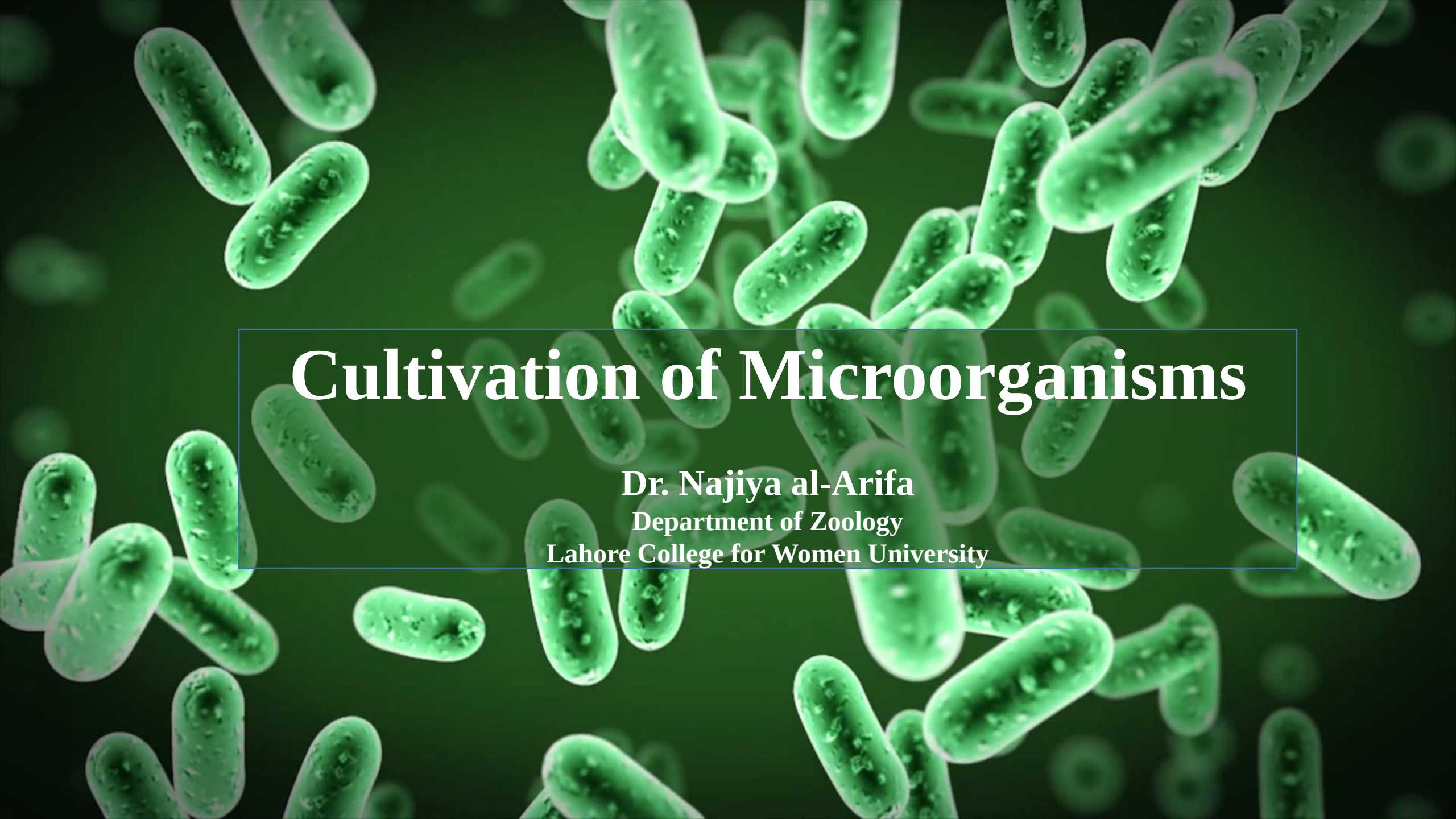

Cultivation of Microorganisms

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