外教社——麦克米伦中学双语教材系列

生物
BIOLOGY 2A

学生用书

Student's Edition

Sarah Rigby（吴珊丽）

李富种 (Eric Lee Fu Chung)

上海外语教育出版社 外教社 SHANGHAI FOREIGN LANGUAGE EDUCATION PRESS

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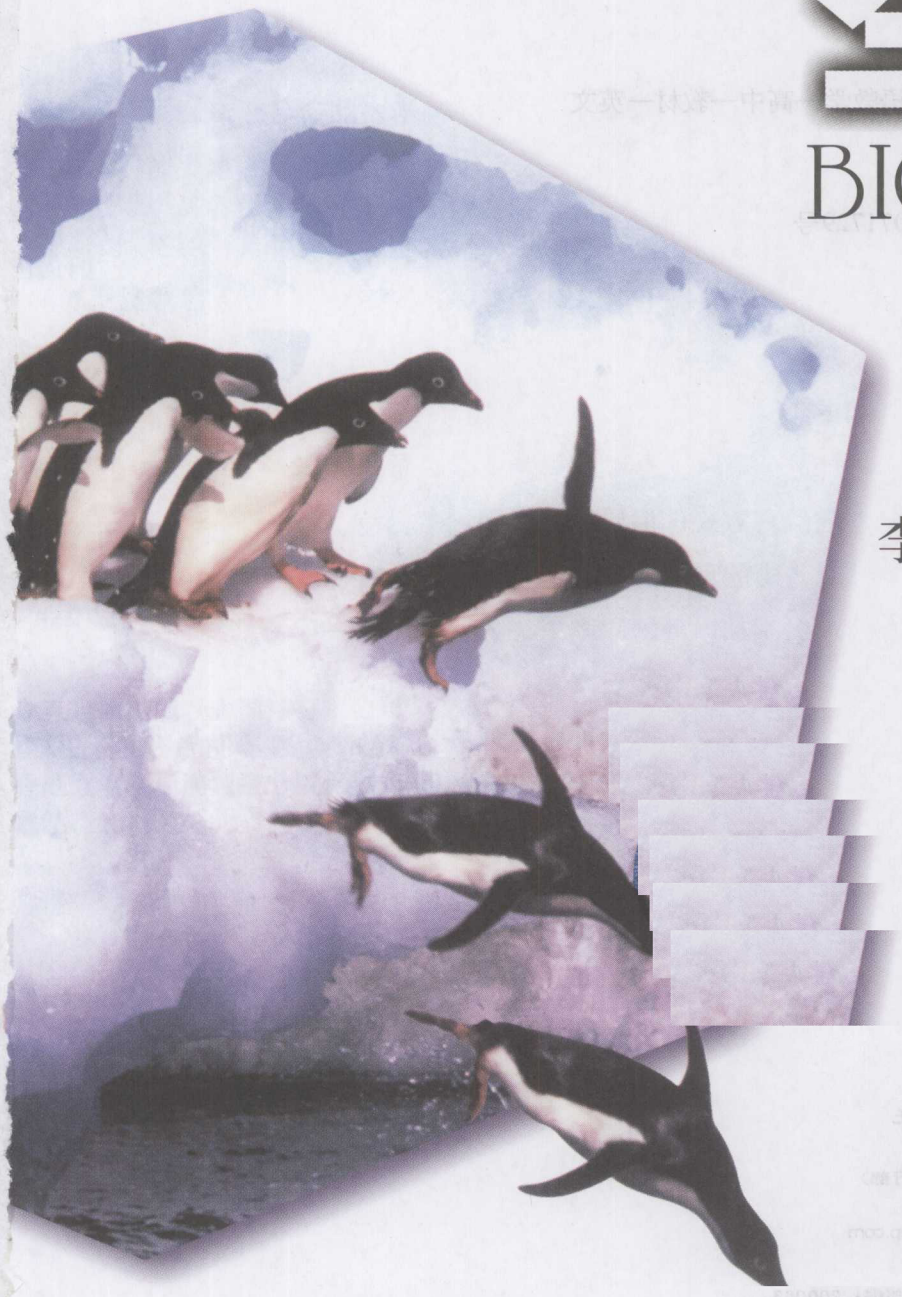

