

University of Oregon Leaflet Series

Published by the Extension Division.

Botanical Bulletin

October, 1920

Vol. 6, No. 3, Part I

Toadstool Talks

BY ALBERT R. SWEETSER

Professor of Botany in the
University of Oregon
Eugene, Oregon

It is desired that these leaflets reach those to whom they are of the most service. Accordingly, if you wish them continued, kindly send your request on a postal to the Extension Division, University of Oregon.

Published monthly by the University of Oregon, and admitted as second class matter at the postoffice at Eugene, Oregon.

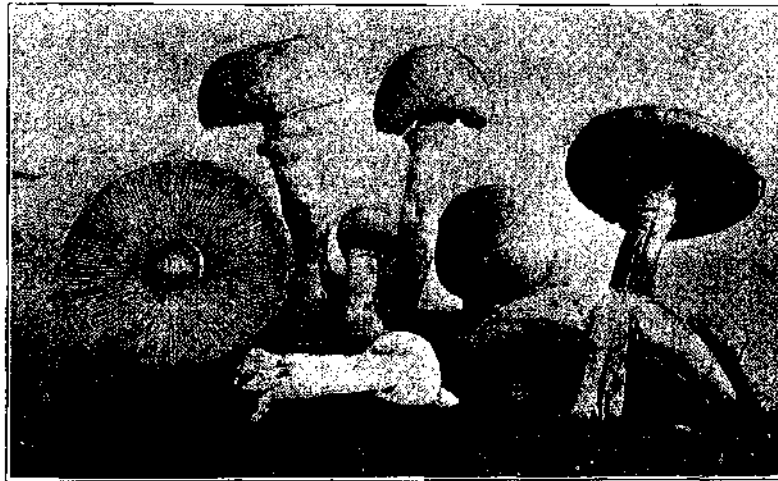


Fig. 1.
Smooth Lepiota (*Lepiota ruscinoides*); edible.

In the upper row are five individuals in various stages from the button to the mature. The left hand lower is a view of the under side with the stem removed and showing gills. The other two are sections of the button and the mature.

Fig. 1.
Smooth Lepiota (*Lepiota naueinoides*)*; edible.

In the upper row are five individuals in various stages from the button to the mature. The left hand lower is a view of the under side with the stem removed and showing gills. The other two are sections of the button and the mature.

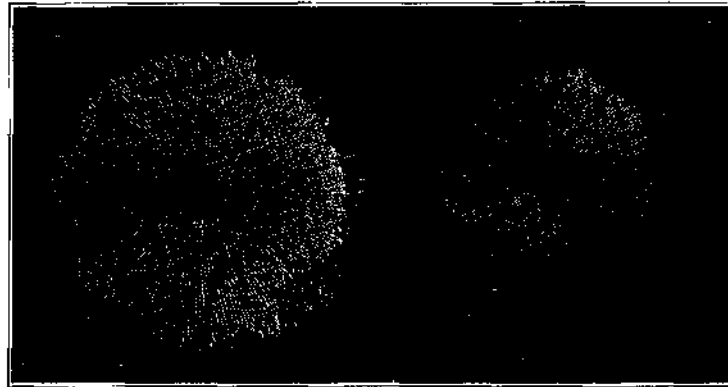


Fig. 2.
Spore Prints.

[2]

Fig. 2.
Spore Prints.

[2]