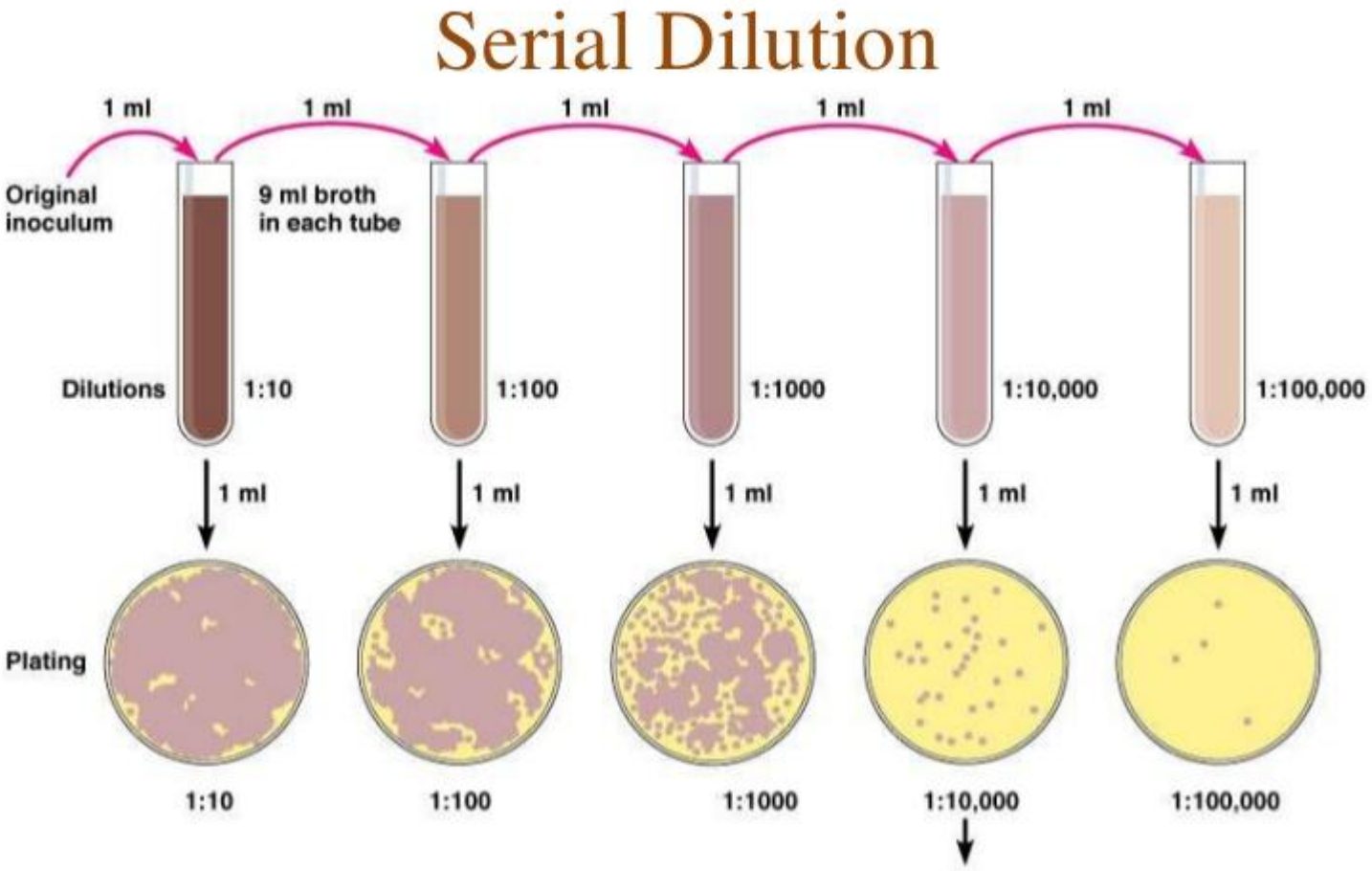
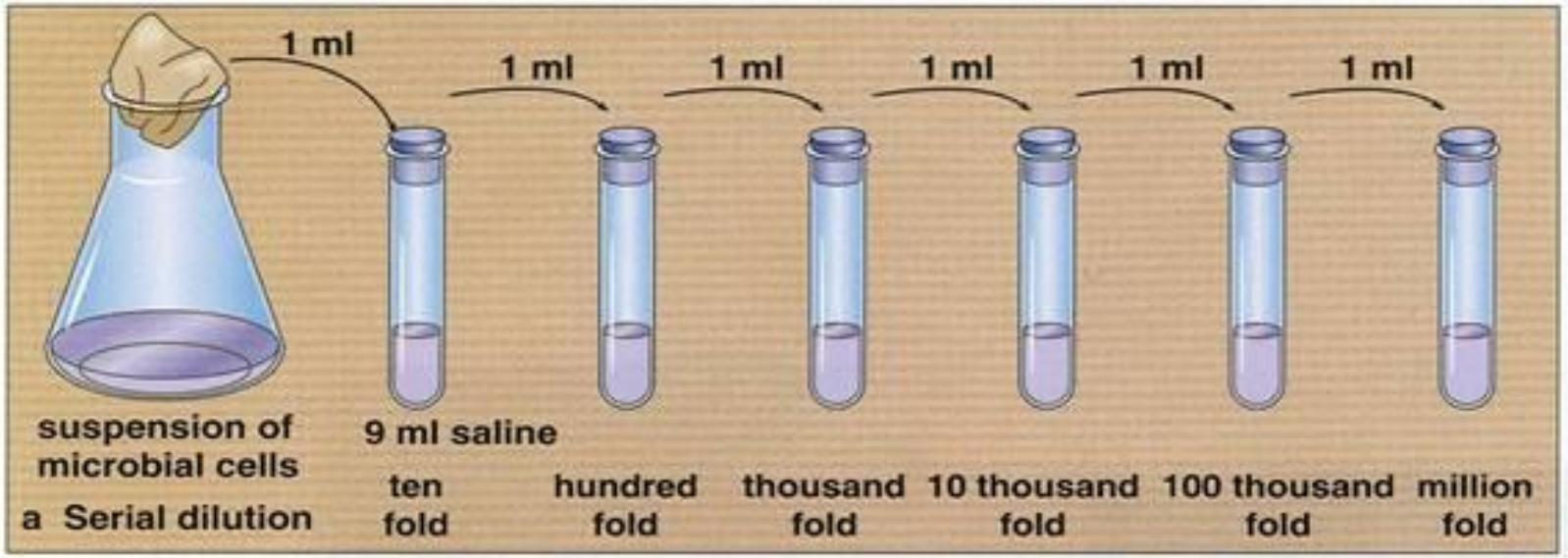
Isolation of Microorganisms

