LACTARIUS SUBPURPUREUS
No. 1246. NATURAL SIZE
THE LACTARIAS OF NORTH CAROLINA

By W. C. Coker

Plants fleshy, the cells of the cap flesh in great part vesicular as in Russula, when broken exuding a milky juice (latex) which is white or colored (occasionally almost watery) and mild or acrid; gills adnate or decurrent; stem central, its flesh continuous with that of the cap; spores globose to short-elliptic, warted or with combined warts and ridges, very rarely smooth. In a few species the milk may be mild at one time and acrid at another.

This genus is distinguished from Russula mainly by the milky juice, but there are certain more intimate distinguishing characters that are usually present and that one soon learns to recognize, e.g., the cap in this genus is often zoned and the texture is usually less fragile than in Russula. The abundance of the milk varies greatly in different species, and in some, especially after maturity, it may disappear at times. Berkeley and Ravenel describe a species of Lactarius without milk that they name *L. illachrymans*, and it is reported from North Carolina by Curtis, but I have found so many species of Lactarius without milk when dry or old that I agree with Miss Burlingham in not considering this a good species without further evidence.

In practically all texts the spores of Lactarius are described as white, but this is not correct for many species. They vary with the species from pure white through cream, buff, yellowish, to ochreous or light cinnamon and have sometimes a tint of pink or salmon.

All species with pleasant taste when fresh are supposed to be edible, and many of the peppery ones that have been considered poisonous have now been found to be harmless. The peppery taste disappears
in cooking. Only a few species are still thought to be harmful (such as L. rufus, L. torminosus, L. fuliginosus, L. pyrogalus, and L. scrobiculatus), but none should be eaten without caution unless certainly known to be good.

To Miss Gertrude Burlingham, who has carefully studied the Lactarias of America, I am greatly indebted for help in determining a considerable number of my most puzzling collections. For the errors, of course, I alone am responsible. All collections are from Chapel Hill unless some other locality is given. Asheville records were obtained from Mr. Beardslee by correspondence. The photographs were all made by me except that of L. subdulcis, which was taken by Mr. J. N. Couch. All are natural size unless otherwise noted. The spores were drawn by me and inked in by Mr. Curtis Vogler, our assistant in botany. The colored plate was painted by my niece, Miss Gladys Coker.

Important American literature:


**Key to the Species***

A. Milk bright colored from the first....................1
   1. Milk salmon ........................................L. Curtisii (33)
   1. Milk blue ...........................................L. Indigo (28)
   1. Milk dark red .......................................L. subpurpureus (27)
   1. Milk orange or reddish-orange .....................L. deliciosus (25)
   1. Milk saffron-yellow .................................L. Chelidonium (26)

B. Milk white at first, then turning yellow...........
   1. Margin of young cap strongly felted-tomentose..L. scrobiculatus (13)
   1. Margin of young cap smooth or minutely tomentose ........................................2
      1. Entire cap and stem tomentose, white.........L. veillereus (3)

*Figures in parenthesis refer to the species number.

Two species of Lactarius have been found both north and south of us, but do not seem to have been recorded from North Carolina. They are L. involutus and L. alpinus. The former is distinguished by its small size (2-5 cm.), white or pale ochraceous color, very acid milk, minutely silky margin and very small spores; the latter by its small size (1.5-4 cm.), tawny-ochraceous color, squamulose cap and white acid milk. For full descriptions of these see Burlingham, Lactariae of the U. S., Memoirs T. B. C. 14, No. 1: 28 and 79. 1908; or North Am. Flora 9: 177 and 191. 1910.
2. Milk bitterish, then moderately acrid, smell pungent .................................................. *L. theiogalus* (29)
2. Milk decidedly acrid ............................................................ 3
3. Cap light yellow with spotted zones. .................................... *L. chrysorheus* (30)
3. Cap deep yellow, zones faint and unspotted. .................... *L. croceus* (23)
3. Cap maize-yellow with salmon tint, zones faint. ............ *L. delicatus* (24)

C. Milk white at first, then turning lilac or heliotrope. *L. speciosus* (22)

D. Milk or flesh white at first, then turning salmon or reddish or pink ........................................ 1

1. Cap smooth (minutely pruinose when young) .................. 3
1. Cap velvety ................................................................. *L. ligniotus* (41)
1. Cap margin coarsely felted tomentose ......................... 2

2. Milk acrid ................................................................. *L. torminosus* (9)
2. Milk mild ................................................................. *L. subtorminosus* (10)
3. Gills not very distant, stem becoming hollow ............... *L. plinthogalus* (39)
3. Gills very distant, stem solid ..................................... *L. subplinthogalus* (40)

E. Milk white, then turning slowly to a deep brown. *L. luteolus* (46)

F. Milk or flesh white, then turning (sometimes quite slowly) to greenish or olive, or greenish-brown, or greenish-blue, or greenish-cream ........................ 1

1. Cap white, smooth, gills very much crowded. ............ *L. pergamenus* (2)

1. Cap white (at times with faint lilac or cream tints), velvety, tomentose, gills moderately crowded, flesh turning light greenish-cream. *L. subvellereus* Form A (4a)

1. Cap minutely velvety, reddish or pinkish-cinnamon or in part whitish, gills not crowded. .......... *L. Allardii* (5)

1. Cap greenish ................................................................. *L. atroviridis* (8)
1. Cap an earthy-gray-brown color, milk becoming greenish ................................................ *L. rusticanus* (7)
1. Cap yellowish-ochraceous, gills many times forked ................................................................. *L. furcatus* (11)
1. Cap sepia in center, light on margin, milk drying blue-greenish gray .................................................. *L. mucidus* (17)

G. Milk white, or watery white, or light cream color, unchanging .................................................. 1

1. Milk betterish, slightly or not at all acrid .................. 2
1. Milk quite mild, not bitterish or acrid ..................... 4
1. Milk barely acrid, not bitterish ................................. 3
1. Milk moderately or decidedly acrid (also bitterish in some cases) .............................................. 12
2. Cap and stem tomentose ................................................ *L. lanuginosus* (20)
2. Cap and stem smooth (base of stem may be fibrous), margin not striate or faintly so ............... *L. subdulcis* (50)
3. Surface velvety .............................................................. *L. Gerardi* (42)
3. Surface glabrous ............................................................ *L. subdulcis* (50)
3. Surface squamulose, slate gray to smoke gray... L. griseus (38)
      Form A (38a)
3. Surface squamulose, reddish or yellowish brown... L. helvus (36)
4. Texture extremely tough, margin strongly
      cracked, gills thick, very distant......... L. lentus (47)
4. Cap squamulose-warted or floccose-squamulose... 5
4. Cap cracked all over into minute areas...... L. rimosellus (49)
4. Cap not: squamulose or cracked............. 6
5. Cap slate gray to smoke gray.............. L. griseus (38)
      Form A (38a)
5. Cap reddish or yellowish brown............ L. helvus (36)
6. Surface pruinose, gills distant........... L. hygrophanus (44)
6. Surface velvety................................ 7
6. Surface not velvety................................ 8
7. Gills distant................................ L. Gerardi (42)
7. Gills not distant............................. L. corrugis (45)
8. Cap sparingly coarse tomentose........... L. lanuginosus (20)
8. Cap glabrous.................................. 9
9. Odor aromatic, surface not cracked........ L. camphoratus (48)
9. Odor not aromatic............................. 10
10. Milk very abundant, sticky, cap usually rugose... L. voileus (43)
10. Milk not so abundant........................ 11
11. Cap sordid brown............................ L. cyathulus (32)
11. Cap ochraceous-buff or tawny, tall slender plant... L. sp.? (page 59)
11. Cap pinkish tan to wood brown.............. L. subulatus (50)
11. Cap light buff; low, broad plant........... L. quietus (31)
12. Cap white or creamy (brownish-cream in a form
      of L. chrysorheus).......................... 13
12. Cap not white.................................. 18
13. Surface glabrous, even on margin.......... 14
13. Surface not glabrous........................ 15
14. Not zonate, flesh thin, gills very crowded, only
       1 mm. wide............................... L. pergamenus (2)
14. Not zonate, flesh thick, gills 2-3 mm. wide... L. piperatorus (1)
14. Zonate, brownish-gray...................... L. circellatus (18)
      Form A (30a)
15. Surface velvety tomentose.................. 16
15. Surface slightly tomentose, brownish-gray,
      zonate.................................... L. circellatus (18)
15. Surface glabrous except on margin.......... L. deceps (6)
16. Gills distant................................ L. vellebus (3)
16. Gills close ........................................ 17
17. Stem bluish gray at top........................... L. subvellereus.
   Form A (4a)
17. Stem not bluish gray at top...................... L. subvellereus (4)
18. Margin persistently felted-tomentose until matura-
    ture .............................................. L. torminosus (9)
18. Margin not tomentose at maturity ............... 19
19. Stem distinctly spotted, gills little forked...... L. insulsus (14)
19. Stem distinctly spotted, gills repeatedly forked L. furcatus (11)
19. Stem not distinctly spotted ...................... 20
20. Cap velvety, dry .................................. 21
20. Cap squamulose, dry, color russet-vinaceous... L. griseus.
   Form A (38a)
20. Cap not velvety, viscid, at least when wet..... 22
20. Cap not velvety, dry or faintly viscid......... L. subdulcis (50)
21. Cap deep red-brown .............................. L. Peckii (37)
21. Cap slate or smoky-gray ........................ L. griseus (38)
22. Stem very short, cap fibrous, quite viscid...... L. ciliicoides (12)
22. Stem not very short .............................. 23
23. Cap very viscid, slimy ......................... 24
23. Cap moderately viscid when wet ............... 25
24. Cap reddish orange ................................ L. coleopteris (16)
24. Cap buff, surface rugose ....................... L. agglutinatus (19)
24. Cap yellow-brown with olive tint ................ L. turpis (21)
24. Cap smoky-gray with tint of violet ............ L. cinereus (35)
25. Cap orange to buff or straw color, usually zoned L. insulsus (14)
25. Cap not zoned, grayish-lead with liver tint... L. trivialis (15)
25. Cap not zoned, fulvous in center, cinnamon to-
    wards the crenate margin ..................... L. minusculus (34)

1. Lactarius piperatus (L.) Pers.

   **Plate 2.**

   Cap about 6-12 cm. wide, depressed in center and margin upturned;
surface quite smooth and somewhat shining, nearly milk white, or
with dull dirty white or buff shades. Flesh white, rather soft, not
changing color on exposure. Milk copious, white and unchanging,
exceedingly peppery.

   Gills only fairly close, many forked, from 2-3 mm. deep; creamy
at first, then darkening a little, becoming light buffy brown where
bruised.
Stem usually short and tapering downward, about 3 cm. or sometimes up to 5 cm. long, varying much in thickness, 1.3-2.5 cm. in diameter, quite smooth or slightly pruinose, white, or with buff shades and stains, solid, but with soft flesh like the cap.

Spores (of No. 585) varying greatly in size in the same spore-print, pure white, short-elliptic, very minutely warted to almost smooth, 6.7-7.5 x 8-13, averaging about 7.4 x 11μ.

A large white species that is common in dry woods in fall and not rare in summer. It is distinguished from L. deceptivus by smooth stem and more crowded and narrower gills; and from L. glaucescens by the much less close and somewhat deeper gills, the milk not turning greenish and cap more shining. The plants also run considerably larger than L. glaucescens, and the flesh is somewhat firmer, and the milk more peppery than in that species. Distinguished from L. velereus by smooth cap and stem and closer gills.

In the mountains of this State (Pisgah Forest) Miss Burlingham found a fragrant form of this species of which she writes as follows:

"In North Carolina I found plants agreeing in all other essentials with Lactoria piperata except that the latex dried a pale yellowish, and the fresh plant when wet or when rubbed had the odor of crushed blackberries, and the gills were slightly less crowded. This can scarcely represent more than a form of the species, and on account of the odor, which is the distinguishing characteristic, I will refer to it as form fragrans. It is No. 79, 1907, of my North Carolina plants. Gillet recognizes a form amara, in which the milk becomes yellowish in drying, but the plant is odorless."

586. Low place below branch below Howell's spring. October 17, 1912.
906. Woods near cemetery, October 10, 1913. Spores 6.3-7.5 x 7-8.5μ, very minutely warted.
1052. Woods south of South Building, September 16, 1910.
1211. On side of well shaded hill near path along right-hand side of Bowlin's Creek, a short distance below Fern Banks, July 25, 1914. Photo.

Common, in dry woods. Curtis.
Blowing Rock. Atkinson.
Asheville. Beardslee.
2. *Lactarius pergamenus* Fr.

*L. glaucescens* Crossland.

**Plates 3 and 40.**

Cap 7-13 cm. broad, depressed in center at maturity, the margin upturned, surface dry, not zoned, smooth or more often rugose-wrinkled as in *L. volemus*, especially towards the center, glabrous, nearly white or with brownish-buff shades and deeper colored areas, especially when old; rarely with a faint pinkish tint. Flesh nearly white or creamy, firm and solid. Milk white at first, changing slowly to a glaucous green or not changing, very peppery or at times only moderately so.

Gills very close, narrow, many forked, only 1.5 mm. wide, white at first, then light fleshly cream, turning honey color in fresh plants when wounded, or a glaucous green usually where there is much milk, and in age becoming dull cinnamon-straw color.

Stem 4-5 cm. long, smooth, pruinose when very fresh, color of cap, 1.3-1.7 cm. in diameter in middle, tapering very gradually downward, very firm and solid.

Spores (of No. 904) pure white, spherical to short-elliptic, smooth, 5-5.6 x 6-7.5μ.

This species is most like *L. piperatus*, but differs in the much closer and even narrower gills, more solid and firm flesh, much less peppery milk, and smaller and smoother spores. The green color of the milk cannot be relied upon, as in the same plant it may change color in one part and not in another.

Miss Burlingham has recognized the name *L. glaucescens* as covering the form with greenish change, but our plants agree so exactly with Fries' description that I do not think we are justified in considering this whimsical character as of specific importance.

Very abundant in summer. In mid-July, 1917, it was more abundant, perhaps, than all other mushrooms put together, and it is, therefore, important to know that the species is not only edible but very good when properly prepared. If the plants are parboiled and the water thrown away the peppery taste is got rid of, and they may then be creamed or otherwise served to taste.
904. Woods near cemetery, October 10, 1913. Photo.

1195. Scattered through low woods south of cemetery, July 23, 1914. A fine lot of plants in all stages, giving good evidence of the species character. Many were decidedly rugose, mostly in central part, quite as much so as L. volutus often is; milk plentiful and moderately peppery, white at first, sometimes turning a fine olive green and sometimes not turning green. Many cuts were made to test this, and in most of the plants some of the milk would turn green and some would not, just as in collection No. 904. Spores pure white, spherical to short-oval, smooth or minutely roughened, one large oil drop, 3.4-5.1 x 5.1-6.8 μ.