Toadstool Talks

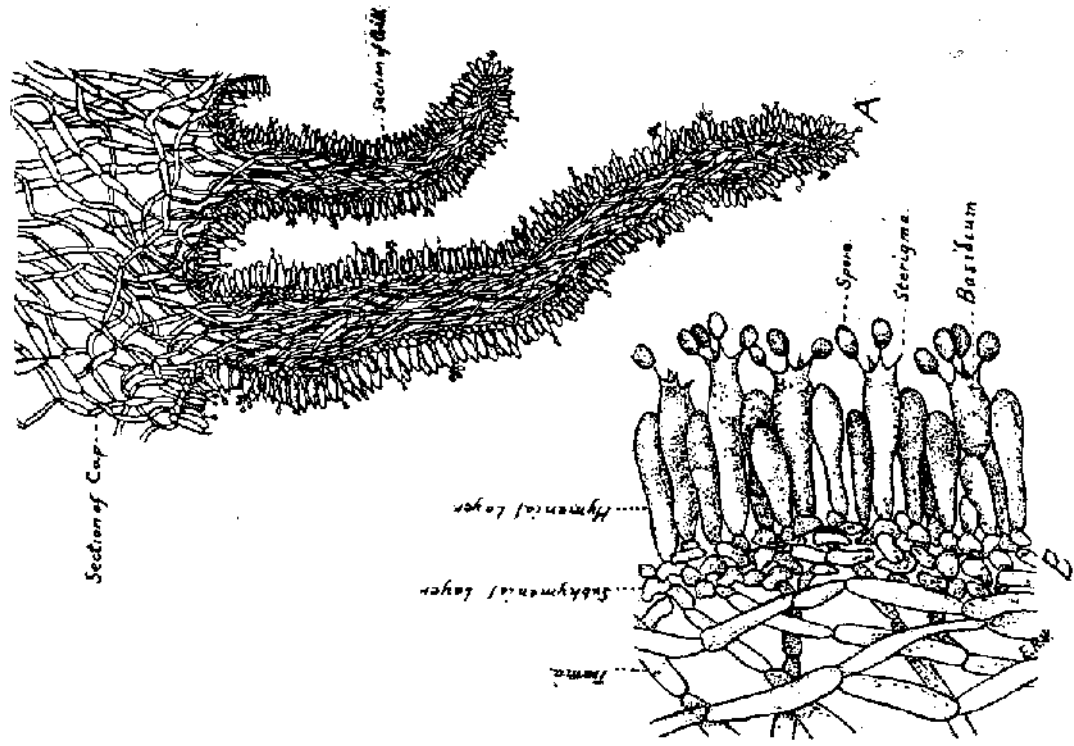
“**T**OADSTOOLS,” says one—“we don’t care to hear about those deadly things; we want to know what we may safely eat; we would learn to recognize the mushrooms.”

Now this distinction in the use of the two words is implied rather than real. They are all toadstools, they are all mushrooms; and some are edible and some are not; but there is *no royal rule by which they may be distinguished*, including the blackening of a silver spoon, ease of peeling, odor, etc., etc. Experiment has demonstrated that several hundred varieties may be eaten, but we do not care to play the part of experimenters, and the only safe plan is to know a few of the clearly differentiated and well-flavored forms and *stick* to them.

Figure 1 is from a photograph of an edible species quite common in our fields and old ploughed grounds in the fall when the ground becomes softened. The stem is usually enlarged below into a sort of bulb, but *not* a cup or socket, tapers upward and has a ring around it. The top or cap is white, sometimes with brown patches or tinged with brown; and on the under side are radiating plates or gills. These gills bear innumerable minute white spores, which have the same office as the seeds of the higher plants, but differ in every other respect. This particular mushroom was chosen to serve as an introduction to the study. When growing in the field it might be mistaken for the pink-gilled meadow mushroom, but its white spores are a distinguishing mark. It has a fine flavor and very rarely harbors worms, which is not true of the meadow mushroom. To recapitulate: Cap smooth as kid; gills and spores white; ring on stem; cup absent.

The cut shows the progressive development from the button to the mature condition. It will be noted that at first the cap is down like a closed umbrella, and its edges are joined to the stem by a thin membrane or veil. As development progresses, the cap is uplifted, breaking away from the stem and leaving the veil attached as a ring. In the lower row to the left is a view of the underside of a mature specimen with the stem removed, showing the gills; then a lengthwise section of a button with the gills still attached to the stem by the veil; and last a similar section of a mature plant.

