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November 2013

### Amanita Notebook 3

L. R. Hesler

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# INDEX TO AMANITA

Amanita <sup>a</sup> abruptibulba . . . . .	42
Amanita <sup>a</sup> aestivolis . . . . .	40
Amanita <sup>a</sup> agglutinato . . . . .	26
Amanita alba . . . . .	7
Amanita alpina . . . . .	5
Amanita aspera . . . . .	49
Amanita bisporigera . . . . .	28
Amanita brunnescens . . . . .	41
Amanita caesaris . . . . .	15
Amanita calypetroderma . . . . .	14b
Amanita calyptratoides var. alba . . . . .	32
Amanita chlorinosma . . . . .	45
Amanita cinereconia . . . . .	52
Amanita citrina . . . . .	39
Amanita cothurnata . . . . .	22
Amanita cothurnata . . . . .	23
Amanita cylindrospora . . . . .	31
Amanita elliptosperma . . . . .	36
Amanita farinosa . . . . .	1
Amanita flavoconia . . . . .	48 47
Amanita flavorubescens . . . . .	47
Amanita fulva . . . . .	9
Amanita gemmata . . . . .	4
Amanita hygroskopica . . . . .	34



Amanita inaurato . . . . .	14a
Amanita junquillea . . . . .	25
Amanita livida . . . . .	13
Amanita magnivelaris . . . . .	33
merschii	27
Amanita muscaria . . . . .	18
Amanita muscaria . . . . .	19
Amanita muscaria alba . . . . .	20
Amanita ocreata . . . . .	37
Amanita pantherina . . . . .	24
Amanita parcivolvata . . . . .	3
Amanita peckiana . . . . .	26a
Amanita porphyria . . . . .	38
Amanita pubescens . . . . .	5
Amanita robusta . . . . .	14
Amanita rubescens . . . . .	46
Amanita solitaria . . . . .	<del>44</del> 43
Amanita spissa . . . . .	50
Amanita spissa . . . . .	51
Amanita spreata . . . . .	17
Amanita strobiliiformis . . . . .	43
Amanita velosa . . . . .	8
Amanita virosa . . . . .	30
Amanita <u>Mersch N. Jersey</u> . . . . .	27
Amanita Sm-1550 . . . . .	22
Amanita Sm-8753 . . . . .	1
Amanita Sm-9653 . . . . .	23
Amanita Sm-10267 . . . . .	50

Amanita Sm-13771 . . . . .	12
Amanita Sm-21805 . . . . .	29
Amanita Sm-26164 . . . . .	7
Amanita Sm-29692 . . . . .	10
Amanita Sm-37141 . . . . .	16
Amanita Sm-38367 . . . . .	35
Amanita Sm-38732 . . . . .	51
Amanita Sm-42276 . . . . .	11
Amanita Sm-44902 . . . . .	6
Amanita Sm-44957 . . . . .	2
Amanita Sm-45057 . . . . .	21
Amanita Sm-45357 . . . . .	5



KEY TO SPECIES OF AMANITA FOR NORTH AMERICA  
(1955 Version)

Alexander H. Smith

1. Spores nonamyloid . . . . . 2
1. Spores amyloid . . . . . 26
  2. Annulus typically none (partial veil absent or so delicate as not to form one) . . . . . 3
  2. Annulus typically present . . . . . 16
3. Spores distinctly ellipsoid to ovate (rarely subglobose to drop-shaped) . . . . . 4
3. Spores (minus the apiculus) globose to subglobose . . . . . 9
  4. Universal veil powdery and gray, remnants as granulose patches on pileus and around base of stipe. . . . . 1. A. farinosa
  4. If universal veil powdery then its color white to yellowish . . . . . 5
5. Pileus "drab" (dark gray to brownish gray) . . . . . 2. A. Sm-44957
5. Pileus whitish, yellow, orange to red . . . . . 6
  6. Pileus scarlet to rich orange on disc, margin plicate-striate . . . . . 3. A. parviovata
  6. Pileus at most pale yellow beneath the veil . . . . . 7
7. Cap margin coarsely tuberculate striate . . . . . 4. A. gemmata
7. Cap margin even or ~~only slightly striate~~ <sup>plicate-striate</sup> . . . . . 8
  8. With a free margined volva but the margin not inrolled . . . . . 5. A. pubescens (Sm-45357)



