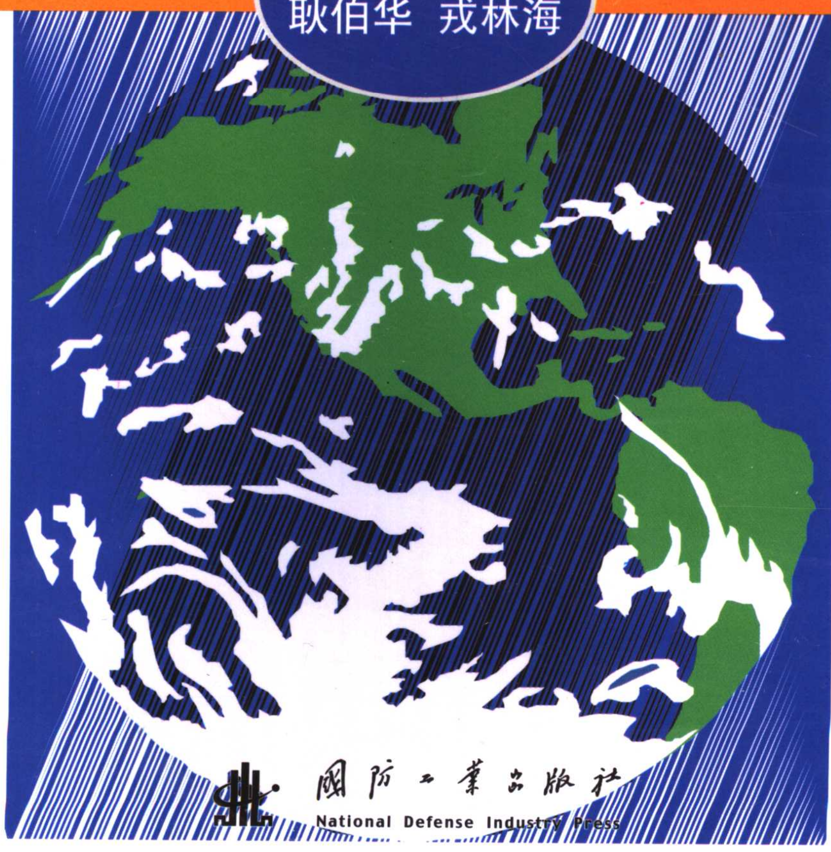
科技英语读本

主编
耿伯华 戎林海



国防工業出版社
National Defense Industry Press

科技英语读本

主编　耿伯华　戎林海
编委　（按姓名笔画排列）
戎林海　朱　江
李　静　张春燕
邵党喜　承晓燕
耿伯华　蒋　勇

国防工业出版社
·北京·

内 容 简 介

本书所选材料新、覆盖面广，涉及包括基础学科到科技新领域的 27 个学科。每个学科为一个单元，文中对涉及到的疑难词语进行了详细的注释，并且文后配有练习。本书可用作为高校英语专业学生的教材，亦可用作科普英语读本。

图书在版编目(CIP)数据

科技英语读本/耿伯华，戎林海主编.—北京：国防工业出版社，2006.8

ISBN 7-118-04628-0

Ⅰ.科... Ⅱ.①耿...②戎... Ⅲ.科学技术－英语 Ⅳ.H31

中国版本图书馆 CIP 数据核字(2006)第 075944 号

※

国防工業出版社出版发行

(北京市海淀区紫竹院南路 23 号 邮政编码 100044)

天利华印刷装订有限公司印刷

新华书店经售

*

开本 710×960 1/16 印张 17¾ 字数 336 千字

2006 年 8 月第 1 版第 1 次印刷 印数 1—4000 册 定价 29.00 元

(本书如有印装错误，我社负责调换)

国防书店：(010)68428422 发行邮购：(010)68414474

发行传真：(010)68411535 发行业务：(010)68472764

前　言

现代科技发展日新月异，新学科、新知识不断出现，我们感到，原有的一些科技英语课程的教材已不能适应教学需要。为改变教材滞后的现象，我们在多年教学实践不断吸收成功经验的基础上，编写了本书。