One of the first divisions in the classification of the toadstool is based on the color of the spores. It will not do to rely upon the color of the gills of the young plant, as the gills often change with age. The method commonly used is to make a spore print, such as seen in Figure 2. This may be done by cutting off the stem close up to the cap and placing the cap, gill side down, on paper



A. Cross Section of a part of Cap and two gills Low power
 B. A portion of gill under high power.

Fig. 3

and covering with a bowl or cup to prevent drafts; the next day the gills will be outlined by the spores, which lie as they fell and in their true color.

DETAILED DESCRIPTION

In figure 3 (A) a thin slice has been cut through the cap and the two gills. A view under a low power of the microscope is given. It will be noticed that the whole plant is a mass of compacted threads, and if we had a similar section of the stem we should find that it was also composed of threads. If we investigate further we shall find, in the soil or decayed wood, or whatever the toadstool may be growing upon, what appear to be masses of colorless roots. But they are such in appearance only, for a microscopic examination would reveal the fact that they are also composed of numerous threads continuous with those of the stem. This underground portion is what is known as the mycelium, which when carefully searched will sometimes reveal enlargements of various sizes, these being toadstools in various stages of development. This underground growth continues until the plants have attained considerable size, when they push into the air, and this accounts for their sudden appearance as if they had sprung at once full grown like a jack-in-the-box. This mycelium combined with manure and pressed into cakes, is the "spawn" of commerce.

Figure 3 (B) shows a small portion of one of tile gills more highly magnified. It will be seen that the threads in the middle of the gill end in swollen tips, or basidia, on the face of the gill, and are packed so closely together as to give the appearance of a smooth surface. On these basidia are four slender threads, each of which carries a spore, the reproductive body.

THE PINK GILLS

The tribe of the Meadow Mushroom is known by its pink gills, pink when young but becoming brown with age. This is perhaps the best known and most commonly gathered of all the mushrooms. It is often spoken of as *The* Mushroom, the emphasis on "the" implying that it is the only safe one. Now although the expert indulges in several hundred kinds, unless one is well versed in the distinguishing marks of the edible forms, it is better to confine one's eating to these pink gilled forms.

The illustration, Fig. 4, shows various stages in the development of one member of this family. This particular species, *Agaricus placomyces*, prefers a little shade and is often found on the edges of woods. While it may be eaten with safety it is not as delicately flavored as its sister, the common Meadow Mushroom. The number of the forms of the Pink-gilled Mushrooms is considerable but they all agree in having pink gills, a ring on the stem, but no cup at the base.

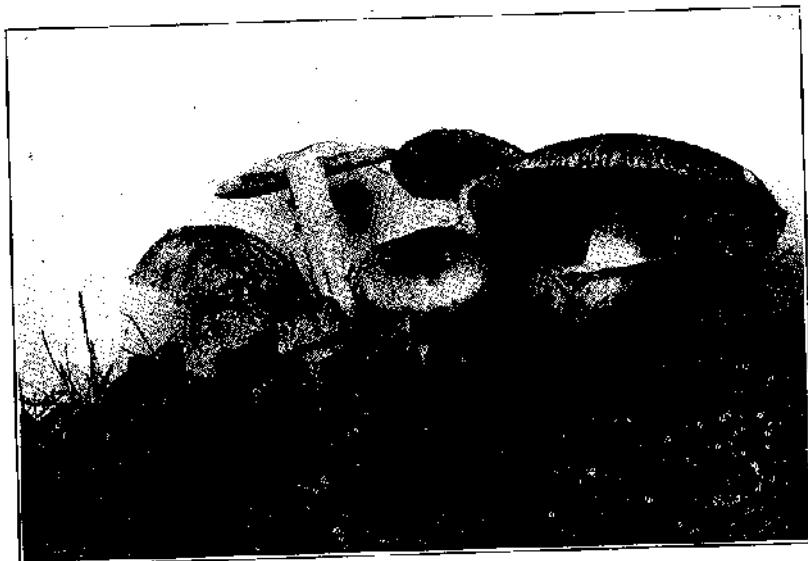


Fig. 4
A Pink-Gill Mushroom.



Fig. 5
A Deadly Mushroom, the Fly Toadstool, *Amanita muscaria*.