8. Volva present as a basal zone, tissue friable and readily breaking up . . 6. A. Sm-44902
9. Pileus pure white to various shades of pale yellow . . . . . 10
9. Pileus differently colored . . . . . 11
10. Pileus glabrous and pure white . . . . 7. A. alba
10. Pileus usually with an irregular patch of the membranous volva present, surface beneath pale buff to orange buff . . 8. A. velosa
11. Pileus tawny to dark yellow-brown . . . . . 12
11. Pileus blackish to gray or olive brown . . . . . 14
12. Pileus tawny to ochraceous tawny; spores 8 - 10  $\mu$  . . . . . 9. A. <sup>fulva</sup> ~~vaginata~~
12. Pileus dingy dark yellow-brown; spores 9 - 13  $\mu$  . . . . . 13
13. Lamellae white, edges at maturity (at least in part) pale yellowish brown to wood brown . . . . . 10. A. Sm-29692
13. Lamellae pallid to pale cinereous and not marginate at maturity . . . . . 11. A. Sm-42276
14. Lamellae "pale smoke gray" and not marginate . . . . . 12. A. Sm-13771
14. Lamellae white . . . . . 15
15. Pileus typically glabrous and pale smoke gray; lamellae not marginate . . . . . 13. A. livida G
15. Pileus blackish when young, occasionally with large patches of volva adhering and gills marginate . . . . . 14. A. robusta



15. Pileus blackish brown and with numerous warts  
of gray friable universal veil tissue on  
warts; some type of tissue around base of  
stipe as a volva . . . . . 14a. A. inaurata
16. Volva tough and membrous, truly cup-  
like, free margin often lobed; pileus  
typically glabrous. . . . . 17
16. Volva friable as is evidenced by wart-  
like or powdery remains on pileus . . . . . 18
17. Pileus typically <sup>calyptate</sup> ~~calyptate~~ from a membranous  
patch of universal veil tissue, color yellow  
to yellow brown. . . . . 14b. A. calypetroderma
17. Pileus typically glabrous and not colored  
as above . . . . . 17a
- 17a. Pileus scarlet to orange . . . . . 15. A. caesaria
- 17a. Pileus differently colored . . . . . 17b
- 17b. Pileus gray to grayish brown . . . . . 17. A. spreata
- 17b. Pileus cinnamon buff to pale  
argilaceous . . . . . 16. A. Sm-37141
18. Pileus coarsely tuberculate-striate on  
the margin; annulus median to basal and  
often evanescent . . . . . 4. A. gemmata
18. Not as above; annulus well formed if  
cap is distinctly striate at maturity  
or in age . . . . . 19



19. Universal veil remnants on pileus not organized into discrete warts - often a layer or this broken up into poorly formed soon evanescent warts . . . .20
19. Universal veil typically leaving remnants on pileus as discrete warts . . . . .21
20. Volva with a free margin. .5. A. alpina (Sm-45357)
20. Volva as a second basal annulus of friable tissue . . . . .6. A. Sm-44902
21. Universal veil intergrown with bulb and volva present as interrupted zones of innate tissue over bulb and lower part of stipe . . . . .22
21. Volva with a definite inrolled collarlike margin around base of bulb or the margin free but volva not broken up into innate zones . . . 23
22. Pileus dark blood red . . . . .18. A. muscaria var. muscaria
22. Pileus orange to yellow . . . . .19. A. muscaria var. formosa
22. Pileus white or pallid ..20. A. muscaria var. alba
23. Volva with a free ragged margin (not inrolled); pileus pinkish buff to dingy cinnamon buff or grayer. . . . .21. A. Sm-45057
23. Not with above combination of characters. . . . .24
24. Pileus ± creamy yellow on disc at first, becoming white over all . . . . .22. A. cothurnata (Sm-1550)



24. Pileus white except for grayish brown  
disco; margin tuberculate-striate  
. . . . . 23. A. cothurnata (Sm-9653)
24. Pileus more distinctly colored than in  
either of the above choices. . . . . 25
25. Warts of universal veil tissue essentially  
pyramidal and with convex bases; cap color  
bister to dull yellow brown or dingy yellow  
. . . . . 24. A. pantherina
25. Warts of universal veil tissue of discrete  
irregular patches often showing cleavage  
lines for further subdivision (these 5 mm.  
to 2 cm.); pilei pale clear yellow at  
first . . . . . 25. A. junquillea
26. Annulus typically absent (rarely present in  
A. agglutinata and peckiana) . . . . . 27
26. Annulus typically present . . . . . 28
27. Pileus pallid to dingy brownish and staining  
reddish where bruised . . . . . 26. A. agglutinata
27. Pileus white to pallid cream color, not staining  
. . . . . 26a. A. peckiana
27. Pileus orange and unchanging . . . . . 27. A. Merschii
28. Pileus typically glabrous or with  
remnants of a membranous volva in  
the form of large patches . . . . . }  
Volva <sup>on</sup> membranous and with a free margin) . . . . . 29  
^
28. Pileus with warts or innate scales;  
volva not as above . . . . . 37