本书所选材料新，大多为近年来正式刊物上发表的反映各学科最新发展的文章。材料覆盖面广，涉及包括基础学科到科技新领域的 27 个学科。每学科为一个单元。

为帮助教师教学，方便学生及其他读者的阅读与理解，本书以脚注形式对每篇文章中的疑难词语（主要是专业词汇）进行比较详细的注释。每篇文章后都配有有助于加深理解和巩固学习的练习，练习分为三类：一类是问题，一类是词语翻译，另一类是段落翻译。问题中既有针对文章内容的问题，又有启发读者独立思考的问题；词语翻译既有英译汉又有汉译英；段落英译汉的两段文字一段选自本单元文章，另一段选自书外，以利进一步拓宽读者的思路。

书中还介绍了科技英语翻译的知识和技巧，这是科技英语教学的一个重要内容。为此，本书主编人员在总结多年从事科技英语教学和翻译实践的基础上，以实用为出发点，着重介绍了科技英语翻译中特别须加注意的地方，所用的例句大多选自本书中的文章。

本书可用作高校英语专业学生的科技英语课程教材，也可用作科普英语读本。

参加本书编写的有耿伯华、戎林海、朱江、邵党喜、李静、张春燕、承晓燕、蒋勇。耿伯华、戎林海任主编，负责全书的策划、部分材料的选用、所选材料的审定和全部注释、练习的修改及全书初稿的审定；耿伯华编写了附录Ⅰ，戎林海对全书进行了最后的统稿和审校。编委的分工如下：朱江负责收集化学篇、石油化工篇、纺织工业篇的全部文章，注释和练习的编写。邵党喜负责收集能源科学篇、材料科学篇、医学篇、纳米科学篇的全部文章，注释和练习的编写。李静负责收集海洋篇、交通运输篇、汽车工业篇、军事科学篇的全部文章，注释和

练习的编写。张春燕负责收集电子工程篇、计算机科学篇、网络工程篇、信息工程篇的全部文章，注释和练习的编写，并完成了数学篇和物理学篇的注释和练习编写。承晓燕负责收集生命科学篇、生物工程篇、基因工程篇、仿生学篇、航空航天篇的全部文章，注释和练习的编写，并完成了机械工程篇和电气工程篇的注释和练习的编写。蒋勇负责收集生态学篇、环境工程篇、城市建设篇的全部文章，注释和练习的编写。附录Ⅱ、Ⅲ、Ⅳ分别由蒋勇和承晓燕、张春燕、李静完成。

限于作者水平，不妥之处在所难免，敬请读者指出。

编 者

Contents

Unit 1 Mathematics 1
Text A What is Mathematics, Anyway? 1
Exercises 5
Text B The Long Road to Calculus 6
Exercises 10
Text C Mathematics at Forefront of Gulf War 11
Exercises 12
Unit 2 Physics 14
Text A The Science of Matter, Space and Time 14
Exercises 17
Text B Light and Heat 18
Exercises 20
Unit 3 Chemistry 21
Text A What is Chemistry? 21
Exercises 24
Text B An Introduction to Organic Chemistry 25
Exercises 28
Unit 4 Mechanical Engineering 29
Text A Advanced Manufacturing Technology 29
Exercises 31
Text B Continuous Manufacture 32
Exercises 34
Unit 5 Electronic Engineering 36
Text A The New Generation of Advanced Process Control 36
Exercises 40
Text B Power System Control in Next Century 41
Exercises 46
Unit 6 Electronic Engineering 48

Text A Basic Knowledge of Electronics ······ 48
Exercises ······ 50
Text B The Transistor and Its Basic Circuit ······ 51
Exercises ······ 52
Unit 7 Computer Science ······ 54
Text A Computer and its Kind ······ 54
Exercises ······ 56
Text B Central Processing Unit(CPU) ······ 57
Exercises ······ 60
Unit 8 Network Engineering ······ 62
Text A Computer Network ······ 62
Exercises ······ 64
Text B Internet and Remote Access ······ 65
Exercises ······ 68
Unit 9 Information Technology ······ 70
Text A Information Technology ······ 70
Exercises ······ 71
Text B Satellite Communication ······ 72
Exercises ······ 73
Text C Plug-and-Play Robots ······ 74
Exercises ······ 77
Unit 10 Energy Science ······ 79
Text A Renewable Energy ······ 79
Exercises ······ 84
Text B Fuel for the Future ······ 85
Exercises ······ 87
Unit 11 Petrochemistry ······ 89
Text A What is Petrochemistry? ······ 89
Exercises ······ 92
Text B Brief Introduction to Essential Oil Chemistry ······ 93
Exercises ······ 95
Text C Petrochemistry in Everyday Life ······ 96
Exercises ······ 99
Unit 12 Textile Technology ······ 100
Text A The New Textile Technology ······ 100