1550. Mixed pine and oak woods by path to Meeting of the Waters, June 18, 1915. Spores elliptic, slightly roughened, 4.5-5.4 x 6.3-7.5 μ.

1588. In dry sandy soil in woods north of Judge Brockwell's, June 21, 1915.

1672. Woods near Meeting of the Waters, July 26, 1915. The largest of these typical plants was 13 cm. wide. In one of the young plants the gills were of a decided green tint all over when untouched.

Low districts, in woods. Curtis.
Blowing Rock. Atkinson.
Asheville. Beardslee.
Pink Bed Valley (as L. glaucescens). Burlingham.

3. Lactarius vellereus Fr.

Plates 4 and 40.

Cap deeply infundibuliform, often containing water like a cup, and frequently split down one side; when young strongly involute on the margin. Surface dry, whitish or buffy, closely and finely tomentose, or varying to more roughly tomentose, smooth. Flesh about 8-10 mm. thick near stem, moderately soft, white, but turning a dull brownish yellow or cream color when cut. Milk white and remaining so or changing to a decided creamy yellow, very peppery.

Gills usually somewhat distant when young, becoming distinctly distant at maturity, narrow, not regularly forking, but the short marginal ones often anastomose with the long ones; color nearly white when young, turning maize yellow at maturity, with faint tint of flesh color when seen at an angle.

Stem short, stout, tapering downward, 3-4 cm. long and about 1.5-2.5 cm. thick, solid but soft inside and often cavernous by grubs;
surface white, minutely soft-tomentose, the white tomentum often missing in areas, sometimes over a large part of the stem (such places are smooth and show the brownish tan sub-layer).

Spores (of No. 1385) oval or slightly elliptical, very minutely tuberculate, or some seem smooth, 6.6-7.5 x 7.5-9.5μ. Cystidia cylindrical, often with a point or knob.

A large species, usually white all over except for yellowish discolorations in age. Dried plants are a rich buff or buffy cinnamon, the stem often darkest; the gills reddish brown and glaucous. It may be distinguished from all others near it, except L. subvellereus and L. Allardii by its tomentose cap and stem. It is very common in woods in summer, more common at times even than L. piperatus, L. pergymanus, and L. deceptivus. The latter, which has a tomentose stem, is easily distinguished by the conspicuously rough spores and lighter color of all parts when dry. Miss Burlingham also mentions the occurrence at times of yellowish latex in this species as recorded by Earl and by Massee.

108. Mixed woods near Sparrow's Point. October 2, 1908.
109. Open woods east of campus, September 18, 1908.
110. Battle's Park, below Piney Prospect, October 13, 1908.
1199. In hollow south of cemetery and near path by branch west of cemetery, July 23, 1914. Photo. Milk white, but changing to a decided cream-yellow, very peppery.
1207. By path along Battle's Branch, just where east path to Piney Prospect leaves the branch, July 24, 1914. Spores spherical to short-elliptic, some apparently quite smooth, others with a few minute tubercles, 7-9 x 8-11μ.
1551. Woods south of athletic field, near branch, June 18, 1915. Spores subspherical to elliptic, smooth, clear, 5.4-6 x 7.2-9.4μ.
1585. In woods by path to Piney Prospect, June 21, 1915. Spores subspherical, nearly smooth, 6.6-7.5 x 7.5-8.5μ.
1632. Among leaves by branch north of Meeting of the Waters, July 23, 1915. Photo. Gills distant, about 4 mm. deep in middle, pale cream color, brownish-buff when wounded; milk peppery, turning cream and tan-buff; cap tomentose; stem minutely tomentose, in places only pruinose; flesh turning creamy when cut.

Blowing Rock. Atkinson.
Common, in dry woods. Curtis.
Asheville. Beardslee.

Plants considered typical of this species except for somewhat more distant gills were collected in the mountains of this State by Miss Burlingham. She describes the species as follows (Mem. Torr. Bot. Club 14:23. 1908):*

“Pileus fleshy, thin, convex, soon umbilicate, at length nearly infundibuliform, white, becoming tinged or spotted with yellowish, and when dried cinnamon colored (323.t.1-4), azonate, dry, covered with velvet-like tomentum, 7.5-15 cm. broad, margin at first and for some time very involute, at length spreading; gills white to pale cream-colored, staining amber-white (12.t.4) where the latex dries, often forking, adnate or slightly decurrent, narrow; stem white, tapering slightly toward the base, dry, velvety-pubescent, firm, 1.8-2.8 cm. long, 1.2-2.5 cm. thick; flesh amber-white, odor faint; spores subglobose, smooth, 6.6-6.5 x 6.5-7.5 μ, latex pale cream-colored or whitish, very acrid, usually abundant.


“**Distinguishing Field-Marks:** This species differs from *L. vellerea*, to which it is closely related, in the narrow close gills, and the finer velvety tomentum or pubescence covering the pileus and the stem. The latex is cream-colored or dries yellowish on the gills. The change in color of the pileus and stem during drying is a marked characteristic.”

Mountains. Burlingham.

4a. *Lactarius subvellereus* Pk. Form A.

**Plates 5 and 40.**

Cap of moderate or large size, up to 15.5 cm. wide, strongly depressed in center, the margin plane or drooping, more graceful than *L. vellereus*; color white, sometimes with faint lilac or cream tints, very closely and finely tomentose all over. Flesh thin, only about

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*I consider it very doubtful if *L. subvellereus* is a good species. The few characters supposed to separate it from *L. vellereus* are quite variable and confusing. Plants with close gills may have coarse tomentum and those with distant gills may have plush-like tomentum. The only two distinctions brought out by Peck are the closer gills and yellowish change in milk. The latter is often shown by typical *L. vellereus*.***
7 mm. thick near the stem, firm, white, turning light greenish cream when cut, with a faint tint of bluish gray, peppery to the taste. Fresh milk was not obvious, as the plants were very dry, but it probably turns a greenish cream as indicated by cut flesh.

Gills quite close when young, moderately narrow, about 2-2.5 mm. deep in good-sized plants, light greenish cream in young plants, then dull cream, then cinnamon-buff (Ridgway). The gills fork only slightly, but often anastomose, particularly near the margin. In this collection (No. 1218) the gills in all the six plants were abundantly dotted on the edges with small milk-white droplets of dried milk.

Stem rather short, but not so stubby as in *L. vellereus*, 2-4.5 cm. long, 1.2-2 cm. thick, tapering downward; surface finely velvety like the cap, white except at the top where it is bluish gray. The flesh is like that of the cap and turns the same color when cut, very solid and not becoming cavernous.

Spores white, smooth, oval, 5.1-6.5 x 6.8-8.5μ.

One of the most notable characters of this collection was the bluish-gray color of the stem surface at the top and the faint tint of this same color in the gill surface and cut flesh.

The plants differ from typical *L. vellereus* in the closer and narrower gills which are not maize-yellow; more finely tomentose cap (the tomentum of *L. vellereus* is in places almost hairy under a lens); firmer stem; more graceful shape, and tints of green in cut flesh. It is like *L. subvellereus* except for the swamp habitat, the bluish-gray color of the stem apex and same tint plus greenish in the cut flesh. In these characters and in the greenish tint of flesh it approaches *L. Allardii*, but it differs from that in the white cap, gills not distinctly veined and not becoming reddish brown finally when wounded, in the less finely velvety cap and in the very different appearance of the dried plants which have lighter gills and darker, smoother stems than in *L. Allardii*. Miss Burlingham has seen my plants (No. 1218) and confirms their reference to *L. subvellereus*.

1218. In swamp of New Hope Creek, one-quarter mile below Durham road crossing, July 27, 1914. Two photos.
5. **Lactarius Allardii** n. sp.

**Plates 6, 7, and 40.**

Cap up to 17 cm. broad, azonate, deeply infundibuliform, the margin strongly inrolled until maturity, then nearly plane or uplifted, uneven, wavy, and often deeply lobed and distorted, surface quite dry, minutely velvety, not distinctly tomentose as in *L. vellereus*, color reddish cinnamon or pinkish-buff, often lighter towards the margin, sometimes with whitish areas where covered with leaves; when quite young the margin is white, then pinkish-buff or cinnamon. Flesh firm, thick, coarse, dry, rather brittle, about 1 cm. thick in middle, white, but slowly turning to pink with a faint lavender tint when cut. In young plants, where the milk appears on cutting, the pinkish tinge is followed after some minutes by an olive color; odorless until old age, then with a somewhat sweetish smell. Milk sticky, tardily but decidedly acrid, sparse, white at first then passing through the same colors as the cut gills.

Gills moderately close to rather distant when young, becoming sub-distant to distant at maturity, from 1.5-3 mm. apart, nearly equal the whole length, about 2-4 mm. wide, attached to stem and only slightly decurrent, strongly veined at cap, more or less branched and sometimes anastomosing, many short ones, color when very young white, then a distinct cream, not dark with age, tinted here and there with pinkish-lavender; when wounded turning slowly to a distinct dull green, then to olive, and after a long time to deep reddish-brown or smoky-brown, and finally blackish-brown.

Stem short and thick, about 3-4 cm. long and 2.5-3 cm. thick, tapering downward, surface texture like that of cap, minutely velvety tomentose (scarcey more than pruinose); color pure white when quite young, then whitish or brownish below and pinkish-lavender or pinkish-buff above, or cinnamon-buff and white; texture firm and rather rigid, inside stuffed then cavernous in age.

Spores (of No. 1670) white, spherical to sub-elliptic, smooth or a few apparently minutely roughened, 6-9 x 7-10μ in diameter. Cystidia about 20-35μ long, mostly abruptly long pointed.
A large, brittle, deeply infundibuliform plant with velvety cap and stem, distant, cream-colored gills, and white, acrid milk, which slowly changes to olive and then deeper. It is most like *L. vellereus* and *L. subvellereus* Pk., but is easily distinguished by its decided color, milk turning olive green then red-brown on exposure, veined gills, lavender pink tint of stem surface and cut flesh. The dried plants of all the collections are distinctive in appearance and are unlike specimens of any form of *L. subvellereus* or of *L. vellereus*, particularly in regard to the stem, which is whitish and not rich buff or cinnamon and lacks the smooth velvety appearance of the others. The dried gills are a dark reddish-brown with a dull olive tint and are often very glaucous from the spores.

I take pleasure in naming this species for Mr. H. A. Allard, my first assistant in botany, who is now with the U. S. Department of Agriculture.

1154. In hollow southeast of athletic field, July 16, 1914. Two photos.
1176. Near branch, about 200 yards west of Meeting of the Waters, July 21, 1914. Milk becoming a distinct olive green; spores pure white, elliptic or subspherical, usually smooth, 5.5-7 x 7-10 μ.
1178. In hollow southeast of athletic field, July 21, 1914.
1670. In mixed woods not far from Meeting of the Waters Branch, July 28, 1915. Photo. Type.
1726. Sandy soil in woods by branch north of Meeting of the Waters, September 10, 1915. Spores subspherical to short-elliptic, mostly quite smooth, a few minutely or doubtfully roughened, 6-8 x 7-9 μ.
1874. In mossy, shaded, low place by branch, one-quarter miles below Meeting of the Waters, September 24, 1915. Photo. Three plants exactly like No. 1670, except that the gills were only sub-distant.
2329. Woods near branch above Meeting of the Waters, June 30, 1916. Ten fine plants; spores sub-globose, doubtfully roughened under highest power, 6-7 x 7-8.5 μ.
2345. Damp woods by road to Scott's Hole, July 3, 1916.
2748. Low woods, Battle's Park, July 21, 1917.


*Plates 8, 9, and 40.*

Cap usually about 10-11 cm. broad, deeply umbilicate, at first with the margin arched and strongly inrolled, later more expanded and
infundibuliform with the margin uplifted, still inrolled, outline rather regular, or lobed and unevenly developed on one side; surface quite glabrous except on the margin, which is typically covered with a soft, tomentose, cottony roll, appearance of white kid at first, with buff or brownish-ochraceous or cinnamon stains, then more or less cracking or roughish and more chalky looking. Flesh about 7 mm. thick at stem, pure white, elastic, not brittle, rather slowly but decidedly acid, and with an unpleasant taste, thinning quickly on the inrolled portion; smell like sour bread, strong after maturity. Milk white, unchanging, acrid, sparse.

Gills rather crowded, in age less so, appearing slightly decurrent, 3.5-4.5 mm. wide in center, narrow at each end, white at first, then pallid cream, with an olive tint as they begin to dry, turning ochraceous or dull brown when bruised, some forked. Margin regular and even, remarkable for the fine fibers which often stretch across from gill to gill and are made visible by the spores that stick to them. They may be seen both in half-grown and mature plants.

Stem about 2-3 cm. long and 1.5-2.5 cm. thick at top, tapering downward and firmly attached at the blout base by fine mycelium; surface beautifully and densely soft white tomentose all over, quite firm and solid all through, the flesh like that of the cap, but at times with ochraceous stains.

Spores (of No. 1877) white, regularly elliptic, distinctly tuberculate, 7.4-8 x 10.6-11.2μ.

The plants grow among leaves and are often covered by them. The white mycelium is conspicuous running from the base of the stem.

This species is much like L. velereus, but the cap is not tomentose as in that species except for the marginal roll, the spores are strongly warded, and dried plants are much lighter. It is also shaped like L. piperatus, but is easily distinguished from that species by the tomentose stem and much deeper and less crowded gills. For an illustration in color see N. Y. St. Mu. Rep. 54: Pl. 70. 1902.

121. Chapel Hill, October 24, 1910.
558. Pine and oak woods near path south of campus, October 14, 1912.
883. In leaves, mixed woods south of cemetery, October 5, 1913. Photo. Spores tuberculate, 6.5-9.2 x 7.4-11μ.
1877. Sandy soil in path by branch north of Meeting of the Waters, September 27, 1915. This is *L. deceptivus*, but is distinguished from the usual form by the entire absence of tomentum on the margin at all ages, by the closer and narrower gills. The smooth margin is probably due to the very dry weather.

2831. Low, damp deciduous woods at foot of Lone Pine Hill, September 14, 1917. Photo. Nearly white, but soon with buffy stains, old wounds changing to buffy-cinnamon. Spores strongly warty, 6.6-7.8 x 9-11μ.

Blowing Rock. Atkinson.

N. C. mountains, 1,000 to 1,675 meters elevation. Burlington.

Asheville. Beardslee.

7. *Lactarius rusticanus* (Scop.) Burl.

*L. pyrogalus* Fr.

**Plates 10, 11, and 40.**

Cap 10 cm. broad, nearly flat, the center depressed. Surface smooth except for a scurfy appearance from the collapse in places of the lighter superficial layer; color a peculiar earthy gray-brown (near light drab—Ridgway) with zones of deeper soaked brown. Flesh white, thick, firm, unchanging. Milk white, moderately acrid, changing slowly to a light greenish-brown.

Gills light creamy-white, becoming fleshly-cream and sordid when bruised, ochraceous-buff at maturity, moderately close, about 4 mm. deep in center, scarcely pruinose.

