

Five kingdoms of life

‘Animal, vegetable or mineral?’ The question implies that living things are either plants or animals, and historically biologists have taken the same view. Biologists did encounter some creatures, such as mushrooms, that violated the distinction, but they forced them into the plant or animal group. Mushrooms are fungi, for instance, and biologists until recently classed fungi as plants – more accurately ‘as plants that do not photosynthesize’.

Then there were the microbes. Biologists found increasing numbers of microscopic life forms in the wake of their discovery in the seventeenth century, and these were duly forced into the plant/animal distinction. Some microbes which could photosynthesize were defined as algae and grouped with plants. Others which seemed more like animals were defined as protozoa and grouped with animals. In the nineteenth century biologists discovered bacteria – even smaller microbes – but these no one managed to define as either animals or plants.

By the twentieth century biologists knew that all life could not be divided into animals and plants, but the old idea was not finally laid to rest until 1969 when an American ecologist, Robert Whittaker, proposed his five-kingdom classification. He divided life into animals, plants, fungi, protists and bacteria. Animals, plants, fungi and protists are ‘eukaryotes’; they are built of cells (or one cell in the case of protists) with a distinct nucleus. Bacteria are ‘prokaryotes’; their single cell has no distinct nucleus. Whittaker’s classification struck a chord. Fungi have nothing to do with plants; indeed, they are more closely related to animals.

Subsequent research has modified Whittaker’s scheme. Some biologists prefer to divide the protists into more than one kingdom, but the most important development came when Carl Woese discovered that there are two groups of prokaryotes (archaeans and bacteria), not one. That has led to a ‘three-domain’ classification of life: archaeans, bacteria and eukaryotes (the last of which contain the other four kingdoms of Whittaker’s scheme).

1. Why can the historical classification of fungi as plants be considered as forced?

In Line 5 it says that biologists classed fungi as “plants that do not photosynthesize”; now, a major general characteristic of plants is precisely their ability to photosynthesize (this information is not provided in the text, but it is assumed that it is common knowledge) - therefore

a) Because fungi are minerals.

NO – minerals are not living things.

b) Because fungi belong to the animal kingdom.

NO – even if it says in Lines 17 and 18 that fungi are more closely related to animals than to plants, the fact that biologists found it necessary to create a separate kingdom for fungi indicates that these organisms do not possess the requisites to be classified in the animal kingdom.

c) Because fungi do not photosynthesize.

YES – despite the fact that, unlike all other plants, fungi do not photosynthesize, biologists historically “forced” them into the plant group because, as it says in Line 1, they wished to classify all living things as either animal or vegetable.

d) Because fungi are prokaryotes.

NO – in Line 15 it says fungi are eukaryotes, not prokaryotes

e) Because fungi photosynthesize.

NO – in Line 5 it is says that fungi do not photosynthesize

2. Which of the following lists includes all the groups in the ‘three-domain’ classification of life?

In Lines 22 and 23 it says the ‘three domain’ classification of life consists of archaeans, bacteria and eukaryotes – with this latter containing the “other four kingdoms of Whittaker’s scheme” i.e. the other four in addition to bacteria, as cited in Lines 14 and 15 – therefore:

a) Bacteria, archaeans, protists, fungi, plants and animals.

YES - this list includes bacteria, archaeans, plus the other four kingdoms making up the eukaryotes.

b) Animals, vegetables and minerals.

NO – this was the view biologists took historically.

c) Algae, protists, and bacteria.

NO - archaeans are missing and eukaryotes incomplete.

d) Plants, animals, minerals, archaeans and bacteria.

NO – minerals were never included in any classification of life.

e) Animals, plants, fungi, protists and archaeans.

NO – bacteria are missing.

3. When was the view that all living things could be defined as either plants or animals definitively abandoned?

In Line 12 it says that the old idea (i.e. that all life could be divided into animals and plants) was “not finally laid to rest until 1969”; the phrase “finally laid to rest” can be treated as synonymous with the phrase “definitively abandoned” - therefore:

a) In the nineteenth century.

NO – this includes only the years from 1800 to 1899

b) In the early twentieth century.

NO - “early” would only include the first ten or so years of the century i.e. 1900 to about 1910

c) In the seventeenth century.

NO – this includes only the years from 1600 to 1699

d) In 1969.

YES – in Lines 12 to 14 it says that 1969 is the year Roger Whittaker put forward his five-kingdom classification, which, it is implied, replaced the old idea.

e) In the 1970s.

NO – the 1970s covers all the years from 1970 to 1979, and 1969 does not fall within this range.

4. Which of the following are NOT eukaryotes?

In Line 15 it says “animals, plants, fungi and protists are 'eukaryotes' – therefore:

a) Animals.

NO – these are eukaryotes

b) Mushrooms.

