

## 菌學의 將來展望

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## The Vision of Mycology in the Future

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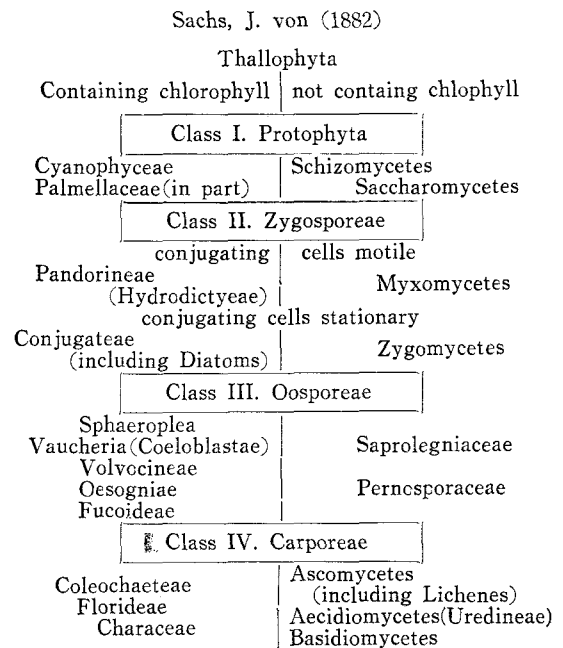
*Exo-President of Mycological Society of Japan, Japan*

The Korean Society of Mycology has been going on very well in these ten years and came to-day to get up such a significant international mycological symposium. Our Japanese Mycological Society became already twenty five years old, going also well and recently has more than a thousand members and issues transactions of more than 400 pages in every year. Nevertheless, many people, not studying on fungi, don't know the term of "mycology" and have very poor knowledge on the Society. It was very shocking from a true zoologist in our university, such words "what is mycology?" when we talk about to establish a new chair of mycology in the university. How is it in Korea and in other countries in such cases? So, I feel keenly to explain exact meaning of mycology for general people. In a word, mycology is a natural science to research on fungi. But it is problematic that the knowledge of common people is not clear for fungi.

About fifty years ago, when I started to learn botany, there common ideas that fungi are a sort of plants as algae and that fungi became from algae getting loss of pigments of photosynthesis. These ideas are presumed from the fact that we know many phanerogamous plants lost chlorophyll, as *Monotropa*, *Monosropastrum* of Pirolaceae, *Cuscuta* of Cuscutaceae, *Aegineti*, *Boschniakia*, *Orobancha* of Orobanchaceae and *Galeola*, *Gastrodia* of Orchidaceae, except *Cuscuta viridicaulis* and *Gastrodia viridis* remain some chlorophyll. The algal origin theory of fungi is yet believed by many persons who is'nt clear on fungi.

Meanwhile, I looked through the old literatures written on fungus systematic, and I paid most attention to Sachs's work on classification of Thallophyta. J. von Sachs is a famous botanist in Germany who observed on many algae and fungi himself and proposed in 1882, an epochmaking system on Thallophyte. It was appreciated as excellent work, in parallel with the famous systematic work of Bentham-Hooker on Spermatophyte.

From Sachs's list, we can imagine easily that he thought the algae, put in the left column, have a relation to the fungi in the corresponding right



colum. As this system is not only, so smart, but also stood als one at that time, it was soon spreaded in Euiope and many botanists maintained it.

In 1883, A.W. Eichler wrote a text book on systematic botany. It is famous that He introduced the theory of evolution in his system. he divided the plant kingdom into Phanerogamae and Cryptogamae. The former is same to Anthophyta and contains all flowering plants, while the latter is divided into Pteridophta, Bryophyta and Thallophyta, which contains algae and fungi. Sachs's idea of the relation between algae and fungi was followed in his system. This Eichler's book was translated into Japanese, before and after 1900, and distributed very widely in their science education.