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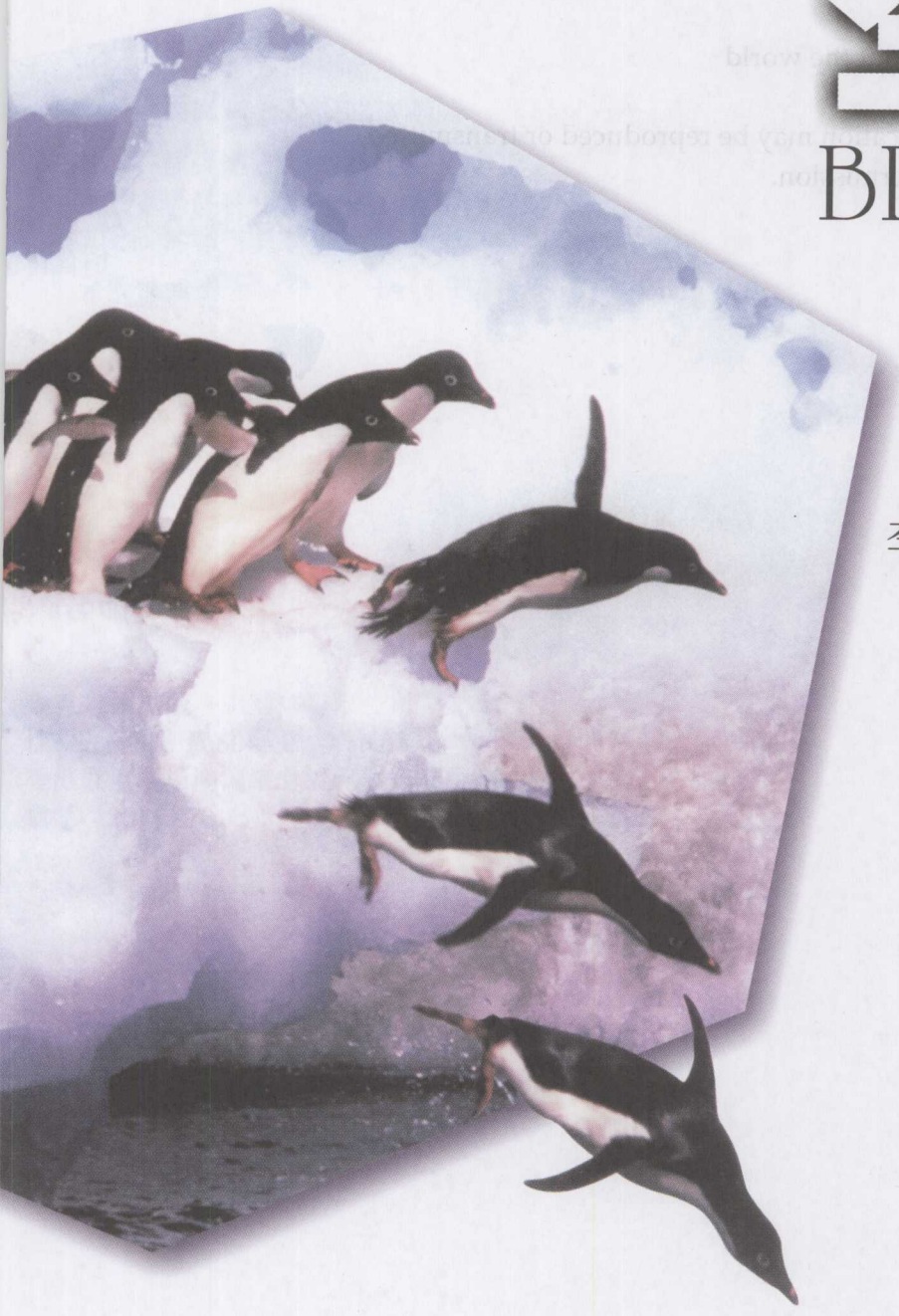

Sarah Rigby（吴珊丽）

李富种 (Eric Lee Fu Chung)

MACMILLAN

Unit 1812, 18/F, Paul Y. Centre
51 Hung To Road
Kwun Tong, Kowloon

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出版前言

双语教育以外语作为学科的教学语言，直接进行学科知识的教学。这种新的教学尝试引起了教育主管部门、教育工作者、外语专家以及成千上万学子和家长的关注。随着对外开放的不断深入以及成功加入WTO，我国在经济、科技、教育等领域全面步入国际舞台，在更大范围内和更深层次上参与国际竞争，这对我们人才培养的规模和规格提出了崭新的要求。为了培养能够熟练运用外语吸收先进科技知识、参与国际交流的人才，基础教育的改革势在必行。双语教育对教师、学生、教育研究人员以及教育服务机构都是一种新的挑战。这种新的教学方法要取得成功，需要大胆而又科学的摸索与实践，也需要教师、学生、教育研究人员和教育服务机构各方的协同努力。