29. Spores globose to subglobose . . . . . 30
29. Spores ellipsoid to cylindric . . . . . 32
30. Spores 7 - 10  $\mu$ ; basidia 2-spored  
. . . . . 28. A. bisporigera
30. Basidia 4-spored . . . . . 31
31. Pileus umber-brown to pale gray, 2 - 4 cm.  
. . . . . 29. A. Sm-21805
31. Pileus pure white, 6 - 12 (15) cm. . . . . 30. A. virosa
32. Spores 11 - 15 x 4.5 - 5.5  $\mu$   
allantoid in side view, cylindric in  
face view . . . . . 31. A. cylindrospora
32. Spores broader in relation to their  
length . . . . . 33
33. With a large membranous patch of volva tissue  
over the disc . . . . .  
32. A. calyptraloides var. alba Kauff. unpublished
33. Rarely with a well-formed volva (tissue as large  
flaps around the bulb - rarely on pileus)  
. . . . . 33. A. magnivelaris
33. Volva cup-like at base of stipe . . . . . 34
34. Pileus typically with a water-soaked  
appearing disc . . . . . 34. A. hygroskopica
34. Not as above . . . . . 35
35. Bulb large and ellipsoid, volva standing out  
from the base of the stipe and collapsing only  
in age; habitat on sand in fire lanes, etc.  
. . . . . 35. A. Sm-38367



35. Bulb subglobose to ovate . . . . . 36
36. Spores  $10 - 14 \times 6 - 7 \mu$  . . 36. A. elliptosperma
36. Spores  $9 - 11 \times 7 - 8.5 \mu$  . . . . .
37. A. ocreata sensu Rea
37. Spores globose to subglobose . . . . . 38
37. Spores ellipsoid to ovoid . . . . . 40
38. Pileus, stipe, gills and universal veil  
all in the cinereous to drab or wood  
brown color series . . . . . 38. A. porphyria
38. Not as above, at least the gills white  
to cream color. . . . . 39
39. Pileus pale greenish yellow; odor faintly  
reminding one of chloride of lime. . . . 39. A. citrina
39. Pileus white to tulleul buff. .40. A. aestivalis Singer
39. Pileus dark olive brown to umber at least on  
the disc (margin frequently faded). .41. A. brunnescens
40. Pileus white or disc tinged yellowish; bulb  
prominent and abrupt, rounded below  
. . . . .42. A. abrupt<sup>a</sup>bulba
40. Not as above . . . . . 41
41. Pileus dry and with innate scales, lower part  
of stipe with dry recurved scales. {42. A. strobiliformis  
Odor fragrant. . . . . {43. A. solitaria
41. Not as above . . . . . 42
42. Spores  $10 - 13 \times 5 - 7 \mu$ ; odor typically  
strong - of chloride of lime. . 44. A. chlorinosma
42. Spores  $7 - 10 \mu$  long, odor not distinctive. . . 43



43. Staining red to wine color when bruised or in age . . . 44
43. Not staining or only in age with slight inconstant  
discolorations . . . . . 45
44. Pileus umber, grayish, avellaneous or  
reddish brown; veil not yellow . . 45. A. rubescens
44. Pileus lemon yellow to brownish; universal  
veil remnants yellow (see A. aspera also)  
. . . . . 46. A. flavorubescens
45. Pileus chrome yellow to pale yellow; universal  
veil remnants yellow to pallid . . . 47. A. flavoconia
45. Pileus and veil not as above . . . . . 46
46. Pileus <sup>2</sup>row umber to bister, margin typically  
with ochraceous tones and ochraceous tones  
also evident in universal veil remnants,  
margin of annulus, or on stipe below  
annulus. . . . . 48. A. aspera
46. Ochraceous tones not evident as in above . . . 47
47. Universal veil remnants whitish  
. . . . . 49. A. spissa (Sm-10267)
47. Universal veil remnants cinereous . . . . . 48
48. Bulb of stipe oval to rounded  
below . . . . . 50. A. spissa (Sm-38732)
48. Bulb subfusiform and base ending in at  
least a short pseudorhiza . . . 51. A. cinereconia



*Amanita farinosa* Schweinitz, Sm-8753

Pileus 3 - 7 cm. broad, convex remaining so or becoming plane in age or with an arched margin, at times the margin finally uplifted, surface dry, covered with a dense coating of mealy particles which is very easily rubbed off, often with dense patches of downy glistening particles, margin at first hung with the remains of the veil, and in age coarsely tuberculate-striate, color evenly pale ashy gray to mouse-color; flesh moderately thick, white, firm, odor none.

Lamellae close ( $\pm$  140 reach stipe), narrowly adnate, fairly broad (5 - 8 mm.), white or very pale gray, edges white fimbriate.