NO – in Line 4 it says mushrooms are fungi, and fungi are eukaryotes

c) Protists

NO – these are eukaryotes

d) Archaeans.

YES – in Line 22 it says archaeans are one of the 'three domain' classification of life – the other two being bacteria and eukaryotes; it can therefore be deduced that archaeans are not eukaryotes.

e) Algae.

NO – in Lines 8 and 9 it says that defining an organism as algae enabled it to be grouped with plants – from which it can be deduced that algae are plants, and therefore they are eukaryotes.

5. Which of the following life forms were biologists unable to define as either animals or plants before the twentieth century?

In Lines 10 and 11 it says that in the nineteenth century biologists discovered bacteria, but were unable to define them as either animals or plants – therefore:

a) Fungi.

NO – in Line 4 it says biologists classified these as plants until recently (i.e. until 1969 – as it says in Lines 13 and 14)

b) Bacteria.

YES – this is what it says in Lines 10 and 11

c) Protozoa.

NO – in Line 9 it says biologists classified these as animals – after the 17th century (Line 7) and before the 19th century (Line 10)

d) Algae.

NO – in Lines 8 and 9 it says biologists classified these as plants.- after the 17th century (Line 7) and before the 19th century (Line 10)

e) Microbes in general.

NO – in Lines 6 to 9 it says biologists classified some microbes as plants, others as animals - after the 17th century (Line 7) and before the 19th century (Line 10)

The Melissa Macro

The Melissa computer virus, which in March 1999 spread in Microsoft Word documents sent via e-mail attachment, was among the first viruses to cause widespread damage by means of the internet. Someone created Melissa as a "macro" (a small utility program) in a Word document uploaded to an Internet newsgroup. Anyone who downloaded the document and opened it would trigger the virus, which would thereupon send the document (and thus itself) in an e-mail message to the first 50 people in the person's address book. From each of these recipients, the virus would then create a further 50 messages - and so on. As a result, Melissa was the fastest-spreading virus ever seen. Melissa took advantage of the programming language built into Microsoft Word called Visual Basic for Applications (VBA), which is a complete programming language and can be programmed to do things like modify files and send e-mail messages. It also has a useful, but dangerous, auto-execute feature. A programmer can insert a VBA program ("macro") into a document that runs instantly whenever the document is opened. This is how Melissa was programmed and is why merely opening a document infected with Melissa would immediately activate the virus. Nevertheless, Microsoft applications have a feature built into them which could guard against such risks, it is called Macro Virus Protection. If this is turned on, the auto-execute feature is disabled and any document trying to auto-execute viral code causes a dialog to appear warning the user. Melissa spread despite this safeguard because most people either ignored the dialog, or had the protection mechanism turned off.

Clearly, to protect yourself from such macro viruses you should make sure that Macro Virus Protection is enabled in all Microsoft applications you use and always act on any dialog warnings that appear. If you do this then any attachments that arrive as Word files (.DOC), spreadsheets (.XLS), images (.GIF and .JPG), etc., being data files, can do no damage. But you should never double-click on a file with an extension like EXE, COM or VBS which arrives as an e-mail attachment. Such a file is an executable and once you run it, you have given it permission to do anything on your machine.

1) What would have been the extension of a file which arrived as an e-mail attachment and which was infected with the Melissa virus?

In Line 3 it says that the Melissa virus was created as a "macro" program in a Word document; in Line 21 it says that the extension of a Word file is ".DOC" (Nota Bene: although you might usually expect a virus to arrive in an executable file, in the case of Melissa the executable file was a VBA program contained INSIDE a normal Word document. It is this which made Melissa so insidious.... and successful!)

A) .EXE

NO – .EXE is indeed a common extension for an executable file, but Melissa was a VBA program contained INSIDE a Word document.

B) .XLS

NO – in Lines 21-22 it says .XLS is the extension of a spreadsheet file (i.e. foglie elettroniche)

C) .JPG

NO – in Line 22 it says that .JPG is the extension of an image file

D) .DOC

YES – when it arrived in e-mail attachment Melissa was hidden inside what seemed to be an ordinary Word document with the extension .DOC. The virus was in the form of a “macro”, programmed using VBA, – in Lines 11 and 12 it says that such a VBA “macro” is inserted into a document and only runs when the document is opened.

E) .VBS

NO – .VBS is indeed a common extension for an executable file, but Melissa was a VBA program contained INSIDE a Word document.

2) What action would initiate the infection of a computer by the Melissa virus?

In Lines 4 and 5 it says that anyone “who downloaded the document (i.e. a Word document containing the Melissa virus) and opened it would trigger the virus”. In Lines 12 and 13 it repeats “merely opening a document infected with Melissa would immediately activate the virus” - therefore:

A) double-clicking on a Word document infected with Melissa.