THE DEADLY TOADSTOOLS

That there are deadly forms whose consumption will be attended with pain and even death, is not to be denied. And it happens the most deadly are confined to a single family whose characteristics must be thoroughly understood by those who will eat mushrooms. Do not read into this a negative that does not exist, and conclude that all forms not belonging to this family are harmless, for there are a considerable number, not included in this deadly group, whose presence in the digestive organs might produce decidedly disagreeable, or in certain cases even dangerous results.

The danger signals are clearly shown by the member of this genus which is here illustrated, Fig. 5. This is the Fly Fungus, *Amanita muscaria*. It easily attracts attention by its striking cap which is usually some shade of yellow or red and covered with scattered patches of white. The gills and the stem are white, from the stem depends an encircling petticoat-like ring, and on the bottom is a cup in which the stem sits as in a socket. *There is danger in the cup*. This cup, or vulva, as it is called, when present, is sometimes more or less below ground. The whole fungus should be picked.

When young, just peeping above the grawl, the little toadstool is enclosed in a membraceous shell. As it matures it elongates, stretches its shell and finally ruptures it, leaving the lower portion under the ground as the *cup* or *volva*, while the remnant is carried up on top of the cap and usually broken up into scattered patches by the radial increase in the size of the cap. The cap is united to the stem *by* another membrane, but as growth progresses the cap opens up like an umbrella, breaking away from the stem and leaving the petticoat-ring.

Although in some countries small portions of this toadstool are eaten to produce a form of intoxication, it should be avoided. The most deadly of this group, *Amanita phalloides*, is a beautiful and attractive form and has little to suggest its danger. it is often white throughout though sometimes the cap is a shade of yellow. But on the bottom of the stem is the cup, often below ground. This is most common in the Fall but a very similar species and not easily distinguished by the amateur, grows in the Spring and just as dangerous.

In spite of the fact that there are members of this group which are not deadly, yet for the sake of absolute safety they are to be shunned. These are the danger signs : a cup, more or less below the ground, making it imperative always to pick the whole plant when gathering mushrooms; a veil or ring on the stem, and scales or patches on the cap. Too much weight must not be attached to these last characteristics ; and whenever a cup is present, discard the plant no matter what other signs may or may not be present.

On the contrary the absence of the danger signs will not warrant a feeling of safety in the use of any sort as a food. As *was* said in the beginning, so let us repeat emphatically that there is no universal test. *Learn to know a few well marked forms that are safe and be satisfied to confine your eating to them.*

TUBE FUNGI

The collector often gathers a fungus that interests and puzzles him. On top it has the familiar appearance of the usual toadstool, but underneath it is very different. The place of the gills is taken by a spongy, honey-comb-like structure. Fig. 6 is a view from above, Fig. 7 the underneath with central stem removed. The



Fig. 6
Tube Toadstool, *Boletus*

little pores are the mouths of tubes running upward toward the top of the cap. These tubes are lined with an immense number of spore-bearing threads.

Some of these are good and wholesome eating but unfortunately many are visited by insects for the deposition of eggs which speedily hatch into worms. Many however are dangerous, especially the highly colored specimens and those whose flesh changes color when wounded. Caution is the watchword here also.

The Bracket Fungi growing on trees and trunks, belong to this group and always attract the attention. Some of them are fleshy and good eating as the Sulphur Polyporous, with its red and yellow coloration, but most of them are hard and woody. It is something of a fad to trace drawings on the under surface of the woody type.

