ENGLISH IN FOCUS

English in Biological Science

Ian Pearson

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IAN PEARSON

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Introduction

The aim of this book is to show how English is used to write about Biology. It is intended for students who have completed at least a basic four-year English language course and who now need to study biological subjects in the medium of English. Such students can be expected to show many weak spots in their English, especially when they have to write, and it cannot be assumed that they know a great deal of Biology.

The Biology topics that the book deals with are all ones that are normally included in a secondary school course, although some of the organisms that are described will be new to the students. The aim has been to cover a range of subject-matter that deals with some of the fundamental ideas of Biology. As far as possible, these ideas are presented in such a way that this book is scientifically self-sufficient.

The language work directs the student's attention to features of English which he needs to have control over if he is to study Biology efficiently and profitably. It is not suggested that these features constitute a special grammar of English that is unique to Biology; the book deals with quite normal English, but in the context of its use as the medium of communication among biologists.

All the work in this book is based solidly upon the need to express the facts and ideas of Biology. After working through the units the student should be able to read Biology texts more confidently and write about Biology more fluently. In each unit there is material which focuses attention on to important elements of grammar, but this is always as preparation for the reading and writing of texts.

This book is intended to teach English and not Biology. However, mastery of the language and mastery of the science are closely interdependent: it is just as important to get the science right as it is to get the language right, since the one depends upon the other. The teacher does not need to be a biologist but he does need to take the science seriously.

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1 Biology – the Study of Living Organisms

I READING AND COMPREHENSION

Biology is usually divided into Plant Biology or Botany, and Animal Biology or Zoology. However, all organisms, both plants and animals, are similar in several important ways. For example, each kind of organism has its own particular shape, or **morphology**. Plant Morphology and Animal Morphology are therefore the branches of Botany and of Zoology in which we study the external shape of plants and of animals.

An organism also has a particular internal structure which is more or less different from the internal structure of all other kinds of organisms. This is studied in either Plant or Animal **Anatomy**. We also want to know about all the different chemical activities that take place in an organism, and the study of the chemistry of organisms is called **Physiology**.

Before organisms die they usually produce offspring. The name of the process of producing offspring is **reproduction**, and we call the study of the process Reproduction as well. The offspring produced can be seen to resemble their parents in some ways and to differ from them in other ways. **Genetics** is the study of the reasons for such similarities and differences. The process that takes place when an egg develops into an adult is studied in a separate branch of study called **Embryology**.

Most biologists believe that after long periods of time the descendants of a group of reproducing organisms can become very different from their ancestors. The study of how and why groups of organisms change, or evolve, is called **Evolution**. On the basis of an organism's evolutionary history, and in terms of its morphology and anatomy, we try to classify it. The name of this study is **Taxonomy**.

Organisms respond to changes such as the coming of darkness in the evening, and they react to dangers and events. The study of what organisms do in particular situations is known as **Behaviour**. We also want to know about the relationships between different organisms and between an organism and the non-living, physical world that it lives in. For example, we want to know which animals eat particular plants and why a plant can grow in one place but not in another. The study of questions such as these is called **Ecology**.

EXERCISE A *Listing the important points*

As a student you need to be able to make notes of what you read. One way to do this is to make lists of the important points. List I below is a list of the ten branches of Biology described in the passage. List II tells us what the different branches cover, but the two lists do not match. Write both lists in your notebook, changing the order in list II so that the two lists match.

I	II
Morphology	internal chemical activities
Anatomy	similarities and differences between parents and offspring
Physiology	responses to external changes
Reproduction	external shape
Genetics	internal structure
Embryology	classification
Evolution	the production of offspring
Taxonomy	relationships between one organism and another, and between an organism and the physical world
Behaviour	development of the egg
Ecology	the differences between ancestors and their descendants

EXERCISE B *Finding out about the meaning of words*

Some words in the passage may be new or unfamiliar. Here are definitions for seven words from the passage. See if you can find these words by looking at the passage. For example:

special *or* individual (1:3)

This means you have to find a word in paragraph 1 in the third sentence which means the same thing as *special* or *individual*. The word you need is *particular*.

