稱通常不用大寫，例如用以指稱黑人的“blacks”或白種人的“whites”。

The survey found that the majority of both blacks and whites support the policy.

組織、歷史事件、時代及歷史條約的名稱皆必須大寫。

the Treasury Department	the United Nations
the Civil War	World War I
the Magna Charta	the Treaty of Versailles

周日、月份及假日必須大寫。

Monday July Thanksgiving Mother's Day

書本、戲劇、影片、電視節目、雜誌、報紙、文章標題，以及所有的版權、商標名稱或產品，全部必須大寫。同時，出現於刊物標題



冒號後面的首個字詞也要大寫。這些標題及名稱中，除了冠詞、連接詞、不定詞 *to* 和少於五個字母的介系詞以外，其餘字詞及首個字詞都必須大寫。

*The Lord of the Rings*    *Heart of Darkness*    *Newsweek*  
*Death of a Salesman*    *The New York Times*    *Kleenex*

人名前面的職銜、人名後面的學位縮寫和專業名銜也應為大寫。

President Clinton    Dr. John Fitzpatrick    Professor Chen  
W. H. Wang, Ph.D.    Vice President Chang    Ronald Blake, M.D.

接在人名後面的公司、學院或政府的職銜，則不可以大寫。

C. F. Chen, professor of physics    F.L. Lin, director of finance  
R. J. Smith, general manager    Edward Kennedy, senator from  
Massachusetts

如 *road, street, avenue, park, island, river, lake, ocean, sea* 等此類字詞，本來是普通名詞，但如果把它們加於專有名詞後面而變成專有名詞時，必須大寫。

the Amazon River    Franklin Street    Harvard University  
the Indian Ocean    the Pearl River    Oak Island  
Elm Lake    Central Park    Marston Road

然而，當普通名詞為複數時，便不應大寫：

He has sailed solo across the Atlantic and Pacific oceans.  
The patrolmen were assigned to cruise up and down Maple and Elm streets.

4. 科學定律與原理的專有名詞和地質學時期的術語，必須大寫，但接於其後的普通名詞則不用。此外，化學元素與化合物的名稱不須大寫。

Ohm's law    Newton's laws    the Ricatti equation  
the Jurassic era    carbon dioxide    sodium phosphate

5. 撰寫書或論文時，如果要指出書中或文章中的通用標題（例如序言 (preface)、導論 (introduction) 或附錄 (appendix)），必須大寫。

A proof of the theorem is given in the Appendix.

This problem was mentioned in the Introduction. [*Introduction* 是指該論文的導論，故為大寫]

Baker states the central aim of his research in the introduction of his book. [*introduction* 非指該論文的導論而是指另一本書中的導論，故為小寫。]

6. 字詞 *chapter, section* 是用來指稱書或論文中的章節，這些字詞應否用大寫並沒一致的通則。許多作者會將它們視為專有名詞，自然使用大寫；但亦有某些著名的格式指導手冊則建議不應大寫。

The experimental procedure is described in Section 3.

Relevant work in the literature is discussed in section 2.

7. 圖形、表格及方程式的名稱通常為大寫，但某些作者喜用小寫來表示。要瞭解是否須要大寫，可參閱各特定期刊的格式規章。

The results of the experiments are shown in Figure 3 and Table 1.

The relationship between the two parameters is plotted in figure 6.

The solution can be derived from Equation (9).

This term is defined in equation (3).

8. 各羅盤方位（即東西南北）或季節的名稱不用大寫。

east west summer winter

但當羅盤方位所指為地理區域時，則必須大寫。

She has lived in the South all her life.

Is this your first visit to the Far East?

He believes in using a Western management style.

9. 當普通名詞用以替代專有名詞時，不可大寫。

正： Michael is a student in the Mathematics Department at Princeton University.

誤： Michael is studying Mathematics in University.

正： Michael is studying mathematics in university.

誤： Our Company is one of the fastest-growing firms in the Asian Semiconductor Industry.

正： Our company is one of the fastest-growing firms in the Asian semiconductor industry.

10. 撰寫英文文章時，切勿任意使用大寫字母。將一個字詞或片語的所有字母大寫，是表示吶喊的意思。除了書寫頭字語、字首語、縮寫及某些特定語辭（如某些電腦程式語言的名稱）外，千萬不要把一個字詞的所有字母以大寫書寫。頭字語和字首語是由數個單字字首組成的縮寫字。頭字語 (acronym) 是數個字詞的縮寫，且能在拼音上組成單字，例如 *random access memory* 的縮寫是 *RAM*，可發單字“ram”的音。字首語 (initialism) 雖也是數個單字的縮寫，但發音是逐個縮寫字母地發，例如 *Graduate Record Examination* 的縮寫 *GRE*，應發三個字母“G”、“R”、“E”的音。

PC DOS CPU IBM BMW NATO ISDN

頭字語和字首語皆由數個字詞的縮寫組成，每個縮寫字母都各代表一個字詞，故全部應以大寫字母書寫。然而，請注意下列的書寫形式：

FAX MODEM SUN workstation

這些縮寫和名稱的大寫字母並沒代表任何字詞，所以都是錯誤的。正確的書寫形式應該是：

fax modem Sun workstation

在英文文件中，公司名稱應為大寫，但公司名稱的所有字母不應以大寫書寫：

誤： Our firm, CHIPTECH, INC., has developed a new memory module.

正： Our firm, Chiptech, Inc., has developed a new memory module.

11. 研究論文中，圖表字詞大寫的用法有各種不同的習慣。圖表標題的首個字詞和表格各記錄開端的首個字詞，都必須大寫。亦有某些刊物將圖表標題及表格中的每個字詞全都以大寫（介系詞、連接詞及冠詞除外）。圖表字詞的大寫用法，應參閱投稿期刊的規定。

## 斜體字 (Italics)

1. 書本、雜誌、學術期刊及其他刊物的標題，均必須為斜體字；但期刊或論文集的文章和書中章節的標題，則不應以斜體表示。

<i>The Atlantic Monthly</i>	<i>The Wall Street Journal</i>
<i>Romeo and Juliet</i>	<i>The Old Man and the Sea</i>
<i>Proceedings of the Sixth Conference on Neural Networks</i>	<i>The Journal of Mechanical Engineering</i>

2. 指稱字詞、字母或數字時可使用斜體。

The sixth letter in *government* is *n*.  
Some people think my *6s* look like *4s*.

3. 斜體字用於標示首次引介或界定的特殊語辭。已引介或界定過的語辭，則不需以斜體書寫。

The *farad* is the basic unit used to measure capacitance. A farad is the amount of capacitance in a capacitor in which a charge of 1 coulomb produces a change of 1 volt in the potential difference between the capacitor's terminals.

4. 斜體字亦可用於表示非英語的外來字詞，如下例中的 *chun jie*（春節）和 *hong bao*（紅包）。

During *chun jie*, Chinese children receive *hong bao* from their parents and relatives.

如果一個外來語（例如 *ad hoc*）已列於標準英文字典中，而且在字典中亦非以斜體表示，則不須使用斜體。

The committee held an *ad hoc* meeting on Wednesday, September 5.

5. 拉丁文縮寫，例如 *cf.*, *e.g.*, *et al.*, *etc.*, *ibid.*, *i.e.* 和 *op. cit.*，傳統上為斜體字。然而，現今多數作者和刊物在使用時，已不再以斜體字表示。

6. 斜體字有時用於強調一些字詞或片語。

Applications must be received *on or before April 1*. No application received after that date will be considered.

Julie said she *couldn't* come to the beach; she didn't say she didn't *want* to come.

切勿過度使用斜體字來強調字詞。事實上，某些編輯也許會認為上述例句亦可不需使用。在科技寫作中，真正需要使用斜體字的機會微乎其微。

7. 在專業科技期刊和書籍中，數學符號（向量除外）與數學公式經常會以斜體字表示。

## 粗體字 (Bold Print)

粗體字只適宜用於標題或小標題，而不適宜用於強調論文中的字詞。當真的需要強調某特殊的意思時，則可使用斜體字表示。

粗體字亦用於表示向量、矩陣等形式的數學符號。

## 屬格符號 (Apostrophe)

1. 單數名詞、專名、不定代名詞及字尾非 *s* 的複數名詞，它們的屬格都應使用屬格符號加上字母 *s* 來表示（最後一個字母為 *s* 的單數名詞也不例外）。

Alice's mirror      the men's club      everyone's opinion  
Charles's paper      the dog's ball      Chris's bicycle

2. 複數且字尾為 *s* 的名詞，只需在 *s* 後加上屬格符號便為屬格。

the teachers' parking lot      the employees' welfare

3. 當句中提及的一個物件有兩個或以上的擁有者時，只有最後一個指涉擁有者的名詞才需為屬格。如句中出現的物件，都各有不同的擁有者，指涉擁有者的名詞都必須為屬格。

I read Bill and John's paper this morning. [文章是 Bill 和 John 共同寫的。]

I read Bill's and John's papers this morning. [我讀了兩篇文章，分別是 Bill 和 John 寫的。]

4. 屬格符號可用來表示省略了的字母或數字。

does not    →    doesn't                      1992    →    '92  
it is        →    it's                              I am     →    I'm

年份的縮寫（如“2003”）為‘03，而非 03’。此外，正確的日期縮寫（如“December 30, 2003”）為“12/30/03”（美式）或“30/12/03”（英式），“12/30/03”是錯誤的。

5. 小寫字母要構成複數，可加上屬格符號。（這類字母亦常為斜體。）

*x*'s and *y*'s    *p*'s and *q*'s    three  $\theta$ 's

大寫字母的複數形式亦可加上屬格符號，但有時會省略。

two A's    four Bs

加有標點的片語或複合名詞縮寫，可加上屬格符號以表示複數形式。

M.S. → M.S.'s    Ph.D. → Ph.D.'s.

沒加標點的片語、複合名詞或數字縮寫，通常不用屬格符號來表示複數形式。

two SRAMs    four ICs    two BIOSs    100 DRAMs  
the 1980s    two XJ-100s

不同的英文格式指導書在複數的屬格符號用法上有不同的規則。如果要將論文投遞到學術或專業期刊，還是應查閱該期刊的格式規章。

6. 如果科學定律、理論或數學方程式的名稱中包含人名，則只有在不使用定冠詞 *the* 時，才會使用 's 的屬格形式。換言之，如果使用了定冠詞 *the*，則不使用屬格符號和 *s*。

誤：the Ohm's law

正：Ohm's law

誤：the Ricatti's equation

正：the Ricatti equation

誤：the Einstein's theory of relativity

正：Einstein's theory of relativity

## 斜線號 (Virgule)

1. 斜線號（有人稱為 *slash*，但 *virgule* 較正確）在測量單位中表示 *per* 或 *to* 的意思，有時也用來表示 *at, for* 或 *with* 等字詞的意思。

25 gm/100 cc      a 30/70 split      a price/performance tradeoff  
U.C./Berkeley      fax/modem      Executive Assistant/Planning

2. 當有兩種選擇並列時，斜線號有時也可用來代表字詞 *and* 或 *or*。

boys/girls camp      parent/guardian      input/output

3. 斜線號有時用於表示 *and*。

The class of 1944/45      the April/May order      a camping/fishing trip

但許多時，以斜線號表示 *and* 或 *or* 常會導致文意曖昧不明。例如：

The functional departments/divisions will provide the resources needed to complete the project.

在這句中，斜線號使句意變得不明確。句子的意思是“departments and divisions”嗎？如果是的話，則作者應使用 *and* 而非斜線號。再者，這裏根本沒必要同時提及 departments 和 divisions。（“Division”比“department”大，如果用“division”，則讀者會瞭解一個“division”可能包括數個“departments”。）如果作者刪除其中一個，又或者用 *and* 或 *or* 取代斜線號，則句意會明晰得多。作者在撰文時，千萬不要任意使用斜線號作縮寫，因追求簡潔而犧牲了文意的清晰。

4. 某些縮寫是以斜線號作標點。

c/o (care of)      w/ (with)      w/o (without)

5. 斜線號可用於標點日期和分數。

6/11/02      4/20/84      1/2      3/4

（美式日期縮寫的順序是月、日、年，例如，“12/30/03”；但英國和歐陸國家的順序則是日、月、年，例如，“30/12/03”。）

## 連字號 (Hyphen)

連字號用於構成複合字詞，還可用來連接一個剛好介乎於兩行之間的

字詞。連字號是條短橫線，是英文鍵盤上 '0' 字右方的鍵。連字號直接接在字母後面，不須留空格。連字號不同於底線符號：連字號位於字行的中間，底線符號則位於字行行底。同時，連字號亦與破折號不同（參閱上面 5.2 節），連字號（“-”）都較長破折號（“—”）和短破折號（“-”）短。

1. 連字號可用來連結兩個或以上的形容詞，而變成複合形容詞去修飾名詞。但如果一個複合形容詞是接於動詞之後，而作述詞使用（即非直接置於所修飾名詞的前面），則通常不應使用連字號。

One well-known method for solving this problem was proposed by Thompson [9].

Thompson's method [9] is very well known.

A 16-bit or 32-bit bus may be used.

The bus width may be 16 bits or 32 bits.

Our firm will introduce a new, high-technology model early next year.

The New York-based firm plans to go public next year.

We propose a neural-network-based system for controlling robot motions.

字尾是 *ly* 的副詞和其他字詞之間不應使用連字號。

誤： a rapidly-growing market segment

正： a rapidly growing market segment

2. 連字號會用來連結一些尚未成爲單一字詞的複合字詞。（要知道複合字詞是否需要加上連字號，應翻查字典。）

built-in    custom-designed    time-sharing    all-in-one

3. 使用連字號可避免產生含混不明的字母組合。例如，*recover* 的意思爲重新獲得原有的力量（即「康復」），但 *re-cover* 則爲再次覆蓋的意思。當懷疑一字詞是否需要用連字號時，應翻查字典。
4. 書寫英文數字二十一到九十九時，都需用到連字號。當使用分數去修飾名詞時，分數中的分母和分子亦應使用連字號連結；當分數不是用以修飾名詞時，分母和分子之間則不應加上連字號。



twenty-three	sixty-seven
two thirds	one half
one-half cup of milk	a two-thirds majority in the legislature
two thirds of the water	a six-inch silicon wafer

5. 連字號常和某些字首或字尾合用，例如 *self-*, *ex-* 和 *pre-*。

This is a self-correcting system that learns from its mistakes.

## 連字號與分節法

當一個字詞書寫到一半卻已到了行尾時，另一半便需要於下一行繼續，該字詞會被分割成兩半。在英文中，字詞只能以音節來割斷，並必須在割斷的地方插入連字號。在這種情形下，連字號必須緊接在字詞前部分的後面，而不可置於下一行的開始。

現今多數文書處理軟體都有自動分音節和插入連字號的斷字功能。但如果真的要自行斷字，可參閱字典。英文字典裏，每個字詞中都會出現一些點子，這就是區分音節的標記（像 *syllable*, *text·book*, *observation*）。

斷字的方法，有兩個重要規則：

1. 不可分割只有一個音節的字詞。

誤： *tir-ed*, *pho-ne*, *tra-in*

正： *tired*, *phone*, *train*

2. 如一個字詞在斷字後，會令其中一行剩下一個字母，則切勿斷字。

誤： *a-round*, *o-ver*, *cream-y*

正： *around*, *over*, *creamy*

## 5.4 方程式的標點符號

撰寫科技論文的人常都關心一個問題：句中的數學方程式或公式後面，應否加入標點符號（如逗點或句點）？參考下列：

If  $V_{CC}$  and  $R_L$  are known, the load line equation may be written as

$$V_{CC} = I_C * R_L + V_{CE}.$$

句尾是方程式，因此在“ $V_{CE}$ ”後加上句點似乎很合理。再看下列：

Under these assumptions, the load line equation may be written as

$$V_{CC} = I_C * R_L + V_{CE},$$

where  $V_{CC}$  and  $R_L$  are known.

字詞 *where  $V_{CC}$  and  $R_L$  are known* 是一個非限定關係子句，用以修飾方程式，所以在文法上“ $V_{CE}$ ”後應有一逗點。

在上述情況中，應否使用標點符號並沒明確規則。有些作者認為在方程式與公式後面使用標點符號，可有助釐清句子的文法結構，令文章更清晰易讀。在某些情況中，標點符號更可避免讀者誤解。不過，亦有作者則會省略方程式或公式後的標點符號。他們或許認為釐清句意並不需要標點符號，又或許他們認為在載有大量數學公式的文章中，使用標點符號會讓頁面過於擁擠，文章反而變得不夠清晰易讀。然而，使用標點符號似乎還是較合理的，因為方程式與公式確實是句子的一部分。不過，在決定使用前，亦應先查閱投稿期刊的格式指導規章。

如果數學方程式或公式與句子其餘部分沒有隔開，且在句子結構上有需要的情況下，則應使用標點符號。

## 5.5 數字

英文數字 (numbers) 和阿拉伯數字 (numerals) 的使用規則會隨著文字脈絡的不同而有所改變。如報紙的規則和出版社的便有所不同，而它們的規則亦跟科技期刊的不一樣。然而，除非投遞論文的期刊有特別的規定，否則科技論文作者都應遵循下述的使用規則。

1. 論文文章中，十以下的整數應寫成 *one, two, three* 般的文字。

誤： We conducted 2 experiments, each with 5 trials.

正： We conducted two experiments, each with five trials.

正： The conference committee accepted 25 papers.

但在量度單位前面，應使用阿拉伯數字。如果量度單位是縮寫或符號形式，更必須使用阿拉伯數字。

誤： The two samples were both eight cm long and each weighed about one kg.

正： The two samples were both 8 cm long and each weighed about 1 kg.

如果在同一個句子或段落中出現兩個或以上可比較的數字，則數字的格式應當一致，而通常是以最大的數字的格式為準。

正： In the first set of experiments, six of the eight trials were successful.

誤： In the second set of experiments, eight of the 12 trials were successful.

正： In the second set of experiments, 8 of the 12 trials were successful.

2. 以阿拉伯數字開首的句子是錯誤的。如果句子無可避免要以數字來開首，則數字必須以英文拼出，否則便應改寫句子。

誤： 32 engineers attended the meeting.

正： Thirty-two engineers attended the meeting.

正： There were 32 engineers at the meeting.

3. 阿拉伯數字可用於表示時間、錢數、測量值、小數和百分比。

10:30 a.m.      3:15      75% 或 75 percent

\$10.56          4 mm      4.56      3.1415

然而，“o'clock”，必須是“ten o'clock”，不可以寫成“10 o'clock”。

4. 十以下的序數切勿縮寫，十以上的序數則可以。

誤： 1st, 2nd, 3rd

正： first, second, third

正： 15th, 21st, 52nd

5. 小於一的分數必須以字詞表示。

one-half kilogram of rice      one third of the passengers

6. 一百萬以上的數字應以阿拉伯數字與字詞合用：

The company sold 4 million cars last year.

Sales this year are expected to reach 6 million units.

7. 書中的章節與頁碼通常為阿拉伯數字。

See chapter 4.

This analysis is presented on page 9 in section 3.

8. 阿拉伯數字的後面可接著符號或縮寫。同時，阿拉伯數字和符號或縮寫之間必須留一個空格。

a 1 MB cache memory

6 MHz

Absolute zero is 0 K.

（例子“0 K”是“zero kelvin”（開式溫度）的縮寫，開式溫度不會加上度（“°”）的符號。）

9. 在小於一的分數中，小數點之前應加上一個“0”。

0.5 (非“.5”)

0.1 (非“.1”)

10. 複合數字形容詞的首個數字應以字詞表示，第二個應為阿拉伯數字。

誤：12 256K SRAMs

正：twelve 256K SRAMs

11. 如已以英文拼出了數字，切勿再重複書寫阿拉伯數字，並加上括號。

誤：We ran four (4) trials.

正：We ran four trials.

例外：On May 16, we sent you an order for six (6) buzzword eliminators. [只有在某些法律或商業的文件中才會這樣。]

12. 用阿拉伯數字來書寫日期時，切勿以縮寫的序數來表達。（雖然日期必然會唸成序數，但書寫上必須是基數形式。）

誤：I suggest we meet on May 1st and begin operations on June 15th.

正：I suggest we meet on May 1 and begin operations on June 15.

## 5.6 複數

大多數英文名詞的複數 (plurals)，都是由單數名詞加上 *s* 而成的。如果一個單數名詞的字尾為 *s*, *x*, *z*, *ch* 或 *sh*，要把它改為複數的話，則應加上 *es*，因為這些名詞需要一個額外的音節才能發音。如果一個名詞的字尾是 *y*，而 *y* 字的前面為子音，要把它改成複數，就要將 *y* 改為 *i* 再加上 *es*。

不過，事實上也有不少英文名詞的複數，並不符合這些通則。所以當要撰寫一些特殊名詞時，要知道它們正確的複數形式，最好是翻查字典。假如一個名詞的複數是不規則的，字典定會列出；如果字典沒有列出，則此名詞的複數極可能是根據上述通則來構成。

以下列出許多於科技論文中常見的特殊複數形式。

1. 單一字詞的縮寫，常會加上句點。句點前面可以加上 *s*。（以下分別是 *figures*, *tables* 和 *sections* 的縮寫。）

fig. → figs.      tab. → tabs.      sec. → secs.

2. 帶標點的片語或複合語詞縮寫，可在最後一個句點後加上 *'s*。片語或複合語詞縮寫而沒有標點的，則可直接在縮寫後加上 *s*。

M.S. → M.S.'s      Ph.D. → Ph.D.'s  
 BIOS → BIOSs      DRAM → DRAMs

3. 只有一個小寫字母的縮寫而又非測量單位，可重複字母而構成複數。

pp. (*pages*)      cc. (*copies*)

4. 一般測量單位的縮寫，其單複數形式相同。

100 cc    30 min.    75 m    10 cm    50 sec.

5. 外來語的複數形式，通常是與其外語中的複數形式一樣。但有時亦可寫成英文中的規則複數（即加上 *s* 或 *es*）。

phenomenon → phenomena  
 schema → schemata 或 schemas  
 formula → formulae 或 formulas

thesis → theses  
datum → data  
series → series  
index → indices 或 indexes  
appendix → appendices 或 appendixes

6. 英文字母的複數通常是加上 's 而成的。

a series of *x*'s and *y*'s      ten A's and B's in the matrix

7. 斜體字、片語及字母的複數形式，通常是在單數的字尾後，加上屬格符號和非斜體的 *s* 而成。

two *yes*'s and three *no*'s      a series of *x*'s and *y*'s

8. 雖然某些編輯會選用 's 來表示數字的複數形式，但亦可在單數形式的後面只加上 *s*。此外，英文數字字詞的複數形式，通常只會在字尾加上 *s*，而不加上屬格符號。

the 1990s      an order for ten XJ-100s  
two 2s and three 3s      he threw two sevens in a row

9. 當只指涉一個字詞，而非使用該字詞以表示一個意思時，該字詞的複數形式，通常會於字尾接著非斜體的屬格符號和 *s*。

a string of clauses connected by *and*'s or *but*'s  
replace all of these &'s with *and*'s  
change the *you*'s to *we*'s

10. 一個名詞，受包含複數受詞的 *of* 片語修飾，可以是單數，也可以是複數。這要視乎句子想強調的意思而定。

The *price* of these components *has* been increasing.  
The *prices* of these components *have* been increasing.

這兩句都是正確的，但第二句強調了那些零組件各有不同的價格。

以下兩個句子都是正確的：

Next, record the *value* of  $V_s$ , *f*, *R*, *C*, and  $V_o$ .  
Next, record the *values* of  $V_s$ , *f*, *R*, *C*, and  $V_o$ .

第一句中，動詞的受詞可解釋為 “the value of  $V_s$ , that of *f*, that of *R*,

etc.”。第二句中，動詞的受詞則可闡釋為“the values of all of these parameters:  $V_s$ ,  $f$ ,  $R$ , etc.”。兩者的意思都很合理，亦皆為正確的句子。

以上兩例中，字詞 *value* 指一種參數值。如果取 *value* 較抽象之意，則使用單數形式會較自然。例如：

The *value* of houses in our city has been increasing.

11. 如果一個符號在用法上是作某個名詞的限定同位語，則不可同時以複數表示此名詞與符號。以下是一個怪句：

誤：From this equation, we obtain the error signals  $\delta$ 's for the different cases.

作者應以下列其中一個句子取代：

正：From this equation, we obtain the error signal  $\delta$  for the different cases.

正：From this equation, we obtain the value of the error signal  $\delta$  for the different cases. [假如要強調有許多不同的案例，而這些案例各有不同數值，則“value”亦可改為複數“values”。]

正：From this equation, we obtain the value of  $\delta$  for the different cases.

12. 當某個數字後面接有量度單位時，除非前面的數字剛好是一，否則此量度單位通常應以複數形式表示。

0.3 inches (非 0.3 inch)                      0.5 microns (非 0.5 micron)

0 wait states (非 0 wait state)              0.8 degrees (非 0.8 degree)

量度單位只有在單獨使用時，才以複數形式表示。假如量度單位後面接有名詞，則不寫複數，並必須以連字號和前面的阿拉伯數字連結。

0.5 microns              a 0.5-micron manufacturing process

8 inches                      an 8-inch silicon wafer

13. 當 *the number of* 是用來表示“how many”的意思時，不可寫成複數。

誤：We wish to determine *the numbers of* airports needed to serve a large metropolitan area.

正： We wish to determine *the number of* airports needed to serve a large metropolitan area.

當 *the number of* 用來表示一個特定的數字時，則可寫成複數形式。

What are *the numbers of* those two basketball players? [那兩個籃球選手的運動衫上各有不同的號碼。]

## 5.7 專業術語的縮寫

若要使用專業術語的縮寫形式，應在專業術語首次出現於論文時，寫出術語的全寫，並在後面加上縮寫和括號。在論文接下來的段落中，該科技術語即可用縮寫表示。

On the front panel of the terminal adapter is a three-inch liquid crystal display (LCD). The LCD is used to display menus, through which the user may adjust the configuration of the adapter. The LCD also displays messages concerning the status of the adapter during data communication.

Genetic algorithms (GAs) have attracted a great deal of interest in recent years. GAs are useful in a wide variety of applications. . . .

上述兩個段落的首句都分別對“LCD”和“GA”等縮寫定義清楚，讀者應已瞭解這些縮寫的意思，作者遂可放心在接下來的段落使用縮寫。

## 5.8 縮進排印

每個英文段落的首行，都應從左邊縮進排印，除了下列的例外：

1. 方程式或引言，應整句或整段從左邊縮排。如果引言中只有一個段落的話，就算是段落的開始，仍不需再縮排。而如果引言中連續有兩個或以上的段落，則首段的首行不需要再縮排，而從第二個段落起，每段的首行皆需再縮排。
2. 論文與章節的首段首行，某些作者和刊物會不縮排，副標題下的首段首行亦是如此。



## 5.9 使用標點符號之常犯錯誤

本節將敘述中國作者撰寫的英文科技論文中，使用標點符號時常犯的幾個錯誤。中英文的標點符號，用法上有許多差異。研讀本節，可能你會發現，某些習以為常的用法原來是錯誤的。

### 空格

在打字時，要注意字詞及標點符號空格是否正確。（正確的空格規則，已在各種標點符號的次小節中講述。）下列幾個要點尤其重要：

打字稿中，各英文字詞間只能有一個空格。逗點和句點之前絕對不可加上空格。逗點、分號、冒號和句點後面必須留一個空格。

右括號前面和左括號後面都不能有空格。

誤：( This, for example, is wrong. )

正：(This is correct.)

當然，左括號前面和右括號後面都應留一個空格，但若右括號後面接有逗點或句點，則括號與逗點或句點間不可留空格。

誤：Do not omit the space before a left parenthesis(like this) or the space after a right (like this)parenthesis.

在中文中，當作者要把資訊列於一覽表或表格時，都會習慣把各行的冒號對齊，排成一條垂直的線。

Name : Technocorp  
Established : 1987  
Employees : 400  
Location : Taipei

但如把這做法搬到英文去，便會顯得非常奇怪。英文正確的排列方式，是直接把冒號加於第一欄的字詞後面。

Name: Technocorp  
Established: 1987  
Employees: 400  
Location: Taipei

百分比符號前面不須加上空格。百分之五十二是“52%”，而不是“52 %”。

溫度符號前面不應留空格。攝氏四百度是“400° C”，而非“400 °C”。但溫度符號與字母“C”之間必須留一個空格。此外，絕對溫度的縮寫沒有溫度符號，絕對零度是“0 K”，而非“0° K”。

字詞和阿拉伯數字之間應留一個空格，正確的寫法是“pin 1 and pin 2”，而非“pin1 and pin2”。

在研究論文中，方程式號碼常與方程式列於同一行，且會寫於靠近右邊界的括號內。方程式和方程式號碼之間的空格應為空白，切勿在方程式和號碼之間置入虛線或一連串的連字號。

要投出去接受評審的論文，每行間應有兩行行距，同時四個邊界也不應太狹窄。

## 逗點

逗點可用來區分非限定子句或片語與句子的其餘部分。切勿在限定子句或片語的前後插入逗點（詳見 5.2 節中討論逗點的第三項）。限定子句或片語的作用在於限定名詞的意義，因此是無法省略的，否則會影響整句的語意。然而非限定子句即使是省略而仍不改句子主要子句的意思。

非限定的： The personal computer, *which became popular in the 1980s*, has revolutionized many types of work.

限定的： The personal computer *that I bought on Saturday* is much faster than my old one.

方程式後面常緊接著附屬子句（“where” 為開端的附屬子句最常見），以說明方程式中符號的意義。此種子句為單一子句，如果子句內只有兩個主詞和兩個動詞，則不應在第一個主、動詞和第二個主、動詞之間加入逗點。

誤：

The force can be calculated as follows:

$$F = ma,$$

where  $m$  represents mass, and  $a$  represents acceleration.

正：

The force can be calculated as follows:

$$F = ma,$$

where  $m$  represents mass and  $a$  represents acceleration.

只有在包含三個或以上的主詞及動詞的子句中，才使用逗點：

正：

This law can be expressed as follows:

$$F = ma,$$

where  $F$  represents force,  $m$  represents mass, and  $a$  represents acceleration.

(亦可縮短成：“where  $F$  represents force,  $m$  mass, and  $a$  acceleration” )

字詞 *respectively* 和拉丁文縮寫 *i.e.* 及 *e.g.*，必須用逗點將它們和句子的其餘部分分開。假如這類字詞出現在句子的中間，則必須在字詞的前後加上逗點。

The growth rate of samples A and B increased by 25% and 30%, respectively, when oxygen was added to the reaction mixture.

書寫英文時，切勿在主詞和動詞之間加逗點，除非是使用一對逗點以隔開插入的非限定片語。下列的錯誤句中，逗點正正把主詞 *hypotheses* 和動詞 *may be* 分開了：

誤：Hypotheses derived from other training instances or taken from other sources, may also be valid.

正：Hypotheses derived from other training instances or taken from other sources may also be valid.

當句首出現類似 *thus* 或 *therefore* 的字詞時，通常不須在這類字詞後面加逗點，尤其是短句。

We originally planned to go, but that morning it rained heavily. There-

*fore* we decided to stay home.

Transistors are rated according to their ability to dissipate power. *Thus* a transistor used as a low-level audio amplifier may have a power rating that is quite low.

在諸如 *show that* 之類的表達形式中，千萬別在字詞 *that* 後加逗點：

誤：Michelson's work shows that, the theory is valid for this range of values.

正：Michelson's work shows that the theory is valid for this range of values.

當只提到兩個項目時，逗點不能用來表示“and”的意思。

誤：For cases 1, 2 we apply equation (12).

正：For cases 1 and 2 we apply equation (12).

誤：Substituting these values for x, y, we obtain the following solution.

正：Substituting these values for x and y, we obtain the following solution.

參考引文數字是例外，這類引文數字往往會置於方括號內，如 [2, 3]。

英文中沒有頓號（、）（在英文中，頓號稱做 *semicolon*）。當列出數個項目時，切勿以頓號取代逗點。

誤：The results for algorithms A、B and C are shown in Table 3.

正：The results for algorithms A, B, and C are shown in Table 3.

## 大寫字母的用法

請勿因覺得一些字詞重要，就任意將字詞大寫。專有名詞（或名稱）當然要大寫，但專有名詞相對於所有的名詞來說，是非常少的，故文章中不應有太多大寫字詞。

誤：The new Local Bus design allows the Processor to access Memory faster.

正：The new local bus design allows the processor to access memory faster.

只有頭字語和字首語才會將一個字詞的所有字母大寫，因為它們

都是縮寫的形式，即每個字母都代表一個字詞。例如，“CPU”是正確的，因為“C”代表“central”，“P”代表“processing”，而“U”代表“unit”。“ROM”也是正確的，因為“R”代表“read”，“O”代表“only”，而“M”代表“memory”。相反，雖然 *fax* 是 *facsimile* 的縮寫，但“FAX”是錯誤的，因為字母“F,”“A”和“X”各自不代表任何事物。同樣，“MODEM”亦是錯誤的（“MODEM”中的“O”代表甚麼？），故應寫成“modem”。

除非公司或組織的名稱是縮寫，否則不要將名稱的所有字母大寫。Sun workstation 是一種高性能的電腦，不能寫成 SUN workstation。Ford 是一個有名的汽車製造廠商，也不能寫成 FORD。還有，“IBM”和“GM”是正確的：第一個縮寫是代表 International Business Machines，第二個則是 General Motors。

在英文中，將字詞的所有字母大寫就像代表著吶喊，在論文中不能以此作強調之用。（信封上的國家名稱常全部大寫，是爲了便於傳遞郵件。）

論文或書本標題中的冠詞、連接詞、用於不定動詞的 *to* 或者長度少於五個字母的介系詞，都不可以大寫。當上述字詞是標題中的第一個字或冒號後面的第一個字時，則應大寫。此外，標題中長度五個字母以上的介系詞也要大寫（例如，*About, Before, Between*）。

## 冒號

冒號前面應爲完整句子。下例的用法很不自然：

誤：The frequency can be expressed as:

句子應修正成：

正：The frequency can be expressed as follows:

正：The frequency can be expressed as [直接寫出方程式]

下列句子都是正確的：

The dB attenuation is as follows: [使用冒號最恰當的用法]

The dB attenuation is [直接接著數學方程式而不加冒號]

The dB attenuation is: [根據某些編輯格式指南，如果接著的方程式和句子其他部分是分開的，或接著列出的項目很多，則在 *to be* 或 *to include* 等動詞後面加冒號，也算正確。]

介紹方程式時，要使用完整句子。在下例中，字詞 *then* 並非完整句子：

When designing an attenuator, we already know  $R_1$ ,  $R_2$ , and  $P_1/P_2$ .  
Then: [方程式]

如果改寫為以下的句子，則文章會更順暢好讀：

When designing an attenuator, we already know  $R_1$ ,  $R_2$ , and  $P_1/P_2$ .  
Thus we have the following equation: [方程式]

When designing an attenuator, we already know  $R_1$ ,  $R_2$ , and  $P_1/P_2$ .  
Thus we have: [方程式]

## 其他錯誤

一個句子只能標一個句點。就算句末的最後一個字詞是縮寫（例如 *etc.* 或 *et al.*），亦不應在縮寫後面多加一個句點。

誤：He is going to school in the U.S..

正：He is going to school in the U.S.

在正式的英文中，請勿以記號“&”取代字詞 *and*。在某些期刊的參考格式中有時會允許使用“&”，但最好還是查閱投稿期刊的格式規章。

請勿使用“~”這符號來代表 *to*（「至」）這字，這絕非標準英文標點符號。需要代替 *to* 時，應使用短破折號（“-”）。短破折號比長破折號（“—”）稍短，但比連字號（“-”）長。如果文書處理系統沒提供短破折號這符號，可嘗試使用減號或連字號，或直接把 *to* 拼寫出來。

誤：the 1995~1996 school year

正：the 1995–1996 school year

文章的標題（或任何非獨立刊物的標題）要放在引號內，書名或期刊的名稱（即獨立的刊物）則使用斜體字或底線。

Smith, John. 1989. "Recent Advances in Widget Design." *Widget News*, Vol. 5, No. 2, April 1989, pp. 21–36.

Smith, John. 1988. *Widget Design and Implementation*. New York: Widget Technology Research Institute.

不要把連字號放在副詞和其所修飾的字詞中間。

誤： One *commonly-used* method is chemical vapor deposition.

正： One *commonly used* method is chemical vapor deposition.

括號內的字詞結尾處，不能加上句點。除非括號內的字詞，是獨立於括號外的完整句子時，才可使用句點。

誤： We can use an ohmmeter (a digital meter used for diode testing.) to check these values.

正： We can use an ohmmeter (a digital meter used for diode testing) to check these values.

誤： To check these values we can use an ohmmeter (a digital meter used for diode testing.)

正： To check these values we can use an ohmmeter (a digital meter used for diode testing).

正： We can use an ohmmeter to check these values. (An ohmmeter is a digital meter used for diode testing.)

年份的縮寫，例如 1992，是 '92，而非 92'。

括了括號的補充字詞，應置於冒號前面，而不應放於冒號之後。

誤： The contents of this register are shown below: (for RGB mode and 24-bit YCbCr mode)

正： The contents of this register are shown below (for RGB mode and 24-bit YCbCr mode):

## 練習 5-1 標點符號

修正下列句中錯誤的標點符號。有些句子有多於一個錯誤，有些則完全沒有錯誤。如果句子的標點符號沒有錯誤，請說明理由。

1. Consider the circuit shown in Figure 10-1 where  $R_1$  is in port 1 and  $R_2$  is in port 2.

2. As just mentioned the input and output impedance of the attenuator should match those of the original circuit's.
3. The personal computer which became popular in the 1980s has had a far-reaching impact on the way research in this field is conducted.
4. Researchers who do not enjoy teaching should not become university professors.
5. Professor Thompson sitting in the second row raised his hand to ask a question.
6. The difference between their method and ours is, as follows.
7. Next, connect the current source as shown in Figure 8.
8. The market radius decreases as population density increases as shown in Figure 5.
9. The students sitting in the back could not hear the lecturer.
10. Sales revenue in the local computer industry has grown rapidly over the last three years as shown in Figure 4.
11. Consider the case in which  $t > 0$ .
12. Let  $a$  represent  $x$ , and  $b$  represent  $y$ .
13. An objects radar cross section ( RCS ) may depend more on it's shape than on it's physical size.. A small truck with its sharp edges, abrupt flat surfaces can reflect electromagnetic waves, better than a smooth edged Jumbo Jet. The RCS of a pickup truck ( measured head-on at Microwave frequencies. ) is about 200 square meters while that of a Jumbo Jet Airliner is only about 100.<sup>1</sup>



14. The last twenty years have seen major developments in clinical transplantation , particularly of such vital organs as the Heart · liver & kidneys . However despite these apparent breakthroughs the success of tissue transplants remains dependent on first overwhelming and then chronically suppressing the patient's Immune System with a variety of drugs. The drug therapy currently in use , has many undesirable side effects(particularly in children ), because it is based on nonselective cytotoxic drugs, which indiscriminately kill all rapidly dividing cells.An encouraging development of the 1980s was the introduction of CYCLOSPORIN A, an immunosuppressant with more specific effects on the Immune System , that leave the patient with some resistance against infection. Nevertheless even this immunosuppressive drug , is not free from side effects, including damage to the Kidneys.<sup>2</sup>



## 第二部分

---

### 修辭原則



# 第六章

---

## 簡明的英文

本章及第七章皆旨在介紹英文基本的修辭原則。修辭原則與文法規則不同，原則是大體的，而非絕對的規條。不遵循這些原則，未必表示文章的英文不正確。但如要學好英文寫作，除了按照文法規則寫出正確的英文之外，還必須遵循一些修辭原則，表達才會自然暢達。

英文寫作一個很重要的原則是表達要簡明。這是說，文章應該精確具體，避免不必要的字詞。本章將介紹十個英文修辭原則，好讓寫論文的作者了解，怎樣表達才會更簡潔清晰。

中英文寫作有許多不同之處。許多作者書寫中文時，為求使句子結構較均稱、聲韻較和諧，字詞都寫一雙成對的，甚至有時寧犧牲文章的簡潔；資深的英文作家寫作時，一般則較直接簡潔。在中文文章中，作者時會假定讀者知道句子的主詞所指為何，因此會省略主詞；然而在英文文章中，每個句子定要有一個主詞。在中文裏，於文章的開首，或在支持重要的論點時，作者都喜用成語、俗語；相反，絕大多數好的英文文章中，都鮮有成語或俗語。本書不

打算深入討論中英寫作原則異同，只希望中國的研究人員，特別注意這兩章所介紹的英文修辭原則，能避免用中文寫作或修辭方式去撰寫英文論文。

## 6.1 句意要精確具體

文章要寫得好，就必須學會把句子寫得精確具體，遣詞精準而簡煉。資深的作者都用字精煉，描述事物絕不模稜兩可。

撰寫科技論文必須表達得精確具體，但有些作者往往未能做到。例如，許多撰寫工程研究報告的人，就常濫用 *good* 和 *better* 這兩個形容詞。以下是兩個典型的例子：

Our method is *better* than Smith's method.

The proposed algorithm performs *better* than Chen's algorithm.

這兩句並沒有文法錯誤，但卻不夠精確具體。在第一個例句中，作者的方法如何比斯密夫的方法「更好」？到底是更快、更準確、更精密、更容易程式化、抑或是其他？此句傳達給讀者的具體內容實際上非常少。在第二個例句中，也有相同的問題：作者的演算法究竟如何比陳氏的演算法好？作者應具體直接地告訴讀者。

這兩句應怎樣修改呢？在這兩句中，作者必須指明評價方法或性能優劣的標準。例如：

Our method is *more accurate* than Smith's method and *nearly twice as fast*.

The proposed algorithm is *more efficient* than Chen's algorithm.

這兩句很明白地指出了作者的方法與演算法，為何比別的方法與演算法要來得好。

再看另一個例子。以下亦是一段很模糊的文章：

Kemp and Tate [4] proposed a method for transferring files between nodes of the network, but there are several points that their method does not consider. Therefore, in this paper we propose a new file transfer technique.

坎普和泰特忽略的“several points”是甚麼？他們的方法有何不足？作者應明確指出，自己要補足別人的方法的哪些缺點。

再看以下這個不精確的英文句子：

The present method is limited to treating binary patterns, but it can be extended to treat analog input vectors by applying the idea used in [8].

在這句中，參考文獻 [8] 運用的方法是甚麼？讀者沒有責任要記得參考文獻 [8] 的內容。而且，作者真正所指的是哪項方法，讀者也未必能確定。所以，作者應直接明確地告訴讀者：

The present method is limited to treating binary patterns, but it can be extended to treat analog input vectors by incorporating fuzzy logic techniques in a manner similar to that described in [8].

讀者現在便可清楚知道作者所討論的是哪種方法。如果讀者想回頭參閱參考文獻 [8]，還可很快找到該方法。

以下同是不夠精確的例子：

The choice of which calcium compound to use in wastewater processing is important. The amount of sludge produced may vary by a factor of 15 depending on whether calcium hydroxide or calcium chloride is used.

這段文章的作者到底認為在廢水處理中，應使用 calcium hydroxide 還是 calcium chloride？除非讀者非常熟悉這課題，否則根本無從猜測作者的意思。作者應說明清楚，這兩種混合物中哪個較有效減少污泥數量：

The choice of which calcium compound to use in wastewater processing is important. If calcium chloride is used instead of calcium hydroxide, the amount of sludge produced can be reduced by a factor of 15.

簡言之，科技論文作者不應寫出模稜兩可的句子，不可要讀者猜測句子所指為何。作者應當提供精確具體的信息，好讓讀者清楚瞭解論文的意思。

## 6.2 省略贅詞

撰寫科技論文時，除了表達要精確具體之外，還必須懂得辨識並省略贅詞。但這並不表示句子要寫得很短，亦非是說論文不可以有詳細說明。省略贅詞是指當找到對句子毫無意義的字詞，就應該省略。句中每個字詞，都應是句子整體意義不可或缺的一部分。

中國人撰寫的英文句子，常有一些贅詞。例如 *phenomenon* 這字：

累贅： We must also consider the phenomenon of the fringe effect.

這裏字詞 *the phenomenon of* 對整個句子毫無意義，說 “the fringe effect” 和說 “the phenomenon of the fringe effect” 沒任何差別。因此，省略 *the phenomenon of*，可使句子較為簡潔直接：

簡潔： We must also consider the fringe effect.

另一個常見的贅詞是 *basically*。例如：

累贅： Basically, the process can be divided into two parts.

在這句中，*basically* 有甚麼作用呢？「把過程分成兩個部分」和「基本上，把過程分成兩個部分」，沒任何差別。因此，這句應省略 *basically*。

簡潔： The process can be divided into two parts.

假如作者要強調那兩個是「基本」的部分，則亦不應把副詞 *basically* 放在句首，而應以形容詞（如 *basic* 或 *main*）來修飾 *parts*，例如：

The process can be divided into two main parts.

The process can be divided into two basic parts.

像 *very, somewhat, rather, quite* 這類修飾詞，通常是多餘的：

累贅： The proposed algorithm is *very* simple in design and is *quite* fast and *somewhat* easier to program than previous methods.

簡潔： The proposed algorithm is simple, fast, and easier to program than previous methods.



以下是典型的冗長英文句子：

冗長： It is the aim of the research in this paper to propose and justify recommended modifications to the conventional method so as to enhance and strengthen the performance and effectiveness of on-line control systems.

這段文章中，既然用了 *research*，又何必再用 *paper*？有必要同時用 *propose* 和 *justify* 嗎？為何要加上 *recommended*？（假如作者不推薦那些修正，根本不會撰寫報告。）*Enhance* 和 *strengthen* 的意思不是大同小異嗎？*Performance* 和 *effectiveness* 不是指同一件事情嗎？

或許這段文章的作者，認為這樣可更清楚而「完整」地表達自己的意思。又或許他覺得論文的論點非常重要，必須用較多的字詞來強調。但贅詞只會阻礙閱讀，無法令讀者馬上掌握句意。作者大可省略這些贅詞，表達會更見簡潔：

簡潔： The aim of this paper is to modify the conventional method so as to enhance the effectiveness of on-line control systems.

修改過後，省略的字詞近一半，但句子內容無改。而且，讀者可更快更易看到文句的重點。

中國作者亦應特別注意避免累贅動詞。例如，以下兩個例句，每個例句中到底有多少個動作呢？

The final estimates *are summarized and listed* in Table 8.

The generating function for node x *is given and derived* as follows.

事實上，這兩句各自都只描述一個動作而已，作者何必每句都用兩個動詞呢？在這兩個例句中，各應省略一個動詞：

The final estimates *are listed* in Table 8.

The generating function for node x *can be derived* as follows.

論文作者不要以為唯有不斷重複，讀者才能理解文意。作者表達一個論點時，必須清楚扼要，一氣呵成。

贅字固然要省略，「贅句」同樣也應省略，且原則雷同。當發現一個句子並非段落中必要的，或只是重複一個已相當清楚的意

思，便應刪除。在一個段落中，每個句子應清楚地表達一個獨立的意思，而不應只換上不同的字眼去述說同一個論點。請仔細看下面描述地震儀的段落，當中有否對段落整體沒大意義的句子？

<sup>1</sup>The intensity and frequency of earthquakes can be measured by means of seismometers. <sup>2</sup>A seismometer consists of a mass suspended by a spring or other elastic mechanism inside a metal frame that is anchored to the ground. <sup>3</sup>A magnet is attached to the mass and an electric coil to the frame. <sup>4</sup>Any vibration of the ground shakes the seismometer's frame, but inertia tends to hold the mass in its place. <sup>5</sup>In other words, the frame moves, while the mass stays in its original position. <sup>6</sup>Thus the coil on the frame moves in relation to the magnet on the mass, and this movement generates an electrical signal that represents the intensity and frequency of the movement.<sup>1</sup>

像第四句已清楚說明，當地震儀周圍的地層震動時，地震儀的外架會搖動，但儀內的質量仍在原位。而第五句只是第四句的重複，它既沒為前句作澄清或補充，又沒帶來新內容。故省略此句，可使段落更簡潔直接。

## 關係代名詞

關係代名詞（即關係子句前面的代名詞）有時是不必要的，可以省略。如果限定關係子句以關係代名詞以及 *to be* 助動詞開首，而後面又緊接著動詞片語，則可省略關係代名詞和助動詞。（限定和非限定的關係子句之間的差別，詳見第五章 5.2 節中逗點的規則三。）下列的例句中，都可省略關係代名詞以及助動詞，而句意無改。

We expect the new processor *that was* developed by our firm to become very popular.

We expect the new processor developed by our firm to become very popular.

The flame *that is* produced by this fuel is extremely unusual.

The flame produced by this fuel is extremely unusual.

The professor *who is* teaching the course this year is very knowledgeable.

The professor teaching the course this year is very knowledgeable.

如果決定省略關係代名詞和助動詞 *be* (即 *is, are, was* 和 *were*)，則兩個都必須同時省略，而不能只省略助動詞。例如，下面句子的文法是錯誤的：

誤：The nodes *that produced* by isolated strokes must be deleted.