YES – this action would open the document and thus activate Melissa by triggering the auto-execute feature of the macro in which the virus was hidden (it is assumed that it is common knowledge that double clicking on a Word document causes it to open)

B) downloading a Word document infected with Melissa from an Internet newsgroup.

NO – downloading the document would not in itself activate Melissa – it had to be downloaded and *THEN* opened.

C) inserting a VBA program into a Word document and so auto-executing Melissa.

NO – the causality in this statement is confused – it was not the insertion of the VBA program which led to Melissa being activated. The unknown person who inserted Melissa - in the form of a macro programmed using VBA - took advantage of (exploited) the auto-execute feature. But it still needed a subsequent user of Word to open an infected document to activate Melissa.

D) creating Melissa as a macro and uploading it to an Internet newsgroup.

NO – this is the initial action performed by the unknown person who originated the Melissa virus; however this, in itself, did not initiate the infection of any computer. The file containing Melissa had to be subsequently downloaded and opened for infection to occur (on the computer upon which it had been opened).

E) opening an e-mail which had a file infected with Melissa in attachment.

NO – opening the email would not in itself activate Melissa – the attachment had to be downloaded and then opened in order for Melissa to be activated.

3) Which ONE of the following statements is FALSE, according to the information given in the text?

a) Melissa would have been unlikely to have spread as quickly as it did, in the days before e-mail use became widespread.

NO – this is TRUE, in Lines 5 to 7 it says that Melissa spread quickly by sending itself to the first 50 people in the address book on each computer it infected. In the days before the widespread use of e-mail there are unlikely to have been so many email accounts, and thus persons in address books, and so the virus would have found it harder to find new contacts..

b) Melissa spread more quickly than any previous virus.

NO – this is TRUE, it says so in Line 7.

c) Melissa's spread was helped because for every one computer the virus succeeded in infecting, it could potentially infect a further 50.

NO – this is TRUE, it says so in Lines 6 and 7

d) Melissa's spread was helped because a number of people opened the document, even though they had been warned it contained a virus.

NO – this is TRUE, it says so in Lines 16 to 18

e) Melissa spread solely because people had the Macro Virus Protection feature turned off.

YES – this is FALSE, in Lines 17 and 18 it says Melissa spread because most people *EITHER* ignored the dialog, *OR* had the protection mechanism turned off.

4) What would happen if a file containing viral code tried to auto-execute in a Microsoft application whose Macro Virus Protection was enabled?

a) the auto-execute feature would be turned on.

NO – this contradicts what it says in Line 15: if Macro Virus Protection is turned on (i.e. enabled) the auto-execute feature is disabled (i.e. turned off)

b) the VBA macro would run instantly.

NO – in Lines 10 and 11 it is implied that the ability of a VBA macro to run instantly relies on the auto-execute feature – and in Line 15 it says the auto-execute feature is disabled if Macro Virus Protection is turned on.

c) the dialog would be ignored by the application.

NO – in Line 16 it says the dialog is produced to warn the user, while in Line 17 it says people - not the application - ignored the dialog.

d) the virus would immediately be activated.

NO – in Line 16 it says that any attempt to auto-execute viral code causes a dialog to appear warning the user (the virus would only be activated subsequently, if the user ignored this dialog).

e) a dialog would appear warning the user.

YES – it says this in Line 16.

5) If a person receives a file named "money.com" as an e-mail attachment, what should she or he do?

In Lines 22 to 25 it says that you should never double-click (i.e. open, or run) a file with a .COM extension which arrives as an e-mail attachment, because if it contained a virus you would thereby allow it to do anything on your computer

a) make sure that Macro Virus Protection is enabled and then open "money.com" by double clicking on it.

NO – Macro Virus Protection only protects against potential viruses contained in macro programs *INSIDE* a non-executable applications file (such as a Word document). Money.com would be an executable file, and therefore the advice of Lines 22 to 25 is to never double-click on it.

b) double-click on "money.com" to get some money.

NO – this is nonsense (it may be precisely the vain hope of getting money that the creator of the virus is trying to exploit!!)

c) run "money.com" once, and only once.

NO – in Lines 22 and 23 it says “never double-click” (a virus program only needs to run once to infect a computer)

d) avoid double-clicking on "money.com".

YES – this is in accordance with the advice given in Lines 22 to 25.

e) give "money.com" permission to do anything on the machine, in order to test if it is a virus.

NO – this would be tantamount to playing “Russian Roulette” with the computer, it directly contradicts the advice given in Lines 22 to 25.

KEYS:

Grammar

1. e, 2. a, 3. d, 4. e, 5. b, 6. c, 7. d, 8. c, 9. b, 10. e, 11. d, 12. c, 13. a, 14. e, 15. a, 16. c, 17. d, 18. b, 19. e, 20. c

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1. c, 2. a, 3. d, 4. d, 5. b

The Melissa macro

1. d, 2. a, 3. e, 4. e, 5. d