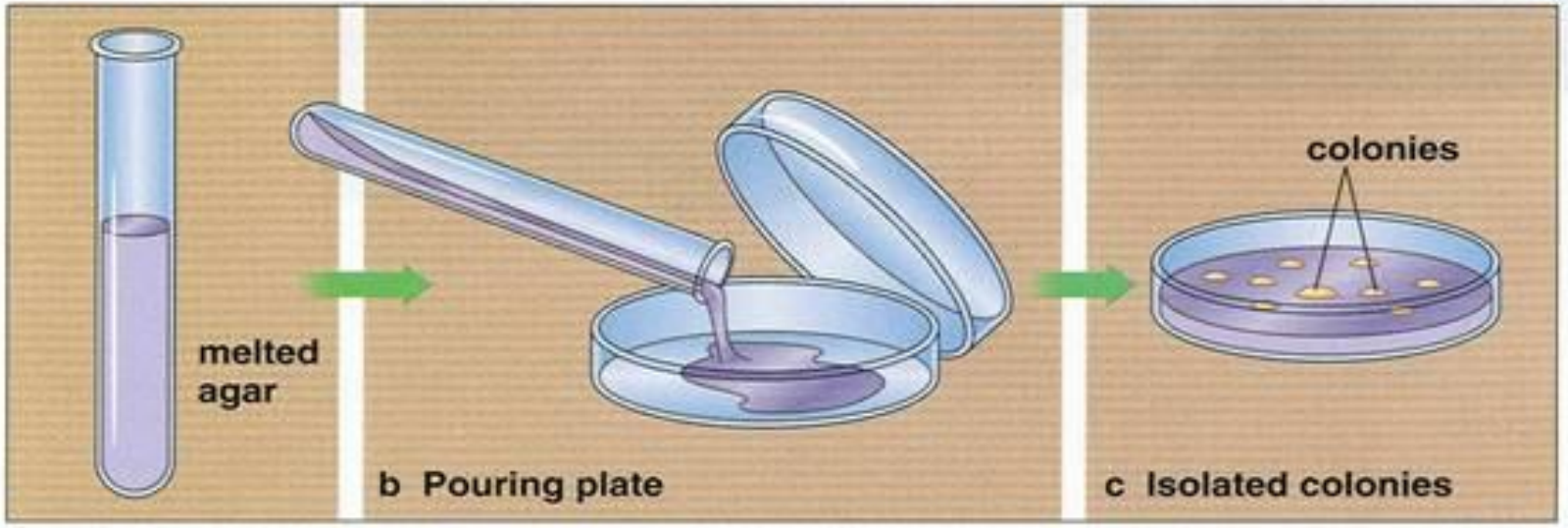
- Isolation of Microorganisms from the Environment
  - Soil
  - Air
  - Water