作为外语教育出版领域的专业出版社，外教社秉承一贯“全心致力中国外语教育事业的发展”的宗旨，为更好地推动双语教育，抓住时机，经过精心策划，从众多的双语教材中选择了原由麦克米伦出版社出版、在我国香港地区广泛使用的教材，供大陆地区进行双语教育试验的学校使用。本套《外教社—麦克米伦中学双语教材系列》主要有以下特点：

1. 英语语言纯正流畅，适合中学生水平，学生可以比较轻松地掌握学科知识，并在学习的过程中不知不觉地提高英语应用能力。
2. 教学内容丰富，编写体系完整，例证贴近生活，注重跨学科教育。
3. 版式活泼，插图精美，表格详细，各种知识的表现更加直观易懂，从而提高学生兴趣，增强教学效果。
4. 注意现代化教学手段的运用。页边空白处列出与授课内容相关的网址，为学生了解更多相关知识提供了有益的参考。

尽管本套教材可能在编写体系、知识结构、学科内容等方面与大陆地区传统学科教学稍有不同之处，我们相信其纯正地道的英语、丰富的课程资源以及全新的教学理念会对大陆地区的双语教育产生良好的推动作用。

本套教材可供有较好英语基础的双语学校、国际学校、外国语学校以及重点中学进行双语教学使用。

本教材承蒙上海外国语大学双语学校的李秀萍、胡敏老师仔细审读，在此表示衷心的感谢。同时也欢迎使用本套教材的师生向我们提出宝贵意见。

上海外语教育出版社

2003年5月

Preface

Biology – A Process Approach was first published in 1993 and since then we have been lucky enough to receive a number of comments and suggestions from those Biology teachers using the course. It is these invaluable comments and suggestions that have formed the backbone of changes and which hopefully have resulted in a Second Edition that is even more in tune with the expectations and requirements of both teachers and students.

As we worked on the Second Edition, we took a careful look at the contents and approach of every chapter and reviewed the 'usefulness' of every feature of the book. The Second Edition is just as direct and informative in style and, if anything, is more concise as any parts of the book that fell outside the syllabus have been removed or clearly delineated in the section called 'Understanding more'. Many of the illustrations have been redrawn and relabelled, and the photographs have been more extensively labelled to aid comprehension.

The exercises have been enriched to include both recall and higher level processing types. We have also introduced a section called 'Misconception analysis' where students can do a self-check to ensure that they do not hold any wrong concepts.

To show students that Biology really is relevant to everyday life, we have also included even more of the social, environmental and technological aspects of Biology. These are covered in the 'Understanding more' sections, in the 'Talking point' sections and also in the questions.

In short, we think we have managed to build on all the welcomed features of the First Edition to create a truly improved Second Edition. We would like to thank all those teachers who were kind enough to contribute and look forward to receiving any further comments.

Sarah Rigby
Eric Lee Fu Chung

Summary of the important features of this course

Simple text

- The writing style is direct and informative.
- Text is kept to an absolute minimum and is often presented in clear, numbered points. Paragraphs are short.
- Important words appear in bold.
- Chinese translations are provided where necessary.
- Photographs appear next to relevant diagrams to aid understanding and encourage interest.

Process diagrams

- Process diagrams explain in a step-by-step way the important processes encountered in Biology.
- They aid learning by avoiding convoluted and wordy explanations.
- They show students what is happening and where.

Experiments

- All experiments recommended by the CDC and HKCEE Syllabuses are included.
- Experiments are accompanied by detailed step-by-step illustrations.
- The experiments include questions and, in addition, students are encouraged to design control experiments.

Prevention of misconceptions

- Each chapter contains a set of multiple-choice questions that test for common misconceptions and mistakes. This 'Misconception analysis' allows students to identify their misconceptions early in the learning process and provides a sound foundation for future learning.
- Most chapters also contain an exercise that asks students to identify sentences that contain misconceptions and rewrite them accurately.