在這句中，作者要不省略 *that*，要不就用 *that are* 這兩個字詞。

正：The nodes *produced* by isolated strokes must be deleted.

正：The nodes *that are produced* by isolated strokes must be deleted.

應否省略句子中的關係代名詞和助動詞，是有準則可循的：如果緊接在關係代名詞和助動詞後面的字詞是需強調的，則不要省略。如果緊接在關係代名詞和助動詞後面的字詞並非句中的重要概念，則可省略。

The professor *who is* teaching the course this year is very knowledgeable.

The professor teaching the course this year is very knowledgeable.

這句的主要意思是：教授是個學問淵博的人。字詞 *teaching* 並非句子的重要概念，故省略 *who is*，表達會較簡潔暢達。但如果：

The professor *who designed this course* is very knowledgeable, but the professor *who is teaching the course* this year is not an expert in the field.

在這句中，作者大概想強調 *teaching* 這字詞，因而強調設計課程的教授和講授課程的教授之間的分別。這種情形下，作者可保留 *who is*，就可引導讀者自然而然地注意到 *teaching* 這個字。(英語口語自然的節奏是當讀者唸到句子的第二個子句時，會傾向於先強調 *professor*，而會較輕聲唸 *who is*，再強調字詞 *teaching*。)

如果關係子句以關係代名詞開首而接著名詞片語或另一個代名詞，只要句意依然清楚，則可省略該關係代名詞。

The statistical treatment *that we propose* is highly efficient.

The statistical treatment *we propose* is highly efficient.

The phenomena *that any acceptable theory must explain* are the following.

The phenomena *any acceptable theory must explain* are the following.

如果關係子句以關係代名詞開首而接著一主要動詞，則可省略關係代名詞，並把該主要動詞改爲 *-ing* 形（即現在分詞）。

Planes *that travel* in these areas may experience radio disturbance.

Planes *traveling* in these areas may experience radio disturbance.

Algorithms *that involve* complex calculations are difficult to apply in real-time control systems.

Algorithms *involving* complex calculations are difficult to apply in real-time control systems.

然而，如果緊接在關係代名詞後面的是語態助動詞，如 *can, may, will* 或 *should*，或以助動詞 *to be* 或 *to have* 形式的動詞，則不能使用這規則。

正：There are many problems *that must be solved* before the system will be ready for practical application.

誤：There are many problems *must being solved* before the system will be ready for practical application.

正：All of the samples *that were produced* in the second run met the specifications.

正：All of the samples *produced* in the second run met the specifications.

誤：The samples *being produced* in the second run met the specifications.

許多時，作者可能決定不省略關係代名詞並把動詞改成 *-ing* 形。如果要強調關係子句，或關係子句表達的是句子的核心意思，則應用完整的關係子句，同時不把動詞改成 *-ing* 形。如果關係子句的內容非句子的重點，則把動詞改成 *-ing* 形可能較適當。請看下面的例句：

A bandpass filter is a filter *that passes* only frequencies within a specific range.

在這句中，關係子句表達的是句子的核心意思，所以把關係代名詞和動詞 *that passes* 改成 *-ing* 形 *passing* 顯然不合適（事實上，如果動詞是 *-ing* 形 *passing*，則這句很不自然）。此句陳述通帶濾波器的定義，而關係子句是陳述此類濾波器的特徵。如果使用完整的關係子句，則可引導讀者更注意該子句，並強調 *passes* 這字詞，進而強調這意思：一個濾波器究竟是否通帶濾波器，正決定於它過濾頻率的方式。

比較下面的例句：

The factors *that affect* the reproduction of these organisms have been thoroughly investigated, but the factors *that affect* their development are poorly understood.

The factors *affecting* the reproduction of these organisms have been thoroughly investigated, but the factors *affecting* their development are poorly understood.

這兩句都是正確的英文，但有些人會認為第二個例句（即動詞是 *-ing* 形的）比第一個來得通順。兩個例句都在比較影響有機體繁殖和有機體發展的因素，述詞 *thoroughly investigated* 及 *poorly understood* 來表示比較的重點。在這兩個句子中，關係子句和 *affect* 這字詞皆非句子重點，假若用 *affecting*，會使讀者的視線從前後兩主詞 *the factors* 迅速轉移到 *reproduction* 和 *development* 上，再會注意到比較的重點。相反，如果用完整的關係子句 *that affect...*，則會使得讀者較為注意到關係子句，這耽擱了讀者看出兩個主要子句的核心意思（即 *thoroughly investigated* 及 *poorly understood* 的對比）。因此，在這句中，動詞是 *-ing* 形真的比 *that affect* 來得恰當。

## 6.3 直接表達

要寫出簡明的英文，作者應直接乾脆敘述句子的重點，避免不必要的修飾詞或迂迴的敘述。請看下列例句：

迂迴：In this paper, *we concentrate our efforts* on these issues.

作者撰寫這論文目的究竟是甚麼？“concentrate our efforts on these issues” 是何解？何不更直接來敘述這句的重點？

直接： In this paper, we investigate these issues.

直接： In this paper, we propose a method for solving these problems.

下面同樣是需要修改的例句：

迂迴： In this paper, we will try to propose a new method to solve this problem.

迂迴： In this section, we will focus on investigating the relationship between these parameters.

第一個例句中，*try to* 是贅詞。作者不應如此間接寫 *we will try to propose*，而應直接寫 *we will propose*。第二個例句中，*we will focus on investigating* 一點也不直接。動詞 *investigate* 已能表達出句子的重點，故把主詞、動詞直接改成 *we will investigate*，句子會更直接、簡潔：

直接： In this paper, we will propose a new method to solve this problem.

直接： In this section, we will investigate the relationship between these parameters.

上一節已討論過贅詞，即可省略而不改句意的字詞。作者如果不細心修改自己的文章，不刪除贅詞，就常會寫出冗長的句子。不過，有些冗長的句子，並非句中包含太多贅詞之故，而是由於作者行文迂迴。例如：

Based on the well-known characteristic that the peak value of the pass-band code detector output has a close relationship with the peak value of the channel pulse response, we can use the detector output to tune the AGC gain.

這個句子中，第一個子句非常冗長，可是卻非贅詞太多的緣故。因為除了 *well-known* 之外，這子句已沒有可省略的字詞。就算隨便去掉幾個單字，亦不足以使句子變得簡潔直接，可能還會改變句意。所以唯一可行的方法是徹底改寫：首先，刪除字詞 *well-known char-*

*acteristic*，因為提醒讀者句子所指的關係是廣為人知的，實在沒有必要。第二，描述偵測器的輸出和瞬間波動反應之間的關係，可用更精準的字詞，如 *is proportional to*, *is determined by* 或 *can be controlled by*（熟悉電子學的讀者或許會想到更恰當的字詞）。最後，應把 *because* 放在句首來更直接表達兩個子句間的因果關係。因為句子意謂第二子句所述的事情是基於第一子句的內容。

*Because the peak value of the passband code detector output is proportional to the peak value of the channel pulse response, we can use the detector output to tune the AGC gain.*

改寫過的第一個子句，字數從 29 個減到 21 個，而重點無一遺留。從這個例子可看出，簡單直接的表達方式不僅可減少冗詞，同時可使讀者更易瞭解文章內容。

## 6.4 避免堆砌名詞以及弱動詞

中國人常會寫出「堆砌名詞」的英文句子。這些句子常包含太多名詞，使名詞與其他詞類（尤其是動詞和形容詞）不成比例。例如：

*This method has the advantage of accuracy but the disadvantage of slowness.*

這句共有字詞十二個，其中五個是名詞，只有一個動詞，沒任何形容詞。塞滿名詞的句子，既生硬，又難讀。為了使得句子通順易讀，必須刪除部分的名詞，或可以以其他詞類來取代。

仔細看句中的名詞，其中兩個 *advantage* 和 *disadvantage* 是贅詞。有必要告訴讀者「準確」是優點，而「速度慢」是缺點嗎？這些是連外行人都知道的事情。因此，這裏可先省略這兩個名詞：

劣：This method has accuracy but slowness.

這樣便可清楚地看出句子的結構是多麼的不自然。不論中文或英文，把 “This method is accurate”，（「此方法很準確」）寫成 “This method has accuracy”，（「此方法具準確性」），既間接又不自然。因此，名詞 *accuracy* 和 *slowness* 應改成形容詞 *accurate* 和 *slow*，並

用動詞 *is* 取代 *has*。試比較修改前後的句子：

劣： This method has the advantage of accuracy but the disadvantage of slowness.

佳： This method is accurate but slow.

刪除不必要的名詞，並把部分名詞改形成形容詞，句子就會簡明得多。

假如可使用動詞，則應避免使用名詞；假如可用子句，則應避免使用名詞片語或一連串介系詞片語。下面是個不自然而冗長的例句：

This problem is caused by the lack of consideration of the effect of the bandwidth gain that results from the termination request.

這句的主要動詞後面緊接著很長的介系詞片語，這介系詞片語是由三個介系詞片語組成，而最後一個介系詞片語還包含一個關係子句。此外，句子中間還出現了五個名詞：*lack*, *consideration*, *effect*, *bandwidth* 以及 *gain*。這樣的句子，堆滿了名詞，難於閱讀——讀者可能要讀上兩三次才能理解句意。如要句子變得直接易讀，應改寫整句，把至少一個名詞改成動詞，並省略介系詞片語。

修改的第一步是先去掉一個名詞，*consideration* 用不定詞 *to consider* 取代，以 *failure* 取代 *lack*，並以動狀詞 *resulting* 取代 *that results*。

This problem is caused by *the failure to consider* the effect of the bandwidth gain *resulting* from the termination request.

這句比原句簡潔，不過還是堆滿名詞，仍有點笨拙。因此，可進一步把名詞 *failure* 變成動詞 *fail*，同時把動詞後面冗長的介系詞片語改成一個附屬子句。另外，最好亦把被動式改成主動動詞，並加上一個主詞，做這個主動動詞的施事者。下面是兩種修改方式：

*This problem occurs because we failed to consider* the effect of the bandwidth gain *resulting* from the termination request.

*This problem occurs because the proposed model fails to consider* the effect of the bandwidth gain *resulting* from the termination request.



最後，考慮到名詞 *effect* 非為整句意思不可或缺的字詞，所以是累贅的，應該省略：

修正句： This problem occurs because we failed to consider the bandwidth gain resulting from the termination request.

修正句： This problem occurs because the proposed model fails to consider the bandwidth gain resulting from the termination request.

此外，*fail to consider* 其實還可用 *neglect* 這動詞來取代：

修正句： This problem occurs because we *neglected* the bandwidth gain resulting from the termination request.

修正句： This problem occurs because the proposed model *neglects* the bandwidth gain resulting from the termination request.

用動詞取代名詞，並以附屬子句 (“because...”) 來取代冗長的介系詞片語，就可寫出比原句簡短直接而容易瞭解的句子。

下面是另一個堆砌名詞的句子：

This approach solves the problem at the cost of various amounts of bandwidth wastage.

這句的主要動詞和直接受詞後面，有三個介系詞片語，而這些片語中又包含了四個名詞。如前所示，以動詞取代句中的名詞，可使句子較易讀。同時，這裏應該考慮至少刪除一兩個介系詞片語。所以，可先從名詞 *wastage* 著手，用動狀詞 *wasting* 來取代：

This approach solves the problem at the cost of wasting various amounts of bandwidth.

這句比原句通順，但卻沒有比原句簡潔。要做到簡潔，就可用一簡短的子句取代介系詞片語 *at the cost of wasting...*。並且，字詞 *various amounts of* 對整體句意是多餘的，可以省略：

This approach solves the problem but wastes bandwidth.

修改後的句子簡潔直接。還有，直接使用動詞來表達而不用一連串介系詞片語，使之比原句更強而有力。

## 名物化名詞和弱動詞

撰寫科技論文的人應避免另一種冗長而間接的句子結構——名物化名詞和「弱動詞」連用句。所謂的「名物化名詞」(nominal) 是一個由動詞加上名物化字尾所變成的，這些名物化字尾有如 *-tion*, *-ance*, *-ness*, *-ment* 等。例如，*performance* 是由動詞 *perform* 變成的名物化名詞，*calculation* 是由 *calculate* 變成的，*achievement* 是由 *achieve* 變成的。

名物化名詞本是英文中很重要的一種詞，有時作者要表達某個特定的意思時，也許就只有這種名詞正能表達出那特定意思。然而，當句子中出現此種名詞時，常要配合「弱動詞」(“weak” verb) 作主要動詞，如 *do*, *give*, *have*, *make*, *take*, *achieve*, *effect*, *conduct*, *perform* 等。這些動詞的意思既微弱，又模糊，故稱之為「弱動詞」。這種句子中，弱動詞代替了名物化名詞背後較「強」而具體的動詞，使句子較冗長，表達的動作較間接。

如要修改名物化名詞和弱動詞連用結構，而想寫出較簡潔直接的英文，那必須把名詞背後較「強」而具體的動詞抽出，作句子的主要動詞。試看這個名物化名詞和弱動詞連用結構的句子：

弱動詞： *The calculation of this parameter can be performed using Lee's algorithm.*

句子主要動詞 *perform* 係一個弱動詞，句中 *calculation* 是名物化名詞。修改這句其實很容易，只要用較強而具體的動詞 *calculate* 取代 *the calculation...can be performed*，並把 *calculate* 轉成被動語態，這樣句子便會變得簡潔直接：

簡潔： *This parameter can be calculated using Lee's algorithm.*

修改後的句子不單較原句簡明，且更強而有力。此外，原句本來就不夠精確，作者原意大概不會是利用李氏演算法算出「參數」，而是算出「參數值」。所以，句子還應進一步修改：

精確： *The value of this parameter can be calculated using Lee's algorithm.*

現在來看另一個例句：

弱動詞： They *reached the conclusion* that a disruptive approach is more effective.

這句中，*reach* 是弱動詞，而名詞 *conclusion* 可改為動詞。為求把句子修改得簡潔直接，最好是用動詞 *concluded* 取代 *reached the conclusion*：

簡潔： They *concluded* that a disruptive approach is more effective.

## 練習 6-1 簡明的句子

請把下列句子修改得較簡明。其中有些句子可能要大幅修改。

1. In this paper, we try to propose an algorithm to handle noisy and uncertain data. The new proposed algorithm easily handles false negative training instances.
2. The values obtained in the first two trials are plotted and compared in Figure 3.
3. In application aspects, many applications of fuzzy neural networks have been reported.
4. The procedure is outlined and described below.
5. The second method uses a relatively more complex formulation.
6. For the purpose of comparison, consider and compare the performance of Chen's method.
7. Section 6 shows the summary of the results. For the sake of simplicity, the results have been divided into two sets.
8. The reasons for this poor performance can be characterized as the following.

9. This paper concentrates on an attempt to study the effects of three types of mutation on the performance of genetic algorithms.
10. Table 4 shows the comparison of the speed of our algorithm with that of the other algorithms.
11. In this paper, we focus on the analysis of the stability of clamping with passive friction forces.
12. The data have been simplified for the reason that we can treat this problem well and more easily in the finite element analysis.
13. In order to respond to this requirement, development of an optimization technique for implicit-form problems becomes necessary.
14. This allocation technique may lead to longer delays and blocked connections in time-insensitive and time-sensitive applications, respectively.
15. The shortcomings of the application of the general cell mapping method can be eliminated by combining application of this method with application of interpolated cell mapping.
16. For the purpose of examining the variation in tensile strain along the free edge, we have calculated and plotted the relationship between tensile strain and element number in Fig. 5.
17. A larger scale of operations is needed not only because of manufacturing cost reduction considerations, but also for R&D investment justification.
18. If we compare Chang's method with ours, we find that the major and most significant difference between them is that our technique does not rely on external forces to ensure smooth, natural animated motion.

19. The proposed algorithm is better than Matsumoto's method, which is slower and takes up much more memory.
20. With the consideration of the algorithm level and architecture level in our design approach, the resulting filter design has the features of programmability, low cost, and an accumulation-free tap structure.

## 練習 6-2 名物化名詞和弱動詞

請刪除下列的弱動詞，並把名物化名詞改為動詞。

1. The proposed method offers great improvement in the accuracy of the analysis.
2. In section 4 performance comparisons between the proposed method and several existing methods are discussed.
3. In section 2, a brief survey is made of existing blending techniques.
4. This policy may result in a considerable amount of bandwidth wastage.
5. The conclusion is made in section 6.
6. The activation of the triggers was done sequentially.
7. The modal controllability has a more compact expression as follows.
8. The level sufficient for successful identification is dependent on several factors.
9. Under the condition of the use of high-temperature processing, the phenomenon of reduction of yield occurs.
10. The stability analysis of these solutions will be studied below.

11. Chen [5] states the definition of the problem in a similar way.
12. To make a comparison of the performance of the two processors, we ran another series of tests.
13. This technique can be used to achieve an improvement in the performance of CAD systems.
14. The compiler is responsible for the insertion of communication instructions. Insertion of instructions will occur wherever the compiler judges they should be.
15. With this new method, a substantial reduction in the severity of the staircase effect can be achieved.
16. The effect of speed adjustment can be accomplished by means of the technique described in section 2.

## 6.5 多用主動語態

通順的科技論文中，句子大多使用主動語態。與被動語態相比，主動語態令句子更直接，且更強而有力。同時，用較多主動語態的文章會較簡潔而直截了當。請看下面兩例句：

The mice *were shown* by the experimental results to prefer sweet foods.

The experimental results *showed* that the mice preferred sweet foods.

這樣就可看出主動和被動語態的分別。第二個句子是主動語態，故較清楚直接，通順有力。這句的主要子句和動詞後的名詞子句，結構都非常簡單直接：主詞後緊接著主動動詞，然後再接著直接受詞。

試看更多的例子：

被動：*It can be observed* that steps 2 and 3 of the algorithm are re-

peated several times.

主動： *Observe* [或 *Note*] that steps 2 and 3 of the algorithm are repeated several times.

或： Steps 2 and 3 of the algorithm are repeated several times. [此句雖然也使用被動語態，但比原句簡潔直接得多。]

被動： *From these data it can be seen that the phase modulation is enhanced by forward pumping.*

主動： *These data indicate that forward pumping enhances the phase modulation.*

然而，這並非說文章應一律避免使用被動語態。資深的作者亦會使用被動語態：事實上，他們的文章中平均有 25% 的句子是被動語態，但他們都是有好理由時才使用：在某些句子中，使用被動語態會比主動語態更簡潔。或者有時要強調某個字詞，而把它作句子的主詞，亦會使用被動語態。還有當要描述某個標準的過程，而無需提及過程的執行者時，用被動語態就最好不過了。此外，以被動語態來描述實驗的程序也是約定俗成的。但如果只因慣性或暫時未想到更好的寫法而濫用被動語態，都是不妥當的。（詳見第四章 4.7 節濫用被動語態問題。）唯有在比較使用被動和主動語態的優劣後，並認為被動語態確實較為恰當，才可使用。

想進一步瞭解如何適當使用被動語態，還可參考第九章 9.3 節。

## 6.6 正面表達

科技論文貴能一語道破研究重點，正面的言說方式可使文句清楚直接。如非必要，作者不應使用反面的說法（必要的情況非常少）。一般來說，作者不應說「某人某物沒做甚麼」，而應說「某人某物是做甚麼」。

*This technique does not produce good results.*

這句子用了一個否定動詞，使句意既間接，又模糊。讀者詮釋這句

時，不僅要消化句子的表面意思，還要進一步思考「這技術不產理想效用」的意思。句中“not good”意思並不清楚：到底是指「很差」，還是「雖不理想，但可接受」？如果省略否定動詞並以 *good* 的相反詞代替，則句子就較清楚直接了：

This technique produces poor results.

This technique produces unsatisfactory results.

這例可看出：盡量用正面而肯定的動詞來表達，句子會較直接簡潔。

類似的原則可應用在修飾詞上：別告訴讀者「事情非如此」，而應該說「事情到底是怎麼樣」。請看下列例句：

The construction of a TLT is not difficult, but the construction of a PAT is not easy.

句中的否定詞會阻礙讀者掌握句意。如要句子變得較易瞭解，應省略否定詞，並更改形容詞，換上它的反義詞：

The construction of a TLT is easy, but the construction of a PAT is difficult. [亦可用 *straightforward*, *simple* 等同義字取代 *easy*]

此外，如果把 *the construction of* 改為動名詞，句子會更簡潔：

Constructing a TLT is easy, but constructing a PAT is difficult.

科技論文非文學作品，不應只說事情非這非那，留下疑團讓讀者「細味」。正面直接告訴讀者你的意思，這往往更適當。

## 練習 6-3 主動語態及正面表達

請用主動語態及正面方式改寫下列句子，使它們變得更簡潔清楚。

（提示：一句可能不只一種正確修正方式。）

1. The reaction did not occur quickly.
2. It has been observed by several researchers that in solving this type of problem genetic algorithms tend to be attracted by local minima.



3. A valid schedule cannot have an iteration period that does not exceed this bound.
4. We cannot provide only one plot.
5. The conventional method is shown by the experimental results to be outperformed by the proposed algorithm.
6. The effects of computer-assisted instruction and traditional instruction techniques have been compared in this study.
7. The analysis is not valid.
8. For the hardware cost to be reduced, a more efficient filter design must be developed.
9. Designing an on-line control system for this application is not a simple task.
10. The electrical properties of the films were found to be improved after the films were doped with boron.
11. The iterations do not stop if the convergence test is not satisfied.
12. As shown by the simulation results, with the proposed control algorithm the cutting system can be adjusted quickly and effectively in response to different cutting conditions.

## 6.7 少用虛主詞

句首為 *it is*, *there is* 或 *there are* (或這些表達形式的其他時態), 稱為「虛主詞結構」(expletive construction)。當要強調句子動詞後面的觀念時, 可使用虛主詞結構句。比較下列兩個例句:

*Two tall trees were* in front of the house.

*There were two tall trees* in front of the house.

這兩句提供同樣的信息，但強調的重點卻不同。第一個句子較強調樹木的位置，讀者閱讀這句時，會自然而然強調 *in front*；第二個句子則較強調「兩棵樹」，由於閱讀時會自然而然強調 *two tall trees*。

同時，虛主詞結構會讓讀者的注意力集中在某個事實或某個行為所產生的結果，而不會去注意實踐行為的人或物。比較下列例句：

*Scientists have little evidence to support this theory.*

*There is little evidence to support this theory.*

相比之下，第二個句子較強調「理論欠缺證據」，證據是誰掌握並不重要，使用虛主詞就可不用指明是誰掌握了證據。

另外還有兩個例句：

*We can approach this problem in three ways.*

*There are three ways of approaching this problem.*

第一個句子強調「我們」處理問題，並且有三種處理方式；第二個句子則沒有指明是誰處理問題，而會較強調「有三種處理問題方法」這個事實。誰都可用這些方法，所以誰在考慮使用並不重要。

當要強調句子裏某些特定的意思時，使用虛主詞結構有時是非常適合的。然而，虛主詞卻常為文章中的贅詞。如果省略虛主詞會使句子更簡明，則應避免使用。如在下列例句中，*there is* 和 *there are* 顯然都是累贅而應省略的：

*There are fourteen cases presented here.*

*There is no desired velocity specified in the equilibrium control.*

在這兩例中，主詞（“fourteen cases” 和 “desired velocity”）後面緊接著關係子句（兩個子句 “presented here” 和 “specified in the equilibrium control” 都省略了關係代名詞和助動詞）。如果刪除兩句中的虛主詞，而把關係子句的動詞作句子主要動詞，則這兩個句子就會變得較簡潔：

Fourteen cases are presented here.

No desired velocity is specified in the equilibrium control.

這樣可推出一個普遍的原則：如果一個虛主詞結構句中包含一個關係子句或名詞子句，則應省略虛主詞，並把子句中的動詞作句子主要動詞。這通常會使句子變得較為簡潔。現再舉幾個例子：

劣：There are several methods that have been proposed for selecting the fittest individuals.

佳：Several methods have been proposed for selecting the fittest individuals.

劣：There are seven companies that participated in the program.

佳：Seven companies participated in the program.

劣：It is clear from the data that raising the temperature led to an increase in the deposition rate.

佳：Raising the temperature clearly led to an increase in the deposition rate.

佳：The data clearly show that raising the temperature led to an increase in the deposition rate.

有些中國人會濫用虛主詞結構，使句子沒有任何具體內容，例如：

劣：There are some important characteristics of the common-base amplifier. The first is that...

以英文為母語的作者一定不會這樣使用 *there are*。正確的寫法應該是：

佳：The common-base amplifier has a number of important characteristics. The first is that...

佳：Important characteristics of the common-base amplifier include ... [直接列出重要特性]

句首出現諸如 *it should be noted that* 或 *it can be observed that* 之類的詞語，句子的重點必定是於 *that* 後面的子句中。刪除不必要的虛主詞結構，突顯句子的重點，好讓讀者能更快看到句子的重點。

冗長：*It should be noted that* program enrollment is inversely proportional to economic growth.

簡潔：Program enrollment is inversely proportional to economic

growth.

冗長：*It can be observed that the rate increases as a function of temperature.*

簡潔：*The rate increases as a function of temperature.*

若 *it should be noted* 或 *it can be observed* 是句意必要的部分，不能刪除，常可用祈使語氣來改寫，而變得較簡潔。

冗長：*It should also be noted that...*

簡潔：*Note that...*

冗長：*It can be observed that...*

簡潔：*Observe that...*

## 練習 6-4 虛主詞結構

刪除下列句中不必要或錯誤的虛主詞結構，並省略贅詞。（提示：第五題是文法錯誤的句子。）

1. It should be noted here that the analysis presented above is not applicable to nonlinear systems.
2. There have been many filter designs proposed in the literature.
3. It would be time-consuming to solve equation (5) directly.
4. There are many new applications of neural networks that have been proposed in the last ten years.
5. \*There needs an on-chip buffer for raster-scan ordering of the pixels.
6. It can be concluded from these results that hypothesis  $H_1$  is false.
7. There are three types of events defined in the program.
8. There is another advantage to this method in that we need only a shifter and

an adder to complete the circuit.

9. It is the purpose of mission planning to maximize instrument operating time subject to various constraints.
10. From these figures it can clearly be seen that the classification accuracy increases as  $i$  and  $j$  increase.

## 6.8 第一人稱句

科技研究報告中，有些作者會以為要讓文章看來「科學」、「客觀」，最好避免使用第一人稱複數代名詞 *we*。但這理由是站不住腳的。研究廣告或政治宣傳的人都知道：避免使用第一人稱，不會讓文章更「客觀」；即使使用第一人稱，也絕不會讓文章過於「主觀」。報告內容的客觀程度，是不受有否使用第一人稱影響的。

只要整篇文章的語氣連貫，且沒累贅之虞，在正式的科技論文中還是可使用第一人稱。在很多文脈中，例如在科學及數學教科書中，*we* 根本不是指作者自己，而是泛指作者和讀者。不過有時候，*we* 也確是指作者自己，以表示論文研究目的、發現或結論是作者本人之見。如此使用第一人稱，既無迫使讀者接受作者觀點之嫌，反能讓讀者看出作者所扮演的角色——資訊的提供者，好讓讀者進一步評斷作者的觀點。

可惜有些撰寫科技論文的人，誤以為凡使用第一人稱都會讓論文「不夠科學」或過於「主觀」。他們會千方百計地避免代名詞 *we*，就算要被迫寫出不自然而迂迴的句子。下面是一個正確的英文句子：

佳： We need to show that the proposed method is more accurate than the conventional one.

曾經有位作者就是為了避免使用 *we*，把這句「修正」如下：

劣： The proposed method requires to be shown to be more accurate than the conventional one.

原句是自然正確的英文，然而那位作者就把句子「修正」得既不自然，又使句意模糊。有些編輯甚至還會認為這樣的句子有語法錯誤。

如果那位作者實在不想用第一人稱，其實他亦大可保留句子的主動語態，而另找一個新主詞。他也可用下面這些句子來取代原句：

The following analysis will show that the proposed method is more accurate than the conventional one.

The purpose of this section is to show that the proposed method is more accurate than the conventional one.

是否使用第一人稱，主要是依作者個人寫作風格而定；但有些學術領域的論文使用第一人稱的情況可能沒那麼普遍；而有些作者覺得這可讓文章較通順自然且口語化，就像自己在演講般。使用第一人稱既可避免濫用被動語態，有時還可有助避免不自然的句子（尤其是在包括很多數學方程式的論文）。在某些情形下，使用以 *we* 為主詞的句子來陳述某個論點，可能是最簡單直接的寫法。作者在衡量一個句子的主詞要不要用第一人稱時，不要擔心論文內容會因而變得不夠「客觀」，而應考慮：可否寫出較通順的句子；是否與論文整體的風格一致；在特定的句子中，*we* 是否累贅而應省略。

試比較下面兩個意思大致相同的例句：

The solution can be obtained by substituting this value into expression (22).

To obtain the solution, we can substitute this value into expression (22).

兩個句子的英文皆正確。有些作者可能比較喜歡第一句，或許是它看來較正式。但有些作者會較喜歡第二句，因為它是主動語態，比較口語化，沒那麼生硬。兩句都適用於科技研究報告中，而皆有各自適合的文章脈絡。

我們再列出兩對例句，讀者可作比較：

This paper presents a new algorithm that performs character thinning quickly and reliably.

We present a new algorithm that performs character thinning quickly and reliably.

Here the following method will be employed.

We will employ the following method.

同樣，上面四句都是正確的英文，且也適用於科技寫作。應選用哪個句子，則要看文章脈絡及作者個人的寫作風格而定。這裏要強調：沒有一條普遍規則是「非第一人稱句定比第一人稱句好」。

某些句子中，*we* 可能是不必要的，因此作者可考慮省略：

From the graph, we observe that the value of  $x$  increases sharply after time  $t$ .

The graph shows that the value of  $x$  increases sharply after time  $t$ .

某些文章脈絡中，像第一個句子中的 *we observe that*，可能是累贅的。整個句子的重點是描述圖形，所以第二個句子就比第一個合適。相反，在下列例句中，*we believe that* 是句子的重點：

We believe that the actual mechanism has yet to be discovered.

在這句中，作者用 *we believe that* 來陳述出自己的看法，所以不能省略，否則會影響句意。如果作者想避免用 *we* 來陳述出自己的想法，還可以用臆測動詞（如 *appears*）來改寫：

It appears that the actual mechanism has yet to be discovered.

（“Has yet to be discovered” 和 “has not yet been discovered” 意思一樣。）

然而，雖然在科技論文中可使用第一人稱，但切勿過多使用。下面就是濫用代名詞 *we* 的例子：

We can judge whether a diode we test is good if the forward-biased resistance we read is much less than the reversed-biased resistance we read.

這句的作者實在沒必要重複 *we* 四次。以下有兩種修改方式：第一種是只保留一個 *we*，第二種則省略所有的 *we*。

We can judge whether a diode is good by checking whether the forward-biased resistance is much less than the reversed-biased resistance.

A diode is good if the forward-biased resistance is much less than the reversed-biased resistance.

請注意這兩句的語氣有何不同。第一句使用代名詞 *we*，較口語化，而且突出了作者的行為（也許亦指讀者）。這句的意思是：「我們的目的是要檢查兩極真空管是否良好，而達致這個目的所採取的方法是…」；第二句則突出了兩極真空管及其特性，卻完全省略作者的行為。這句幾乎是一個定義，句中既沒有提到是誰想應用那定義，也沒交待定義目的。如果作者認為研究者的動作在句中很重要（例如專供實驗課程使用的教科書），則第一個修正句會較恰當。相反，如果作者是想說明甚麼是兩極真空管，以及描述它的特性，則第二個修正句會較恰當。

雖然在科技研究報告中可使用第一人稱 *we*，像論文是由多位作者共同撰寫的，但絕不可以使用第一人稱單數代名詞 *I*。即使只有一位作者，在報告中還是可使用 *we*。（也有少數作者會使用 *the author*。）此外，偶爾也可以在科技論文中使用不定代名詞 *one*，但如濫用的話，文章的語氣便會變得生硬。

## 6.9 避免偽術語

無論任何學術領域，專家都需要一些專業術語以方便溝通。使用專業術語是用較簡潔的方式，來表示一些較複雜的概念。很多專業術語所表達的意思，都是不能在日常語言中找到對應的詞彙來表達，各學術領域的專家才會構造出這些術語。在研究報告中，當要提到某研究領域的專家已通曉的概念時，使用他們已有共識的專業術語來指稱，就不需再作長篇解釋。

然而，論文作者卻應避免用偽術語 (*jargon*)。與前段所描述的情形不同，偽術語是不必要的專業術語，它所表達的概念根本就是可用日常語言的字詞來表達的，而它通常卻又比日常語言模糊或冗



長。在撰寫論文時，如果想使用的專業術語，沒有比日常語言更清楚精確，則應使用日常語言，以避免濫用專業術語。

例如：當 *first step* 已可表達得當，就不應寫 *initial phase*；當你可以寫 *The system will be reviewed immediately*，就別寫成 *The system review operation has been prioritized*；可以寫 *to refer* 或 *to retrieve* 時，就不要寫 *to reference*；明明可寫 *to affect*，就別寫成 *to impact*；本來可以寫 *to connect*，寫 *to interface* 就是作態；*function* 已很恰當，為何要寫 *functionality*？有 *important, central, main, primary* 或 *crucial* 等如此多字詞可選擇使用，為何只用 *key* 來形容所有重要的事物？電子產品推銷員別再把每個新產品（或產品線）稱為 *total solution*，應改用更精確的字詞來告訴客戶產品有甚麼特別功能；描述所有硬體或軟體設備之間的關係時，別再用 *support*，而應該用 *provide, include, can be used with, is compatible with* 等較精確的字詞；*costdown* 根本就不是正確的英文字詞，作者應該用 *reduce costs*（動詞）或 *cost reduction*（名詞）。總而言之，在一個句子中，如果有兩個字詞都是正確的選擇，就應使用較精簡的一個，別以為非用「專業」字詞不可。

撰寫科技論文時，當首次提到某個專業術語時，必須同時定義清楚這術語並以斜體字標示之。此外，論文中首次提及一個「頭字語」（acronym）（即由數個字詞的首個字母組成的字詞）或縮寫字時，也應完整地列出這些字母所代表的字詞，並用括號括著頭字語或縮寫。這樣，作者便可假定讀者已瞭解頭字語或縮寫的意思，而可放心在論文中使用。如果必須用到特別多的縮寫或術語，可以考慮加上“nomenclature”或“notation”的小節來結集所有術語的定義。（英文的 *nomenclature, notation* 及 *terminology* 意思是一組術語或符號，都是不可數名詞，故沒複數形式。）作者應盡量避免用過多專業術語，如果是萬不得已的話，應確定讀者都已知道這些術語的意思。

## 6.10 避免直接疑問句

在英文科技論文中，當作者需要帶出一個問題或新的課題時，通常會使用直述句或間接疑問句，而不會使用直接疑問句。試看以下例子：

An important question is, “Why do we need normalization?” This question will be addressed in the next section.

這句文法雖正確，但作者卻用了太多字詞來表達實際上很簡單的意思。作者應使用間接疑問句或直述句來取代，這在說明為何需要 normalization 時，會較簡潔直接。

The question of why normalization is needed will be addressed in the next section. [這句仍稍嫌冗長]

The next section will explain why normalization is needed. [比較簡潔]

在某些文章脈絡中，還是可把直接疑問句當作有效的主題句：

Why is normalization needed? Normalization allows us to compensate for the variation in the data that results from collecting samples from many different speakers.

不過，有些資深的作者會認為這個直接疑問句也是多餘的，應該省略。他們會建議把這段文章修改為：

Normalization is needed to compensate for the variation in the data that results from collecting samples from many different speakers.

這樣就能用較簡潔的方式來表達相同的論點。

中國作者應特別注意避免寫出不自然或文法有誤的直接疑問句。在中文裏，直接和間接疑問句之間並沒有很清楚的區別，但英文中，它們在句法上有很大的分別。例如，下例兩個「劣」句似乎是由中文直接翻成的英文。這些英文句子非常不自然，應該修改成間接疑問句：

劣：We must now discuss, Does the proposed modification increase the computational complexity of the method?

佳：We must now discuss *whether* the proposed modification *in-*

*creases* the computational complexity of the method.

劣：The next step is to consider, How can the speed of the system be increased?

佳：The next step is to consider *how* the speed of the system *can* be increased.

佳：The next step is to consider *how to increase* the speed of the system.

要把第一個「劣」句修改成間接疑問句，必須加上 *whether* 這字詞，並省略直接疑問句裏的助動詞。當我們把第二個「劣」句修改為間接疑問句時，必須改動助動詞的位置。

## 練習 6-5 直接疑問句

請把下列直接疑問句修改成間接疑問句或直述句。（提示：下面六個習題中，只有第一個是文法正確的句子。）

1. An interesting question is, Is the relationship between these chromosomes an original form or is it itself a result of evolution?
2. Let us now consider, How does the circuit work?
3. We must now explain, Why did the samples immersed in the HF solution show increased selectivity during the second deposition phase?
4. Section 3 discusses the proposed algorithm outperforms the conventional method in what types of applications?
5. In section 4 we evaluate How does the performance of the proposed method compare with that of the conventional method?
6. In the second experiment, we investigated, Does the amount of fluorine incorporated into the film depend on the amount of water in the immersing solution?

# 第七章

---

## 通順的句子

若要寫出流暢得體的英文，則必須學習造出自然通順的句子。這一章將介紹五個基本修辭原則，在撰寫或修改英文句子時，這些原則皆有助作者寫出自然通順的英文。

### 7.1 善用不同的句子結構

高明的作者往往懂得利用不同的句子結構來反映不同的句子內容。一個既簡單且重要的意思，應使用簡短有力的句子來表達。相反，一個複雜詳盡的說明，則需要用較長而複雜的句子來陳述。帶出新的話題、提出重要論點，或是陳述段落或章節的結論，可用短句；詳細說明並支持段落的主要論點，可用長句。簡言之，作者應學會運用句子結構來強調文章內容，從而使句子意思更清晰。

要把握以結構強調內容的技巧，應多觀察以英語為母語的專家

如何使用不同的句子結構。在他們的文章中，常看到一種組織模式：先是一個有力的短句，用以介紹新論點；接著有一個或一些長句，用以展開、推陳或說明該論點；然後再來一個短句，用以敘述結論或提出另一個新論點。在撰寫英文論文時，如果發現初稿中有太多的長句，則應予以修改。先找出主要論點，並使用短句直接有力地表達出來，然後再以一些長句來討論這些論點。

注意下列段落如何有效地利用不同句子結構：

<sup>1</sup>Today color constancy, if it is mentioned at all, is treated by a skeptical footnote in textbooks on vision. <sup>2</sup>The skepticism is not hard to understand. <sup>3</sup>Since many of us virtually live our lives under artificial lighting, we have become inured to the experience that faces and cosmetics, for example, change color between incandescent and fluorescent lighting. <sup>4</sup>Yet the skepticism is wrong. <sup>5</sup>Investigators of a century ago knew that color constancy poses a serious problem for efforts to understand perception. <sup>6</sup>The constancy is so reliable that one routinely compares by memory the face color and lip color of someone who now stands under one form of daylight with the colors seen an hour ago, a day ago, a week ago, and under another form of daylight, and thus detects changes due to blushing or paling or signifying disease such as jaundice (which turns the skin yellow) or anoxia (which turns it blue). <sup>7</sup>Such changes are much smaller than the possible changes in daylight color. <sup>8</sup>It is as if, in the words of the 19th-century physiologist Hermann von Helmholtz, we “discount the illuminant” when we perceive color.<sup>1</sup>

段落的開首是中等長度的句子（句子 1），指出當代流行的「色彩不變說」的懷疑論態度（贊成「色彩不變說」的學者認為，無論日光照明有何變化，人類知覺到事物的顏色是大致不變的）。接著是一個有力的短句（句子 2），敘述一個簡要的論點：有些人抱持這種懷疑論態度並不難瞭解。然後是一個長句（句子 3），提供資料去支持前面短句的論點。跟著，作者使用另一個短句（句子 4）以表達一個極鮮明的論點：懷疑論是錯誤的。緊接在後是幾個長句，其中一個（句子 6）特別長，作者用它來強調，即使隨著時間不同，日光照明有所變化，人類知覺到事物的顏色，大致上還是不變的。

總而言之，一個好的英文段落中，句子會有不同的結構。撰寫論文時，作者應根據句子內容來選用合適的句子結構。

## 7.2 避免散亂句

英文的句子結構不應過於冗長或複雜。一般而言，一個句子只應表達一兩個主要意思，且必須清楚易懂，能讓人一讀就能瞭解句意。冗長或過於複雜的句子，或一個包含太多意思的句子，稱之為「散亂句」。

以下是一散亂句。在這句中，先出現兩個附屬子句，其中一個子句本身又包含兩個附屬子句，接著是一個很長的介系詞片語，主要子句最後才出現，且也是相當長的。這句結構極冗長複雜，未能表達出清楚易明的論點，使讀者難以閱讀與瞭解。

散亂句：When a technology is to be transferred from the R&D stage to the production stage, if the learning cost of the technology is so high as to create a situation where, when private companies are deciding whether or not to adopt the technology, research institutes are unable to provide investment support, then from the perspective of converting new technology to commercial applications, the possibility of the industrial sector transferring the results of government-funded R&D to commercial applications is not high.

像這樣的句子，讀者通常很少能一讀便能瞭解句意。就傳達信息的效率而言，可說是非常差。當閱讀一個句子時，我們通常不會逐字來消化句子內容，散亂句提供過多信息，使讀者無法同時記得整句的內容，因而擾亂正常的閱讀過程。

想修改以上的散亂句，必先找出句中的幾個主要意思，然後把它們以獨立的句子來表達。即是說，把原句分割成兩個以上的句子，而分割後的句子都只表達一或兩個意思。在修改這類極繁雜迂迴的句子時，還必須細心考慮原句的重點，可否更直接去表達，並看原句陳述的意思中，有否多餘而可省略的部分。

下面是一種修正方法。為使整段文章變得較清楚直接，我們把

原來的散亂句分成兩個句子，同時刪除了一些不必要的子句：

修正： The learning cost involved in transferring a technology from the R&D stage to the production stage may be very high. If part of this cost is not defrayed through investment by the government research institute that developed the technology, then private companies may be unwilling or unable to apply the new technology commercially.

修正後表達都較直接簡潔。由於原來的散亂句極迂迴，故還可以有很多修正方法，在此僅列一種，以供參考。

散亂句未必都像以上的例子般那樣長。下列句子也是一例：

In this situation, the sizes of the pitch radii and addenda will be altered and are known as operating sizes which were first discussed by Johnson [9] and are expressed as follows.

這句不特別長（僅 31 字），但它同樣雜亂無章。此句共有四個動詞，兩個是在一個長的關係子句中，即 “which were first discussed...and are expressed...”（這個關係子句為非限定子句，故子句前應加上逗點）。作者似乎要把幾個不同的意思都塞進一個句子裏去，故句中沒清楚的焦點，且句中不同意思間的邏輯關係並不明瞭，實在令人費解。讀者根本不可能會瞭解句中哪個動詞要和哪個主詞搭配，哪些動詞受片語 *in this situation* 修飾，或動詞之間的關係。要修改此句，必須把它分成至少兩句，每句表達一個清楚的論點。以下有三種可能的修改方法：

In this situation, the size of the pitch radii and addenda will be altered; the altered sizes are known as operating sizes, which were first discussed by Johnson [9]. The operating sizes can be expressed as follows.

In this situation, the size of the pitch radii and addenda will be altered. The altered sizes, which were called operating sizes by Johnson [9], can be expressed as follows.

In this situation, the size of the pitch radii and addenda will be altered. The altered sizes, which are known as operating sizes (see Johnson [9]), can be expressed as follows.

第一個修正句把原句分割成兩個獨立句子，在保留了原句的所有資

料之餘，補充了幾個字詞以闡明句意。第二與第三個修正句則省略了原句部分資料，以造出較簡潔的句子。三個修正句都是清楚自然的英文，尤以第二與第三句為通順，而第一個修正句還是缺乏精確的焦點。

在修改論文初稿時，應注意文稿中有否散亂句。如果有的話，則可應用上述的方法來修改：先找出句子的主要意思，並考慮有否可省略的地方。然後把原句分成兩個或以上較短的句子，每句表達原句中一兩個意思。（關於散亂句子的詳細討論，請參閱第四章 4.2 節。）

### 7.3 避免片斷句成篇

在 7.1 節曾說明，撰寫英文文章時應善用不同的句子結構：短句用以陳述簡單直接的重點，長句則用以陳述較詳細複雜的說明。一篇論文不可能只有一個個孤零的重點，卻沒有詳細的說明，因此文章中應避免出現一連串短句。如果短句太多，則表示作者無法聯繫不同句子內容之間的關係。同時，這樣的文章會非常沉悶，如同小學國文讀本一樣。當文章中連續出現許多片斷句時，應使用適當的對等結構及附屬結構來把這些片斷句合併，並闡明句子之間的關係（有關對等結構和附屬結構的進一步討論，請參閱下面 7.5 節）。

以下段落是由一連串片斷式的句子所組成的：

The substrates were mounted on brackets. The brackets were placed in the reaction chamber. The chamber was sealed. The microwave power was turned on. The temperature was set to 600° C. The gas mixture was introduced into the reaction chamber. The reaction was allowed to continue for four hours. Then the samples were removed from the chamber. Next, the samples were submerged in distilled water. The samples were placed in the water for 30 minutes.

這段英文非常呆板。作者把許多零星的意思，都用一個個短句來表達，短句間互相獨立，中間看似沒甚關係。事實上，段落中各句子所表達的意思之間都密切相關，這段英文卻沒有表達出這些關係。



要把這段落修改得通順流暢，必須把關係密切的意思合併成一句，再以主要子句來表達主要意思，以附屬子句來敘述次要意思。此外，段落中的句子應有不同的結構。以下是一種修改方法：

The substrates were mounted on brackets and placed in the reaction chamber, which was then sealed. The microwave power was turned on, and the temperature was set to 600° C. The gas mixture was then introduced into the reaction chamber. The reaction was allowed to continue for four hours, after which the samples were removed from the chamber and submerged in distilled water for 30 minutes.

原來的段落共有十個短句，修正段落則只有四句，句子也有長短的變化。修正段落通順流暢，每句之間的關係亦清楚得多。

## 練習 7-1 散亂句

下面的文章都是一些散亂句。請改寫這些句子，使文章變得更簡短，焦點更清晰。在某些句子中，需省略一些累贅的轉接詞，才能造出合理的句子。（第四章中練習 4-2 有更多習題。）

1. Another type of network used in neural-network-based object recognition is the neocognitron, which is a hierarchical multilayered network based on the model of the human visual system, in which the initial stage is an input layer, and each succeeding stage has a layer of S-cells followed by a layer of C-cells, and thus layers of S-cells and C-cells are arranged alternately throughout the whole network, a detailed analysis of the training process used with this type of network can be found in Matsumoto [8].

The neocognitron has two disadvantages, of which the first is that the training process is very slow, because the number of cells in the model increases almost linearly with the number of objects it is required to learn to distinguish, and second, the network must be completely retrained for each

new set of patterns.

2. Housing is an extremely heterogeneous product, reflecting the uniqueness of each building site, the long life of the structure, and particularly the decentralized means of production, which shows up sharply in a comparison with the automobile, which for most people is second only to housing in size and cost, but only a few manufacturers produce automobiles, whereas in housing, however, the 100 largest developers produce only about 15 percent of the annual new construction, and the remainder is mostly built by companies of small or medium size or by individuals—all with their own idea of what constitutes a house. Moreover, the builder, unlike the automobile manufacturer, makes no systematic effort to control the quality of maintenance once the product has been sold, but instead the owner must deal with an even more decentralized system of local repair and remodeling services—all with their own views of what should be done, and local building codes are one of the few sources of standardized construction and maintenance procedures, yet they are notorious for differing from one another and for being circumvented by owners in any event.<sup>2</sup>

## 練習 7-2 片斷式句子

以下的文章都包含過多片斷式的句子。請把這些句子與其前後的句子合併，以造出較順暢連貫的文章。在某些句子中，可能需省略一些贅詞，或可能需修改或補充一些字詞。

1. To the observer, a change in state is a sudden and dramatic event. It renders a material essentially unrecognizable after it occurs. Certainly, at first

glance, an ice cube seems to have more in common with a quartz crystal or a diamond. It seems to have less in common with the steam pouring from a kettle of boiling water. On a microscopic scale, however, all three forms of water contain the same two atoms of hydrogen to one of oxygen. All are held together by the same electromagnetic force. Moreover, despite the apparent abruptness of a change in state, the sequence of events that precedes it is anything but sudden and dramatic. Typically, it is a smooth and unremarkable continuum. Lower the temperature of a glass of water degree by degree. At some point the change from water to ice will take place. Experience tells us at what temperature the change will occur. But no simple theoretical formula predicts it.<sup>3</sup>

2. In the 1920s, researchers realized that the brain was in ceaseless electrical activity. So the idea became popular that memories could take the form of recurrent electrical signals between cells. But memories can withstand all sorts of shocks to the head or brain. These shocks range from concussion to electroconvulsive therapy. These shocks totally disrupt this electrical activity. So memories cannot be stored in purely electrical form. On the other hand, such damage does tend to result in loss of very recent memory. Recent memory is memory for events minutes to hours before the shock. This is why people who have been in crashes often cannot remember the events that led up to the accident.