Stipe 6 - 8 cm. long, 1 - 1.5 cm. thick at apex, hollow, equal to clavate, with an onion-like bulb at base, base of the bulb regularly narrowed to an abruptly constricted short pseudorhiza, surface of bulb at first covered by grayish delicate patches of veil tissue, soon glabrescent, surface above white and minutely fibrillose-scaly at apex or pruinose.

Spores 7 - 9 x 5 - 6  $\mu$ , drop-shaped, smooth, not amyloid, (yellowish hyaline in Melzer's); basidia 36 - 44 x 8 - 11  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia clavate, 10 - 20  $\mu$  broad; gill trama divergent from a central strand; pileus trama with a



*Amanita farinosa* Schweinitz, Sm-8753, cont.

cystoderma-like cuticle of inflated to globose cells mixed in with filaments, all hyaline in KOH; clamp connections none.

Habit, habitat and distribution: Scattered under spruce, Fort Smith, California, Nov. 16, 1937 (Sm-8753).

Observations: No yellow tones were present in the veil. The drop-shaped non-amyloid spores, lack of an annulus, mouse-colored to ashy veil, and plicate-striate pileus in age are distinctive. Compare with material from the southeast again.



Amanita Sm-44957 ("plumbed" group)

Pileus 4 - 7 cm. broad, obtusely conic to oval when young, expanding to plano-umbonate or the margin finally recurved, surface viscid, glabrous or decorated with a large irregular patch of u. veil tissue, color "drab" over all at first, margin becoming paler ("avellaneous" to "wood brown") and plicate striate; flesh white, soft, odor none.

Lamellae close, broad, reaching the apex of the stipe, but free, whitish with a pale vinaceous reflection, grayish in age when wet, margins minutely white-crenulate at first.

Stipe 9 - 14 cm. long, 1.5 - 2 cm. thick, equal, cylindric, surface appressed fibrillose, the fibrils white to somewhat avellaneous, pruinose above; annulus lacking; volva split into 2 - 3 lobes or broken up and adhering variously around the base of the stipe.

Spores 11 - 15 x 8 - 9 (10)  $\mu$ , broadly ellipsoid to subglobose, smooth, thin-walled, hyaline-yellowish in Melzer's sol.; basidia 60 - 70 x 10 - 15  $\mu$ , 4-spored; hyaline in KOH; pleurocystidia none; cheilocystidia none found - gill edges bearing basidia; gill trama divergent from a central strand; pileus with a gelatinous pellicle of narrower (4 - 9  $\mu$ ) appressed hyphae, the layer dingy as revived in KOH; no clamp connections found.



Amanita Sm-44957 ("plumbea" group), cont.

Habit, habitat and distribution: Scattered under conifers, Lake Fork Creek, Payette Lakes, Idaho, July 15, 1954, Sm-44957.

Observations: The thick white membranous volva, large broadly ellipsoid spore which are non-amyloid, non-marginate gills and dark gray-brown pileus are distinctive. I think that the patch of veil tissue on the cap in many specimens is accidental and so hesitate to emphasize it.

Spores 10-15 x 5-8  $\mu$ , broadly ellipsoid to subglobose, smooth, thin-walled, hyaline-yellowish in KOH; peridium 50-70 x 10-15  $\mu$ , 4-spored; hyaline in KOH; pleurocystidia none; cheilocystidia none found. Gills 11-12, adnexed, basidia 11-12 x 4-5  $\mu$ , 4-spored; pileus with a glaucous pallor of narrow (4-5  $\mu$ ) appressed gills, the layer dingy as seen in KOH; no clamp connections found.



*Amanita parcivolvata* (Pk.)

*Amanitopsis parcivolvata* Peck

Pileus 4 - 8 (9) cm. broad, oval to convex when young, expanding to broadly conic or nearly plane, surface viscid, glabrous or covered with scattered warts from the friable veil, margin plicate-striate, rich scarlet over disc shading to orange or cadmium yellow on the margin; flesh yellowish, no odor noted.

Lamellae free pale cream color, close narrow to moderately broad, edges flocculose from fine yellow particles of a very thin partial veil (?).

Stipe 5 - 10 (14) cm. long, 3 - 12 mm. thick at apex and equal to slightly enlarged below, stuffed, base slightly to scarcely bulbous, surface unpolished from a dusting of yellow pulverulence; annulus absent; volva white to yellowish friable tissue and leaving particles variously distributed over the base of the stipe or adhering to the soil.

Spores 9 - 12 x 6 - 8  $\mu$ , broadly ellipsoid, not amyloid, thin-walled, smooth; basidia 4-spored, 40 - 50 x 12 - 14  $\mu$ , hyaline in KOH; pleurocystidia none; cheilochstidia 36 - 44 x 8 - 12  $\mu$ , clavate and hyaline, a few fusoid cells 35 x 7  $\mu$  were also found; gill trama of hyphae diverging from a central strand; pileus trama with a thick gelatinous pellicle; clamp connections none.

