



Promoting microbiology in schools and colleges since 1969

# Fungi and climate change

## Aim of the competition

To develop an understanding among teenagers of the interrelationships between the activities of fungi and climate change.

## Background

The fungal kingdom is one of the oldest and largest groups of living organisms. Originating in water and diverging from a common ancestor with animals up to 900 million years ago, fungi have become particularly diverse on land where they are widely distributed because they are dispersed by airborne spores. Found from the tropics to Antarctica, the distribution and activities of fungi are controlled by their environment. Within the last century, climate change resulting from human activity has altered those environments. The release of greenhouse gases has resulted in an increase in global temperatures, affecting the activities of fungi as well as other organisms.

As fungal hyphae grow, their long and branching filaments help to bind soil particles together and improve soil structure. Some hyphae form close relationships with the roots of up to 90% of land plants. Such mycorrhizal associations enhance the plants' growth, providing them with better access to water and nutrients. This enables

**Closing date extended: 31st October 2021**

plants to trap and convert more CO<sub>2</sub> into sugars during photosynthesis. In long-lived trees, captured carbon is stored for up to hundreds of years until they die. Mycorrhizas can therefore temporarily reduce some greenhouse gases, as can certain human activities, e.g. aerobic composting which reduces emissions of methane (CH<sub>4</sub>), a potent greenhouse gas, but not CO<sub>2</sub>.

Fungi break down organic matter in the presence of oxygen by respiration so that carbon, oxygen, nitrogen and other elements are recycled, therefore maintaining soil fertility. Fungi can decompose the cellulose and lignin in plants, activities which generate CO<sub>2</sub>. Chytrids, anaerobic fungi living in stomachs of ruminant mammals, provide the energy for resident prokaryotic archaea which produce methane.

Fungal physiology, activities and geographical range are themselves affected by climate change, often resulting in the reduction or death of beneficial fungi in some regions, or the invasion of foreign species into new situations. This can cause diseases such as chytridiomycosis of amphibians, tar spot of maize and the human fungal infection by *Candida auris*.



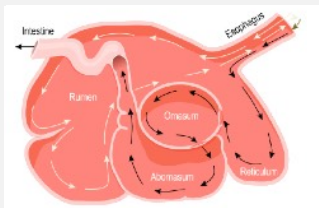
Extreme effects on land of climate change. Image by Mycella from Canstockphoto.com



Hyphae of mycorrhizal fungi (white hairs) associated with plant roots. Image: Paula Flynn, Iowa State University Extension



Wood decay fungi: decomposition of cellulose & lignin. (Robert L. Anderson, USDA Forest Service, Bugwood.org) CC BY 3.0 US; licensed under a Creative Commons Attribution 3.0 License.



4-chamber stomach of a ruminant. Image Shutterstock

## Some useful web sites

Where possible, search for phrases such as "Fungi & climate change".  
<http://misac.org.uk/infoleaflets.html>  
[www.ukfungusday.co.uk](http://www.ukfungusday.co.uk); Explore the Resources and Blog tabs including *What are Fungi?* and *Out of sight, out of mind*.  
<http://www.davidmoore.org.uk>  
 Search Guidebook pages for *fungi and climate change* or go to Chapter 13.7.  
<https://microbiology.society.org>  
<https://www.kew.org/science/state-of-the-worlds-plants-and-fungi> Plant-fungal interactions and Climate change.  
[www.newscientist.com](http://www.newscientist.com)  
[www.sciencedaily.com](http://www.sciencedaily.com)

## Sponsors of the 2021 competition



British Mycological Society  
promoting fungal science

[www.britmycolsoc.org.uk](http://www.britmycolsoc.org.uk)

## Object of the competition

You are required to produce information for a social-media web site for teenagers called **What you didn't know about climate change**. You should explain:

- the concept of climate change and its effects,
- how the activities of fungi affect climate change,
- how fungi themselves are influenced by climate change.

## Format of entries

- You must produce 2 equal pages for the **What you didn't know about climate change** web site.
- The entry must be produced on paper as hard copy on one A3 sheet (or two A4 sheets secured side by side with adhesive tape) using only one side of the paper.
- You may produce your entry either by hand or computer.
- The entry may be submitted by an individual or a group of not more than four students.