Hence researchers came to believe that memory exists in at least two forms. One is memory for very recent events. This is called short-term memory. It is relatively labile and easily disruptable. The other is long-term

memory. It is much more stable. Not everything that gets into short-term memory becomes fixed in the long-term store. A filtering mechanism selects things that might be important. It discards the rest. If this were not the case, we would remember everything that impinged upon us. If we remembered everything that impinged upon us, we would soon become hopelessly overloaded.<sup>4</sup>

## 7.4 對稱法

當英文論文中提到兩個或以上的對等概念時，這些對等概念應皆以對稱的文法結構去表達，這原則稱為「對稱法」(parallelism)。對等的概念是指兩個或多個概念在某一個文脈中，是同等重要的，例如用以描述同一個事物的連串形容詞，或一個程序中的幾個必要的步驟。表達對等概念的字詞可以是單字、片語或整個子句。對稱法有助作者以語文結構來反映內容，只要以對稱結構來寫對等的字詞、片語或子句，讀者便能較快較易地掌握文章內容。

下列例句都包含對稱結構：

A research report should be *clear and concise*. [兩個對等的形容詞]

The baseball sailed *over the tree, through the open window, and into Mrs. Smith's soup*. [三個對等的介系詞片語]

The technician *holds* the module at a 45 degree angle from the system board, *inserts* it into the socket, and *gently presses* it forward until it snaps into place. [三個對等的動詞]

*Before annealing, the samples were soft and flexible; after annealing, they were hard and brittle*. [兩個對等的獨立子句]

序列的項目亦應使用對稱結構。參考以下的序列：

The process may be divided into four phases:

Harvesting

The drying procedure

Roasting

## Product is packaged

把以上各項目改成對稱形式，會令序列更清晰。第一和第三個項目都是動名詞（即動詞的 *-ing* 形）；第二個項目包含一個動名詞與一個名詞；第四個項目則包含一個動詞（“packaged”），而這動詞可輕易改成動名詞。所以最簡單的修改方式就是把全部項目都改為動名詞：

The process may be divided into four phases:

Harvesting

Drying

Roasting

Packaging

修改後，序列項目的文法結構都對稱一致，會更順暢易讀。

有時候，作者必須正確使用對稱結構，句意才不會含糊。譬如，根據文法結構，下面句子的意思似乎是：動畫系統能創造出兩種事物的表象，即「實際的景觀」和「模型上的交互作用」。

The animation system is designed to create lifelike representations of real scenes and modeling interactions between objects in a scene.

然而，作者的原意是這個系統有兩種功能，它能創造出實際景觀的表象，並做出景觀中事物間交互作用的模型。因為指稱這兩個功能的動詞沒有寫成對稱的形式，因此很易誤導讀者：

The animation system is designed *to create* lifelike representations of real scenes and *modeling* interactions between objects in a scene.

如果把兩個動詞改寫成對稱形式，句意會清楚得多：

The animation system is designed *to create* lifelike representations of real scenes and *to model* interactions between objects in a scene.

英文文法規定，相關連接詞 (*not only...but, both...and, either...or*) 後面的內容必須為對稱結構。

誤：The algorithm *not only must avoid* local maxima *but also converge* as quickly as possible.

正：The algorithm *not only must avoid* local maxima *but must con-*

*verge as quickly as possible.*

正：The algorithm must *not only avoid* local maxima *but converge as quickly as possible.*

誤：Light can *either be treated as waves or as particles.*

正：Light can *either be treated as waves or be treated as particles.*

正：Light can be treated *either as waves or as particles.*

當對稱結構中的字詞或片語要加上冠詞或介系詞時，可以只加在首個字詞或片語前面，否則必須加在每個對等字詞或片語的前面。

正：We will analyze *the* structure, computational complexity, and performance of the algorithm.

正：We will analyze *the* structure, *the* computational complexity, and *the* performance of the algorithm.

誤：We will analyze *the* structure, computational complexity, and *the* performance of the algorithm.

如果對稱結構中的字詞各須加上不同的介系詞，則必須在每個對等字詞前或後面加上適當的介系詞。

誤：This interface is used for *reading* and *writing to* memory.

正：This interface is used for *reading from* and *writing to* memory.

在某些句子中，必須在對稱結構中的對等項前面都加上一個介系詞或其他字（例如 *that* 或 *to*），才能突出對稱結構，使句意更明確。看以下的例句：

Our aim is to *identify the difficulties* faced by customers who *purchase these devices* and *develop more user-friendly products.*

這句子的意思模稜兩可：要開發新產品的是作者還是其客戶？作者原本想強調的對等結構是 *identify the difficulties* 和 *develop more user-friendly products* 兩個不定詞片語。這兩個片語的形式確實對稱，但剛好後者的形式和 *purchase these devices* 也對稱，故對稱的片語究竟是哪兩個？要澄清句意，作者必須在第二個對稱的不定詞片語前面也加上 *to*：

Our aim is *to identify* the difficulties faced by customers who purchase these devices and *to develop* more user-friendly products.

以下是另一個例子：

The experimental data confirm that the proposed method is *accurate* and *fast* algorithms based on this method can be implemented in practical applications.

這句相當容易誤導讀者。乍看之下，還以為作者的意思是自己的方法既準又快。作者應多加一個 *that*，使能突出句中的對稱結構：

The experimental data confirm *that* the proposed method is accurate and *that* fast algorithms based on this method can be implemented in practical applications.

對稱法不但可應用在句子中對等的概念，還可應用到段落中有對等關係的句子。對稱法應用到句與句之間，可讓段落中在內容和功能上相似的句子，以相似的文法結構標示出來。這樣的段落會更鮮明易讀。試參考這例：

On the front panel of the modem are seven control buttons and a row of LED indicators. An RS-232 connector, a line jack, a phone jack, and a power connector can be found on the rear panel.

這段的寫法有點笨拙，且很容易會把讀者搞糊塗。讀者會期待描述數據機背面板的第二句，與描述正面板的第一句在結構上對稱。所以，應把第二句改寫成與第一句對稱，這才明瞭通順。

*On the front panel of the modem are seven control buttons and a row of LED indicators. On the rear panel are an RS-232 connector, a line jack, a phone jack, and a power connector.*

下面是另一個例子：

The algorithm we have proposed is superior to the conventional algorithm in two ways. Our algorithm is much faster than the conventional algorithm, especially in applications with only a small number of parameters. And, particularly in applications involving large sets of data, the conventional method is more difficult to program than our method.

這段文章中，第三句的結構和第二句的不對稱，使段落不通順，尤以第三句更見笨拙難懂。作者在首句指出自己的新演算法有兩方面

比傳統的優勝，遂於第二句把新演算法和傳統的作對照，並舉例說明新的速度明顯較快。在看過第二句後，讀者會期待接著的第三句是兩演算法之間的另一個對照，還會期待它的結構會和第二句的對稱。爲了滿足這些期望，作者應把 *our method* 當作第三句的主詞，並把這主詞放到句首：

The algorithm we have proposed is superior to the conventional algorithm in two ways. *Our algorithm is much faster* than the conventional algorithm, especially in applications with only a small number of parameters. *Our method is also easier to program* than the conventional method, particularly in applications involving large sets of data.

修改後的段落，意思更明瞭合理，結構更見工整。

### 練習 7-3 對稱結構

請將下列對等的字詞、片語或子句改寫成對稱形式，並刪除贅詞。

1. We are developing a new memory product with large capacity, requires low power, and it has fast access speed.
2. My report discusses how to increase sales, how to improve quality, and developing new products.
3. The terms will either be a sequence of 1's or 0's.
4. In our latest work, we have prepared fiber with liquid crystal cladding, a measurement system has been set up, and theoretical formulas have been derived.
5. The selection criteria for government-funded R&D projects are the following:
  - A major technology essential to economic growth is developed
  - Requires substantial funding



- The project fills a gap in private firms' development plans
- 6. The new method is simpler and faster than the conventional method, and it has higher accuracy compared with the conventional method.
- 7. The indirect control method has two advantages: no need to install flux sensors and easy to use at low speeds.
- 8. When the principal point lies on the right side of the graph, the angular velocity is negative and the direction of the friction force is counterclockwise. The direction of the friction force is clockwise and the angular velocity is positive when the principal point lies on the left side of the graph.

## 7.5 善用對等與附屬結構

一個句子中所包含的概念，不一定都同等重要。除了主要意思的部分外，句中可能也有一些次要或補充的部分。在英文中，用來標示句中不同意思之間關係的文法結構有兩種：對等結構和附屬結構。對等結構 (coordinate construction) 用來表達相關而對等的意思；附屬結構 (subordinate construction) 則用來表達補充而次要的意思，即非句中的主要意思。句子的主要重點可用主要子句來表達，而次要且附屬的意思則可用附屬結構表達。

對等結構以對等連接詞、相關連接詞或連接副詞作連接而構成。對等連接詞 (*and, but, or, nor, so, yet, for*) 及相關連接詞 (*not only...but, either...or, both...and*) 是連接句子內對等的字詞、片語或子句的。至於連接副詞 (*however, therefore, nevertheless, consequently* 等等) 則用來表示兩個句子之間的對等關係。

以下是兩個對等結構的範例。在首句中，有三個以 *and* 連接的對等述詞。第二句中則有兩個以 *but* 連接的對等獨立子句。

The precipitate was *filtered* out of the solution, *dried*, and *weighed*.

*The substance was not soluble in water at room temperature, but it was soluble in water heated to 75° C.*

以上兩個例句中，以斜體字表示的都是對等的概念：首句所提到的三個步驟都同等重要，第二句敘述的那兩個事實也一樣重要。因此，這兩句都應寫成對等結構。

附屬結構是包括附屬子句、關係子句、同位語、分詞片語以及獨立片語。這種結構常用來表示因果關係（以 *because*, *since* 等字詞引介的附屬結構）、條件關係 (*if*, *unless*)、讓步關係 (*although*)、目的關係 (*in order to*, *so that*)、時間關係 (*after*, *before*, *when*, *while*) 或地點 (*where*)。附屬結構能清楚地表示出句中不同概念之間的關係，是造出簡明英文句子的重要工具。如能善用附屬結構，可有助突出句子的重點，並顯示出句中其餘的概念和重點的關係。

要瞭解附屬結構的重要，可參考下面這個段落。在這段落中，所有內容都以對等結構表達，沒有任何附屬結構。

The Vu Quang ox is a rare mammal, and it resembles cattle, goats, and antelope in different respects. The Vu Quang ox lives in an isolated, inaccessible region of Vietnam, and the existence of this species was unknown to scientists until 1992. A hunter captured a young female Vu Quang ox, and scientists recently obtained the first living specimen of this unusual animal.

這段文章的內容全都以對等形式表達，所以文中的句子皆缺乏清晰的焦點。此文章提供了許多信息，但信息之間的關係卻不清楚。第二句中，兩個子句之間的關係為何？第三句中，獵人所捕捉的動物和科學家獲得的動物是否為同一隻？若改用適當的附屬結構，文中概念之間的關係得以闡明，將有助讀者更易瞭解文意。

The Vu Quang ox is a rare mammal *that in different respects resembles cattle, goats, and antelope*. *Because the Vu Quang ox lives in an isolated, inaccessible region of Vietnam*, the existence of this species was unknown to scientists until 1992. Scientists recently obtained the first living specimen of this unusual animal *from a hunter who captured a young female Vu Quang ox*.

修改過後，文章通順得多，模糊之處都已澄清：第二句中，清晰顯示出兩個子句之間的因果關係，第一個子句是因，第二個子句是果。第三句則表明了，獵人捕捉了一隻動物，然後交了給科學家。

要寫出流暢自然的英文科技論文，必須學習適當使用對等結構與附屬結構。中國作者寫的英文文章中有一常犯錯誤：必須用附屬結構時，卻不使用。以下句子是兩個以連接詞 *and* 連接的對等子句：

The number of directions in each frequency contour is at most two, *and* we divide the contours into two sections.

兩個子句的關係不夠明瞭：句子的主要意思是甚麼？好像是 *we divide the contours into two sections*，而它與第一個子句之間的關係又似乎是因果關係：因為方向最多只有兩個，所以作者決定把每條線分成兩節。假設這個詮釋正確，作者應在句首加上附屬連接詞（如 *because* 或 *since*），使第一個子句附屬於第二個子句：

*Since* the number of directions in each frequency contour is at most two, we divide the contours into two sections.

下面的句子也沒有適當使用附屬結構：

The dynamic Coulomb friction between two sliding surfaces always opposes the direction of motion and is given by the following expression.

這句非常不自然。讀者可看出句中兩個動詞 (*opposes* 和 *is given*) 的意思並不對等：第一個動詞指科學的事實，第二個則指作者使用的某特定數學公式。再者，句中兩個對等動詞在文法結構上都受副詞 *always* 修飾，這有點荒謬。摩擦力怎樣「總是」以接著的方程式表示？（如果沒有物理學家，根本不會有任何方程式表示這摩擦力）。爲了把這句改得合理通順，應該將其中一個動詞併入一附屬結構。假設重點是可使用作者所介紹的方程式來表示摩擦力，此句應修改如下：

The dynamic Coulomb friction between two sliding surfaces, *which always opposes the direction of motion*, can be expressed by the following equation.

但如果重點是摩擦力的方向和動作的方向總是相反，則此句應改寫成：

The dynamic Coulomb friction between two sliding surfaces, *which can be expressed by the equation below*, always opposes the direction of motion.

The dynamic Coulomb friction between two sliding surfaces always opposes the direction of motion, *as shown in the equation below*.

在這個例子中，第一個修正句大概較能表達出作者原意。其實無論選擇哪個修正句，最重要是選出其中一個動詞來作句子的重點，並把另一個動詞併入關係子句中，使它附屬於這個重點。

## 練習 7-4 對等與附屬結構

請改寫下列句子和段落，以適切的附屬子句或片語來表達次要的意思。（提示：修改時可能需更改句子結構和標點符號，或修改、刪除、補充一些字詞。第 7、8 題中，斜體字是應改成附屬結構的部分。）

1. When designing practical controllers, one often encounters systems with uncertain parameters and these can be represented mathematically as follows.
2. This type of job dispatching balances the workload of the processors and is called dynamic load balancing.
3. The upper row displays eight icons, and users can assemble these into query graphs.
4. The results of the first trial were surprising, and we repeated the experiment using a new set of data.
5. Live-line workers approach their jobs with the care accorded lion training

and skydiving. *A significant electrostatic field surrounds a live power line for several tens of meters and increases in strength the nearer to the line, and a lineman's body is energized well before he touches the conductor. Within a meter or so, the field may be 20-30 kV less than the conductor's voltage. Despite that difference, a human body has a relatively small mass. The lineman contacts the line with his wand, and a current of no more than a few microamperes is induced in his body. That difference in voltage exists, however, and an arc will leap between conductor and wand as the lineman approaches the conductor. (Such sparks are not strong enough to be fatal. They can cause a brief loss of sensation in the hand.)*

6. The lineman's wand and steel-mesh suit prevent the spark from touching his body: the arc jumps from line to wand rather than to a gloved hand or finger, and the suit equalizes the charge across its surface. *The suit works on the principle of a Faraday cage. The lineman is bonded, and then contact is maintained through a short tie from suit to conductor, and the tie is called a bonding lead. The suit is required at voltages above 150 kV, and it also protects the lineman against the corona effect, the ionization of the air around a person's body. The ionization results in a distinct buzzing sound and a prickly sensation on protruding body parts such as the ears.*<sup>5</sup>

# 第八章

---

## 統一連貫的段落

第六章和第七章已介紹有關英文論文由字詞使用到句子結構的修辭原則，本章則進一步討論段落結構。

一個段落 (paragraph) 是由一些共同針對某一特定主題的句子所組成的。段落是文章的基本單位，因此想寫一篇好論文，便要從統一連貫、組織嚴謹的段落開始。如果一篇論文的段落組織緊湊，會讓研究人員易於閱讀，較易瞭解論文內容。

一個緊湊的段落通常有三個主要特性：

- **統一 (unity)**：一個段落應集中討論一個主題或重點，並應先在主題句中清楚點出，然後再詳細敘述或舉例說明。
- **連貫 (coherence)**：一個段落應有清楚的組織，段中的每個句子，都應支持段落的主題或主要論點。
- **發展 (development)**：一個段落必須包括一些例子、數據和解釋，來具體地闡述主題或主要論點，從而使讀者相信論點合情合理。

本章將討論兩個段落寫作之基本要點：主題句及段落組織。

## 8.1 主題句

主題句 (topic sentence) 通常是在段落的首句或首幾句。一個清晰具體的主題句大致有三個作用：

- 一、直接告訴讀者段落的重點或主題。
- 二、讓讀者能看出段落的內容與讀者的背景知識有何關聯。
- 三、可作為一背景脈絡，使段落中其他的句子，都能針對著一個重點展開討論或予以支持。

當讀到一個段落時，每個人都自然想儘快知道該段將會講甚麼，或是該內容與自己的背景知識有何關聯，故一個好的主題句應能滿足這些要求。同時，主題句也應能讓讀者在瀏覽文章時立即瞭解各段重點，以便決定哪些段落要仔細閱讀或略過。

科技論文的每個段落中都應該有主題句。主題句通常是在段首，但有時也會出現在別的位置。一般來說，主題句的位置可以有三種：

- 段落首句。科技論文的導論或「討論」(Discussion) 章節中的段落，常以主題句開首。
- 段落的首幾句。有時段首會以一個句子或子句來承接上文，而第二個子句或第二、三句才會是主題句。
- 段落末句。在科技研究報告的「結果」(Results) 章節中，作者經常會先陳述一些資料，然後再以歸納形式作結，因此會順理成章把歸納得來的結論放於段末。這個結論就是段落的主題句。

雖然並非每個段首都是主題句，但段落首句都應明白地指出：  
 (一) 段落的內容和作者的背景知識有何關聯。(二) 整段到底要表達甚麼。例如，下列是一篇論文的結果章節中某段落的首句：

The electrical characteristics of the six samples are shown in Table 2.

雖然這句並非該段落的主題句（在原文中，由表二的資料所歸納得來的結論，即主題句，其實是在段落的末句），但它告訴讀者這個

段落將會討論甚麼，同時也指出該段內容和前段的關聯。（在原文中，導論和「方法」(Method) 章節已交代過，論文目的在於探討不同環境下製造的樣本，其電子特性的差異。）

主題句不單要點明段落將會討論甚麼，還要提供具體的內容。舉個例說，假設某段落的首句是這樣的一個句子：

The structure of the system will be described now.

這是一個不妥當的主題句，因為內容太少。這句表示該段落將要描述一個系統的結構，但卻未真正提供有關這系統結構的任何信息。一個較妥當的主題句應是這樣的：

The system consists of two main parts.

這句不單指出將會描述一個系統，同時也確切地陳述有關這系統結構的一些信息。

儘管主題句非常重要，但有時仍然會給不少作者忘記。試看下列這個討論電腦程式語言缺點的段落：

Among the proposed object-oriented or object-based specification languages, the language of PROTOB incorporates standard programming languages to specify object behavior, and the language of OBSERV does not provide any mechanism for specifying inheritance relationships and system functions. The language proposed by Lee cannot specify classes and relationships between objects, and the language of ENVISAGER does not provide any mechanism for specifying system functions or a large-scale model partitioning structure.

這段沒有主題句，使段落的要義不明。作者清楚地述說了一些內容，但卻沒指出述說的目的，或這些內容所用作支持的論點。想修改這段落，必須找出它的主要論點，然後寫成一個主題句。在原文中，作者曾在這段落之前提出過良好的程式語言所應符合的條件。據此，我們可推斷這段落的主要論點是：作者所批評的語言中，沒有一個能滿足所有這些條件。故此，以這論點作為主題句的基礎非常恰當。下面以斜體字標示的便是主題句：

*None of the proposed object-oriented or object-based specification languages satisfies all of the criteria we have set forth. The language used*



in PROTOB relies on standard programming languages to specify object behavior; the language proposed by Lee cannot specify classes and relationships between objects. The language of OBSERV fails to provide a mechanism for specifying inheritance relationships and system functions, and the language used in ENVISAGER provides neither a mechanism for specifying system functions nor a large-scale model partitioning structure.

科技論文作者時會在同一個段落中陳述很多事實，有時這些事實彼此間表面上會出現矛盾，令人困惑。這時明確的主題句就特別重要。試看以下這個比較風力與化石燃料的段落：

Wind power is more expensive than energy generated from traditional sources such as fossil fuels. In general, energy produced by wind turbines costs more than twice as much as energy produced from natural gas, and it is also more expensive than energy produced from oil or coal. The technology for producing energy from wind is improving steadily, and the cost of wind-generated energy may soon be competitive with that of energy generated from fossil fuels, especially if the prices of fossil fuels rise. The earth's reserves of fossil fuels are limited and will one day be depleted, but wind is an infinitely renewable resource. Wind turbines are nonpolluting, and they can coexist with agriculture. In addition, energy sources such as oil and coal have hidden social costs, because they pollute the environment and, particularly in the case of coal, cause a variety of occupational illnesses. Wind power has no such hidden costs.

這段落的主要論點似乎是：雖然現今以風力產生能源，較其他自然資源昂貴，但仍有許多理由能證明風力是甚具潛力的資源。然而，作者並沒直接表示這論點，讀者只能從段落內容中推斷出來。更嚴重的，是段首兩句很易誤導讀者。乍看之下，這兩句像是與上述推斷出來的論點相牴觸。讀完首兩句，讀者可能會假設段落重點是指出風力的缺點，卻非肯定它的價值。由於這段落陳述了幾個表面上互相矛盾的事實，作者實在有必要在段落的開首加上明確的主題句，以便讀者掌握段意。以下是一個修改方法，以斜體標示的是主題句：

*Although wind power is currently more expensive than energy generated from traditional sources such as fossil fuels, it is a promising*

*source of energy for the future.* In general, energy produced by wind turbines costs more than twice as much as energy produced from natural gas, and it is also more expensive than energy produced from oil or coal. Yet the technology for producing energy from wind is improving steadily, and the cost of wind-generated energy may soon be competitive with that of energy generated from fossil fuels; especially if the prices of fossil fuels rise. Energy sources such as oil and coal have hidden social costs, because they pollute the environment and, particularly in the case of coal, cause a variety of occupational illnesses. Moreover, the earth's reserves of fossil fuels are limited and will one day be depleted. In contrast, wind power has no such hidden costs. Wind turbines are nonpolluting and can coexist with agriculture, and wind is an infinitely renewable resource.

加上明確的主題句之餘，段落也應重組，以闡明風力與傳統能源來源的對比。同時，作者也應該採用一些「信號」字眼 (*yet, although, in contrast*) 來闡明或強調某些概念之間的關係（有關「信號」字眼，詳見第九章 9.7 節）。在首句中，加上 *although* 這字眼尤其重要，它有助澄清一個轉折關係：雖然首個子句對風力的報告像是負面的，但段落對風力的整體評價仍屬正面。

## 練習 8-1 主題句

為下列段落選出最適當的主題句。（假設所選句子是該段的首句。）

1. The longer and deeper they stay below, the more of the gas dissolves in their blood. Eventually too much of it is driven into solution by the sea's greater-than-atmospheric pressure. Subsequently, if a diver returns to the surface without letting his body adjust to the lower pressure, the gas starts bubbling out of the blood and blocking circulation. This causes the bends, the effects of which can be permanently crippling or lethal. In essence, the deeper the dive from the surface, the shorter the stay on the bottom should be.<sup>1</sup>

主題句：

- (a) Divers must pay careful attention to the effects of nitrogen gas.
- (b) What ultimately limits divers' time under water is nitrogen gas.
- (c) One danger of deep-sea diving is the bends, a phenomenon caused

by nitrogen gas dissolved in divers' blood.

2. Jupiter's latitudinal bands, the zonal jet streams, and the long-lived oval spots were known before Voyager. The intense eddy activity at scales below the resolution of Earth-based telescopes was an important Voyager discovery that served to deepen the mystery surrounding the long-lived ovals and latitudinal bands. The 1800-km/hour winds of Saturn, three times faster than those of Jupiter, were another important discovery. The existence of latitudinal bands on Uranus, despite that planet's peculiar orientation, showed that planetary rotations, not energy sources, control the patterns of atmospheric circulation. Neptune was a surprise because its wind speeds were greater than any seen elsewhere in the solar system, despite its low solar energy input. The power per unit area that drives Neptune's Great Dark Spot, for example, is 5% of that which drives the Great Red Spot of Jupiter.<sup>2</sup>

主題句：

- (a) A major discovery due to the Voyager spacecraft was that the winds on Saturn are much faster than those on Jupiter.
  - (b) The two Voyager spacecraft have allowed us to compare characteristics of the outer planets in new ways.
  - (c) The two Voyager spacecraft revealed much about the dynamics of the atmospheres of the outer planets.
3. They must be longer, relative to the body, than the legs of most slower animals, yet they must oscillate very fast. They must also be relatively light, yet strong enough to deliver enormous thrust and to sustain tremendous loads. All of this must be done with sufficient economy of effort to provide endurance. It is evident that nature places greater demands on the mechanical design of horse legs than on the legs of most other animals, even including those of the faster but smaller cheetah.<sup>3</sup>

主題句：

- (a) The legs of a horse have a unique structure, unmatched in the animal world.
- (b) The horse's great running ability coupled with its large size places unusual demands on its legs.

- (c) In comparison with the legs of a cheetah, a horse's legs are longer, lighter, and stronger.

4. The tubular body of the leech is built of 32 similar segments and offers the possibility of understanding the entire animal by studying just one of its segments. Of the 32 segments the frontmost four make up the specialized structures of the head, including a pair of eyes on the dorsal, or upper surface and a front sucker on the ventral, or lower surface. The rearmost seven segments make up the specialized structures of the tail, including the anus and a large rear sucker. The anatomy of the intervening 21 mid-body segments is highly stereotyped. Each segment has a complete set of visceral organs, including circulatory vessels, kidneys, and gut. The skin of each segment is subdivided into a fixed number of annuli, or rings; the middle annulus bears an array of sensory organs distributed around the circumference of the body tube. The body wall of each segment is girded by circular muscles that can constrict the body tube. Deeper in the wall lie longitudinal muscles; their contraction shortens the body tube.<sup>4</sup>

主題句：

- (a) The leech's simple body plan makes it an attractive animal to the experimental biologist.
  - (b) The structure of the leech's body has been the subject of extensive study by biologists.
  - (c) The body of the leech is similar in structure to that of the earthworm, its close relative.
5. In a topping system (Fig. 1), electricity is delivered first, and the thermal power exhausted is captured for further use. In a bottoming system (Fig. 2), thermal energy is extracted from the heat source after it has been used in a process, and it is used to drive a turbine to generate electricity. Both types of systems vary in size and hardware, depending on the electrical and thermal needs of the user.<sup>5</sup>

主題句：

- (a) A bottoming system is usually more efficient than a topping system.
- (b) Both topping and bottoming systems have been used in many applications.

- (c) There are two basic types of cogeneration systems.
6. Algorithmic computing is ideal for accounting, aerodynamic and hydrodynamic modeling, and the like. Neural networks are ideal for pattern recognition, fuzzy knowledge processing, and adaptive control. Neurocomputers should not be used to balance checkbooks. Algorithmic computers should not be used to recognize speech. The two types of computing can be used together and can be integrated easily in hardware.<sup>6</sup>

主題句：

- (a) Both algorithmic computing and neurocomputing have many important applications.
- (b) Neural computing is unlikely to replace algorithmic computing.
- (c) Algorithmic computing and neurocomputing complement each other well.

## 8.2 段落組織

本章 8.1 節曾指出，一個緊湊的段落有三個基本特性：統一、聯貫和發展。要寫出統一聯貫的段落，首先要確定段落中有明確適當的主題句。接著是給予段落恰當的組織形式，這除了有助段落統一聯貫外，更可保證段落中包含足夠的內容，從而發展並支持主題句中所提出的論點。

修改段落時，要找出段落的組織形式，並評估該段主題是否明確且能獲得有力的支持。接著再看是否需要進一步修改，例如調動、合併、增加或刪除一些句子。

以下是科技寫作中最常用的一些段落組織形式。這些組織形式並不互相排斥，有時還可兩三個形式合用。例如，作者可列出一連串過程並同時比較其優劣點，或是依時間順序來描述一連串事件，並解釋事件之間的因果關係。

## 依時間順序

依照事件發生的先後次序來描述一連串事件，是依時間順序的組織形式。這種組織形式通常用於科技研究報告的方法章節，也常用於研究報告中文獻回顧的段落中。（以時間順序表達的段落，如實驗報告方法章節中的段落，有時只描述實驗步驟而不寫主題句。）

在依時間順序的段落中，定要用轉接詞和表示時間的用語，讀者才能清楚瞭解所描述事件之間的關係。可能使用到的時間用語包括 *afterwards, as soon as, at the same time, before, finally, first, immediately, later, next, second, soon, third, until, when* 以及 *while* 等。

以下是一個以時間順序來組織的例子。注意段落如何以表示時間用語和轉接詞（以斜體字標示）來闡明事件發生的先後次序：

Donor and control nests were located in two areas of north-central Florida where there are large numbers of nesting bald eagles. Aerial surveys *during the breeding seasons from 1985 to 1987* were initiated *prior to egg-laying (in October and November)* and repeated *approximately every week until nearly all the eggs hatched (mid-March)*. *From mid-March until the eaglets fledged*, surveys were conducted *approximately every two weeks* to monitor chronology and productivity at all nests. A total of 42 suitable donor nests were *eventually* located, and 87 eggs were removed *over three breeding seasons*. One egg-collecting trip was made *in 1985* and two *in 1986 and 1987*. Eggs were removed by climbers and *then* quickly dispatched to the research center.<sup>7</sup>

## 空間順序

依物件或景觀的空間結構來描述，是段落中空間順序的組織形式。它通常是按照一般人親身觀察時的順序描述，例如：從上到下、從前到後，或從左到右地描述物件的各部分。論文的方法章節或材料與方法 (Methods and Materials) 章節常會使用這種組織形式。描述物件之間關係的常用字有 *above, below, on the right, at the top, at the bottom, in the middle, in the center, at the top right (bottom right, top left, bottom left)* 等介系詞。

下面描述水底研究站的例子，就是用空間順序的組織形式。請

注意段落中的描述手法：先描述水底研究站的大致情形，再以合理的順序，描述研究站的每個部分——依照人們身臨其境時自然觀察的次序。以斜體標示的字詞皆有助闡明描述物件之間的關係。

In its final form, the underwater habitat weighs 73,500 kilograms and has three chambers (see Figure 3). Divers enter and leave the habitat *through a hole in the floor of a wet porch*. An entrance lock 2.4 meters long and 2.75 meters in diameter *connects the porch to the main lock, where scientists eat, sleep, relax, and do their desk work*. A tube 6.5 meters long with a 2.75-meter diameter, *it contains six bunks, a dining and work table, and a small kitchen*. Air, fresh water, and electricity flow *down into the habitat through umbilical pipes and cables from equipment on a 13-meter life support buoy anchored permanently overhead*.<sup>8</sup>

## 因果分析

要解釋某事發生的原因、過程或運作方式，進而預測即將發生的事，都可運用因果分析的段落組織形式。在解釋因果關係時，最好先說明原因再敘述結果，因為這樣會較簡潔自然。除非結果是句中的「舊」內容，才可能先說結果再說原因（有關這裏所指的先後次序，詳見第九章 9.1 節「先舊後新」）。

作因果分析時，必須用轉接詞和附屬子句來標示所描述的因果關係。這類的字詞包括 *accordingly, as a result, because, consequently, hence, if, since, so, then, therefore* 以及 *thus* 等。

以下段落便是因果分析之組織形式的例子。注意以斜體字表示的動詞和轉接詞，如何幫助闡明此段落中的因果關係。

The atomic structure of ceramics *gives* them a chemical stability that is manifested as imperviousness to environmental degradation, such as dissolution in solvents. Also, *because* many ceramics are composed of metal oxides, further oxidation (whether by combustion or by other chemical reaction) is often impossible. (In essence, a metal-oxide ceramic has already been “burned” or “corroded,” *so* the final ceramic object cannot be further subjected to either of these degradations.) The strength of the bonds in ceramics *endows* them with a high melting point, hardness, and stiffness. Unfortunately, this strength also *prevents* planes of atoms from sliding easily over one another; the material can-

not deform to relieve the stresses imposed by a load. *As a result*, ceramics maintain their shape admirably under stress until a certain threshold is exceeded; *then* the bonds suddenly give way and the material fails catastrophically. A further *consequence* of this brittleness is that ceramics can withstand compressive loads far better than they can withstand tensile or shear loads. Under compressive loads incipient cracks tend to be squeezed shut, whereas under tensile loads the crack surfaces tend to be pulled apart, further widening the cracks.<sup>9</sup>

## 邏輯論證

這種組織形式是因果分析的個例，它通常用以支持或反駁某種觀點、理論或解釋。在邏輯論證方式的段落中，常出現的轉接詞包括：*although, as a result, because, but, consequently, even though, for, hence, however, if, otherwise, since, so, then, therefore* 以及 *thus* 等。

以下段落是邏輯論證的例子。請注意以斜體字表示的轉接詞，如何幫助闡明段落中論證的結構。

Fission hypotheses, which assert that the material for the moon came from the earth's mantle, encounter two basic difficulties. The angular momentum of the earth-moon system, *although* large, is insufficient by a factor of about four to support rotational fission. There is no acceptable mechanism for removing the excess angular momentum following lunar formation. A second objection is even more telling. Fission models have become the most readily testable of all following the collection of lunar samples, *since* they predict that the chemistry of the moon should bear some recognizable signature of the terrestrial mantle. *However*, the moon contains 50% more iron than the earth's mantle and has distinctly different signatures of trace siderophile elements. The best estimates for the abundances of the refractory elements in the moon exceed those in the terrestrial mantle by 50%. *Even though* mechanisms for depleting the volatile elements can be incorporated into fission models, the enhancement of iron and the refractory elements cannot be accomplished by such means. The hypothesis *thus* fails the test of finding an identifiable chemical signature of the terrestrial mantle.<sup>10</sup>

## 比較與對照

科技論文的作者經常需要比較與對照不同的對象或現象。尤其是工程學論文的作者，更常需要比較和對照不同過程或方法的特性，進



而決定選用哪種方法，或要顯示出自己提出的新方法是怎樣優越。

在寫比較和對照的段落時，有兩點必須注意。首先，要用「信號」字眼來闡明比較和對照的目的或要義，例如：

The recognition rate of our program is 98.5%, and that of Smith's program is 92%.

上述兩種程式的辨識率皆已達百分之九十以上，讀者一般都會相信這兩種程式均相當有效。但現在假設另一種情況：在同類的程式中，只要辨識率是低於百分之九十五的，就已是毫無用處的。如果是這種情況的話，則那兩種程式之間就有很大的差別。上述句子並未能指出這要點，所以應修改為：

The recognition rate of our program is 98.5%, *whereas* that of Smith's program is *only* 92%.

在修改句中，附屬連接詞 *whereas* 和字詞 *only* 強調了作者的程式遠比斯密的程式有效，且這個性能的差別才是重點所在。

此外，如果要比較的兩件事物，有幾項特性（如製作過程的成本、效率、準確度、開發時間或簡易性等），則要避免每句交替且重複地說第一個事物是怎麼樣，第二個又是怎麼樣，這樣會十分生硬。要從某幾項特性去比較兩個事物，應先仔細將那些特性分組，然後一組一組來討論；或者可先舉出一項的所有優點，再談另外一項的優點，最後談兩者的缺點。

在比較和對照的段落中，用來顯示概念之間關係的轉接詞或其他用語有：*although, at the same time, but, by contrast, conversely, despite, however, in contrast, likewise, more, nevertheless, less, on the other hand, similarly, still, than, unlike, whereas, while, yet* 等。

以下段落就是用比較和對照的組織形式。請注意以斜體字標示的字詞，如何幫助闡明段落的對照。

Because of its large size, the running horse places more deflecting forces on its legs (in turning, or in stepping on angled surfaces) *than* do many smaller, slower animals. *Yet* its musculature, being adapted to function largely in one plane, is, if anything, *less* suited to stabilize the

joints. This animal *instead* employs mechanisms that are better suited for speed and endurance, because they are lighter than muscles and are passive—hence, free of energetic cost. For example, *whereas* the human wrist joint, being ellipsoid, allows motions in two planes of space, that of the horse is a hinge that turns only front and back. The joints between our palm bones (metacarpals) and finger bones likewise work in two planes (making a fist and spreading the fingers), *in contrast to* the corresponding joint of the horse, which again is a hinge. These hinges, and those at the elbow and heel—the horse’s hock (Fig. 2)—are strengthened against dislocation by having a flange on one member of the hinge that turns in a groove in the other (Fig. 3). Rotation of the forearm is prevented by fusion of the two bones there (radius and ulna). The head of the human thigh bone (femur) forms a large part of a nearly perfect sphere, and the hip joint is thus a ball and socket, allowing freedom of motion in all planes but requiring muscles to prevent unwanted sideways motions. *By contrast*, the head of a horse’s femur is a lesser part of a sphere, and is somewhat cylindrical on top (with axis transverse to the body), thus passively restraining motions that are not front and back.<sup>11</sup>

## 列舉法

列舉法也是科技寫作中常用的段落組織形式。這種方式通常出現在研究報告的導論，用來回顧相關的研究著作。列舉法有時也會用在報告的材料 (Materials) 章節，以描述某項實驗所用到的材料類型。在使用列舉法的段落中，所列出的每個項目都應該用對稱結構來表達（如果所列項目很多，則可分組，而每組中的各項目仍須以對稱結構來表達）。此外，用列舉法的段落必須以明確的主題句開首，也就是在列舉之前，先說明列出項目的原因。

在使用列舉法的段落中經常出現的轉接詞包括：*also, and, and then, equally important, finally, first, further, furthermore, in addition, last, likewise, moreover, next, second, similarly, third, too* 等。

請注意以下段落如何以斜體標示的字詞來強調各列舉項目。

A variety of interrelated reasons have contributed to problems with the accuracy of radar speed readings. *First*, the police radar industry is highly competitive and has been growing rapidly. Because of this competition and the fact that most operators are technically unknowledge-

able, a number of “convenience” features of dubious merit have been introduced to help sell equipment. *Second*, operator training has been left, by default, in the hands of equipment manufacturers, and no standards for operator training have been established. The equipment manufacturers, by and large, have instructed operators, or instructors of operators, in the nominal setup and use of the radar, but have fallen short on explaining equipment shortcomings. *Third*, there are no standards for equipment performance except for the Federal Communication Commission’s frequency and power output requirements and licensing procedures. But this simple license has itself led to serious misconceptions among some equipment users, since the FCC is concerned only with a small portion of the equipment and not with the accuracy and performance of the complete device. *Finally*, there are no standards for the calibration or maintenance of the equipment.<sup>12</sup>

### 由概括到個別描述

如果作者在一段首已提出一個概括的論點，然後再列出一些具體事項來支持，這種組織手法便是由概括到個別描述。在這類段落中，句子的描述範圍會隨著段落的發展而漸漸縮小，在科技論文中十分常見。

例如，以下段落的首句表示了一個概括的論點：「地球—月球」系統在太陽系中是相當獨特的，接著再指出一些該系統具有的特質來支持首句的論點。

The earth-moon system is unmatched among the inner, or terrestrial, planets. Neither Venus, close in size to the earth, nor Mercury has a moon, while Phobos and Deimos, the two moons of Mars, are probably tiny captured asteroids, with primitive compositions. The satellites of the outer planets are mostly ice-rock mixtures. The orbit of the moon about the earth is neither in the equatorial plane of the earth nor in the plan of the ecliptic, but is inclined at  $5.1^\circ$  to the latter, and the angular momentum of the earth-moon system is anomalously high compared to that of the other planets.<sup>13</sup>

在某些段落中，由概括到個別描述還可能會與歸納法（歸納法即由個別到概括描述）合用。即是說，會先作概括論述，遂提出具體事項來支持，最後再以另一概述結尾，扼要說明全段重點或結論。

## 歸納法

在科技論文中結果章節和討論章節中，有時會使用歸納法。使用這種形式時，作者應先提出一些資料，然後討論這些資料的涵意，最後再推出一個或多個結論。在這種類型的段落中，句子的描述範圍會隨著段落的發展漸漸擴大。還有，段中末句可能會以這些字詞開始：*in conclusion, in short, in summary, on the whole, to conclude, to summarize, to sum up* 等。

下列段落節錄自一篇論文的結果章節，而這段就採用了歸納法。段落的前六句指出了實驗工作的結果，最後兩句便扼要說明這些結果，並從中推出結論。請注意這段使用了 *to summarize* 這轉接詞來帶出歸納的結果。

For the first set of 10 odorants, including the brand names, the number of correct responses ranged from 1 to 9, with a mean of 4.4, or 44%, and a standard deviation of 1.9. The mean number of correct responses for the five brand names was 2.4, with a standard deviation of 1.3. The mean for the five other odorants was 2.1, with a standard deviation of 1.2. For the scratch-and-sniff experiment with 13 odorants, the number of correct responses ranged from 1 to 8, with a mean of 4.2, or 32%. In both experiments, women were significantly more successful than men in identifying the odors, with a mean number of correct responses of 4.9 versus 4.1 for men in the first experiment and 4.9 versus 3.8 for men in the second. Regarding differences between odors, the percentage of correct identification ranged from 27% for rose to 75% for bubble gum in the first experiment and from 0% for musk to 83% for licorice in the second experiment. *To summarize*, although there are individual differences, people are not good at naming even very familiar odors. The main point is that, on the average, fewer than half of the odors were correctly named, even with a liberal scoring system.<sup>14</sup>

## 分類法

分類法是用來描述可分為不同種類的物件，或可把某些類別的事物細分為一些次類別。這種方式常用於論文的文獻回顧或討論章節。如果需要討論的資料相當多，可先將討論對象分組，然後再逐組討論，並比較每組裏的項與項或是組與組本身的特性。

下列的段落所用的是分類法。作者先說明高能雷射可分為兩類及分類的基準，然後再描述這兩大類別下的次類別。

It is becoming common to speak of two classes of high-power lasers, light and heavy. The classification depends mainly on the power. Light lasers operate in the range from a few tens of watts to a few hundred. Many of these lasers are fairly small solid-state devices: ruby lasers (with a wavelength of 0.69 micrometers), neodymium-doped glass lasers, and neodymium-doped yttrium aluminum garnet lasers (both with a wavelength of 1.06 micrometers in the infrared). Ruby and neodymium-doped glass lasers are usually operated in the pulsed mode; neodymium-doped yttrium aluminum garnet lasers can be operated either in the continuous-wave mode or in the pulsed mode. The light class of lasers also includes certain gas lasers (argon and carbon dioxide), which are operated mostly in the continuous-wave mode. The heavy lasers range in power from a few kilowatts to a few tens of kilowatts. At present, however, only experimental or laboratory devices exceed 20 kilowatts. Most of the heavy lasers are carbon dioxide lasers operating in the continuous mode.<sup>15</sup>

## 定義

當作者需要為一個複雜精密的概念或過程下定義時，通常會作一種延伸且仔細的定義。在這種段落中，作者可能會先下一個概略的定義，再說明定義中所提到的概念，或是進一步補充要定義的概念的一些相關細節。作者也可能先概述要定義的概念，接著用列舉法、比較與對照或其他的技巧來描述此概念的其他面向。

以下的段落為陶瓷作了詳細的定義。段落先提出一個概略的定義，然後再補充說明有關陶瓷的一些資料，並列出陶瓷的類型及其應用。這些細節對不熟悉化學的人很重要，因為他們大概不會瞭解首句中那概略的定義。

Materials scientists generally define ceramics as including all solid materials that are neither metals nor polymers (although they may contain metallic and polymeric elements as constituents or additives). Ceramics can be fabricated from a wide variety of raw materials other than clay (some of which are not found in nature), and they come in a wide variety of forms: glasses, crystallized glasses, monolithic crystals, conglomerations of small crystals and combinations of these. They serve as

abrasives and cutting tools, as heat shields and electrical insulators, and as lasing crystals, nuclear fuels, and artificial bone implants. The diverse applications of ceramics make them not only common materials but also indispensable ones in modern society.<sup>16</sup>

想寫出統一聯貫、結構嚴謹的段落，論文作者必須細心檢查草稿，找出與段落不聯貫或不通順的句子，然後不斷修改、調動或省略一些句子，以及修改或重組段落。

## 練習 8-2 段落組織

請指出下列段落所用的組織形式。

1. Perceptions of odors and colors operate according to different principles. Colors involve a lexical system which is organized in memory in a relatively abstract and rigidly controlled way. By contrast, odor perception is characterized by flexibility and adaptability, and a relatively concrete but open-ended nonverbal coding system. This manner of organization in turn affects odor memory. What is stored about odors is not likely to involve semantic categories which can be used to retrieve odors. Rather, odor memory involves perceptually unitary episodes described in an idiosyncratic lexicon (Engen 1982). Because the odor is an integral part of the episode, what is stored in memory is not interfered with or even forgotten through frequent experience with similar names or closely related sensory information. Another important difference between odor and color lies in the direction of association between a name and a stimulus. Once one has presented a color chip and had a subject name it, the subject can conjure up a mental image of the color of the chip when the name is subsequently presented (Dorcus 1932). But in odor perception there is no such reciprocity: while perception of an odor may elicit an associated name, such a name cannot be used later to bring back the original odor perception. The strength of the association is weak from odor to name and nearly zero from name to odor.<sup>17</sup>
2. The result of this analysis is shown in Fig. 7. The left-hand curve is  $d\bar{u}/dy$ , and the center and right-hand curves are  $r(u', v')$  from Voyager 1 and Voyager 2, respectively. Here  $r(u', v')$  is the correlation coefficient,  $\bar{u}\bar{v}'$  divided by standard deviations of  $u'$  and  $v'$  for the latitude. For the

planet as a whole the standard deviations of  $u'$  and  $v'$  are 10 and 6, respectively. Figure 7 shows that the correlation coefficients are of order 0.3 and that the sign of  $r(u', v')$  tends to be the same as that of  $d\bar{u}/dy$ . The implied rate of energy transfer is enough to double the kinetic energy of the zonal jets in 75 days. If such transfers are occurring over a layer 2.5 bars deep, the transfer rate is  $2.3 \text{ W/m}^2$ , or 15% of the total thermal energy flux at Jupiter. For Earth, the same term in the mechanical energy cycle is only 0.1% of the total thermal flux. Either Jupiter is much more efficient than Earth in converting thermal energy to mechanical energy, or else the measurements are misleading.<sup>18</sup>

3. The solar water heater used in the experiment is shown in Figure 2. At the top left of the water heater is a cold-water inlet, where water flows into the apparatus. The main portion of the heater consists of many coils of plastic pipe connected together in an accordion fashion and covered with a sheet of heat-absorbing plastic. The water flows through the pipes, absorbing heat from the sun, and then exits the heating apparatus through the outlet at the lower right of the heater. From the outlet the water flows into an insulated storage tank in the basement of the house, from which hot water is drawn when needed.
4. What is a transform? Think of a function  $f(x)$ , for example,  $\exp(-|x|)$ , on which some explicit operation  $T$  is carried out, leading to another function  $T\{f(x)\}$ . Call this other function  $F()$ . We say that  $F()$  is the such-and-such transform of the function  $f()$  that we first thought of. The symbols for the independent variables are deliberately omitted in order to focus attention on the idea that the function shape  $F()$  derives from the original shape  $f()$ , not from either the value of the independent variable or its identity. With the Fourier transform, the operation  $T$  is as follows. "Multiply the function  $f(x)$  by  $\exp(-i2\pi sx)$ , where  $s$  is the transform variable, and integrate with respect to  $x$  from  $-\infty$  to  $\infty$ ." Applying this operation to  $f(x) = \exp(-|x|)$ , we find that  $T\{f(x)\} = F(s) = 2/[1 + (2\pi s)^2]$ , which is the Fourier transform of  $\exp(-|x|)$ .<sup>19</sup>
5. The intensity and frequency of earthquakes can be measured by means of seismometers. A seismometer consists of a mass suspended by a spring or other elastic mechanism inside a metal frame that is anchored to the ground. A magnet is attached to the mass and an electric coil to the frame. Any vi-

bration of the ground shakes the seismometer's frame, but inertia tends to hold the mass in its place. Thus the coil on the frame moves in relation to the magnet on the mass, and this movement generates an electrical signal that represents the intensity and frequency of the movement.<sup>20</sup>