Exercises 108
Unit 13 Materials Science 109
Text A Introduction to Materials Science and Engineering 109
Exercises 110
Text B Materials Science 111
Exercises 118
Unit 14 Nanotechnology 120
Text A Nanotechnology 120
Exercises 125
Text B Machine-Phase Nanotechnology 126
Exercises 130
Unit 15 Medical Science 132
Text A AIDS (Acquired Immunodeficiency Syndrome) 132
Exercises 136
Text B Nasal Solution Joins SARS Race 137
Exercises 139
Unit 16 Life Science 141
Text A Scientific Researches on Body's Rhythms 141
Exercises 142
Text B What Are Biorhythms? 143
Exercises 145
Unit 17 Bioengineering 146
Text A The Biotech Century 146
Exercises 148
Text B The Biological Switchboard 149
Exercises 151
Unit 18 Gene Technology 152
Text A First Transplant of Non-human Gene 152
Exercises 153
Text B The Age of Cloning 154
Exercises 157
Unit 19 Bionics 159
Text A Applied Bionics 159
Exercises 160
Text B Don't Swat That Fly. It's A Spacecraft! 161

Exercises ······ 163
Unit 20 Ecology ······ 165
Text A Introduction to Ecology ······ 165
Exercises ······ 166
Text B Importance of Wetlands ······ 167
Exercises ······ 169
Unit 21 Environmental Technology ······ 171
Text A Solar Wind Hammers the Ozone Layer ······ 171
Exercises ······ 173
Text B Wastewater Treatment ······ 174
Exercises ······ 177
Unit 22 Urban Planning and Development ······ 179
Text A Urban Planning ······ 179
Exercises ······ 181
Text B Post-Modernism and Urban Planning ······ 183
Exercises ······ 189
Unit 23 Communication and Transportation ······ 191
Text A Floating Trains: What a Way to Go ······ 191
Exercises ······ 194
Text B Electric Traction ······ 195
Exercises ······ 199
Unit 24 Auto Industry ······ 201
Text A The History and Future of Automobile Industry ······ 201
Exercises ······ 204
Text B Automobile Structure ······ 205
Exercises ······ 208
Unit 25 Aeronautics and Space Technology ······ 210
Text A Downsized Spacecraft for the New Millennium ······ 210
Exercises ······ 211
Text B Piggy-backs in Space ······ 212
Exercises ······ 214
Unit 26 Oceanography ······ 216
Text A Oceanography and Ocean Ramifications ······ 216
Exercises ······ 219
Text B Oceans at Risk ······ 220

Exercises ······ 222
Unit 27 Military Science ······ 224
Text A A Third Generation of Nukes ······ 224
Exercises ······ 227
Text B "Star Trek" Shields to Protect Supertanks ······ 228
Exercises ······ 230
附录 I 科技英语翻译 ABC ······ 232
附录 II 常用科技英语缩略语 ······ 245
附录 III 常用数学符号的英语表达 ······ 265
附录 IV 常用度量衡单位英汉对照表 ······ 270
Reference ······ 274

Unit 1 Mathematics

Text A What is Mathematics, Anyway?

We keep the broad definition here, that mathematics includes all the related areas which touch on quantitative, geometric, and logical themes. This includes Statistics, Computer Science, Logic, Applied Mathematics, and other fields which are frequently considered distinct from mathematics, as well as fields which study the study of mathematics (!)—History of Mathematics, Mathematics Education, and so on. We draw the line only at experimental sciences, philosophy, and computer applications. Personal perspectives vary widely, of course.

A fairly standard definition is the one in the Columbia Encyclopedia (5th ed.): "Mathematics: deductive study of numbers, geometry, and various abstract constructs, or structures. The latter often arise from analytical models in the empirical sciences, but may emerge from purely mathematical considerations."