Stem very smooth, even, brownish silvery-gray to ochraceous-buff, solid, 3-4.5 cm. long, 1-1.5 cm. thick.

Spores (of No. 1166) cream color, spherical, tuberculate, one oil drop, 6.5-7.4μ.

Miss Burlington gives the range of this species as south only to Maryland.

1166. In sand in bottom of dry-weather branch, below sphagnum moss bed, July 20, 1914. Photo.


Blowing Rock. Atkinson.

**Plates 12 and 40.**

A firm heavy plant up to 10 cm. in diameter, with very short stem. Cap covered with a deep green tomentose-fibrous superficial layer which is distributed in different degrees in expanding; where it is thinnest the color is less intense. Flesh about cartilage color, scarcely changing when cut. Milk white, changing after a good while to a light dull green, very peppery.

Gills reaching stem, and in some cases slightly decurrent, only 3.5-5 mm. deep, not crowded, many short, but no forked ones, pallid flesh color changing to dull green then dirty earth color when bruised.

Stem short, 2.5-4.6 cm. long, 1.5-2.2 cm. broad at top, tapering downward, very fragile, stuffed, but hollowed by grubs. Its surface is like that of the cap, and it is also blotched in the same way with deeper and lighter green.

Spores light cream, spherical, distinctly tuberculate, 6.5-7.4μ in diameter.

Not before reported south of the District of Columbia. For an illustration in color see *Mycologia* 8: Pl. 187. 1916.

872. About twenty feet from the brook in Battle's Park, behind Dr. Wheeler's house, October 3, 1913. Photo. Spores as above, 5.5-8.3μ.
903. Woods, Battle's Park, September, 1913.
1721. Growing in woods near branch west of Meeting of the Waters, September 9, 1915.
2300. Mixed woods south of Dr. Pratt's, June 28, 1916.


**Plates 13 and 40.**

Cap large, usually 10-12.5 cm. broad, strongly depreseed in center to nearly infundibuliform, the margin involute until full maturity, surface zonate, dull-ochraceous or lighter creamy-tan with tints of pink or lavender pink at times, and in our plants always more or less distinctly zonate, viscid, felted tomentose on the marginal third until maturity, the margin most felted and remaining visibly so until full maturity or old age. Flesh only 6-7 mm. thick at stem, white, un-
changing or (in a Chapel Hill form) turning when cut (if not too old) to light pink with or without a light tint of lavender; odor very slight, pleasant. Milk abundant, light creamy white, not changing, very acrid, but not otherwise disagreeable.

Gills crowded, narrow, only 3-4 mm. wide, nearly equal, the whole wavy, attached, some forking at the stem, nearly white, then creamy, then maize yellow with a distinct flesh tint, turning sordid brown when bruised.

Stem short, stout, 2.5-3 cm. long, and 1.6-2.2 cm. thick, usually equal, minutely pruinose-felted or somewhat smoothish, nearly white with more or less distinct yellowish scrobiculate spots, and sometimes with lavender-pink tints, firm and brittle, becoming hollow, the flesh at times becoming pink when cut.

Spores yellowish, elliptic, strongly tuberculate, 5.5-7.4 x 7.4-9.2μ.

Easily recognized by the large size, felted margin, and unchanging acrid milk. Distinguished from *L. cilioides* by zoned cap with center smooth and less bright color of the gills when dry. It is poisonous, but the poison is said to disappear on cooking (*Ford. Jour. Phar. and Exp. Ther.* 2:296. 1911). The species is described as having unchanging flesh, and this was true of our No. 764. In Nos. 2361 and 2393, on the other hand, the flesh turned pinkish when cut, though in other respects the plants were just like the typical form. The colored figure, given in *Mycologia* 8: Pl. 87. 1916, would give a very misleading idea of our plant. Dried plants of this species at the New York Botanical Gardens appear exactly like ours.

764. Woods near Battle’s Brook, Chapel Hill, September 14, 1913. Milk white, unchanging, decidedly acrid; pock-marks on stem, small and faint; no forked gills; flesh and gills not turning lilac or pink when cut or bruised; spores warted and ridged, 6.6-7.5 x 7.5-8.5μ. This is typical *L. terminosus*.

2361. Under cedars behind President’s house, July 5, 1916. Photo.

2393. Under cedars behind President’s house, July 18, 1916. In this and in No. 2361, representing numerous plants, the flesh turned light pink when cut.

Blowing Rock. Atkinson.
Asheville. Beardslee.
Pisgah Forest. Burlington.
10. *Lactarius subtorminosus* n. sp.

**Plate 40.**

Cap 5-6 cm. broad, irregular, coarsely tomentose, whitish with creamy or honey-colored zones, margin involute.

Gills crowded, 2-3 mm. broad, a few forked, cream at maturity, turning pink then light smoky-brown when cut.

Stem 1.5 cm. long, tapering downward, 1.1-1.5 cm. thick above, white with a few creamy dots, densely but minutely tomentose *all over*, or with a few scrobiculate spots, hollow.

Milk white, very scarce, quite mild. Taste of flesh like cypress wood.

Spores moderately warted and ridged, subspherical, 5.8-6.5 x 6.5-7 μ.

This differs from *L. torminosus* (our pink-changing form) in the quite mild milk and much smaller spores. It differs from *L. speciosus* in change to *pink* and *smoky, not heliotrope*, and in the much smaller spores.

2813. In weeds and shrubs by sidewalk near Mrs. Gore's house, July 3, 1917. Type.

11. *Lactarius furcatus* n. sp.

**Plates 14 and 40.**

Cap 6-10 cm. broad, infundibuliform at maturity with the margin plane and narrowly revolute; surface with low, felted tomentum all over and remaining so, moderately viscid when wet, yellowish ochraceous, faintly many-zoned; margin not striate. Flesh white with distinct zones of dull ochraceous, up to 7 mm. thick near stem; no decided odor. Milk not abundant, white, then after many minutes a distinct glaucous green and remaining this color indefinitely; moderately acrid.

Gills quite crowded, very narrow, only 1.5-1.8 mm. wide, all *forking three or four times*, color fleshy-ochraceous with a tint of salmon.

Stem 2-3 cm. long and about 1.3 cm. thick, firm, solid, and tough, surface light yellowish with small ochraceous spots.
Spores fleshy-ochraceous, short-elliptic, faintly tuberculate, pointed and somewhat bent at one end, 3.5-4 \times 3.7-6.6 \mu.

This large and very distinct species is decidedly marked by its crowded, much-forked gills, tomentose cap, and acrid milk which becomes green. It seems to be related most closely to *L. torminosus*, from which it is easily separated by its forked gills, green milk, and its nearly smooth and much smaller spores.

2232. Bank of New Hope Creek, near Durham bridge, June 24, 1916. Photo. Type.

12. *Lactarius cilicioides* Fr.

**Plate 15.**

Cap 4-9 cm. broad, usually about 6-7 cm., sharply depressed in center, usually irregular and lobed; the margin extending beyond the gills and strongly inrolled when young, becoming plane only at full maturity or remaining sharply bent down; surface quite viscid, and often cracked and roughened, azonate, covered with viscid fibers which are usually stuck together and collapsed on the surface. In some cases a superficial, thin, viscid, shiny pellicle seems to cover the fibers. On the incurved margin the tomentum appears as a dense roll of coarsely woven and partly fused fibers which collapse at maturity. Color rather uniform, being a rather light "orange buff" or "pale yellow-orange," the central depression sometimes water soaked and deeper in color. Flesh about 8 mm. thick near stem, light and fleshy cream color, very spongy and dry like sponge cake; taste decidedly peppery; milk often entirely absent, even in young plants; when present very scant, white and remaining so, quite acrid.

Gills rather crowded, very little branched, about 4-6 mm. deep in middle, narrowing toward the stem and reaching it with a slight depression, lightly decurrent by lines in most cases; color a light cream with a pinkish tint at first, becoming a light creamy pinkish buff when mature.

Stem very short, varying from 1-2 cm. long, and from 8-15 mm. thick, tapering downward; surface about color of cap, or with a more
pinkish tint, sometimes marked with darker blotches below, nearly smooth or with a thin secruffy tomentum especially below. Flesh solid, colored like that of the cap, but much firmer.

Spores pure white, warted, spherical to short elliptic, 4.6-6.4 x 6.4-9.2μ.

In spite of some peculiarities, this plant seems too close to L. silicio-
ides Fr. to be separated, and I shall consider it a short-stemmed form
of that species. In shape, texture of cap, and very short stem it re-
sembles L. atroviridis. Distinguishing qualities are: absence of latex
(or very scant); very short stem; surface of dense compacted fibers
which are viscid when wet; inrolled margin covered when young with
a roll of loose and not very long fibers which soon collapse; absence
of zones, and yellowish orange color.

This is the first record of this European plant in the Southern
States, and it has been found only a few times in the North. Dis-
inctly a boreal species, occurring in cold weather in fall and spring,
and always near pines on uplands.

972. Many plants in all stages, growing among pines in hillside pasture on
west side of Glenn Burnie Farm, November 11, 1913. Two photos.
These plants were found at the same time and place with a large
number of plants of Boletus brevipes, and these two are remarkably
alike in size, shape, length of stem, and place and time of growth.
There had been hard freezing the preceding two nights and many of
the plants were frozen when found. Microscopic examination of the
flesh of the cap shows very loosely woven fibers with open places
between them and almost no vesicular cells, latex quite absent at all
stages in this lot, none being visible even with a lens in young
plants just collected.

1441. In pines northeast of Piney Prospect, October 28, 1914. Photo.
3015. In sedge among pines near Cobb's Terrace, April 21, 1918. No visible
milk, spores 5 x 6-7μ. These plants were typical and showed a very
little milk, which was quite peppery and white and unchanging.
The milk was so scarce as not to be noticed unless carefully looked
for. Spores white, subspherical to elliptic, warted, one large oil
drop, 4.2-5.1 x 5.1-7.6μ. In these plants the fibrous nature of the cap
was not noticeable except near the margin. The surface elsewhere
was shiny and nearly smooth from the collapsed and fused, viscid
fibers.
13. *Lactarius scrobiculatus* (Scop.) Fr.

**Plates 16 and 40.**

Cap up to 12 cm. broad, deeply depressed in center and finally infundibuliform, margin even, incurved, distinctly tomentose at first, glabrous or nearly so at maturity, surface rather light brownish-yellow or pale buffy-yellow, distinctly or scarcely zoned, the superficial layer a whitish, slightly shining material which seems collapsed in zones and areas, thus giving the surface a roughish appearance under a glass, viscid when moist; flesh rather thin, firm, white, turning yellow when cut, odor noticeable and rather soapy. Milk quite acrid, white, then changing quickly to sulphur-yellow.

Gills subdistant to rather close, pale creamy-flesh color, turning sulphur-yellow when cut, then brownish, slightly decurrent, none or few forked, 5-10 mm. wide in middle.

Stem 3-4.5 cm. long, tapering downward, 1-2.8 cm. thick in center, firm, hollow, surface glabrous, typically marked all over with more or less circular or elliptic brownish yellow pits that are usually of very variable size, surface between them a light cream color or pure white. Rarely the spots are absent, as in our Coll: No. 1863. The stem is frequently furnished with a distinct elevated ridge near the top which represents the collapsed fibers which connected it with the gills in youth.

Spores (of No. 2371) creamy white, distinctly warded, elliptic, 4.8-6.3 x 6.3-7.4μ.

Our Chapel Hill form of this species is a large squat plant that seems confined to pine or mixed pine and deciduous woods. The gills are not crowded and are slightly tinted with flesh-color.

1915. On rocky, wooded hillside, Rocky Ridge Farm, September 22, 1915. Photo. Spores 5-5.5 x 6.6-7.5μ. Stem not spotted.

1957. In rather dry soil, pine woods between Stroud’s Spring and Howell’s Branch, November 3, 1915.


2371. Pine woods (with oaks) southwest of athletic field, July 5, 1916. Spores creamy with a faint salmon tint, elliptic, tuberculate, 4.8-6.3 x 6.3-7.4μ. Gills subdistant, 10 cm. wide.

Asheville. Beardslee.
Lactarius insulsus Fr.

Plates 17 and 40.

Cap medium to large, usually about 7-10 cm. and up to 15 cm. wide, deeply depressed in center, smooth all over, moderately viscid when wet, varying greatly in color, deep orange to pale buff or straw color, conspicuously and regularly zoned, or very obscurely so, especially when old and wet, and in pale-colored plants (as in No. 1637). Flesh white when young, becoming buff in age, up to 6 mm. thick near the stem, firm; odor somewhat acrid, but not nearly so strong or of the same character as in Lactarius coleopteris. Milk white, rather slowly but very acrid, unchanging, sparse.

Gills ochraceous-buff, deeper in color than most other species, appearing somewhat decurrent by the shape of the cap, nearly equal in width their whole length, and about 4-7 mm. deep, of unequal length, rarely forked, rather inconspicuously veined, varying from moderately close to quite distant.

Stem 2.5-5 cm. long, varying much in thickness, pointed at base, light creamy-buff or with a flesh tint, often vaguely spotted, but not with the conspicuous pock marks of L. scrobiculatus, smooth, stuffed, or becoming hollow. There is usually a lighter colored ring at the top of the stem which may remain noticeable in the dried plants. This is not so conspicuous as in L. coleopteris.

Spores light cinnamon-buff, spherical to subspherical or short-elliptic, strongly warted and ridged, about 5.5 x 7μ.

This species can be distinguished in the field from L. scrobiculatus by the milk not turning yellow, the entire absence of tomentum on the margin, and the faint or absent pock marks on the stem; from L. terminosus by the absence of the heavy marginal tomentum of that species; from L. chrysorheus and L. theiogalus by the milk not turning yellow.

115. Battle's Park, September, 1908.
492. Near Battle's Branch, back of Dr. Pratt's, October 4, 1912. Photo.
Photo. Spores light cinnamon-buff, nearly pale orange-yellow of Ridgway, subspherical, warted, 6.8-7.8μ.
1792. Mixed woods in pasture back of Pritchard's, September 16, 1915.

1854. Deep woods near Battle's Branch, near Stroud's pasture, September 22, 1915. Cap cinnamon buff with lighter zones, not very viscid, stem long, not spotted. Milk white, unchanging, peppery, one plant just like the others, otherwise had distant gills from 2-5 mm. apart except on the margin.

2309. Deep woods near Meeting of the Waters Branch, July 5, 1916. Spores elliptic, warted. 4.8-5.9 x 5.9-7.4\(\mu\).

Blowing Rock. Atkinson.
Asheville. Beardslee.

15. *Lactarius trivialis* Fr.

Plates 18 and 40.

This is a very common, fairly large plant with cap up to 14 cm. (often much smaller), strongly depressed in center, smooth, not zoned, viscid, the margin strongly inturned until half grown; color grayish-lead suffused with liver color (fawn color of Ridgway), very pale where covered with leaves, in old age becoming sordid earth color.