Habit, habitat and distribution: Coker states it is common in lawns, graves and at times in cultivated places, June, less common in the fall; eastern and southeastern United States.



*Amanita parcivolvata* (Pk.), cont.

Observations: The lack of an annulus should readily separate this from *A. muscaria* with which it has apparently been confused - though I can't see why.

Cap: 1-2 cm. diam., convex to slightly flattened, yellow to yellowish, with a thin, yellowish veil, which is more or less complete at the margin; flesh white, becoming yellowish at the base of the stem.

Stem: 1-2 cm. high, slender, yellowish, with a thin, yellowish veil, which is more or less complete at the margin; flesh white, becoming yellowish at the base of the stem.

Gills: 1-2 cm. long, slender, yellowish, with a thin, yellowish veil, which is more or less complete at the margin; flesh white, becoming yellowish at the base of the stem.

Spores: 1-2  $\mu$  diam., ellipsoid, yellowish, with a thin, yellowish veil, which is more or less complete at the margin; flesh white, becoming yellowish at the base of the stem.

Habit, Habitat and Distribution: Sober shape it is common in woods, grassy and at times in cultivated places; June, less common in the fall; eastern and southeastern United States.



*Ananite gemmata* (Fr.) Gillet, Les Hymenomycetes, p. 52. 1874.

*Agaricus gemmatus* Fries, Epicr. Syst. Myc., 1:12. 1836.

Pileus 4-9(12) cm. broad, convex to broadly convex, in age plane or the margin uplifted, surface viscid when moist, when young with scattered to numerous soft white patches of volva remnants, in age often glabrous and the margin coarsely tuberculate-striate, color pale yellow to egg-yellow varying to creamy tan or in age fading to whitish; flesh thin, white, fragile, odor not distinctive, taste not recorded.

Lamellae free, more or less crowded, very broad in front and narrowed toward the stipe, white to cream colored, edges often floccose.

Stipe 6-12(18) cm. long, 1-2 cm. thick, clavate-bulbous, soon hollow, white or tinged yellowish, somewhat floccose below or with a basal ring of veil remnants or veil remnants scattered over lower third, the bulb ovoid and white; apex silky and striate; annulus absent or present as a basal more or less floccose zone, occasionally present as a distinct collar at the apex of the bulb.

Spores white in mass, broadly ellipsoid, 9-11  $\times$  7-8.5  $\mu$ , smooth, not amyloid; basidia 36-42  $\times$  8-9  $\mu$ , four-spored; cheilocystidia basidia like, yellowish when revived in KOH (gill edges yellowish in some dried specimens); pleurocystidia none seen; gill trama of divergent hyphae; pileus trama loosely floccose beneath a gelatinous pellicle. (Sm-18521).



*Arbutus geminata* (Fr.)

Cont.

Habit, habitat and distribution: Throughout eastern North America under conifers and hardwoods, common during warm wet seasons.

Observations: *check this carefully for clump connections.*



*Amanita "alpina"* (try *pubescens* also) Sm-45357

Pileus 4 - 9 cm. broad, convex expanding to plane or nearly so, surface thinly viscid beneath poorly formed floccose warts which collapse in age, warts somewhat conic when well-formed and white, cap margin even or (and very rarely) in extreme age short-striate, ground color pale yellow to cream color but in age often whitish, finally discoloring to brownish; flesh white, unchanging, odor not distinctive.

Lamellae white or in age with a creamy tone, broad, close to subdistant, attached narrowly to the stipe, breaking away in age, not staining when bruised.

Stipe 3 - 9 cm. long, 1 - 2.5 cm. thick at apex, with a rounded bulb at the base and a free-margined volva which is not inrolled, above this often occur interrupted zones of partial veil tissue or a true median or superior annulus, or all remains of a partial veil obliterated (about half the specimens).

Spores 9 - 11.5 x 6 - 7.5  $\mu$ , ellipsoid, smooth, yellowish-hyaline in Melzer's sol.; basidia 45 - 55 x 10 - 13  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia (the only ones seen were basidium-like); gill trama divergent from a central strand; pileus trama homogeneous beneath a hyaline gelatinous pellicle; clamp connections present.



Amanita "alpina" (try pubescens also) Sm-45357, cont.

Habit, habitat and distribution: Scattered under Pinus flexicaulis at high elevations, Heaven's Gate Ridge, Seven Devils Mts., Idaho, July 26, 1954, Bigelow & Smith-45357.