6. The silicon substrates were prepared for diamond deposition as follows. First, p-type or n-type silicon wafers were chemically cleaned and the nucleation sites were patterned with  $\text{SiO}_2$ . Next, ultrasonic agitation was performed for various lengths of time in water containing diamond powder with a grain size of 1 to 2  $\mu\text{m}$ . Acetone and HF were then used to remove the  $\text{SiO}_2$  pattern. Finally, the substrates were dipped into a solution of  $\text{HF}:\text{HNO}_3:\text{H}_2\text{O}$  (1:1.1:10) for various lengths of time to increase the selectivity during the second stage of diamond growth.<sup>21</sup>
7. The search for extraterrestrial intelligence has already been productive in several respects. It has contributed to the development of new technologies, such as the 8.4 million channel spectrometer developed for the META program at Harvard. It has prompted members of the scientific community to think deeply about basic questions regarding the probability of the emergence of planetary systems, life, intelligence, and technological civilizations. It has also posed fundamental questions about the further development of our own civilization. What are the relative likelihoods of our alternative futures: annihilation, planet-bound stagnation, or continued growth and expansion into the galaxy?<sup>22</sup>
8. The amount of  $\text{H}_2\text{O}$  added to the immersing solution used in liquid phase deposition affects the concentration of fluorine in the resulting silicon oxide. Specifically, a decrease in the quantity of  $\text{H}_2\text{O}$  per 100 ml of immersing solution results in a linear increase in the fluorine concentration. It appears that as the quantity of  $\text{H}_2\text{O}$  in the immersing solution decreases, the concentration of HF increases. This increased HF concentration causes the Si-OH on the substrate to be subject to HF attack, with the result that more fluorine is incorporated into the LPD oxide.<sup>23</sup>
9. The popular stereotype of jackals as skulking scavengers with base and reprehensible behavior is belied, as is so often the case, by long-term observations. Jackals are one of the few species of mammals in which males and females form long-term pair-bonds, often lasting a lifetime. They hunt together, share food, groom each other, jointly defend their territory, and



provision and defend their pups together (Fig. 1). Some of the pups stay with their parents and at the age of one year help raise the next litter, their full brothers and sisters.<sup>24</sup>

10. Speculation inspired by Hart's paper led to the formation of the N=1 school, researchers arguing for the uniqueness of our own technological civilization. Several scientists asserted that the creation of life is highly unlikely because of the exceedingly small probabilities for the random assembly of polypeptide sequences (e.g., Monod 1971 and Shklovskii 1978). More recent research on problems of chemical evolution relating to the origin of life, however, tends to argue in the opposite direction. For example, it has been demonstrated that the coupling of autocatalytic cycles ("hypercycles") could well produce self-replicating macromolecules in relatively short times, rather than the billions of years that would be required by random assembly (Field 1985). Similarly, the phenomenon of RNA catalyzing its own synthesis (see Lewin 1986) supports the idea that the appearance of life may not be particularly unlikely. Shapiro (1986) has explored this complex debate in greater detail. In any case, fossil evidence (stromatolites) indicates that life appeared fairly quickly on earth within one billion years of its formation, perhaps as soon as meteoric bombardment of the primordial crust had subsided.<sup>25</sup>

11. 在練習 8-1 中，請指出每個段落所用的組織形式。

# 第九章

---

## 易讀的論文

本章將提出一些基本寫作準則，有助科技論文作者寫出較易閱讀的英語論文。第六章和第七章所介紹的，是標準英文作文遣詞造句的基本規則；本章則集中討論如何鋪排英文句子與段落的内容，令文章更易讀。

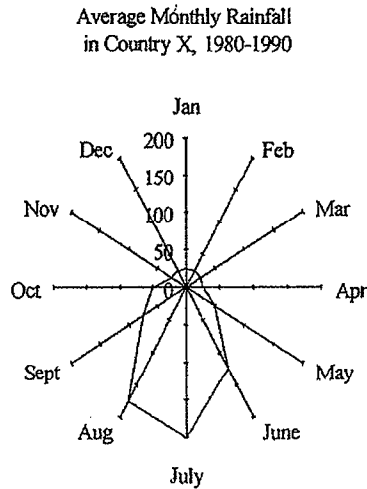
本章所介紹的是一般的「準則」，而非必須固守的嚴格「規則」。在某些特殊情形下，違反這些準則或許更能寫出簡潔的句子。此外，這些準則偶爾可能會互相衝突，此時作者必須自行取捨。但一般而言，撰寫論文的作者只要遵循這些準則，便可寫出較連貫流暢的文章。

### 結構與內容

本章介紹的準則，皆出於一個基本的假定：文章的表達結構，經常影響讀者對文章內容的理解。換言之，句子與段落的結構，會增進或阻礙讀者對論文內容的理解。因此，作者在鋪排句子與段落內容時，應以讀者較易理解的先後次序為依歸。本章將提出幾個準則，

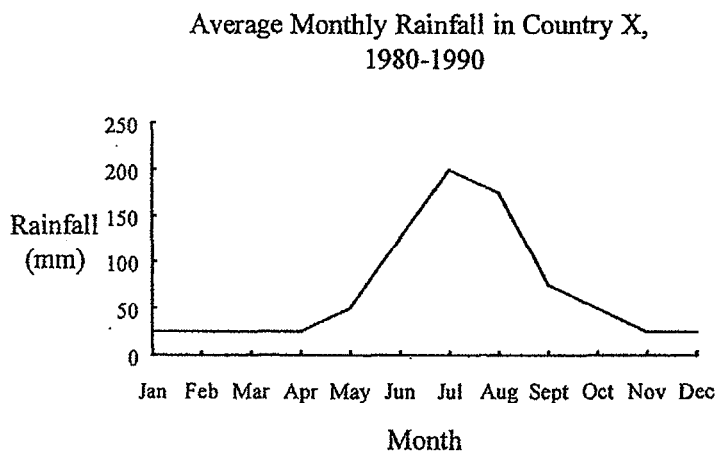
望能指導科技論文的作者達到這目的。這些準則共同的基礎是信息的表達應符合「讀者的期望」(reader expectations)。只要句子與段落遵循這些準則，便能滿足讀者的期望，從而令文章更易讀。

舉個簡單的例子，便可說明信息的「結構」如何影響讀者對信息的領悟，以及「結構」與「讀者的期望」的關係。假設我們打算前往異國旅行，希望旅行時能享受到明媚的風光和怡人的天氣，所以要避開雨季。我們遂瀏覽該國旅遊局的網站，查看當地各月的平均雨量。網站提供很多旅遊資料，其中包括下列圖表：



這個圖表已提供我們所需的資料，但是讀這圖表卻非常吃力。它表達資料的方式既不自然，又不清楚。因此，我們把圖表上的資料抄寫在筆記本上：十二月和十一月的雨量大約各為 25 公釐；十月的為 50 公釐；九月為 75 公釐；八月為 175 公釐；七月為 200 公釐；六月為 125 公釐；五月為 50 公釐；至於四月到一月大約各為 25 公釐。接著我們重畫了另一個圖表。因為我們想知道每月雨

量變化的情形，所以把月份畫在 x 座標上，雨量畫在 y 座標上，結果如下：



修改後的圖表一目瞭然，當地雨季顯然是從五、六月開始，七月達高峰，而於九、十月結束。

兩個圖表包含的資料相同，但為何第二個圖表較易閱讀？這就是因為它顯示資料的結構較符合讀者的期望。讀者會希望圖表的自變數畫在 x 座標上，而修改後的圖表正是如此：我們把自變數（即時間）畫在 x 座標上，並把因變數（即雨量）畫在 y 座標上。此外，讀者也會希望圖表中的資料是從左往右排列，因為易於閱讀與瞭解。修改後的圖表也滿足了這期望：只要從左往右讀，立刻就可看出 X 國每年雨季及乾季的周期。相反，原來圖表的結構，卻與一般讀者的期望相反，因此難以理解。

由上面的例子可以看出：使用符合讀者期望的表達方式，可以使讀者更易瞭解所要表達的內容。反之，使用間接而違反直覺的表達方式，即使是很簡單的內容，也會變得難以瞭解。因此，撰寫科技研究報告時，作者應使用可滿足讀者期望的結構來表達，以便讀者更容易瞭解文章內容。簡單來說，應把讀者希望看到的內容放在讀者希望看到的地方。下面幾個準則就是以這概念作為主要的理論

基礎。

## 9.1 先舊後新

讀者閱讀科技論文時，自然想儘快掌握一個新的句子和讀過的句子之間的關聯。爲了滿足這需求，作者可採用下列技巧：首先重複一些「舊」內容（即已提過的內容），然後才提出「新」內容。這樣不僅可清楚交待句子和前文內容的關係，還可交待句中的新內容在整個段落脈絡中的角色。此外，在英文中，讀者傾向於強調處於句尾的字詞。作者應明白這閱讀習慣，把希望讀者注意的新內容放在句尾。

舉個例說，下面這個段落摘錄自一篇科技管理研究報告。請從頭到尾閱讀一遍，但不要重讀，然後再自問：要瞭解這段需付出多少心力。

There is often a significant learning cost involved in transferring a new technology from the R&D stage to the production stage. Frequently, investment by the research institute that developed the technology will defray part of this cost. Private industry will probably show little interest in finding commercial applications for a new technology if such investment is unavailable.

大多數讀者都會覺得要把這個段落讀懂，需要付出相當大的心力，也覺得它「不夠流暢」。由於第二、三句與第一句的關係不夠清楚，所以閱讀每一句時，必先記下一大堆資料才能瞭解句意。

只要檢查這個段落內容的排列順序，馬上就能瞭解它難讀的原因。試把每句裏的名詞片語都當是一個資料「項目」。我們便會發現，段落首句已提到兩個主要的資料「項目」：「學習成本」和「從研發階段到生產階段的技術移轉」。在看完首句後，我們自然希望進一步認識這兩個資料「項目」，但第二句卻讓我們的期望落空。作者先提到一個新的資料「項目」（即研究機構的投資），並強迫我們一直讀到第二句句尾，才終於提到“this cost”。接著當讀到第三句時，期望又再次落空。因爲在讀完第二句後，我們希望馬上

可以對學習成本或研究機構的投資認識更多。然而，第三句的首個名詞片語卻又是另一個新的資料「項目」——“private industry”，我們還是必須多讀十六個字詞，才能讀到期待已久的“such investment”，這正是第三句應進一步解釋的資料「項目」之一。

當開始讀一個句子的時候，我們總希望知道該句和前面提過的資料「項目」（即「舊」內容）有何關係。以上面段落為例，斜體字表示了第二和第三句中的「舊」內容：

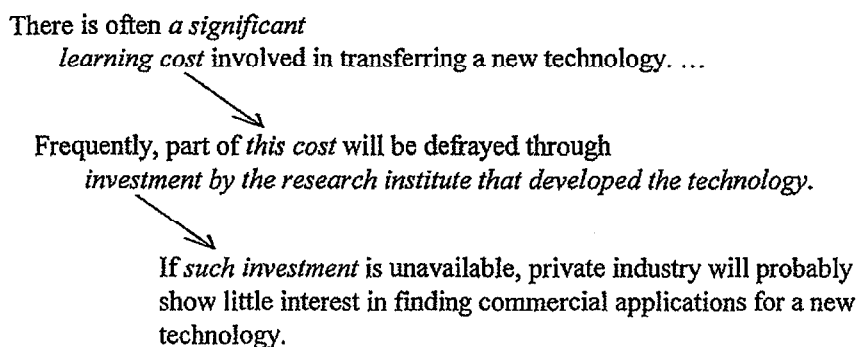
There is often a significant learning cost involved in transferring a new technology from the R&D stage to the production stage. Frequently, investment by the research institute that developed the technology will defray part of *this cost*. Private industry will probably show little interest in finding commercial applications for a new technology if *such investment* is unavailable.

這個段落難讀的原因，在於第二和第三句中的「舊」內容都在句尾，並且是在「新」內容之後。要這個段落較易讀，必須重寫這兩句，並將「舊」內容（即第二句中的 *this cost* 和第三句中的 *such investment*）置於「新」內容的前面。以下是一種修改方式（「舊」內容以斜體字標示）：

There is often a significant learning cost involved in transferring a new technology from the R&D stage to the production stage. Frequently, part of *this cost* will be defrayed through investment by the research institute that developed the technology. If *such investment* is unavailable, private industry will probably show little interest in finding commercial applications for a new technology.

修改後的段落通順易讀，只要看它的內容排列方式，就會瞭解原因所在。與閱讀原文一樣，看完首句後，我們希望馬上可進一步認識「學習成本」或「從研發階段到生產階段的技術移轉」。修改後便能滿足讀者這個期望，因為第二句句首便提到「學習成本」。在開始閱讀第三句時，我們希望能多瞭解「學習成本」或「研究機構的投資」，而修改後句首又馬上提供相關內容：「研究機構的投資」。

再以修正後的段落中的三個句子為例。斜體字表示句中的舊和新內容，也是三個句子相關的關鍵。請注意這些以斜體字標示的名詞片語如何像吊鉤一樣，把三個句子連在一起。



提到「舊」內容可以有許多不同方式。其中一種是直接重複前文的名詞片語，但這常會造出冗贅的句子。因此，大多數作者在提到舊內容時，不是用代名詞（如“it”或“this”）來指稱曾經提過的名詞片語，就是把原來的名詞片語稍作變形或縮短。例如，在以上段落的首句中，名詞片語 *a significant learning cost* 在第二句中縮短為 *this cost*。至於第二句中的名詞片語 *investment by the research institute that developed the technology*，在第三句中則縮短為 *such investment*。

這個「先舊後新」的原則，並非表示句首定要為舊內容的字詞（在很多句子中，要做到這點是不可能的）。這準則是要強調，科技論文作者應該養成習慣，在介紹讀者未知的新資料之前，應先提到一些曾經討論的相關舊資料。（但請注意「先舊後新」的原則有時並不適用於新段落中的首句，因為首句可能只會包含新內容。）

先重複曾經提過的內容，建立一個能讓讀者輕鬆進入的脈絡，是有效溝通的基本原則。然而，為何有這麼多作者（如本節開首的段落）違反「先舊後新」這個準則呢？這大概由於這準則和作者於寫作時的心態恰好背道而馳。在撰寫論文初稿時，作者會急於表達新的內容，或想儘快把它記下來。因為新內容特別顯眼，亦可能是因作者怕會忘記或遺漏任何重點。故此，在撰寫初稿時難以遵守

「先舊後新」，是很自然的。但在初稿完成後，作者必須特別檢查文章中的句子有否遵循這準則，看應否作出修改。

## 9.2 主題作主詞

把舊內容放在新內容之前，是鋪排句中內容時的首要準則。然而，如果句中包含二個或以上的舊資料項目，則作者必須決定以哪個項目作句子的主詞。作者在決定時，仍是應以考慮讀者的期望為依歸。讀者總希望作者會針對某個特定的主題作聯貫的討論，而句子的主詞就是討論的主題。在這種情況下，作者應挑出實際討論的焦點，並把這焦點作主詞。

試參考這個段落：

The algorithm we have proposed is superior to the conventional algorithm in two ways. Our algorithm is much faster than the conventional algorithm, especially in applications with only a small number of parameters. And, particularly in applications involving large sets of data, the conventional method is more difficult to program than our method.

讀者自然會假定句子的主題就是句中的主詞。因此，這段首句的主題是“the algorithm we have proposed”。這個句子指出，新演算法有兩方面比傳統演算法優勝。第二句的主題也是新演算法，此句則闡明了新演算法較優勝的一個面向。然而，第三句卻有一個問題，這句不僅出現了兩個舊資料項目：“the conventional method”及“our method”。而且由於前者是句子主詞，表面看來它是討論的主題。但事實上，段落討論的焦點並非為「傳統演算法」，而是比它優勝的新演算法。因此，作者應在第三句中，把真正的討論焦點「新演算法」當作句子主詞，同時把新演算法（即舊的內容）置於演算法的應用（即新內容）之前：

The algorithm we have proposed is superior to the conventional algorithm in two ways. *Our algorithm* is much faster than the conventional algorithm, especially in applications with only a small number of parameters. *Our method* is also easier to program than the conven-



tional method, particularly in applications involving large sets of data.

讀者讀到第三句時，會期望以「新演算法」為討論的主題，並希望能進一步瞭解「新演算法」。因此，只要把“our method”當作第三句的主詞，就可以滿足讀者的期望。此外，在修改後的段落中，第二和第三句亦改寫成一對稱結構，加強了段落的整體結構。

### 9.3 被動語態

在第六章 6.5 節中曾經奉勸科技論文作者不要濫用被動語態，但同時亦指出一項事實：資深作者大約會使用 25% 的被動語態句子，被動語態顯然是英文寫作中的重要部分。

甚麼時候應使用被動語態呢？在此可以提供兩個判準，它們便是 9.1 節和 9.2 節中的寫作準則：如果唯有使用被動語態才能遵循「先舊後新」或「主題應作主詞」這兩個準則，則科技論文作者就有很好的理由使用被動語態。試回想在 9.1 節中一段修改過的段落：

There is often a significant learning cost involved in transferring a new technology from the R&D stage to the production stage. Frequently, part of this cost *will be defrayed* through investment by the research institute that developed the technology. If such investment is unavailable, private industry will probably show little interest in finding commercial applications for a new technology.

段中第二句是被動語態，而被動動詞為 *will be defrayed*。此句使用被動語態是恰當的，因為這能使句子符合「先舊後新」的準則。這句的舊內容是 *this cost*，新內容則是 *investment by the research institute*。如果把句子改成主動語態，則句子就會變成「先新後舊」：

Frequently, *investment by the research institute* that developed the technology *will defray* part of *this cost*.

因此這句使用被動語態，比主動語態要來得好。

濫用被動語態，會使文章生硬冗長。但如果作者使用被動語態，是為了遵循 9.1 節和 9.2 節的寫作準則，則這反而會使文章更

易讀。

## 9.4 先短後長

英文科技寫作中常出現這類不通順的句子：主詞是很長的名詞片語，再接著很短的動詞片語。閱讀這種結構的句子，會讓人非常傷神。。如果論文中出現很多這種句子，定會使讀者吃不消：

In this paper, the molecular director configuration of a closed cylinder of liquid crystal (CCLC) with negative dielectric anisotropy in an external field is studied.

閱讀這句時，需要消耗許多短暫記憶力，令人難以消化句意。人類的短期記憶力只能在一段時間內保有一小部分的新資訊（僅約五到九項）。如果一個字詞是一項資訊，則可以說：能在句子或子句約前九個字詞中，就可看到主要部分（至少主詞和動詞），最易會讓人掌握到句意。瞭解「九個字詞」這限制後，再看以上的例句。例句強迫我們在從頭到尾看完整整共二十四個字詞後，才可看到句子的主詞和主要動詞，知道主角是誰和在發生甚麼事情。在還未弄清句子是描述甚麼行為之前，我們就已經被迫接收一大堆資訊。

科技論文中，句子超過九個字詞是很正常的。但作者亦絕不可忽略讀者的需要：儘快看到句子的主角及其行為。因此，作者應把主要的文法單元（至少主詞和動詞）放在句子的開首。要達到這目的，可用以下方法：把「短」片語放在「長」片語前面，如果句子包含一個以上的子句，則在子句中亦是先放「短」片語。讀者通常會逐一消化句中的所有子句，所以只要每個子句都是「先短後長」，即使到第二或第三個子句才出現主詞和主要動詞，整句仍會順暢易讀。

參考下面的段落，便可瞭解「先短後長」的重要：

Based on the Cholesky decomposition of the Gram matrix formed by successively received data vectors, a new fast recursive least-squares algorithm in transversal filter form is derived. Related issues such as sensitivity to the finite precision effect, numerical stabilization methods,

and initialization considerations are also addressed.

段落中的兩個句子都是「先長後短」結構。首句是一個很長的分詞片語，再接著一個很長的名詞片語（“a new fast recursive least-squares algorithm in transversal filter form”）和一個很短的動詞片語（“is derived”）。同樣，第二句也有一個很長的名詞片語（“related issues such as sensitivity to the finite precision effect, numerical stabilization methods, and initialization considerations”），其後接著一個很短的動詞片語（“are also addressed”）。

要用「先短後長」的準則來修改這類句子，便應把每句中的動詞放在長的名詞片語前面。同時，也可以把句子從被動語態變成主動語態。以下有兩個修改方法。多數讀者都會覺得這些修正句較易解讀（在修正句中，每個子句的主詞和動詞皆以斜體字標示）。

*This paper presents a new, fast recursive least-squares algorithm in transversal filter form; the algorithm is based on the Cholesky decomposition of the Gram matrix formed by successively received data vectors. The paper also addresses related issues such as sensitivity to the finite precision effect, numerical stabilization methods, and initialization considerations.*

*We employ the Cholesky decomposition of the Gram matrix formed by successively received data vectors to derive a new, fast recursive least-squares algorithm in transversal filter form. We also address related issues such as sensitivity to the finite precision effect, numerical stabilization methods, and initialization considerations.*

即使要保留被動語態，仍可用「先短後長」的準則來修改。首先，把原文中放在首句句首的長片語調到句尾。接著可把第二句句首的名詞片語分成兩部分，並把這片語中較長的部分調到句尾（每個子句的主詞和動詞皆以斜體字標示）：

*A new, fast recursive least-squares algorithm in transversal filter form is derived by applying the Cholesky decomposition of the Gram matrix formed by successively received data vectors. Related issues are also addressed, including sensitivity to the finite precision effect, numerical stabilization methods, and initialization considerations.*

修改後，段落的首句並沒違反「先短後長」這準則，因為句中放在動詞前面的名詞片語，遠比動詞後面的片語短。

以上三個修改過的段落都比原來的好，至於採用哪一個修改方法，則視乎個人寫作風格。

另一種違反「先短後長」準則的句子，通常是一個很長的主詞後面接著聯繫動詞，動詞後面又接著一個很短的述詞名詞或述詞形容詞。以下就是這種結構的句子（動詞以斜體字標示）：

That increasing the concentration of fluorine atoms around the silicide/silicon interface improves the high temperature stability of thin cobalt silicide film *is clear*.

其中一種修改方法是把原本的主詞移到句尾，並以虛主詞“it”替代：

*It is clear* that increasing the concentration of fluorine atoms around the silicide/silicon interface improves the high temperature stability of thin cobalt silicide film.

另一種修改方式是取出名詞子句中的動詞（“improves”），作句子的主要動詞。接著把述詞形容詞“clear”改成副詞，用來修飾主要動詞：

Increasing the concentration of fluorine atoms around the silicide/silicon interface *clearly improves* the high temperature stability of thin cobalt silicide film.

雖然句子的主詞還是有點長，但動詞前後部分的長度大致相同，句子整體尚算平衡。只要主詞不是太長，也算符合「先短後長」準則。

除此之外，「先短後長」準則也適用於介系詞片語。試看以下句子中接在動詞後面的兩個介系詞片語：

The signals are relayed *by means of a beam of highly directional high-frequency waves* from one station to another.

以斜體字標示的片語遠比接在其後的片語長。因此，我們可應用「先短後長」準則，把這兩個片語前後對調：

The signals are relayed from one station to another *by means of a beam*

*of highly directional high-frequency waves.*

把長片語 *by means of a beam of highly directional high-frequency waves* 調到較短片語 *from one station to another* 後面，句子便較易於閱讀與瞭解。

## 練習 9-1 句子內容的順序

請依據 9.1 節到 9.4 節所介紹的準則來修改下列段落。

1. In this paper, we propose a new service for digital mobile communication systems. Two or more users can hold a secure electronic conference using this service.
2. A block of four DIP switches is located on the bottom of the UT620. The unit can be configured for different types of systems by adjusting these DIP switches. Table 2 below shows the correct DIP switch settings.
3. Much recent research on machine pattern recognition has focused on the use of neural networks. Extracting the features of the patterns to be recognized is an important step in most existing neural-network-based methods. The recognition rate achieved is determined largely by the quality of feature extraction.
4. A distinctive feature of the MOS resistor is that its resistance value can be adjusted by varying the gate voltage. Thus the gain of the wideband amplifier can be tuned by the MOS resistor. However, the frequency response is degraded slightly by the parasitic capacitance of the MOS device.
5. If the CPU address does not match the tag, a cache miss occurs. The controller will check whether the alter bit of the cache line involved is clean or

dirty when a cache read miss occurs. The main memory will be updated by the controller with the data currently stored in the cache if the alter bit is dirty.

6. The solar water heater used in the experiment is shown in Figure 2. A cold-water inlet, where water flows into the apparatus, is at the top left of the water heater. Many lengths of plastic pipe connected together in an accordion fashion and covered with a sheet of heat-absorbing plastic make up the main portion of the heater.
7. The atomic structure of ceramics gives them a chemical stability that makes them impervious to environmental degradation, such as dissolution in solvents. Characteristics such as a high melting point, hardness, and stiffness are the result of the strength of the bonds in ceramics. Also, because metal oxides are components of many ceramics, further oxidation is often impossible.<sup>1</sup>
8. In this paper, the financial investment and technological requirements involved in putting nitrogen-based techniques for fabricating widgets to use in commercial manufacturing are investigated. The per-unit cost of traditional methods of manufacturing widgets is higher than the per-unit cost of nitrogen-based techniques, so these techniques are an attractive investment. However, a number of technical problems must be overcome before nitrogen-based techniques can be adopted.
9. A bus master either oversees the transfer of data between devices or, more often, exchanges information with one or more slaves. Slaves are selected by the bus master by placing address information on the bus; each slave

compares this information with its own address. A connection is established by the master and slave and the slave becomes a responder if the addresses match. Broadcast addresses are what addresses that identify more than one slave are called. A particular device may act as both master and slave, but not at the same time.<sup>2</sup>

10. Perceptions of odors and colors operate according to different principles. A lexical system which is organized in memory in a relatively abstract and rigidly controlled way is involved in color perception. By contrast, flexibility and adaptability, and a relatively concrete but open-ended nonverbal coding system, are the characteristics of odor perception. Odor memory is in turn affected by this manner of organization. What is stored about odors is not likely to involve semantic categories which can be used to retrieve odors. Rather, perceptually unitary episodes described in idiosyncratic terminology are involved in odor memory.<sup>3</sup>

## 練習 9-2 長短片語的順序

請根據 9.4 節介紹的「先短後長」準則，修改下列句子。

1. The problem of the nonlinear nonreciprocity of soliton transmission in an EDFA with different pumping configurations is also discussed in this article.
2. In this paper, through the use of an internal model control method a fully digital servo control for an AC induction motor is developed.
3. In this paper, the molecular director configuration of a closed cylinder of liquid crystal with negative dielectric anisotropy in an external field is investigated.

4. A global calibration scheme to resolve the coordinate equivalence problem encountered when CAD systems are integrated with robot manipulators is proposed.
5. In section 7, experiments in which the proposed method is applied to control a standard industrial robot manipulator are described.
6. In this report, an efficient algorithm that employs the concept of static equilibrium to determine the stability of clamping is developed.

## 9.5 縮短主動詞距離

讀者開始閱讀一個句子時，會希望能儘早知道句中的人物和行為的施事者。當讀者讀到主詞後，會想儘快看到搭配主詞的動詞。為滿足讀者期望，科技研究報告的作者一般都應盡量在主詞之後及早接上動詞。如果修飾的片語或子句可放在其他地方（如擺在主詞前面），則應避免把這些片語或子句插在主詞和動詞之間，尤其當修飾的片語或子句特別長。雖然資深的作者有時亦會把修飾的片語或子句放在主詞和動詞之間，但在科技論文中把片語或子句放在其他位置，通常會令論文句子較易閱讀。

比較下列兩對原句和修正句：

原句：The port enable input, *when high*, disables ports A and B by placing them in high-Z condition.

修正：When high, the port enable input disables ports A and B by placing them in high-Z condition.

原句：The architecture, *as shown in Figure 3*, incorporates two modules linked together by a map field.

修正：As shown in Figure 3, the architecture incorporates two modules linked together by a map field.

兩個原句中，主動詞之間的字詞似乎破壞了句子的流暢，並暫時干



擾讀者把主動詞聯結。修正後的兩句，不僅較通順，且更易讀。

現在請看這段特別長的段落：

A two-phase extraction procedure (see Figure 3), with one phase that identifies the similarities between nodes on the same level in the graph and one that uses these features to extract the common parts of the nodes, is used to identify complementary pairs and common factors among the nodes in the graph. The extraction procedure, which begins from the lowest level of the graph, where all nodes contain only terminal child node zero and terminal child node one, and moves upward level by level, eventually yields the output logic functions in a minimized factored form.

這個段落非常難讀，因為每句的主動詞間夾著的字詞都非常多。下面是同一個段落，只是主詞和動詞都已以斜體字標示。現在就可清楚看出每句的主動詞間到底插入了多少字詞：

*A two-phase extraction procedure* (see Figure 3), with one phase that identifies the similarities between nodes on the same level in the graph and one that uses these features to extract the common parts of the nodes, *is used* to identify complementary pairs and common factors among the nodes in the graph. *The extraction procedure*, which begins from the lowest level of the graph, where all nodes contain only terminal child node zero and terminal child node one, and moves upward level by level, eventually *yields* the output logic functions in a minimized factored form.

要讓文章變得易讀，必須把句子的主動詞放在一起，再加以改寫。首先，必須把原來兩句各分成兩個以上句子；我們可以把主動詞間的長片語或子句全部刪除，並將它們改寫為獨立的句子。下面是一種修改方式，其中每句的主詞和動詞都以斜體字來標示：

*A two-phase extraction procedure is used* to identify complementary pairs and common factors among the nodes in the graph (see Figure 3). *The first phase identifies* the similarities between nodes on the same level in the graph. *The second phase uses* these features to extract the common parts of the nodes. *The extraction procedure begins* from the lowest level of the graph, where all nodes contain only terminal child node zero and terminal child node one. *It then moves* upward level by level, eventually yielding the output logic functions in a minimized factored form.

段落已分成五句，而修正後的每句中，主動詞都連在一起。這比原文來得易讀。

### 練習 9-3 主動詞相連

請把下列句中的主詞皆與其動詞連在一起。（提示：有些句子需要在中間斷句。）

1. The solar cell may, in strong light conditions, deliver a supply voltage that is so high that the LCD display segments cannot be switched off.
2. The techniques used to produce maps, progressing from field workers and manual surveying to satellites and computers, have changed dramatically over the past fifty years. The predominant method for creating maps, before World War II, was field surveying. After World War II, map-making methods began to include manual photogrammetry. Manual photogrammetry, although still used today, is being supplanted by digital cartography, and computers are becoming the hub of the mapping process.<sup>4</sup>
3. In recent years an extraordinary increase in the attention, both popular and scientific, that has been paid to mutation and its consequences has occurred. The sources of this interest, which has led to research that has improved our understanding of DNA and of its metabolism and organization into genes, are the recognition that components of our environment pose a largely un-evaluated threat to the conservation of genetic material and the realization that mutations frequently have serious consequences for human health.<sup>5</sup>
4. These insects, as Figure 1 shows, are physically dissimilar from species common in North America, and they have a voracious appetite. Numerous

studies—see, for example, James (1982), Halton (1987), Mayumi (1989), and Brandom (1992)—have documented the unusually large amount of vegetation an individual of the species can consume in a single day.

5. Impressive advances in technology during the last two decades, which have led to the development of sophisticated new instruments such as filled-aperture telescopes and interferometric arrays, have provided astronomers with the ability to observe star-forming regions in considerable detail at infrared, millimeter, and submillimeter wavelengths. Over the last few years, observations with these and other instruments have produced a series of remarkable, exciting, and unexpected discoveries concerning the star-formation process in our galaxy. Astronomers, as a result of these discoveries, are beginning to understand the processes of star formation and early stellar evolution.<sup>6</sup>
6. The test apparatus, which is based partly on the design described by Susky and Hopfeld [4]—although it is easier to move and assemble than their device, requiring only two people for transportation and setup—samples and records the rate of evaporation over a  $4 \times 5$  meter area.

## 9.6 動作以動詞表達

大多數句子都會描述某種動作，而讀者總希望動作可由動詞來表達。如果句中動作表達得不明顯，或是句子的動作都不用動詞表達，反是隱藏於名詞之中，則讀者就難以明白句子的動作是甚麼。請看下面這個段落，當中的動詞皆以斜體字標示：

After etching, a decrease *was observed* in the intensity of the Si(2s), Si(2p), and C(1s) peaks, but an increase *was observed* in the intensity of

the O(2p) and O(1s) peaks at 103.4 and 531.6 eV. This *may be* because of removal of undesired crystallites and oxidation of the silicon due to a mixture of nitric acid (HNO<sub>3</sub>) and hydrofluoric acid (HF), which *resulted* in the formation of silicon oxide. At low HF and high HNO<sub>3</sub> concentrations, the etching rate *is* HF-dependent, evidently because HF *causes* the removal of SiO<sub>2</sub> during SiO<sub>2</sub> formation.

這個段落表達得很不夠清楚直接，讀者必須費許多心力去理解作者的意思。主要理由是：整個段落從頭到尾既沒有清楚交待句子的動作，也沒有交待動作的施事者。像第一句的動作就隱藏在名詞 *a decrease* 和 *an increase* 中，沒以動詞表達出來。至於第二句的動作更藏得無影無蹤：第二句的動詞只是聯繫動詞加上語態助動詞 (*may be*)。末句作者更捨動態動詞不用，反而使用聯繫動詞 *is*。整個段落中的動詞幾乎都是弱動詞（參考第六章 6.4 節），根本沒有表達任何具體的動作（全段動詞包括 *was observed, may be, resulted, is* 及 *causes*）。

要這個段落更清楚易讀，必須把每句（或子句）中的動作用動詞來表達。如果可以的話，作者也應指出動作的施事者，並以之作句子的主詞。以下是一種修改方式，以斜體字標示的都是動詞：

After etching, the intensity of the Si(2s), Si(2p), and C(1s) peaks *decreased*, but the intensity of the O(2p) and O(1s) peaks at 103.4 and 531.6 eV *increased*. This *may be* because a mixture of nitric acid (HNO<sub>3</sub>) and hydrofluoric acid (HF) *removed* undesired crystallites and *caused* the silicon to oxidize, *forming* silicon oxide. At low HF and high HNO<sub>3</sub> concentrations, the amount of HF available *determines* the etching rate, evidently because HF *removes* SiO<sub>2</sub> as it *forms*.

現在的段落有力易讀多了。只要把首句改成主動語態，並用主動動詞 *decreased* 和 *increased* 來取代冗長被動的結構 *a decrease is observed* 和 *an increase is observed*。第二句用了動詞 *remove* 及 *caused... to oxidize* 來取代名詞 *removal* 和 *oxidation*，並以動狀詞 *forming* 來取代冗長的 *resulted in the formation of*。末句則用了較精確的說法 *the amount of HF available determines the etching rate* 來取代模糊的 *the etching rate is HF-dependent*。此外，我們也把名詞 *removal* 和 *formation* 改

成動詞 *removes* 和 *forms*。如此一來，段落中的動作都一律以動詞來表達。

要確定句中的動作以動詞表達，必先找出句子的動作。有些句子的動詞很模糊，沒有把句子的動作具體表達出來。例如：

Excess  $\text{HNO}_3$  *may lead* to a thin oxide film on the substrate surface and thus inhibition of nucleation in non-target regions and an improved degree of selectivity.

這個句子沒有表達任何具體的動作。動詞 *may lead* 的意思很模糊，而它的三個直接受詞 (*film*, *inhibition* 和 *degree*) 與主詞  $\text{HNO}_3$ ，甚至三個受詞之間的因果關係，都不夠精確。此外，句中的兩個名物化名詞 (*inhibition* 和 *nucleation*)，指涉的皆為具體動作，為何不以動詞表達？以下是一種修改方法，動詞都以斜體字標示：

Excess  $\text{HNO}_3$  *may cause* a thin oxide film *to form* on the substrate surface that *inhibits* nucleation in non-target regions, thus *increasing* the degree of selectivity.

先刪除模糊的動詞 *lead to*，換上 *cause...to form*。還有，阻礙成核的似乎是氧化薄膜，而非  $\text{HNO}_3$ 。因此，應把名詞 *inhibition* 改成動詞 *inhibits*，並放在關係子句中，而以關係子句的主詞作指稱氧化薄膜的代名詞。最後，「選擇度的增加」似乎是由於在非目標區阻礙成核。為了闡明這種關係，應省略 *improved* 這形容詞而插入動狀詞 *increasing*。修改過的句子易讀得多，因為所有的動作都能精確具體地表達出來。

儘管如此，修改句還是有一值得商榷之處。有些讀者可能仍會認為修改句中，關係代名詞 *that* 所指的前述詞不夠清楚。從句子的意思，我們可以推斷 *that* 是指名詞片語 *a thin oxide film*；但根據句子的結構，*that* 也可以是指另一名詞片語 *the substrate surface*。對專業讀者而言，修改句相當清楚。因為根據上下文，他們可立刻推斷出動詞 *inhibits* 的主詞必定是 *a thin oxide film*。但假如文章的對象是不諳化學的大眾，則應考慮進一步修改，以保證讀者不會誤解句

意：

Excess  $\text{HNO}_3$  may cause a thin oxide film to form on the substrate surface, thus *inhibiting* nucleation in non-target regions and *increasing* the degree of selectivity.

「動作以動詞表達」原則可補充第六章中的論點。6.4 節建議讀者要避免弱動詞和名物化名詞，並盡量用清楚具體的動詞來表達句子的動作。6.7 節則建議避免虛主詞結構，從而造出簡明的句子。從以下例子可看出，第六章的規則和本節陳述的原則是互補的。當中的弱動詞、名物化名詞和虛主詞結構，都以斜體字標示：

Increasing the acidity of the nutrient solution *has* two effects on the growth of strain B. First, *there is* a general *inhibition* of growth, and second, *destabilization* of existing healthy cultures *is observed*.

首句包含一個與名詞 *effects* 連用的弱動詞 *has*，第二句則包含一個 *there is* 結構及兩個名物化名詞：*inhibition* 和 *destabilization*。要修改首句，必須用較具體的動詞 *affects* 來取代弱動詞 *has* 及名詞 *effects*。同時，第二句必須捨虛主詞結構 *there is an inhibition of growth*，改用動詞來表達句子的動作，即 *it inhibited growth*（“it”指稱「增加溶液的酸度」）。最後，作者應刪去名物化名詞及弱動詞 *destabilization...is observed*，改為 *it destabilizes*（“it”再次指稱「增加溶液的酸度」）。下面是修改好的句子，以斜體字標示的是動詞：

Increasing the acidity of the nutrient solution *affects* the growth of strain B in two ways. First, it *inhibits* growth generally, and second, it *destabilizes* existing healthy cultures.

應用以上這種修改方式，既可用動詞來表達句子的動作，也可避免弱動詞、名物化名詞以及不必要的 *there is* 結構。無論修改的理由是以何種原則去說明，修改後的句子顯然較流暢易讀。

## 練習 9-4 動作以動詞表達

請修改下列段落，使每句或子句中的動作都能以動詞表達。

1. Measurement of the intensity and frequency of earthquakes can be performed using seismometers. A seismometer consists of a mass suspended by a spring or other elastic mechanism inside a metal frame that is anchored to the ground. A magnet is attached to the mass and an electric coil to the frame. Any vibration of the ground causes shaking of the seismometer's frame, but inertia tends to hold the mass in its place. Thus movement of the coil on the frame in relation to the magnet on the mass is observed, and this movement results in generation of an electrical signal that is a representation of the intensity and frequency of the movement.<sup>7</sup>
2. Control of the amount of fluorine incorporated into the silicon film can be achieved by reduction of the amount of water added to the immersing solution. Addition of less water results in the release of more fluorine atoms, as shown in the reaction equation. The increase in the number of free fluorine atoms in the solution leads to incorporation of a greater amount of fluorine in the film.
3. Since each sensor receives information from only a limited range, combining information from many sensors is necessary.
4. As closing of landfills takes place, many communities are passing recycling laws and undertaking construction of waste-to-energy plants. Although waste-to-energy plants face many of the same technical, regulatory, and political obstacles as conventional power plants, some issues are peculiar to them. Unlike most power plants, municipal waste incinerators perform burning of many different types of materials, resulting in creation of different types of toxic byproducts. Whereas fossil fuel plants may lead to air pollu-

tion, waste incinerators may result in pollution of the earth. Since most ash is buried along with garbage in municipal landfills, environmentalists fear that seeping of contaminants into groundwater may occur.<sup>8</sup>

## 9.7 邏輯關係要清楚

讀者期望科技研究報告中的討論是合理、合符邏輯及井然有序的。為滿足這期望，科技論文作者應清楚明確地顯示段落中各句子間的邏輯關係，避免突然從一個主題跳到另一個。此外，也該用適當的字眼作為「信號」（如 *however, since, because, so, thus, although, in contrast, only* 等等），為讀者闡明不同子句或句子間的邏輯關係。

撰寫論文時，別以為句子間的邏輯關係不用表明，讀者亦可領會。例如：

Requirements analysis is the most error-prone step in the software development process. A widely accepted technique for solving this problem is rapid prototyping.

“Rapid prototyping” 所要解決的「問題」是甚麼？這個句子連一個問題都沒提過。作者指出的「需求的分析」是個容易出錯的「步驟」，卻不是「問題」。顯然，作者希望讀者能自行推斷出：需求的分析過程中常出現的錯誤本身便是「問題」。儘管這種省略看來微不足道，卻可能會把讀者弄糊塗。就算讀者真的能推斷成功，但他並沒這種責任。我們應改寫原句，以避免出現邏輯的「跳躍」：

Requirements analysis is the most error-prone step in the software development process. Errors in requirements analysis can often be prevented by applying a widely accepted technique known as rapid prototyping.

Most errors in the software development process occur during requirements analysis. These errors can often be prevented by applying a widely accepted technique known as rapid prototyping.

由於對自己的研究非常熟悉，作者時會錯誤假定內容之間的邏



輯關係是不言而喻的，因此很容易會發生邏輯的「跳躍」。例如：

Process A generally requires test information that is not directly available from the specifications. As an alternative to the expensive test evaluation, we will adopt Process B, which is widely recognized as an effective design technique. To reduce the complexity of Process B, we propose to modify it in the following way.

這個段落至少有兩個閱讀障礙：首句與第二句、第二句與末句之間，都遺漏了重要的信息，使讀者難以看出句子間的關係。在第二句中，作者提出以另一種處理方式去取代方式 A，因為方式 A 需要昂貴的試驗。但作者既沒事先明白的指出處理方式 A 需要昂貴的試驗，也沒有交待該昂貴的試驗是指花費昂貴、曠日費時，還是其他？在末句中，作者介紹了一個計畫，可減少處理方式 B 的複雜度，但卻沒有事先指出處理方式 B 太複雜，也沒指出過是哪方面複雜。作者從頭到尾都假定讀者已經知道自己的想法。然而，這個假定是站不住腳的。讀者未必會知道段落中的內容之間有何關聯，作者有義務將意思逐步合理地表達出來。

如果這個段落的作者想把自己的意思有效傳達給讀者，則必須填補句子間的三個邏輯「跳躍」。以下是一初步的修改方式：

Process A generally requires test information that is not directly available from the specifications, *and the testing needed to obtain this information is costly*. This expensive testing can be avoided by adopting Process B, which is widely recognized as an effective design technique. *In its present form, however, Process B has a major drawback: it requires extremely complex calculations*. To reduce the complexity of Process B, we propose to modify it in the following way.

在修改過的段落中，已經清楚解釋了處理方式 A 需要昂貴的試驗，而處理方式 B 所需的計算太複雜。所以句子間的邏輯關係已得以闡明。（如果我們知道「昂貴」和「複雜」實指為何，則還能進一步修改。）只要不用讓讀者自行去推斷句子間的邏輯關係，能簡化讀者的詮釋工作，我們的文章就會更易於閱讀及瞭解。

科技論文作者應明白句子之間必須有清晰的邏輯關係，且也應

擅於在文章中找出且避免邏輯「跳躍」。千萬別假定讀者和自己一樣熟悉文章的主題；即使是博學多聞的讀者，也可能不常接觸自己討論的主題，同樣需要文章提供背景知識及詳細的說明。如果邏輯「跳躍」是無關緊要，則只會阻礙讀者閱讀；但如果邏輯「跳躍」是嚴重的話，則會使讀者覺得文章莫名其妙。

反過來說，不存在邏輯關係的地方，就不應該暗示存在著邏輯關係。請看下面的例子：

We have now obtained all of the solutions, so they are summarized in Table 3.

這個句子看來極不自然。連接詞 *so* 暗示了前後兩子句間蘊含邏輯或因果關係，但在句意上，它們之間卻沒有這種關係。「作者在圖 3 列出解答」，並非「獲得所有解答」的邏輯或因果上的結果。我們可一方面獲得解答，另一方面不把這些解答列於圖 3 中，兩者沒必然或因果關係。因此，連接詞 *so* 必須用其他字詞替代。由於第一個子句表達了句子的主要意思，所以可把第二個子句改成關係子句，並把它納入附屬結構：

We have now obtained all of the solutions, which are summarized in Table 3.

這個句子比原句合理自然得多。

爲了向讀者強調重要的概念，並闡明文章的概念之間的邏輯關係，以及不同子句或句子之間的轉接，科技論文作者應常使用適當的「信號」字眼。常用的「信號」字眼有：*although, because, but, however, since, so, thus, in comparison, in contrast, despite, only, few, little* 等等。「信號」字眼可能是連接詞、連接副詞，也可能是一般形容詞和副詞。

「信號」字眼在溝通中尤其重要，現以一淺顯例子作說明：

Experimental trials show that the proposed algorithm has an average recognition rate of 98% and the conventional algorithm has an average rate of 91%.

這句的重點是甚麼？它陳述了兩個明顯的事實。然而，只要不知道上下文，就無法瞭解作者撰寫這個句子的目的。我們只知道兩個演算法都有很高的平均辨識率，作者並沒指出辨識率差異的重要。

這句則加上了「信號」字眼，試觀察當中的差別：

Experimental trials show that the proposed algorithm has an average recognition rate of 98%; *in contrast*, the conventional algorithm has an average rate of *only* 91%.

現在即使不知原句的脈絡，仍可大略猜測作者的撰寫目的。*In contrast* 這字詞把句子中的兩個子句關聯起來，並指出了句子主要目的在於提出一個新演算法，以跟現有的演算法作對照。至於 *only* 則暗示作者肯定演算法辨識率差異的重要。要強調這差異，大概是由於作者認為新演算法較傳統演算法優勝，並可取代它。原句和修正句都表達了相同的事實，但修正句中的「信號」字眼，卻可讓讀者瞭解到作者的態度，以及句子在原來脈絡中的目的。

## 練習 9-5 邏輯關係不清

指出下列不清楚或錯誤的邏輯關係，並一併改正。

1. Roski [3] studied the characteristics of the built-up edge (BUE) and developed a chamfered main edge cutting tool. This method involves tool geometries that produce a BUE that flows away continuously in the form of a separated secondary chip. Therefore, we conducted cutting experiments on carbon steel and pure aluminum to examine the mechanism underlying secondary chip formation.
2. Based on a trade-off between the operating cost and the travel cost, this paper has formulated a nonlinear programming problem to determine the optimal market size.
3. In this paper, we analyze the stability of clamping with passive friction forces. Based on the concept of the instant center of rotation, the stability analysis is transformed into a search for a static equilibrium state. Other

properties are also studied and then applied to increase the efficiency of the search algorithm.

4. A distinctive feature of the data model is how names are used. Users can specify multiple names for classes, attributes, methods, and reference relationships. Multiple names must have the same semantics. For example, *person*, *people*, and *human* are good names for a class which contains information about persons. When users want to retrieve information about persons, they can use one of these names in their query.
5. The reaction between n-butyl bromide and phenoxide ions exhibits a slow reaction rate because the two substances consist of different phases. Many investigators have devoted a great deal of effort to solving this problem by using various catalysts.
6. Vendor selection is one of the most important parts of the purchasing process. Recently, the concept of dimensional analysis was used to propose a supplier performance measure and to obtain an index called INY. The performance criteria used in INY include quantitative and qualitative criteria. For qualitative criteria, a two-directional evaluation is employed instead of the one-directional approach used in INY. Then all scores for quantitative and qualitative criteria are combined into a sum of weighted averages called INZ. The use of INZ is compared with that of INY by means of several examples.

# 第十章

---

## 字詞誤用

本章旨在討論中國人撰寫的英文科技論文中經常誤用的字詞及片語。誤用的情況中，有些是文法錯誤；有些則為文法正確，然而文章欠清晰通順。

*A, an.* 名詞前應使用不定冠詞 *a* 還是 *an*，是取決於名詞第一個音節的發音而定，而非取決於名詞的首個字母是否為母音字母。如果名詞首個音節的發音是以子音開頭，則必須使用 *a*。如果名詞首個音節的發音是以母音開頭，則必須使用 *an*。

The doctor sent him to have *an* X-ray taken.

I am working on *a* unified approach to these problems.