Gills narrow, only 5 mm. deep, even in large plants, crowded, many short ones but none forked, color light creamy flesh, becoming yellowish-brown, turning smoky brown when bruised, and quite dark brown when old. Milk light creamy white, not changing, quite acrid or only moderately so, and often becoming so only after a quarter or a half minute, sparse or moderately plentiful, said to turn the gills glaucous green, but this is scarcely noticeable in our plants.

Stem solid, smooth, nearly white or lightly tinted like the cap or gills, unpitted, in large plants up to 8 cm. long and 3.5 cm. thick.

Spores (of No. 566) grayish brown (dust color), distinctly warted and ridged, short-elliptic, 7-8 x 8-10\(\mu\), not counting spines.

Flesh white, tinted like cap near surface, not changing color when cut.

119. Battle's Park, behind Dr. Wheeler's, near branch, September 21, 1908.
120. Woods south of Dr. Battle's yard, Battle's Park, September 18, 1908.
517. Woods near branch south of campus, October 7, 1912.
66. Near small stream south of campus, October 16, 1912.

770. "Fern Banks" along Bowlin's Creek, September 14, 1913.

772. Woods near Battle's Branch. Spores light buff (Ridgway).

1560. In deep woods by path along Meeting of the Waters Branch, June 19, 1915. Spores light ochraceous-buff (Ridgway), spherical, tuberculate, about 7.2 x 9 \( \mu \); cap light liver color on marginal part, pallid earth color in center.

1573. On ground in hollow below Stroud's Spring, June 25, 1915.

2141. Oak woods near northeast foot of Lone Pine Hill, June 18, 1916.

2531. Sandy mixed woods near branch below Meeting of the Waters, June 20, 1917. Photo.

Asheville. Bear'slee.

16. Lactarius coleopteris n. sp.

**Plates 19 and 40.**

Cap up to 14 cm. broad, depressed in center, margin rounded, irregular, quite smooth, surface very slimy-viscid, deep reddish orange, no zones except a few faint ones near the margin, marked with low radial striae like a Russula stem. Flesh 5 mm. thick at stem, firm, brittle, white; cut surfaces, especially at the stem, after standing a good while, become more or less ochraceous and in places dull green. Milk white, unchanging, acrid, sparse.

Gills moderately crowded, of equal width all the way, ending rather definitely at the stem and slightly decurrent by a short line (they are usually curved to one side just before reaching the stem so that the lines do not run straight down the stem, but at an angle), a few forked near the stem, 4-5 mm. wide, whitish when young, then creamy buff, when wounded becoming a dull reddish-brown; fleshy-buff when dry.

Stem 3-4 cm. long, 2-3 cm. thick, tapering downwards, smooth, whitish or straw colored with buffy red stains, a few faint streaks, or spots, a large cavity in center. There is a pinkish white collar at the top about 3 mm. wide, which is easily distinct from the rest and does not change color.

Spores (of No. 1851) buffy-yellow, spherical, minutely warted, 5-6.3 x 6.7 \( \mu \).
This plant has a strong acrid odor like that of some beetles, much stronger than in *L. theiogalus* or *L. acris* or *L. insulsus*. In drying, the gills become a pallid-buff, and there is a distinctly lighter zone at the top of the stem where the pinkish-white collar has faded. It also differs from *L. insulsus* in its slimy, zoneless cap, pink collar on stem, and acrid odor. Also in *L. insulsus* the color of the dry gills is very different—a deep brownish-red with a distinct overcolor of old gold. From *L. hisgenus* it differs in its color, pink-collared stem, and acrid odor. It resembles *L. agglutinatus* in its somewhat rugose cap, and strong odor, but it differs from it in much deeper color, pink ring on stem, and more acrid odor, different color of gills in the dried plant, and absence of the squamulose appearance of the dried cap.

It is also near *L. affinis* Pk., but neither Peck nor Miss Burlingham mention the strong odor or pinkish collar on stem, and the spores are smaller and darker and the color of the cap deeper than they give for that species.

1851. On ground in edge of woods south of South Building, September 21, 1915. Photo. Type.

1842. Mixed woods east of cemetery, September 20, 1915. This was exactly like 1851 in every particular except that there was no trace of zonation on the cap. The same light color at top of stem, and gills bent sideways on reaching stem. Spores buffy-yellow (about maize-yellow of Ridgway), spherical, minutely warted, 5.4-7.2 μ.

1873. In damp shaded place below Meeting of the Waters. These two plants were exactly like collection 1851. Cap 7 cm. broad, very glutinous, deep reddish-bay color; milk white, unchanging, very acrid; taste and odor strong and pungent like that of some beetles; white collar on stem just below gills; stem cavernous; spores buffy-yellow.

17. *Lactarius mucidus* Burl.

This species has so far been reported only from Vermont and from the mountains of North Carolina. As we have not found it in Chapel Hill, we take the following from Miss Burlingham (Mem. T. B. C. 14:56. 1908):

“Pileus fleshy, rather thin, convex umbilicate, then plane, at length infundibuliform, warm-sepia (305 t. 2, 3) in the center, putty colored (311) to stone colored (312) on the extreme margin, azonate, very
viscid and shining when wet, glabrous, 3-9 cm. broad, margin even at first, slightly wavy and striate in old plants; gills white, scarcely changing color with age, staining blue-greenish-gray where the milk dries (249 t. 1), sometimes forking near the stem, close, adnate to slightly decurrent, acute at the inner end, up to 7 mm. broad; stem of the same color as the pileus or paler, tapering upwards, slightly viscid when wet, glabrous, sometimes with faint striae, stuffed, then hollow, 4-7 cm. long, 7-10 mm. thick at the top, 10-15 mm. at the base; flesh white, odor none; spores white, broadly elliptical, echinulate, 7-8\(\mu\) x 8-9.5\(\mu\); latex white, drying blue-greenish-gray on the gills and the broken flesh, acrid.

"Hab.: Under hemlocks, in wet weather. Late August and September.

"DISTINGUISHING FIELD-MARKS: This species may be easily recognized by the contrasting dark-sepia color of the center, the whitish color of the margin of the pileus, and its slimy shining appearance, as well as by the blue-greenish-gray color of the dried latex. It closely resembles Lactarius cinerea Pk. in size and texture, but differs in the habitat, in the color of the pileus, and in the change in color of the more acrid latex. While L. cinerea is most abundant in August, L. mucida does not appear until late in August and is most plentiful in September. I have found it only under hemlock trees, while L. cinera seems to grow only under beech trees. From L. trivialis it may be distinguished by the white spores, the more lax flesh, and the absence of lilac tints in the color of the pileus, which does not become yellowish in fading."

18. Lactarius circellatus Fr.

We have not found this in Chapel Hill, and the following description is prepared by Mr. Beardslee. It has been reported heretofore in America only from Vermont:

"Cap fleshy, convex, then depressed at the center and infundibuliform, opaque and slightly tomentose, brownish-gray, with numerous narrow, darker lines which form eight to ten zones, margin even, incurved. Milk white, unchangeable, very acrid."
"Gills close, white, then dingy, forking and unequal.
"Stem short, equal, pallid.
"Spores subglobose, rough, 6-7μ long.
"The dull brown pileus and numerous zones mark it."

Asheville, in woods, not common. Beardslee.

19. **Lactarius agglutinatus** Burl.

This species has so far been found only in the "Pink Beds" on Mount Pisgah, and I give below the original description by Miss Burlingham (Mem. T. B. C. 14:42, fig. 5. 1908):

"Pileus convex-umbilicate, then depressed in the center with the margin uplifted, at length infundibuliform, buff (309 t. 4) fading to buff (310) when mature, slightly zonate when young, scarcely so when older, slimy-viscid when wet, with subrugose elevations or papille showing through the gluten, appearing squamulose to squarrosulate when dry, 6-10 cm. broad, margin involute and minutely pubescent at first, the pubescence becoming less noticeable as the margin unfolds; gills yellowish-buff (310 t. 1), some forking near the stem, close, slightly decurrent, 2-4 mm. broad; stem of the same color as the pileus or paler, sometimes spotted, equal or tapering downwards, viscid when wet, glabrous, firm as though solid, becoming spongy to hollow, 2.5-4 cm. long, 1-1.5 cm. thick; spores creamy-white in mass (10. t. 1, 2), subglobose, echinulate, 7-8μ; flesh white, odor somewhat like raw pumpkin; latex white, unchanging, acrid.

"Hab.: Among dead leaves, in rather sandy soil, oak-chestnut woods, frequently under the flowering dogwood. August and September.

"Distinguishing Field-Marks: The medium size, buff color, and the papilliform and rugose elevations showing through thick, glistening gluten when wet, and the squamulose appearance of the pileus when dry. One peculiarity of the pileus is that if it becomes wet again after having dried, the squamules swell up and the surface appears papilliform and rugulose as at first."


PLATE 20.

Cap up to 7.5 cm. wide, deeply depressed in center, the margin inrolled until maturity, then expanded or uplifted so as to become infundibuliform, surface viscid, sparingly and rather coarsely tomentose all over, margin not most so and the tomentum fading away there towards maturity. Zoned with soaked ochraceous and lighter honey-colored tints. Flesh 6 mm. thick at stem, thinning regularly to margin, firm, nearly white, not changing when cut. Milk white and remaining so, sparse, slightly bitterish-astringent, but scarcely at all acrid, sometimes quite mild.

Gills narrow, scarcely 3 mm. deep, crowded, many short, none branched, a clear ochraceous buff at maturity, turning smoky-brown when bruised.

Stem 1.5-3 cm. long, 9-12 mm. thick at stem, tapering strongly downward, 4-5 mm. at base, surface pure white or stained with buff, densely soft tomentose all over or the central region becoming less tomentose in age. Flesh brittle, whitish, hollow.

Spores ochraceous-buff, spherical or subspherical, warded, one oil drop, 5.4-6.3 μ in diameter.

Distinguished from all our species by white, unchanging, nearly mild milk; deep ochraceous-buff and crowded gills; short, white-tomentose, pointed stem. It has been found only on Mount Pisgah and in Chapel Hill.

559. Low place by Meeting of Waters, October 14, 1912.
569. Low woods near Howell’s Branch, October 18, 1912.
1796. In low place in woods south of Peabody Building, September 15, 1915. Photo.
1839. Woods by branch south of Raleigh road, Rocky Ridge Farm, September 20, 1915.

Pisgah Forest, North Carolina, under oak, maples, alder, and rhododendron. Burlingham.


We have not seen this in Chapel Hill, but it is recorded from North Carolina by Schweinitz and has been found at Asheville by Beardslee.
The following description is from Miss Burlingham (Mem. T. B. C. 14:44. 1908):

"Pileus fleshy firm, thick, convex-umbilicate, then plane to depressed in the center, yellowish-brown or umber, with olivaceous tinge, darker in the center, azonate, slimy-viscid in wet weather, glabrous or agglutinated-fibrous, 6-12 cm. broad, margin involute at first and yellow-villosse, then glabrous; gills cream-colored, then darker yellow, becoming nearly black where bruised, then ash-colored from the spores, many forking near the stem, close, somewhat decurrent, 3-4 mm. broad; stem of the same color as the pileus, equal or slightly smaller at the base, viscid when wet, glabrous, smooth or somewhat serobiculate, or sometimes merely spotted, spots becoming nearly black in dried specimens, firm, stuffed, occasionally becoming hollow when old, usually 3-4 cm. long, 1.5-2.5 cm. thick; flesh whitish, odor slight; spores white, globose to sub-globose, echinulate, 6.5-8μ; latex white, unchanging, acrid. Possibly edible.

"Hab.: On the ground in mixed woods, often near fir or spruce trees. August and September.

"DISTINGUISHING FIELD-MARKS: The yellowish-brown or olivaceous color of young plants and the blackish color of mature plants, the slimy condition of the whole mushroom in wet weather, the blackening of the gills with injury or in drying, and in many cases the grayish color due to the presence of the spores. The pileus may be covered with villose fibers which are closely stuck to the surface, and are not easily distinguishable, or it may be practically glabrous. The yellow down or villosity on the margin disappears in the mature plant, and is at no time conspicuous."

Middle district (Schw.) woods. Curtis.
Asheville. Beardslee.

22. Lactarius speciosus Burl.

Plates 21 and 40.

Cap up to 7.6 cm. in diameter, depressed in center, the margin strongly inrolled when young and deeply clothed with long, coarse tomentum just as in L. torminosus, remainder of cap more thinly
furnished with flattened fibers pinched up into scattered squamules which are somewhat concentrically arranged; color a soaked ocherous or honey color with lighter zones and with faint heliotrope tints where bruised; not viscid. In mature plants the marginal tomentum collapses and is not so conspicuous as in *L. torminosus*. Flesh firm, brittle, white, turning rather slowly to a pretty heliotrope color when cut. Milk white and remaining so; usually mildly astringent, but very slightly acrid, or not at all so.

Gills narrow, broadest in center where they are 4 mm. deep, reaching the stem, but not decurrent except by a little tooth, many short, but no forking ones; cream color to maize yellow, turning heliotrope when wounded.

Stem up to 4.5 cm. long, firm, hollow, tapering slightly downward, faintly tomentose at very base, only obscurely spotted or more often marked by many large and small pock marks, which are brownish yellow (egg yellow when young) like deeper parts of cap; areas between pock marks are nearly white or light to strong heliotrope; flesh except the very dry inside turning heliotrope when cut.

Spores (of No. 2199) pure white, short-elliptic, papillate, 8.5-9.5 \( \times 10.5-11.5 \mu \).

This species is like *L. torminosus* in its white, unchanging milk and general appearance; it differs in nearly mild milk, strongly spotted stem, heliotrope change of color, less tomentose margin at maturity, and larger spores. It is like *L. scrobiculatus* in strongly spotted stem and not very fibrous margin, but differs in mild, unchanging milk and heliotrope change in flesh.

This species is so far known only from North Carolina, Virginia, and Tennessee.

753. Woods east of Graded School, September 13, 1913.
1812. In moss by Howell’s Spring, September 17, 1915. Photo.
1855. In deep woods by Battle’s Branch, near Stroud’s pasture, September 22, 1915. Stem strongly spotted, the surface between the ochreous spots a bright strong heliotrope.

2199. Wooded pasture southwest of Mr. Pritchard’s, June 22, 1916. Spores cream color, subspherical to elliptic, distinctly papillate, 7.4-11.5 \( \mu \) long.
2343. Woods near Meeting of the Waters, July 1, 1916.
2685. Battle's Grove (oaks), July 12, 1917.

Pisgah Forest. Burlington.
Asheville. Beardslee.

23. Lactarius croceus Burl.*

PLATE 40.

Cap 6.3 cm. broad, depressed in center, the margin rounded and revolute until full maturity, quite smooth all over and decidedly viscid, when wet faintly many zonate, the zones not conspicuously spotted; color a rather light orange yellow. Flesh firm, rather brittle, about 6 mm. thick near stem and turning slowly to reddish yellow when wounded. Milk quite sparse, very acrid, most so after several minutes, white, its change of color not noticeable at once, but after a time the cut surfaces become a deep reddish yellow.