Everyday Biology

- Students' interest in Biology is aroused by a feature called 'Talking point'. These focus on everyday issues and encourage students to think about the everyday relevance of Biology. This feature also prompts students to apply what they have learnt to new situations.
- Every chapter begins with a small cartoon of everyday life that encourages students to think about what they might already know about a subject or what they can expect to learn.

Skill Building

- At various points throughout the text, 'Skill Pages' identify skills that may need further reinforcement, for example, drawing diagrams, drawing graphs, analysing a genetics problem, and exam skills.
- 'Important words to learn and spell' are listed at the back of each chapter. Poor spelling is a common weakness and this feature ensures that students address the problem as they learn.
- Word building helps students to learn difficult words by explaining how words are constructed. This feature is introduced in the margin next to the word and will help spelling and also give clues to the meaning of new, unknown terms.

Extension

- 'Understanding more' introduces extension material. The extension material is designed to help students *understand* more about a topic and does not burden them with excessive new structures and terms.

Glossary

- The glossary contains all the words in the 'Important words to learn and spell' together with a definition and a Chinese translation. It also contains a range of biological terms that students will encounter both in this textbook and in their wider reading.

Contents

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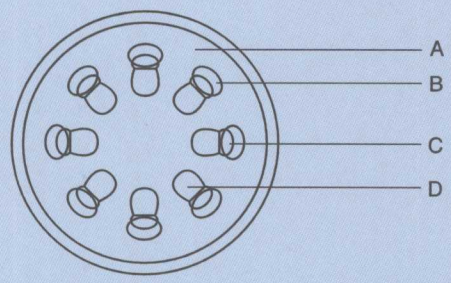
1 Support and movement

As you work through this chapter, you should be able to answer these questions.

(* These questions are from HKCEE, SEG, MEG and ULEAC.)

1* The diagram below shows a cross section of a young stem.

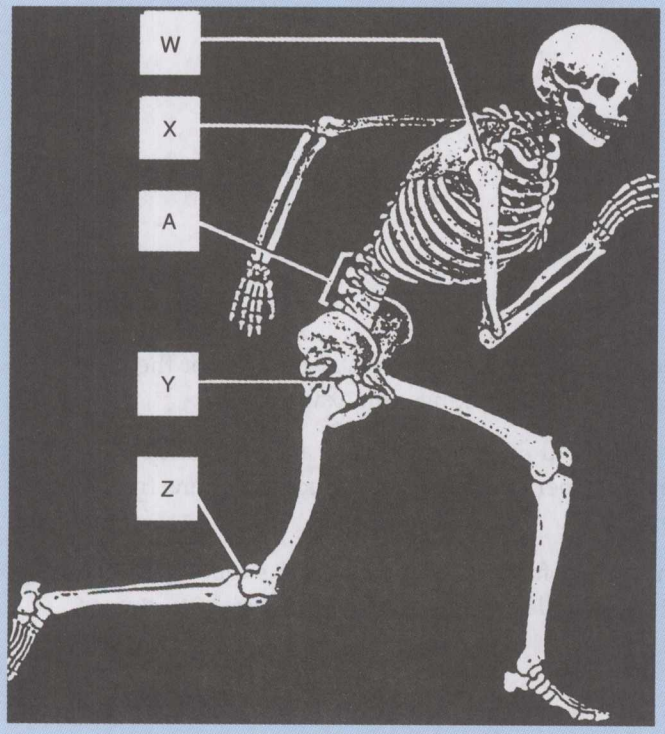


(a) Using the letters in the diagram, state TWO different parts which provide support to the stem.
Based on its structure, explain how each part can carry out this support function. (6 marks)

(b) When this plant is placed in direct sunlight for a few hours, explain why the stem might be unable to remain upright. (2 marks)

2* The photograph below shows the side view of a human skeleton.

(a) Give three functions of structure A. (3 marks)



(b) Name the type of movable joint to which
(i) both W and Y belong (1 mark)
(ii) both X and Z belong (1 mark)

(c) State the difference in the range of movements allowed by joint W and joint Z. (2 marks)

3* Figure 1 below shows a human leg. Figure 2 shows a model used to demonstrate leg movement.
The component parts of the model and their corresponding structures in the human leg are summarized in the table opposite.