*A lot of.* *A lot of* 是口語，因此在正式論文中應避免使用，而應以 *many, much* 或 *a great deal of* 去表達。

*Above.* 可用以指稱曾經提過的資料。以 *above* 指稱的資料應是在前幾句或前段中出現過的，而不應用以指稱前幾個段落甚至前幾頁中曾提過的資料，因為讀者可能並不知道其所指為何。

We can now apply *the above technique*... [如果是剛提及該技術，則此乃正確的寫法，否則應該改用以下的寫法。]

We can now apply *the technique introduced in section 2*...

We can now apply *the technique introduced earlier*...

**Adopt, adapt.** 不要把這兩個字詞混淆。*Adopt* 的意思是「採用」或「選擇並遵循」。然而 *adapt* 卻是「為使之更適合而作修改」或「適應」之意。

We shall *adopt* Watson's technique, but we must *adapt* it slightly so that the reaction will take place at a lower temperature.

**Affect.** 不要把 *affect* 和 *effect* 混淆。*Affect* 是動詞，意思是「影響」。然而 *effect* 既可作動詞，也可作名詞：作動詞時的意思是「實現」或「達成」，作名詞時的意思則是「結果」或「影響」。（*Effect* 在科技論文中通常作名詞使用，而少會作動詞使用。）

Increasing the annealing temperature *affected* the junctions in two ways.

Increasing the annealing temperature had two *effects* on the junctions.

**Aforementioned.** 撰寫科技研究報告時，應避免使用如 *aforementioned* 或 *hereinafter* 之類的生硬古語。在當代英文中，這種古語只在某些正式的法律文件中使用。即使是法律上的使用，英文修辭學專家之間也有爭議。

生硬：We shall now use *the aforementioned method* to solve this problem.

自然：We shall now use *the method described above* to solve this problem.

自然：We shall now use *the proposed method* to solve this problem.

生硬：This set will *hereinafter* be referred to as set S.

自然：This set will be referred to *below* as set S.

自然：We will refer to this set as set S.

**Alternate, alternative.** *Alternate* 是指每隔一個的意思，亦可表示「交替者」；*alternately* 則表示兩者交替輪流。*Alternative* 是兩個選擇中的其中一個；*alternatively* 則是非此即彼之意，可視作「要不

然」。在提出另一個可能的選擇時，應使用 *alternative* 或 *alternatively*，而不要使用 *alternate*。

The traditional algorithm processes the data from the bottom up. An *alternative* approach is to begin from the top and work downward.

*Alternatively*, we can use the following method.

**Although...but.** 將兩個子句連接時，不能同時使用 *although* 和 *but* 這兩個連接詞，必須在兩者中選擇一個來使用。

誤： *Although* the algorithm is precise, *but* it is slow.

正： *Although* the algorithm is precise, it is slow.

正： The algorithm is precise, *but* it is slow.

**Among.** 一般而言，如想表示「從幾個可能的選擇中選出一個項目」，不應只用 *among*，而應使用 *from among*。

劣： This algorithm selects the optimal solution *among* all possible dynamic alignment patterns.

佳： This algorithm selects the optimal solution *from among* all possible dynamic alignment patterns.

**Among, between.** *Among* 這介系詞，是表示把東西分給三個或以上的人或物，或表示某事物和其他事物間的關係。至於 *between* 則指某種相對或一對一的關係，而不論相關者的數目。所以千萬別以為只要指稱三個或以上的人或物，就必須用 *among*。在科技寫作中，*between* 比較常用。

劣： Messages are passed *among* objects in two ways.

佳： Messages are passed *between* objects in two ways.

劣： Let us examine the relationships *among* the three variables.

佳： Let us examine the relationships *between* the three variables.

正： The additional profits were divided *among* the stockholders.

正： Professor Chen is *among* the leaders in her field.

**Amount, number.** *Amount* 用以指稱不可數名詞，*number* 則用來指稱可數名詞。

劣：The system must handle a large *amount* of objects.

佳：The system must handle a large *number* of objects.

正：In the second trial, the *amount* of oxygen added to the system was increased.

**And.** 一般而言，英文句子不應以 *and* 開首。不過，資深的作者有時也會為造出某種特殊效果而違反這規則。儘管如此，在科技寫作中的句子，不太可能有好理由以 *and* 開首。

劣：*And* our theory explains why the anomalous Hall effect does not occur in conventional superconductors.

佳：*Moreover*, our theory explains why the anomalous Hall effect does not occur in conventional superconductors.

**And/or.** *And/or* 意思十分模糊。我們應兩者擇一，否則乾脆用 *or both*。

模糊：This modification may improve the efficiency *and/or* accuracy of the algorithm.

清楚：This modification may improve the efficiency *and* accuracy of the algorithm.

清楚：This modification may improve the efficiency *or* accuracy of the algorithm *or both*.

很多以斜線把兩個字詞相連的句子，意思都是模稜兩可的。讀者在碰到這種字詞時，都會不解作者為何不另選較精確的字詞表達。在大部分的情形下，作者以 *and* 或 *or* 來取代斜線，或乾脆在兩個字詞中選擇其一，通常會使句意更清楚。

**Anymore.** 在正式英文文章中，如果句子有 *anymore* 及否定動詞，都應改寫成 *no longer* 及肯定動詞。

劣：After this cycle, the memory *does not contain* invalid data *anymore*.

佳：After this cycle, the memory *no longer contains* invalid data.

**Apparently.** 這字詞有「顯然」之意，不過也常有「似乎（但未必）為真」或「似乎（但不確定）」之意。為免混淆起見，在科技寫作中，不應用 *apparently* 來表示 *obviously* 或 *clearly*。



不清楚：*Apparently*, the number of defects decreased as the temperature increased. [這句意思似乎是 “The number of defects *seems* to have decreased as the temperature increased.”]

清楚：*Clearly*, the number of defects decreased as the temperature increased.

清楚：The number of defects *clearly* decreased as the temperature increased.

**Appendix.** 如果研究報告只有一個附錄，則文章中應以 *the Appendix* 來指示這附錄（*Appendix* 前面加定冠詞）。如果研究報告有兩個或以上的附錄，則應以 *Appendix A*, *Appendix B* 等（或 *Appendix I*, *Appendix II* 等）來指明這些附錄，而不應加上定冠詞（這裏 *Appendix A*, *Appendix B* 等是作專有名詞使用）。

誤：The proof of Theorem I is stated in detail *in Appendix*.

正：The proof of Theorem I is stated in detail *in the Appendix*.

正：The proof of Theorem I is stated in detail *in Appendix A*.

**Approach.** *Approach* 作動詞使用時，後面不應接著介系詞 *to*。

誤：As *x* increases, the value of the function *approaches to* zero.

正：As *x* increases, the value of the function *approaches* zero.

*Approach* 作名詞使用時，後面常會緊接著介系詞 *to* 及另外一個名詞。如果 *approach to* 後面緊接著一個用來修飾 *approach* 的動狀詞，（即表示是怎樣的 *approach*），則該動狀詞必須以 *-ing* 結尾（即動名詞）。*Approach* 後面不能接不定詞，因為緊接其後的 *to* 是介系詞，而非不定詞前面的 *to*。

劣：This paper proposes a new *approach to solve* this problem. [如果 *to solve this problem* 這片語是用以修飾動詞 *propose*，則這句是正確的。但作者似乎是想用這片語來修飾名詞 *approach*，所以這裏 *to solve* 是錯誤的。]

正：This paper proposes a new *approach to solving* this problem.

正：This paper proposes a new *approach to* this problem.

**A priori.** 小心把這個片語與 *prior* 混淆。*A priori* 是拉丁文，意

思為「先驗」、「先於經驗」或者為「不倚仗經驗」之意。*Prior* 則表示「在前」或「優先」。

*As* 配合過去式或進行式的動詞使用時，可表示「正在」或「當中」之意。但如果 *as* 跟現在式動詞配搭，要表示“when”（「當」或「屆時」）之意，則句子會看來不太自然。此外，在科技寫作中應避免以 *as* 來表示「因為」或「由於」，以免使句意模稜兩可。

自然：*As the solution was stirred, more water was added.*

自然：*As we were preparing for the experiment, we heard a loud explosion in the lab next door.*

劣：*As node CS receives a message, type analysis begins.*

佳：*When node CS receives a message, type analysis begins.*

劣：*As the force is large enough, the asperities are completely deformed and the body begins to slip.*

佳：*When the force is large enough, the asperities are completely deformed and the body begins to slip.*

佳：*Because the force is very large, the asperities are completely deformed and the body begins to slip.*

*As follows*、*As follows* 和 *the following* 都是正確的用法（*as shown below* 也是正確的）。

正：*This relationship can be expressed as follows:*

正：*Commonly used methods include the following:*

正：*The equations of motion can be written in the following way:*

誤：*as the followings*

誤：*as followings*

列：*as below*

*As follows* 作非限定修飾詞使用時，前面必須加逗點（詳見第五章 5.2 節中逗點的第四條規則）。*As follows* 及 *the following* 後面，通常必須接著冒號，但有些情況也可接句號。一般而言，如果 *as follows* 或 *the following* 所介紹的項目很短（如只有幾個數學方程式），

則後面就應接著冒號。但如果 *as follows* 或 *the following* 所介紹的項目很長（如很長的例子或演算法），則應接著句點。

一般而言，在論文中不應使用 *as follows* 來介紹新的小節。例如，在結束一個小節而開始另一個之時，不應以 “We will discuss this problem as follows” 結尾，而應寫 “We will discuss this problem below” 或 “We will discuss this problem in the next section” 般的句子。

*As mentioned above. As mentioned previously.* 兩者的用法稍有不同。*As mentioned previously*（或 *as mentioned earlier*）通常是用來指涉幾個段落或幾頁前提過的內容。至於 *as mentioned above*，雖然也可這樣使用，但通常是指讀者印象猶新的內容，如前一兩段剛提過的。此外，作者想指稱前幾句提過的內容時，則可使用 *as just mentioned*。

作者應盡可能用較精確的字詞來取代 *as mentioned above* 或 *as mentioned earlier* 這些片語。例如，如果作者要指稱上一節的內容，大可用 *as mentioned in the preceding section* 來代替 *as mentioned above*。

*As you know. As we know.* 在科技論文中，千萬別使用這些片語。不管句子內容是甚麼，它們必定是贅詞。

*As well as.* 這個片語的意思和 *and* 不盡相同。*As well as* 相等於 *in addition to*，是用來強調前面的名詞。例如，*John as well as Mary is coming* 這句所強調的是專有名詞 *John*：讀者本已知 *Mary* 要來，但不知道 *John* 也一同前來。同樣，*This material can be used in cars, motorcycles, and bicycles as well as airplanes*，這句中，讀者早已知悉所指的材料可用來製造飛機，但句子要強調的，亦是讀者不知道的，是這種材料也可用來製造汽車、機車以及腳踏車。

*Aspect.* 在英文句子中，*aspect* 及 *area* 之類的字詞經常是累贅的。

累贅：Regarding the application *aspect* of fuzzy neural networks, many approaches have been proposed.

累贅：In the *area* of application of fuzzy neural networks, many ap-

proaches have been proposed.

簡潔：Many approaches to the application of fuzzy neural networks have been proposed.

簡潔：Many applications of fuzzy neural networks have been proposed.

**Assume.** 這個動詞後面不應緊接 *as*。正確寫法是 *assume to be*。

誤：The parameters of the price indices can be *assumed as* constants.

正：The parameters of the price indices can be *assumed to be* constants.

正：We can *assume that* the parameters of the price indices are constants.

**Assure.** 請參見 *ensure*。

**At.** *At Table 2, at Figure 3, at row x in the matrix* 這些片語中使用 *at* 是錯誤的，應改用 *in*：*in Table 2, in Figure 3, in row x in the matrix*。

**At first.** 不要把 *at first* 和 *first* 混淆。*At first*（即「當初」）表示所述情形已隨時間而改變。至於 *first* 則是指一系列項目、事件或步驟中首個行為或事物。

*At first she wanted to use the first method, but later she decided to use the second one.*

**At last.** 同理，亦別將 *at last* 和 *last* 混淆。*At last* 是指「終於」，但 *last* 卻是指一系列項目、事件或步驟中最後一個行為或事物。

*At last we reached the last house on the street.*

**Based on.** 以 *based on* 開首的句子通常都是不精確的，甚至有時還會有文法錯誤。*Base* 是動詞，而非介系詞。因此，如果句首是以 *based on* 開首的片語，則這就是分詞片語。根據英文文法，這個分詞片語應修飾句子的主詞（參見第四章 4.9 節）。然而，絕大多數以 *based on* 開首的句子中，這分詞片語卻都不能合理地修飾句子的主詞。因此，應盡量以 *on the basis of, by, from, according to* 或其他字詞來取代 *based on*，否則應重寫句子，清楚指出甚麼是甚麼的「基

礎」。

- 劣： *Based on* the conventional method using Lagrange multipliers, the closed form solution can be written as follows.
- 佳： *According to* the conventional method using Lagrange multipliers, the closed form solution can be written as follows.
- 佳： The conventional method using Lagrange multipliers yields the closed form solution:... [直接列出解答]
- 佳： *Applying* the conventional method using Lagrange multipliers, we can write the closed form solution as follows.
- 佳： *If we apply* the conventional method using Lagrange multipliers, we can write the closed form solution as follows.
- 誤： *Based on* Eq. (8), it is obtained that...
- 正： *From* Eq. (8), we obtain...
- 正： Equation (8) entails that...
- 劣： *Based on* our experimental results, we conclude that...
- 佳： *On the basis of* our experimental results, we conclude that...
- 佳： *From* our experimental results, we conclude that...
- 佳： Our experimental results show that...
- 劣： *Based on* decomposition of the matrix formed by successively received data vectors, we develop a fast, recursive least-squares algorithm in transversal filter form.
- 佳： *Through* decomposition of the matrix formed by successively received data vectors, we develop a fast, recursive least-squares algorithm in transversal filter form. [或 *By decomposing* the matrix...]
- 佳： We present a fast, recursive least-squares algorithm in transversal filter form. *The algorithm is based on* decomposition of the matrix formed by successively received data vectors.

假如以 *based on* 開首的片語真的可以修飾句子的主詞，則應把這片語放在句首（但這種情形很少見）。例如，下列例句中，以 *based on* 開首的片語便可以用來修飾句子的主詞。這個句子的涵意是：XPG 系統的架構是以“advanced digital technology”為基礎。

*Based on* advanced digital technology, the XPG system provides reli-

able operation with minimal maintenance.

**-based.** 以連字號加上如 *-based* 之類的字尾，有時很有用，尤其是它可把很長的名詞片語縮短（例如，可把 *a computer system that is based on a Pentium microprocessor* 縮短成 *a Pentium-based computer system*）。然而，在首次使用一個名詞片語時，應寫出整個片語。還有，應盡量使用更文雅且精確的字詞，避免使用這種字尾的寫法。

模糊： We propose *a neural-network-based control system*. [如果同一篇論文中曾經提到以神經網路為基礎的控制系統，則可使用這種寫法，否則應用以下的寫法。]

清楚： We propose *a control system based on a neural network*.

更清楚： We propose *a control system that uses a neural network to maintain the operating parameters within the proper range*.

**Basically.** 人們常濫用這個字詞。在大多數的英文句子中，這是個模糊並應省略的修飾詞。有時使用「基本上」可造出通順的中文，但在相同情況下卻不能造出通順的英文。

累贅： There are *basically* two types of reactors.

簡潔： There are two types of reactors.

簡潔： There are two *basic* types of reactors.

**Because of the fact that.** 這是個冗贅的片語。*Of the fact that* 應省略，寫 *because* 便成。

冗贅： *Because of the fact that* the system is intended for real-time processing, a faster algorithm is needed.

簡潔： *Because* the system is intended for real-time processing, a faster algorithm is needed.

**Because...so.** 這兩個連接詞不能在同一句中並存。

誤： *Because* the method is fast, *so* it can be used for real-time processing.

正： *Because* the method is fast, it can be used for real-time processing.

正： The method is fast, *so* it can be used for real-time processing.

**Because that.** *Because* 後面緊接著 *that*，是不合文法的。

誤： *Because that* the system is intended for real-time processing, a faster algorithm is needed.

正： *Because* the system is intended for real-time processing, a faster algorithm is needed.

誤： This is *because that* the system makes full use of the link capacity.

正： This is *because* the system makes full use of the link capacity.

**Become.** 在英文中，*become* 的用法和中文的「成爲」不盡相同。除非要描述某種變化，否則不應使用 *to become* 這動詞。下面的句子只陳述普遍的事實，並沒描述某種變化，所以句中的動詞應使用 *to be*，而不能使用 *to become*。

劣： *Because official records do not include information on this type of sale, transaction records from realtors become the only source of detailed information.*

佳： *Because official records do not include information on this type of sale, transaction records from realtors are the only source of detailed information.*

劣： *For these cases, Monte Carlo simulation becomes a powerful technique for estimating the probability  $p$ .*

佳： *For these cases, Monte Carlo simulation is a powerful technique for estimating the probability  $p$ .*

如果想以 *become* 來描述某種從過去到現在的改變，正確的動詞時態應爲現在完成式，而非簡單現在式。

誤： *Computers become more widely used in education in recent years.*

正： *Computers have become more widely used in education in recent years.*

**Behavior.** 在英文的用法中，*behavior* 通常是不可數名詞，因此爲單數。在某些特殊的文脈裏（如心理學的文章），作者爲強調所指涉的是幾種不同類型的行爲，會把 *behavior* 當作可數的複數名詞來使用。

**Belong.** 英文的 *belong* 與中文的「屬於」不能互譯來使用。在英文中，*belong* 通常表示「適合」或「屬於某人」之意。

正：This land belongs to the university.

正：This house belongs to Mr. Davis.

正：Robert is an excellent student, one who belongs at the finest university in the country.

誤：The frictional characteristics of this type of damper *belong to* dry friction.

劣：The frictional characteristics of this type of damper *fall under the category of* dry friction. [稍見冗長]

正：The friction that occurs in this type of damper *is a form of* dry friction.

正：The friction in this type of damper is dry friction.

正：This type of damper is subject to dry friction.

誤：This problem *belongs to* a linear programming problem.

正：This problem *can be classified as a* linear programming problem.

正：This problem *is a type of* linear programming problem.

**Besides.** 正式英文文章中，要表示「此外」不應以 *besides* 作連接副詞來表達，而應使用 *in addition, moreover* 或 *furthermore* 表達。

劣：*Besides*, the following problem arises when we consider the effects of friction.

佳：*In addition*, the following problem arises when we consider the effects of friction.

佳：*Moreover*, the following problem arises when we consider the effects of friction.

**Better.** *Good* 是英文最常見的褒詞，故意思相當含糊。當比較兩件事物時，用詞應力求精準，不要只說某方「較好」（即“better”）。

模糊：Our algorithm is *better* than the conventional one.

精確：Our algorithm is *more accurate* than the conventional one.

精確：Our algorithm is *faster* than the conventional one.

**Build.** 在大多數科技論文中，使用 *construct* 比 *build* 更恰當。

劣：We shall *build* an efficient natural language parser.



佳：We shall *construct* an efficient natural language parser.

劣：The switched current approach to *building* the low-pass filter has several advantages.

佳：The switched current approach to *constructing* the low-pass filter has several advantages

**But.** 一般而言，英文的句首不應使用 *but*。但與 *and* 相同，資深的作者偶爾也會為造出特殊的修辭效果而違反這規則。儘管如此，在科技寫作中，違反規則通常都是沒有好理由的。如果要在句首表示「然而」或「但是」之意，則應使用 *however*。（對等連接詞後面本來就不加逗點，故萬一在句首使用 *but*，亦千萬別加逗點。）

不恰當：*But* Smith's theory does not explain why the anomalous Hall effect does not occur in conventional superconductors.

恰當：*However*, Smith's theory does not explain why the anomalous Hall effect does not occur in conventional superconductors.

**By this way.** 這個片語正確的寫法是 *in this way*。

誤：*By this way*, we can obtain the solution to equation (7).

正：*In this way*, we can obtain the solution to equation (7).

**Call.** 千萬別在 *call* 後面加上 *as*；但 *refer to* 後面必須跟著 *as*。

誤：We shall *call* this algorithm *as* the new GA.

正：We shall *call* this algorithm the new GA.

正：We shall *refer to* this algorithm *as* the new GA.

**Called.** 科技論文作者常用 *called* 來介紹新術語或某事物的別名。然而，*called* 有時是可省略的。

原句：*In the first phase, called graph analysis, the similarities between nodes on the same level are identified.*

修正句：*In the first phase, graph analysis, the similarities between nodes on the same level are identified.*

**Can.** 在英文中，*can* 常為贅詞。在一個中文句子中使用「可以」是很恰當時，但在意思相同的英文句子中卻可能沒必要加上

*can*。

累贅：Our method *can find* the optimal solution quickly.

簡潔：Our method *finds* the optimal solution quickly.

讀者應分清 *can* 和 *may* 的分別。*Can* 是指能力，但 *may* 則為可能或允許之意。

This technique *can* prevent the radiation from interacting with the natural convection.

There are many situations in which radiation *may* interact with natural convection.

首個例句表示：採用這個技術「可以」或「能夠」避免某種交互作用。第二個例句則表示：在很多情形下都有「可能」發生某種交互作用。

I *can* go for a walk today.

I *may* go for a walk today.

“You *may* go out and play,” said the children’s mother.

首個例句的意思是：我今天可以出去散步。（我有空，沒給事情絆住。）第二個例句的意思是：我今天可能出去散步。（我可能會去，但不一定。）第三個例句的意思則為：母親允許小孩子出去玩。

*Cannot*. 英文寫作中，*cannot* 通常應寫成一個字，尤其當它表示「不能」或「不可能」的意思時，更不應拆開。

劣：A car *can not* go as fast as an airplane.

佳：A car *cannot* go as fast as an airplane.

假如要表示「可以不必這樣做」或「能夠不必這樣做」之意，或者需要強調 *not* 這字，則 *can* 與 *not* 可以分開。

We have already received several interesting papers for the conference, so we *can not accept* late submissions, if we prefer. [我們可以不接受遲交的論文——我們沒必要接受]

然而，正面的表達方式通常會更清楚：

We have already received several interesting papers for the conference, so we *can reject* late submissions, if we prefer.

**Case.** 名詞 *case* 後面的關係代名詞，必須使用 *in which* 或 *when*，而不能用 *that*。（有些資深的作者也會用 *where*，但這用法備受爭議。）

誤：Let us now discuss *the case that*  $q$  is greater than 0.

正：Let us now discuss *the case in which*  $q$  is greater than 0.

有時候，*case* 是贅詞。把它省略的話，句子會較簡潔。

累贅：In many cases, these systems are slow and inaccurate.

簡潔：Many of these systems are slow and inaccurate.

**Change.** 如果用 *change* 來描述因時而遷的變化，則其後的介系詞應是 *in*，而非 *of*。

劣：The changes *of* the rotor temperature were measured at 30 second intervals.

佳：The changes *in* the rotor temperature were measured at 30 second intervals.

**Choose as.** 下面這樣使用 *chose as* 是錯誤的：

誤：We *choose* the frequency of the carrier *as* 300 kHz.

使用 *choose as*（或 *select as*）的正確方式如下：

正：We *choose* 300 kHz *as* the frequency of the carrier.

此外，這些例句也是正確的英文：

We specify the frequency of the carrier *as* 300 kHz.

The frequency of the carrier is specified *as* 300 kHz.

The frequency of the carrier is set *as* 300 kHz.

The frequency of the carrier is set to be 300 kHz.

**Classical, traditional, conventional.** 雖然這三個形容詞的用法有時大致相同，但涵義卻有少許分別。*Classical* 強調某理論或方法是「經典」的，即是在過去廣為學者承認，但現已被新理論或方法取代。*Traditional* 通常表示某理論或方法已行之日久，或許現在仍有

人使用，但很可能已經有更新的理論或方法提出。至於 *conventional* 則可形容某理論、方法或技術是時下最流行的或約定俗成的，但與 *traditional* 不同，它沒有表示歷時多久。當作者使用 *conventional* 這字詞時，大概是在暗示自己將會提出或已經出現更先進的做法或技術。

原句： In *traditional* physics, force is considered to be the product of mass and acceleration.

修正： In *classical* physics, force is considered to be the product of mass and acceleration.

原句： The proposed architecture is more efficient than the *traditional* design, which was originally developed by researchers at IBM in 1993. [設計是近年發明的，用 *traditional* 不太妥當。]

修正： The proposed architecture is more efficient than the *conventional* design, which was originally developed by researchers at IBM in 1993.

**Compare.** *Compare to* 用以比較兩個有基本差異的事物的相同之處；*compare with* 則用以比較兩個大致相同事物的相異之處。因此，在科技寫作中，*compare with* 應比 *compare to* 常用。當比較不同的數據或結果時，尤應使用 *compare with*。

The human brain has been *compared to* a computer.

Let us *compare* these results *with* those obtained in the first experiment.

**Compensate.** *Compensate* 有「補充」或「抵消」之意。其後通常必須加上介系詞 *for*，而不加直接受詞。唯一例外的情況是當直接受詞正是得到補償的人或事物。

誤： This mechanism *compensates* the slower speed of the genetic algorithm.

正： This mechanism *compensates for* the slower speed of the genetic algorithm.

正： The boss *compensated* the staff *for* their hard work by paying them a bonus at the end of the month.

**Complete.** *Complete* 爲及物動詞，必須接著直接受詞，除非句子是被動語態。若要表示某事情完成了，則應用述詞形容詞 *is completed*.

正：We *completed* the experiment on Tuesday.

正：The memory access *is completed* in one cycle.

誤：When the operation *completes*, the system enters standby mode.

正：When the operation *is completed*, the system enters standby mode.

**Comprise.** *Comprise* 意思爲「包含」；*is comprised of* 是錯誤的。

誤：The system *is comprised of* four functional blocks.

正：The system *comprises* four functional blocks.

正：The system *consists of* four functional blocks.

正：The system *is composed of* four functional blocks.

正：Four functional blocks *constitute* the system.

**Conclusion.** *State* 及 *present* 這兩個動詞可跟 *conclusion* 搭配；但千萬別寫 *make conclusions* 或 *give conclusions*。想避免寫出不自然的句子，可以只寫 *conclude*，非常簡單。

劣：Finally, we *make a conclusion* in section 6.

佳：Finally, we *state our conclusions* in section 6.

劣：The final section of the paper *gives the conclusions*.

佳：The final section *states the conclusions of the paper*.

佳：Section 5 *concludes* the paper.

**Consider.** 如果 *consider* 是表示「相信」或「視爲」之意，則其後不應有 *as*。（有些作者爲求表達清楚，會用 *consider to be*。嚴格說來，*to be* 通常是可以省略的。）但 *regard as* 及 *view as* 都是正確的。

誤：For practical purposes, this may be *considered as* an adiabatic reaction.

正：For practical purposes, this may be *considered* an adiabatic reaction.

正：For practical purposes, this may be *regarded as* an adiabatic reaction.

當 *consider* 意指「評價」、「討論」或「考慮」，其後可加上 *as*：

正：We *considered him as* a candidate for the job, but in the end we decided to hire another applicant.

*Contrary.* 參見 *on the contrary*。

*Currently.* 參見 *recently*。

*Criteria.* *Criteria* 是複數，單數形式是 *criterion*。“*Criteria*”是錯誤的。

There are three major design *criteria*. The first *criterion* is that the system must be shock resistant.

*Data.* 在正式文章中，*data* 應作複數名詞。

劣：The data that *is* received *is* stored in the FIFO buffer.

佳：The data that *are* received *are* stored in the FIFO buffer.

*Decide.* *Decide* 應為「做決定」或「判斷」之意。如果要表示「確定」、「辨認」或「定義」之意，則用 *determine* 會較自然。

We *decided* to use this approach for several reasons.

*Determining* which hypothesis is true is a difficult task.

The overall speed of the system *is determined* mainly by the speed of this algorithm.

*Defect.* 這個字詞不但指「缺點」，也指「瑕疵」或「毛病」。在某些文脈中，以 *defect* 來指某方法或系統的缺點是不自然的。因為即使該方法不是最理想的，但未必有很明顯的毛病。這種情況中，可用 *shortcoming*, *disadvantage* 或 *drawback* 來表示「缺點」的意思。

原句：Smith's method has four major *defects*.

修正：Smith's method has four major *shortcomings*.

修正：Smith's method has four major *drawbacks*.

*Defined.* 當 *define* 在被動句中，跟它配合的介系詞應為 *in* 或 *by*，而非 *as*。

誤：The variable  $z$  is defined *as* equation (12).

正：The variable  $z$  is defined *in* equation (12).

正：The variable  $z$  is defined *by* equation (12).

如果想指稱曾經定義過的變數或名詞，則可使用下面的句式：

The solution is  $5z$ , where  $z$  is *as defined in* equation (12).

The solution is  $5z$ , where  $z$  is *defined as in* equation (12).

此外，跟 *definition* 配合的介系詞應該是 *of*：

The definition *of* this term was stated in section 3.

The definition *of* this term was given in section 3.

This term was defined in section 3.

*Demonstrate*. 不要把 *demonstrates* 和 *illustrates*, *depicts* 或 *presents* 混淆。*Demonstrate* 指「清楚示範」，即向他人示範如何做某事情。此外，*demonstrate* 也可表示「證明」之意。

劣：Figure 3.6 *demonstrates* the effect of the Rayleigh number on the wall temperature of the inner cylinder.

佳：Figure 3.6 *illustrates* the effect of the Rayleigh number on the wall temperature of the inner cylinder.

劣：Figure 3.6 *demonstrates* the variation of the data over time.

佳：Figure 3.6 *depicts* the variation of the data over time.

劣：This paper *demonstrates* a new method for bandwidth allocation.

佳：This paper *presents* a new method for bandwidth allocation.

正：In section 3, we *demonstrate* how to estimate the bit error rate using the proposed method.

*Denote*. 當 *Denote* 在被動句中出現時，其後必須加上 *by*，而非 *as*。（但 *referred to* 後面卻是加上 *as*。）此外，*represent* 也可作 *denote* 的同義字使用。

誤：In this equation, the force in the radial direction *is denoted as*  $r$ .

正：In this equation, the force in the radial direction *is denoted by*  $r$ .

正：In this equation, the force in the radial direction *is represented by*  $r$ .

正：In this equation,  $r$  *denotes* the force in the radial direction.

正：In this equation, the letter  $r$  *represents* the force in the radial direction.

誤：Denote  $r$  to be the force in the radial direction.

正：Let  $r$  denote the force in the radial direction.

誤：Johnson and Kirk's method *is denoted* below as "the JK method."

正：Johnson and Kirk's method *is referred to* below as "the JK method."

正：Johnson and Kirk's method *is abbreviated* below as "the JK method."

正：A static random access memory is often *referred to as* an SRAM.

正：We will *refer to* these memories *as* SRAMs.

**Depict.** *Depict* 的基本意思是「用圖畫表示」。在科技寫作中，不應用 *depict* 來表示「描述」之意。

劣：The contents of each mission segment are *depicted* in section 3.

佳：The contents of each mission segment are *described* in section 3.

**Desire.** 要表達「需求」的意思，千萬別以 *desire* 與被動語態並用來表示；而應使用 *need* 或 *must*，並使用主動語態句。

誤：Hence the reliability of the system *is desired to be* improved.

正：Hence the reliability of the system *needs to be* improved.

正：Hence the reliability of the system *must be* improved.

正：Hence the system *must be* made more reliable.

**Despite the fact that.** 此冗長的詞語應以 *although* 或 *though* 來代替。

劣：*Despite the fact that* this method is reliable, it is too slow for medical applications.

佳：*Although* this method is reliable, it is too slow for medical applications.

佳：This method is reliable but too slow for medical applications.

**Detail.** *Describe in detail* 是「詳細地描述」，*a detailed description*



則是「一個詳細的描述」。千萬別寫“*detailly*”或“*detailedly*”，這些都是錯誤英文。此外，*detail* 不能作動詞，要表達「描述」或「說明」的意思，應該用 *describe*。例如：

劣：The functions of the system *will be detailed* in section 2.

佳：The functions of the system *will be described* in section 2.

**Details.** 中國人撰寫科技論文時，常會在介紹一項技術或程序後，接著寫 *The details will be described in the next section*（作者大概認為這句的意思是「下一節將詳細描述這些技術」）。但其實這是個意思不明的句子，因為它根本沒清楚指出要詳細描述的事物是甚麼。以下三句都是正確的英文：

The method will be described in detail in the next section.

The details of this method will be described in the next section.

A detailed description of this method will be given in the next section.

**Difference.** 當 *difference* 用來比較兩個事物時，應與介系詞 *between*（有時也可用 *in*）連用，例如：“the difference between x and y”。

誤：This risk is reflected in the difference of the prices *between* real estate in the pre-sales market and that in the finished housing market.

正：This risk is reflected in the difference *between* the price of real estate in the pre-sales market *and* the price of real estate in the finished housing market.

正：This risk is reflected in the difference *between* the price of real estate in the pre-sales market *and that* in the finished housing market.

正：This risk is reflected in the difference *in* the price of real estate in the pre-sales market and that in the finished housing market.

**Different.** 正確與 *different* 配合的介系詞是 *from*。千萬別寫成 *different than*, *different to* 或 *different between*。

誤：The characteristics of the second sample were *different than* those of the first.

正：The characteristics of the second sample were *different from* those of the first.

誤：The operation is slightly *different between* x and y.

正：The operation of x is slightly *different from* that of y.

不過，如果使用名詞 *difference*，則應以 *between* 配合：

正：There is a slight *difference between* the operation of x and that of y.

此外，句子不應以 *different from* 開首。（可參見 *unlike*。）

**Display.** *Display* 及 *exhibit* 可指「呈現」，如 *The data display a decreasing trend*。然而，*display* 及 *exhibit* 卻不應用來表示「提出」：

劣：The analysis is *displayed* in section 3.

劣：The analysis is *exhibited* in section 3.

佳：The analysis is *presented* in section 3.

此外，*display* 也可表示「以圖表表示」（一般而言，作者多會使用 *show*）。但用 *exhibit* 來表示「以圖表表示」，則會顯得不自然：

正：The test results *are shown* in Figure 4.

正：The test results *are displayed* in Figure 4.

劣：The test results *are exhibited* in Figure 4.

**Dramatic, drastic.** *Dramatic* 通常指「興奮」或「轟動」。至於 *drastic* 則指「強烈」或「激烈」。 *Dramatic* 的意思可以是正面或負面的； *drastic* 則通常是負面的。要表示「大幅增加」，通常應該用 *a dramatic increase* 來表示；至於 *drastic* 則常這樣使用：*The economy will improve only if drastic changes in the finance laws are made*。

**Due to.** 標準英文中，*due to* 只能修飾名詞，旨在指出事件起因。如果 *due to* 不修飾名詞，則應用 *because of* 代替。還有，別用 *due to* 作介系詞來表示「由於」之意。

正：The breakdowns were *due to* poor design.

正：We observed changes *due to* the presence of excess fluorine in the system.

劣：*Due to* this problem, a conventional controller cannot be used in

this case.

佳： *Because of this problem, a conventional controller cannot be used in this case.*

**Due to the fact that.** 這冗長的詞語應以 *because* 代替。

冗長： This unexpected result occurred *due to the fact that* the raw materials were impure.

簡潔： This unexpected result occurred *because* the raw materials were impure.

**Effect.** 參見 *affect*。

**E.g.** 此乃拉丁文片語 *exempli gratia* 的縮寫，意思是「例如」。由於它是非限定片語，所以一定要用逗點把它與句子其他部分隔開。注意這縮寫的正確寫法是“e.g.”，兩個字母後都必須有句號。

**Ensure.** *Ensure* 和 *insure* 都是「確保」之意，但用 *ensure* 較好。至於 *insure* 則特指「防止財務損失」（例如保險（insurance））。此外，許多人常把 *assure* 和 *ensure* 混淆：*assure* 是「承諾」或「保證」，而不是「確保」。 *Assure* 及 *insure* 都很少在科技寫作中出現。

Overflow protection *ensures* that recorded messages will not be lost when the memory is full.

She *assured* the professor that her report would be completed by the end of the week.

**Equal.** *Equal* 作動詞時，其後不應接介系詞。作形容詞時，其後才必須加上介系詞 *to*。

誤： A kilogram *equals to* 1000 grams.

正： A kilogram *is equal to* 1000 grams.

正： The value of this variable *equals* half the value of z.

**Especially.** 把 *especially*（或 *particularly*）放在句首或子句開首來表示「尤其」或「特別」是錯誤的，這時應使用 *in particular*。

劣： All of our algorithms performed well; *especially*, algorithm 3 was nearly twice as fast as the conventional method.

佳： All of our algorithms performed well; *in particular*, algorithm 3

was nearly twice as fast as the conventional method.

用 *especially* 來修飾形容詞是正確的：

正：All of the algorithms are fast, but Algorithm 3 is *especially* fast.

*Et al.* 這是拉丁文片語 *et alii* 的縮寫，意思是「以及其他的人」。在援引書籍或論文時，如該書籍或論文的作者超過三位，就可只列出首位作者的名字，並把 *et al.* 放在這名字後面，來代表所有的作者（例如，“Smith *et al.*”）。請注意這縮寫正確的寫法是“*et al.*”，“*al.*”之後應有一個句點（“*et.al.*”或“*et al*”都是錯誤的）。此外，在論文的引文中，在首位作者和 *et al.* 之間，通常不加逗點。但在參考書目中，必須在首位作者和 *et al.* 之間加上逗點。

*Etc.* 此為拉丁文片語 *et cetera* 的縮寫，意指「以及其他事物」。但英文的 *etc.* 和中文的「等」，用法不盡相同。中文的「等」係用來表示一系列事物的結束，即使已沒有可提及的事物。英文的 *etc.* 意思和中文的「等等」較為相近。然而，在正式英文文章中，卻不應常用 *etc.*，尤其是中國人在文章中所用的 *etc.*，大多應省略。

*Etc.* 尤其不應出現在以 *such as, including, for example* 或 *e.g.* 引介的一系列項目的結尾。如果作者事實上已再沒有可以提及的事物，則不應使用 *etc.*。如果讀者並不明瞭作者所指的「其他事物」是甚麼，也不應使用 *etc.*。在很多句子中，即使有理由使用 *etc.*，然而片語 *and so on* 或 *and so forth* 仍是較佳的選擇。

劣：Computers can be used for a wide variety of applications, including word processing, graphics processing, and entertainment, *etc.*

佳：Computers can be used for a wide variety of applications, including word processing, graphics processing, and entertainment.

正：The items in the series will be denoted by  $i_1, i_2, i_3, \text{etc.}$  [讀者都明瞭作者所指的其他事物為何，即： $i_4, i_5, i_6$  等等。]

*Evidence.* 這是不可數名詞。「證據很多」是 *much evidence*，而非 *many evidences*。

**Exhibit.** 參見 *display*。

**Exist.** 以 *exist* 來表示「有」或「在內」或「包含」，是不自然的寫法。這樣的寫法應修改，以其他字詞來代替 *exist*。

劣：Many inconsistent training instances *exist* in the training set.

佳：Many inconsistent training instances *are present* in the training set.

佳：Many inconsistent training instances *can be found* in the training set.

佳：There *are* many inconsistent training instances in the training set.

佳：The training set *includes* many inconsistent training instances.

誤：We shall develop a method for guiding the motion of the robot *with the existence of* obstacles.

正：We shall develop a method for guiding the motion of the robot *in the presence of* obstacles.

誤：Many factors *exist* in designing a good learning system.

正：Many factors *must be considered* in order to design a good learning system.

正：Many factors *must be considered* in the design of a good learning system.

正：Many factors *are involved* in the design of a good learning system.

**Fact.** 如果句子中出現了 *the fact that*，則應把它省略，並改寫句子。改寫後的句子通常會較為簡潔。

冗贅：The *fact that* the temperature rose caused the reaction rate to increase.

簡潔：The rise in temperature caused the reaction rate to increase.

簡潔：Because the temperature rose, the reaction rate increased.

**Famous.** 在科技論文中，*well-known* 常比 *famous* 恰當。

不自然：A *famous* approach to solving this problem is the method introduced by Zucker [4].

自然：One *well-known* approach to solving this problem is the method introduced by Zucker [4].

**Farther, further.** *Farther*（「更遠」）是指距離，而 *further*（「更多」、「更進一步」）則指時間或數量。

Singapore is *farther* from here than Hong Kong.

We will now modify the algorithm *further* to improve its efficiency.

**Feedback.** *Feedback* 只能作名詞使用。如果想作動詞使用，則必須寫成兩個字：*feed back*（被動語態和過去式是 *fed back*）。

誤：Each output neuron *is feedbacked* to the corresponding node in the input layer.

正：Each output neuron *is fed back* to the corresponding node in the input layer.

正：Each output neuron *is connected* to the corresponding node in the input layer.

**Few, a few.** *Few* 意指「很少」，而 *a few* 則指「一些」或「幾個」。

*Few* people know this. [很少人知道。]

*A few* people have written papers about this problem. [已有幾個人對這問題發表文章了。]

**Fewer, less.** 修飾可數名詞時，應使用 *fewer*；修飾不可數名詞時，則應使用 *less*。

The new method requires *fewer* cycles to complete the calculation.

In the second experiment, *less* nitrogen was used.

**Finalize.** 參見 *-ize*。

**Firstly, secondly.** *First, second* 等字詞比 *firstly, secondly* 等字詞文雅簡潔。*First, second* 加上了字尾 *-ly* 是強迫讀者多閱讀一個累贅的音節。

劣：*Secondly*, the annealing temperature was higher for this group of samples.

佳：*Second*, the annealing temperature was higher for this group of samples.

在下面的「誤」句中，*firstly* 的使用方式是錯誤的：

誤：How to form a crossing region is *firstly* explained.

正：We *first* explain how to form a crossing region.

正：*First*, we will explain how to form a crossing region.

*The following.* 參見 *as follows*。

*For example.* *For example* 是正確的英文用法，*for examples* 則是錯誤的。注意 *for example* 是連接副詞，因此只能用來表示兩個子句、句子或段落間的關係。*For example* 之後不應有一連串例子：

誤：The employees were asked to indicate the level of importance of 12 aspects of their jobs, *for example*, salary, benefits, safety, and opportunities for advancement.

正：The employees were asked to indicate the level of importance of 12 aspects of their jobs, *such as* salary, benefits, safety, and opportunities for advancement.

正：The employees were asked to indicate the level of importance of 12 aspects of their jobs, *including* salary, benefits, safety, and opportunities for advancement.

正：The employees were asked to indicate the level of importance of 12 aspects of their jobs. *For example*, they were asked to compare the relative importance of salary, benefits, safety, and opportunities for advancement.

*For* + 動名詞 (gerund)。參見 *To do x*。

*Form, formulate.* *To form* 指「形成」、「組成」或「產生」。*To formulate* 則指「寫成公式」或「規劃」。

When water boils, steam *forms*.

The girls *formed* a basketball team to play against the boys.

We can *formulate* the problem in the following way.

The soldiers *formulated* a detailed plan for the attack.

*Functionality.* 如果 *function* 可表達句意，則別寫 *functionality*。

劣：The system has many convenient *functionalities*.

佳：The system has many convenient *functions*.

模糊：The *functionality* of the device has been expanded.

清楚：The device has several new *functions*.

**Get.** 這字詞不夠正式。科技論文中應使用 *obtain, have, derive* 或其他字詞才是。

劣：By inserting these values into equation (10), we *get* the following solution.

佳：By inserting these values into equation (10), we *obtain* the following solution.

**Give.** 中國人撰寫英文科技論文時，常會濫用 *give*。Give 本身是個意思不精確的字詞，故在大多數情況中，使用如 *state, present* 或 *propose* 這些較精確的字詞，遠比使用 *give* 來得好。

模糊：Smith *gave* a theorem that shows...

精確：Smith *stated* a theorem that shows...

精確：Smith *presented* a theorem that shows...

精確：Smith *proved* a theorem that shows...

模糊：First we will *give* the following definitions.

精確：First we will *state* the following definitions.

精確：First we will *define* the following terms.

在很多中國學生撰寫的研究報告導論中，常可看到這個句子：

劣：The final section *gives* the conclusions.

這句是非常不自然的英文，應改寫如下：

佳：The final section *states* the conclusions of the paper.

佳：The final section *presents* the conclusions of the paper.

佳：Section 5 *concludes* the paper.

佳：The conclusions of the paper are *stated* in section 5.

**Given.** *Given* 不是限定動詞。因此，像 *given a set of data* 這樣的片語，並非完整句子，因此其後必須緊接一個主要子句。

誤：Given that  $x=y$ . We can prove the theorem as shown below.

正：Given that  $x=y$ , we can prove the theorem as shown below.

正：Assume that  $x=y$ ; the theorem can then be proven as shown below.

正：If  $x=y$ , then the theorem can be proven as shown below.



**Given as.** 以 *given as* 指「從某處得到」或「表達」的句子，是非常不自然的：

劣：The solution *is given as*...

佳：The solution *is given by* the following equation.

劣：The centripetal force *is given as* the following:

佳：The centripetal force *can be expressed* as follows:

**Good.** 參見 *better*。

**Happen.** 在科技論文中，使用 *occur* 通常比使用 *happen* 好。

原句：We then observed what *happened* as the experiment proceeded.

恰當：We then observed what *occurred* as the experiment proceeded.

**Her.** 要指稱公司或機關學校，別用 *she* 或 *her*，而應用 *it* 或 *its*。

誤：Technocorp agrees to fulfill *her* obligations promptly.

正：Technocorp agrees to fulfill *its* obligations promptly.

**Herein.** 避免使用 *herein* 這種古英文字詞。

劣：We *herein* select the ART I model.

佳：*Here* we select the ART I model.

佳：*In this study*, we will use the ART I model.

**However.** 如果要以 *however* 表示「可是」或「然而」的意思，則必須用逗點把 *however* 與句子其餘部分隔開。如果句子以 *however* 開首而缺少逗點，則 *however* 就是「無論」的意思。

*However*, little research has been done on the effects of excessive rainfall on this type of habitat.

*However* you attempt to stop me, I will still go.

**The idea of.** *The idea of* 和中文的「這個概念」或「這個主意」意思相似。在 *She found the idea of going to Canada for school very exciting* 及 *Everyone thought the idea of having a party was a good one* 這兩句中，*the idea of* 都是正確的用法。然而，想解釋自己的方法或理論背後的

基本概念時，千萬別用 *the idea of*，而應用 *the idea behind* 或 *the idea underlying*。

劣： *The main idea of the proposed method is to use a region-growing technique to cluster the data.*

佳： *The main idea behind the proposed method is to use a region-growing technique to cluster the data.*

佳： *The main idea underlying the proposed method is to use a region-growing technique to cluster the data.*

*I.e. I.e.* 係拉丁文片語 *id est* 的縮寫，指「即是」（“that is (to say)”）。*I.e.* 是非限定片語，因此必須用逗點把它與句子其他部分隔開。注意這縮寫正確寫法是“i.e.”，每個字母後面都必須有句號。

*Illustrate. Illustrate* 是「舉例說明」之意。因此，我們不能“illustrate”一個例子，對象應是一個論點或方法才是。

誤： *Two examples of the proposed method are illustrated in section III.*

正： *Two examples are presented in section III to illustrate the proposed method.*

正： *In section III the proposed method is illustrated by means of two examples.*

*Illustration.* 不要混淆 *illustration* 和 *example*。

誤： *A numerical illustration will show how the coordinates of these points can be found.*

正： *A numerical example will show how the coordinates of these points can be found.*

*Impact.* 不要把 *impact* 作動詞來表示「影響」。

誤： *Boron doping impacts the characteristics of the substrates in two ways.*

正： *Boron doping affects the characteristics of the substrates in two ways.*

*In such case.* 這是錯誤英文，*in this case* 才是對的。

*In this way.* 參見 *by this way*。

*In other words. In other words*（「換句話說」）是正確的寫法，但

*in another word* 或 *in a word* 都是錯誤的。*In a word* 是正確的英文，而與 *in other words* 意思不同。*In a word* 意思類似於中文的「簡單地說」，但很少在科技論文中出現。

***In order to.*** 很多有 *in order to X...* 的句子，都可省略 *in order*。

原句：*In order to overcome this problem, we propose using a new mixture of gases in the reaction chamber.*

簡潔：*To overcome this problem, we propose using a new mixture of gases in the reaction chamber.*

***Insure.*** 參見 *ensure*。

***It should be noted that.*** 如此冗贅的表達，可省略成 *note that*。（大部分的情形中，*it is noted that* 也是錯誤英文，因此應以 *note that* 取代。）

冗贅：*It should be noted that these findings are subject to several restrictions.*

簡潔：*Note that these findings are subject to several restrictions.*

***Interesting, interested.*** *Interesting* 係表示某人對某主題或事物感興趣；*interested* 則用以形容某人對某事感興趣。千萬別以 *interested* 來修飾某主題或事物。

Many people find circuit design *interesting*, but I am more *interested* in software development.

