FUNGI IMPERFECTI
(Deuteromycota)

nonphylogenetic group of fungi without known sexual cycles or with unobserved sexual cycles.

Unique Phylum

1. **groupings may or may not represent phylogeny**
   e.g., species in same genus may be less related than species in different genera

2. **most species are, in reality, members of other Phyla, particularly Ascomycota and Basidiomycota, but cannot be classified morphologically because nonsexual***

3. **members often have two and sometimes more acceptable scientific names**

***currently being classified molecularly**

WHY FUNGI IMPERFECTI?

1. **Recognition that sexual cycles of fungi, particularly of Ascomycota and Basidiomycota, were important for understanding relationships. However, this created a problem**

2. **Problem was what to do taxonomically with fungi that had no known sex cycles?***

3. **Problem solved by creating a unique Phylum of fungi in which fungi are named with little regard for relationships. Identification without regard to classification; based on morphological observations and naming of asexual states.**

   ***majority**

ASEXUAL STATES = IMPERFECT STATE

Therefore: Fungi Imperfecti = Deuteromycota

1. **Fungi Imperfecti named according to rules of Botanical Nomenclature for asexual (mitosporic) fungi***

2. **When perfect (sexual) states become known they are classified and renamed according to rules of Botanical Nomenclature for sexual fungi***

***mitosporic fungi, anamorphic fungi, imperfect fungi, etc.** **Older Fungi Imperfecti names usually better known**

Question - **Why are asexual states usually known before sexual states?**

1. **If organism grows, then it usually exhibits its asexual (anamorphic) phase first.**
   vegetative growth → asexual reproduction - then sexual reproduction

2. **With medically important fungi one can identify and treat fungus causing disease without knowing about sexual stage or how the fungus is classified.**

3. **Induction of sexuality is often dependent upon inducing sex in mated self-sterile (heterothallic) strains.**

4. **Induction of sexuality often requires special environmental or physiological conditions.**

Homothallism vs Heterothallism

Most medically important fungi are heterothallic*

haploid self-sterile (nonsexual) strains **haploid (1N)**

A haploid (1N) **A*****
x karyogamy → Aa (2N)** → meiosis** → A**
a haploid (1N) **a**
a

Only a relatively few are homothallic (self-fertile)

*** sex requires = pairs of "opposite" mating strains**

****meiosis often requires special physiological conditions**

*****meiotic nuclei incorporated into meiospores**
ascospores
basidiospores

****** or N+N (dikaryon) → 2N → 1N**

Concept of Anamorphy, Teleomorphy, and Holomorphy, Synanomorphy

Asexual phases of fungi are termed their anamorphic phase or anamorph*

Sexual phases of fungi are termed their teleomorphic phase or teleomorph**

Both phases termed holomorph**

*** Fungi Imperfecti name**
**** Phylogenetic name**

Synanomorph(s)? Same fungus, but different asexual morphology.

Examples of medically-important fungi with 2 valid names

Anamorphic (asexual phase)	**Teleomorphic (sexual phase)**
Histoplasma capsulatum **Hyphomycete**	***Ajellomyces capsulata*** **Ascomycota**
Form-species ***Blastomyces dermatitidis*** **Hyphomycete**	***Ajellomyces dermatitidis*** **meiospores Ascomycota**
Cryptococcus neoformans **Blastomycete**	***Filobasidiella neoformans*** **Basidiomycota**

Holomorph

Today's Problems with Phylum Fungi Imperfecti*

Good News -- perfect states of many fungi have been and continue to be discovered

Bad News -- hundreds of common fungi have new names

More Bad News -- great resistance to learning and understanding about why we are having reclassifications

Great resistance to use of new names by non-mycologists & professionals

Both imperfect and perfect names of sexual fungi commonly used (more often than not, old imperfect species name)

Particularly true in regard to applied fields like
- **-medical mycology**
- **-plant pathology**
- **-industrial mycology**

***This phylum may become obsolete because of molecular biology.**

Fungi Imperfecti

Form-classes	Characteristics
Blastomycetes	**Asexual yeasts or the nonsexual yeast phases (anamorphs) of asco-mycetous, basidiomycetous or dimorphic fungi**
Hyphomycetes	**Asexual conidial fungi or nonsexual phases (anamorphs) of ascomycetous or basidiomycetous hyphal fungi**
Coelomycetes	**Asexual fungi or nonsexual phases (anamorphs) of ascomycetous or basidiomycetous hyphal fungi that produce conidia in multihyphal aggregates called conidiomata (conidioma)**
Mycelia Sterilia	**nonconidiogenous hyphal fungi that reproduce only by fragmentation**

Majority of Medically-Important Fungi

Hyphomycetes (conidial hyphal fungi) that have known or suspected Ascomycota affinities.

In general, these Ascomycota are Plectomycetes (cleistothecial ascomycetes), although a large number that cause relatively few infections are Loculoascomycetes (loculostromatic ascomycetes) of order Chaetothyriales..

Most are also heterothallic.