Write the words you can find in a list in your notebook, as follows:

particular: special or individual

Now here are the definitions:

1. arrangement of parts *or* construction (2:1)
2. new organisms *or* young (3:1)
3. grows (3:5)
4. fully grown *or* mature (3:5)
5. offspring from the same ancestor (4:1)
6. arrange in groups *or* group together (4:3)
7. connections *or* links (5:3)

Find a phrase in paragraph 4 which has the same meaning as *according to* or *in terms of*. Which two verbs in paragraph 5 have the same meaning?

EXERCISE C *Checking facts and ideas*

Look again at the passage and decide whether the following statements are true or false. Write the numbers 1 to 5 in your notebook and T (true) or F (false) in each case.

1. Animal Morphology includes the study of an animal's bones.
2. The chemical activity of the brain is studied by a physiologist.
3. The similarities and differences between parents and their offspring can be explained.
4. Not all biologists believe that organisms evolve.
5. The fact that lions eat zebras is a question of Behaviour, but the way lions hunt and kill zebras is a question of Ecology.

The next three questions ask you to think about facts and ideas as well. In each case decide which of the suggested answers you think is correct and write (a), (b) or (c) in your notebook.

6. What do you think is the most important idea in the passage?

   (a) Plants differ from animals in many ways.
   (b) Biology is usually divided into Botany and Zoology.
   (c) Organisms are studied in several different ways.

7. Why is reproduction so important?

   (a) Organisms do not live for ever.
   (b) Only adult organisms reproduce.
   (c) Some individuals do not reproduce.

8. In the sea, large fish eat small fish and small fish eat plants and various very small animals. Who studies these feeding relationships?

   (a) an ecologist
   (b) a physiologist
   (c) a taxonomist

EXERCISE D *Connecting facts and ideas*

The summary below is based on paragraph 3 of the reading passage. Complete the summary and write it in your notebook. If necessary, look back to the passage for help. The three dots (...) here (and in the rest of the book) tell you that one or more words are missing. In this particular exercise only one word is needed to fill each blank.

Animal Reproduction is the study of how animals produce ... Animal ..., on the other hand, is the study of the reasons for the ... and ... between ... and their offspring. The process of development from ... to ... is studied in a third ... of Zoology called Animal Embryology.

II USE OF LANGUAGE

In this section we will describe the morphology and anatomy of the seven organisms illustrated in Figure 1.1 on page 5. These animals are all extremely small and belong to the taxonomic group called the Protozoa, which consists of all the one-celled (or unicellular) animals. Four of the seven are members of the Class Flagellata (i.e. they possess flagella) and the other three belong to the Class Ciliophora (i.e. they possess cilia). We will use the English names: protozoans, flagellates and ciliates.

Notes on the labelling of the seven protozoans in Figure 1.1.

c cilia (these are short movable threads used in locomotion and feeding)
cv contractile vacuole (a small cavity which takes in water from the body and expels it to the exterior by contracting)
f flagellum (a long movable thread that is different from a cilium in size only)
f_1 the 'first' or longer flagellum
f_2 the 'second' or shorter flagellum
fv food vacuole (a small vacuole or cavity in which food materials are digested)
n nucleus (a small body that controls all the activities of the cell)
Mn meganucleus (the larger of two sizes of nucleus in a single cell)
mn micronucleus (the smaller of two sizes of nucleus in a single cell)
p plastid (a small body in a cell which usually contains a coloured pigment; the green plastids found in most plants are called *chloroplasts*)
pm paramylon (a chemical substance that is stored by certain protozoans as a food reserve)
r reservoir (a small pocket that opens on to the outside)

Remember that three of these terms have unusual plural forms: *cilium/cilia*; *flagellum/flagella*; *nucleus/nuclei*.

Note that every kind of organism has its own Latin name. This is used by biologists all over the world. You probably know, for example, that man is called *Homo sapiens*. This name, like all the Latin names of organisms, has two parts: *Homo* and *sapiens*. The first part (*Homo*) tells us what genus man belongs to, and the second part (*sapiens*) tells us what species man is. The first, or generic name, is always written with an initial capital letter. The second, or specific name, always begins with a small letter. In a printed book, the Latin name of an organism is always printed in *italics*, and when we write by hand we must always underline it. In this book only the generic name is given in some cases.