Observations: The carpophores of this species frequently do not break through the duff but actually shed their spores while completely subterranean. We located many specimens by digging around humps in the duff. The presence or absence of an annulus does not appear to me to be of any more significance in this species than in A. gemmata. This species must be carefully compared with Amanita pubescens Schw. Coker's ( ) plate 9, pictures our material very well, and the descriptions agree in all essential characters. The differences seem to be that our Heaven's Gate material does have an annulus in at least half the specimens, grows at high elevations, and under conifers in deep duff. How much emphasis to give these characters is still problematic. Peck's original account of A. frostiana should be compared with the annulate form.



Amanita Sm-44902

Pileus 3 - 9 cm. broad, obtuse to convex, expanding to plane, surface viscid beneath an almost powdery layer of evenly distributed veil remnants which are whitish to yellowish white (never aggregated into scales as in A. muscaria), color beneath the veil lemon yellow or a darker yellow on the disc, pallid clear yellow on the margin; flesh soft, white, no odor and no color change.

Lamellae close, broad, white to creamy white, reaching the stipe but free from it, no color change when bruised.

Stipe 3 - 7 cm. long, 2 - 3 cm. thick at apex, narrowed downward or nearly equal to the oval bulb, soft, white, silky above; annulus median or lower and only a poorly formed band which soon breaks up, the tissue very soft; volva present mostly as a second "annulus" a short distance below the one left by the partial veil or near the apex of the bulb, tissue friable and easily destroyed.

Spores 9 - 11 x 6.5 - 8  $\mu$ , broadly ellipsoid, smooth, thin-walled, yellowish in Melzer's sol.; basidia 4-spored, 44 - 55 x 10 - 13  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate - up to 22  $\mu$  broad, readily collapsing and (in KOH) edge yellowish and amorphous; gill trama divergent from a central strand; pileus trama homogeneous beneath a viscid pellicle; clamp connections present.



Amanita Sm-44902, cont.

Habit, habitat and distribution: Cespitose-gregarious under Pinus contorta 20-mile Creek, Upper Payette Lake, Idaho. July 13, 1954. Sm-44902.

Observations: The annulus may be either present or absent and the veil remnants are distributed in a layer which is broken up rather than in discrete warts as in A. muscaria, but it appears closest to that species nevertheless. I suspect this of being a form of 45357. (a. "alpina" or a. puberula if habitat is disregarded).



*Amanita alba* (Sm-26164)

Pileus 5 - 10 cm. broad, oval when young, expanding to convex or broadly convex or finally nearly plane, surface viscid but soon dry, sulcate striate over marginal area, glabrous or rarely with a few patches of veil tissue; flesh white, soft, odor not distinctive.

Lamellae free white or whitish, close, broad, broadest in front, narrowed behind, edges often crenulate.

Stipe 8 - 15 cm. long, 5 - 10 mm. thick, equal or evenly enlarged downward, very fragile, hollow, unpolished but in age often slightly squamulose, base not or only slightly bulbous and sunken deeply in the ground, sheathed with the cup-like volva; volva membranous, white, often lobed, *annulus none*.

Spores 10 - 13 x 9 - 11  $\mu$ , drop-shaped (drawn out at apiculate end), nonamyloid, smooth, thin-walled; basidia 4-spored, 40 - 48 x 10 - 13  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate, 25 - 30 x 15 - 20  $\mu$ , pedicel broad, readily collapsing, hyaline and thin-walled; gill trama divergent; pileus trama floccose beneath a thin gelatinous pellicle; clamp connections absent.

Habit, habitat and distribution: Solitary to scattered on humus under hardwoods, not common, summer and early fall.



*Amanita alba* (Sm-26164), cont.

Observations: This is a white fungus with drop-shaped spores which are not amyloid, a plicate-striate pileus and membranous white volva in the non-amulate group of *Amanitas* formerly placed in *Amanitopsis*.



*Amanita velosa* (Pk.), comb. nov. ?

Amanitopsis velosa Peck, Bull. Torrey Club, 22: 485.  
1895.

Vaginata velosa Murrill, Mycologia 4: 239. 1912.

Pileus 4 - 9.5 cm. broad, convex to nearly plane, viscid when wet but soon dry, pale buff to orange buff, margin sulcate striate (very rarely even), almost invariably with one large patch of the thick felt-like white volva covering the disc, usually glabrous elsewhere; flesh white, unchanging, thick next to the stipe, 4 - 10 mm., thinning rapidly to the margin, odor strong and pungent.

Lamellae close, usually pale creamy but often white, sometimes in age assuming a strong pink color when past maturity, broadest near the cap-margin (5 - 8 mm.), subventricose, narrowed toward the stipe and decurrent on it by lines, edges fimbriate.