Gills moderately distant, a few forked or anastomosing, about 5.5 mm. wide beyond the middle, rounded at stem and attached, color creamy on side view, deeper on edge view, turning deep reddish yellow when bruised.

Stem 3.5 cm. long, 14 mm. thick at top, tapering downward, smooth, lighter than cap, a few scrobiculate spots which in this case were not deeper colored, surface becoming darker when handled; flesh firm, stuffed.

Spores light ochraceous, short-elliptic, tuberculate, 5.5-6.2x7.5-8.2μ.

This species may be distinguished from L. chrysorheus by the distant gills, darker and more viscid cap, and absence of fishy taste; from L. theiogalus by the much more acrid taste, distant gills, etc. It was found by Miss Burlingham in the Pink Bed Valley, North Carolina (elevation about 1,000 meters). For an illustration of the species see Mem. T. B. C. 14: fig. 3. 1908.


*As Lactaria crocea.

This species is known only from Mount Pisgah, North Carolina, and the following is taken from Miss Burlingham's original description (Mem. Torr. B. C. 14:40, fig. 4. 1908):

"Pileus fleshy, firm, convex, umbilicate, at length nearly infundibuliform, maize-yellow (38 t. 3), tinted in the center with yellowish-salmon (65), faintly but decidedly zonate, viscid and covered with gluten when wet, glabrous, 8-12 cm. broad, margin involute at first and covered with coarse short tomentum, then merely deflexed and glabrous; gills whitish, becoming maize-yellow with age, some forking near the stem, close, slightly decurrent, 5-7 mm. broad; stem whitish to maize-yellow tinted with yellowish salmon, more or less scrobiculate-spotted, spots of the same color as the rest of the stem or duller, equal or tapering downwards, glabrous, stuffed, becoming hollow, 4-5 cm. long, 1.5-2.5 cm. thick; flesh white, odor strong; spores tinted yellowish-salmon in mass, subglobose, echinulate, 7-8μ; latex white, becoming sulphur-yellow, acrid, scanty.

"Hab.: In sandy loam and dense shade, oak and chestnut woods. July and August.

"Distinguishing Field-Marks: The large size, the delicate yellowish-salmon tint over nearly the whole pileus, the faint nearly concolorous zones, the short tomentum on the margin of the immature pileus, the rather persistent viscidity, the lily shape of the mature pileus, and the change in the color of the latex."

Pisgah Forest, 1,000 meters elevation. Burlingham.

25. *Lactarius deliciosus* (L.) Fr.

**Plate 22.**

A good-sized plant that is not rare with us in pine woods in fall. It varies considerably in color, but is marked by such distinctive characters as to be easily recognized.

Cap up to about 11 cm. broad, deeply depressed in center at maturity and striate on the very margin, or not striate until old, surface slightly viscid, smooth, but showing inherent fibers, sometimes not
zoned, again with obscure and distant zones. In color the cap may be yellowish or orange-clay or orange-gray and is nearly always marked with deep green zones and blotches towards and after maturity.

Gills a light orange-clay color, soon becoming duller and dotted with green, then all green in drying, when wounded turning immediately to the milk color, a deep orange and then green. Milk deep orange when fresh, then changing to green.

Stem about 3.75 cm. long and 1.5-2.5 cm. thick, nearly equal or tapering downwards, smooth, hollow in age, orange colored with nearly white apex and base (in No. 601), or it may be violet-purple, shading to blue or green below (in No. 107). Flesh a light creamy orange color and often with greenish tint next the gills, quite mild or slightly peppery.

Spores (of No. 601) yellowish-cream color, subspherical to short-elliptic, warded, 6.9 x 7.9μ.

Our plants might as well be referred, perhaps, to L. Chelidonium which seems poorly defined and doubtfully distinct from this.

As the name implies, L. deliciosus is widely known as edible, and is considered one of the best. For an illustration in color see Gibson, Our Edible Toadstools and Mushrooms, Pl. 18; also, N. Y. St. Mu. Ref. 48: Pl. 29. 1897. 2nd ed.

601. Low place in woods back of athletic field, October 21, 1912. Photo.
777. By Howell's Brook, September 16, 1913.
896. Woods, fall of 1913. Photo.
1284. On rocky hillside in pasture about one-quarter mile southwest of Graded School, September 29, 1914. Two photos.
1310. In pine woods along path south of athletic field, October 6, 1914.
1335. Scattered through Battle's Park in rather dry woods, north of cemetery, October 13, 1914.
1370. In thick woods, hillside, northwest of Glen Burnie Farm, October 17, 1914. Photo. Spores light cinnamon-buff, subspherical to short-elliptic, tuberculate, a large oil drop; 5.1-6.8 x 6.8-8.9μ.

Low and middle districts, pine woods. Curtis.
Asheville. Beardslee.
26. **Lactarius Chelidonium** Pk.

This species has so far been reported from North Carolina only by Atkinson. I am not sure that it is really distinct from *L. deliciosus*. The following description is by Miss Burlingham (Mem. Torr. B. C. 14: 59. 1908):

"Pileus fleshy, firm, convex, then plane with the center more or less depressed, 'grayish yellow or tawny,' at length stained with bluish and greenish, usually with two or three narrow zones near the margin, slightly viscid when wet, glabrous, 5-8 cm. broad, margin involute at first and naked; gills saffron-yellow mixed with gray, sometimes forking, close, 'anastomosing or wavy at the base,' adnate, then slightly decurrent, narrow; stem of the same color as the pileus, nearly equal, glabrous, becoming hollow, 2.5-4 cm. long, 10-12 mm. thick; flesh whitish, staining saffron-yellow from the latex, then becoming bluish and at length greenish; spores yellowish, globular to broadly elliptical, echinulate, 7 x 8µ (9µ Peck); latex saffron-yellow, mild, scanty. **Edible.**

"Hab.: 'Sandy soil under or near pine trees' (Peck); also in dry spruce woods.

"**DISTINGUISHING FIELD-MARKS:** It is a paler yellow and duller in color than *Lactaria deliciosus*, the flesh is firm, the pileus scarcely viscid, the zones marginal, the stem short, the gills narrow, and the latex saffron-yellow rather than orange. It is usually found in dry woods in the vicinity of pine trees, while *Lactaria deliciosus* is most abundant in mossy wet woods, especially near hemlocks."

For an illustration of this species see Atkinson, Stud. Am. Fungi, Pl. 35, fig. 2. 1900; also, see N. Y. St. Mu. Mem. 3: Pl. 53. 1900 (in color).

Asheville. Beardslee.

27. **Lactarius subpurpureus** Pk.

**PLATES 1 AND 40.**

Cap 5.7 cm. broad, plane on margin, depressed in center, slightly viscid, light pinkish-buff (nearly white) with distinct zones of rather faint olive showing through; surface smooth and very much like
L. delicisus in appearance. Flesh firmly spongy, 4 mm. thick near stem, very light pinkish near the surface, deep wine color at gills, after several hours the cut surface becomes greenish.

Gills close, hardly decurrent, many short ones, none branched, 3 mm. deep in center, grayish-pink (hydrangea pink—Ridgway), much deeper colored in face than surface view, when wounded becoming greenish after several hours. Milk sparse, scarcely peppery, watery, deep wine color (dark vinaceous of Ridgway).

Stem very short and small, just as in L. virescens; 1.3 cm. long, 8 mm. thick, colored very much like the cap, with greenish and reddish stains and apparently solid normally, but hollowed by grubs.

Spores creamy white, oval, warted and ridged, one large oil drop, 5.9-6.8 x 6.8-8.5μ.

For other illustrations see Mem. Tor. B. C. 14: fig. 8. 1908; also, N. Y. St. Mu. Rep. 54: Pl. 70. 1902 (in color).

1246. On burnt-over ground under pines, edge of Raleigh road by Judge Brockwell's, September 23, 1914. Two photos and painting.

Blowing Rock. Atkinson.
Asheville. Beardslee.

28. Lactarius Indigo (Schw.) Fr.

Plates 23 and 40.

A beautiful and conspicuous plant, easily recognized by the fine indigo color of the cap and flesh and milk.

Cap up to 14.5 cm. broad, depressed in center, the margin turned down or nearly plane, often crenate and irregular; surface viscid, smooth, covered with a thin white layer through which the deep indigo color of the flesh shows in distinct zones of indigo, often with deep green areas where bruised. Flesh firm, deep indigo. Milk deep indigo, turning dark-green on exposure.

Gills close, attached, 3.5-4 mm. deep and nearly the same width throughout, distinctly indigo from the flesh showing through the whitish surface layer, turning deep indigo and then green when bruised. As the spores ripen a clay color is added to the gill surface.
Stem about 5-8 cm. long, usually, and 1.5-2 cm. thick, firm, hollow, color of cap, smooth, equal. Not rarely the stem is lateral and very short.

Spores warted and ridged, cream colored in mass, 5.6-6.7 x 7.8-8.2μ. This species is edible, but is so coarse and so lacking in savor as to be of little value. While not abundant, it is not rare in summer and autumn.

111. Battle’s Park, in woods just above Green Bench Spring, October 2, 1909.
112. Top of Lone Pine Hill, Glen Burnie Farm, September 19, 1908.
606. Near Meeting of the Waters, October 22, 1912.
742. Woods near branch east of Meeting of the Waters, September 13, 1913. Photo.
816. Woods above Howell’s Spring, September 16, 1913.
1172. By path along branches north and west of Meeting of the Waters, July 24, 1914.
1345. In woods by branch 100 yards west of Meeting of the Waters, October 14, 1914. Photo. Spores subspherical to elliptic, tuberculate, a large oil drop, 5.1-6.4 x 6.4-8.5μ.
1365. Battle’s Park, woods northwest of Brockwell’s Spring, October 16, 1914.
1369. In thick woods, hillside northwest of barn, Glen Burnie Farm, October 17, 1914. Photo.

Common in woods. Curtis.
Blowing Rock. Atkinson.
Asheville. Beardslee.

29. Lactarius theiogalus (Bull.) Fr.

Plate 24.

Cap depressed in center, almost infundibuliform, up to 9.5 cm. wide, in youth pruinose, quite smooth everywhere at maturity, or the center more or less pitted and roughened, viscid, pale creamy buff color with ochraceous and pinkish stains, very faintly or not at all zonate; margin nearly plane, often crenated and lobed. Flesh firm, then softer, white, turning a clear yellow with greenish tints when cut and after a time a deeper orange yellow, bitter and then mildly acrid; order perfumed-pungent when broken. In age when the milk disappears the flesh becomes a light flesh color and does not change when cut. Milk white, then deep yellow, bitterish, then moderately acrid.
LACTARIUS THEIOGALUS. Nos. 1919 AND 1929
Gills slightly decurrent, rather crowded, only 3-4 mm. wide, creamy at first then much deeper pinkish-cinnamon on edge view, a lighter buff color at a strong angle.

Stem about 2.5-4.5 cm. long and 1.2-1.8 cm. thick, sometimes enlarging downwards and tending to be fistulose, pruinose when young, smooth at maturity, but the base sometimes tomentose, whitish but stains of the cap color or color of cap all over, with small and usually inconspicuous scrobiculate marks, cavernous inside; flesh firm, brittle, turning yellow when cut.

Spores distinctly cinnamon (about light pinkish cinnamon of Ridgway), subspherical, warded, 5.8-6.3 x 5.8-7.2μ.

A small plant of low, damp woods, usually about 4 cm. broad and 5 cm. high. The species differs from L. chrysorheus (see No. 1838) in zones being much less clear and not spotted, in pungent smell, in much deeper colored gills and less acrid milk, also in spores being cinnamon and not white (Miss Burlingham gives the spores of both L. chrysorheus and L. theicogalus as white, but in our plants the spores of the latter are distinctly colored).

92. In woods north of cemetery, November 7, 1911. Spores creamy in bulk, subspherical, 4.6-5.5μ.


1196. In damp, cool hollow south of cemetery, July 23, 1914.

1800. On edge of pine woods near branch above Tenny's Ravine, September 17, 1915. Zones not dotted, spores spherical to subspherical, warded, one oil drop, 5.4-7.2μ in diameter.

1840. In damp woods by branch, north side of Rocky Ridge Farm, September 20, 1915. Photo.


1944. In pine woods, near Meeting of the Waters, October 29, 1915.

Blowing Rock. Atkinson.
North Carolina (Pisgah Forest?). Burlingham.
Asheville. Beardslee.
30. **Lactarius chrysorheus** Fr.

**Plates 25 and 40.**

Cap up to 8 cm. broad, deeply depressed in center, often quite irregular and aborted on one side, margin strongly incurved until maturity and then not at all incurved, faintly or hardly at all tomentose when young, smooth afterwards, or tomentose on very margin nearly to maturity; surface viscid, quite smooth, pale maize-yellow or even lighter with faint zones of a dotted appearance. Flesh about 5 mm. thick near stem, soft but rather rigid and brittle; milk sparse, white, then greenish-yellow (about sulphur-yellow), very acrid and with a very disagreeable fishy taste, which is entirely different from the taste of any of our other species. The odor is similar, but not so strong.

Gills crowded, slightly decurrent, only 2-4 mm. wide, whitish when young, turning a rather light creamy buff, with a tint of pink in edge view.

Stem about 2.5-5 cm. long, 1.3-1.8 cm. broad at cap, tapering downward, whitish or colored like the cap, smooth, pruinose at top, marked by numerous, irregular, scrobiculate spots that are scarcely or not at all darker than the rest, hollow in center.

Spores (of No. 1838) white or faintly creamy, subspherical, warted, 5.8-6.3 x 5.8-7.2μ.

The distinctions between this species and *L. theiogalus* are not conspicuous. The gills in the former are lighter, and the zones on the cap are made up of dots, also the milk is more peppery and with a very bad fishy taste. The spores also afford a means of distinction; in *L. chrysorheus* they are essentially white, in *L. theiogalus* they are distinctly cinnamon.


1838. In trash pile by road just east of cemetery, September 20, 1915. Photo.

2386. Thick brush, oak woods on Rocky Ridge Farm, July 18, 1916.

Blowing Rock. Atkinson.
Pisgah Forest. Burlington.
Common in swamps. Curtis.
Asheville. Beardslee.
30a. *Lactarius chrysorheus*. Form A, with unchanging milk.

**Plate 40.**

In Chapel Hill we have met with a plant in which the milk does not change color when exposed, but which cannot otherwise be distinguished from *L. chrysorheus*. Collection No. 774 was described as follows:

Cap up to 6.5 cm. broad, sharply depressed in center and sometimes with a deep sinus on one side, surface quite glabrous, a light brownish cream color with superficial layer of white slightly shiny material. Rather faintly zoned with brownish-cream and nearly white lines, the darker zones apparently formed by collapse of the white stuff, the zones, spotted. Flesh chalk white and not changing when cut. Milk white, not changing, moderately peppery.

