

Jumping spiders

Peter Aldhons examines how Portia spiders catch their prey

A For a stalking predator, the element of surprise is crucial. And for jumping spiders that sneak onto other spiders' webs to prey on their owners, it can be the difference between having lunch and becoming it. Now zoologists have discovered the secret of these spiders' tactics: creeping forward when their prey's web is vibrating.

B The fifteen known species of Portia jumping spiders are relatively small, with adults being about two centimeters long (that's smaller than the cap on most pens). They habitually stay in the webs of other spiders, and in an area of these webs that is as out-of-the-way as possible. Portia spiders live mostly in tropical forests, where the climate is hot and humid. They hunt a range of other spiders, some of which could easily turn the tables on them. 'They will attack something about twice their own size if they are really hungry,' says Stimson Wilcox of Binghamton University in New York State. Wilcox and his colleague, Kristen Gentile of the University of Canterbury in Christchurch, New Zealand, wanted to find out how Portia spiders keep the upper hand.

C All jumping spiders have large eyes that look like binocular lenses, and they function pretty much the same way. Most jumping spiders locate their prey visually, and then jump and capture from one centimeter to over ten centimeters away. Only a few species of jumping spiders invade the webs of other spiders, and the Portia spider is among them. Jumping spiders, including Portia spiders, prey on insects and other arthropods by stalking. Sometimes the spiders lure their victims by vibrating the web to mimic the struggles of a trapped insect. But many web-weaving spiders appear to be wise to these tricks, so stalking is often a better strategy. Sometimes, the researchers found, Portia spiders take advantage of the vibrations created in the web by a gentle breeze. But if necessary, they will make their own vibrations.

D The researchers allowed various prey spiders to spin webs in the laboratory and then introduced Portia spiders. To simulate the shaking effect of a breeze the zoologists used either a model aircraft propeller or attached a tiny magnet to the centre of the web which could be vibrated by applying a varying electrical field. The researchers noticed that the stalking Portia spiders moved more when the webs were shaking than when they were still and they were more likely to capture their prey during tests in which the webs were periodically shaken than in those where the webs were undisturbed. If the spiders were placed onto unoccupied webs, they would make no attempt to change their movements.

E It is the Portia spider's tactic of making its victims' webs shake that has most intrigued the researchers. They noticed that the spiders would sometimes shake their quarry's web violently, then creep forwards up to five millimeters before the vibrations died down. 'They'd make a big pluck with one of their hind legs,' says Wilcox. These twangs were much more powerful than the gentler vibrations Portia spiders use to mimic a trapped insect, and the researchers were initially surprised that the prey spiders did not respond to them in any way. But they have since discovered that the violent twanging produces a pattern of vibrations that match those caused by a twig falling onto the web.

F Other predators make use of natural 'smokescreens' or disguises to hide from their prey: lions hunting at night, for example, move in on their prey when clouds obscure the moon. 'But this is the first example of an animal making its own smokescreen that we know of,' says Wilcox. 'Portia spiders are clearly intelligent and they often learn from their prey as they are trying to capture it. They do this by making different signals on the web of their prey until the prey spider makes a movement. In general, Portia spiders adjust their stalking strategy according to their prey and what the prey is doing. Thus, Portia spiders use trial-and-error learning in stalking. Sometimes they will even take an indirect route to reach a prey spider they can see from a distance. This can sometimes take one to two hours following a predetermined route. When it does this, the Portia spider is actually solving problems and thinking ahead about its actions.'

Questions 1-9

The Reading Passage has six paragraphs labelled **A-F**.

Which paragraph contains the following information?

Write the correct letter **A-F** in your answer sheet.

NB You may use any letter more than once.

1. the reaction of the Portia spider's prey to strong web vibrations
2. a description of how the researchers set up their experiment
3. a comparison between Portia spiders and another animal species
4. an explanation of how the researchers mimicked natural conditions
5. a comparison between Portia spiders and their prey
6. the reason why concealment is important to Portia spiders
7. a description of the Portia spider's habitat
8. the number of species of Portia spiders
9. an example of the Portia spider's cleverness

Questions 10-13

Choose the correct letter, A, B, C or D and write in your answer sheet.