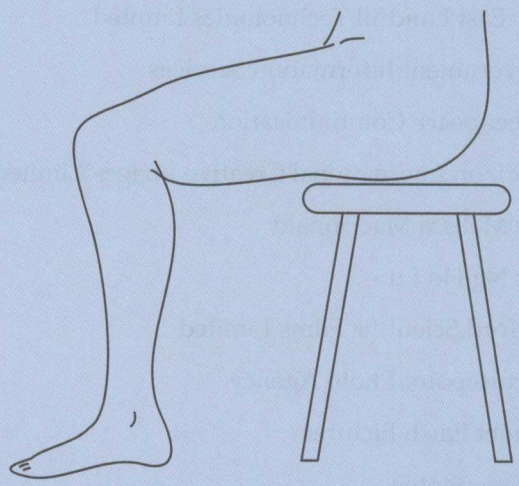


figure 1

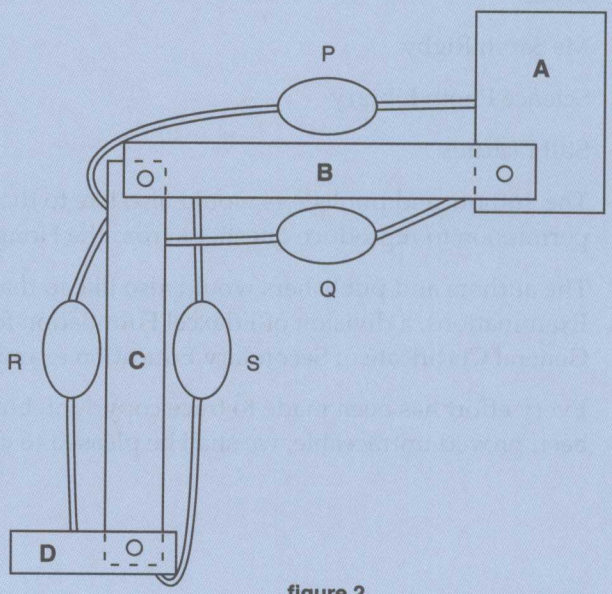
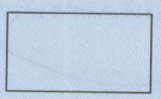


figure 2

Component part in the model	Material used in the model	Corresponding structure in the human leg
	balloon	muscle
	wooden board	X
	screw	joint
	inelastic string	Y

(a) Name the type of structure represented by X and Y respectively. (2 marks)

(b) If the model were set to a position to show the human leg standing erect on tiptoe, which balloon (P, Q, R or S) would appear to be thinner and longer? (2 marks)

(c) Put P, Q, R and S into two categories according to the function of the muscles they represent. Explain your answer. (4 marks)

(d) Explain why the relative movement between the wooden boards A and B cannot fully illustrate the degree of movement between the corresponding structures in the human leg. (2 marks)

1 Support and movement

1.1 The importance of support

Support maintains the body in particular positions and shapes. There are many different support mechanisms in the animal and plant kingdoms. In this course, we will look at support in plants and then support in mammals.

Fig 1.1 *Tall trees receive more light than their neighbours*

The importance of support in plants

Plants that grow on land need to maintain an upright position for three main reasons:

1 Tall plants have an advantage as they receive more light than their neighbours (see Fig 1.1).

2 Tall plants can disperse their **seeds** (种子) over a wider area.

3 Plants need to place their leaves in the best position to absorb light (i.e. in a leaf mosaic).

The importance of support in mammals

Mammals need support for a variety of reasons including:

1 A body that is held above the ground is less affected by friction (摩擦力). This makes movement easier.

2 Particular body shapes have advantages. For example, the giraffe's long neck allows it to find food in high places.

Fig 1.2 *The Alocasia leaf stalk is mainly supported by cell turgidity*

1.2 Support in plants

Plants have two main mechanisms of support. Support in young plants (and non-woody parts of a plant) is mainly provided by **turgidity** （硬胀） of cells. In woody stems, support is mainly provided by **xylem** （木质部）.

Cell turgidity

In Chapter 10 of Book 1, we learnt that under normal water conditions, plant cells are turgid. These turgid cells are packed together closely and press against each other to form rigid （坚硬的） building blocks. The turgidity of the cells provide support to the plant structures. If the plant cells lose turgidity, the plant **wilts** （凋萎）.

An Elephant Ear (*Alocasia*) （海芋） leaf stalk shows how powerful this mechanism is (see Fig 1.2). This large leaf is mainly supported by the turgidity of the cortex （皮层） cells in the leaf stalk. Similar cells also occupy a large volume of the stem. Figure 1.3 shows them labelled as the cortex and the **pith** （髓）.