Serial Dilution

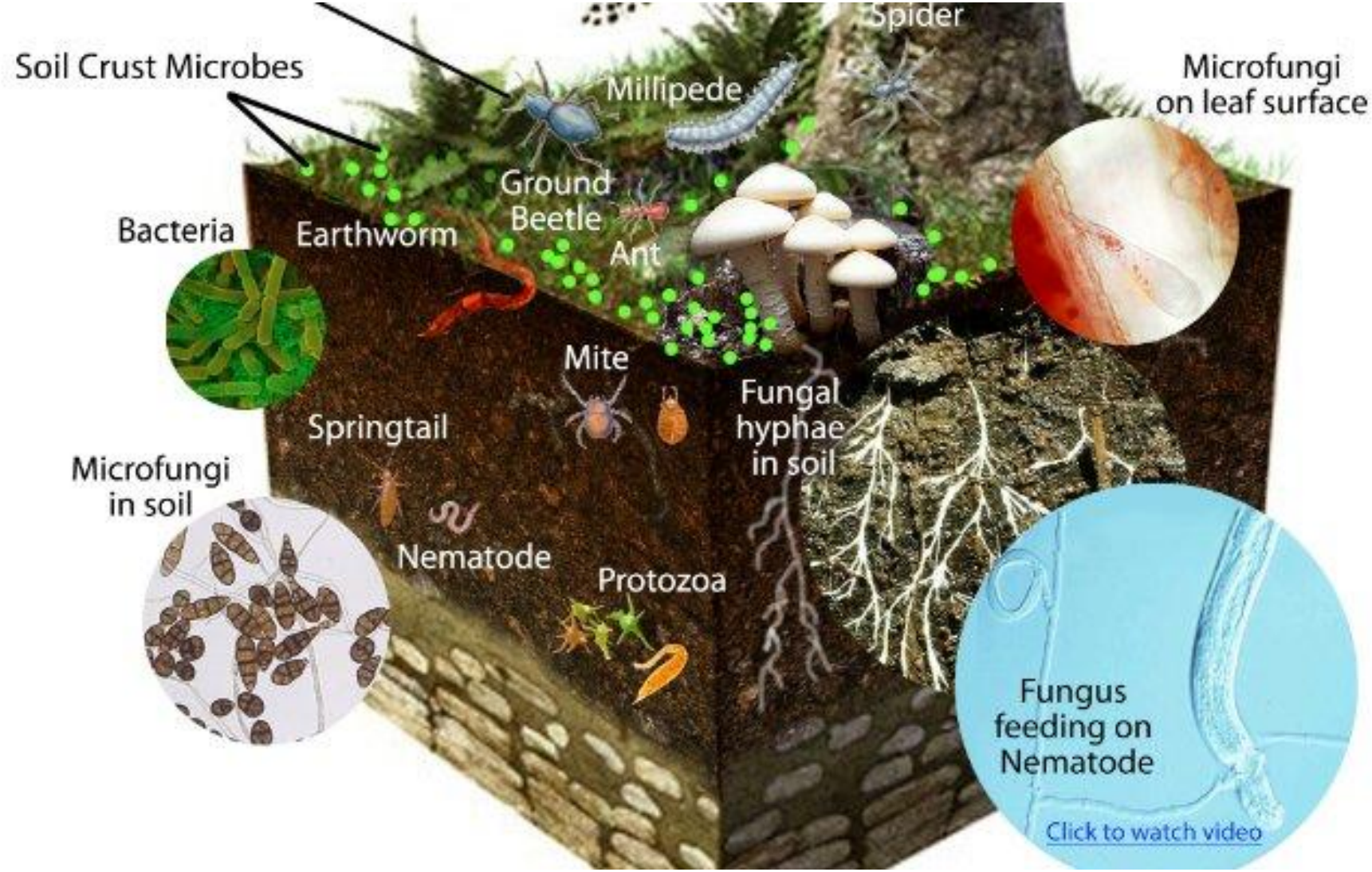


Pour Plating Method



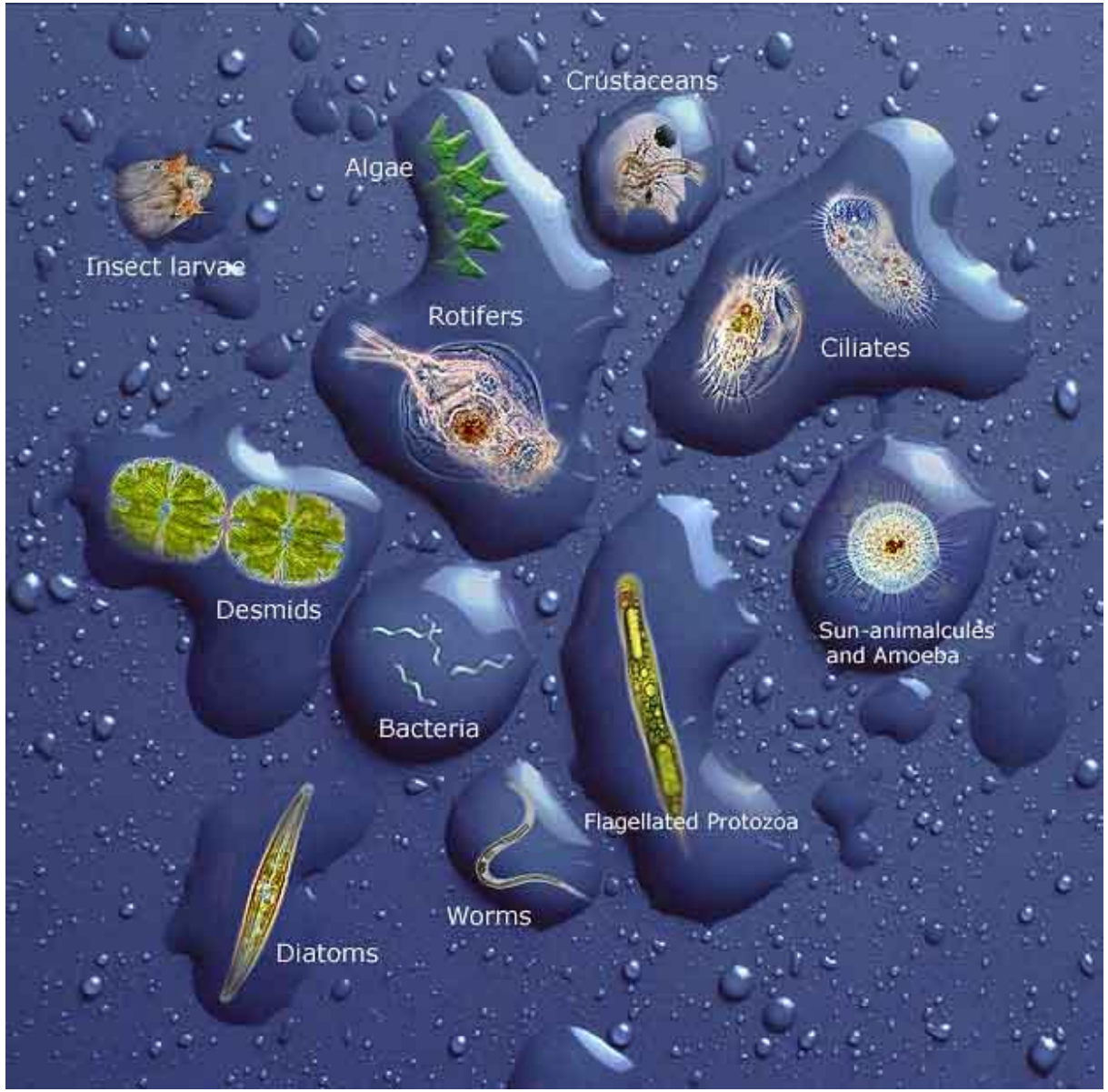


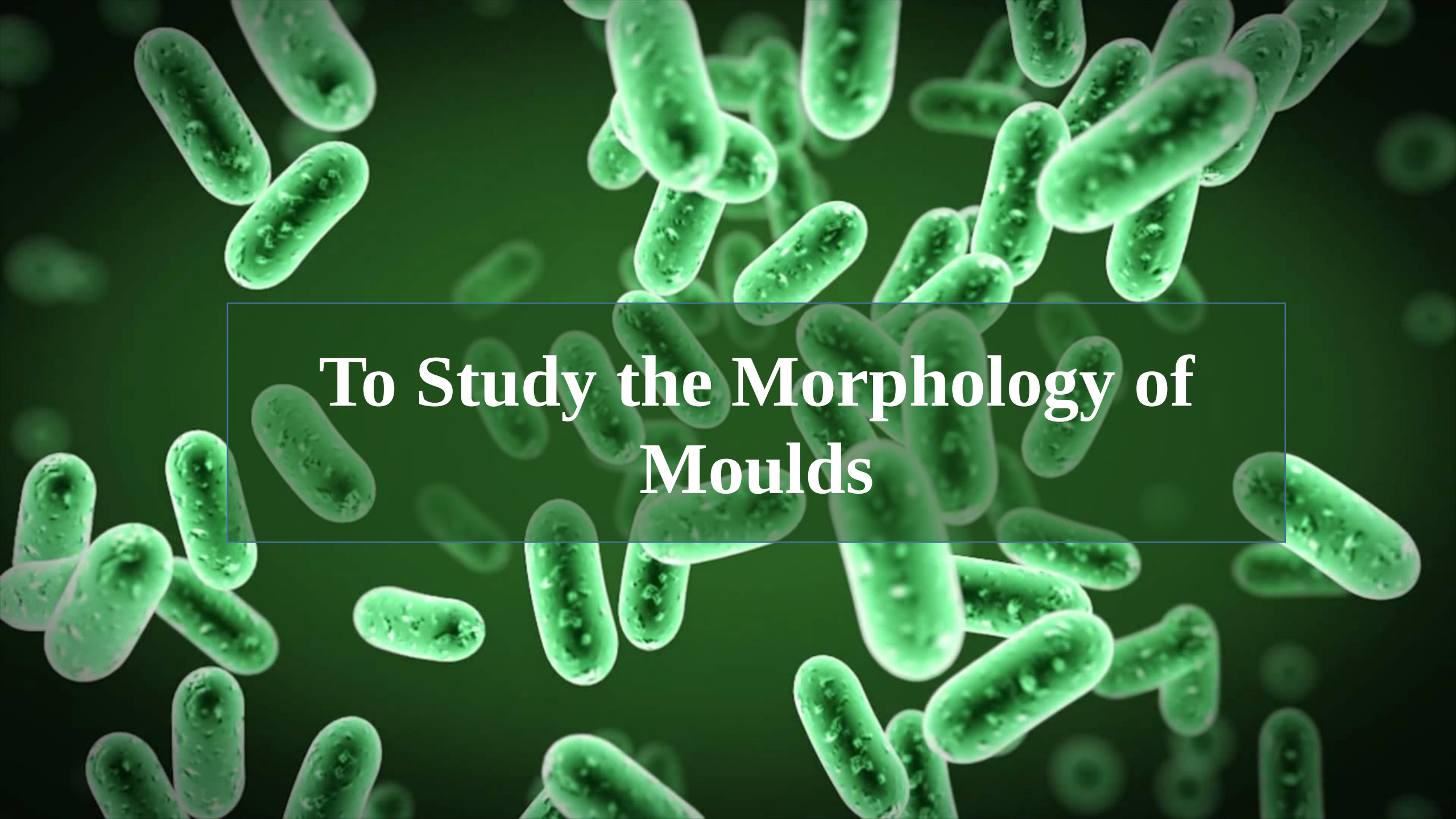
Soil Microorganisms



Air Microorganisms

Water Microorganisms





To Study the Morphology of Moulds

Moulds

- Moulds appear as dusty little spots often found spreading over bread, cheese, books, and other things in the home
- Moulds cause the loss of millions of dollars to the economy every year
- Moulds may be a menace to our health
- Moulds are microscopic, plant-like organisms, composed of long filaments called hyphae
- Because of their filamentous construction and consistent lack of chlorophyll they are considered by most biologists to be separate from the plant kingdom and members of the kingdom of fungi
