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国外优秀生命科学教学用书

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# ESSENTIALS OF GENETICS

SIXTH EDITION

## 遗传学基础

(第6版)(影印版)

William S. Klug  
Michael R. Cummings  
Charlotte A. Spencer



高等教育出版社  
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# 前言

《遗传学基础》是应课程设置的需要而编写的，与包含内容更为广泛的姊妹篇《遗传学概念》相比，它更为短小，也更为基础，但仍然覆盖全面，内容新颖，制作精良，尤其适合于低年级生物专业的学生以及农业、化学、工程、林业、心理和野生生物管理等专业的学生。由于篇幅比其他很多书都短，本书更适合于单季课程和一学期课程。

## 目标

尽管《遗传学精要》比它的姊妹篇少约 150 页的内容，但在修订过程中，我们的目标是相同的。我们尤其渴望达到：

- 强调概念，而不是过多的细节；
- 通过清楚、直接的描述，提供给学生关于复杂主题的易于理解的诠释；
- 在章节内部和章节之间建立缜密的组织架构；
- 不断强调科学是一种阐述我们如何得知我们已知东西的方法；
- 传播遗传学的丰富历史，该历史完美地阐述了在学科形成和发展过程中，信息是如何获得和扩充的；
- 强调问题的解决，引导学生分析思考，应用和扩充他们的遗传学知识；
- 提供该领域最新的、最前沿的知识；
- 绘制引人入胜的，同时有助于教学的全彩色图，再加上同样有效的照片，为概念的发展提供支持；
- 提供出色的在线媒体指南，引导学生通过高质量的动画、指导练习及自测工具来理解重要的概念。

这些目标是《遗传学基础》的基石，这些教育学基础使这本教科书能够适应不同教学方法和形式的课程。尽管本书提供了一个连贯的内容列表，它代表了一种遗传学教学安排，但各章的编写是相互独立的，允许教员打乱原来的顺序。我们相信蕴含在以上目标中的不同的教学方法，能够向学生提供他们学习遗传学的最佳保障。

能够写作达成这些目标的一本教科书，并且有机会在每一个新版本进行不断地提高，我们乐此不疲。

6 版中每 1 版的产生，不仅反映了我们对于遗传学教学的热情，也反映了过去 15 年来编者、审稿人员以及我们的学生对该书的建设性的反馈意见和鼓励。

## 第 6 版的特点

本版的很多特点使《遗传学基础》继续成为最具特色、最适于教学的遗传学教科书，这些特点包括：

**现在来解决问题** 这一版的新特点是添加了题为“现在来解决问题”的文本框，分布于每一章。这一文本框的功能在于，通过章节末的一道相关题目让学生集中注意力，及时复习刚刚讲过的概念。这不仅起到复习的作用，而且强化了“遗传学是用来解决问题的”这一事实。每个文本框都有“线索”，帮助学生找到问题的答案，以达到教学的目的。

**我们如何得知** 这一文本框安排在每一章的引言之后。现代生物学教育更推崇“科学是求知的途径”这一理念，基于此，该设计使学生了解无数个曾经困扰我们思想的重要问题，并让他们不断地问自己人类是如何得到这些问题的答案的。学生们曾经一直在每章的字里行间追索这些东西，现在我们把它们以这种形式固定下来，相信可以加强他们对每章主题的理解。在第 1 章我们解释了这种安排的幕后考虑，从第 2 章开始就有这个小节了。

**新遗传学、技术和社会短文** 在每次新版修订时，我们都会修订很多这样的短文，添加反映遗传学最新发现及其社会影响的新文章。此次修订增加的短文涉及台-萨氏病 (Tay-Sachs disease) (第 3 章)、脆性染色体位点和癌 (第 6 章)、遗传调控和人类异常 (第 15 章) 以及 DNA 的所有权 (第 18 章)。并对旧版已有的短文进行了补充，内容包括对干细胞、人类性别选择、基因修饰食品、基因治疗、人类克隆、疯牛病和濒危物种的讨论。

**主题现代化** 虽然我们对每一章进行了更新，以反映遗传学领域的最新、最重要的进展，我们仍然特别关注基因组学和蛋白组学中最前沿的主题 (第 18 章)，以及基因工程的应用和伦理 (第 19 章)，这些主题对未来遗传学的研究和社会的影响无疑将是巨大的。另外，我们也更新和扩展了对基因调控 (第 15 章) 和癌的遗传学 (第 16 章) 这些进展快速的领域的描



