

A lawyer and a mycologist walk into a bar...

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The placement of fungi within the broader scheme of the tree of life has undergone drastic revisions throughout the history of MSA. The understanding of fungi as “non-green” plants, initiated by the Florentine scientist Pier Antonio Micheli in his 1737 publication *Nova plantarum genera*, lingered until the second half of the twentieth century, when advances in biochemistry and genetics revealed fungi to be a separate group altogether, more closely related to animals than to plants.

Whereas scientists have made great strides in harnessing and engineering fungal biology, legal interpretations of such biotechnology have lagged behind scientific understanding, mainly due to practical concerns. Given that scientific research is often translated into useful technology by means of patents, this form of intellectual property (IP) serves as a compelling category by which we can understand how basic research becomes biotechnology. For those interested in the intersection of mycology and biotechnology, I will offer a brief overview of how fungi have been managed by the US patent system, emphasizing the placement of fungal technology in relation to the classification of US patents.

The continued classification of some mushroom technologies as plant patents (PLT/394) is perhaps the most curious example of how the US patent system treats fungi. Interestingly, only a single plant patent on a mushroom was issued prior to wide acceptance for the separation of the two kingdoms in the 20th century. However, as of 2015 nineteen plant patents for the edible mushrooms *Hypsizygus* (Shimeji) and *Grifola* (hen-of-the-wood) species had been issued, eleven of which were granted in the 2000's. Section II of plant patent definitions states: “[S]ubclasses in this class have been created based on the commercial or market class in which the plants are normally found. For example, though a tomato is botanically a fruit, it is sold as a vegetable, therefore making classification proper for the vegetable area rather than the fruit area.” The inclusion of mushrooms under plant patents shows that his line of reasoning has been applied to fungi as well.

For some brief context, US plant patents were established in the 1930's to address America's burgeoning agriculture, but fell short of fulfilling comprehensive patent protection on all plants, besides those whose genetics could be entirely reproduced, i.e., propagated asexually. However, from the perspective of the US Patent and Trademark Office (USPTO), maintaining genetic identity (for instance, by transferring any portion of a mycelium to another suitable substrate) is analogous to the regular practice of making cuttings of, e.g., stone fruit trees, or ornamental plant cultivars. It follows that, at least as far as the USPTO is concerned, the integration of some fungal technologies within the institution of plant patents addresses the law's need for semantic consistency. At the same time, the USPTO's very practical interpretation does not advance a correct conceptualization of the idiosyncrasies of mushroom biotechnology within the patent review system.

However, with the exponential rise in national and international IP across all categories, a major organizational shift in patents occurred in 2013. The adoption of the Cooperative Patent Classification (CPC), effective as of 2015, marked a major shift in how fungal patents will be classified by the USPTO. The impetus behind implementing the CPC was the intention to align the US patent system better with that of other nations, as well as to simplify patent classification. Yet, in some instances, fungi are still jerry-rigged into plant categories (e.g. A01G; Horticulture; Cultivation Of Vegetables, Flowers, Rice, Fruit, Vines, Hops Or Seaweed; Forestry; Watering). Additionally, plant patents will remain in effect, adding a third layer of clutter as, for example, “mushroom” patents can be classified under various CPC classes (as fungi, plants, or microbes) or under US plant patents (as plants).

Although the former US patent classifications were made obsolete as of 2015, the slow attempts of the former system to integrate rapidly evolving scientific understanding continue to hinder IP interpretations of fungi under the CPC. In moving forward, already granted patents remain disjointed across several old classes into which fungi haphazardly fit, rather than being given sensible assignments that address the particulars of fungal biology directly.

It is still unclear if and how fungal patents will receive appropriate attention under the CPC. The continued inclusion of fungi under plant patents appears to trivialize the supposed improved organization of the CPC; legally speaking, fungal technologies lend themselves to being treated as asexual plants, sexual plants, and microbial eukaryotes in their own right. Perhaps a more integrated approach on the part of mycologists and patent examiners could help eliminate whatever ambiguities remain. At the forefront of fungal biology in America, MSA is poised to promote the sensible transfer of our research into useful biotechnologies, especially as fungi-based products and innovations become increasingly popular.

· Ainsworth, G. C. 1976. Introduction to the history of mycology. Cambridge [England]: Cambridge University Press.

· Title 35 U.S. Code, Section 161

· Similar examples extend across all of the classification discussed above