- When mould hyphae are numerous enough to be seen by the naked eye they form a cottony mass called a mycelium
- Hyphae and resulting mycelia that invade things and cause them to decay

Mould Spores

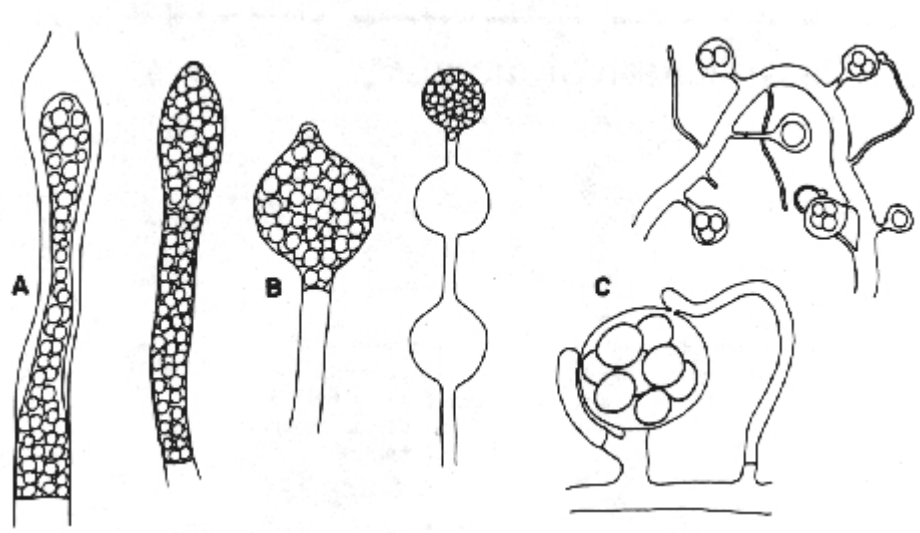
- Moulds reproduce by spores
- Spores are like seeds; they germinate to produce a new mould colony when they land in a suitable place
- Unlike seeds, they are very simple in structure and never contain an embryo or any sort of preformed offspring
- Spores are produced in a variety of ways and occur in a bewildering array of shapes and sizes
- In spite of this diversity, spores are quite constant in shape, size, color and form for any given mould, and are thus very useful for mould identification
- The most basic difference between spores lies in their method of initiation, which can be either sexual or asexual
- Sexually initiated spores result from a mating between two different organisms or hyphae, whereas asexual spores result from a simple internal division or external modification of an individual hypha

Identification of Mould Spores

- Oospores
- Zygospores
- Ascospores
- Basidiospores

Oospores

- Oospores are produced when male gametes (reproductive nuclei) enter a large spherical cell (oogonium) and fertilize the eggs within. The result are numerous oogonia containing one to several spherical and often brownish eggs. The oogonia are usually penetrated by one or more hyphae (antheridia) that give rise to the male nuclei.