述。对保护遗传学(第24章)的深度关注,继续成为我们遗传学现代化的又一个标志。这个以试图评估和维持濒危物种遗传多样性为内容的领域,继续成为遗传学研究的前沿。

**通篇的新图解** 第6版完全使用新的彩版,并且重绘了几乎所有插图,以加强其教学价值和艺术性。有很多流程图,引导学生博览实验流程和技术操作。

**新照片** 有更加丰富的照片来支撑本版教材。

**问题解答** 在每章末,有最多30道难度不同的题目和讨论问题。最具挑战性的题目是基于遗传学文献中得到的实验数据。我们一直试图通过各种努力使学生了解,构成遗传学这门学科的知识是如何得来的,这些题目就是我们努力的部分体现。和过去的版本一样,偶数题的简要答案附在附录B,所有题目和问题的详细答案登在《学生手册和解答指南》中。

**教员和学生实用媒体网址** 提升了对授课和其他教学任务的支撑,原版教科书配套CD的教员资源中心,提供了更多的照片、图表和ppt幻灯片。更新过的辅助网站中的媒体,也反映出一个正在形成的共识,即当今的学生必需尽可能发挥他们的聪明才智,充分利用有限的学习时间。

## 继续重视概念

与其姊妹篇一样,《遗传学基础》继续聚焦于遗传学的概念。我们编写本书的经验,还有多年以来我们一直保持联系的教员的经验都显示,首先关注于基本概念的那些学生,更容易领会和掌握随后课程中遗传学的重要思想以及解决生物学问题的分析方法。

为帮助学生确定重要主题所涉及的概念,每一章均以新的小节开始,称作“本章概念”,列出了即将出现的最重要的概念。如前所述,在每一章内部都有“我们如何得知”的插入,让学生将概念和实验联系起来。“现在来解决问题”使学生把理解概念和解决问题更及时地联系起来。此外,每一章都以“本章小结”结束,小结列举5~10个本章所涵盖的关键点。总之,这些特点确保学生在面对遗传学的大量词汇和很多重要细节内容时,仍然能够关注并理解遗传学的概念。整部书仔细设计的插图,也为此提供了保障。

## 问题解答:洞悉和解答

与生物学的其他学科相比,遗传学更需要解题训练和分析性思维。在很多章的最后,我们有“洞悉和解答”一节,现在它已经极为普遍和成功。这一节包括:

- 问题解答
- 数量分析
- 分析性思考
- 实验原理

摆出题目或问题,给出详细的解答,使学生在开始做每章的题目及讨论问题之前,先做好准备。

配套网站上有 Genetics Web Investigation, 每个 Web Investigation 包括若干网络相连的题目,用来加强和扩展本章所阐释的主题。要完成这些题目,学生们必需积极参与练习和虚拟实验。为便于参照,开始练习之前,解决问题所需的预估时间都会给出。

## 致谢

本书的完成,有赖于许多同仁的倾力合作,对书中的任何错误,我们负全部责任。我们衷心感谢为本书及以前各版进行审阅或者对其内容和学术性作出贡献的每一个人。

这里要明确一点,这本书是群策群力的结晶,所有上面所提到的人,都一并享有本书所带来的任何成功与喜悦。我们希望他们知道,对他们付出的艰苦努力,我们一视同仁。非常非常感谢他们。

## 贡献人员

我们首先特别感谢为本书作出直接贡献的同仁。特别感谢科罗拉多州立大学的 Sarah Ward 写作了第24章——保护遗传学,并且在涉及数量和群体遗传学的各章都有贡献;再有, Amanda Norvell 修订了有关真核生物分子遗传学的部分, Janet Morrison 修订了有关进化遗传学的大量内容。Katherine Uyhazi 撰写了有关人类台-萨病的短文(第3章),并协助修订了其他几篇小品文。Amanda 和 Janet 是新泽西大学的同事, Katherine 原来在新泽西大学,现供职于耶鲁大学。东密歇根大学的 David Kass 提供了初始想法,绘制并协助完成了第15章基因调控的小品文。我们感谢 Slippery Rock 大学的 Mark Shotwell 为本书撰写了数篇“遗传学、技术、社会”的小品文。在以前的版本中,亚利桑那州立大学的 Elliott Goldstein 一直作为我们分子遗传学新发现的顾问。我们也特别感谢 Creighton 大学的 Harry Nickla,他是《学生手册》和《教员指南》的作者,还写了很多新题目,并给出了答案(附录B所示)。

我们衷心感谢上述同仁,不仅在于分享他们的遗传学专业知识和经验,还在于他们对本项目的贡献以及与他们互动的美好经历。

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## 审稿人

最后，我们很高兴地收到很多遗传学界同行在审阅《遗传学基础》及其姊妹篇《遗传学概念》时所提出的意见。他们是：

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书和以前版本的章节设置。他不知疲倦地向我们提供本领域顶尖专家同时也是第一线教师的同仁们的建议, 以确保本书的学术性和构思能够紧随学科知识的快速更新。我们也感谢 Prepare Inc 的各位在本书出版上所付出的努力, 他们精益求精的精神在全书得到了体现。特别是 Fran Daniele 和 Rosaria Cassinese 在那样繁杂的流程中能够潜心工作, 没有他们的敬业和奉献, 本书就不会展现于各位面前。生物部门经理 Crissy Dudoins 不倦地工作, 保证了本书及附录、最前沿媒体连接都吻合得天衣无缝。Patrick Shriner 负责媒体方面, 确保其满足现在教员和学生的要求。最后, York PA 的艺术工作室为本书制作了漂亮和整齐的插图, 我们特别感谢 Patricia Burn 和 Jay McElroy 的努力。