Some definitions of mathematics heard from others:

- That which mathematicians do.
- The study of well-defined things.
- The study of statements of the form "P implies Q".
- The science one could go on practicing should one wake up one morning to find that the world has ceased to exist. (attrib. to Bertrand Russell①)
- The science of patterns. (Keith Devlin②)
- "Mathematics, at the beginning, is sometimes described as the science of Number and Space—better, of Number, Time, Space and Motion."—Saunders MacLane③, in *Mathematics*: Form and Function

Contrary to common perception, mathematics does not consist of "crunching

---

① Bertrand Russell:伯特兰·罗素(1872—1970),英国著名哲学家、数学家、逻辑学家。

② Keith Devlin:凯思·德福林,美国数学家,加州圣玛丽大学理学院院长、数学教授,斯坦福大学语言与资讯研究中心资深研究员。

③ Saunders MacLane:桑德斯·麦克莱恩,美国数学家。

numbers" or "solving equations". As we shall see, there are branches of mathematics concerned with setting up equations, or analyzing their solutions, and there are parts of mathematics devoted to creating methods for doing computations. But there are also parts of mathematics which have nothing at all to do with numbers or equations.

The Division of Mathematics

In order to find one's way around the collection of mathematical ideas, it is useful to organize them and classify them in some way into parts.

Among the ways to divide the field of mathematics is by field of application. There are many books and courses in schools labeled "Engineering mathematics", "Financial mathematics", "Mathematics for social scientists", and so on. While it is perhaps easier for the reader to have the material pre-filtered according to application, this hides the fact that the underlying mathematics is really quite similar—radioactive decay is essentially the same as inflationary depreciation of investments, for example. (At this site we emphasize the mathematics itself rather than the intended application, so this method of dividing material is inappropriate for us.)

Another way to divide the portions of mathematics is by level of complexity. Elementary topics include arithmetic and measurement; intermediate topics include simple algebra and plane geometry. From there we may pass to somewhat more complex topics built upon these: trigonometry①, "advanced" algebra, analytic geometry, and calculus.

That said, we proceed to divide mathematics along thematic lines.

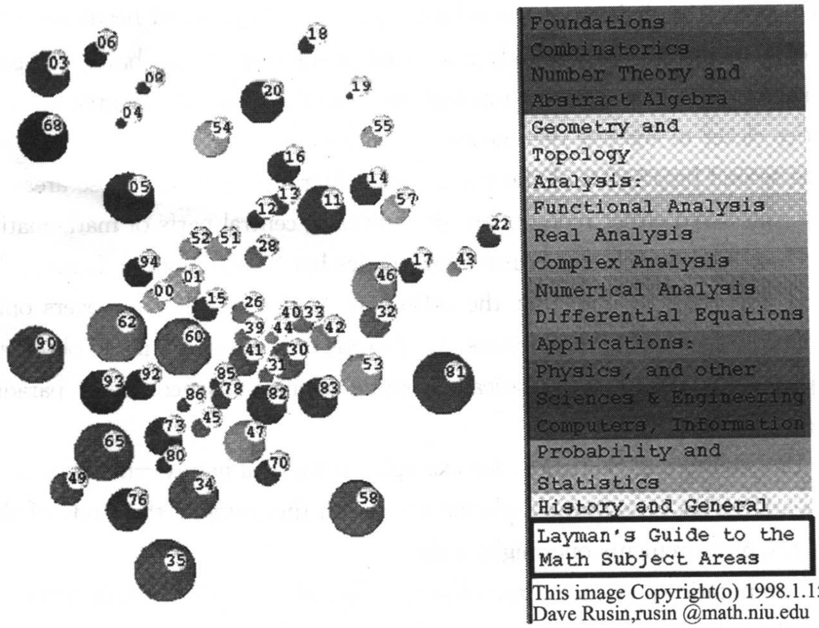
How Many Parts of Mathematics—Two? Eight? Sixty-three?

The image shows a "map" of the subfields of mathematics. These are the major classification groupings used at this site and by most research mathematics projects. The sizes and positions of the "bubbles" are computed to reflect the sizes and relatedness of the various disciplines. On our tour, we'll highlight some of the main groupings of these areas (the different color groups).