Stipe 8 - 15 cm. long, stout, 6 - 9.5 mm. or more thick at the apex, equal or slightly tapering upward, not bulbous, the base within the volva tapering to a point, pruinose above and roughened by decurrent lines where the lamellae were attached and then torn loose, without an annulus but sometimes with an obscure zone where the margin of the pileus was in contact with the stipe, glabrous below but with the cortex sometimes ruptured in irregular partial rings by the elongation of the stipe,



*Amanita velosa* (Pk.), cont.

white within, solid, with a central pithy core, becoming hollow; volva white, ample, membranous, closely sheathing the base for about 2 cm., dividing above into two layers, the outer free, about 1 cm. long, with a more or less regular margin, the inner thicker, short, usually 3 - 4 mm. pressed against the stipe, the stipe in some specimens showing clearly that it is part of the cortex of the stipe ruptured by the stipe's elongation.

Spores globose to ovate,  $8.4 - 11 (12.6) \times 6 - 10.8 \mu$ , hyaline, apiculate, not amyloid, smooth; basidia four-spored, occasionally two-spored,  $60 - 80 \times 12 - 14 \mu$ ; pleurocystidia not differentiated; cheilocystidia more or less like sterile basidia (hardly differentiated); gill trama of somewhat divergent hyphae, not amyloid; pileus trama floccose beneath a thick gelatinous pellicle, not amyloid.

Habit, habitat and distribution: Solitary to gregarious on humus, usually under oak trees, Oregon and California, most frequently in the spring and summer.

Observations: The whole fruiting body has a rather waxy appearance. Old caps with pinkish gills are easily mistaken for a volvariella in the field.



*P. v. v.*

~~Amanitopsis vaginata (Fr.) Karst. var. fulva Seccardo, Sylloge~~  
~~Em., 5: 21. 1887.~~

Pileus 5-8(10) cm. broad, ovoid in button stages, becoming campanulate and finally expanding to convex or nearly plane, glabrous except for an occasional fragment of the broken volva, viscid, usually conspicuously sulcate striate, color evenly fulvous ("tawny" to "ochraceous tawny") fading in age; flesh whitish, thin, fragile, odor not distinctive, taste pleasant.

Lamellae free, white or pallid creamy, close, broadest near the margin of the pileus, narrowed toward the stipe, edges even or slightly fimbriate.

Stipe 8-16 cm. long, 4-8(10) mm. thick, equal or narrowed upward, hollow, fragile, usually somewhat fibrillose or subsquamulose, seldom glabrous, apex silky, base without a bulb and annulus none; inserted deep in the ground; volva pallid or tinged fulvous, membranous, lobed, sheathing the base of the stipe.

Spores globose 8-10  $\mu$ , white in mass, smooth, not amyloid; basidia four-spored, 48-61  $\times$  10-12  $\mu$ , clavate, broadest portion just below the apex; cheilocystidia and pleurocystidia not differentiated; gill trama not amyloid, bilateral; pileus trama not amyloid, floccose beneath a gelatinous pellicle, the pigment diffused through the pellicle (in mounts in KOH). (AHS. 18,373)

Habit, habitat and distribution: Scattered to gregarious, common in or along edges of bogs or in moist woods, eastern North America, summer and fall.

Observations:



Amanita Sm-29692

Pileus (3) 4 - 8 cm. broad, obtusely conic young, expanding to plane or slightly umbonate, the margin often remaining slightly decurved and wavy or occasionally recurved, tuberculate striate halfway to disc, surface viscid, usually glabrous but about one-fourth of the specimens with adhering patches of the dull white to cinereous remains of the volva variously disposed, color at first "Saccardo's umber" to "snuff brown", becoming a paler grayish snuff brown and finally the striate portion nearly pallid (never lead-color, blackish or fulvous); flesh thin fragile, white, unchanging, odor none.

Lamellae attached to stipe by a decurrent line, close, broad toward cap margin, whitish, edges whitish at first (in buttons) but at maturity often pale yellowish brown to grayish (wood brown).

Stipe 8 - 13 cm. long, 6 - 15 mm. at apex, enlarged downward, sheathed at base by submembranous soft thick volval remains, tubular, with a white/pith around the cavity, cortex brownish, surface furfuraceous from snuff brown to grayish squamules; <sup>(annulus none;)</sup> volva matted-fibrillose over exterior and soon stained cinnamon.

Spores globose-apiculate, 9 - 12  $\mu$  without the apiculus, smooth, yellowish hyaline in Melzer's sol. and content homogeneous (from a deposit); basidia 60 - 70 x 11 - 15  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none;



Amanita Sm-29692, cont.

cheilocystidia vesiculose, 12 - 25  $\mu$ , very thin-walled and readily collapsing leaving an amorphous gill edge, pigment when present diffused in this region; gill trama divergent from a central strand; pileus trama floccose-filamentose, some hyphal cells greatly inflated; cuticle of narrower (3 - 6  $\mu$ ) filaments with thin walls and pale smoky-ochraceous content; clamp connections absent.