Gills changing from white to a flesh-cream color, becoming brownish-yellow when bruised, narrow and close, many short ones and a few forking, slightly decurrent.

Stem white above, about color of cap elsewhere, marked with distinct pock-like pits which may or may not be more deeply colored than the rest; hollow.

Spores light cream, subspherical, warty, one large oil drop, 6-7.5 x 7.5-9μ in diameter. The difference in size of the spores between this and the typical form as shown in Plate 40, figs. 20 and 21, is not significant, as the difference is not greater than normal in the species.

The smooth, zonate cap, and persistently white, acrid milk would indicate a relationship to *L. insulsus*, but the gills in that species are much wider and less close and very different in color in both the fresh and dry state, and the species is larger than *L. chrysorheus*. Our dried plants of No. 774 look exactly like dried plants of the latter species.

774. Near Howell's Brook, September 16, 1913. Photo.

31. *Lactarius quietus* Fr.?

**Plate 40.**

Our one collection that I refer doubtfully to this species is a thin, broad, low plant, with much more the aspect of a *Tricholoma* than of
a Lactarius. Cap up to about 8.5 cm. broad, depressed in center, the margin bent down; surface smooth, dull, dry, and a uniform light buff. Flesh thin and transparent, white, the grub channels a creamy-yellow. Milk white, mild, not changing, not very abundant.

Stem only 3.3 cm. long, 1.3 cm. broad at top, tapering downward, very fragile, stuffed, hollowed by grubs.

Gills color of cap, 5 mm. deep, wavy, many short and few branched, reaching the stem but not decurrent.

Spores a warm buff color (Ridgway), spherical, tuberculate and ridged, 5.5-9.2μ in diameter.

The principal difference between our plant and L. quietus is in the lighter color of the former. This, however, may not be of much consequence. The dried plant is like specimens of L. quietus from Miss Burlingham, except that the spores average a little smaller in ours.

This plant seems to agree well with L. pallidus, but as there is doubt about the species being American and as I have no authentic specimens for comparison, the determination must be uncertain until further evidence.

789. Near Battle's Brook, September 19, 1913.

32. Lactarius cyathulus Fr.

L. paludinellus Peck.

This has so far been found in this State only in our mountains. The following description is by Miss Burlingham (Mem. Torr. B. C. 14:66. 1908, as L. paludinellus):

"Pileus fleshy, thin, convex, then plane-umbilicate to depressed in the center, sometimes with a small umbo, brownish-drab (302 t. 2) to dark-fawn (307), expellent, slightly viscid when wet, glabrous, 12 mm. to 4 cm. broad, margin at length slightly striate; gills white to cream colored, becoming darker with age, pruinose, many forking near the stem, close, adnate or slightly decurrent, thin, up to 4 mm. broad; stem of the same color as the pileus or paler, nearly equal, glabrous, except at the base, which is slightly villose when growing in moss, stuffed, sometimes hollow, 2-3 cm. long, 3-4 mm. thick; flesh
white or tinted with the color of the surface; spores white, subglobose, echinulate, 6.5-8.5 μ; latex white, unchanging, mild.

"Hab.: In marshy places in woods, in Sphagnum, or in decaying leaves.

"DISTINGUISHING FIELD-MARKS: The sordid-brown color or the mixture of brownish-drab and yellow-brown, which gives the moist pileus a mottled, streaked, and subzonate appearance, and the striatulate margin. The species is small and is rendered inconspicuous by its dusky coloring. It occurs only in densely shaded places."

Professor Beardslee has collected L. cyathula Fr. in Sweden, and writes me that he has no doubt that Peck's L. paludinellus is the same.

North Carolina (Pisgah Forest?). Burlington.
Asheville, common. Beardslee.

33. Lactarius Curtisii n. sp.

Plates 26 and 40.

Cap 1.5-6 cm., usually about 3.5-5 cm. wide, deeply depressed (umbilicate) in center, the margin inrolled until maturity or after, sometimes expanded in age, rounded or nearly plane, often irregular and with a deep sinus on one side; surface quite smooth, dry, and chalky looking, azonate, chalk-white except for the brownish-yellow stains, turning light or orange salmon when bruised. Flesh quite firm and solid, about 8 mm. thick near stem in large plants, turning a deep orange salmon near the gills when cut, light orange salmon elsewhere, in age not turning salmon; mildly peppery when young, hardly so when old. Milk scant, a beautiful deep orange salmon, mildly peppery, disappearing in age.

Gills moderately close to somewhat distant, not forked, slightly de-current, only about 3 mm. deep in large plants; color when young a fine orange salmon, after some time turning a smoky olive when bruised, fading to pallid ochraceous-buff with a tint of orange in age, smoky-olive in drying.

Stem very short, only 0.6-1.5 cm. long, and 7-10 mm. thick at cap, tapering downward, quite smooth and even, light orange salmon with
a whitish pellicle, hollow, often eccentric. Flesh like that of the cap, turning deep orange salmon near surface when cut.

Spores (of No. 1845) cream color, subspherical to elliptic, distinctly tuberculate, a large oil drop, 6-6.5 x 7.5-8.7μ.

This striking species grows on the ground in pine woods in the fall. It is probably nearest *L. chelidonium* Pk., from which it differs in the dry, white, zoneless cap and orange-salmon color of milk and flesh. It differs from *L. salmoneus* Pk. in the deep orange-salmon gills (salmon-orange to orange-cream of Ridgway), very short stem, absence ofomentum on cap, and entirely different habitat. This adds one more to the very small number of species in which the milk is bright colored from the first.

In looking over the copy, at the New York Botanical Garden, of Berkeley's manuscript notes on North American Fungi (mostly transcribed from notes accompanying the collection of Curtis and of Ravenel) I have recently discovered that this species was collected by Dr. M. A. Curtis (for whom I have named it) in South Carolina in the same kind of habitat. For some reason the species was never published, but Curtis' notes leave no doubt that he had our plant. These notes are as follows:

"1364. (*Lactarius* near to 1293.) Cap clay-white, 1-1½ in. broad, smooth, fleshy (flesh thick, salmon-colored), margin involute when young, becoming depressed in center. Lam. unequal, attached, bright salmon-color, rather thick, straight, narrow, not crowded, occasionally forked, and in the older ones venously connected. Sporidia white (?), stipe white or pale salmon colored, short (½ in.), 4 lines thick, hollow at the top, often eccentric. Among grass in rather damp pine sandy woods. Sept."

We also find the following note in the same manuscript:

"2883. (*Lactarius deliciosus*, var. ut videtur vel nova sp.) Cap ½ in. broad, subviscid, with a thin white cuticle, not zoned, plano-convex, and umbilicate. Substance salmon colored, somewhat pungent. Lam. rich salmon colored, subdistant, not lactescent. Stipe 1 in. long, ½ in. thick, solid, whitish, fragile. Spores white!—Aug. Earth in pine woods."


1857. In a water run in pines east of Piney Prospect, same place as No. 1437, September 22, 1915.

Hartsville, South Carolina: Under pines in low sandy woods near Prestwood's Lake, July 10, 1916 (W. C. Coker). This is in Darlington County, in which is also Society Hill, the place where Dr. Curtis first found his plants.

34. Lactarius minusculus Burl.

This is another species not reported in this State except from the mountains. The following is from Miss Burlingham (Mem. Torr. B. C. 15:65, figs. 9 and 10. 1908):

"Pileus fleshy, thin, broadly convex, with a small umbo, becoming plane then somewhat depressed in the center, fulvous in the center, cinnamon (323. t. 1) toward the still paler margin, azonate, viscid in wet weather, sometimes shining with viscidity, glabrous, 1-3 cm. broad, margin minutely crenate sometimes sulcate, often slightly wavy, pruinose at first; gills whitish, seldom forking, close, adnate or decurrent by a tooth, broad for the thickness of the pileus; stem fulvous near the base but paler toward the pileus, equal, glabrous, sometimes tomentose at the base when growing in moss, stuffed, becoming hollow, 2.5-4.5 cm. long, 3-4 mm. thick; flesh isabelline-white; spores white, subglobose, slightly echinulate, 6-8μ; latex white, unchanging, acrid.

"Hab.: In moist woods, in moss or on decayed wood, under yellow birches, black gum, and black oak. July and August.

"Distinguishing Field-Marks: This species differs from all others in this group in its small size, crenate margin, and more acrid latex. It may be distinguished from L. subdulcis by its viscid pileus, and by being expallent. It is frequently solitary."

North Carolina, 1,000 meters. Burlingham.

35. Lactarius cinereus Pk.

Plate 27

Cap up to 5.3 cm. broad, umbilicate or infundibuliform, the margin plane, or bent down and distinctly striate; surface viscid or scarcely
so, azonate, smooth but with the fine irregularities of a Russula stem, and in some plants inherently fibro-squamulose near the margin; color pale grayish buff (about tilleul buff of Ridgway) or a somewhat darker avellaneous color, often with a tint of lilac. Flesh white, toughish, about 3.5 mm. thick near center, thinning rapidly to 1 mm. or less. Milk watery white, scarcely peppery, bitterish, not abundant, scarcely any odor.

Gills moderately close, none forked, 5 mm. wide in middle, pointed at both ends, scarcely decurrent, nearly white when young, then pale fleshy buff, then slightly darker, pruinose with spores in age, dingy when wounded.

Stem slender, up to 5.5 cm. long, 8 mm. thick at cap, enlarging downwards or upwards, smooth above, somewhat fibrous below, color and texture of cap or paler. Flesh white, soft inside, and occasionally partly or decidedly hollow.

Spores (of No. 1928) about straw color, subspherical to short ovate, warted, 5.9-6.6 x 7.4-8.2 μ.

311. Very low leafy place near Howell’s Branch, September 29, 1911.
327a. In leaf mold near branch below Howell’s Spring, October 4, 1911. Cap smooth, lead color with a tint of lilac, somewhat viscid. Spores subspherical, warted, about 4.5-5.4 x 5.5-6.5 μ in diameter.
576. On ground in low place near branch below Howell’s Spring, October 17, 1912. Photo.
773. Along Battle’s Branch and Howell’s Branch, September 16, 1913. Photo. This plant was just as above except cap was not viscid. Spores subspherical, one large oil drop, 5.5-7.4 μ in diameter.
1928. In thin woods across Battle’s Branch from Indian Spring, October 25, 1915. Photo. One cap had a smaller one growing on it.

Blowing Rock. Atkinson.
North Carolina (Pisgah Forest?). Burlington.
Asheville. Beardslee.

36. **Lactarius helvus** Fr.

**L. aquifluus** Pk.

We have not found in Chapel Hill any plant that we could confidently refer to this species, and take the following from Miss Burlington (Mem. Tor. Bot. Club 14:74. 1908). For comparison of this and *L. rimosella* see under that species.
“Pileus fleshy, fragile, convex, then plane to depressed, subumbonate, testaceous to isabelline, expallent, azonate, dry, the whole surface broken up into floecose-granulose squamules, sometimes rivulose, 5-15 cm. broad, margin involute at first, then spreading; gills white, then tinted with incarnate, finally yellow, often forking, close, decurrent, 2-3 mm. broad; stem pale-testaceous, equal, pruinose, pubescent at the base, stuffed, then hollow, 5-8 cm. long, 1 cm. or more thick; spores globose, echinulate, hyaline, 6-7 μ; flesh of the same color as the pileus but paler, odor faint, sweet, persistent in drying; latex white, scanty, subacrid, more often watery and mild or subacrid. Edible.

“Hab.: In mossy rather wet woods or marshes. ‘In pines, frequently degenerate in swampy places’ (Fries).

“DISTINGUISHING FIELD-MARKS: The rather large size, the tawny buff colored, dry floccose-squamulose pileus, the usually watery milk, and the aromatic odor, which persists in drying.”

Middle district (Schw.) woods. Curtis.
Asheville. Beardslee.

37. Lactarius Peckii Burlg.

Plate 28.

Cap up to 11 cm. broad, depressed in center even when quite small, not umbonate, the margin strongly inrolled up to full growth and then mostly turned down, usually lobed and crimped at maturity. Surface rather roughly velvety, the margin distinctly tomentose when young. The color is very striking, a deep red brown (hazel, burnt sienna and chestnut brown), distinctly zoned or sometimes the zones scarcely visible in young plants. Flesh very firm, a light flesh-brown color, turning darker when cut. Milk very peppery, watery white, unchanging, rather scant.

Gills rather crowded, narrow, slightly decurrent, 2-3 mm. wide, color of cap and becoming a deep rich red-brown with age; pruinose at maturity, darker when bruised.

Stem quite smooth, tapering downward, 3-6 cm. long, about 1.2 cm. thick in center, solid and hard, color of cap, but somewhat lighter,
white tomentose at very base (most noticeable on part under the ground). Flesh like that of cap.

Spores white, spherical, tuberculate, a large oil drop, 5-6μ. See drawing.

Gregarious and often cespitose in low, mossy woods; not common.

113. By sphagnum moss bed west of athletic field, September 25, 1908.
1165. Just below sphagnum moss bed, east of athletic field, July 20, 1914. Photo.

Blowing Rock (as L. rufescens Morgan). Atkinson. (Morgan does not seem to have ever published his L. rufescens.) Pisgah Forest. Burlington.

38. Lactarius griseus Pk.

Both Atkinson and Miss Burlington have found this in the North Carolina mountains, but we have not met with the typical form in Chapel Hill. Miss Burlington’s description follows (Mem. Torr. B. C. 14 :80, fig. 14. 1908):

“Pileus fleshy, rather thin, firm at first, then lax, broadly convex, papillate, then depressed in the center, or at length infundibuliform, with or without papilla, varying from slate-gray (362) to smoke-gray (363), becoming yellowish with age (putty-colored, 311), azonate, dry, minutely tomentose, becoming floccose-tomentose, sometimes appearing squamulose to the naked eye, 1-5 cm. broad, margin involute, then spreading, entire; gills white, becoming cream-colored to honey-yellow, and pruinose, seldom forking, close, adnate to slightly decurrent, broader than the thickness of the pileus; stem of the same color as the pileus or paler, nearly equal, dry, glabrous except at the base, which is sometimes pubescent, stuffed, then hollow, 1.5-6 cm. long, 3-6 mm. thick; flesh white, unchanging; not aromatic; spores white, broadly elliptical, echinulate, 6-7 x 8-9.5μ; latex white, unchanging, slowly acrid.

“Hab.: In moist, mossy places in either coniferous or deciduous woods, on the ground or on decaying logs. July, August, and September.
"Distinguishing Field-Marks: The gray, tomentose, azonate, expallent pileus, the glabrous stem, and the lack of odor. While the plants may be dark-gray at first, they usually become dull-yellowish or putty-colored when mature. This species is closely related to *L. mammosa* Fr., a European plant which has not been found in the United States. As figured by Fries, *L. mammosa* is a larger stouter plant than *L. grisea*, it does not become yellowish with age, and it has a white pubescence on the margin of the young pileus, and the stem is pubescent. *L. grisea* is at first uniformly gray and covered with gray tomentum, which later becomes floccose and less evident."