One first step in dividing the mathematics literature is to decide which books and articles intend to reveal the structure of mathematics itself, and those which intend to apply mathematics to closely allied areas. This division between mathematics and its applications is of course vague. Indeed, we'll see that the two groups cut across each

---

① trigonometry:三角学,三角学理论。



other on the MathMap. The first group divides roughly into just a few broad overlapping areas:

- Foundations considers questions in logic or set theory—the very language of mathematics.
- Algebra is principally concerned with symmetry, patterns, discrete sets①, and the rules for manipulating arithmetic operations; one might think of this as the outgrowth of arithmetic and algebra classes in primary and secondary school.
- Geometry is concerned with shapes and sets, and the properties of which are preserved under various kinds of motions. Naturally this is related to elementary geometry and analytic geometry.
- Analysis studies functions, the real number line②, and the ideas of continuity③ and limit④; this is perhaps the natural successor to courses in graphing, trigonometry, and calculus. (This is a very large area; we subdivide it later into five areas which we may label Calculus and Real Analysis, Complex Analysis, Differential Equations, Theory of Functions, and Numerical Analysis and Optimization.)

---

① discrete sets:离散集合。
② the real number line: 实数直线。
③ continuity: 连续函数的特性;(线条的)连续性。
④ limit: 限,极限。

Of course, the division of the subject areas into these broad headings is a little fuzzy: combinatorics is only weakly associated to the rest of "algebra"; Lie groups[①] are arguably a part of analysis or topology instead of algebra, differential geometry is in practice closer to analysis than geometry, and so on.

The second broad part of the mathematics literature includes those areas which could be considered either independent disciplines or central parts of mathematics, as well as those areas which clearly use mathematics but involve non-mathematical ideas too. It is important to note that the collection of files at this site covers only the mathematical aspects of these subjects; we provide only cursory links to observational and experimental data, mathematically routine applications, computer paradigms, and so on.

- Probability and Statistics, for example, has a dual nature—mathematical and experimental. This classification scheme focuses on the former—the study of the validity of the measurements one might make.
- Computational sciences have obviously flourished in the last half-century, and consider algorithms and information handling. Here we are concerned with what might be computed, not with compilers, architectures and so on.
- Significant mathematics must be developed to formulate ideas in the physical sciences, engineering, and other branches of science. Again it is the theoretical underpinnings which concern us here rather than the experiment or tangible construction.

Finally note that every branch of mathematics has its own history, collections of important works—reference, research, biographical, or expository—and in many cases a suite of important algorithms. The MSC classification allows these topics to be included within each major heading at a secondary level. However, these themes are sometimes best woven together into areas of study which are not so much research into mathematics as research into the enterprise of mathematics—"epi-mathematics", perhaps.

The Mathematics Subject Classification (MSC) scheme breaks down these general areas into 63 numbered subject classifications with widely varying characteristics. (This is the classification system used by the research mathematical societies.) We adhere to the polite fiction that these areas are more distinct than the subfields of some of the larger areas; more detail is available in the pages for the various areas.

(Continue the tour by clicking on any of the major branches of mathematics de-

① Lie groups: 李群,1870 年由挪威数学家索福斯·李发现的连续群。

scribed above. You might want to begin with a tour of foundations.)

But Is This Division "Real"?

In a word, "no". It's false to assume that mathematics consists of discrete subfields, it's false to assume that there is an objective way to gather those subfields into main divisions, and it's false to assume that there is an accurate two-dimensional positioning of the parts. For example, a division into "Pure" and "Applied" Mathematics is traditional, but the boundaries are unclear and cross-fertilization is common. Within the first part it is also traditional to identify Algebra, Geometry, and Analysis as the three largest areas, but again this division is somewhat artificial as we have noted.

Yet the picture we have described above is consistent with the images painted in other sources. Some other systems for classifying mathematics are presented for browsing in the set of subject headings used at this site. Each system is different and yet it is generally possible to match parts of one classification scheme with parts of another.

The National Science Foundation, for example, organizes its mathematics programs into

- Algebra and Number Theory
- Topology and Foundations
- Geometric Analysis
- Analysis
- Statistics and Probability
- Computational Mathematics
- Applied Mathematics

a division which clearly maintains the same larger areas we have indicated, though it gathers the smaller ones somewhat differently.

Exercises

I. Answer the following questions.

1. What is mathematics according to the Columbia Encyclopedia?
2. What subfields of mathematics reveal the structure of mathematics itself? What subfields intend to reveal the applications of mathematics? Can you name some respectively?
3. What's the relationship between pure mathematics and applied mathematics?
4. According to Bertrand Russell, mathematics is the science one could go on

practicing should one wake up one morning to find that the world has ceased to exist? Comment on his viewpoint.

Ⅱ. Write out the equivalents of the following words and expressions.