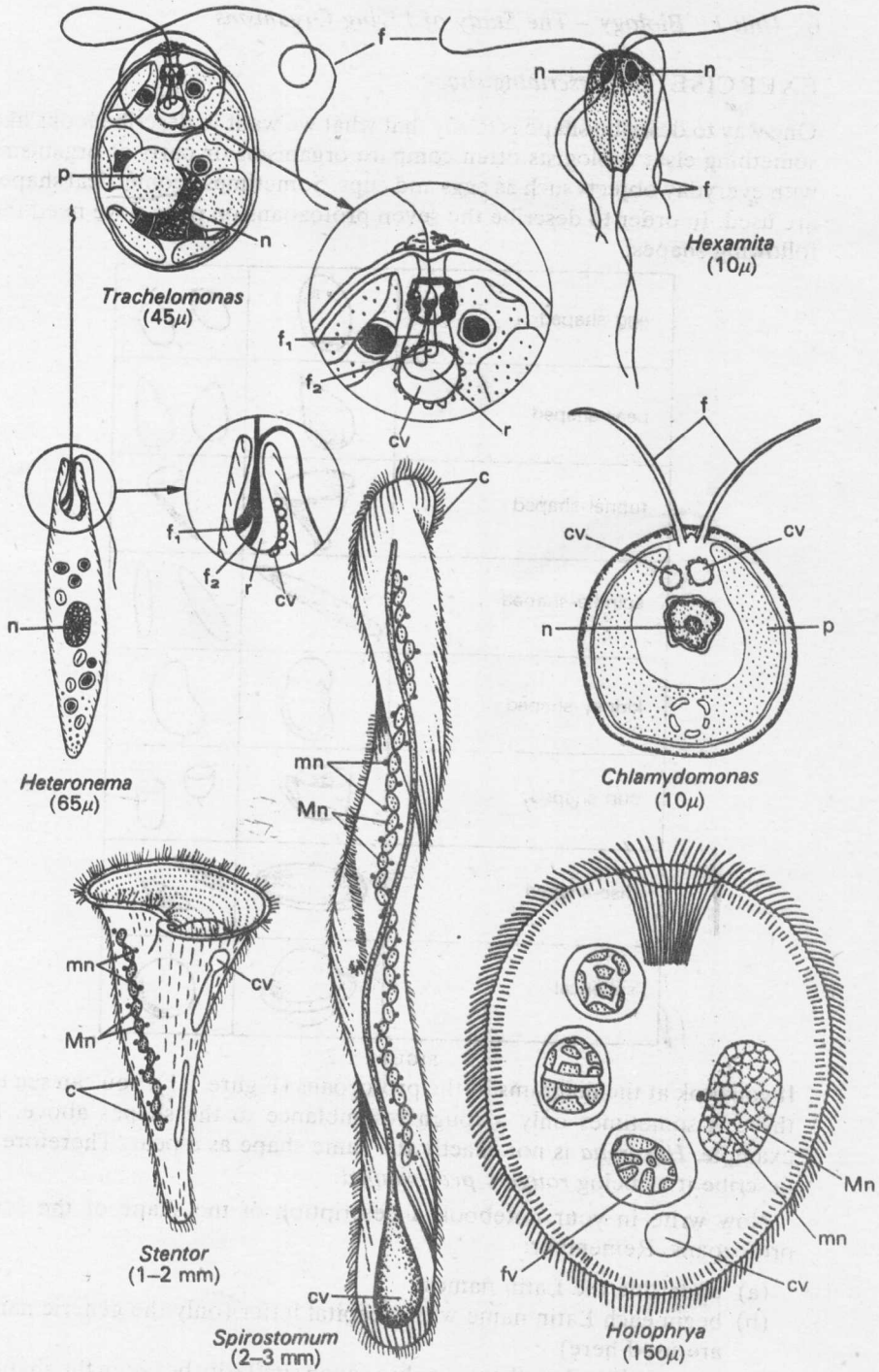

FIGURE 1.1 *Seven protozoans*

EXERCISE E *Describing shape*

One way to describe shape is to say that what we want to describe looks like something else. Biologists often compare organisms or parts of organisms with everyday objects such as eggs and cups. Sometimes geometrical shapes are used. In order to describe the seven protozoans on page 5 we need the following shapes:

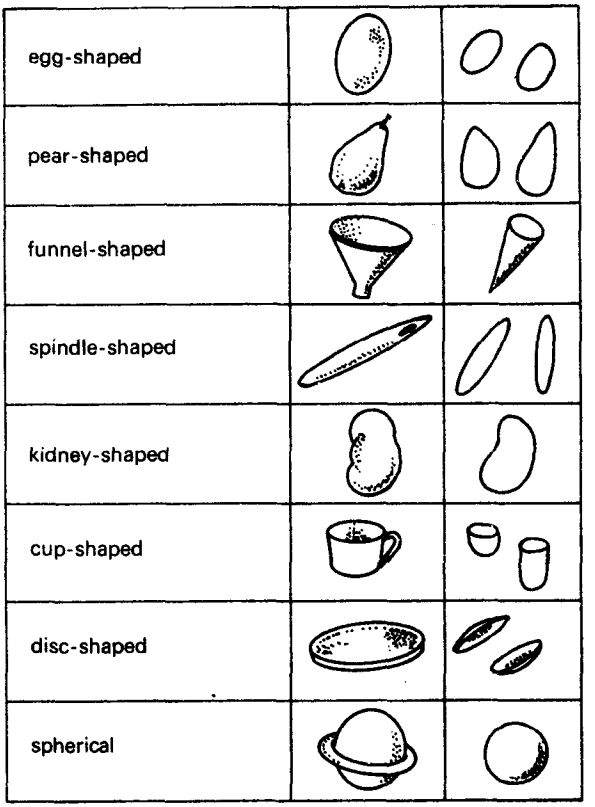

FIGURE 1.2

If you look at the diagrams of the protozoans (Figure 1.1), you can see that there is sometimes only a rough resemblance to the shapes above. For example, *Hexamita* is not exactly the same shape as a pear. Therefore we describe it as being *roughly pear-shaped*.

Now write in your notebook a description of the shape of the seven protozoans. Remember:

(a) underline the Latin names
(b) begin each Latin name with a capital letter (only the generic names are used here)
(c) use *roughly* when there is only a rough similarity between the shape of the protozoan and the everyday object.

1. *Trachelomonas* is ...
2. *Hexamita* is ...
3. *Chlamydomonas* ...
4. *Heteronema*...
5. *Spirostomum* is ... and has a spiral twist.
6. *Holophrya* ...
7. *Stentor* ...

EXERCISE F *Describing size*

Protozoans are nearly all so small that we must measure them in *microns*. One micron is written as '1μ' and it is one-thousandth of a millimetre ($1\mu = 1/1000$ mm). The measurement in microns that follows the name of each protozoan on page 5 is the length of the animal. Of course, some individuals are larger and some are smaller than this average size.

All seven of these particular protozoans are roughly circular in transverse section. In other words, if we cut them across at any level we see that the section is always more or less round. We are therefore interested in their diameter as well as their length:

Trachelomonas is roughly 45μ in length and about 30μ in diameter.

Notice that we say *roughly* and *about* in order to make it clear that we are describing a typical individual.

Now complete these descriptions and write them out in your notebook:

1. *Heteronema* is roughly 65μ ... and about 10μ ...
2. *Hexamita* is roughly 10μ... and about 3μ... at the rounded anterior end.
3. *Chlamydomonas* is roughly spherical and is about 10μ ...
4. ... 150μ ... and about 115μ ...
5. ... 1 to 2 mm... and the opening of the funnel is roughly 0·5 to 1 mm...
6. ... 2 to 3 mm ... and roughly 200μ ...

EXERCISE G *Describing external features*

When we describe the morphology of an organism we must describe the parts that we can see on the outside as well as the shape and the size. The most obvious external features of the seven protozoans are the flagella and the cilia.

Now complete these descriptions:

1. *Trachelomonas* has one external ... It arises in the ... and it is about 130μ ...
2. *Heteronema* has... The first of these is about 50μ ... and the second one is about 30μ ...
3. *Chlamydomonas*... They arise anteriorly and are both roughly 10μ ...