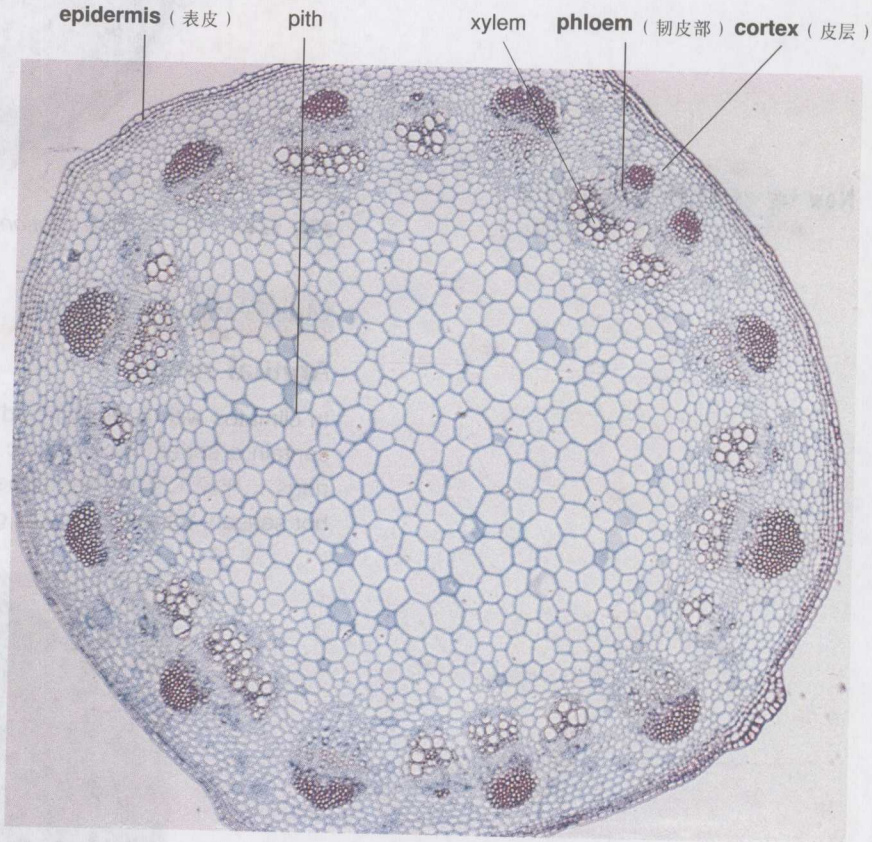


Fig 1.3 *Transverse section of a young dicotyledonous stem*

Xylem

Plant stems are also supported by xylem tissue. Xylem is a specialized tissue that transports water and provides strength. Its detailed structure was covered in Chapter 10, Book 1b.

With maturity, the cell walls of the xylem cells become rich in **lignin** （木质素）. These lignified cells form **wood**（木材）and are pushed towards the centre of the stem. Eventually, the central part of a woody stem is mainly composed of wood, which is hard and supports the plant. The large amount of xylem provides a rigid base to support the extensive aerial （气生的）parts of a woody stem. It also enables the stem to resist the bending force of the wind.