Successively, Ad. Engler wrote Die Natulichen Pflanzenfamilien which is very huge and learned work on systematic botany. He spent more than ten years (1887~1909) to issue this book completly, and contained all the plant groups under cooperation of many specialists of each groups. Later, Engler-Gilg (1924) and Engler-Diels (1936) published Syllabus der Pflanzenfamilien summerizing the Engler's huge publication. This syllabus is very handy for a text book of systematic botany, and distributed widely in the botanical world. Of course this book is adopted in Japanese colleges and universities for text book in the science and applied science courses during these forty years or more.

Engler's system of plant kingdom is also influenced by the idea of Sachs. For instance, in Engler-Diels (1936), Syllabus, the fungi are treated in divisions and classes as follows.

Engler-Diels (1936)

- I Abteilung Schizophyta Klass Schizomycetes
- II Abteilung Myxomycetes
- XII Abteilung Eumycetes Klass Phycomycetes
- Klass Ascomycetes
- Klass Protomycetes
- Klass Basidiomycetes
- Nebenklass Lichenes

In this way, it became a common idea in botanists, that fungi are included in a group or groups, parallel to groups of algae, in Thallophyta. (Fungus is treated

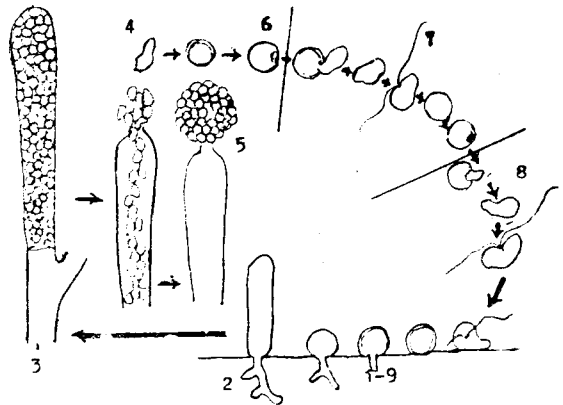
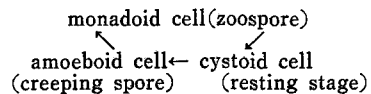


Fig. 1. Life cycle of *Achlya*.

as one of plants).

Since 1935, I engaged in researches for aquatic molds. Aquatic molds have zoosporal stage in their life cycle. Now then, I will tell you about the life cycle of *Achlya* for an example.

When a swimming zoospore of *Achlya* arrive on a suitable substratum, it adheres to it by its rhizoid. Then the body of the spore elongates toward the opposite side of the rhizoizoid, accordingly it grows into hyphal mycelium in the water, then arises branchings. In due time, a zoosporangium occurs at the top of branches. When the zoosporangia become maturity, the mass of cytoplasm of the sporangia divide into a number of cells, and they begin to irritate in the sporangia, then they creep out from a pore at the top of zoosporangium one by one, and encyst at the outside of the pore making a whits spherical cluster. After a certain resting period, a pore appears on every resting spore cells and cytoplasm creep out again to the water, then they become to the secondary zoospores. Such encystment and swiming of zoospores occurs several times, if the circumstance needs it. After all, the zoospores grow into mycelium adhering to the substratum by rhizoid. It is very important feature that the sporal stage of *Achlya* show three forms changing by its circumstantial needs.



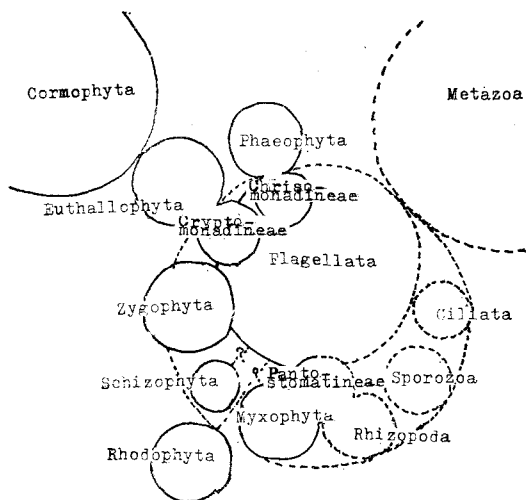


Fig. 2. Wettstein's system (1924).