- 10) In their laboratory experiments, the researchers found that the Portia spiders moved most when the web was
- A vibrating.
 - B motionless.
 - C undisturbed.
 - D unoccupied.
- 11) What discovery did the researchers make about Portia spiders?
- A They make very strong vibrations with one leg.
 - B They move 5 mm at a time on a still web.
 - C They move slowly when vibrations stop.
 - D They use energetic vibrations to mimic a trapped insect.
- 12) Portia spiders are the only known animal to
- A use the weather to disguise themselves.
 - B mimic other prey-eating animals.
 - C create their own smokescreen.
 - D stalk using 'trial and error'.
- 13) The Portia spider demonstrates 'thinking ahead' when it
- A chooses prey that is a short distance away.
 - B takes a longer route to reach its prey.
 - C reaches its prey in a short time.
 - D solves the problem of locating its prey.

The Nature and Aims of Archaeology

Archaeology is partly the discovery of treasures of the past, partly the work of the scientific analyst, partly the exercise of the creative imagination. It is toiling in the sun on an excavation in the Middle East, it is working with living Inuit in the snows of Alaska, and it is investigating the sewers of Roman Britain. But it is also the painstaking task of interpretation, so that we come to understand what these things mean for the human story. And it is the conservation of the world's cultural heritage against looting and careless harm.

Archaeology, then, is both a physical activity out in the field, and an intellectual pursuit in the study or laboratory. That is part of its great attraction. The rich mixture of danger and detective work has also made it the perfect vehicle for fiction writers and film-makers, from Agatha Christie with *Murder in Mesopotamia* to Stephen Spielberg with *Indiana Jones*. However far from reality such portrayals are, they capture the essential truth that archaeology is an exciting quest – the quest for knowledge about ourselves and our past.

But how does archaeology relate to other disciplines such as anthropology and history that are also concerned with the human story? Is archaeology itself a science? And what are the responsibilities of the archaeologist in today's world?

Anthropology, at its broadest, is the study of humanity- our physical characteristics as animals and our unique non-biological characteristics that we call culture. Culture in this sense includes what the anthropologist, Edward Tylor, summarised in 1871 as 'knowledge, beliefs, art, morals, custom and any other capabilities and habits acquired by man as a member of society'. Anthropologists also use the term 'culture' in a more restricted sense when they refer to the 'culture' of a particular society, meaning the non-biological characteristics unique to that society, which distinguish it from other societies. Anthropology is thus a broad discipline – so broad that it is generally broken down into three smaller disciplines: physical anthropology, cultural anthropology and archaeology.

Physical anthropology, or biological anthropology as it is called, concerns the study of human biological or physical characteristics and how they evolved. Cultural anthropology – or social anthropology – analyses human culture and society. Two of its branches are ethnography (the study at first hand of individual living cultures) and ethnology (which sets out to compare cultures using ethnographic evidence to derive general principles about human society).

Nevertheless, one of the most important tasks for the archaeologist today is to know how to interpret material culture in human terms. How were those pots used? Why are some dwellings round and others square. Here the methods of archaeology and ethnography overlap. Archaeologists in recent decades have developed 'ethnoarchaeology' where, like ethnographers, they live among contemporary communities, but with the specific purpose of learning how such societies use material culture – how they make their tools and weapons, why they build their settlements where they do, and so on. Moreover, archaeology has a role to play in the field of conservation. Heritage studies constitute a developing field, where it is realised that the world's cultural heritage is a diminishing resource which holds different meanings for different people.

If, then, archaeology deals with the past, in what way does it differ from history? In the broadest sense, just as archaeology is an aspect of anthropology, so too is it a part of history – where we mean the whole history of humankind from its beginnings over three million years ago. Indeed, for more than ninety-nine percent of that huge span of time, archaeology – the

study of past material culture – is the only significant source of information. Conventional historical sources begin only with the introduction of written records around 3,000 BC in western Asia, and much later in most other parts in the world.