On the first web page,

1. **briefly** explain the scientific basis of climate change,
2. give **one** example of fungal activity which reduces greenhouse gases and indicate the special features which enable the fungus to achieve this.

On the second web page, using specific examples,

1. give details of **one** fungal activity which increases greenhouse gases and its consequences,
2. explain how climate change affects the activity and distribution of many fungi, and

3. briefly comment on whether fungal activity results in an overall increase or decrease in climate change

## Important

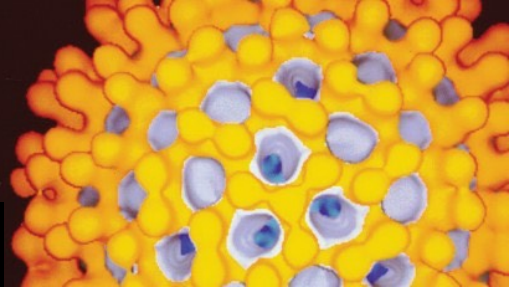
Remember that part of the competition judging will be on the *scientific merit* of an entry. Use the scientific name of any fungus you identify, remembering that the first name (genus) begins with an upper-case letter and the second name (species) has a lower case initial letter (e.g. *Amanita muscaria*). Use an italic font for the scientific name - or underline it if your entry is hand-written. Always use your own words because plagiarism will be penalised. For data and other material used to illustrate your entry, provide information of their sources.

## What makes a good social-media page?

Effective web pages rely on being not only informative but attractive, lively, well-designed and amusing in order to make an immediate and visual impact. Make the presentation of your entry entertaining for its intended audience, i.e. teenagers. This can be achieved by using photographs, diagrams, drawings, in addition to data and sources of further information.

Prizes	Schools	1st £250	2nd £125	3rd £70
	Students		1st £100	2nd £50

A certificate will be awarded to each student submitting an entry of scientific merit. The results, winning entries and a report of the competition will be published on the MiSAC web site competition pages at [www.misac.org.uk](http://www.misac.org.uk).



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### Rules

- Judging will be based on two entry groups: Key Stage 3 (S1/2) and Key Stage 4 (S3/4).
- Each entry must be submitted on paper, on **one A3 sheet** (or two A4 sheets taped together) using one side of the paper only, and may be produced either by hand or by computer.
- Entries may be created either by individuals or groups of no more than 4 students.
- A maximum of 10 entries per school in each entry group is permitted.
- Account will be taken of originality, presentation and effectiveness in communicating with the intended audience.
- Only entries that conform to the competition rules and show scientific merit will be considered; note the requirements and consider the suggestions given on the front page.
- Evidence of plagiarism, such as downloading text directly from web sites without modification and interpretation, will result in disqualification. (MiSAC recommends only reputable sites for research; see [www.open.ac.uk/webguide](http://www.open.ac.uk/webguide) for tips on using the internet.)
- Each entry must be clearly labelled on the back with the name and address of the school, the teacher's name, the full name of each contributing student and the entry group, i.e. Key Stage 3 or S1/2 and Key Stage 4 or S3/4.
- Entries cannot be returned and may be used for promotional purposes by MiSAC.

**Closing date extended: 31st October 2021.**

### Check list for teachers

Please tick before submitting entries

- Students' name/s on entry? [ ]
- School name on entry? [ ]
- School address on entry? [ ]
- Teacher's name on entry? [ ]
- Key stage on entry? [ ]
- Entry form completed? [ ]

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British Mycological Society promoting fungal science

[www.britmycolsoc.org.uk](http://www.britmycolsoc.org.uk)

### Entry form \*

Name of teacher: .....

Tel no: .....

Email:.....

### KS3, S1/2 entry group

Name(s) of student(s)

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

7 .....

8 .....

9 .....

10 .....

### Name and address of school

.....

.....

.....

### KS4, S3/4 entry group

Name(s) of student(s)

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

7 .....

8 .....

9 .....

10 .....

### How did you learn of the competition? *Please tick*

[ ] MiSAC web site [ ] BMS web site [ ] Post to school [ ] Emailing [ ] Social media [ ] Other .....

**Don't forget to keep a copy of the rules and entry form!**

*\* Personal data for use only by MiSAC in connection with the MiSAC Annual Competition*

Address for entries: MiSAC Competition, c/o NCBE, University of Reading, 2 Earley Gate, Whiteknights Road, Reading RG6 6AU