(佟向军 译)

# Nobel Prizes Awarded for Research in Genetics or Genetics-Related Areas

Year	Recipients	Nobel Prize	Research Topic
2006	R. Kornberg	Chemistry	The molecular basis of eukaryotic transcription
2006	A. Z. Fire C. C. Mello	Medicine or Physiology	Discovery of RNA interference (RNAi)
2002	S. Brenner H. R. Horvitz J. E. Sulston	Medicine or Physiology	Discovery of the genetic regulation of organ development and programmed cell death
2001	L. Hartwell P. Nurse T. Hunt	Medicine or Physiology	Discovery of genes and regulatory molecules controlling the cell cycle
1999	G. Blobel	Medicine or Physiology	Discovery that proteins contain genetically encoded sequences that guide their transport within cells
1997	S. Prusiner	Medicine or Physiology	Discovery of prions—a new biological principle of infection
1995	E. B. Lewis C. Nusslein-Volhard E. Wieschaus	Medicine or Physiology	Genetic control of early development in <i>Drosophila</i>
1993	R. Roberts P. Sharp K. Mullis M. Smith	Medicine or Physiology	RNA processing of split genes
1989	J. M. Bishop H. E. Varmus T. R. Cech S. Altman	Chemistry	Development of polymerase chain reaction (PCR) and site-directed mutagenesis (SDM)
		Medicine or Physiology	Role of retroviruses and oncogenes in cancer
1987	S. Tonegawa	Medicine or Physiology	Ribozyme function during RNA splicing
1985	M. S. Brown J. L. Goldstein	Medicine or Physiology	Genetic basis of antibody diversity
1983	B. McClintock	Medicine or Physiology	Genetic regulation of cholesterol metabolism
1982	A. Klug	Chemistry	Mobile genetic elements in maize
1980	P. Berg W. Gilbert F. Sanger	Chemistry	Crystalline structure analysis of significant complexes, including tRNA and nucleosomes
1978	W. Arber D. Nathans H. O. Smith	Medicine or Physiology	Development of recombinant DNA and DNA sequencing technology
			Recombinant DNA technology using restriction endonuclease technology

More Nobel laureates will be found on the inside back cover



Year	Recipients	Nobel Prize	Résearch Topic
1976	D. C. Gajdusek	Medicine or Physiology	Elucidation of prion-based human diseases, kuru and Creutzfeldt-Jakob dementia
1975	D. Baltimore R. Dulbecco H. Temin	Medicine or Physiology	Molecular genetics of tumor viruses
1972	G. M. Edelman R. R. Porter C. Anfinsen	Medicine or Physiology Chemistry	Chemical structure of immunoglobulins Relationship between primary and tertiary structure of proteins
1970	N. Borlaug	Peace Prize	Genetic improvement of Mexican wheat
1969	M. Delbruck A. D. Hershey S. E. Luria	Medicine or Physiology	Replication mechanisms and genetic structure of bacteriophages
1968	H. G. Khorana M. W. Nirenberg	Medicine or Physiology	Deciphering the genetic code
	R. W. Holley	Medicine or Physiology	Structure and nucleotide sequence of transfer RNA
1966	P. F. Rous	Medicine or Physiology	Viral induction of cancer in chickens
1965	F. Jacob A. M. L'woff J. L. Monod	Medicine or Physiology	Genetic regulation of enzyme synthesis in bacteria
1962	F. H. C. Crick J. D. Watson M. H. F. Wilkins J. C. Kendrew M. F. Perutz	Medicine or Physiology Chemistry	Double helical model of DNA Three-dimensional structure of globular proteins
1959	A. Kornberg S. Ochoa	Medicine or Physiology	Biological synthesis of DNA and RNA
1958	G. W. Beadle E. L. Tatum	Medicine or Physiology	Genetic control of biochemical processes
	J. Lederberg	Medicine or Physiology	Genetic recombination in bacteria
	F. Sanger	Chemistry	Primary structure of proteins
1954	L. Pauling	Chemistry	Alpha helical structure of proteins
1946	H. J. Muller	Medicine or Physiology	X-ray induction of mutations in Drosophila
1933	T. H. Morgan	Medicine or Physiology	Chromosomal theory of genetics
1930	K. Landsteiner	Medicine or Physiology	Discovery of human blood groups

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