A commonly drawn distinction is between pre-history, i.e. the period before written records - and history in the narrow sense, meaning the study of the past using written evidence. To archaeology, which studies all cultures and periods, whether with or without writing, the distinction between history and pre-history is a convenient dividing line that recognises the importance of the written word, but in no way lessens the importance of the useful information contained in oral histories.

Since the aim of archaeology is the understanding of humankind, it is a humanistic study, and since it deals with the human past, it is a historical discipline. But it differs from the study of written history in a fundamental way. The material the archaeologist finds does not tell us directly what to think. Historical records make statements, offer opinions and pass judgements. The objects the archaeologists discover, on the other hand, tell us nothing directly in themselves. In this respect, the practice of the archaeologist is rather like that of the scientist, who collects data, conducts experiments, formulates a hypothesis tests the hypothesis against more data, and then, in conclusion, devises a model that seems best to summarise the pattern observed in the data. The archaeologist has to develop a picture of the past, just as the scientist has to develop a coherent view of the natural world.

Questions 14-19

Do the following statements agree with the claims of the writer in Reading Passage In boxes 14-19 on your answer sheet write:

YES if the statement agrees with the claims of the writer

NO if the statement contradicts the claims of the writer

NOT GIVEN if it is impossible to say what the writer thinks about this

- 14) Archaeology involves creativity as well as investigative work.
- 15) Archaeologist must be able to translate texts from ancient languages.
- 16) Movies give a realistic picture of the work of archaeologists.
- 17) Anthropologist define culture in more than one way.
- 18) Archaeology is a more demanding field of study than anthropology.
- 19) The history of Europe has been documented since 3,000 BC.

Questions 20 and 21

Choose **TWO** letters **A – E** Write your answer in boxes 20 and 21 on your answer sheet. The list below gives some statements about anthropology. Which **TWO** statements are mentioned by the writer of the text?

- A It is important for government planners.
- B It is a continually growing field of study.
- C It often involves long periods of fieldwork.
- D It is subdivided for study purposes.
- E It studies human evolutionary patterns.

Questions 22 and 23

Choose **TWO** letters **A – E** Write your answer in boxes 22 and 23 on your answer sheet. The list below gives some of the tasks of an archaeologist. Which **TWO** of these tasks are mentioned by the writer of the text?

- A examining ancient waste sites to investigate diet
- B studying cave art to determine its significance
- C deducing reasons for the shape of domestic buildings
- D investigating the way different cultures make and use objects
- E examining evidence for past climate changes

Questions 24-27

Complete the summary of the last two paragraphs of Reading Passage Choose **NO MORE THAN TWO WORDS** from the passage for each answer. Write your answer in boxes **24-27** on your answer sheet.

Much of the work of archaeologists can be done using written records, but they find **24** equally valuable. The writer describes archaeology as both a **25** and a **26** However, as archaeologists do not try to influence human behaviour, the writer compares their style of working to that of a **27**

Questions 28-31

Reading Passage 165 has **five** sections **A-E** Choose the correct heading for section A and **C-E** from the list of headings below. Write the correct number i-viii in boxes **28-31** on your answer sheet.

List of Headings

- i The connection between health-care and other human rights
- ii The development of market-based health systems.
- iii The role of the state in health-care
- iv A problem shared by every economically developed country
- v The impact of recent change
- vi The views of the medical establishment
- vii The end of an illusion
- viii Sustainable economic development

28	Section A	
	Example	Answer
	Section B	viii
29	Section C	
30	Section D	
31	Section E	

The Problem of Scarce Resources

Section A

The problem of how health-care resources should be allocated or apportioned, so that they are distributed in both the most just and most efficient way, is not a new one. Every health system in an economically developed society is faced with the need to decide (either formally or informally) what proportion of the community's total resources should be spent on health-care; how resources are to be apportioned; what diseases and disabilities and which forms of treatment are to be given priority; which members of the community are to be given special consideration in respect of their health needs; and which forms of treatment are the most cost-effective.