Blowing Rock, on a rotted log. Atkinson.
North Carolina (Pisgah Forest?), 1,000 meters. Burlingham.
Asheville. Beardslee.


**Plates 29 and 40.**

Cap up to 6.6 cm. broad, moderately depressed and at times with a small, sharp or bluntest papilla in the depression which does not disappear in age, shape irregular, wavy, the margin lobed and bent down, surface scarcely viscid, not zoned, very peculiar, squamulose-warted and roughened all over, the very center least so, the warts sharply pointed. Color grayish russet vinaceous (about light russet vinaceous or vinaceous drab of Ridgway), little changed in drying. Flesh dry, brittle, firm, about 5-6 mm. thick near stem, grayish-brown, with a tint of the cap color, not acrid, or decidedly acrid with a bitterish taste added, odor faint, sweet, and pleasant. Milk white and remaining so, sparse even in immature plants, mild or distinctly acrid.

Gills ending abruptly and somewhat rounded at stem, not properly decurrent, distant, none branched, short ones of two lengths, narrowed at both ends, bent, veined at cap, 4-5 mm. wide in center, color a clear cinnamon with a tint of the cap color, on drying becoming a pale buffy-gray, edge quite smooth and regular.

Stem about 2.5 cm. long, 1 cm. thick at cap, tapering downwards, pruinose above, color of cap or lighter, the base whitish. Flesh firm, brittle, color like that of cap, a large hollow in center.
Spores (of No. 1850) maize-yellow, subspherical, papillate and reticulated, one oil drop, 6.3-7.5 x 7.5-8.2μ.

Our Chapel Hill plant is exactly like *L. griseus* from Miss Burlingham, except for the vinaceous tint and larger size. The spores, also, are identical and differ from those of *L. helvus*. The color has remained constant for five years and may be said to characterize our form. The typical form is said to be slate-gray to smoke-gray, becoming yellowish with age, and its maximum size is less. At maturity the cap of the Chapel Hill form is azonate as described, but when young it may be distinctly zoned. Plants collected from the same spot (apparently the same mycelium) may be quite mild at one time and distinctly acrid at another; all of one collection are either mild or acrid. The plants, which are single or cespitose, are frequently attacked by a white mold which may completely cover them and ruin the larger part of a colony.

2305. Same place as No. 1850, June 29, 1916.
2350. By Meeting of the Waters Branch, near Scott's Hole, July 3, 1916.
2560. Low damp place at foot of Lone Pine Hill, June 24, 1917. Photo. Taste distinctly acrid and slightly bitter; growing in same place as plants of collection No. 1850, which were mild. Spores as in No. 1850, 6.6-7.5 x 7.5-8.5μ.
3114. Same spot as collection No. 1850 and identical in all respects.


*L. fuliginosus* Fr.

**Plates 30 and 40.**

Cap up to 5.2 cm. broad, dull, dry, surface with texture of leather and with a bloom when young, no zones, flatly depressed in center, the margin strongly incurved in youth, rather light buffy-drab to much lighter straw-buff or white, tending to be somewhat rugose and pitted in center or all over. Flesh rather thin, nearly white, but usually turning quickly salmon or brick red when cut, sometimes scarcely changing. Milk white, unchanging or sometimes becoming
salmon or brick red or pink when in contact with the flesh, mild when first tasted then after a moment becoming moderately or exceedingly peppery, sometimes remaining quite mild. Fries says that the milk is mild at first, soon becoming acrid, but after a time and in adult specimens sweet and pleasant.

Gills crowded or in some forms moderately distant, about 3-4 mm. wide, pointed at stem and somewhat decurrent, none forked, many short ones of about three lengths, at first nearly white, then light cinnamon-buff. When bruised they become brick-red or salmon-red in color.

Stem up to 3 cm. long and 8 mm. thick, nearly smooth, color and texture of the cap or lighter, nearly equal or tapering downward, stuffed with much softer material and often becoming hollow (as in No. 1593).

Spores (of No. 771) cinnamon-buff (Ridgway), spherical, strongly papillate and ridged, one large oil drop, 7.5-9μ in diameter, including the spines, most about 8.3μ.

1593. Damp ground near Battle’s Branch, July 9, 1915. Photo. Spores cinnamon-buff, spherical, 6.3-7.5μ in diameter. Milk white at first, then brick-red when touching flesh.
1628. Damp soil by Battle’s Branch, July 22, 1915. This plant is typical of L. pinthogatus, but the latex is absolutely mild. Cap texture of leather, snuff-brown, zoneless, dry, wounds on any part turning salmon-red. Gills creamy, adnate. Stem even, texture of cap, somewhat lighter in color.

1772. Battle’s Park in woods west of Brockwell’s Spring, September 12, 1915. Milk mild.
1817. Damp soil, woods below Howell’s Spring, September 20, 1915.
1834. In woods east of cemetery, September 20, 1915. Photo. Gills crowded, narrow; stem stuffed; spores cinnamon-buff, spherical, 6.6-10μ in diameter, most about 7.5μ, covered with a strong, blunt papilla.
2233. Bank of New Hope Creek, below Durham-Chapel Hill Bridge, June 24, 1916. Spores 7.3-8.5μ.
2538. By path along branch above Meeting of the Waters, June 22, 1917.
2577. Mixed woods, Battle’s Park, July 2, 1917.

Asheville. Beardslee.
40. **Lactarius subplinthogalus** n. sp.

**Plates 31 and 40.**

Cap up to 10.5 cm. broad, usually 3-5 cm., moderately depressed in center, the margin rounded and somewhat irregular, or at times beautifully and regularly crimped; surface smooth, dull, minutely pruinose when young, scarcely so at maturity, marginal third with rather strong, radial, irregular pleats which extend in from the marginal crimps; color snuff brown, buffy-drab (avellaneous, Ridgway) to pale ochraceous-buff or occasionally even lighter (light buff, Ridgway). Flesh about 6 mm. thick near stem, tough, soft, whitish, turning rosy-salmon when cut, odor pleasant. Milk white, acrid, turning a deep rosy-salmon in contact with flesh and gills.

Gills very distant, somewhat decurrent, but ending abruptly and somewhat rounded at stem, none branching, not veined at cap, full length ones about 1-1.4 mm. apart at margin and 1-1.4 mm. deep. Between these are shorter ones of three lengths and three distinct widths, all bluntly rounded at the inner end. Color cinnamon-buff, turning rosy-salmon when cut.

Stem usually 3-4 cm. long, but at times up to 8 cm.; 7-15 mm. thick at cap, tapering slightly downward, smooth, about color of cap or lighter, flesh varying from solid and elastic and not noticeably stuffed in center (of the same firm consistency all through) to distinctly stuffed and sometimes cavernous in age.

Spores (of No. 1835) cinnamon, spherical, covered with strong, blunt spines of varying lengths on the same spore, some 1.5μ long, others shorter, diameter with spines 10-12μ, most about 11μ.

This species is distinguished from *L. plinthogalus* by the larger spores, the solid stem, the very distant and deep gills, and the usually larger size of the plant. It is also usually darker than *L. plinthogalus*.

Miss Burlingham considers these plants as coming within the variation range of *L. plinthogalus*, and there is no doubt that this species is a very variable one. However, after careful observation of these plants in Chapel Hill, it seems to me that we have two distinct forms. We do not find confusing intermediates, and all our collections can be easily referred to one or the other group. I consider it less confusing,
therefore, to treat them as distinct. On writing Mr. Beardslee in
regard to this plant, he replied: "I have this the same exactly as
you find it. I have noted the form you have as very different from
the type of the species. I find one form taller than this with their
crowded gills and your plant with the deep, distant gills, and I do not
find intermediates. I find, however, forms larger than those you send
with the same gills. I am inclined to think they should be separated.
I do not find spores as small as Miss Burlingham's lower limits for
them."

78. Low place east of athletic field, September 16, 1910.
1162. Swamp of New Hope Creek below Durham bridge, July, 1914. Spores
spherical with blunt papillae, average 11\(\mu\) in diameter, including
spines.
1835. In deep woods, north side Rocky Ridge Farm, September 20, 1915.
Photo.
2349. By Meeting of the Waters Branch, near Scott's Hole, July 3, 1916.
Photo. Type.
2394. Woods at top of Lone Pine Hill, July 18, 1916. Margin beautifully
crenated.
2436. Clay soil, mixed woods, Battle's Park, July 24, 1916. Gills and flesh
slowly turn dull deep red when wounded; taste acrid.
2666. Low damp woods by branch below Howell's Spring, July 14, 1917.
Stem in this specimen quite lateral as in Pleurotus.

Asheville. Beardslee.

41. Lactarius ligniotus Fr.

Plate 32.

Cap 4.5-7 cm. broad, excenctric and quite irregular, the margin
broadly drooping, depressed in center or scarcely so, surface rugose all
over, just as in L. rugosa, dresden brown all over, darkening to mummy
brown in age, not zoned, dry, pulverulent with minute granules.
Flesh about 5-8 mm. thick in center, quickly thinning towards the
margin, rather spongy and elastic, pale cream-color, mild. Milk
moderately plentiful, light pink or quite distinctly a clear pink
color and not changing for a long time, then becoming sordid ochraceous like the wounded gills.
Gills distant, irregular, many short, some anastomosing near the margin and a few forked, about 3-4 mm. wide, slightly decurrent, pale creamy white, turning sordid ochraceous when wounded, and discolored in age.

Stem eccentric, 2.5-3 cm. long, 0.8-1.2 cm. thick, nearly equal, firm, stuffed, or cavernously hollow, surface even, pulverulent above, velvety below, colored like the cap but darker.

Spores yellowish, subspherical to elliptic, with a long mucro, very minutely papillate or papillate warty, 5.5-7.4 x 7.4-11μ.

A rare plant in Chapel Hill and represented so far by a single collection, which is of a short-stemmed form. The stem is said to reach a length of 8 cm.

2181. Damp soil by branch west of Meeting of the Waters, June 20, 1915. Photo.


42. Lactarius Gerardii Peck.

The following is from Miss Burlington (Mem. Torr. B. C., 14: 87, 1908):

"Pileus fleshy, firm, convex at first, often with a small umbo, then plane or depressed, dark seal-brown, becoming golden-brown or umber, or sometimes paler, azonate, dry, surface velvety rugose radiately from the center, sometimes becoming cracked near the margin, margin even or wavy and irregular, often paler in color, thin, becoming extended; gills white then cream-colored, more or less interveined, distant, appearing more so in older specimens with somewhat irregular spaces, decurrent, not very thin, broad; stem the same color as the pileus, velvety to the touch, equal or ventricose, stuffed, then hollow, 2.5-5 cm. long, 4-20 mm. thick; flesh white, unchanging; spores white, globular, echinulate, 6.5-9μ; latex white, unchanging, mild, then slightly acrid. Edible.

"Hab.: On the ground in woods or in open groves. July to September."
"Distinguishing Field-Marks: This species is closely related to Lactaria ligniota Fr., but can be distinguished from it by the white spores, the unchanging color of the broken flesh or gills, and the more distant gills."

For an illustration in color see N. Y. St. Mu. Mem. 3: Pl. 53. 1900.

Blowing Rock. Atkinson.
Pisgah Forest. Burlington.

43. Lactarius volemus Fr.
L. lactiflua (L.) Burl.

Plates 33 and 40.

Cap generally more or less infundibuliform with various irregularities of the edges, surface smooth, not velvety, often with decided corrugations, particularly near the edge, and not rarely with cracks on the margin, color brownish-orange, or a much deeper brownish-red (Sanford's brown or cinnamon-rufous, Ridgway), sometimes very much lighter, not darker than light cream color. Flesh firm, white at first, changing when cut to a brownish-red. Milk very abundant, sticky, mild, white, and remaining white.

Gills at first creamy-white, turning a pretty creamy-yellow, and when bruised a dark, sordid brown, about 4-5 mm. wide, pointed at the stem, more or less decurrent, varying greatly in number, and so quite crowded or decidedly distant.

Stem 1.5-5 cm., usually 3-4 cm., long and about 1 cm. thick, very irregular, stuffed, surface pruinose except at base, where it is finely white velvety, colored about like the cap and lightest at the top.

Spores (of No. 104) white, globular, warted, 7.4-8.2 μ in diameter.

This plant is nearest L. corrugis, but has not the fine tomentum of that species or the deeply colored gills when young. It is a good-sized, attractive, and rather common plant that is recorded among the best to eat. For an illustration in color see N. Y. St. Mu. Rep. 48: Pl. 30. 1897. 2nd. ed.

95. Mixed woods south of Dr. Battle's in a rather low place with Smilax rotundifolia, September 25, 1911. No milk could be gotten from this individual, although at its perfection. Spores warted, 7.4-8 μ.

102. Low woods east of the athletic field, September 25, 1908.
327. Battle's Park, September 26, 1911.
802. Dr. Pratt's lawn, south side, September 21, 1913. Photo. Spores 7.4-11μ.
1007. Low woods west of athletic field, September 26, 1911.
1148. In sphagnum moss bed east of athletic field, July 10, 1914.

Blowing Rock. Atkinson.
Common in woods. Curtis.
Mount Pisgah. Burlingham.
Asheville. Beardslee.

44. **Lactarius hygrophoroides** B. & C.

**Plate 34.**

Cap about 5.5-8 cm. broad, deeply depressed in center, the margin arched and irregular, and sometimes prettily crenated; surface smooth or decidedly rugose, dull and distinctly pruinose, not viscid, about pinkish cinnamon to cinnamon (Ridgway). Flesh white, elastic, about 3 mm. thick near the stem, mild and odorless. Milk white, mild, not abundant.

Gills distant, 6-7 mm. wide beyond the middle, pointed and decurrent at the stem, light yellowish-cream, thick and irregular, short ones near the margin, not changing when wounded.

Stem about 2.5-4 cm. long, 11-14 mm. thick at top, tapering downward, smooth, about color of cap, solid.

Spores distinctly roughened with low warts, elliptic, 5.5-7.4 x 7.4-11μ. They are exactly like the spores of the plant of this species in Miss Burlingham's exsiccati.

In drying the plant, especially the gills, has a strong tendency to become watery and moldy, contrasting in this way will the related *L. volemus* and *L. corrugis*, which dry readily. For an illustration in color see Mycologia 8: Pl. 187. 1916; also, N. Y. St. Mu. Mem. 3: Pl. 53. 1900 (as *L. distans*).

45. **Lactarius corrugis** Pk.

**Plate 35.**

Cap usually 8-9 cm. broad, depressed in center and margin nearly plane. Surface finely velvety-pubescent, the pubescence tending to lighten and obscure the color below; usually much corrugated, as in *L. volemus*, a very deep bay brown (chestnut) usually, but sometimes lighter, dry and without zones. Flesh white, turning quickly to a reddish-brown when cut. Milk white, bountiful, unchanging, very sticky.