***Introduce.*** 可以用 *explain*, *describe* 或 *state* 時，就別用 *introduce*：

劣：*We will introduce the geometric significance of the theorem in section 3.*

佳：*We will explain the geometric significance of the theorem in section 3.*

***Its, it's.*** *Its* 是屬格代名詞，指「它的」；*It's* 則表示“it is”。

誤：*We will design a fuzzy neural network and then test it's performance.*

正：*We will design a fuzzy neural network and then test its performance.*

*-ize*. 別以這個字尾來造出新單字。避免使用如 *finalize* 及 *prioritize* 這種意思模糊的偽術語。

模糊：We have not yet *finalized* the design.

清楚：We have not yet *put* the design *into final form*.

清楚：We have not yet *finished* the design.

清楚：We have not yet *decided on the final design*.

**Know.** 英文的 *know* 是靜態動詞，不能用來表達從「不知道」變成「知道」的轉變。英文的 *know* 通常不用於表示「學習」、「看出」、「發現」或「得知」，只能用以表示「知道某事」的心理狀態。

劣：From the figure we can *know* that *x* increases with time.

佳：From the figure we can *see* that *x* increases with time.

正：From the figure we *know* that *x* increases with time. [此句之意非「從圖中資料，我們可以發現這點」，而是「根據圖中的資料，我們知道這點」。]

誤：According to these test results, we can *know* that the genetic algorithm is more effective.

正：From these test results, we can *see* that the genetic algorithm is more effective.

正：These test results *show* that the genetic algorithm is more effective.

**Latter, former.** *Latter* 是指兩個曾經提及的項目中的次項，*former* 則指兩個項目中的首項。它們與 *first, last* 的意思不同。*First* 是指連續多個項目中的首項，就算只有兩項；*last* 則指連續三個以上項目中的最後一項。注意 *latter* 與 *later* 是不同的，*later* 是指「在一段時間後」。

**Less.** 請參見 *fewer*。

**Less than.** 嚴格說來，像 *with size less than 1* 及 *has value less than x* 的寫法都是錯誤的（但有些人把這些詞句當作正確的縮寫形式）。正確寫法應該是 *with a size of less than 1* 及 *has a value of less than x*。

誤： We then obtain a result *with error less than* the size of the cell.

正： We then obtain a result *with an error of less than* the size of the cell.

**Let.** *Let* 是動詞，並非附屬連接詞。因此以 *let* 開首的子句應接著句號或分號，而非逗點。否則便會造出缺乏連接詞的複句（請參考第四章 4.3 節）。此外，正式科技論文中，最好別以 *let's* 來代替 *let us*。

誤： Let  $x=y$ , the following equation can then be obtained.

正： Let  $x=y$ ; the following equation can then be obtained.

正： Let  $x=y$ . The following equation can then be obtained.

**List.** 惟真正列出幾個不同的項目時，才可用動詞 *list*，否則應用 *state, describe* 或其他字詞。

劣： The solution can be found by using the procedure *listed* in this section.

佳： The solution can be found by using the procedure *stated* in this section.

佳： The solution can be found by using the procedure *described* in this section.

劣： The proof is *listed* in the Appendix.

佳： The proof is *stated* in the Appendix.

佳： The proof is *given* in the Appendix.

正： The error rates for each of the trials are *listed* in Table 3.

**Make.** *Make* 為弱動詞，意思非常模糊。因此，應盡量使用較特定具體的動詞來取代 *make*。

模糊： From the results of the experiments, the following conclusions can be *made*.

清楚： From the results of the experiments, the following conclusions can be *drawn*.

清楚： The experimental results *support* the following conclusions.

清楚： From the experimental results, we can *conclude* that...[直接敘述結論]

模糊：A new, more detailed analysis of the problem is *made* in section 3.

清楚：A new, more detailed analysis of the problem is *presented* in section 3.

在上面「模糊」的例句中，*make* 使用得非常不自然。以英文為母語的作者絕不會寫出像“make a conclusion”或“make an analysis”的詞句。

**Match.** 比較不同資料時，用 *agree* 或其他字都常比 *match* 恰當。

原句：The experimental data *match* the theoretical predictions.

恰當：The experimental data *agree with* the theoretical predictions.

恰當：The experimental data *are in good agreement with* the theoretical predictions.

恰當：The experimental data *are consistent with* the theoretical predictions.

恰當：The experimental data *confirm the accuracy of* the theoretical predictions.

**May.** 與 *can* 的意思並不相同。*Can* 表示能力，*may* 則表示可能或許可。請參見 *can*。

**Meanwhile.** 中文的「同時」可以指「此外」、「也」或「而且」之意。但英文的 *meanwhile* 只能指「在同一段時間」。如果以 *meanwhile* 來表示中文的「同時」，則會非常不自然。

劣：This technique increases the rate of convergence; *meanwhile*, it prevents the algorithm from becoming trapped in local optima.

佳：This technique increases the rate of convergence; *moreover*, it prevents the algorithm from becoming trapped in local optima.

佳：This technique increases the rate of convergence; *in addition*, it prevents the algorithm from becoming trapped in local optima.

**Method for.** *Method* 後面常緊接介系詞 *for* 或 *of* 及一個動名詞，這樣通常比使用不定詞自然。

劣：We shall discuss two *methods to solve* this problem.

佳：We shall discuss two *methods for solving* this problem.

佳： We shall discuss two *methods of solving* this problem.

**Modern.** 許多時，*modern* 並不能清楚表示所指時代為何。*Modern* 可以是指從近幾十年到一百年或以上，但科技論文中提到的“modern technology”，當然絕非指六十、八十年前的技術。相對地，使用 *contemporary* 或 *recent* 的話，意思會較清楚。

模糊： The cache memory has become a standard feature of *modern* computer designs.

清楚： The cache memory has become a standard feature of *contemporary* computer designs.

**More than one.** 使用這詞句作主詞時，必須用單數動詞。

*More than one* researcher has attempted to solve this problem.

**Most, most of.** *Most* 和 *most of* 表示不同的普遍程度。*Most* 指一個總類中的大部分個例，緊接其後的複數名詞不加任何冠詞。*Most of* 則指某一組事物中的大部分個例，其後必須接著定冠詞 *the*。當使用 *most of the* 時，如所指事物不是前文已提過或讀者早已知道的，句中就應清楚界定所指對象為何。許多時，*most* 都可代替一個句子中的 *most of the* 而使句意不變。相反，除非讀者已知所指的是哪些特定事物，否則以 *most of the* 代替 *most*，可能會使句意不清。

正： *Most* graduate students are hard-working.

誤： *Most of* graduate students are hard-working.

模糊： *Most of the* graduate students are hard-working.  
[不明所指為哪些研究生]

清楚： *Most of the* graduate students *in our department* are hard-working.

清楚： *Most* graduate students *in our department* are hard-working.

**Some** 的使用規則，與 *most* 大致相同。

正： *Some* graduate students are lazy.

誤： *Some of* graduate students are lazy.

模糊： *Some of the* graduate students are lazy. [不明所指為哪些研究生]

清楚：*Some of the graduate students in our department are lazy.*

*Namely.* 在很多句子中是不必要的，可以省略。

累贅：*Two important components in the AGC loop, namely, the variable gain amplifier and the bandpass filter, must now be designed.*

簡潔：*Two important components in the AGC loop, the variable gain amplifier and the bandpass filter, must now be designed.*

簡潔：*Two important components in the AGC loop must now be designed: the variable gain amplifier and the bandpass filter.*

*Notation.* 當 *notation* 是指一整組符號時，應作不可數名詞使用；但當所指為一個特定的符號時，則有時可作可數名詞使用，並寫成複數。然而，使用 *types of notation* 或 *symbols* 總比 *notations* 恰當。

正：*The notation used in this paper is summarized in Table 1.*

劣：*The authors used two different notations to represent the same force.*

佳：*The authors used two different types of notation to represent the same force.*

佳：*The authors used two different symbols to represent the same force.*

*Obvious, obviously.* *Obvious* 這形容詞的意思是「清楚而容易看出的」，且常是 *clear* 的同義詞。*Obviously* 這副詞的主要意思是「容易看出或瞭解的」（即「顯然」，卻非「明顯」），但有時不適合用作 *clearly* 的同義字。例如，下面句子使用 *obviously* 的方式不太自然，而應以 *clearly* 或 *significantly* 來代替。

劣：*The intensity of the C-H bond absorption peaks decreased obviously as the annealing temperature increased.*

佳：*The intensity of the C-H bond absorption peaks clearly decreased as the annealing temperature increased.*

佳：*The intensity of the C-H bond absorption peaks decreased significantly as the annealing temperature increased.*

正：*Obviously, the annealing temperature affects the intensity of the*



C-H bond absorption peaks in some way.

**Occur.** 在正式文章中，使用 *occur* 比用 *happen* 或 *there is* 恰當。

原句：*There was a problem during the preparation stage.*

恰當：*A problem occurred during the preparation stage.*

**Of.** 中國人寫英文文章時，常會誤把介系詞 *of* 代替所有介系詞，例如往往把 *of* 和 *in* 混淆：

誤：*We aim to prevent errors of the digitalization process.*

正：*We aim to prevent errors in the digitalization process.*

誤：*The samples were examined for changes of thickness.*

正：*The samples were examined for changes in thickness.*

撰寫英文報告時需特別注意，不能把中文的「的」字直譯成英文的 *of* 來使用。下面以斜體字標示的介系詞都表示「關於」或「針對」之意，因此不能使用 *of*，而必須用 *about*, *on*, *concerning* 或 *regarding*：

誤：*The test reports of our new product are finished.*

正：*The test reports on our new product are finished.*

誤：*Professor Chen has done some interesting research of neural networks.*

正：*Professor Chen has done some interesting research on neural networks*

誤：*This is a book of the design of mixed-signal circuits.*

正：*This is a book about the design of mixed-signal circuits.*

誤：*The information of the input pattern is stored here.*

正：*The information on/concerning/about the input pattern is stored here.*

此外，千萬別混淆 *of* 和 *for*：

誤：*All of the arrangements of the conference are finished.*

正：*All of the arrangements for the conference are finished.*

誤：*This is our strategy of expanding sales in Europe.*

正：This is our strategy for expanding sales in Europe.

*On the contrary, on the other hand, in contrast, in comparison.* 這四個詞語意思都有所不同。*On the contrary* 用以否定前一個句子或子句的論點。

He argues that this strategy has increased sales. *On the contrary*, sales revenue has dropped 20% since the strategy was adopted.

千萬別混淆 *on the contrary* 與 *in contrast* (或 *by contrast*)，後者是用來介紹一個與前句概念作強烈對照的新概念：

Approach A provides high speed at the cost of increased memory requirements. *In contrast*, approach B is slower but requires much less memory.

*On the other hand* 和 *in comparison* (或 *by comparison*) 是用來提出新內容，並與前一個句子或子句的內容作比較或對照。

The serial design is still the most common design. *On the other hand*, the parallel design is becoming increasingly popular.

The parallel design is quite complex. *In comparison*, the serial design is much simpler.

*On the other hand, in comparison* 和 *in contrast* 的語法功能類似，且意思也相近。不過，與 *on the other hand* 或 *in comparison* 相比，*in contrast* 更強調句子內容和前文的對照。這三者與 *on the contrary* 的意思截然不同。*On the other hand, in comparison* 和 *in contrast* 的功能在於引導新概念，令讀者較注意下文內容；而 *on the contrary* 的功能則在於強調否定前文內容，會令讀者暫時較注意前文論點。

*On the other hand* 這片語只有在其引介句子的主題為前文提過時，或引介句子與前幾句主題有明顯的對照關係時，方可使用。下面句子中，*on the other hand* 用得很適當，因句中的兩種活動有明顯的對照：

I enjoy playing sports with my friends and going dancing on Saturday nights. *On the other hand*, I also enjoy many quiet, solitary activities.

相反，下面的 *on the other hand* 就用得很不自然。因為討論的兩

個項目 (“fuzzy set theory” 和 “neural networks”) 既沒明顯的對照，前文也不曾提過。

Fuzzy set theory has been the focus of much research in the last decade, because it can be used to model ambiguous data or uncertain information. *On the other hand*, neural networks have also attracted a great deal of attention in the last ten years.

第二句最好是直接省略 *on the other hand*。下面是一種修改方式：

Fuzzy set theory has been the focus of much research in the last decade, because it can be used to model ambiguous data or uncertain information. Neural networks are another area of research that has attracted a great deal of attention in the last ten years.

**-oriented.** 凡為這字尾的字，意思通常是空洞模糊的。作者應以較精確的字詞去取代這種表達方式。

模糊：Our firm emphasizes *market-oriented* products.

清楚：Our firm develops products that meet the demands of the market.

模糊：We provide *customer-oriented* operations.

清楚：We provide excellent customer service.

清楚：Our goal is to meet the customer's needs quickly and efficiently.

清楚：Our strategy is to analyze the customer's needs and to design systems that meet those needs.

**Otherwise.** 要指稱某個狀態或情況，除非所指已非常清楚，否則不要使用 *otherwise*。下面是一個句意模稜兩可的例子，因為根本看不出 *otherwise* 所指的情況是 bit 2 不設為 0、數據不送到 pin R0，還是其他。因此，應使用更精確的陳述方式取代 *otherwise*。

不精確：If bit 2 is 0, the data will be transmitted to pin R0. *Otherwise*, the data will be transmitted to pin R1.

精確：If bit 2 is 0, the data will be transmitted to pin R0. If bit 2 is set to 1, the data will be transmitted to pin R1.

還有，*otherwise* 不可作連接詞使用。

誤： He must submit his thesis by September, *otherwise* he will not graduate.

正： He must submit his thesis by September, *or* he will not graduate.

正： He must submit his thesis by September; *otherwise*, he will not graduate.

*Owing to the fact that*. 這種表達方式太冗贅，應以 *because* 或 *since* 取代。

冗贅： *Owing to the fact that* X increases over time...

簡潔： *Because* X increases over time...

*Particularly*. 請參見 *especially*。

*Performance*. 在評估和比較不同的方法或系統時，理工學者常提到某個方法或電腦系統的“performance”。在這種文脈中，*performance* 文法雖正確，卻略嫌模糊。故應換上較精確的字詞，如 *speed*, *throughput*, *accuracy* 或 *efficiency*，否則應定義好“performance”的意思。

模糊： When this technique is used, system *performance* is enhanced significantly.

清楚： When this technique is used, the speed of the system increases significantly.

清楚： This technique increases the accuracy of the system by 20%.

誤： Parallel computing is a popular technique for improving *the performance of scientific calculations*.

正： Parallel computing is a popular technique for improving *the speed of scientific calculations*.

*Phenomena*. *Phenomena* 是複數名詞，單數形式是 *phenomenon*。*Phenomenon* 即「現象」，在中文裏很常用，但在英文中會較少用到。所以英文句子中最好省略這字詞，而改用較具體的字詞。中國人應格外留意，若自己的句子中出現 *phenomenon*，很可能就是贅詞。

累贅： We must also consider *the phenomenon of* the fringe effect.

簡潔： We must also consider the fringe effect.

累贅：The *quenching and aging phenomena* in plastics have been studied extensively.

簡潔：*Quenching and aging* in plastics have been studied extensively.

**Precise, accurate.** *Precise* 是「精確」，指重複某動作或測量而可以絲毫無差。*Accurate* 指「準確」或「正確」，意思是某個動作或測量符合公認標準。具有高精確度 (*highly precise*) 的儀器若沒有經過正確的校正，仍然可能會不準確 (*inaccurate*)。

**Present, propose.** 這兩個動詞的意思稍有不同。“To present” (*prɪˈzɛnt*) 是提出某意見供他人參考。“To propose” 亦有此意，卻也有指「建議」或「推薦」之意。一個學者可“present”某個自己不認同的理論。但“propose”一個理論，等於建議別人接受這理論。在理工論文中，要指出論文推薦的方法或技術，應以 *the proposed method* 或 *the proposed technique* 等名詞片語表達；如果用“presented”的話，則是錯誤的。

誤：*Our presented scheme* successfully extracts the objects in the image.

正：*The proposed scheme* successfully extracts the objects in the image.

*Present* (*ˈpreznt*) (即「目前」) 可用來形容論文作者提出的理論或方法。“The present method” 便是代表 “the method proposed in this paper” 或 “the method we are now proposing” 的意思。

The *present* theory successfully explains how the increased concentration of boron affects the electrical characteristics of the films.

The *present* method is simpler and more elegant than Miller's method.

**Principal, principle.** *Principal* 的意思是「主要」或「最重要」，*principle* 的意思則是「原則」或「原理」。

The *principal* technique used is a modified Kalman filter.

A number of *principles* may be used to explain this result, but we believe the most likely explanation is that suggested by Daniels (1991).

**Propose.** 只有指涉一個真正的提議時，才可用 *propose*。例如，

在下面「誤」句中，*propose* 的使用方式是錯誤的：

誤：Smith *has proposed* theoretical aspects of the problem.

正：Smith *has studied* theoretical aspects of the problem.

正：Smith *has discussed* theoretical aspects of the problem.

**Prove.** 除非是指數學的證明，否則 *prove* 這個字的意思可能會太過強烈。所以應考慮以 *confirm*, *verify* 或其他字詞取代。

These examples *prove* the effectiveness of our method.

These examples *confirm* the effectiveness of our method.

**Purpose.** 在許多文脈中，*purpose* 都是贅詞。

累贅：The address counter is used for record and playback positioning *purposes*.

累贅：The address counter is used for *the purpose of* record and playback positioning.

簡潔：The address counter is used for record and playback positioning.

**Reason is because. Reason why.** 在 *the reason is because* 和 *the reason why* 中，*because* 和 *why* 都是贅詞。

冗贅：The reason we were late *is because* our car broke down.

冗贅：The reason *why* we were late is that our car broke down.

簡潔：The reason we were late is that our car broke down.

簡潔：We were late *because* our car broke down.

**Reason is that.** 需要說明某個事件或現象時，使用 *the reason is that* 是不夠精確的。*The reason for this is that* 較為清楚，但略嫌冗贅。最簡短直接的表達方式是 *this is because*。

冗贅：It is clear from the figure that the two plots differ. *The reason for this difference is that* the temperature was higher in the second trial.

簡潔：It is clear from the figure that the two plots differ. *This is because* the temperature was higher in the second trial.

簡潔：The figure clearly shows that the two plots differ. *This difference occurred because* the temperature was higher in the sec-

ond trial.

*Recently*. 在中文中，很多句子會以表示時間副詞片語開首，如「近幾年」、「近年來」或「目前」等等。中國人寫英文文章時，有時會把這種中文句式直譯成英文，把如 *recently* 或 *currently* 這類副詞擺在句首。在英文中，把表示時間的單一副詞擺在句首，雖沒有文法錯誤，但卻會不夠自然。

*Recently*, many researchers have investigated this phenomenon.

*Currently*, this problem is attracting a great deal of attention.

若將副詞擺在動詞前後或移到句尾，則句子會較自然通順：

Many researchers have investigated this phenomenon *recently*.

This problem is *currently* attracting a great deal of attention.

如果想強調某事件發生的時間，則可把句首的時間副詞改成副詞片語，如 *in recent years* 或 *at present*。同時，這樣會使句子較自然。

*In recent years*, many researchers have investigated this phenomenon.

*At present*, this problem is attracting a great deal of attention.

此外，*recently* 這字詞的意思極為模糊。對讀者來說，「最近」指的是哪一段時間，這並不清楚。「六年以前」算是最近嗎？對於一個發展一日千里的研究領域而言，六年前的研究結果已經是史料了。因此，表示時間應使用較具體的語詞，例如 *in the past decade* 或 *in the last four years*。

*Refer*. 當要引述參考資料時，不要把 *refer* 作被動動詞使用。這時 *refer* 應為主動動詞，並把句子寫成祈使語氣。

誤：Detailed descriptions of the evaluation method *are referred to* Smith (1993).

誤：Detailed descriptions of the evaluation method *can be referred to* in Smith (1993).

正：For a detailed description of the evaluation method, *refer to* Smith (1993).

正：For a detailed description of the evaluation method, *see* Smith

(1993).

正：A detailed description of the evaluation method *can be found in* Smith (1993).

正：For a detailed description of the evaluation method, *readers are referred to* Smith (1993). [文法雖正確，但略嫌冗長]

當 *refer* 表示「稱爲」的意思，正確寫法是“refer to...as...”（主動）或“...is referred to as...”（被動）。

Let us refer to this method as *the shortcut method*.

This process is referred to as “etching.”

**Reference.** 不要把名詞 *reference* 和動詞 *refer* 混淆。在電腦術語中，*reference* 有時可作動詞使用。但一般而言，應避免把 *reference* 作動詞使用，而應以 *refer* 或 *retrieve, read, recall, use* 等字詞取代。

誤：For the details of the proof, *reference* the Appendix.

正：For the details of the proof, *refer to* the Appendix.

正：For the details of the proof, *see* the Appendix.

劣：The CPU then *references* the data *in* memory.

佳：The CPU then *reads* the data *from* memory.

佳：The CPU then *retrieves* the data *from* memory.

**Represent.** 不要把 *represent*（即「代表」）和 *indicate*（即「表示」或「指出」）混淆。

劣：This result *represents* that the coefficient is significant at the 95% level.

佳：This result *indicates* that the coefficient is significant at the 95% level.

佳：This result *shows* that the coefficient is significant at the 95% level.

**Request, require.** *Request* 指要求，但被要求者不受約束，可以不答應。*Require* 也指要求，但被要求者必須滿足要求。

**Research.** 與它配合的介系詞應爲 *on*，而非 *of*。當代英文中，*research* 是不可數名詞，因此它是單數形式，不可寫成 *researches*。



誤：Much research *of* this problem has been published.

正：Much research *on* this problem has been published.

誤：Many *researches* have been published in this area.

正：Much *research* has been published in this area.

**Respectively.** 它是在科技論文中常被濫用的贅詞：

累贅：We then measured the nominal sensitivity of the 4140 steel and the stainless steel, *respectively*.

正：We then measured the nominal sensitivity of the 4140 steel and the stainless steel.

在某些情況下，使用 *respectively* 雖沒文法錯誤，但如果省略它並改寫句子的話，則會使句子更直接易讀。

不清楚：The nominal sensitivity was 200 and 270 mV/mil for 4140 and stainless steel, *respectively*.

清楚：The nominal sensitivity was 200 mV/mil for 4140 steel and 270 mV/mil for stainless steel.

清楚：The nominal sensitivity of 4140 steel was 200 mV/mil and that of stainless steel was 270 mV/mil.

讀者在閱讀首句時，在心裏會被迫停下來，把兩數字和兩種鋼鐵對應。第二和第三句將各種鋼鐵的名稱與數字一併列出，因此能讓讀者一目瞭然。若要提到多種項目，用上 *respectively* 的句子，格外令人費解。例如：

不清楚：The initial values of  $b$ ,  $h$ ,  $k$ ,  $q$ ,  $x$ ,  $\alpha$ ,  $\beta$ , and the coefficients in the  $x$  and  $y$  directions were 3,  $\rho/2$ , 183, 50, 60,  $33/22$ ,  $\rho/2$ , 0.45, and 0.38, *respectively*.

假如真的需要表達這麼多項目，則應用表格列出。這比以文章表達更清晰易明。

此外，*respectively* 與句子其他部分，必須以逗點隔開。

**Restated.** 不要將 *restated* 作轉接詞來引介某種解釋或結論。如使用 *in other words*, *that is*, *thus*, *in summary* 或其他字詞，句子會較清楚自然。

劣：Restated, the value of  $x$  increases when  $y$  is increased.

佳： *In other words*, the value of x increases when y is increased.

佳： *In summary*, the value of x increases when y is increased.

**Reveal.** 這字詞只能表示「揭露原先被遮掩的事物」。如果可使用 *show* 或 *indicate*，則不要使用 *reveal*。

劣： The test results are *revealed* in Table 6.

佳： The test results are *shown* in Table 6.

正： Experiments *revealed* that the theory was false.

不要把 *reveal* 與 *exhibit* 或 *display* 混淆。

劣： The magnesium dopant also *revealed* less activation energy than the zinc dopant.

佳： The magnesium dopant also *exhibited* less activation energy than the zinc dopant.

**Right-hand.** 諸如 *Right-hand* 和 *left-hand* 等形容詞，必須用連字號將兩個字連結，才是正確的拼法。

Look at *the right-hand side* of the equation.

**Same.** *A is the same as B* 是正確的，而 *A is the same with B* 卻是錯誤的。

**Search.** 當 *search* 後面加上介系詞 *for* 時，*search* 的意思會隨之改變。例如，*She searched her bag* 的意思是她在袋子裏找某東西；*She searched for her bag* 的意思則是她要找回遺失了的袋子。所以，不應該寫 *We searched the solution*，而應寫 *We searched for the solution*。還有，*We searched the set of possible solutions to find the optimal solution* 也是正確的。

**Secondly, thirdly.** 這些字在當代英文中聽來很生硬。應該使用 *second, third* 等等。（請參見 *firstly*。）

**Show.** 不要使用 *show* 來表示「提出」。

誤： The paper *shows* simulation results that demonstrate the effectiveness of the method.

正： The paper *presents* simulation results that demonstrate the effectiveness of the method.

誤：Experimental results *are shown* in section 4 of the paper.

正：Experimental results *are presented* in section 4 of the paper.

不要以 *show* 來表示「討論」、「探討」或「考察」。

誤：We will *show* some properties of these types of graphs below.

正：We will *examine* some properties of these types of graphs below.

在引介數學方程式時，別以 *show* 來表示「表示」或「寫出」。

誤：The closed-loop gain can then be *shown* as follows.

正：The closed-loop gain can then be *expressed* as follows.

正：The closed-loop gain can then be *written* as follows.

如果可找到較清楚簡潔的動詞，就不要使用 *show*。

誤：Table 4 *shows the comparison of* the accuracy of our learning algorithm with that of the other algorithms.

正：Table 4 *compares* the accuracy of our learning algorithm with that of the other algorithms.

誤：Section 6 *shows the summary of* the results.

正：Section 6 *summarizes* the results.

*Show* 有時也有「證明」的意思，因此語意會變為較強烈。撰寫研究報告時，有些情況使用語意較弱的字來取代，可能會較恰當。

最強：Smith (1984) *showed* that the burn rate increases greatly under these conditions.

較弱：Smith (1984) *found* that the burn rate increases greatly under these conditions.

最弱：Smith (1984) *suggested* that the burn rate increases greatly under these conditions.

**Significant.** *Significant* (即「重要」、「有意義」)、*obvious* (「明顯」、「顯然」)、*apparent* (「顯然」、「表面上」) 以及這些字的 *-ly* 副詞形式，意義都各有不同。例如，*an apparent change* 是指很容易憑外表觀察出來的變化，但 *apparent* 亦暗示那變化未必為真。*An obvious change* 則指清楚容易觀察出來的變化。*A significant change* 是指在特定情形中性質或數量方面的重要變化。通常“obvious”的變

化也會同樣是“significant”。但對沒有具備專業知識的人而言，“significant”的變化卻未必“obvious”。此外，一個“apparent”的變化卻可能並不“significant”。

下面句中的 *obvious* 或 *significant* 都可修飾 *decrease*。若受 *obvious* 修飾，則句意是「這減少是可清楚觀察到的」，若受 *significant* 修飾，則是指「這減少在這特定文脈中相當重要」。在這例子中，除非要暗示「減少僅是表面的，並沒真正發生」，否則不應使用 *apparent*。

When the annealing temperature was increased, an *obvious* decrease in the C-H bond absorption peaks was observed.

When the annealing temperature was increased, a *significant* decrease in the C-H bond absorption peaks was observed.

**Similar.** 與它配合的介系詞應為 *to*，而非 *as*。此外，不要把名詞置於 *similar* 和 *to* 之間，參考下面的例句：

劣：The second element has a *similar structure to* the first.

正：The second element has a *structure similar to* the first.

嚴格說來，上面句子的比較項目是第一個和第二個元素的結構，因此可考慮進一步修改：

正：The second element has a structure similar to *that of* the first.

**Similarly.** 這字詞是用來指出兩個概念或事物之間相似的地方。當所指涉的並非相似關係，而是對照或相對關係時，則不應使用 *similarly*，應以 *in contrast*, *by contrast* 或 *conversely* 來表達。

劣：A sufficiently large scale of operations is needed to justify R&D investment. *Similarly*, a fruitful R&D program is necessary to support the growth of the company's operations.

佳：A sufficiently large scale of operations is needed to justify R&D investment. *Conversely*, a fruitful R&D program is necessary to support the growth of the company's operations.

**Simply.** 這字詞有時可有效地強調一個複雜的和一個簡單的動作之間的對照。但許多時，*simply* 都是多餘的。

正： Instead of carrying out this complex measurement procedure, we *simply* derive the value from Equation (3).

累贅： Whenever a model changes its status, it *simply* broadcasts a change message to all its dependents.

簡潔： Whenever a model changes its status, it broadcasts a change message to all its dependents.

*Since*. 當把 *since* 作附屬連接詞來表示「因為」時，*since* 後面不應接著 *that*。在以 *since* 開首的句子中，不應把 *then* 放在主要子句前面。

誤： *Since that* the result was unsatisfactory, we repeated the experiment.

誤： *Since* the result was unsatisfactory, *then* we repeated the experiment.

正： *Since* the result was unsatisfactory, we repeated the experiment.

*So*. 在正式的英文中，這字不應用來表示 *very* 的意思。

劣： These exercises are *so* difficult.

佳： These exercises are *very* difficult.

由於 *so* 為對等連接詞，英文句子一般不應以 *so* 開首。但資深的作者偶爾也會為求得某種特殊效果而違反這準則。儘管如此，科技寫作中，如果想在句首表示「所以」或「因此」之意，則應使用 *thus* 或 *hence*。此外，對等連接詞後面本來就不加逗點，所以如果真的要句首使用 *so*，千萬別在後面加上逗點。

劣： Any vibration of the ground shakes the seismometer's frame, but inertia tends to hold the mass in its place. *So*, the coil on the frame moves in relation to the magnet on the mass.

佳： Any vibration of the ground shakes the seismometer's frame, but inertia tends to hold the mass in its place. *Thus* the coil on the frame moves in relation to the magnet on the mass.

*So-called*. 構成這複合形容詞的兩個字，必須以連字號連接：

誤： *so called*

正： *so-called*

*So far*. 在研究報告的文獻回顧部分，最好別以 *so far* 或 *until*

*now* 來表達「到目前為止」的意思，它們都太口語，所以使用 *to date* 會較適合。如果使用現在完成式，則沒必要用 *to date* 去指涉事發的時間，因為現在完成式本身就已清楚交代了「從過去持續到目前」的意思。

劣： *So far*, little research has been done on this problem.

佳： *To date*, little research has been done on this problem.

佳： Little research has been done on this problem.

***So that***. 在表示目的或理由的子句前，用 *so that* 比 *so* 來得適合。

模糊： First the cache memory is cleared *so* the result will not be affected by stale data.

精確： First the cache memory is cleared *so that* the result will not be affected by stale data.

***So that, such that***. *So that* 引介的子句，是敘述主要子句中的動作的目的或理由。*Such that* 則用來陳述某種條件，通常用以修飾其前面的名詞。

誤： I went to the library *such that* I could study.

正： I went to the library *so that* I could study.

正： There exist two objects  $x$  and  $y$  *such that*  $x$  does not equal  $y$  and  $x$  and  $y$  are members of the set  $S$ .

表達因果或邏輯關係時，應使用 *so* 而不應使用 *such that* 或 *so that*。在以下例句中，第二個子句非但沒表示出第一個子句中動作的目的，反而卻是第一個子句的結果。

誤： Here  $C_b$  and  $C_r$  share the same field *such that* both are forced to be identical.

正： Here  $C_b$  and  $C_r$  share the same field, *so* they must be identical.

***Solution***. 當談到某個問題或方程式的解答時，*solution* 後應加上介系詞 *to*，如 *the solution to the problem (or equation)*。當談到某方程式  $E$  中的某一個變數  $y$  的值時，*solution* 後應加上介系詞 *for*，如 *the solution for  $y$  in equation  $E$* 。（參見 *solve*。）

只有在真正遇上問題或困難而必須解決時，才可使用 *solution* 這字詞。科技寫作中，應避免以術語 *solution* 來代替 *system*, *package*, *kit*, *design* 等這些較精確的字詞。

模糊：This is a complete office automation solution.

精確：This is a complete office automation system.

冗贅：We have a new design solution.

簡潔：We have a new design.

模糊：Our firm will soon release an exciting new LAN solution.

精確：Our firm will soon release a new LAN chip set.

精確：Our firm will soon release a new LAN card.

*Solve*. 在表示要解決某個問題或方程式時，應寫 *solve the problem* 或 *solve the equation*。在指稱由某方程式得出的變數  $x$  值時，應使用 *solve for x*。

*Solving* the above equation, we obtain the following value for the angular momentum.

*Solving for x* in Equation (3), we obtain the following expression for the angular momentum.

只有當確實有問題要解決時，才可用 *solve* 這動詞，否則應使用 *treat*, *handle* 或更精確的動詞。

劣：The case in which the sample rate is uniform can be *solved* by using direct duplication of serial registers.

佳：The case in which the sample rate is uniform can be *treated* by using direct duplication of serial registers.

*Some*. 英文文章中，使用 *some*, *very*, *rather* 及 *quite* 之類的修飾詞常會使句意模糊而微弱，故可免則免。若必須使用 *some* 的話，則應考慮使用 *several*, *a number of* 或 *many* 代替。例如，如果要以 *some* 表示「某一組」之意，則應以 *specific* 或 *certain* 代替。

模糊：In recent years, *some* researchers have proposed *quite a few* methods for solving this *rather* challenging problem.

清楚：In recent years, *researchers* have proposed *many* methods for

solving this *challenging* problem.

**Such.** *Such a* 有時可表示「這種」(this type of) 的意思，但千萬別以 *such* 來表示「這個」(this) 的意思。不少中國人撰寫 *In such a case, the strategy is invalid* 時，其實應寫成 *In this case, the strategy is invalid*。

誤： *Such* selection operator guarantees that the best M strings will always survive.

正： *This* selection operator guarantees that the best M strings will always survive.

**Suffer.** 若使用 *suffer* 這動詞來指出某方法或做法的缺點，則其後必須接著介系詞 *from*，否則不但是語法有錯，而且句意可能會與作者的原意背道而馳，因為 *suffer* 也有「忍耐」之意。

誤： This method *suffers* several problems.

正： This method *suffers from* several problems.

正： There are several problems with this method.

正： This method has several problems.

正： This method is subject to several problems.

**Suggest.** 一般用法的意思為「建議」。此外，這字詞還有「表示」之意，可用來表達由某些證據推出結論。*Suggest* 的意思沒有 *indicate* 或 *show* 般強。

正： These data *suggest* that deposition rate depends on the amount of nitrogen available.

正： The survey results *suggest* that men tend to prefer sour flavors.

**Support.** 從事資訊電子業的工程師往往濫用這字詞，他們會用它來指涉任何兩種項目（包括人類、電子零件、電腦與其他硬體設備、軟體等等）之間所有的關係。故應特別注意要避免濫用 *support*，而應另找較精確的字詞取代。（請參見第六章 6.9 節。）

模糊： The computer *supports* many popular software applications.

清楚： The computer *can run* many popular software applications.

模糊： We *support* customers with a variety of services.

清楚： We *provide* customers a variety of services.



模糊：The system *supports* two operating modes.

清楚：The system *has* two operating modes.

模糊：The program *supports* both Windows™ and DOS.

清楚：The program *is compatible with* either Windows or DOS.

清楚：The program *can be used with* either Windows or DOS.

**Suppose.** 別把 *suppose* 和 *if* 混淆。*Suppose* 是動詞，所以 *suppose that x is true* 是獨立子句，可當為一完整句子。*If* 則為附屬連接詞，以 *if* 開首的就是附屬子句，不能當完整句使用。以 *suppose* 開首的子句應接著句號或分號，但接逗點是錯誤的。唯一可接逗點的情況是，逗點後接有以連接詞 (*and, but* 等等) 開首的獨立子句。

誤：Suppose that all the parameters are set to 1, then the system will achieve maximal efficiency.

正：Suppose that all the parameters are set to 1. Then the system will achieve maximal efficiency.

正：Suppose that all the parameters are set to 1; then the system will achieve maximal efficiency.

正：If all the parameters are set to 1, then the system will achieve maximal efficiency.

正：Suppose all the parameters are set to 1, and the system runs for one hour.

**Terminology.** 在絕大多數情形下，*terminology* 是不可數名詞，因此不應該寫成複數形式（詳見第二章 2.1 節）。

**That.** 在限定關係子句中，應以 *that* 作關係代名詞，而不用 *which*。（參閱第四章 4.15 節「代名詞和前述詞一致」。限定子句和非限定子句的區分，詳見第五章 5.2 節中逗點的討論）。

原句：This is the computer *which* I bought last week.

恰當：This is the computer *that* I bought last week.

但如果限定關係子句以介系詞開首，則關係代名詞必須用 *which*。

誤：The node numbers determine the order *in that* each producer

writes its message into the buffer.

正：The node numbers determine the order *in which* each producer writes its message into the buffer.

使用 *that* 這字來引介名詞子句時，*that* 後面不加逗點。

誤：The results show *that*, the theorem is true.

正：The results show *that* the theorem is true.

當 *that* 出現在名詞子句或關係子句的開頭時，如果 *that* 後面緊接著名詞片語或代名詞，只要句意依然清楚，則可省略 *that*。

正：Suppose *that* the system includes ten processors.

正：Suppose the system includes ten processors.

下面兩個例子中，假若省略 *that*，則句子會變得不自然而易令人誤解，因此 *that* 不應省略。在名詞子句或關係子句前面使用 *that*，可使句子更清晰，通常亦不會使句子不通順。所以在科技研究報告中，一般而言還是保留 *that* 較恰當。

清楚：The phenomena *that* the theory must explain are very complex.

模糊：The phenomena the theory must explain are very complex.

清楚：It has been suggested *that* the stability of the film deteriorates at high temperatures.

模糊：It has been suggested the stability of the film deteriorates at high temperatures.

**Then.** 因為 *then* 非對等連接詞，而是連接副詞，所以“A, then B”是錯誤英文。在 *then* 前面必須加上對等連接詞，如 *and* 或 *but*，或是把 *then* 前面的逗點改成句號或分號（參閱第四章 4.3 節）。

誤：The samples were dipped into the solution, *then* they were washed with water.

正：The samples were dipped into the solution, *and then* they were washed with water.

正：The samples were dipped into the solution. *Then* they were washed with water.

*There exists.* 不要任意以 *there exists* 代替 *there is* 來表示「有」或「存在著」。在討論邏輯或數學時，可用 *there exists* 以表示存在量詞（“ $\exists$ ”）。但在一般情形下，寫 *there is* 或 *there are* 通常較恰當。

劣： *There exist two techniques for controlling this type of system.*

佳： *There are two techniques for controlling this type of system.*

*They.* 第三人稱複數代名詞 *they* 不應用來指稱單數前述詞，如 *each person* 或 *everyone* 等等。如果使用第三人稱單數代名詞 *he* 或 *she* 不太恰當的話，則應修改句子，把前後的名詞及代名詞都一致改為複數。否則，應省略代名詞，並改寫句子。（詳見第四章 4.14 節。）

誤： *When each person arrives, they must check in.*

正： *When each person arrives, he must check in.*

正： *When the guests arrive, they must check in.*

正： *Upon arriving, each guest must check in.*

正： *Upon arrival, each guest must check in.*

*This.* 如果以 *this* 來指涉一整個子句或句子的意思，則所指意思必須清楚明瞭。否則，最好在 *this* 後面加上一個名詞，以指出 *this* 所指為何。（詳見第四章 4.13 節。）

劣： *The subjects identified fewer than half of the odors correctly.  
This was surprising.*

佳： *The subjects identified fewer than half of the odors correctly.  
This result was surprising.*

佳： *The subjects identified fewer than half of the odors correctly.  
This low success rate was surprising.*

*Those.* 在許多情形下，名詞前面使用指示詞 *those* 會使句子不自然。這時應以 *the* 取代，或乾脆把 *those* 刪除。

劣： *We must also factor in the service time of those customers that arrive before the labeled customer.*

佳： *We must also factor in the service time of the customers that ar-*

rive before the labeled customer.

佳：We must also factor in the service time of customers that arrive before the labeled customer.

*Thus*. 只有當第二個句子或子句的意思，確實為第一個句子或子句的意思所蘊涵的結果時，方可用 *thus*（或 *therefore*）來連接。例如，下面例子中，第二句並非第一句在邏輯或因果上的結果，所以使用 *thus* 會令人費解。這例子中的 *thus* 應省略，或可以 *for example* 來取代。

劣：R&D projects undertaken by the institute aim to develop major industrial technologies essential to the development of the nation's economy. *Thus* project A, project B, and other projects related to automation technology were carried out to increase productivity in several important industries.

*To do x, for doing x*. 要解釋某事物的功能或某行為的目標時，如果受修飾的對象為名詞，則通常使用介系詞（通常是 *for*）加上動名詞來修飾。但如果受修飾的對象為動詞，則常以不定詞來修飾。（這並非絕對的規則，但往往是對的。）下列例句中，不定詞片語修飾了句子的動詞，以說明進行掃描的原因，所以使用得非常自然。

Scanning was performed *to confirm* the accuracy of the results.

但如果以 *for confirming* 取代 *to confirm* 這不定詞，則句子會變得很不自然：

劣：Scanning was performed *for confirming* the accuracy of the results.

下面例句中，片語 *for designing mixed mode ICs* 修飾名詞 *system*，這片語說明所購買的是何種系統。因為被修飾的是名詞，所以使用介系詞加動名詞而成的介系詞片語，會比較自然。

We recently purchased a new CAD system *for designing* mixed mode ICs.

雖然在文法上動名詞和不定詞都可作句子主詞使用，然而使用

動名詞比不定詞常會較自然。

劣： *To prove* the uniqueness of problem (i) is equivalent to proving that *X* is negative at R.

佳： *Proving* the uniqueness of problem (i) is equivalent to proving that *X* is negative at R.

上面句子中，緊接 *is equivalent to* 後面的字詞該是動名詞而非不定詞，因為此時 *to* 是介系詞，而非不定詞開首的 *to*。

誤： *Proving* the uniqueness of problem (i) is equivalent *to prove* that *X* is negative at R.

**Totally.** 意思是「完全」，並不能表示「總共」或「一共」之意。如果要表示「總共」之意，則應用 *a total of* 或 *altogether*。

誤： There are three solutions *totally*.

誤： There are *totally* three solutions.

正： There are *a total of* three solutions.

正： There are three solutions *altogether*.

**Type of.** *Type of*, *form of* 及 *kind of* 這些詞語的數和接在其後的名詞的數必須一致。在正式文章中，寫 *type of* 比寫 *kind of* 恰當。

正： We are designing a new *type of* computer.

正： There are four *types of methods* that can be used to solve this problem.

誤： This is Sarah's favorite *kind of shoes*.

正： This is Sarah's favorite *kind of shoe*.

**Unlike.** 英文的 *unlike* 可放在句首，來表示中文「與 *x* 不同，…」或「不同於 *x*，…」的意思。若把 *different from* 或 *differing from* 放在句首，則句子會顯得很不自然。

劣： *Differing from* previous authors, we use the mean age and mean excess to obtain the formula for the mean waiting time.

劣： *Different from* previous authors, we use the mean age and mean excess to obtain the formula for the mean waiting time.

佳： *Unlike* previous authors, we use the mean age and mean excess to obtain the formula for the mean waiting time.

*Until now.* 在研究報告的文獻回顧中，應該以 *to date* 表示「到目前為止」。在大部分正式文章中，使用 *until now* 及 *so far* 都是不恰當的。

劣：*Until now, however, the effect of boron on the reaction rate has not been examined.*

佳：*To date, however, the effect of boron on the reaction rate has not been examined.*

因為英文的現在完成式本身就表示「到目前為止」之意，所以在大部分使用 *until now, so far* 或 *to date* 的句子中，這些詞語都可以省略。

佳：*However, the effect of boron on the reaction rate has not been examined.*

佳：*However, the effect of boron on the reaction rate has yet to be examined.*

*Utilize.* 撰寫科技論文時，應避免使用 *utilize*，而以 *use* 取代。如此一來，語法會較簡單直接。*Employ* 也比 *utilize* 恰當。

原句：*We will utilize an LP parser for the parsing procedure.*

更恰當：*We will use an LP parser for the parsing procedure.*

*Versus.* 這個字詞正確的縮寫是 *vs.*，“*v.s.*”是錯誤的寫法。

*Very.* 這個字詞是用來加強形容詞形容程度的副詞，但它的意思卻微弱。大部分情形下，*very* 並非句子必要的部分，通常應省略。

累贅：*Very many researchers have studied this problem.*

簡潔：*Many researchers have studied this problem.*

*Whether or not.* 在大多數使用 *whether or not* 的文脈中，*or not* 可以省略，以使得句子更簡潔。只有當要特別強調有兩種可能情形時，才有必要寫 *whether or not*。如果意思是「無論如何」，則寫 *whether or not* 也是正確的。

累贅：*After the first iteration, we check to see whether or not the weight exceeds the threshold q.*

簡潔：*After the first iteration, we check to see whether the weight ex-*

ceeds the threshold  $q$ .

正確： *Whether or not* excess oxygen is available, the fuel will still burn. [意思是「無論如何」]

**Which.** 限定關係子句中（限定關係子句的說明，詳見第五章 5.2 節），以 *that* 作關係代名詞比以 *which* 恰當。然而，如果關係子句以介系詞開首，則必須以 *which* 作關係代名詞。

原句： This is the system *which* we shall use.

恰當： This is the system *that* we shall use.

誤： The water flows into a storage tank, from *that* hot water can be drawn when needed.

正： The water flows into a storage tank, from *which* hot water can be drawn when needed.

**While, when.** *When* 可指一個頃刻或一段時間，*while* 則只能指一段時間。在 *while* 開首的子句中，常使用進行式的動詞（有時也可用簡單現在式或過去式）。

正： *When* the magnesium *was added* to the solution, a precipitate immediately formed.

正： *While* the engine *was running*, three different types of faults were simulated.

劣： *While* the solution *begins* to boil, the temperature levels off.  
[“Begins to boil” 是指一個頃刻，故用 *while* 不自然。]

佳： *When* the solution *begins* to boil, the temperature levels off.

**Without loss of generality.** 這片語正確的寫法是 *without loss of generality*，下面前三個例句的寫法都是錯誤的。

誤： *Without the loss of the generality*, we can assume that...

誤： *Without losing the generality*, we can assume that...

誤： *Without lost generality*, we can assume that...

正： *Without loss of generality*, we can assume that...

# 習題答案

---

## 練習 2-1

device	可數	file	可數
hydrogen	不可數	hydrochloric acid	不可數
substrate	可數	deposition	不可數
telecommunications	不可數	system	可數
equipment	不可數	liter of hydrochloric acid	可數
research	不可數	concept	可數
software	不可數	term	可數
evidence	不可數	terminology	不可數
project	可數	gold	不可數
information	不可數	rain	不可數
biology	不可數	kilogram	可數
mass	不可數 / 兩用	efficiency	不可數

## 練習 2-2

1. 不可數，不可數，不可數，可數，可數，可數。



2. 不可數。
3. 可數，可數。
4. 可數，不可數，可數。
5. 不可數，不可數，不可數，可數，可數，不可數，不可數，可數，不可數，可數，可數。
6. 不可數，可數，不可數。
7. 不可數，可數，可數，可數。
8. 不可數，可數。

### 練習 2-3

一般而言，一個名詞應使用定冠詞還是不定冠詞都有明確的答案；但有時候，答案要視乎作者意思而定。以下的答案都是文章本來的寫法。所以讀者也許會發現部分答案和自己的不同，但又覺得自己的答案也同樣合理。有這種情況的話，最好是請教母語為英語的老師，看你的用法是否也可接受。

1. In the late 1970s, the laser printer had just arrived on the market. It used a complex and expensive optical system to scan a diode laser beam in straight lines across a photoconductive drum. This optical system consisted of a rotary polygonal-mirror scanner and special focusing lenses. The laser beam is simultaneously modulated and deflected by the rotating mirror so that it repeatedly scans straight lines, forming an electrically charged image on the photoconductive drum. This image is then transformed into a visible image on paper by an electrophotocopying process of the kind used by photocopiers.

Vital to the optical system of the early laser printer was a high-precision, mirror-scanner motor needed to minimize fluctuations in the placement and straightness of the scanning lines. In laser printers, about 10 scanning lines are generated per rotation. Each line must scan exactly the same position on the photoconductive drum. If the shaft of the motor rotating the scanner wobbles, the scanning line also will deflect. The permissible runout angle for motor shafts of mirror scanners is about 5 seconds, depending on the system. In a typical scanner, the placement error should be less than 25 micrometers, which usually corresponds to a deflection angle change of less than 10 arc seconds. The line produced by laser printers may curve no more than  $\pm 0.1$  millimeter over the entire scanning range of about 260 mm. To correct placement errors due to mirror wobble, cylindrical lenses often are

used.