1. empirical sciences	9. 应用数学
2. Financial Mathematics	10. 工程数学
3. plane geometry	11. 解析几何
4. Differential Equations	12. 微积分和实分析
5. combinatorics	13. 复分析
6. Theory of Functions	14. 数值分析和最优化
7. topology	15. 微分几何
8. physical sciences	16. 概率与统计

Ⅲ. Translate the following into Chinese.

(1)

We keep the broad definition here, that mathematics includes all the related areas which touch on quantitative, geometric, and logical themes. This includes Statistics, Computer Science, Logic, Applied Mathematics, and other fields which are frequently considered distinct from mathematics, as well as fields which study the study of mathematics (!)—History of Mathematics, Mathematics Education, and so on.

(2)

The analogies between mathematics and logic should not be overrated; they only go so far. Logic may be regarded as the manipulation of concepts of any kind, whereas mathematics concerns specifically numerical concepts. Although there is some intervention of mathematics in logic, for the resolution of quantitative issues, and we may be said to think logically when engaged in mathematics, these sciences are very different fields of interest. They have rationalism in common, but their scopes are different and neither is really a subsidiary of the other.

Text B The Long Road to Calculus

The origins of calculus go back over 2,000 years to the work of the Greeks on areas and tangents. Archimedes① (287-212 B. C.) found the area of a section of a

① Archimedes:阿基米德,古希腊杰出的数学家、物理学家,在其著作《论平板的平衡》中提出的数学方法成为17世纪无穷小分析的基础。

parabola[①], an accomplishment that amounts in our terms to evaluating $\int_0^b x^2 dx$. He also found the area of an ellipse and both the surface area and the volume of a sphere. Apollonius[②] (around 260-200 B.C.) wrote about tangents to ellipses, parabolas, and hyperbolas, and Archimedes discussed the tangents to a certain spiral-shaped curve. Little did they suspect that the "area" and "tangent" problems were to converge many centuries later.

With the collapse of the Greek world, symbolized by the Emperor Justinian's[③] closing in A.D. 529 of Plato's Academy[④], which had survived for a thousand years, it was the Arab world that preserved the works of Greek mathematicians. In its liberal atmosphere, Arab, Christian, and Jewish scholars worked together, translating and commenting on the old writings, occasionally adding their own embellishments. For instance, Alhazen (A.D. 965-1039) computed volumes of certain solids, in essence evaluating $\int_0^b x^3 dx$ and $\int_0^b x^4 dx$.

It was not until the seventeenth century that several ideas came together to form calculus. In 1637, both Descartes[⑤] (1596-1650) and Fermat[⑥] (1601-1665) introduced analytic geometry. Descartes examined a given curve with the aid of algebra, while Fermat took the opposite tack, exploring the geometry hidden in a given equation. For instance, Fermat showed that the graph of $ax^2 + bxy + cy^2 + dx + ey + f = 0$ is always an ellipse, hyperbola, parabola, or one of their degenerate forms.

In this same period, Cavalieri[⑦] (1598-1647) found the area under the curve $y = x^n$ for $n = 1, 2, 3, \ldots, 9$ by a method the length of whose computations grew rapidly as the exponent increased. Stopping at $n = 9$, he conjectured that the pattern would continue for larger exponents. In the next 20 years, several mathematicians

---

① the area of a section of a parabola:抛物线弓形面积。

② Apollonius:阿波罗尼奥斯,古希腊数学家,所著《圆锥曲线》一书是古代科学巨著之一。

③ Justinian:查士丁尼一世,拜占庭皇帝(527—565年在位),曾主持编纂著名的《查士丁尼法典》,曾率兵征战波斯,征服北非及意大利等地。

④ Plato's Academy:雅典学院,柏拉图在雅典郊外创办的一所学校,在他死后持续了9个多世纪,公元529年,查士丁尼一世将其封闭,academy一词即源于此。

⑤ Descartes:笛卡儿,法国哲学家、数学家、物理学家,所著《几何》一书于1637年出版,标志着解析几何学的创立。

⑥ Fermat:费尔马,法国数学家,致力于数论、几何、分析、概率论等方面的研究,以其未经证明的"费尔马大定理"著称于世。

⑦ Cavalieri:卡瓦列里,意大利数学家,波伦尼亚大学教授,1635年出版《不可分连续量几何》,用不可分原理制定了一种简单形式的积分法,为微积分学先驱之一。