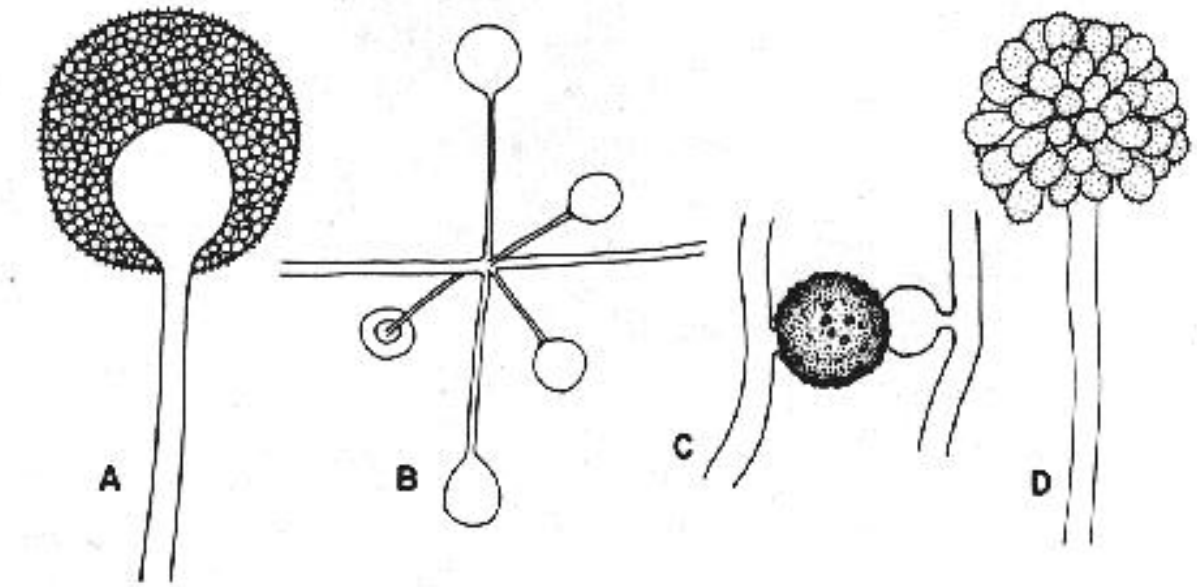


Oomycota. A: zoosporangia of *Saprolegnia* sp. B: zoosporangia of *Pythium* sp. C: oogonia and antheridia of *Saprolegnia* sp.

Oogonia of *Saprolegnia* sp., isolated from the Ramioul Cave in Belgium.

Zygospores

- Zygospores do not occur inside any kind of enclosing structure, but are produced by the direct fusion of two hyphal protrusions (suspensors) from neighboring filaments. Usually zygospores are recognized as large, nearly spherical, often dark brown or black, rough-walled spores with two connecting hyphae, representing the two mating gametangia. Sometimes the zygospore may be surrounded by several finger-like extensions from the two gametangia.