Section B

What is new is that, from the 1950s onwards, there have been certain general changes in outlook about the finitude of resources as a whole and of health-care resources in particular, as well as more specific changes regarding the clientele of health-care resources and the cost to the community of those resources. Thus, in the 1950s and 1960s, there emerged an awareness in Western societies that resources for the provision of fossil fuel energy were finite and exhaustible and that the capacity of nature or the environment to sustain economic development and population was also finite. In other words, we became aware of the obvious fact that there were 'limits to growth'. The new consciousness that there were also severe limits to health-care resources was part of this general revelation of the obvious. Looking back, it now seems quite incredible that in the national health systems that emerged in many countries in the years immediately after the 1939-45 World War, it was assumed without question that all the basic health needs of any community could be satisfied, at least in principle; the 'invisible hand' of economic progress would provide.

Section C

However, at exactly the same time as this new realization of the finite character of health-care resources was sinking in, an awareness of a contrary kind was developing in Western societies: that people have a basic right to health-care as a necessary condition of a proper human life. Like education, political and legal processes and institutions, public order, communication, transport and money supply, health-care came to be seen as one of the fundamental social facilities necessary for people to exercise their other rights as autonomous human beings. People are not in a position to exercise personal liberty and to be self-determining if they are poverty-stricken, or deprived of basic education, or do not live within a context of law and order. In the same way, basic health-care is a condition of the exercise of autonomy.

Section D

Although the language of 'rights' sometimes leads to confusion, by the late 1970s it was recognized in most societies that people have a right to health-care (though there has been considerable resistance in the United States to the idea that there is a formal right to health-care). It is also accepted that this right generates an obligation or duty for the state to ensure that adequate health-care resources are provided out of the public purse. The state has no obligation to provide a health-care system itself, but to ensure that such a system is provided. Put another way, basic health-care is now recognized as a 'public good', rather than a 'private good' that one is expected to buy for oneself. As the 1976 declaration of the World Health Organisation put it: 'The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition'. As has just been remarked, in a liberal society basic health is seen as one of the indispensable conditions for the exercise of personal autonomy.

Section E

Just at the time when it became obvious that health-care resources could not possibly meet the demands being made upon them, people were demanding that their fundamental right to health-care be satisfied by the state. The second set of more specific changes that have led to the present concern about the distribution of health-care resources stems from the dramatic rise in health costs in most OECD countries, accompanied by large-scale demographic and social changes which have meant, to take one example, that elderly people are now major (and relatively very expensive) consumers of health-care resources. Thus in OECD countries as a whole, health costs increased from 3.8% of GDP in 1960 to 7% of GDP in 1980, and it has been predicted that the proportion of health costs to GDP will continue to increase. (In the US the current figure is about 12% of GDP, and in Australia about 7.8% of GDP.)

As a consequence, during the 1980s a kind of doomsday scenario (analogous to similar doomsday extrapolations about energy needs and fossil fuels or about population increases) was projected by health administrators, economists and politicians. In this scenario, ever-rising health costs were matched against static or declining resources.

Note

OECD: Organisation for Economic Cooperation and Development

GDP: Gross Domestic Product

Questions 32-35

Classify the following as first occurring

- A between 1945 and 1950
- B between 1950 and 1980
- C after 1980

Write the correct letter **A**, **B** or **C** in boxes **32-35** on your answer sheet.

- 32** the realisation that the resources of the national health system were limited
- 33** a sharp rise in the cost of health-care.
- 34** a belief that all the health-care resources the community needed would be produced by economic growth
- 35** an acceptance of the role of the state in guaranteeing the provision of health-care.

Questions 36-40

Do the following statements agree with the view of the writer in Reading Passage 165? In boxes 36-40 on your answer sheet write:

- YES** if the statement agrees with the views of the writer
- NO** if the statement contradicts the views of the writer
- NOT GIVEN** if it is impossible to say what the writer thinks about this

- 36** Personal liberty and independence have never been regarded as directly linked to health-care.
- 37** Health-care came to be seen as a right at about the same time that the limits of health-care resources became evident.
- 38** IN OECD countries population changes have had an impact on health-care costs in recent years.
- 39** OECD governments have consistently underestimated the level of health-care provision needed.
- 40** In most economically developed countries the elderly will to make special provision for their health-care in the future.