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发育的原理

(原书第三版)

..... PRINCIPLES OF DEVELOPMENT

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内 容 简 介

本书以小鼠、果蝇等各种模式生物的胚胎发育为代表,清晰地介绍了从受精卵发育到多细胞生物这一过程中的种种生物学事件,以及调控这些事件发生的分子机制,如个体的体轴(前后、左右和背腹)是如何决定的,器官发生采用了何种机制,细胞的分裂、分化如何与发育过程密切相关等等。除了动物的发育以外,本书还介绍了植物的发育及其特点。以此为基础,本书还进一步介绍了干细胞研究、器官再生以及物种进化等与发育密切相关的研究领域的最新进展。

本书适合所有对发育生物学感兴趣的人阅读。

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译 者 的 话

当我们提到一个新生命的诞生时，往往指的是“出生”这一事件，如婴儿呱呱坠地、毛茸茸的小鸡破壳而出等等。它们的形象与我们所熟悉的成体形象几乎没有差别，只是个头小了很多。但是，肯定有不少人曾经想过，在这些生命体“出生”之前，它们是什么样的呢？

事实上，生命始于精卵结合，那时候的生命体只是一个单个的细胞，往往小到肉眼看不见，从形态上看，它和“出生”时的个体有天壤之别。但是，按照一定的规律，它经历了细胞分裂、迁移、原肠运动、器官发生等种种发育事件，最终成为“出生”时的形态，而发育生物学就是研究这一过程的学科。综合了分子生物学、生物化学、细胞生物学以及遗传学等各门生物学科的成果积累，发育生物学想要回答的问题是：从受精卵到具有物种特点的个体，胚胎经历了哪些变化？在此期间一维的遗传信息如何转变为三维的个体？其中各种生物大分子如何相互作用以保证正确的形态发生？胚胎发育中的各种事件如特异基因表达的调控、细胞分化潜能的本质等，其规律有可能被应用到成体中吗？

对于这些研究内容，本书用简洁的语言和简明的图表一一加以介绍，通过插入在全书各章节不同位置的“信息窗”和“工具箱”，作者对各种有助于理解该书的概念和技术做了补充说明，因此对于不同知识背景的读者，也都能够很容易享受到阅读的愉快。

根据出版社的要求，我们翻译了本书的部分内容，其目的是希望以较快的速度向尽可能多的读者介绍本书。我们努力使我们的翻译准确，语句尽可能流畅。当然由于时间紧迫，也许还会有不尽如人意的地方，我们衷心希望读者向我们指出，以便重印时加以改正。

让我们共享发育生物学的迷人之处！

译 者

2007年6月10日

前 言

发育生物学是有关多细胞生物的所有生物学的核心。它研究受精卵中的基因如何调控胚胎中细胞的行为，从而决定动植物本性的过程。进化正是通过改变生物的发育，从而产生适应性更好的生物形式。随着细胞及分子生物学先进技术的应用，近几年发育生物学研究取得了长足的进步，新的信息大量增加。在第三版中，我们加入了许多新的进展，例如对体轴形成、神经发育和干细胞的新认识。这些新内容我们都用新增的插图加以补充。

《发育的原理》是为本科生设计的，重点介绍发育的原理和基本概念。我们认为只有理解基因如何调控细胞行为，才能真正理解发育。虽然我们希望学习本书的学生具备基本的细胞生物学和遗传学知识，但是所有相关的重要概念，如基因表达调控，我们在正文中仍然做了解释。

我们明白学习这门课会给学生带来压力，所以我们尽量使用最清楚的语言来描述这些原理，并且提供了很多文字和图表形式的总结，努力避免增加过多的细节。插图是本书的一大特色，这些插图都经过仔细的设计和挑选，能清晰地说明实验和机制。

我们避免了大而全地描述发育的每一方面，而集中描述了最能说明普适原理的几种模式生物。的确，贯穿本书的中心主题就是掌控发育过程的普适原理。所以，我们相信本书的内容在任何层面上都是本科生应该知道的关于发育的知识。

因此，我们集中介绍了脊椎动物和果蝇，但也不排除其他生物，如线虫和海胆，因为在某些时候，它们能最好地阐明某些原理。由于人们对果蝇发育的清楚认识和它对发育生物学产生的巨大影响，因此在这一版中我们从介绍果蝇开始，而并非从脊椎动物开始。这本书的另一重要特色是有关植物发育的内容，因为在大部分的发育生物学课本中，这一部分经常被忽略。最近，对于植物发育的认识有了巨大进展，使我们认识到植物发育的一些独特而重要的特点。

有别于早先的版本，我们将描述模式生物胚胎学和遗传学的内容放入介绍它们早期发育的章节中，没有另设一章单独介绍所有的模式生物。

本书重点介绍早期发育、身体图式以及器官系统的建立，如附肢和神经系统。我们也加入了发育的晚期事件，包括生长和再生。最后，我们以对进化和发育的思考结束本书。

对于补充阅读资料，我们主要关心如何能引导学生阅读对他们有帮助的文章，而非仅仅让他们知道做出过重大贡献的科学家。对于那些因此被忽略的科学家，我们深表歉意。

这一新版中，我们欢迎 Elizabeth Robertson 加入我们的共同作者之列。每一章都由很多专家审阅过（见 ix 页），我们在此对他们一并致谢。我做了最初的修改，随后，我们的编辑 Eleanor Lawrence 做了进一步的解释、编辑和加工，他的专业技巧和影响在书中随处可见。Matthew McClements 为本书绘制并修改了新的插图，本书初版的插图也出自他之手。

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L. Wolpert

伦 敦

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Lewis Wolpert 是英国伦敦大学学院解剖与发育生物学系应用医学生物学专业的退休教授。他的著作包括《胚胎的胜利》、《科学的热情》、《科学的非自然本质》以及《早餐前的六件不可能的事情》。

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Matthew McClements 是专门为科学、技术和医学类传媒设计图片的绘图师。

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