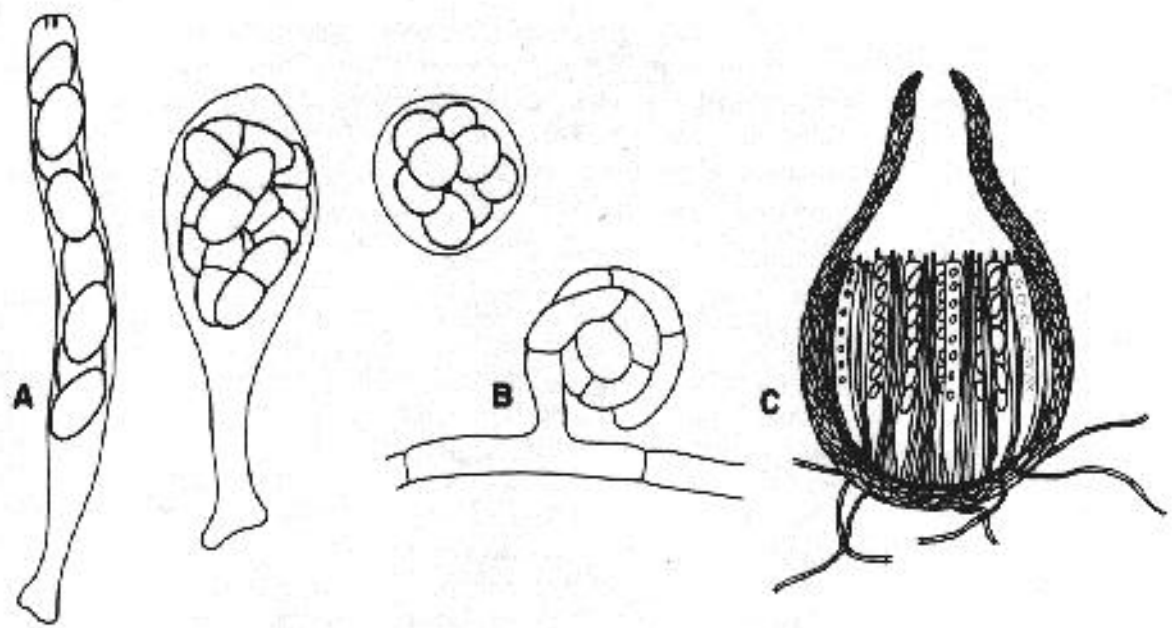


Zygomycota A: sporangia of *Mucor* sp. B: whorl of sporangia of *Absidia* sp. C: zygospore of *Zygorhynchus* sp. D: sporangiophore and sporangiola of *Cunninghamella* sp.

Syncephalis, a member of the Zygomycota parasitic on other Zygomycota

Ascospores

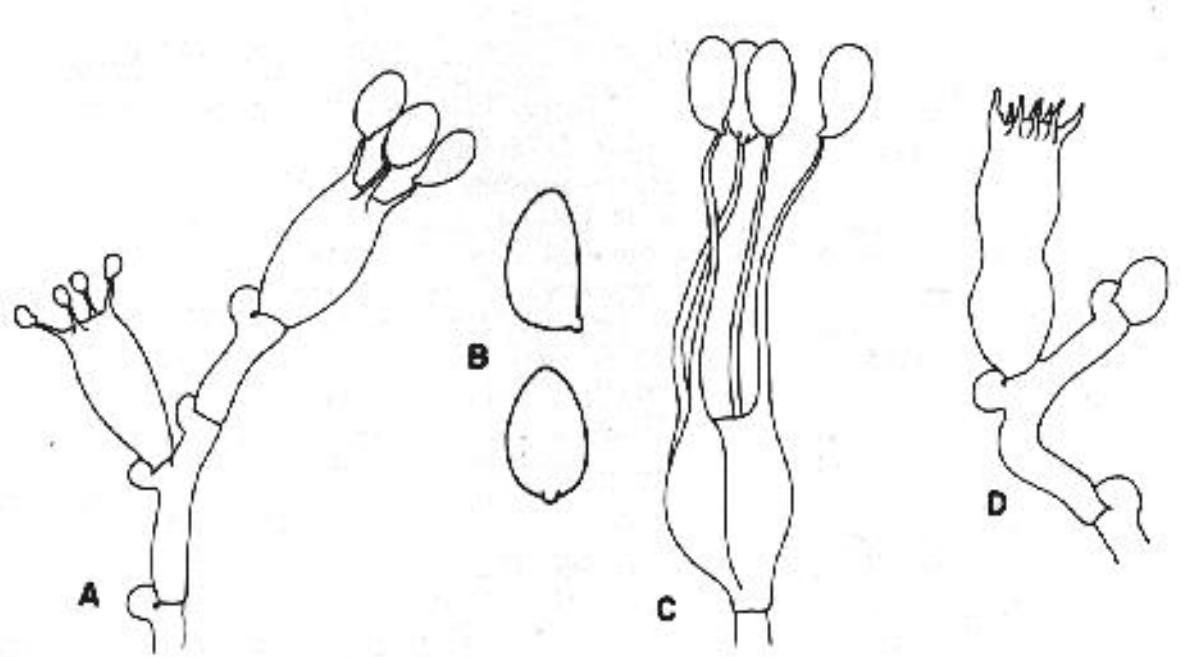
- Ascospores are produced within spherical to cylindrical cells called asci, most often in groups of four or eight. Usually the asci are produced within some kind of enclosing structure and thus are not found exposed on the hyphae. In a few cases the asci may be borne among hyphae and resemble oogonia with eggs, but they will never be penetrated by any sort of fertilizing hypha. Fertilization occurs early in the life cycle and is not evident at the time ascospores are produced.



Ascomycetes A: three kinds of asci: cylindrical, clavate, and spherical. B: initial phase of sexual reproduction. C: cross-section of a flask-shaped perithecium bearing cylindrical asci.

Basidiospores

- Basidiospores are always produced externally on a structure called a basidium. Basidia come in a variety of forms, but those commonly encountered on moulds will be club-shaped and bear four or eight spores on sharp projections at the apex. At first it may be difficult to distinguish between a basidiospores and one of the asexually initiated spore types, but one should always suspect the presence of basidia when externally produced spores consistently occur in groups of four or eight. As with ascospores, basidiospores are the result of an early fertilization that is not easily observed.



asidiomycetes A: four-spored undivided basidium (holobasidium); note the clamp connection at each cross-wall. B: two typical basidiospores, the upper one in side view and the lower in front view. C: a four-celled, cruciate basidium typical of many jelly fungi. D: eight-spored holobasidium typical of species of *Sistotrema*; the spores have been discharged.