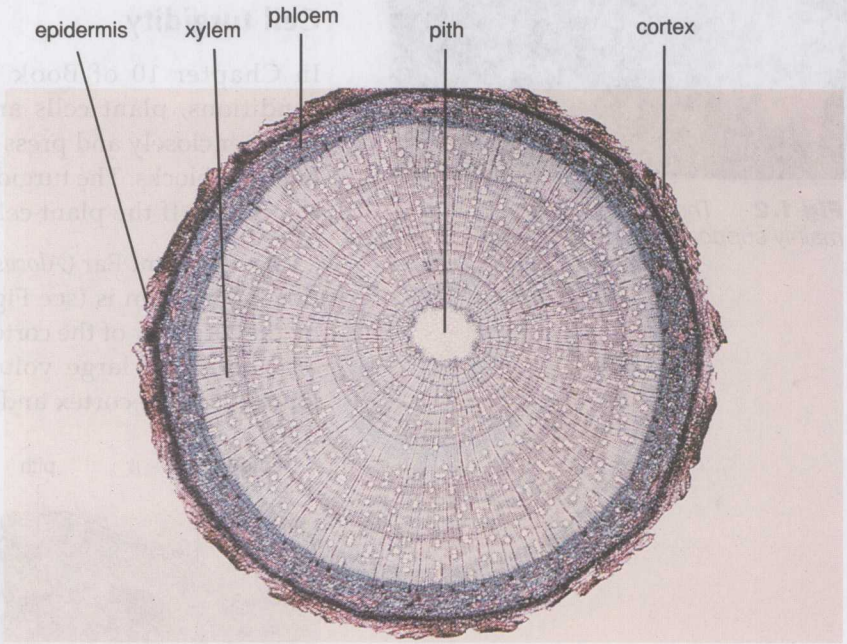


Fig 1.4 *Transverse section of a woody stem*

Now try question 1 on page 2

Understanding more

Annual rings

In climates with a distinct cold and hot season, the wood of trees appears to contain a series of concentric （同心的）rings. These are known as annual rings （年轮）. They are formed as a result of rapid growth of the xylem in the hot season, followed by slow growth in the cold season.

EXPERIMENT

Examining the structures of a young dicotyledonous stem and a woody stem

Principle

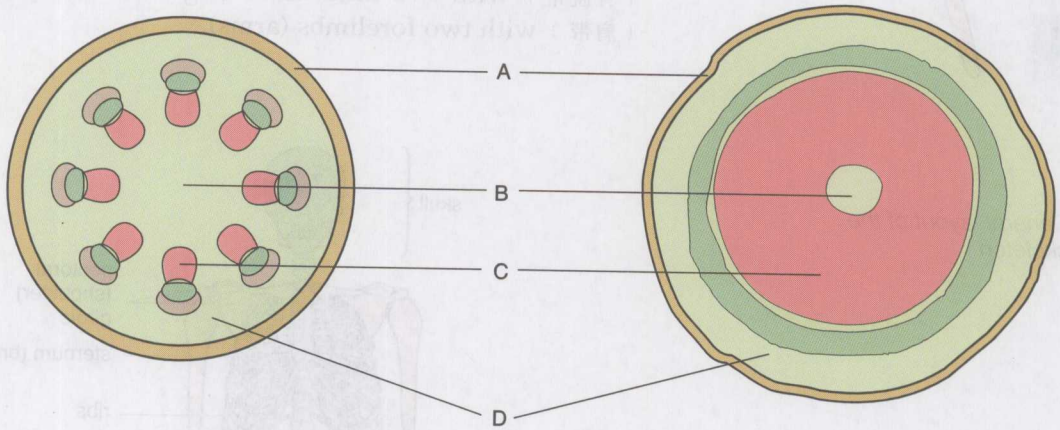
Plants do not possess any specialized supporting tissue like the **skeleton** (骨骼) in mammals. In a young dicotyledonous stem, support is mainly provided by turgidity of the cells. In a woody stem, the supporting tissue is mainly xylem.

Procedure

1 You will be given prepared slides of a young dicotyledonous stem and a woody stem (or see Figs 1.3 and 1.4).
2 Study the slides under a microscope.

Questions

1 Study the diagrams below. Which parts are the main supporting tissue in a young stem?
2 What are the names of these tissues?



3 Which part is the main supporting tissue in a woody stem?
4 What is the name of this tissue?

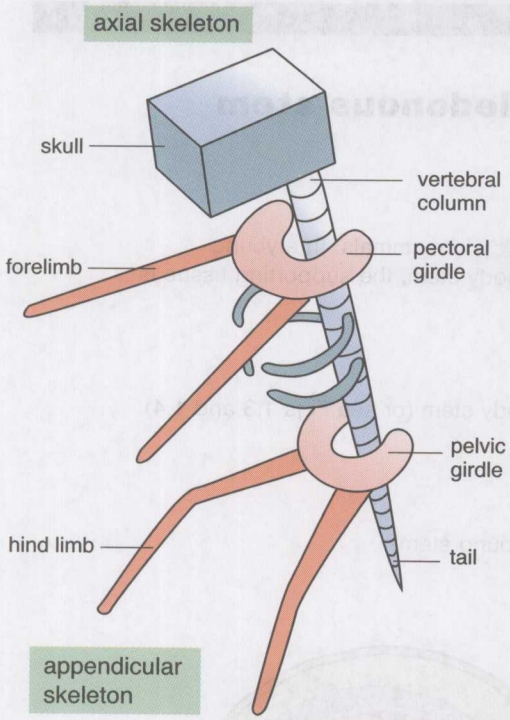
Main points

In young dicotyledonous stems, the main support is provided by the turgidity of the cells in the cortex and pith. The **xylem vessels** (木质导管), with their highly lignified cell walls, are the main supporting tissue of woody stems.