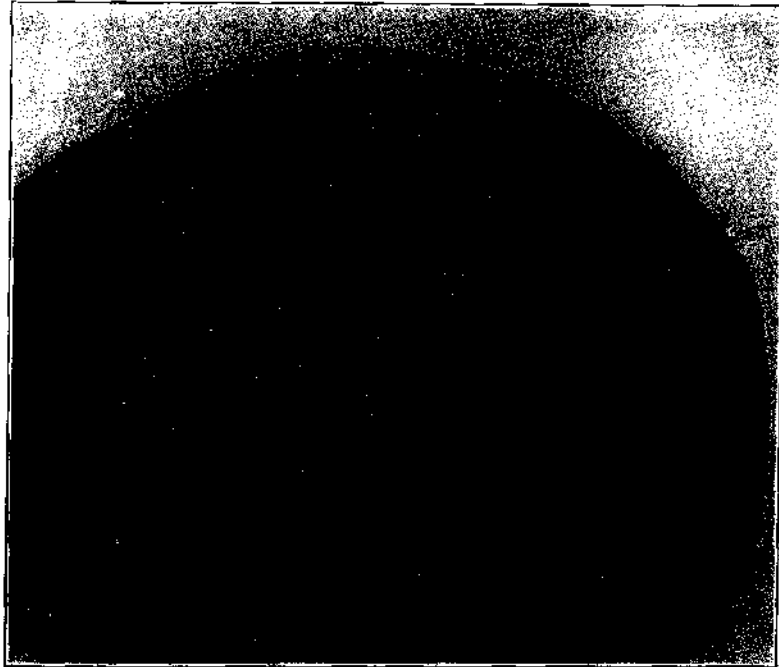
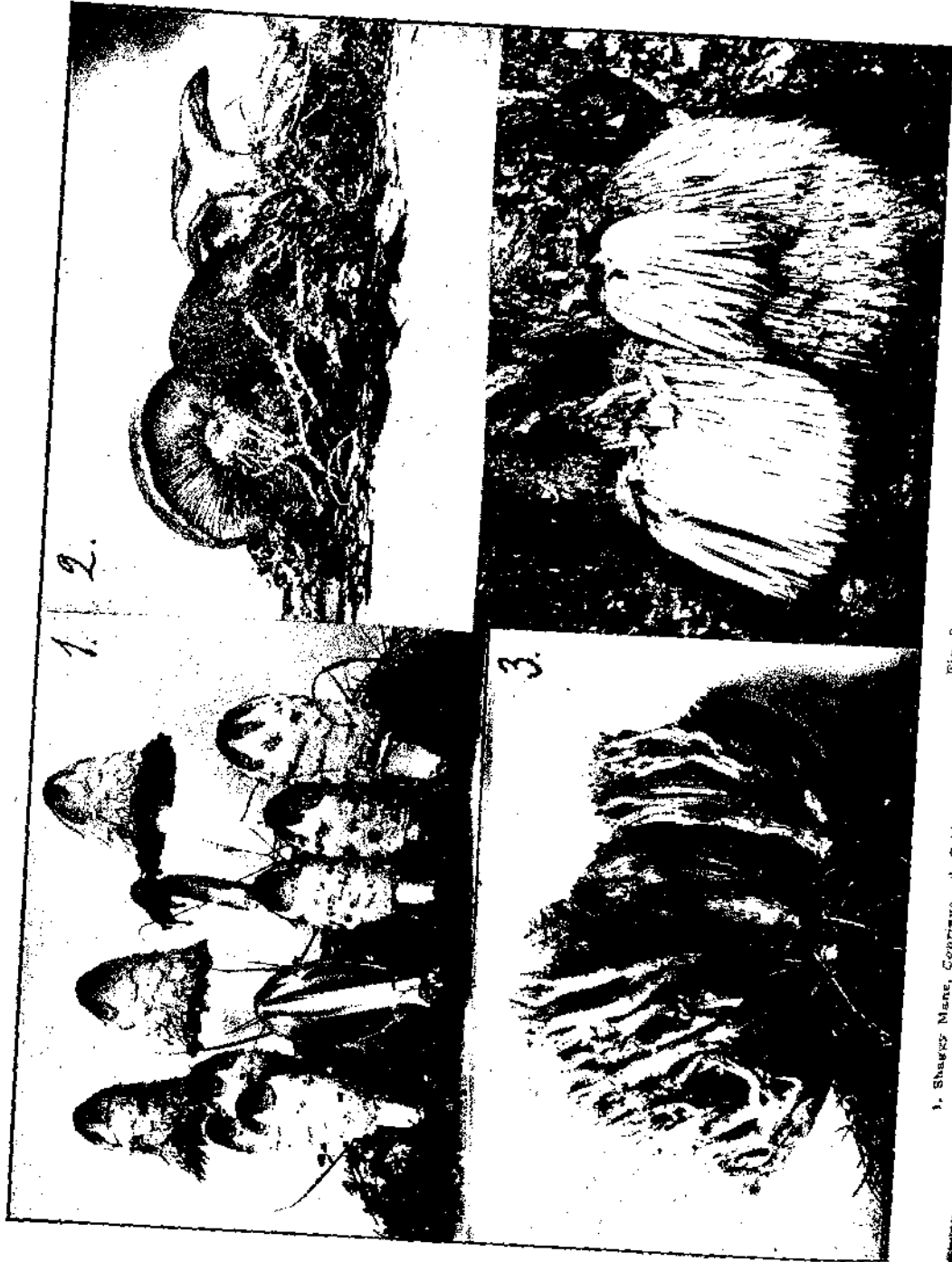