2. Thermonuclear fusion is the process through which light nuclei—such as hydrogen and its isotopes, deuterium and tritium—fuse at extremely high temperatures to produce heavier elements. It is the fundamental source of energy in the universe, providing the power for the sun and all other stars. Ultimately, all forms of energy used on Earth—including fossil fuels, hydroelectric power, and solar power—derive from fusion energy. Even the energy stored in uranium was originally a product of fusion reactions in a nearby supernova.

Since nuclei are all positively charged, very high temperatures—over 100 million Kelvin—are required to give them sufficient energy to overcome coulomb electrical repulsion and to react. The basic problem of controlled fusion reactions is, therefore, to produce these high temperatures and simultaneously to confine the resulting plasma long enough and at sufficient density for the release of economically significant energy.

There are two main approaches to the use of fusion for power generation: inertial confinement and magnetic confinement. Of these two, magnetic confinement has yielded the best results so far. Magnetic confinement makes use of the fact that the charged ions and electrons that make up the thermonuclear plasma tend to spiral around magnetic lines of force rather than move across them. With good design, therefore, magnetic “bottles” can be devised to contain the plasma even at very high temperatures, while a combination of magnetic field compression and other methods can be used for heating.

3. Early computers required a special environment, with raised floors to carry the interconnecting cables and large air-conditioning units to remove the dissipated heat; the maintenance man had to be summoned frequently. At a cost of over a dollar for either a discrete transistor or a bit of memory, the price of early computer systems generally came to a few million dollars. The high cost forced compromises on computer designers, such as the use of a single accumulator register as the source of one argument in every operation of computer logic or arithmetic. This simplified the control structure but generally necessitated time-consuming transfers of data that were extraneous to the intended calculation.

Since that time, the speed, cost, reliability, and size of computer circuitry have changed beyond recognition. The cost of a single transistor or bit of memory is less than a hundredth of a cent, circuits operate for thousands of hours without failing, and a computing unit that far exceeds the capabilities of the ENIAC measures about a centimeter on a side, consumes a fraction of a watt, and can be bought for only a few dollars. This has been brought about, on the supply side, by a remarkably diverse body of new

technology and, on the demand side, by the emergence of new, massive, and diverse applications of computational resources, which for the most part bear little resemblance to those for which the general-purpose computer was originally intended.

4. Radio astronomy—the measurement of radio frequencies emitted by interstellar molecules—is the chief method for observing how stars form from interstellar clouds of gas and dust, or die and release such clouds. We live about 30,000 light years from the center of our galaxy, but interstellar dust blocks most of the distance from view by optical telescopes. However, radio waves travel through the dust and can be recorded by special receivers, since the wavelengths are much longer than the size of the dust grains.

Radio telescopes are somewhat similar to optical telescopes. Radio waves from interstellar space are reflected off the antenna—a bowl-shaped mirror—onto a secondary mirror. The waves are reflected down to the center of the bowl, where they enter a radio receiver, or radiometer. The signal is then amplified, filtered, and processed by a detector with a short integration time—about 0.1 ms, or the response time suitable for a loudspeaker.

In making an observation, the astronomer typically steers the antenna toward a radio source, such as a nebula. The signals from various species of molecules—at least 40 have been identified so far—are measured by tuning the receiver to the wavelength characteristic of each species. The observed peak output power of many regions of an interstellar cloud can be plotted as a map with isophotes.

5. Computers would seem much friendlier if it were possible to verbally ask them for information or command them to carry out a task, and if they could respond by talking in natural, conversational English. However, the prospects for automatic recognition of fluent, continuous speech in the near future are not encouraging, in part because of the complexity of the task and in part because of inadequate research support.

A fundamental question in automatic speech recognition by computers is how much information is contained in the acoustic wave patterns that make up the words and sentences used in communicating by voice. In other words, can the machine decipher a voice command and act on it simply by decoding the wave pattern, or does it need to know certain additional information? In all cases, the answer seems to be that extra knowledge must be programmed into the computer.

Speech recognition by a computer comprises two operations. The first is the decomposition of acoustic wave patterns into the basic sounds or elements of speech, called phonemes. Existing speech recognition machines do this job with no more than 65 percent accuracy, in part because the wave patterns corresponding to neighboring phonemes tend to overlap. The sec-

ond operation is to arrange the phonemes into words and the words into sentences, taking into account that a substantial fraction of the phonemes may be misidentified, and it is here that the need for linguistic and contextual knowledge arises.

6. The molecules of most fuels have far too many atoms for combustion to proceed as a concerted event. Imagine the tangle that would arise if the eight carbon atoms and the 18 hydrogen atoms of an octane molecule ( $C_8H_{18}$ ) were to disengage from one another and combine all at once with the surrounding molecules of diatomic oxygen ( $O_2$ ), forming the new chemical bonds of carbon dioxide ( $CO_2$ ) and water ( $H_2O$ ). No fuel burns that way. Instead the breakdown of fuel molecules and the formation of combustion products proceed in long sequences of steps; each step involves only a small rearrangement of chemical bonds.

A step of this type is termed an elementary reaction; the various molecules created along the way are called reactive intermediates, and the set of all elementary reactions that together account for the net chemical transformation is the reaction mechanism. The equation describing the overall chemical reaction that takes place in a flame gives no hint of what the individual molecular changes are; the equations describing elementary reactions, however, do represent real chemical events at the molecular level. Only when all the important elementary reactions are known can the path from fuel to combustion products be accurately described in terms of the rearrangements of atoms in molecules.

7. As far as chemists and biologists are concerned, the basic building blocks of matter are atoms and molecules, combinations of atoms that are bound together electrically. An atom consists of a nucleus, which has a positive electric charge, surrounded by one or more electrons that are negatively charged. The electrons are over a thousand times less massive than the nucleus, but they usually occupy a volume with a diameter more than ten thousand times that of the nucleus. Thus, to all intents and purposes, the size of an atom is determined by its electrons.

Since oppositely charged particles attract one another, electrons in an atom tend to stay as close to the nucleus as possible. If one of the electrons is given additional energy, however, the force binding that electron to the nucleus is partially or totally overcome. When the compensation is partial, we speak of a process of excitation; when total, of ionization.

The more the attractive force within the atom is counterbalanced, the greater the separation of the excited electron and the nucleus. If one electron in an atom is at a much greater distance from the nucleus than all the others, the atom is called a Rydberg atom, the highly excited electron a Rydberg electron, and the rest of the atom (the nucleus plus the less distant electrons)

the core of the Rydberg atom.

8. More complex circuits are generally more specialized in their functions and thus are less in demand. The efforts of integrated circuit designers have focused on developing commercially viable products using integrated circuits in the face of this and other constraints.

Undoubtedly the most successful such product has been the memory circuit, which makes large data bases practical; the second most successful class of devices has been the microprocessor and its successor the microcomputer, which is, literally, a computer on a chip. The programming of microcomputers often involves a program written permanently into a special read-only memory (ROM) on the chip during the manufacturing process, which makes it possible to use this class of circuits in a wide variety of ways.

9. The expansion of the universe was discovered when it was found that cosmic objects move away from us with speeds that are higher the farther away the object is located. The speed at which objects move away from us increases by about 15 km/sec for every  $10^6$  light years distance from us. The expansion must be imagined not as the penetration of a limited amount of matter into empty space surrounding it, but as an increasing dilution of matter everywhere in the universe. Each point can be considered the center of this dilution. Indeed, regardless of his location in the universe, an observer would see exactly the same thing with respect to the objects around him; that is, objects would recede from him at the rate of 15 km/sec/ $10^6$  light years. The expansion of the universe does not distinguish any point and is the same all over space.

This expansion leads to a remarkable conclusion when we try to extrapolate it toward the past: one can easily calculate that about 18 billion years ago the density of matter must have been infinite. Thus we can indeed calculate approximately the date of the Primal Bang.

It is important to keep in mind that the Primal Bang is not a local phenomenon. The descriptions of it in the popular literature are often grossly misleading; it is wrong to imagine that the Primal Bang occurred at a given point in space, matter being expelled in all directions. Actually, the Primal Bang was the beginning of a decompression of an infinite universe. This means that the whole universe, the infinite space, was filled with an infinite density of matter at time zero. Immediately afterward the density became finite though still very high. With the passage of time the density decreased further until it reached the present value.

10. The function of a bus is to transfer information in the form of electric signals between the different parts of an electronic system. The generic term for system components connected by a bus is devices. A group of devices is

connected to a bus segment.

Only one device, the bus master, is allowed to control the bus and initiate data transfers at any one time. Several masters may be present on a bus, so contention between them must be resolved using arbitration rules.

A bus master either oversees the transfer of data between devices or, more often, exchanges information with one or more slaves. The bus master selects slaves by placing address information on the bus; each slave compares this information with its own address. If the addresses match, the master and slave establish a connection and the slave becomes a responder. Addresses that identify more than one slave are called broadcast addresses. A particular device may act as both master and slave, but not at the same time.

Once the slaves are connected, the bus master exchanges data with them over the bus. The master breaks the connection with its responders after the data have been transferred. This sequence of actions—making a connection, transferring data, breaking the connection—is called a transaction. The master may either relinquish bus mastership after a transaction or continue with other transactions.

### 練習 3-1

在大多數情況下，句子應使用甚麼動詞時態，一目瞭然；但有些情況中，卻必須看作者意思而定。下面的答案都是原文的寫法。所以讀者或許會發現自己的答案與這裏所提供的不同，但自覺已依據書中的原則作答。如果是這樣的話，不妨請教英語系國家的老師，看自己的答案是否真的站得住腳。

1. In February of 1899 the British ship *Southern Cross* put 10 men ashore at Cape Adare in Antarctica, thus beginning the first expedition to endure a year on the world's southernmost continent. Today many zoologists credit the expedition, which ushered in the "heroic" era of Antarctic exploration, with a discovery that has intrigued them for almost a century: the coldest marine habitat in the world is actually alive with fishes. The team's zoologist, Nicholai Hanson, did not survive the year on the icy land, but before his death he collected examples of previously unknown fish species.

Almost a century later investigators are still trying to understand the adaptations that enable fish to survive in a region once thought to be virtually uninhabitable. Of particular interest are the evolutionary adaptations of the suborder Notothenioidei, a group of teleosts, or advanced bony fishes, that are related to the perchlike fishes common in virtually all marine habitats. This suborder of between 90 and 100 species is primarily confined to

the Antarctic region; there it dominates, accounting for an estimated two thirds of the fish species and 90 percent of the individual fish in the area.

- Figure 2 shows the current-voltage (I-V) characteristics of aluminum contacts on boron-doped polycrystalline diamond films deposited from gas mixtures with different concentrations of boron. The I-V characteristics were determined by applying a voltage to the Al contact on the diamond film surface while grounding the rear of the Si substrate. Poor rectifying characteristics were obtained as a result of excess reverse leakage current. When the boron concentration increased, the forward current decreased. This decrease in the forward current may be attributed to impurity scattering on the diamond film. For a given temperature, the mobility decreased with increasing impurity concentration because of enhanced impurity scattering. The smaller forward current was due mainly to the smaller hole and electron mobility.

The I-V characteristics of diamond films deposited with various boron concentrations and annealed at a constant temperature in helium ambient at 900° C for 30 min. are shown in Figure 3. After the annealing treatment, there was no deterioration in the I-V characteristics of the undoped films. In the boron-doped films, the leakage current for the 10V forward voltage doubled and deterioration in the rectifying characteristics was observed.

- The amplification of ultrashort pulses in erbium-doped fiber amplifiers (EDFAs) has been intensively studied both theoretically and experimentally. Several theoretical models have been proposed that use different gain descriptions for the pumped erbium ions [2-6]. Numerical studies have shown that an accurate analysis requires the use of the Maxwell-Bloch equations with all the higher-order dispersive and nonlinear terms [7]. However, previous studies have all been concerned with the amplification in an EDFA of a single ultrashort pulse with negligible gain saturation. For this case, our previous work has shown that solving the Bloch equations for the pumped erbium ions is equivalent to using a complex Lorentzian gain profile [9]. Here we extend our previous results to include the important phenomenon of gain saturation, which occurs in the amplification of the pulse train in the amplifier.

This paper presents a model that fully characterizes the amplification of an ultrashort soliton pulse train in an EDFA. This model employs the general formalism of a two-level system to treat the coupled set of Maxwell-Bloch equations. The model provides a general expression for the propagation of the pulse train in the amplifier. The population relaxation time in the Bloch equation is modified to include the pumping rate, and the pump absorption is taken into account by solving the pump intensity evolution equation. This approach allows us to estimate the range of pulse widths where the simpler rate-equation approximation [8] is valid. The paper also dis-

cusses the problem of the nonlinear nonreciprocity of soliton transmission in EDFAs with different pumping configurations.

4. For three and a half centuries after their discovery, the Galilean satellites of Jupiter were studied through telescopes. Then, on 20 August 1977, the first of two Voyager spacecraft was launched from Kennedy Space Center. A year and a half later, the two spacecraft passed through the Jupiter system, and in a few days the Galilean satellites were transformed from small points of light into four separate worlds that could be mapped and studied in great detail. Hundreds of high quality images of the two largest moons, Ganymede and Callisto, were obtained. These objects are of great interest not only because of their great size—Ganymede is larger than the planet Mercury, Callisto only slightly smaller—but also because of their composition. All the planets and moons studied in detail prior to Voyager are composed of rock and, in some cases, metal. Ganymede and Callisto, however, have densities so low—1.9 and 1.9 g/cm<sup>3</sup>—that roughly half their mass must be ice. There are many other icy bodies in the solar system, including the planet Pluto and most of the moons of Saturn, Uranus, and Neptune. Ganymede and Callisto have provided the first look at this previously unexplored class of planetary objects.
5. For many years now, kinship has been recognized as an important factor in human social behavior, and recent studies have demonstrated that kinship influences the social behavior of many other species as well. The widespread occurrence of nepotism, or favoritism shown to genetic relatives, and the rarity of close inbreeding among free-living animals imply that most animals possess mechanisms for distinguishing relatives from nonrelatives and close from distant kin,

However, until the last few years little attention was paid to mechanisms of kin identification. In this paper, we consider some of the theoretical and empirical issues relevant to animal kin recognition, describe recent work on this topic, and outline several mechanisms by which kin might be identified. Finally, we summarize the results of our four-year laboratory and field investigation of kin recognition using ground squirrels.

6. The origin of stars represents one of the most fundamental unsolved problems of contemporary astrophysics. Stars are the basic objects of the universe. Indeed, the discovery of the nature of most stars as hydrogen-burning thermonuclear reactors and the subsequent development of the theory of stellar evolution rank among the greatest triumphs of twentieth-century science. Deciphering stellar genesis, on the other hand, has proven to be a formidable challenge for astronomers. Until a quarter of a century ago, only a rudimentary understanding of the subject existed. This state of comparative ignorance prevailed because no substantive body of empirical data existed



that could be used to critically test even the most basic hypotheses concerning stellar origins.

In our galaxy, stars form within the dust-enshrouded dense cores of molecular clouds. The obscuration provided by the solid grains that permeate the clouds renders newly forming stars (protostars) completely invisible at optical and shorter wavelengths. Moreover, the molecular gas that gives birth to young stars is itself extremely cold (10 to 20 K) and, with a few exceptions, can only be observed in emission in the submillimeter and millimeter regime, a spectral window opened by radio astronomers only in the 1970s.

During the last two decades, impressive advances in technology have provided astronomers with the ability to observe star-forming regions in considerable detail at infrared, millimeter, and submillimeter wavelengths. With this new instrumental capability, a direct assault on the star-formation problem became possible. Indeed, over the last few years, observations with filled-aperture telescopes and interferometric arrays have produced a series of remarkable, exciting, and unexpected discoveries that have begun to remove the veil of mystery that surrounds the star-formation process in our galaxy. As a result of these discoveries, we are beginning to understand the processes of star formation and early stellar evolution and are developing the foundation for a coherent theory of star formation.

7. The experimental apparatus used is shown in Fig. 3. The reactant gas pressure was set at 3.3 kPa (25 Torr). An optical pyrometer was used to monitor the substrate temperature, which was maintained at about 820° C by keeping the microwave power at 450 W. CH<sub>4</sub>-CO<sub>2</sub> gas mixtures without additional H<sub>2</sub> gas were used. The flow rate of CO<sub>2</sub> was fixed at 30 sccm and the flow rate of CH<sub>4</sub> was varied from 19.2 to 20 sccm. Then the silicon substrates were prepared for diamond deposition by carrying out the following steps.
8. As Figure 1 shows, Africanized honeybees are nearly indistinguishable in appearance from the bees familiar in North America and Europe, and sting for sting they are no worse than our own honeybees. What has earned the Africanized bees the undeserved notoriety as killer bees is their extreme aggressiveness. Numerous studies have documented the fierce defensive behavior of this bee (Michener 1972; Collins et al. 1982; Rinderer 1986; Boreham and Roubik 1987). Many have reported that a particularly dangerous attribute of the bees is their aggressiveness after slight jarring or vibration of the hive. Africanized bees can react to an intruder three times faster than do European bees, can inflict ten times as many stings, and will pursue their aggressors over much longer distances, up to a kilometer. However, some evidence suggests that climate has more influence on aggressiveness than racial differences and that Africanized bees are more aggressive under

warmer conditions (Brandenburgo et al. 1977).

9. In recent years an extraordinary increase has occurred in the attention, both popular and scientific, that has been paid to mutation and its consequences. The sources of this interest are the recognition that components of our environment pose a largely unevaluated threat to the conservation of genetic material and the realization that mutations frequently have serious consequences for human health that encompass, at the least, birth defects and cancer. The resulting research effort has improved our understanding of the fundamental genetic substance, DNA, and of the intricacies of its metabolism and organization into genes.

Modern investigations into the mutation process involve the structure of DNA and all the processes that affect it. Inherent in the now-classical description of DNA structure by Watson and Crick in 1953, and immediately recognized by them, was the notion that variations in the electronic structures of the DNA bases could cause incorrect base pairings, and hence mutations. In the early models, however, DNA was viewed as structurally static when not undergoing replication. More recently, the identification of numerous families of alternative structures has led to an expanded view of DNA as far more variable in form. Some of these structures provide explanations for mutational events that were previously mysterious, and others offer intriguing hints for future exploration.

10. Maps are one of the oldest forms of written communication. Land boundary maps on clay tablets were being used in Babylonia as early as 2200 B.C. Through the centuries various materials have been used for maps. The ancient Egyptians used sheets of papyrus, the Chinese used pieces of silk, Eskimos made maps on seal skins, and Polynesians used a network of bamboo canes, with each crossing point indicating an island. Today printed maps pervade our lives, ranging from sketch or location maps in newspapers and advertisements, to parcel maps showing property boundaries, to small-scale maps in atlases.

The techniques used to produce maps have changed dramatically over the past fifty years, in a transition from field workers and mule trains to jet aircraft, satellites, and computers. Before World War II, the predominant method for creating maps was field surveying. After World War II, map-making methods began to include manual photogrammetry (measurement from photographs). Although manual photogrammetry is still used today, it is being supplanted by digital cartography, and computers are becoming the hub of the mapping process.

Soon after their introduction in the 1950s, digital computers were used for various phases of the mapping process, especially for trigonometric calculations of survey data and for orientation of aerial photographs on map

manuscripts. In addition, computer-controlled plotters were used to draw simple outline maps. The process of collecting data for the plotters was slow and expensive, and the drawings were not as precise as those produced by the best manual cartography. Only in the last ten to fifteen years has it become technologically feasible and cost-effective to assemble and use the data required to automate the mapping process.

### 練習 3-2

1. Physics is a subject that has fascinated him since high school.
2. Smith's approach as well as Turner's has several serious shortcomings, which render it unsuitable for practical applications.
3. The on-chip RAM and two I/O ports are an important part of the chip.
4. Each of the samples was annealed for 20 minutes.
5. The number of passengers using the airport has increased each year since 1984.
6. After the members of the examination committee and the department chairman approve the plan, it should be submitted to the Dean's Office.
7. After the members of the examination committee or the department chairman approves the plan, it should be submitted to the Dean's Office.  
After the department chairman or the members of the examination committee approve the plan, it should be submitted to the Dean's Office.
8. The increase in the number of free hydrogen atoms along with the higher temperature causes the reaction rate to increase.
9. Be careful how your research team interprets those figures. Statistics are sometimes highly misleading.
10. An attribute name or a class name is entered in this dialog box.
11. Also of interest is why samples immersed in solution A exhibited a higher growth rate.
12. The automatic power-saving function is just one of the many features that make the Droog 2000 the most cost-effective system on the market today.
13. All of the authors have sent in their papers and every paper has been received.
14. A number of samples were collected from a different geographical region to see whether the phenomenon occurred there as well.
15. Included in the search are all child nodes on the right-hand side of the node of interest.
16. A major problem with this type of system is the many errors that occur in the acceleration stage.

## 練習 4-1

1. Given an input rate  $r$ , we can obtain the solution using equation (3). If  $r$  is unknown but  $T$  is known, we can apply equation (5).
2. The amount of fluorine incorporated into the film on the substrate surface can be controlled by reducing the amount of water added to the immersing solution. When there is less water, more fluorine atoms are released, as shown in the reaction equation above. Because of the increase in free fluorine atoms in the solution, a greater amount of fluorine is incorporated into the film.
3. While there are at least a dozen major different designs for devices that use magnetic fields to control thermonuclear fusion, the best results to date have been achieved with the tokamak, which was developed in the 1960s by Soviet scientists seeking to overcome the inherent instability of earlier magnetic confinement schemes. After the announcement in 1969 of results showing much longer confinement of the plasma under fusion conditions, the United States redirected its fusion program to emphasize tokamak research, and today major tokamak projects are being conducted by the U.S., the European Economic community, Japan, and China.
4. Although physics has made monumental strides in the last hundred years, theoretical descriptions of complex phenomena such as turbulent flow in fluids have remained outstanding unsolved problems. The difficulty lies in the nonlinear character of the mathematical equations which model the physical systems: the Navier-Stokes equations for fluid flows and Newton's equations for three or more interacting particles. Since these equations do not generally admit closed-form analytical solutions, it has proved extremely difficult to construct useful theories that would predict, for example, the drag on the wing of an airplane or the range of validity of statistical mechanics. However, in the last ten years, considerable progress has been made, using a unique synthesis of numerical simulation and analytical approximation.

The key to recent progress has been the use of high-speed digital computers. In particular, high-resolution computer graphics have enabled the "experimental mathematician to identify and explore ordered patterns which would otherwise be buried in reams of computer output. In many cases the persistence of order in irregular behavior was totally unexpected; the discovery of these regularities has led to the development of new analytical methods and approximations which have improved our understanding of complex nonlinear phenomena.

## 練習 4-2

1. A communication network can be modeled as a graph, and a network under attack or with other sources of failure can be modeled as a random graph. A graph, in the sense used here, consists of vertices (or points) and edges. Each vertex corresponds to a command center or other node in a communication network. Each edge represents a two-way communication link between two command centers. In a random graph, an edge may fail, leaving intact the vertices connected by the edge, or a vertex may fail, destroying all the edges connected to the vertex.
2. Slime molds reproduce by means of spores, each of which is an independent, one-celled organism. However, the cells originating from spores divide repeatedly, and eventually the offspring swarm together in a heap to form a common amoeboid mass. The original cell boundaries sometimes disappear, and the once-independent cells take on specialized functions, somewhat like organs in a larger animal. The creeping mass of protoplasm, in some cases as large as 30 cm in diameter, is difficult to classify as plant or animal or, indeed, as either a collection of individuals or a larger, single organism. At any rate, it is one of the most curious examples of self-organization in all biology.

## 練習 4-3

1. Let  $X$  be the Cartesian product of these sets, and let  $A$  be their union.  
Let  $X$  be the Cartesian product of these sets and  $A$  be their union.
2. Consider the circuit shown in Figure 2. We can draw its Norton-equivalent circuit as shown in Figure 3.  
Consider the circuit shown in Figure 2; its Norton-equivalent circuit can be drawn as shown in Figure 3.
3. Assume the input power of port 1 is  $P_1$  and the output power of port 2 is  $P_2$ . Then we have the following equation.  
Assume the input power of port 1 is  $P_1$  and the output power of port 2 is  $P_2$ ; then we have the following equation.
4. Suppose  $C$  can be factored into a product of  $D$  and a cube  $q$ . Then we replace  $C$  in the above expression by  $q$ .  
Suppose  $C$  can be factored into a product of  $D$  and a cube  $q$ ; then we replace  $C$  in the above expression by  $q$ .
5. The samples were fabricated by a standard chemical vapor deposition process. N-type Si (100) substrates were scratched using diamond powder to enhance the nucleation density of the deposits.

The samples were fabricated by a standard chemical vapor deposition process, and N-type Si (100) substrates were scratched using diamond powder to enhance the nucleation density of the deposits.

6. Rearranging the above equation, we obtain the solution.

By rearranging the above equation, we can obtain the solution.

If we rearrange the above equation, we can obtain the solution.

## 練習 4-4

A centralized compression service is economical, but it hampers creativity when developers want to experiment with applications and data. Accordingly, digital video interactive (DVI) technology offers another kind of compression: edit-level video, done on the developer's DVI system in real time. Edit-level video is lower in quality than the presentation-level video made by centralized compression but is adequate for software development.

The user employs edit-level video to develop and test new software. When the user has made his choices and polished the program, he sends the final analog video through the centralized compression service. When the presentation-level compressed video comes back, the user substitutes it for the edit-level files. The newly developed software runs just as it did in testing, but now with higher-quality video.

The heart of the DVI video display processor is two chips: one for processing images stored in memory, the other for displaying the processed images. Each chip is a CMOS chip containing about 132,500 transistors. The set can connect to almost any computer, as long as it has the requisite computing speed and data transfer bandwidth—usually this means a 16-bit or 32-bit processor that operates at a clock speed of 6 megahertz or higher.

## 練習 4-5

1. When researchers a few years ago uncovered a strong link between the sunspot cycle and weather patterns on Earth, many atmospheric scientists were intrigued. Indeed, the correlation seemed so convincing that a few meteorologists even began to plug solar activity into official long-range forecasts. But the whole notion has taken a battering recently, and it may have a tough time recovering.

Many skeptics, in fact, have always said that the postulated correlation was not as firm as it seemed. For starters, they pointed out that it could only be traced back about 40 years, which struck them as too short a record to be convincing. On top of that, solar activity seemed to affect weather patterns one way when winds in the stratosphere above the equator were blowing in

- a westerly direction and another way when they were easterly; statistically speaking, that effectively cut in half an already short record. And most disturbing was the absence of any physical mechanism to explain such behavior. But the skeptics nevertheless had a hard time disproving the link, which had withstood every statistical test—until the winter of 1989.
- Chain-propagating steps alone are insufficient to account for flames. It was recognized in the 1930s that chain-initiating, chain-terminating, and chain-branching steps are also necessary. The 1956 Nobel prize in chemistry was awarded jointly to Cyril N. Hinshelwood of the University of Oxford and Nikolai N. Semenov of the Institute of Chemical Physics in Moscow for their leading roles in showing how the main features of oxidation reactions could be explained in terms of branched-chain reaction mechanisms. (At the time of their research chemists had only provisional ideas about what the actual elementary reactions might be and almost no information at all about the values of the rate coefficients.)
  - While scientists and engineers agree that fusion can work, there is no general agreement on what will be the most economical and desirable type of fusion reactor. To date, the best results have been achieved with the tokamak, a doughnut-shaped machine with powerful magnetic coils, and the optimism that a viable reactor can be built has been primarily based on the tokamak's performance. Although it now appears probable that tokamak reactors will one day produce energy at a cost around that of petroleum and below the cost of solar energy, many scientists think that alternative magnetic fusion devices could produce energy even more cheaply.
  - The sun produces the heating and confinement needed for atomic fusion through its immense gravitational fields. On earth, large-scale fusion reactions have been achieved for 30 years in thermonuclear weapons, where the temperature is provided by a plutonium bomb explosion and the confinement is simply by inertia—that is, the reaction goes so fast that the fusion fuel, lithium deuteride, does not have time to disperse. Inertial confinement is one of the two principal approaches to the use of fusion for power generation. Inertial fusion reactors would use lasers, electron beams, or ion beams to compress and heat pellets of fuel, allowing them to explode in chambers and thereby drive energy generation equipment.

### 練習 4-6

- The aim of this paper is to propose a new simulation method that dramatically reduces the time needed to carry out the simulations.
- Increasing the annealing temperature above 900° C causes the samples to become brittle.

3. Adding more oxygen makes the deposition rate increase significantly.  
Adding more oxygen increases the deposition rate significantly.
4. Let  $N$  represent the number of customers and  $t$  represent the time.
5. Assume that half of the customers exit the system at the same time.
6. Let there be 10 processors in the network.
7. The author should consider proving theorems I and II instead of only stating the theorems.
8. We suggest solving the problem by using a Fourier transform.  
We suggest that the author solve the problem by using a Fourier transform.  
We suggest that a Fourier transform be used to solve the problem.
9. The referee recommends accepting the paper for publication.  
The referee recommends that the paper be accepted for publication.
10. The success of this method depends on solving equation (5) quickly.
11. Let  $X$  be the desired recognition accuracy and  $S$  be the desired recognition speed.
12. We discussed treating practical applications of the new technique in the paper, but we decided doing so would make the paper too long.

### 練習 4-7

1. These figures show that the classification accuracy increases as the size of  $i$  and  $j$  increases.  
From these figures it can be seen that the classification accuracy increases as the size of  $i$  and  $j$  increases.
2. We believe that the annealing treatment improved the electrical characteristics of the films.  
The annealing treatment appears to have improved the electrical characteristics of the films.  
It appears that the annealing treatment improved the electrical characteristics of the films.
3. The difference between the two curves can be attributed to the different values of  $\beta$  used in the two cases.
4. Now that we have modified the method, we can use it to analyze the oscillator.  
Now that the method has been modified, it can be used to analyze the oscillator.
5. Consider the following example.



6. It would be desirable for the country's economy to improve quickly.  
The country needs to improve its economy quickly.  
We hope the country's economy will improve quickly.
7. From these data it can be seen that the self-phase modulation and the self-frequency shift are enhanced by forward pumping.  
These data show that forward pumping enhances the self-phase modulation and the self-frequency shift.
8. Coding of coefficients is difficult to accomplish in real time.  
It is difficult to code the coefficients in real time.
9. The appearance of C-H bonds can be attributed to the large number of non-equilibrium hydrogen atoms in the plasma.  
C-H bonds appear because of the large number of non-equilibrium hydrogen atoms in the plasma.
10. These values can now be substituted into the equations of motion to obtain the solution.  
We can now substitute these values into the equations of motion to obtain the solution.
11. Assume that the arrival rate can be modeled as a Poisson process.  
In this example, we assume that the arrival rate can be modeled as a Poisson process.  
In this example, it is assumed that the arrival rate can be modeled as a Poisson process.
12. Figure 6 indicates that the theoretical model predicts the experimental values accurately.  
The theoretical model predicts the experimental values accurately, as Figure 6 shows.

### 練習 4-8

1. When it was tested, the system provided excellent performance.  
When the system was tested, it performed well.  
When tested, the system performed well.  
When we tested the system, it performed well.
2. If users plan to carry out complex calculations, they should purchase a high-performance workstation.  
For complex calculations, a high-performance workstation is recommended.
3. This type of network is insensitive to differences in scale, translation, and rotation, but it requires an unusually large number of processing elements

and connections.

4. If we attempt to solve the equation in this form, we encounter several difficulties.

If we attempt to solve the equation in this form, several difficulties arise.

Attempting to solve the equation in this form leads to several difficulties.

5. This algorithm provides accurate results but requires a great deal of processing time.
6. The sensors detect errors quickly and feed information about them to the controller.

Errors are quickly detected by the sensors and information about the errors is fed to the controller.

### 練習 4-9

1. After the mapping of  $A_i$  from  $L_1$  to  $L_p$  is determined, the next array dimension can be processed in the same way.

After determining the mapping of  $A_i$  from  $L_1$  to  $L_p$ , we can process the next array dimension in the same way.

After we determine the mapping of  $A_i$  from  $L_1$  to  $L_p$ , we can process the next array dimension in the same way.

2. When Smith's method was applied in our simulations, the modeled objects had an unrealistic shape.

When we applied Smith's method in our simulations, the modeled objects had an unrealistic shape.

3. By choosing an appropriate reference plant model and robustness filter, we can use the IMC structure to produce a controller of the desired order.

If an appropriate reference plant model and robustness filter are chosen, the IMC structure will produce a controller of the desired order.

4. When the input pulse width is decreased further, pulse splitting due to SFS is observed.

5. After performing the simulations, we obtained the following results.

The results of the simulations were the following.

6. To write effective software programs for banks, software engineers need training in both computer science and finance.

7. Verifying the prototype at this stage allows specification errors to be detected and corrected earlier.

By verifying the prototype at this stage, we can detect and correct specification errors earlier.

8. In an NPN bipolar junction transistor, for example, there are three parts: the collector, base, and emitter.

An NPN bipolar junction transistor has three parts: the collector, base, and emitter.

9. Unlike Chen's method, our method does not use external forces to join the panels in the model together.

10. If we apply the finite difference method, we can find the elastic force for an  $M \times N$  grid of points in vector form as follows.

According to the finite difference method, the elastic force for an  $M \times N$  grid of points in vector form is the following.

By the finite difference method, the elastic force for an  $M \times N$  grid of points in vector form is as follows.

11. After the iterative procedure for producing the codebook is performed, each cluster contains a different number of spectral vectors.

12. To develop a high-performance bicycle, engineers must use lightweight materials.

A high-performance bicycle requires lightweight materials.

Lightweight materials are an important part of a high-performance bicycle.

In the design of high-performance bicycles, it is important to use lightweight materials.

13. Before discussing the design of the damper, we must identify the main design factors.

The design of the damper will be discussed below. First, however, the main design factors must be identified.

14. The results indicate that the proposed load compensation technique significantly improves system performance.

15. If this analysis is applied directly to the present case, two difficulties arise.

## 練習 4-10

1. In this case, it would be necessary to search for only the largest subset template.

2. The samples were wrapped in foil and placed in an oven.

3. From the two parameter studies, we can conclude that the appropriate parameters for the recognition system are  $N = 12$ ,  $M = 4$ , and  $T = 18$ .

The two parameter studies indicate that the appropriate parameters for the recognition system are  $N = 12$ ,  $M = 4$ , and  $T = 18$ .

4. Without loss of generality, we can assume that the applied force is always in

the +y direction.

We can assume without loss of generality that the applied force is always in the +y direction.

5. The mathematical model presented above was used to develop a computer program to generate the complete tooth profile.  
On the basis of the mathematical model presented above, we developed a computer program to generate the complete tooth profile.  
Using the mathematical model presented above, we developed a computer program to generate the complete tooth profile.
6. The technique partitions a data set into only two subsets.
7. A general observer-based scheme for generating residuals is depicted in Figure 2.
8. The system can be divided into two basic parts.
9. This is a problem of great complexity in classical physics.
10. The parameters measured in the experiment were used to test the model.

## 練習 4-11

1. When a formal financing system does not exist, a pre-selling system is established to make the market more effective. This type of system can be found in a number of Asian countries.
2. A centralized compression service is economical, but it hampers creativity when developers want to experiment with applications and data. Accordingly, digital video interactive (DVI) technology offers another kind of compression: edit-level video, done on the developer's DVI system in real time. Edit-level video is lower in quality than the video made by centralized compression but is adequate for software development. Users employ edit-level video to develop and test new software. When they have made their choices and polished the program, they send the final analog video through the centralized compression service. When the presentation-level compressed video comes back to them, they substitute it for the edit-level files. Their newly developed software runs just as it did in testing, but now with higher-quality video.
3. The solar water heater used in the experiment is shown in Figure 2. At the top left of the water heater is a cold-water inlet, where water flows into the apparatus. The main portion of the heater consists of many coils of plastic pipe connected together in an accordion fashion and covered with a sheet of heat-absorbing plastic. The water flows through the pipes, absorbing heat from the sun, and then exits the heating apparatus through the outlet at the lower right of the heater. From the outlet the water flows into an insulated

storage tank in the basement of the house, from which hot water is drawn when needed.

4. While scientists and engineers agree that fusion can work, there is no general agreement on what will be the most economical and desirable type of fusion reactor. To date, the best results have been achieved with the tokamak, a doughnut-shaped machine with powerful magnetic coils, and the optimism that a viable reactor can be built is primarily based on the tokamak's performance. Although it now appears probable that tokamak reactors will one day produce energy at a cost around that of petroleum and below the cost of solar energy, many scientists and engineers think that alternative magnetic fusion devices could produce energy even more cheaply.

### 練習 4-12

1. In this paper we introduce a new method for selecting the location of actuators.
2. To achieve realistic modeling, we need to develop a method for avoiding penetration of objects.
3. We will now discuss issues concerning the implementation of this architecture.
4. Next, we will find the service time for cycle  $k$  using the random number stream  $R_i$ .
5. Section 3 presents our method for computing the feedback gain matrix.
6. Existing methods for assigning bandwidth in networks are not suitable for this case.
7. Mitchell [4] described an efficient technique for transferring files in a distributed operating system.
8. The government has enacted new legislation intended to stimulate investment in technology.
9. The company has developed a new program for training operators of machinery used to produce integrated circuits.
10. This document proposes a model for guiding the development of technology at research institutes operated by the government.

### 練習 4-13

1. The alignment problem is simpler in imperative languages than in the functional language Alpha.
2. The cost function and alignment algorithm are also similar to those in [11].

3. The cost of the filter is about half that of the approach in (Wason, 1990).
4. Compare the voltage drop between node 1 and node 2 with that between node 3 and node 2.
5. Lane developed an alternative approach with performance similar to that of the method in (Long, 1992).
6. The accuracy of the new robot arm is greater than that of the conventional one.

The new robot arm is more accurate than the conventional one.

7. Machine recognition of handwritten Chinese characters is more difficult than machine recognition of handwritten English letters.

Developing a machine to recognize handwritten Chinese characters is more difficult than developing one to recognize handwritten English letters.

8. This strategy yields a greater variance reduction than the strategy proposed in [3].
9. These results are consistent with those of Rogers et al. (1985).

10. Low-frequency noise is filtered out more effectively by the AGC than by the limiter.

The AGC filters out low-frequency noise more effectively than the limiter does.

## 練習 4-14

1. Smith [15] gave a parametric solution for the eigenvalue assignment.
2. SPS is an extensible operating system for creating system services.
3. Lee's algorithm can be divided into two parts.  
Lee's algorithm has two main parts.
4. Many applications of fuzzy neural networks have been reported.
5. This problem was solved by adopting the following approach.  
The following approach was adopted to solve this problem.
6. Each character image is identified as belonging to a set of  $m$  candidate characters.
7. The main difference between Lee's approach and ours is that our method is much simpler to use.  
Our method is much simpler than Lee's approach.
8. The institute has been in operation for twenty years.
9. Software can be used to program some I/O devices so that they share interrupts with other devices.

Some I/O devices can be programmed by software to share interrupts with other devices.

Some I/O devices can be programmed to share interrupts with other devices.

10. Figure 4(a) illustrates the effect of the Rayleigh number on the wall temperature of the inner cylinder.

The effect of the Rayleigh number on the wall temperature of the inner cylinder is illustrated in Figure 4(a).

## 練習 5-1

1. Consider the circuit shown in Figure 10-1, where  $R_1$  is in port 1 and  $R_2$  is in port 2.
2. As just mentioned, the input and output impedance of the attenuator should match those of the original circuit.
3. The personal computer, which became popular in the 1980s, has had a far-reaching impact on the way research in this field is conducted.
4. 句子的標點符號正確。子句 “who do not enjoy teaching” 是限定關係子句。
5. Professor Thompson, sitting in the second row, raised his hand to ask a question.
6. The difference between their method and ours is as follows.
7. 句子的標點符號正確。片語 “as shown in Figure 8” 作限定片語使用。但此片語也可合理地解釋為非限定片語，所以在 “source” 後加上逗點亦是正確的。
8. The market radius decreases as population density increases, as shown in Figure 5.
9. 句子的標點符號正確。片語 “sitting in the back” 作限定片語使用。
10. Sales revenue in the local computer industry has grown rapidly over the last three years, as shown in Figure 4.
11. 句子的標點符號正確。
12. Let a represent x and b represent y.
13. An object's radar cross section (RCS) may depend more on its shape than on its physical size. A small truck, with its sharp edges and abrupt flat surfaces, can reflect electromagnetic waves better than a smooth-edged jumbo jet. The RCS of a pickup truck (measured head-on at microwave frequencies) is about 200 square meters, while that of a jumbo jet airliner is only about 100.
14. The last twenty years have seen major developments in clinical transplanta-

tion, particularly of such vital organs as the heart, liver, and kidneys. However, despite these apparent breakthroughs, the success of tissue transplants remains dependent on first overwhelming and then chronically suppressing the patient's immune system with a variety of drugs. The drug therapy currently in use has many undesirable side effects (particularly in children), because it is based on nonselective cytotoxic drugs, which indiscriminately kill all rapidly dividing cells. An encouraging development of the 1980s was the introduction of cyclosporin A, an immunosuppressant with more specific effects on the immune system that leave the patient with some resistance against infection. Nevertheless, even this immunosuppressive drug is not free from side effects, including damage to the kidneys.

## 練習 6-1

下面是一些修改建議。有些句子可能不只一種修改方式，因此除了下面的答案之外，可能還有其他答案。

1. In this paper, we propose an algorithm to handle noisy and uncertain data.  
The proposed algorithm easily handles false negative training instances.  
In this paper, we propose an algorithm for processing noisy and uncertain data that easily handles false negative training instances.
2. The values obtained in the first two trials are compared in Figure 3.  
The values obtained in the first two trials are plotted in Figure 3.
3. Many applications of fuzzy neural networks have been reported.
4. The procedure is described below.
5. The second method uses a more complex formulation.  
The second method is more complex.
6. For comparison, consider the performance of Chen's method.  
In comparison, consider the performance of Chen's method.  
By comparison, Chen's method ... [直接描述陳氏的方法]
7. Section 6 summarizes the results. For simplicity, the results have been divided into two sets.
8. The reasons for this poor performance are the following.  
The reasons for this poor performance are that ... [直接敘述理由]
9. This paper investigates the effects of three types of mutation on the performance of genetic algorithms.  
In this paper, we study the effects of three types of mutation on the performance of genetic algorithms.



10. Table 4 compares the speed of our algorithm with that of the other algorithms.
11. In this paper, we analyze the stability of clamping with passive friction forces.  
In this paper, we investigate the stability of clamping with passive friction forces.
12. The data have been simplified so that the problem can be treated more easily in the finite element analysis.  
The data have been simplified to facilitate treatment of the problem using finite element analysis.
13. To meet this requirement, we must develop an optimization technique for implicit-form problems.  
To meet this requirement, an optimization technique for implicit-form problems must be developed.
14. This allocation technique may lead to longer delays in time-insensitive applications and blocked connections in time-sensitive applications.
15. The shortcomings of the general cell mapping method can be eliminated by combining it with interpolated cell mapping.
16. To examine the variation in tensile strain along the free edge, we have plotted the relationship between tensile strain and element number in Fig. 5.
17. A larger scale of operations is needed not only to reduce manufacturing costs, but also to justify investment in R&D.
18. The major difference between Chang's method and ours is that our technique does not rely on external forces to ensure smooth, natural animated motion.  
Unlike Chang's method, our technique does not rely on external forces to ensure smooth, natural animated motion.
19. The proposed algorithm is faster than Matsumoto's method and uses much less memory.
20. Because our design approach considers both the algorithm level and architecture level, it produces a programmable, low-cost filter design with an accumulation-free tap structure.

## 練習 6-2

1. The proposed method greatly improves the accuracy of the analysis.
2. In section 4 the performance of the proposed method is compared with that of several existing methods.  
Section 4 compares the performance of the proposed method with that of

several existing methods.

3. Section 2 briefly surveys existing blending techniques.

In section 2, we briefly survey existing blending techniques.

Section 2 presents a brief survey of existing blending techniques.

4. This policy may waste a considerable amount of bandwidth.

5. Section 6 concludes the paper.

Section 6 is the conclusion of the paper.

The conclusions of the paper are presented in section 6.

6. The triggers were activated sequentially.

7. The modal controllability can be expressed more compactly as follows.

8. The level sufficient for successful identification depends on several factors.

9. High-temperature processing reduces yield.

When high-temperature processing is used, yield is reduced.

10. The stability of these solutions will be analyzed below.

11. Chen [5] defines the problem in a similar way.

Chen [5] states the problem in a similar way.

12. To compare the performance of the two processors, we ran another series of tests.

13. This technique can be used to improve the performance of CAD systems.

14. The compiler is responsible for inserting communication instructions. Instructions will be inserted wherever the compiler judges they should be.

The compiler inserts communication instructions wherever it judges they should be.

The compiler inserts communication instructions in appropriate locations.

15. With this new method, the severity of the staircase effect can be substantially reduced.

This new method substantially reduces the severity of the staircase effect.

16. The speed can be adjusted by the technique described in section 2.

### 練習 6-3

下面是一些修改建議。有些句子可能不只一種修改方式，因此除了下面的答案之外，可能還有其他答案。

1. The reaction occurred slowly.

The reaction was slow.

2. Several researchers have observed that in solving this type of problem genetic algorithms tend to fall into local minima.  
Several researchers have observed that in solving this type of problem genetic algorithms tend to converge to local minima.
3. A valid schedule must have an iteration period greater than or equal to this bound.  
For a schedule to be valid, its iteration period must be greater than or equal to this bound.  
No valid schedule has an iteration period shorter than this bound.
4. We must provide more than one plot.
5. The experimental results show that the proposed algorithm outperforms the conventional method.
6. This study has compared the effects of computer-assisted instruction and traditional instruction techniques.
7. The analysis is invalid.
8. To reduce the hardware cost, we must develop a more efficient filter design.  
To reduce the hardware cost, a more efficient filter design must be developed.
9. Designing an on-line control system for this application is a complicated task.
10. The electrical properties of the films improved after the films were doped with boron.  
Boron doping was found to improve the electrical properties of the films.  
We found that boron doping improved the electrical properties of the films.  
Boron doping improved the electrical properties of the films.
11. The iterations continue until the convergence test is satisfied.
12. The simulation results show that the proposed control algorithm quickly and effectively adjusts the cutting system in response to different cutting conditions.  
As the simulation results show, the proposed control algorithm quickly and effectively adjusts the cutting system in response to different cutting conditions.

### 練習 6-4

1. Note that the analysis presented above is not applicable to nonlinear systems.
2. Many filter designs have been proposed in the literature.
3. Solving equation (5) directly would be time-consuming.

4. Many new applications of neural networks have been proposed in the last ten years.
5. An on-chip buffer is needed for raster-scan ordering of the pixels.
6. These results show that hypothesis  $H_1$  is false.  
These results imply that hypothesis  $H_1$  is false.  
From these results, we can conclude that hypothesis  $H_1$  is false.
7. Three types of events are defined in the program.
8. Another advantage of this method is that we need only a shifter and an adder to complete the circuit.  
Another advantage of this method is that only a shifter and an adder are needed to complete the circuit.
9. The purpose of mission planning is to maximize instrument operating time subject to various constraints.
10. These figures clearly show that the classification accuracy increases as  $i$  and  $j$  increase.

### 練習 6-5

1. An interesting question is whether the relationship between these chromosomes is an original form or is itself a result of evolution.
2. Let us now consider how the circuit works.
3. We must now explain why the samples immersed in the HF solution showed increased selectivity during the second deposition phase.
4. Section 3 discusses the types of applications in which the proposed algorithm outperforms the conventional method.
5. In section 4 we evaluate the performance of the proposed method in comparison with that of the conventional method.  
In section 4 we compare the performance of the proposed method with that of the conventional method.
6. In the second experiment, we investigated whether the amount of fluorine incorporated into the film depends on the amount of water in the immersing solution.

### 練習 7-1

下面是一些修改建議。有些句子可能不只一種修改方式，因此除了下面的答案之外，可能還有其他答案。

1. Another type of network used in neural-network-based object recognition is the neocognitron, which is a hierarchical multilayered network based on the model of the human visual system. The initial stage is an input layer, and each succeeding stage has a layer of S-cells followed by a layer of C-cells. Thus layers of S-cells and C-cells are arranged alternately throughout the whole network. A detailed analysis of the training process used with this type of network can be found in Matsumoto [8].

The neocognitron has two disadvantages. First, the training process is very slow, because the number of cells in the model increases almost linearly with the number of objects it is required to learn to distinguish. Second, the network must be completely retrained for each new set of patterns.

2. Housing is an extremely heterogeneous product, reflecting the uniqueness of each building site, the long life of the structure, and particularly the decentralized means of production. Decentralization shows up sharply in a comparison with the automobile, which for most people is second only to housing in size and cost. Only a few manufacturers produce automobiles. In housing, however, the 100 largest developers produce only about 15 percent of the annual new construction. The remainder is mostly built by companies of small or medium size or by individuals—all with their own idea of what constitutes a house. Moreover, the builder, unlike the automobile manufacturer, makes no systematic effort to control the quality of maintenance once the product has been sold. Instead the owner must deal with an even more decentralized system of local repair and remodeling services—all with their own views of what should be done. Local building codes are one of the few sources of standardized construction and maintenance procedures, yet they are notorious for differing from one another and for being circumvented by owners in any event.