END

1.3 Support in mammals

Support in mammals is provided by both the **muscles** (肌肉) and the skeleton. Two systems are therefore involved: the skeletal system and the muscular system. **Tendons** (腱) and **ligaments** (韧带) are also very important. Tendons attach muscles to **bones** (骨). Ligaments attach bones to bones. We will find out more about tendons and ligaments later in the chapter.



The skeletal system

All mammals have a skeleton made of bone and some **cartilage** (软骨). Bone is hollow. Its outer layer is made up of living tissue surrounded by inorganic calcium and phosphate compounds. This arrangement allows bones to remain light yet strong. Cartilage is not as hard and rigid as bone. It is more elastic and flexible. Cartilage, for example, is found on the surface of the bones at a **joint** (关节), in the trachea, and where the **ribs** (肋骨) attach to the **sternum** (胸骨).

The skeleton of mammals can be divided into two main parts (see Figs 1.5 and 1.6).

1 **The axial skeleton** (中轴骨骼): This forms the central axis of the body. It comprises the **skull** (颅骨), **vertebral column** (脊柱), ribs and sternum.

2 **The appendicular skeleton** (附肢骨骼): These are the parts that are attached to the axial skeleton. It comprises the **pelvic girdle** (骨盆带) with two hind limbs (legs) and the **pectoral girdle** (肩带) with two forelimbs (arms).

Fig 1.5 *General layout of the mammalian skeleton*

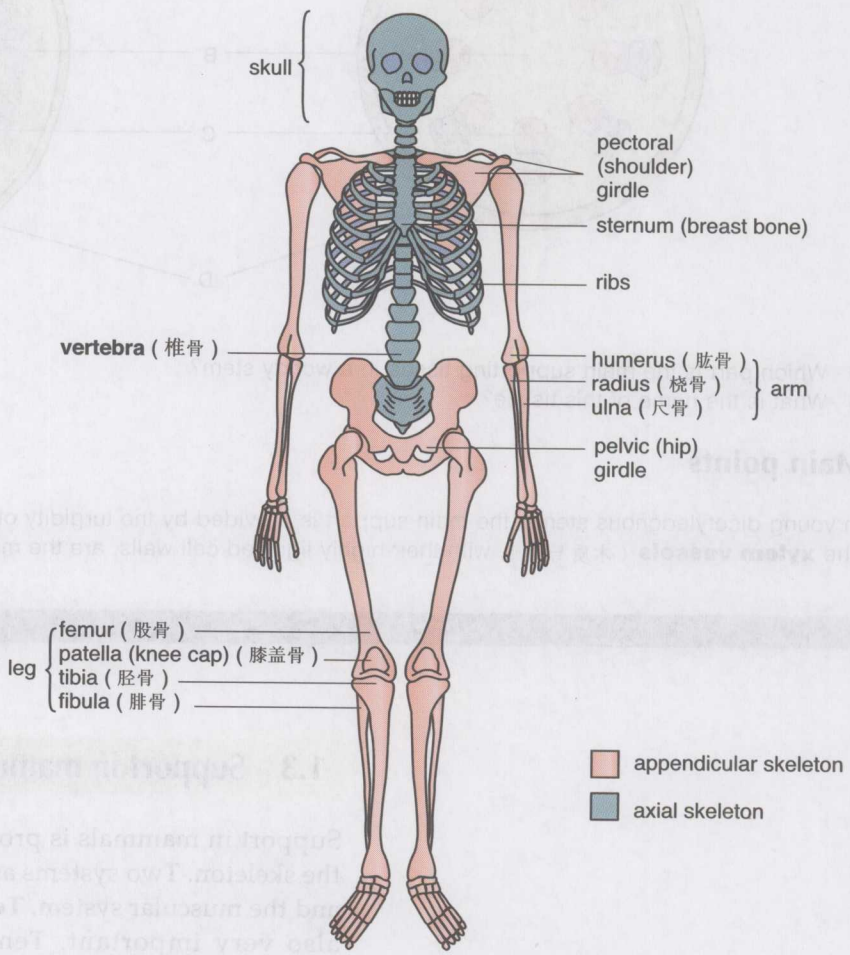


Fig 1.6 *Main parts of the human skeleton*