Fig. 7
Under side of *Boletus*, showing the mouths of the tubes.



1. 2.

3.

Fig. 8
 1. Shaggy Mane, *Copreus*. 2. Golden Milk, *Lucterna*. 3. Coral Funck, *Cicouria*. 4. Satyr's Beard, *Hydaron*.

On the contrary the absence of the danger signs will not warrant a feeling of safety in the use of any sort as a food. As *was* said in the beginning, so let us repeat emphatically that there is no universal test. *Learn to know a few well marked forms that are safe and be satisfied to confine your eating to them.*

TUBE FUNGI

The collector often gathers a fungus that interests and puzzles him. On top it has the familiar appearance of the usual toadstool, but underneath it is very different. The place of the gills is taken by a spongy, honey-comb-like structure. Fig. 6 is a view from above, Fig. 7 the underneath with central stem removed. The



Fig. 6
Tube Toadstool, *Boletus*

Puff Balls

ALL puff balls are edible. "What," someone says, "not those little brown balls, growing in the pastures, that send out a brown dust when trodden upon, they are not good to eat?" Certainly not in that stage, but if gathered while white within, every member of this group is not only safe but delicious to eat, and cannot be mistaken for anything else. They grow entirely

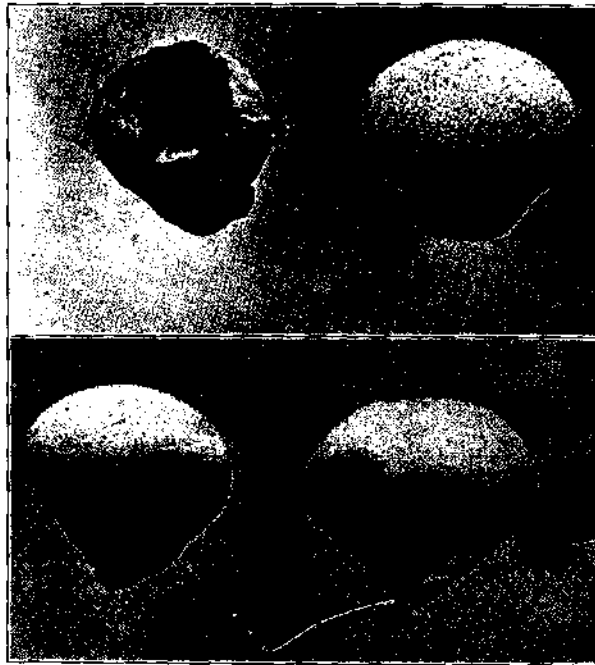


Fig. 9

above the ground or the surface of dead wood or whatever they may be on, and when cut look spongy within and *never show any trace of gill*. The latter will distinguish them from the young or button stage of the common gill-bearing mushroom.

Some puff balls are no larger than one's thumb, while a few species attain the size of a small pumpkin, with variation between these limits.

Figure 9 is the small, meadow puff ball, *Lyeoperdon gentmetum*. The upper left hand one has matured and broken open by a sort of mouth to let the spores escape.