While I was observing such life history of aquatic molds, I met a very interesting book, that is R. Wettstein (1924): *Handbuch der systematischen Botanik* (3te Aufl.). In his book, he proposed a theory that plant and animal derived from Flagellata, explaining his idea by a unique figure.

As his opinion, the Cormophyta originated from Euthallophyta, and fungi, excluding slime molds and bacteria, are included in the Euthallophyta. So it seems that Wettstein agrees with Sachs's system. Slime molds (Myxophyta) was situated very near to Rhizopoda and bacteria is treated as a systematically obscure group.

Now, we can find a number of unicellular species in aquatic fungi. In laterally biflagellate ones, *Ectrogella* and *Olpidiopsis* are known since old time. Their mycelia are unicellular in all the life cycle. In posteriorly uniflagellate ones, many species of chytrids have always unicellular form. *Blastocladia* is a simple hyphal mold but one species of the genus, *Blastocladia stubenii* shows unicellular form.

Wettstein issued the forth revised edition of his book in 1935. He emended some points of the genealogical figure but his fundamental idea of the system was not changed.

In 1932, G.W. Martin who is an American famous researcher of slime molds and fungi, proposed interesting theory on organismal kingdom. That is, the

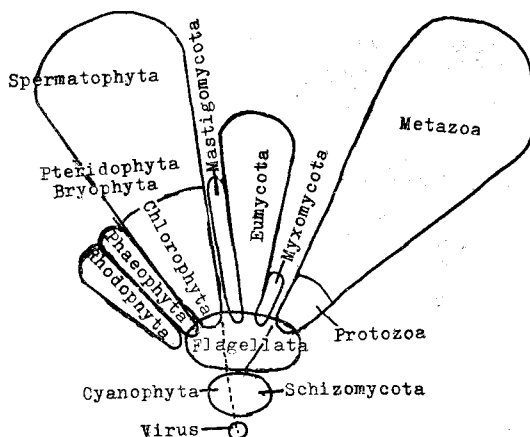


Fig. 3. Indoh's system (1974).

Fungi are a third kingdom of organisms parallel to the Plant and Animal kingdoms. And in 1935, Copeland excluded fungi from plants.

Here, I drew a genealogical figure of organisms, emending the Wettstein's figure.

In Ainsworth and Bisby's *Dictionary of the Fungi* of 6th edition (1971) on p.215, we can see Whittaker (1969)'s an excellent genealogical figure of organisms in which he divided organisms in five kingdoms namely Animal-, Plant-, Fungus-, Akaryota- and Virus- Kingdom. My figure has fundamentally no contradiction to the Whittaker's system.

Some of aquatic molds as certain species of *Pythium* became to parasites on aquatic plants and animals. And further, some Oomycetes, related to *Pythium*, change to terrestrial life type of parasites, as the cases of *Phytophthora* and *Peronospora*. Especially in *Phytophthora*, they lost the swimming stage and their sporangial organ changed to conidial sporangia or conidia. Thus, it must be proper to see some terrestrial fungi ascended from certain aquatic fungi. Although there are some problems on the phyletic lines between unicellular fungi as yeast groups, to Ascomycetes or Basidiomycetes, my genealogical figure based on the Flagellata origin theory, has nothing of troublesome in its fundamental principle.

Again I dare to say, it must be genealogically unnatural to include fungi in plant, as hitherto peoples in general did. Now I hope you to support the theory that the Fungus kingdom is parallel to the Animal

and Plant (strict sense) kingdoms, and also hope to recognize definitely that the object of mycology is the sure fungus kingdom, as I told here. Then you, of course with me, must make efforts to cause every

persons of every countries, to understand the true mycology. I believe then, those efforts must effect to promote mycology and also to promote our mycological societies.