## 練習 7-2

下面是一些修改建議。有些句子可能不只一種修改方式，因此除了下面的答案之外，可能還有其他答案。

1. To the observer, a change in state is a sudden and dramatic event, one that renders a material essentially unrecognizable after it occurs. Certainly, at first glance, an ice cube seems to have more in common with a quartz crystal or a diamond than it does with the steam pouring from a kettle of boiling water. On a microscopic scale, however, all three forms of water contain the same two atoms of hydrogen to one of oxygen, and all are held together by the same electromagnetic force. Moreover, despite the apparent abruptness of a change in state, the sequence of events that precedes it is anything but sudden and dramatic; typically, it is a smooth and unremarkable continuum.

Lower the temperature of a glass of water degree by degree and at some point the change from water to ice will take place. Experience tells us at what temperature the change will occur, but no simple theoretical formula predicts it.

2. In the 1920s, researchers realized that the brain was in ceaseless electrical activity, so the idea became popular that memories could take the form of recurrent electrical signals between cells. But memories can withstand all sorts of shocks to the head or brain—from concussion to electroconvulsive therapy—that totally disrupt this electrical activity. So memories cannot be stored in purely electrical form. On the other hand, such damage does tend to result in loss of very recent memory—for events minutes to hours before the shock—which is why people who have been in crashes often cannot remember the events that led up to the accident.

Hence researchers came to believe that memory exists in at least two forms: memory for very recent events—called short-term memory—which is relatively labile and easily disruptable, and long-term memory, which is much more stable. Not everything that gets into short-term memory becomes fixed in the long-term store. A filtering mechanism selects things that might be important and discards the rest. If this were not the case—if we remembered everything that impinged upon us—we would soon become hopelessly overloaded.

### 練習 7-3

1. We are developing a new memory product with large capacity, low power requirements, and fast access speed.
2. My report discusses how to increase sales, improve quality, and develop new products.
3. The terms will be a sequence of either 1's or 0's.
4. In our latest work, we have prepared fiber with liquid crystal cladding, set up a measurement system, and derived theoretical formulas.
5. The selection criteria for government-funded R&D projects are the following:
  - Develops a major technology essential to economic growth
  - Requires substantial funding
  - Fills a gap in private firms' development plans
6. The new method is simpler, faster, and more accurate than the conventional method.
7. The indirect control method has two advantages: it eliminates the need to install flux sensors and it is easy to use at low speeds.

8. When the principal point lies on the right side of the graph, the angular velocity is negative and the direction of the friction force is counterclockwise. When the principal point lies on the left side of the graph, the angular velocity is positive and the direction of the friction force is clockwise.

## 練習 7-4

- When designing practical controllers, one often encounters systems with uncertain parameters, which can be represented mathematically as follows.  
When designing practical controllers, one often encounters systems with uncertain parameters. These systems can be represented mathematically as follows.
- This type of job dispatching, which is called dynamic load balancing, balances the workload of the processors.  
Because it balances the workload of the processors, this type of job dispatching is called dynamic load balancing.
- The upper row displays eight icons, which users can assemble into query graphs.
- Since the results of the first trial were surprising, we repeated the experiment using a new set of data.  
The results of the first trial were surprising, so we repeated the experiment using a new set of data.
- Live-line workers approach their jobs with the care accorded lion training and skydiving. *Because a significant electrostatic field surrounds a live power line for several tens of meters and increases in strength the nearer to the line, a lineman's body is energized well before he touches the conductor. Within a meter or so, the field may be 20-30 kV less than the conductor's voltage. Despite that difference, a human body has a relatively small mass, and when the lineman contacts the line with his wand a current of no more than a few microamperes is induced in his body. Because of that difference in voltage, however, an arc will leap between conductor and wand as the lineman approaches the conductor. (Although not strong enough to be fatal, such sparks can cause a brief loss of sensation in the hand.)*
- The lineman's wand and steel-mesh suit prevent the spark from touching his body: the arc jumps from line to wand rather than to a gloved hand or finger, and the suit equalizes the charge across its surface, *working on the principle of a Faraday cage. After the lineman is bonded, contact is maintained through a short tie, called a bonding lead, from suit to conductor. The suit, required at voltages above 150 kV, also protects the lineman against the corona effect, the ionization of the air around a person's body that results in a distinct buzzing sound and a prickly sensation on such protruding body*

*parts as the ears.*

## 練習 8-1

1. (b) What ultimately limits divers' time under water is nitrogen gas.
2. (c) The two Voyager spacecraft revealed much about the dynamics of the atmospheres of the outer planets.
3. (b) The horse's great running ability coupled with its large size places unusual demands on its legs.
4. (a) The leech's simple body plan makes it an attractive animal to the experimental biologist.
5. (c) There are two basic types of cogeneration systems.
6. (c) Algorithmic computing and neurocomputing complement each other well.

## 練習 8-2

1. 比較與對照。
2. 歸納法。
3. 空間順序。
4. 定義。
5. 因果分析或定義。
6. 依時間順序。
7. 列舉法。
8. 因果分析。
9. 由概括到個別描述。
10. 邏輯論證。
11. 段落一：由概括到個別描述、由個別到概括描述及因果分析合用。  
段落二：由概括到個別描述。  
段落三：由概括到個別描述和由個別到概括描述合用。  
段落四：空間順序。  
段落五：分類法以及比較與對照。  
段落六：比較與對照以及由概括到個別描述。



## 練習 9-1

1. In this paper, we propose a new service for digital mobile communication systems. This service allows two or more users to hold a secure electronic conference.

In this paper, we propose a new service for digital mobile communication systems that allows two or more users to hold a secure electronic conference.

2. A block of four DIP switches is located on the bottom of the UT240. These DIP switches can be used to configure the unit for different types of systems. The correct DIP switch settings are shown in Table 2 below.

On the bottom of the UT240 is a block of four DIP switches, which can be used to configure the unit for different types of systems. The correct DIP switch settings are shown in Table 2 below.

3. Much recent research on machine pattern recognition has focused on the use of neural networks. An important step in most existing neural-network-based methods is extracting the features of the patterns to be recognized. The quality of feature extraction largely determines the recognition rate achieved.
4. A distinctive feature of the MOS resistor is that its resistance value can be adjusted by varying the gate voltage. Thus the MOS resistor can be used to tune the gain of the wideband amplifier. However, the parasitic capacitance of the MOS device degrades the frequency response slightly.
5. If the CPU address does not match the tag, a cache miss occurs. When a cache read miss occurs, the controller will check whether the alter bit of the cache line involved is clean or dirty. If the alter bit is dirty, the controller will update the main memory with the data currently stored in the cache.
6. The solar water heater used in the experiment is shown in Figure 2. At the top left of the water heater is a cold-water inlet, where water flows into the apparatus. The main portion of the heater consists of many lengths of plastic pipe connected together in an accordion fashion and covered with a sheet of heat-absorbing plastic.
7. The atomic structure of ceramics gives them a chemical stability that makes them impervious to environmental degradation, such as dissolution in solvents. The strength of the bonds in ceramics results in characteristics such as a high melting point, hardness, and stiffness. Also, because many ceramics are composed of metal oxides, further oxidation is often impossible.
8. This paper investigates the financial investment and technological requirements involved in putting nitrogen-based techniques for fabricating widgets to use in commercial manufacturing. These techniques are an attractive in-

vestment, because their per-unit cost is lower than that of traditional methods of manufacturing widgets. However, before nitrogen-based techniques can be adopted, a number of technical problems must be overcome.

9. A bus master either oversees the transfer of data between devices or, more often, exchanges information with one or more slaves. The bus master selects slaves by placing address information on the bus; each slave compares this information with its own address. If the addresses match, the master and slave establish a connection and the slave becomes a responder. Addresses that identify more than one slave are called broadcast addresses. A particular device may act as both master and slave, but not at the same time.
10. Perceptions of odors and colors operate according to different principles. Color perception involves a lexical system which is organized in memory in a relatively abstract and rigidly controlled way. By contrast, the characteristics of odor perception are flexibility and adaptability, and a relatively concrete but open-ended nonverbal coding system. This manner of organization in turn affects odor memory. What is stored about odors is not likely to involve semantic categories which can be used to retrieve odors. Rather, odor memory involves perceptually unitary episodes described in idiosyncratic terminology.

## 練習 9-2

1. This article also discusses the problem of the nonlinear nonreciprocity of soliton transmission in an EDFA with different pumping configurations.
2. In this paper an internal model control method is used to develop a fully digital servo control for an AC induction motor.  
In this paper we use an internal model control method to develop a fully digital servo control for an AC induction motor.  
In this paper a fully digital servo control for an AC induction motor is developed through the use of an internal model control method.
3. This paper investigates the molecular director configuration of a closed cylinder of liquid crystal with negative dielectric anisotropy in an external field.
4. A global calibration scheme is proposed to resolve the coordinate equivalence problem encountered when CAD systems are integrated with robot manipulators.  
We propose a global calibration scheme to resolve the coordinate equivalence problem encountered when CAD systems are integrated with robot manipulators.
5. In section 7, we describe experiments in which the proposed method is applied to control a standard industrial robot manipulator.

In section 7, experiments are described in which the proposed method is applied to control a standard industrial robot manipulator.

Section 7 describes experiments in which the proposed method is applied to control a standard industrial robot manipulator.

6. In this report, an efficient algorithm is developed that employs the concept of static equilibrium to determine the stability of clamping.

In this report, we develop an efficient algorithm that employs the concept of static equilibrium to determine the stability of clamping.

### 練習 9-3

1. In strong light conditions, the solar cell may deliver a supply voltage that is so high that the LCD display segments cannot be switched off.
2. The techniques used to produce maps have changed dramatically over the past fifty years, progressing from field workers and manual surveying to satellites and computers. Before World War II, the predominant method for creating maps was field surveying. After World War II, map-making methods began to include manual photogrammetry. Although manual photogrammetry is still used today, it is being supplanted by digital cartography, and computers are becoming the hub of the mapping process.
3. In recent years an extraordinary increase has occurred in the attention, both popular and scientific, that has been paid to mutation and its consequences. The sources of this interest are the recognition that components of our environment pose a largely unevaluated threat to the conservation of genetic material and the realization that mutations frequently have serious consequences for human health. This interest has led to research that has improved our understanding of DNA and of its metabolism and organization into genes.
4. As Figure 1 shows, these insects are physically dissimilar from species common in North America, and they have a voracious appetite. Numerous studies have documented the unusually large amount of vegetation an individual of the species can consume in a single day (see, for example, James 1982, Halton 1987, Mayumi 1989, and Brandom 1992).
5. During the last two decades, impressive advances in technology have led to the development of sophisticated new instruments such as filled-aperture telescopes and interferometric arrays, which have provided astronomers with the ability to observe star-forming regions in considerable detail at infrared, millimeter, and submillimeter wavelengths. Over the last few years, observations with these and other instruments have produced a series of remarkable, exciting, and unexpected discoveries concerning the star-

formation process in our galaxy. As a result of these discoveries, astronomers are beginning to understand the processes of star formation and early stellar evolution.

6. The test apparatus samples and records the rate of evaporation over a  $4 \times 5$  meter area. The apparatus is based partly on the design described by Susky and Hopfeld [4], although it is easier to move and assemble than their device, requiring only two people for transportation and setup.

### 練習 9-4

1. The intensity and frequency of earthquakes can be measured using seismometers. A seismometer consists of a mass suspended by a spring or other elastic mechanism inside a metal frame that is anchored to the ground. A magnet is attached to the mass and an electric coil to the frame. Any vibration of the ground shakes the seismometer's frame, but inertia tends to hold the mass in its place. Thus the coil on the frame moves in relation to the magnet on the mass, and this movement generates an electrical signal that represents the intensity and frequency of the movement.
2. The amount of fluorine incorporated into the silicon film can be controlled by reducing the amount of water added to the immersing solution. When less water is added, more fluorine atoms are released, as shown in the reaction equation. Because the number of free fluorine atoms in the solution increases, a greater amount of fluorine is incorporated into the film.
3. Since each sensor receives information from only a limited range, information from many sensors must be combined.
4. As landfills are closed, many communities are passing recycling laws and constructing waste-to-energy plants. Although waste-to-energy plants face many of the same technical, regulatory, and political obstacles as conventional power plants, some issues are peculiar to them. Unlike most power plants, municipal waste incinerators burn many different types of materials, creating different types of toxic byproducts. Whereas fossil fuel plants may pollute the air, waste incinerators may pollute the earth. Since most ash is buried along with garbage in municipal landfills, environmentalists fear that contaminants may seep into groundwater.

### 練習 9-5

1. 這段文章主要有兩個問題：一、在第二個句子中，*this method* 究係何指，並不清楚。二、第三個句子的句首 *therefore* 暗示了一

個事實上並不存在的邏輯關係：第二個句子所陳述的事實，既不會是作者作實驗的原因，而且在邏輯上也不會推演出「這些作者會去作實驗」。這段文章可修正如下：

Roski [3] studied the characteristics of the built-up edge (BUE) and developed a chamfered main edge cutting tool. His cutting method involves tool geometries that produce a BUE that flows away continuously in the form of a separated secondary chip. In the research reported here, we studied the mechanism underlying secondary chip formation by conducting cutting experiments on carbon steel and pure aluminum.

2. 究竟甚麼「基於」(“based on”)不同成本之間的取捨情形？這個句子的表面意思是：這篇論文以不同成本之間的取捨為基礎，但這根本就是一派胡言。作者的意思大概是：非線性程式化的問題係以不同成本之間的交易為基礎。可是，這問題究竟如何「以不同成本之間的交易為基礎」，則沒有交待清楚。有些作者如何濫用 *based on* 這模糊不清的字眼，從這句中可見一斑。這句可修改如下：

This paper has presented a nonlinear programming problem that determines the optimal market size by finding the optimal trade-off between the operating cost and the travel cost.

3. 這段文章有幾個問題：一、在第二個句子中，作者說“based on”是甚麼意思？二、第三個句子的 *search algorithm* 究係何物？（作者在還沒介紹這個演算法之前，就已開始討論如何改善它。）此外，第三個句子也提到「其他屬性」，可是這些屬性究竟是甚麼事物的屬性，也不夠清楚。弄清這些邏輯的「跳躍」，這段文章的原作者就把文章修改如下：

In this paper, we analyze the stability of clamping with passive friction forces. The concept of the instant center of rotation is employed to transform the stability analysis into a search for a static equilibrium state. Other properties of clamping are also studied and applied to develop an efficient algorithm for determining the stability of clamping.

4. 這段文章主要的問題是第三和第四個句子間的關係不清：一、

在第三個句子中，作者告訴我們：多種名稱都必須有 “the same semantics”。但作者卻沒有解釋 *semantics* 的意思。（它們都必須為名詞嗎？還是它們都必須指同一件事物？）二、在第四個句子中，作者舉了三個例子，但這些究竟是甚麼事物的例子並不清楚。由於第三個句子提過 “the same semantics”，所以讀者可能已假設第四個句子的例子是想幫助讀者瞭解 “the same semantics”。然而，事實上，這些例子又像是「多種名稱」的例子。三、在第四個句子中，形容詞 *good* 意思非常模糊，作者應用上較精確的形容詞。

我們可省略第三個句子，並改寫第四個句子：

A distinctive feature of the data model is how names are used. Users can specify multiple names for classes, attributes, methods, and reference relationships. For example, *person*, *people*, and *human* could all be used as names of a class which contains information about persons. When users want to retrieve information about persons, they can use any one of these names in their query.

5. 第二個句子所提到的問題究竟是甚麼？在第一個句子中，作者只指出一個事實，而沒提到任何「問題」。我們可省略 *problem* 這字詞，並把第二個句子修改得較具體一點：

The reaction between n-butyl bromide and phenoxide ions exhibits a slow reaction rate because the two substances consist of different phases. Many investigators have attempted to increase the speed of this reaction by using various catalysts.

6. 在這段文章中，從第三個句子到第四個句子的轉接令人眼花撩亂，因為轉接過程中，作者已更換了主題，卻沒提醒讀者。第三個句子仍在討論 INY，可是第四個句子已經開始描述 INZ，並把 INZ 所應用的方法和 INY 所應用的作一對照。作者應在第三個句子之後加上一新句，以指出討論的主題已改變。下面是一種修改方式：

Vendor selection is one of the most important parts of the purchasing process. Recently, the concept of dimensional analysis was used to pro-

propose a vendor performance measure and to obtain an index called INY. The performance criteria used in INY include quantitative and qualitative criteria. In this paper, a new vendor performance index called INZ is proposed as an alternative to INY. For qualitative criteria, a two-directional evaluation is employed instead of the one-directional approach used in INY. Then all scores for quantitative and qualitative criteria are combined into a sum of weighted averages. The use of INZ is compared with that of INY by means of several examples.

# 註釋

---

## 第二章註釋

1. Adapted from Takefumi Inagaki, "Better Laser Printers for Less," *IEEE Spectrum*, March 1989, p. 42.
2. Adapted from Eric J. Lerner, "Magnetic Fusion Power," *IEEE Spectrum*, December 1980, p. 44.
3. Adapted from Glenn W. Preston, "The Very Large Scale Integrated Circuit," *American Scientist*, Vol. 71, September-October 1983, p. 466.
4. Adapted from IEEE Spectrum staff, "Sharper 'Eyes' for Star Gazers," *IEEE Spectrum*, August 1980, p. 26.
5. Adapted from Arthur L. Robinson, "Communicating with Computers by Voice," *Science*, Vol. 203, No. 23, February 23, 1979, p. 734.
6. Adapted from William C. Gardiner, Jr., "The Chemistry of Flames," *Scientific American*, Vol. 246, No. 2, February 1982, pp. 88-89.
7. Adapted from James E. Bayfield, "Rydberg Atoms," *American Scientist*, Vol. 71, July-August 1983, p. 375.
8. Adapted from Glenn W. Preston, "The Very Large Scale Integrated Circuit," *American Scientist*, Vol. 71, September-October 1983, p. 471.
9. Adapted from Victor F. Weisskopf, "The Origin of the Universe," *American Scientist*, Vol. 71, September-October 1983, pp. 475-76.
10. Adapted from W. Kenneth Dawson and Robert W. Dobinson, "What a Bus Is and How It Works: A Primer," *IEEE Spectrum*, October 1986, pp. 52-53.



### 第三章註釋

1. Adapted from Joseph T. Eastman and Arthur L. DeVries, "Antarctic Fishes," *Scientific American*, Vol. 255, No. 5, November 1986, p. 96.
2. Adapted from work by Chia-fu Chen and associates, National Chiao Tung University, Hsinchu, Taiwan.
3. Adapted from Sien Chi, C. W. Chang, and S. Wen, "Ultrashort Soliton Pulse Train Propagation in Erbium-Doped Fiber Amplifiers."
4. Adapted from Steven W. Squyres, "Ganymede and Callisto," *American Scientist*, Vol. 71, January-February 1983, p. 56.
5. Adapted from Warren G. Holmes and Paul W. Sherman, "Kin Recognition in Animals," *American Scientist*, Vol. 71, January-February 1983, p. 46.
6. Adapted from Charles J. Lada and Frank H. Shu, "The Formation of Sunlike Stars," *Science*, Vol. 248, May 4, 1990, p. 564.
7. Adapted from work by Chia-fu Chen and associates, National Chiao Tung University, Hsinchu, Taiwan.
8. Adapted from Scott Camazine and Roger A. Morse, "The Africanized Honey-bee," *American Scientist*, Vol. 76, September-October 1988, p. 465.
9. Adapted from John W. Drake, Barry W. Glickman, and Lynn S. Ripley, "Updating the Theory of Mutation," *American Scientist*, Vol. 71, November-December 1983, p. 621.
10. Adapted from Steven C. Guptill and Lowell E. Starr, "Making Maps with Computers," *American Scientist*, Vol. 76, March-April 1988, pp. 136-137.

### 第四章註釋

1. Adapted from Eric J. Lerner, "Magnetic Fusion Power," *IEEE Spectrum*, December 1980, p. 45.
2. Adapted from Roderick V. Jensen, "Classical Chaos," *American Scientist*, Vol. 75, March-April 1987, p. 168.
3. Adapted from Joel E. Cohen, "The Counterintuitive in Conflict and Cooperation," *American Scientist*, Vol. 76, November-December 1988, p. 578.
4. Adapted from Barry F. Madore and Wendy L. Freedman, "Self-Organizing Systems," *American Scientist*, Vol. 75, May-June 1987, p. 256.
5. Adapted from Arch C. Luther, "You Are There...and in Control," *IEEE Spectrum*, September 1988, pp. 46-47.
6. Adapted from Richard A. Kerr, "Sunspot-Weather Link Is Down But Not Out," *Science*, Vol. 248, May 11, 1990, p. 684.
7. Adapted from William C. Gardiner, Jr., "The Chemistry of Flames," *Scientific American*, Vol. 246, No. 2, February 1982, p. 89.
8. Adapted from Eric J. Lerner, "Magnetic Fusion Power," *IEEE Spectrum*, December 1980, p. 44.

9. Adapted from Eric J. Lerner, "Magnetic Fusion Power," *IEEE Spectrum*, December 1980, p. 44.
10. Adapted from Arch C. Luther, "You Are There...and in Control," *IEEE Spectrum*, September 1988, pp. 46-47.
11. Adapted from Eric J. Lerner, "Magnetic Fusion Power," *IEEE Spectrum*, December 1980, p. 44.

## 第五章註釋

1. Adapted from John A. Adam, "How to Design an 'Invisible' Aircraft," *IEEE Spectrum*, April 1988, p. 28.
2. Adapted from John C. Rodger and Belinda L. Drake, "The Enigma of the Fetal Graft," *American Scientist*, Vol. 75, January-February 1987, p. 51.

## 第六章註釋

1. Adapted from Trudy E. Bell, "Earthquake Prediction: Keeping an Ear to the Ground," *IEEE Spectrum*, May 1988, p. 47.

## 第七章註釋

1. Adapted from Philippe Brou, Thomas R. Sciascia, Lynette Linden, and Jerome Y. Lettvin, "The Colors of Things," *Scientific American*, Vol. 255, No. 3, September 1986, p. 80.
2. Adapted from William C. Baer, "The Shadow Market in Housing," *Scientific American*, Vol. 255, No. 5, November 1986, p. 29.
3. Adapted from Judith Goldhaber, "The Quest for Quark Soup," *New Scientist*, November 13, 1986, p. 40.
4. Adapted from Steven Rose, "Memories and Molecules," *New Scientist*, November 27, 1986, p. 40.
5. Exercises 5 and 6 adapted from Gary Stix, "Working Hot: Life at 765 kV," *IEEE Spectrum*, September 1988, p. 56.

## 第八章註釋

1. Adapted from Glenn Zorpette, "An Underwater Visit to Aquarius," *IEEE Spectrum*, March 1988, p. 25.
2. Adapted from Andrew P. Ingersoll, "Atmospheric Dynamics of the Outer Planets," *Science*, Vol. 248, April 20, 1990, p. 308.
3. Adapted from Milton Hildebrand, "The Mechanics of Horse Legs," *American Scientist*, Vol. 75, November-December 1987, p. 594.

4. Adapted from Gunther S. Stent and David A. Weisblat, "The Development of a Simple Nervous System," *Scientific American*, Vol. 246, No. 1, January 1982, p. 100.
5. Adapted from Joel Fagenbaum, "Cogeneration: An Energy Saver," *IEEE Spectrum*, August 1980, p. 30.
6. Adapted from Robert Hecht-Nielsen, "Neurocomputing: Picking the Human Brain," *IEEE Spectrum*, March 1988, p. 36.
7. Adapted from Ted Simons, Steve K. Sherrod, Michael W. Collopy, and M. Alan Jenkins, "Restoring the Bald Eagle," *American Scientist*, Vol. 76, May-June 1988, p. 254.
8. Adapted from Glenn Zorpette, "An Underwater Visit to Aquarius," *IEEE Spectrum*, March 1988, p. 24.
9. Adapted from H. Kent Brown, "Advanced Ceramics," *Scientific American*, Vol. 255, No. 4, October 1986, pp. 148-149.
10. Adapted from Stuart Ross Taylor, "The Origin of the Moon," *American Scientist*, Vol. 75, September-October 1987, p. 474.
11. Adapted from Milton Hildebrand, "The Mechanics of Horse Legs," *American Scientist*, Vol. 75, November-December 1987, p. 596.
12. Adapted from P. David Fisher, "Shortcomings of Radar Speed Measurement," *IEEE Spectrum*, December 1980, p. 28.
13. Adapted from Stuart Ross Taylor, "The Origin of the Moon," *American Scientist*, Vol. 75, September-October 1987, p. 469.
14. Adapted from Trygg Engen, "Remembering Odors and Their Names," *American Scientist*, Vol. 75, September-October 1987, p. 499.
15. Adapted from Aldo V. LaRocca, "Laser Applications in Manufacturing," *Scientific American*, Vol. 246, No. 3, March 1982, p. 80.
16. Adapted from H. Kent Brown, "Advanced Ceramics," *Scientific American*, Vol. 255, No. 4, October 1986, p. 147.
17. Adapted from Trygg Engen, "Remembering Odors and Their Names," *American Scientist*, Vol. 75, September-October 1987, p. 501.
18. Adapted from Andrew P. Ingersoll, "Atmospheric Dynamics of the Outer Planets," *Science*, Vol. 248, April 20, 1990, p. 314.
19. Adapted from R.N. Bracewell, "Numerical Transforms," *Science*, Vol. 248, May 11, 1990, p. 697.
20. Adapted from Trudy E. Bell, "Earthquake Prediction: Keeping an Ear to the Ground," *IEEE Spectrum*, May 1988, p. 47.
21. Adapted from work by Chia-fu Chen and associates, National Chiao Tung University, Hsinchu, Taiwan.
22. Adapted from David Schwartzman and Lee J. Rickard, "Being Optimistic about the Search for Extraterrestrial Intelligence," *American Scientist*, Vol. 76, July-August 1988, p. 364.
23. Adapted from work by Ching-fa Yeh and Chun-lin Chen, National Chiao Tung University, Hsinchu, Taiwan.
24. Adapted from Patricia D. Moehlman, "Social Organization in Jackals," *American*

*Scientist*, Vol. 75, July-August 1987, p. 366.

25. Adapted from David Schwartzman and Lee J. Rickard, "Being Optimistic about the Search for Extraterrestrial Intelligence," *American Scientist*, Vol. 76, July-August 1988, pp. 365-366.

## 第九章註釋

1. Adapted from H. Kent Brown, "Advanced Ceramics," *Scientific American*, Vol. 255, No. 4, October 1986, pp. 148-149.
2. Adapted from W. Kenneth Dawson and Robert W. Dobinson, "What a Bus Is and How It Works: A Primer," *IEEE Spectrum*, October 1986, pp. 52-53.
3. Adapted from Trygg Engen, "Remembering Odors and Their Names," *American Scientist*, Vol. 75, September-October 1987, p. 501.
4. Adapted from Steven C. Guptill and Lowell E. Starr, "Making Maps with Computers," *American Scientist*, Vol. 76, March-April 1988, pp. 136-137.
5. Adapted from John W. Drake, Barry W. Glickman, and Lynn S. Ripley, "Updating the Theory of Mutation," *American Scientist*, Vol. 71, November-December 1983, p. 621.
6. Adapted from Charles J. Lada and Frank H. Shu, "The Formation of Sunlike Stars," *Science*, Vol. 248, May 4, 1990, p. 564.
7. Adapted from Trudy E. Bell, "Earthquake Prediction: Keeping an Ear to the Ground," *IEEE Spectrum*, May 1988, p. 47.
8. Adapted from Katherine Wollard, "Garbage in, Power out," *IEEE Spectrum*, June 1988, p. 42.

# 參考書目

---

- Vernon Booth, *Communicating in Science*, 2nd ed. (Cambridge University Press, 1993).
- Colburn A. Carelli, "Can We Talk? The Art of Giving Effective, Interesting Technical Presentations," Society for Technical Communication, R.O.C. Chapter, 1995.
- Richard M. Davis, "Publication in Professional Journals: A Survey of Editors," *IEEE Transactions on Professional Communication* PC-28 (2), June 1985, pp. 34-42.
- Robert A. Day, *How to Write and Publish a Scientific Paper* (ISI Press, 1979).
- Joan Detz, *How to Write & Give a Speech* (St. Martin's Press, 1984).
- C. J. Fraser (方克濤), *English Scientific Reports and Presentations* (《英文科技論文》) (Privately published, 1996).
- George Gopen and Judith Swan, "The Science of Scientific Writing," *American Scientist*, Vol. 78, No. 6, pp. 550-558.
- James G. Gray, Jr., *Strategies and Skills of Technical Presentations* (Greenwood Press, 1986).
- Mark H. Henry and Harold K. Lonsdale, "The Researcher's Writing Guide," in Bruce O. Boston, ed., *Stet! Tricks of the Trade for Writers and Editors*, (Editorial Experts, 1986), pp. 108-12.

Thomas Huckin and Leslie Olsen, *Technical Writing and Professional Communication for Nonnative Speakers of English* (McGraw-Hill, 1991).

B. Luey, *Handbook for Academic Authors* (Cambridge University Press, 1987).

J. H. Mitchell, *Writing for Professional and Technical Journals* (John Wiley, 1968).

Peter L. Petrakis, "How to Abstract a Scientific Paper," in Bruce O. Boston, ed., *Stet! Tricks of the Trade for Writers and Editors* (Editorial Experts, 1986), pp. 134–36.

John Swales, *Aspects of Article Introductions*, Aston ESP Research Report No. 1 (University of Aston, 1981).

Robert Weissberg and Suzanne Buker, *Writing Up Research* (Prentice Hall, 1990).

# 索引

---

## 中文索引

### 三畫

大寫字母 (capitalization) 10, 133, 143, 153-57, 160, 174-75

子句 (clause) 15-17, 20-22

### 四畫

不可數名詞 (uncountable noun) 10, 28-30, 32, 33

不完整句 (incomplete sentence) 11, 74-76, 80

不定代名詞 (indefinite pronoun) 11, 66, 83

不定冠詞 (indefinite article) 28-33, 40, 115-16, 224, 279

不定詞 (infinitive verb) 12, 18, 105, 283, 312, 334, 335

不定詞片語 (infinitive phrase) 19, 105-06

介系詞 (preposition) 14, 224

介系詞片語 (prepositional phrase) 14-15, 20, 37, 103-05, 194-95, 262

介系詞受詞 (object of preposition) 14

分詞 (participle) 18, 19, 190

分詞片語 (participial phrase) 20, 102-03, 228

分節法 (syllabification) 163

分號 (semicolon) 17, 78-79, 137, 144-46, 150, 171, 311, 331

及物動詞 (transitive verb) 23

引號 (quotation marks) 134, 136, 142, 149-51, 176

文獻回顧 (review of literature) 53, 55, 91, 327, 336

方法章節 (method section) 53, 91, 98, 99, 201

方括號 (brackets) 151-52

方程式 (equation) 140, 147, 152, 156, 160, 163-64, 172, 176

片語 (phrase) 13, 19–20, 111, 260–63

片斷句 (choppy sentences) 218–19

### 五畫

主要子句 (main clause) 16, 227

主動語態 (active voice) 13, 102–04, 200–201, 202, 208

主詞 (subject) 10, 13, 22, 83, 100, 107, 258–60, 266–68

主詞與動詞一致 (subject-verb agreement) 64–70, 83–84, 87

主詞與動詞間的距離 (subject and verb, distance between) 266–68

主題化 (topicalization) 129

主題句 (topic sentence) 233–36

「主題與評論」句 (topic-and-comment sentence pattern) 129–31

代名詞 (pronoun) 11–12, 117–22, 124

代名詞與前述詞一致 (pronoun-antecedent agreement) 66–67, 120–22

可數名詞 (countable noun) 10, 28–30, 32, 33

句子 (sentence) 9–10, 15, 22–26, 74–78, 214–30

句子內容的順序 (sentence, order of information within) 252–63

句子的長度 (sentence length) 76–78, 214–219

句式 (sentence patterns) 22–25

句點 (period) 78–79, 133–35, 145, 150–53, 163, 164, 167, 171, 176, 177, 284, 301, 308, 311, 331, 332

未來式 (future tense) 84

未經轉折的句子 (fused sentence) 79

### 六畫

同位語 (appositive) 138, 228

名物化名詞 (nominal) 196–97, 271–72

名詞 (noun) 10–11, 124–27, 193–97

名詞子句 (noun clause) 21, 22

名詞片語 (noun phrase) 21, 260

字首語 (initialism) 157, 174

### 七畫

作者的責任 (writer's responsibility) 3, 275

助動詞 (auxiliary verb) 13

形容詞 (adjective) 13, 40

形容詞子句 (adjective clause) 22

系列逗點 (serial comma) 141

### 八畫

兩用名詞 (two-way noun) 32–33

受詞 (object) 15, 24

孤立的修飾詞 (dangling modifier) 101–07

定冠詞 (definite article) 34–43, 115–16, 224

易讀性 (readability) 4, 77, 111, 132, 164, 193, 223, 226, 252–77, 323

直述語氣 (indicative mood) 71

直接受詞 (direct object) 23, 98

直接疑問句 (direct question) 212–13

空格 (space) 133–36, 144, 146–49, 152, 162, 166, 172–74

附屬子句 (subordinate clause) 15, 16, 75, 79, 172, 228, 331

附屬連接詞 (subordinating conjunction) 15–18, 75, 311, 327, 331

附屬結構 (subordinate construction) 227–30

非限定修飾詞 (nonrestrictive modifier) 138–39, 172

### 九畫

「信號」字詞 (signal words) 236, 243, 274–77



- 冒號 (colon) 146-47, 150, 154, 155, 171, 175-76
- 前述詞 (antecedent) 12, 117-22, 124
- 括號 (parentheses) 133, 134, 136, 147, 148-49, 152, 153, 166, 171, 172, 174
- 段落 (paragraph) 170, 232, 239-48
- 段落的組織 (paragraph organization) 239-48
- 省略子句 (elliptical clause) 104
- 省略符號 (ellipses) 152-53
- 相關連接詞 (correlative conjunction) 15, 16, 227
- 祈使句 (imperative sentence) 10, 24, 76
- 祈使語氣 (imperative mood) 71, 206
- 述詞 (predicate) 10
- 述詞名詞 (predicate noun) 13, 24, 65, 262
- 述詞形容詞 (predicate adjective) 13, 24, 262
- 限定的修飾詞 (restrictive modifier) 138-39, 174, 332, 337
- 首語 (head noun) 39, 124-25
- 十畫
- 修飾詞 (modifier) 13-14, 109-15
- 弱動詞 ("weak" verb) 193-97, 270, 272, 311
- 時態 (tense) 12, 51-57, 84-86, 88
- 破折號 (dash) 147-48, 162, 176
- 缺乏連接詞的句子 (comma splice) 78-80, 311
- 討論章節 (discussion section) 246, 247
- 偽術語 (jargon) 170, 210-11
- 誤置的修飾詞 (misplaced modifiers) 109-14
- 十一畫
- 假設語氣 (subjunctive mood) 71-73
- 副詞 (adverb) 13, 109, 110
- 副詞子句 (adverbial clause) 22, 114
- 動名詞 (gerund) 18, 104, 283, 305, 312, 334-35
- 動狀詞 (verbal) 18
- 動詞 (verb) 12-13, 22, 51-73, 83, 84-86, 260, 266-67, 269-72
- 動詞片語 (verb phrase) 260
- 動態動詞 (active verb) 12, 56
- 問號 (question mark) 135-36, 150
- 堆砌名詞的句子 (noun-heavy sentence) 193-97
- 專有名詞 (proper noun) 10, 27, 39, 40, 42, 43, 154-56, 174
- 斜線號 (virgule, slash) 161, 282
- 斜體字 (italics) 151, 158-59, 160, 168, 176
- 現在式 (present tense) 51-52, 84
- 現在完成式 (present perfect tense) 53-56, 84, 328
- 現在進行式 (present progressive tense) 55-57, 84, 337
- 第一人稱 (first person) 207-10
- 粗體字 (bold text) 159
- 累積形容詞 (cumulative adjective) 142
- 被動語態 (passive voice) 13, 25, 91-99, 101-03, 107, 200-201, 208, 259-60
- 逗點 (comma) 17, 78, 79, 122, 136-44, 145, 146, 147, 149, 150, 172-74, 284, 291, 302, 307, 308, 311, 323, 327, 332
- 連字號 (hyphen) 148, 161-63, 169, 172, 176, 177
- 連接副詞 (conjunctive adverb) 14, 16-17, 79, 227

連接詞 (conjunction) 14-16, 75, 78-79

### 十二畫

散亂句 (rambling sentence) 76-78, 81, 216-219

普通名詞 (common noun) 10, 27, 28, 40, 43

結果章節 (results section) 53, 98

結構與內容 (structure and content) 214-16, 222-26, 252-54

虛主詞結構 (expletive construction) 25, 65, 203-06, 272

間接受詞 (indirect object) 23

集合名詞 (collective noun) 10, 67, 68

### 十三畫

感嘆號 (exclamation point) 136, 150

補語 (complement) 23, 24, 84, 86-87, 90

過去式 (past tense) 12, 52-54, 84

過去完成式 (past perfect tense) 55, 85, 86

### 十四畫

對等形容詞 (coordinate adjective) 142

對等連接詞 (coordinating conjunction) 15, 79, 227, 331

對等結構 (coordinate construction) 227-30

對稱法 (parallelism) 222-26

疑問句 (questions) 24

語氣 (mood) 71-73

誤置的修飾詞 (misplaced modifiers) 109-14

### 十五畫

寫作品質的重要性 (writing well, importance of) 2-3

數字 (numbers) 164-67

模糊的比較 (comparison, unclear) 127-28

複句 (complex sentence) 26

複合主詞 (compound subject) 64, 65, 69

複合句 (compound sentence) 27

複合名詞 (compound noun) 124-26

複合述詞 (compound predicate) 75

複合複句 (compound-complex sentence) 26

複數 (plurals) 10, 28, 29, 30, 34, 41, 64-69, 83, 84, 116-17, 167-70

### 十六畫

導論 (introduction section) 156

獨立子句 (independent clause) 16

獨立片語 (absolute phrase) 228

靜態動詞 (stative verb) 12, 56, 85

頭字語 (acronym) 157, 174, 211

### 十七畫

縮進排印 (indentation) 170

縮寫 (abbreviation) 170

聯繫動詞 (linking verb) 12, 24, 262

### 十八畫或以上

簡單句 (simple sentence) 25

關係子句 (relative clause) 36, 66-67, 112-13, 188-91, 228, 331, 337

關係代名詞 (relative pronoun) 66-67, 113, 120, 122, 188-91, 337

屬格 (possessive) 43, 116, 125, 159, 160, 168, 309

屬格符號 (apostrophe) 159-60, 168, 170

讀者的期望 (reader expectations) 226, 253-259, 266, 269, 274

邏輯上的「跳躍」 (logical gaps) 274-277

# 英文索引

- Abbreviations (縮寫) 170
- Acronyms (頭字語) 157, 174, 211
- Active voice (主動語態) 13, 102-04, 200-201, 202, 208
- Adjectives (形容詞) 13, 40
  - Coordinate (對等形容詞) 142
  - Cumulative (累積形容詞) 142
- Adverbs (副詞) 13, 109, 110
- Antecedent (前述詞) 12, 117-22, 124
- Apostrophe (屬格符號) 159-60, 168, 170
- Appositive (同位語) 138, 228
- Articles (冠詞)
  - Definite (定冠詞) 34-43, 115-16, 224
  - Indefinite (不定冠詞) 28-33, 40, 115-16, 224, 279
- Bold text (粗體字) 159
- Brackets (方括號) 151-52
- Capitalization (大寫字母) 10, 133, 143, 153-57, 160, 174-75
- Clauses (子句) 15-17, 20-22
  - Adjective (形容詞子句) 22
  - Adverbial (副詞子句) 22, 114
  - Elliptical (省略子句) 104
  - Independent (獨立子句) 16
  - Main (主要子句) 16, 227
  - Noun (名詞子句) 21, 22
  - Relative (關係子句) 36, 66-67, 112-13, 188-91, 228, 331, 337
  - Subordinate (附屬子句) 15, 16, 75, 79, 172, 228, 331
- Colon (冒號) 146-47, 150, 154, 155, 171, 175-76
- Comma (逗點) 17, 78, 79, 122, 136-44, 145, 146, 147, 149, 150, 172-74, 284, 291, 302, 307, 308, 311, 323, 327, 332
- Comma splice (缺乏連接詞的句子) 78-80, 311
- Comparisons, unclear (模糊的比較) 127-28
- Complement (補語) 23, 24, 84, 86-87, 90
- Compound predicate (複合述詞) 75
- Conjunctions (連接詞) 14-16, 75, 78-79
  - Coordinating (對等連接詞) 15, 79, 227, 331
  - Correlative (相關連接詞) 15, 16, 227
  - Subordinating (附屬連接詞) 15-18, 75, 311, 327, 331
- Conjunctive adverbs (連接副詞) 14, 16-17, 79, 227
- Coordinate constructions (對等結構) 227-30
- Dangling modifiers (孤立的修飾詞) 101-07
- Dash (破折號) 147-48, 162, 176
- Discussion section (討論章節) 246, 247
- Ellipses (省略符號) 152-53
- Equations (方程式) 140, 147, 152, 156, 160, 163-64, 172, 176
- Exclamation point (感嘆號) 136, 150
- Expletive constructions (虛主詞結構) 25, 65, 203-06, 272
- First person (第一人稱) 207-10
- Gerund (動名詞) 18, 104, 283, 305, 312, 334-35
- Head noun (首語) 39, 124-25
- Hyphen (連字號) 148, 161-63, 169, 172, 176, 177

- Indentation (縮進排印) 170
- Initialisms (字首語) 157, 174
- Introduction (導論) 156
- Italics (斜體字) 151, 158-59, 160, 168, 176
- Jargon (偽術語) 170, 210-11
- Logical gaps (邏輯上的「跳躍」) 274-277
- Method section (方法章節) 53, 91, 98, 99, 201
- Modifiers (修飾詞) 13-14, 109-15
  - Dangling (孤立的修飾詞) 101-07
  - Misplaced (誤置的修飾詞) 109-14
  - Nonrestrictive (非限定修飾詞) 138-39, 172
  - Restrictive (限定的修飾詞) 138-39, 174, 332, 337
- Mood (語氣) 71-73
  - Indicative (直述語氣) 71
  - Imperative (祈使語氣) 71, 206
  - Subjunctive (假設語氣) 71-73
- Nominals (名物化名詞) 196-97, 271-72
- Nouns (名詞) 10-11, 124-27, 193-97
  - Collective (集合名詞) 10, 67, 68
  - Common (普通名詞) 10, 27, 28, 40, 43
  - Compound (複合名詞) 124-26
  - Countable (可數名詞) 10, 28-30, 32, 33
  - Predicate (述詞名詞) 13, 24, 65, 262
  - Proper (專有名詞) 10, 27, 39, 40, 42, 43, 154-56, 174
  - Two-way (兩用名詞) 32-33
  - Uncountable (不可數名詞) 10, 28-30, 32, 33
- Noun-heavy sentences (堆砌名詞的句子) 193-97
- Numbers (數字) 164-67
- Objects (受詞) 15, 24
  - Direct (直接受詞) 23, 98
  - Indirect (間接受詞) 23
  - Of preposition (介系詞受詞) 14
- Paragraph (段落) 170, 232, 239-48
- Paragraph organization (段落的組織) 239-48
- Parallelism (對稱法) 222-26
- Parentheses (括號) 133, 134, 136, 147, 148-49, 152, 153, 166, 171, 172, 174
- Participle (分詞) 18, 19, 190
- Passive voice (被動語態) 13, 25, 91-99, 101-03, 107, 200-201, 208, 259-60
- Period (句點) 78-79, 133-35, 145, 150-53, 163, 164, 167, 171, 176, 177, 284, 301, 308, 311, 331, 332
- Phrases (片語) 13, 19-20, 111, 260-63
  - Absolute phrase (獨立片語) 228
  - Infinitive (不定詞片語) 19, 105-6
  - Noun (名詞片語) 21, 260
  - Participial (分詞片語) 20, 102-03, 228
  - Prepositional (介系詞片語) 14-16, 20, 37, 103-05, 194-95, 262
  - Verb (動詞片語) 260
- Plurals (複數) 10, 28, 29, 30, 34, 41, 64-69, 83, 84, 116-17, 167-70
- Possessive (屬格) 43, 116, 125, 159, 164, 168, 309
- Predicate (述詞) 10
- Predicate adjective (述詞形容詞) 13, 262
- Predicate noun (述詞名詞) 13, 24, 65, 262
- Preposition (介系詞) 14, 224

- Pronouns (代名詞) 11-12, 117-22, 124  
     Indefinite (不定代名詞) 11, 66, 83  
     Relative (關係代名詞) 66-67, 113, 120, 122, 188-91, 337
- Pronoun-antecedent agreement (代名詞與前述詞的一致性) 66-67, 120-22
- Questions (疑問句) 24  
     Direct (直接疑問句) 212-13
- Question mark (問號) 135-36, 150
- Quotation marks (引號) 134, 136, 142, 149-51, 176
- Readability (易讀性) 4, 77, 111, 132, 164, 193, 223, 226, 252-77, 323
- Reader expectations (讀者的期望) 226, 253-259, 266, 269, 274
- Results section (結果章節) 53, 98
- Review of literature (文獻回顧) 53, 55, 91, 327, 336
- Semicolon (分號) 17, 78-79, 137, 144-46, 150, 171, 311, 331
- Sentences (句子) 9-10, 15, 22-26, 74-78, 214-30  
     Choppy (片斷句) 218-19  
     Complex (複句) 26  
     Compound (複合句) 27  
     Compound-complex (複合複句) 26  
     Fused (未經轉折的句子) 79  
     Imperative (祈使句) 10, 24, 76  
     Incomplete (不完整句) 11, 74-76, 80  
     Length of (句子的長度) 76-78, 214-219  
     Order of information within (句子內容的順序) 252-63  
     Rambling (散亂句) 76-78, 81, 216-219  
     Simple (簡單句) 25
- Sentence patterns (句式) 22-25
- Serial comma (系列逗點) 141
- Signal words (「信號」字眼) 236, 243, 274-77
- Slash (斜線號) 161, 282
- Spaces (空格) 133-36, 144, 146-49, 152, 162, 166, 172-74
- Structure and content (結構與內容) 214-16, 222-26, 252-54
- Subject (主詞) 10, 13, 22, 83, 100, 107, 258-60, 266-68  
     Compound (複合主詞) 64, 65, 69
- Subject and verb, distance between (主詞與動詞間的距離) 266-68
- Subject-verb agreement (主詞與動詞一致) 64-70, 83-84, 87
- Subordinate constructions (附屬結構) 227-30
- Syllabification (分節法) 163
- Tenses (時態) 12, 51-57, 84-86, 88  
     Future (未來式) 84  
     Past (過去式) 12, 52-54, 84  
     Past perfect (過去完成式) 55, 85, 86  
     Present (現在式) 51-52, 84  
     Present perfect (現在完成式) 53-56, 84, 328  
     Present progressive (現在進行式) 55-57, 84, 337
- Topic-and-comment sentence pattern (「主題與評論」句) 129-31
- Topic sentence (主題句) 233-36
- Topicalization (主題化) 129
- Verbs (動詞) 12-13, 22, 51-73, 83, 84-86, 260, 266-67, 269-72  
     Active (動態動詞) 12, 56  
     Auxiliary (助動詞) 13

392 科技論文英語寫作（上）

- Infinitive（不定詞）12, 18, 105, 283, 312, 334, 335
- Linking（聯繫動詞）12, 24, 262
- Stative（靜態動詞）12, 56, 85
- Transitive（及物動詞）23 1
- Verbal（動狀詞）18
- Virgule（斜線號）161, 282
- “Weak” verbs（弱動詞）193-97, 270, 272, 311
- Writer’s responsibility（作者的責任）3, 275
- Writing well, importance of（寫作品質的重要性）2-3

# 科技論文英語寫作

上冊

**English Scientific and Technical Writing  
Volume I**

著作權 © 2003 方克濤

版權所有・請勿翻印

Copyright © 2003 C. J. Fraser

All rights reserved.

---

著者：方克濤 (C. J. Fraser)

發行人：方克濤

地址：香港新界沙田香港中文大學馮景禧樓 430 室

初版：中華民國八十四年八月

修訂版：中華民國九十二年十二月

定價：新台幣 650 元

ISBN: 957-41-0515-6

---

總經銷：聯寶國際文化事業有限公司

台北(02) 2695-4083 台中(04) 2452-3551 台南(06) 291-2919

新竹代理：銓民書局 (03) 572-7465