Figure 10 shows the thick skinned, giant puff ball, *Lycoperdon cyathiforme*.

There is an interesting sort of a fungus known as an Earth Star, Geaster. At first this appears like any other puff ball, but has a very thick skin. Later, this skin splits down and flattens out, giving the appearance of a star, in the center of which is perched a thin skinned puff ball, Figure 11.

COOKING

These puff balls may be cooked in any of the ways that mushrooms are served. If they have a thick skin they will need to be peeled. Remember that they must *never be used after they begin to turn color within*, but only while they are white and spongy.

DETAILED DESCRIPTION

If cut lengthwise when young, they will appear more or less spongy within. In some, (Figure 12-A), this spongy structure fills the whole of the inside, while in others there is a denser basal portion. If it were possible to examine a bit of this spongy portion under a microscope, we should find it made up of compacted masses of fine fungus threads known as hyphae, so disposed as to form cavities, giving rise to the spongy appearance. On the ends of the threads terminating in these cavities are the spores. This characteristic places puff balls in the toadstool family.

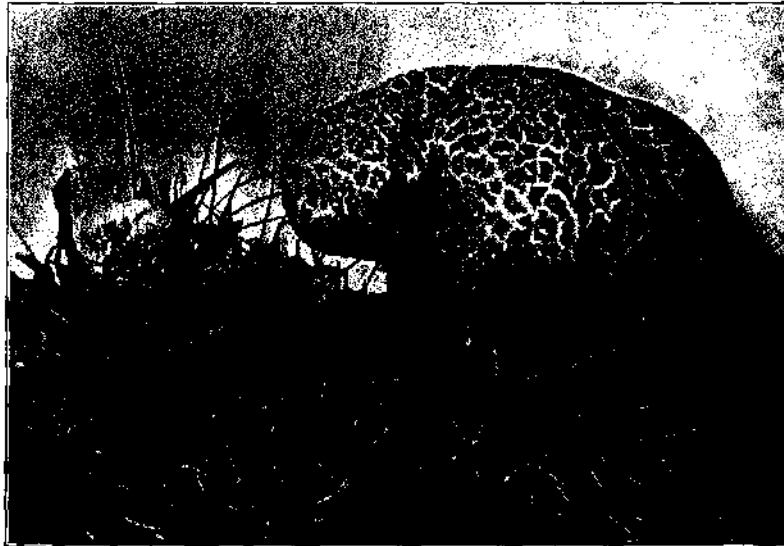


Fig. 10



Figure Earth Stars or Geasters
Fig. 11

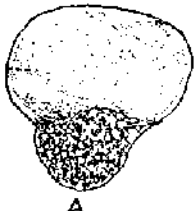
There are different provisions for the escape and dissemination of the spores. In some cases, when ripe, the whole top bursts and liberates the cloud of spores; in others, a hole or pore forms and the escape must be through this. Some go to pieces and decay where they are, and must depend on the breezes to scatter their spores; while others break away from their attachment and go bowling along scattering their spores over a wide area.

FOOD VALUE

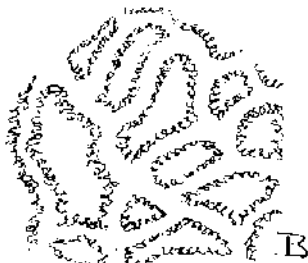
In these days of strenuous conservation, the fleshy fungi are worth considering as an article of food. In former times, extravagant claims were made for them, being called, by some, vegetable meat. This was due to the supposed high nitrogen content. But when we consider the large percent of moisture which they contain, and the fact that possibly not all the nitrogen can be used for food, it will be seen that their value is somewhat diminished. Some authorities consider them of no more value than cabbage or other common vegetables, and so not worth the risk.

But undoubtedly they are a valuable addition to our dietary, and if one sticks to perfectly known forms, they are safe and are worthy to be included as an article of food.

fruiting
portion.



A



B

Section of Pasture Puffball

Fig. 12

PUBLISHED BY THE UNIVERSITY
UNIVERSITY PRESS
1920