Gills a deep fleshy yellow-brown when young, becoming a lighter golden-brown (antimony yellow of Ridgway) when mature, turning a deep scorched brown when bruised, slightly decurrent, moderately close, broadest near margin where they are 5 mm. deep.

Stem solid, 5.5-6.5 cm. long and 1.5-2.3 cm. broad; softly tomentose, color of cap, but lighter.

Spores white, spherical, warded, one large oil drop, 8.5-9.3μ.

The taste is mild and pleasant and the plant is very good to eat.

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803. Woods south of athletic field, September 17, 1913.
1192. Low, damp woods south of cemetery, July 22, 1914. Color very light, a light cream or brownish-cream in places.
1205. Scattered along Battle’s Branch, July 24, 1914.

Blowing Rock. Atkinson.

46. **Lactarius luteolus** Pk.

*L. foetidus* Pk.

**Plate 36.**

Cap 3.5-6 cm. broad, not zonate, the center moderately depressed, the margin nearly plane with its edge incurved, rather irregular; surface covered throughout with a short, dense, felted, tomentum and viscid when moist, color light leathery tan, some parts darker than others. Flesh tough and firm, thick, 9 mm. thick near stem, white but quickly pinkish-brown when cut then deep dull brown,
a decided fungoid odor as in *L. volemus*. Milk abundant, mild, white and remaining so except when in close contact with the flesh, then undergoing the same changes.

Gills moderately close, adnate, simple or some forked near the stem, narrow, only 2 mm. wide, pruinose, pale cream at maturity, when bruised becoming quickly pinkish-brown then slowly deepening to blackish scorched brown.

Stem 2.5-3.5 cm. long, 1-1.5 cm. thick in middle, flaring at the top, tapering downward, color and tomentum exactly like that of the cap all over, brown where bruised; flesh solid, tough, and firm, changing like the cap flesh.

Spores white, subspherical to elliptic, distinctly papillate, 4.8-5.5 x 5-7.4 μ.

This is new to North Carolina, having been reported in the South only from Tennessee and Mississippi. The cap is described as not viscid, but is certainly viscid when quite fresh in our plant. The abundant mild milk and quick change to brown show the kinship of the plant to *L. corrugis* and *L. volemus*.

1715. In sandy soil in woods near branch north of Meeting of the Waters, September 9, 1915. Two photos. Spores 5.4-6.8 x 5.8-7.2 μ.

2817. By rock wall in sidewalk west of Professor Howell’s yard, under white oak, July 30, 1917. Photo.

2820. In grass under oak in Professor Howell’s lawn, August 3, 1917. Seven plants, 3.5-5.5 cm. broad, old ones with the margin elevated. Characters as in No. 2817.

47. *Lactarius lentus* n. sp.

*Plates 37 and 40.*

One plant. Cap 5.5 cm. broad, regular, flatly rounded, soaked looking in center where it is nearly glabrous but dull, and buffy ochraceous, the marginal half or third strongly rugose, the broad cracks showing the fibrous looking and lighter flesh, not at all viscid and not zoned. Flesh pure white, about 5 mm. deep at stem, rapidly thinning towards margin, very tough and firm; tasteless. Milk white, unchanging, mild, not discoloring the gills.
Gills very distant, some short marginal ones and a few branched near the stem, about 4-5 mm. wide, very thick, firm and tough, narrowly attached, not decurrent, not brown when bruised.

Stem 3 cm. long, 11 mm. thick at top, tapering downward, light and smooth above, somewhat scurfy cracked like the cap margin below and of the same color, texture quite firm, tough and solid.

Spores pure white, broad elliptic, minutely warted under high power, 3.7-4.8 x 5.5-7.4μ.

This is evidently in the Lactifluæ group, but differs from related species in the very tough and tenacious texture of all parts, the quite different spores, which are much smaller and smoother than in L. hygrophoroides B. & C. as it is represented in Chapel Hill and in Miss Burlingham’s exsiccati.

2323. Woods near branch above Meeting of the Waters, June 30, 1916. Two photos. Type.

48. Lactarius camphoratus (Bull.) Fr.

We have not recognized this species at Chapel Hill, but it has been reported from North Carolina, and we include the following description, adapted from Miss Burlingham (Mem. Torr. Bot. Club 14:98, 1908):

"Pileus fleshy, firm, rather thin, convex, often umbonate, at length expanded, depressed in the center, but the margin still arcing, fulvous (308) to madder-brown (334), azonate, dry, glabrous, 1-4 cm. broad, margin inrolled and pruinose at first, not striate; gills whitish or flesh-colored (67), becoming reddish-brown, sometimes a few forking next the stem, close, adnate to slightly decurrent, rather narrow; stem of the same color as the pileus or paler, nearly equal, sometimes flexuous, glabrous, pruinose, smooth, firm to spongy, 1-3 cm. long, 3-8 mm. thick; flesh of about the color of the gills, unchanging, odor aromatic, becoming more pronounced in drying; spores white, globose, echinulate, 6-7μ; latex white, unchanging, mild, abundant.

Edible.

"In woods, more abundant in moist mixed woods. July to October.

"This species is of about the size of Lactaria subdulcis and some-
times of nearly the same color, but usually it is a darker-fulvous or more red-brown, and the flesh is firmer. The odor is usually faint at first, but becomes strong as it dries. To me the odor is like that of slippery-elm bark. The pileus is polished in appearance and does not fade with age nor become rimulose.

"The European writers describe the pileus as zonate, but no zonate specimens have been reported in the United States."

Blowing Rock. Atkinson.
Mount Pisgah. Burlingham.
Low districts, woods, and thickets. Curtis.

49. Lactarius rimosellus Pk.

Plate 38.

Cap up to 5 cm. broad, averaging much smaller (about 1.5-3 cm.), sharply umbonate usually, but in age depressed around the umbo; surface minutely subtomentose or plush-like, usually cracked into small areas and appressed scales, deep brick-brown (onion-skin pink to pecan-brown of Ridgway). Flesh firm, color of cap but lighter, thin, 1 mm. thick halfway to margin; odor aromatic, not like camphor, becoming more pronounced in drying. Milk watery-white, mild, unchanging.

Gills rather distant, attached, broadest at stem where they are about 2 mm. wide, slightly decurrent, tough and elastic, a deep rich red-brown and pruinose at maturity.

Stem smooth, cartilaginous, slightly tapering upward, about color of cap, but usually paler, lightest below, about 3.5 cm. long and 2-3.5 mm. thick in center, hollow.

Spores (of No. 1173) light creamy-brown, subspherical to elliptic, tuberculate to papillate, 5.5-7 x 6.6-8.2 µ in diameter.

A pretty little plant, quite common in late June and July and less plentiful later. It is found in woods and groves among grass and moss, generally on the ground, but sometimes on rotting wood. It is plentiful in my yard under oaks.

Miss Burlingham has seen my two collections of plants and considers them L. helvus, but I cannot agree with this determination unless
L. helvus and L. rimosellus are the same. Compared with four good plants from the type collection of L. rimosellus that Dr. House has been so kind as to send me, the plants appear identical in every respect, as much so as if they had been gathered from the same colony. The spores, also, are exactly alike, being subspherical, most about 6.6-7 x 7.2-7.5μ, and with more spine-like papillae than in those of L. helvus from Miss Burlingham, in which the spores are more elliptic and the warts more blunt and low. Lactarius helvus is, moreover, a larger plant than ours, and the gill color is different in the dry state. Peck's plants are decidedly odorous in the dried state, and so are ours (in this respect not differing from L. helvus, unless the odor be somewhat different). Plate 28 shows the largest plant of this species we have found in Chapel Hill.

76. Low places east of athletic field, September 25, 1908.
547. On mossy ground near Battle's Brook, October 10, 1912.
1164. Just below sphagnum moss bed, low woods, July 20, 1914. Spores 5.6-6.4μ. Photo.
1203. In several places along Battle's Branch, wet sandy places, just above water, July 24, 1914.
1594. By path along Meeting of the Waters Branch, near one-quarter mile west of Meeting of the Waters, July 9, 1915. Spores spherical, papillate (some less so), 5.3-7.2μ in diameter.
1753. Low, damp, shaded spot at base of Lone Pine Hill, September 12, 1915.
2357. On a rotting deciduous log, woods, July 3, 1916. Cap surface broken up into small squamulose-looking areas.

50. Lactarius subdulcis (Pers.) Fr.*

PLATE 39.

Cap 1.5-5.3 cm. broad, at times irregular, soon depressed in center, not papillate or umbonate, the margin elevated or nearly plane, in-

*Lactarius sp.?

We have one collection of a tall slender plant growing on wood that we have not yet been able to determine. We have found no other Lactarius growing on wood except L. rimosellus (rarely), and that is easily different with its rimo and velvety cap and different color of gills, particularly when dry. Lactarius subdulcis has less spherical spores and different color (very different when dry), and L. camphoratus has a strong odor. Lactarius ligniticus var. tenusipes has been found on wood in spruce woods in Vermont, but
rolled at first, not striate or crenate, surface smooth, dull, slightly viscid when damp; color pinkish-tan or avellaneous to wood-brown all over or the center darker or mottled with brick-color. Flesh 2-3 mm. thick, tinted like the cap, rather brittle, not changing when bruised; odor faint but usually distinct, rather like dried apples, not stronger on drying. Milk white or watery-white, not abundant, mild on first tasting, then moderately and slowly acrid. Said to be mild or bitterish at times.

Gills crowded or scarcely crowded, adnate or slightly decurrent, none or a few forked, veined, 3-5 mm. wide, color of the cap or paler in youth, darker with age, on drying becoming very white-glaucous.

Stem 1-4 cm. long, 3-7 mm. thick, nearly equal, often compressed, color of cap, smooth, the base coarsely tomentose when in leaves, distinctly hollow except when young.

Spores (of No. 3019) white, tuberculate, 6-6.8 x 7.5-9.3µ.

By the glabrous cap, brownish color of all parts, tardily acrid milk and hollow stem this species may be distinguished. The milk is said to be mild at times. From Miss Burlingham's description our plants differ only in the slightly but distinctly viscid and non-papillate cap. The spores are exactly those of plants from Miss Burlingham, and the dried plants look alike. This is true, however, of L. camphoratus also, plants of which from Miss Burlingham having spores just like those of her L. subdulcis. In fact, no difference appears in the dried plants of the two species, the odor being the same so far as I can detect. From descriptions practically no difference appears except that is very different. Lactarius griseus may also grow on decaying logs, but we have found it only on earth in Chapel Hill. The description of our plant follows:

Cap only 2-3 cm. wide, glabrous, not viscid, depressed in center, light ochraceous-buff to ochraceous-tawny. Flesh thin, firm, fragile, with a light tint of the cap color; odor none. Milk mild, sometimes so sparse as to be scarcely discernible even in very young plants.

Gills close, slightly decurrent, white then tan, with a tint of flesh color.

Stem very long and slender, 3-7 cm. long and about 5 mm. thick, ochraceoustawny, lightly stuffed, base distinctly white villous, the hairs turning ochraceous-tawny in drying like the stem.

Spores white, spherical, a few short-elliptic, warded, 5.9-8.5 x 5.9-10.2µ. Distinctly more spherical than in L. subdulcis, Nos. 3019 and 3040.
that *L. camphorata* is said to develop a strong odor in drying, while
*L. subdulcis* does not, and to be darker usually in color than the latter.
All parts of *L. subdulcis* tend to become a darker brick color on old
bruises and the old gills are often spotted with this color.

For an illustration in color see *Mycologia* 3:168, Pl. 49. 1911.

3019. Pine woods by pond in front of cemetery, May 1, 1918. Photo. Small
plants, cap 1.5-4.2 cm. broad, irregular; stem 1-2.5 cm. long, 3-7 mm.
thick, hollow.

3040. Strowd's lowgrounds in moss, May 18, 1918. Plants larger, cap up to
5.3 cm. broad, wood brown to avellaneous. Milk white, slowly acrid,
in age flesh barely acrid. Spores pure white, tuberculate, elliptic,
6.2-8 x 7.7-10μ.

3065. Strowd's lowgrounds, deciduous woods, May 22, 1918. Small plants;
cap up to 2.5 cm. broad, stem 3 cm. long, center and one cap rugulose.
All quite glabrous and depressed in center; no papilla and scarcely
any odor. Spores pure white, tuberculate, elliptic, 6.5-7.6 x 7.6-9.7μ.

3094. Mixed woods back of athletic field, May 28, 1918.

Blowing Rock. Atkinson.
Mount Pisgah. Burlingham.
Asheville. Beard'slee.
Common, damp grounds. Curtis.

CHAPEL HILL, N. C.
EXPLANATION OF PLATE 40.

(All figures x 2160.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lactarius pergamenus</td>
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<tr>
<td>2.</td>
<td>Lactarius vellereus</td>
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<tr>
<td>3.</td>
<td>Lactarius subvellereus. Form A</td>
</tr>
<tr>
<td>4.</td>
<td>Lactarius Allardii</td>
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<tr>
<td>5.</td>
<td>Lactarius deceitivus</td>
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<td>6.</td>
<td>Lactarius rusticanus</td>
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<td>7.</td>
<td>Lactarius atroviridis</td>
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<tr>
<td>8.</td>
<td>Lactarius torminosus</td>
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<tr>
<td>9.</td>
<td>Lactarius subtorminosus</td>
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<tr>
<td>10.</td>
<td>Lactarius furcatus</td>
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<tr>
<td>11.</td>
<td>Lactarius scrobiculatus</td>
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<tr>
<td>12.</td>
<td>Lactarius scrobiculatus</td>
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<tr>
<td>13.</td>
<td>Lactarius insulsus</td>
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<td>14.</td>
<td>Lactarius trivialis</td>
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<td>15.</td>
<td>Lactarius coleopteris</td>
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<td>16.</td>
<td>Lactarius speciosus</td>
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<td>17.</td>
<td>Lactarius croceus</td>
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<td>18.</td>
<td>Lactarius subpuppureus</td>
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<td>Lactarius Indigo</td>
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<td>20.</td>
<td>Lactarius chrysoheus</td>
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<td>21.</td>
<td>Lactarius chrysorheus. Form A</td>
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<td>22.</td>
<td>Lactarius quietus?</td>
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<td>23.</td>
<td>Lactarius Curtisii</td>
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<td>24.</td>
<td>Lactarius Peckii</td>
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<td>25.</td>
<td>Lactarius griseus. Form A*</td>
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<td>26.</td>
<td>Lactarius plinthogalus</td>
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<td>27.</td>
<td>Lactarius subplinthogalus</td>
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<td>28.</td>
<td>Lactarius volemus</td>
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<tr>
<td>29.</td>
<td>Lactarius lentus</td>
</tr>
</tbody>
</table>

*The drawing of this spore should be more clearly reticulated to accurately represent the majority.*