Habit, habitat and distribution: Scattered under conifers on moist humus, Kautz Creek, Mt. Rainier National Park, Wash., July 31, 1948, Sm-29692.

Observations: This species is distinct from A. fulva by its dingy yellow-brown pileus, larger spores. Since finding it at Kautz Creek, I have collected it many times and it is constant even to having the slightly marginate gills at maturity.



Amanita Sm-42276

Pileus 5 - 10 cm. broad, obtuse, expanding to obtusely umbonate, margin finally spreading and conspicuously sulcate-striate, surface glabrous, viscid, very rarely with irregular patches of volval tissue, color "bister" at first, disc remaining this color but toward the margin becoming "Saccardo's umber" to "tawny olive"; flesh thin, soft, pallid, odor pungent-musty.

Lamellae free but close to the stipe, close, broad, pallid to pale cinereous and with fimbriate edges.

Stipe 10 - 20 cm. long, 10 - 15 mm. thick at apex, evenly enlarged downward, hollow, very fragile, surface fibrillose, the layer pale tawny-olive or more cinereous, nearly pallid in some, squamulose in age; <sup>annulus none</sup> volva saccate but fragile and variously lobed or broken, cinereous above, white deep down in the soil, in some leaving cinereous areolae over basal part of stipe.

Spores globose-apiculate to subglobose, 9 - 12 (13)  $\mu$  without apiculus, hyaline in KOH, yellowish hyaline in Melzer's sol.; basidia 4-spored, 50 - 60 x 10 - 14  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia none seen - gill edge amorphous as revived in KOH; gill trama divergent from a central strand; pileus with a cuticle of gelatinous hyphae 4 - 8  $\mu$  in diam. and dingy yellow brown in KOH; clamp connections absent.



Amanita Sm-42276, cont.

Habit, habitat and distribution: Scattered in a grassy area under birch near Bodie Lake, Luce County, Michigan, Aug. 21, 1953, McVaugh & Smith 42276.

Observations: This appears to be a variety of Sm-29692 with cinereous non-marginate gills.



Amanita Sm-13771

Pileus 8 cm. broad, margin slightly elevated, disc with a low rounded umbo, glabrous, evenly "olive brown" over all, margin coarsely plicate striate; flesh soft thin pale cinereous, odorless.

Lamellae free, reaching the stipe by a line, close ( $\pm$  90 reach the stipe) 8 - 10 mm. broad near cap margin, "pale smoke gray" and not marginate.

Stipe 18 cm. long, 1.2 cm. thick at narrowest part, "pale smoke gray" or darker from a thin cottony coating of fibrils, flesh white, base slightly enlarged, stuffed; volva sheathing and "pale smoke gray", consistency very fragile, easily broken up; annulus none.

Spores 9 - 12  $\mu$ , globose, not amyloid.

Singly under spruce, Cape Flattery, Washington,  
May 27, 1939. Sm-13771.

This is close to A. robusta but does not have a tough volva, the gills are gray, and the whole carpophore is darker than in A. plumbea.



*Amanita livida* (Pk.)

Pileus 3 - 8 cm. broad, oval when young, expanding to broadly oval to convex or finally nearly plane, the margin spreading or uplifted, surface glabrous, viscid but soon dry, margin plicate-striate, pale smoke gray over all or pattern varying darker on the disc and paler over the margin; flesh soft, white, odorless.

Lamellae close, narrow to moderately broad (near cap margin), approximate to the stipe but free, white, edges whitish and minutely floccose.

Stipe 8 - 12 cm. long, 5 - 12 mm. at apex, equal to evenly enlarged downward, surface unpolished or at times the soft covering layer broken up into minute squamules or zones, this coating white to tinged cinereous; annulus lacking; volva white, membranous, sheathing, lobed 2 - 3 times, base of stipe not appreciably enlarged.

Spores 10 - 13  $\mu$ , globose to subglobose, abruptly apiculate, yellowish hyaline in Melzer's sol.; basidia 4-spored, 50 - 60 x 10 - 15  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia vesiculose-pedicellate 36 - 45 x 20 - 28  $\mu$ , hyaline, thin-walled, readily collapsing; gill trama of hyphae divergent from a central strand; pileus trama with a gelatinous pellicle, the hyphae with smoky-ochraceous contents in KOH; clamp connections none.



*Amanita livida* (Pk.), cont.

Habit, habitat and distribution: Solitary to scattered on humus in woods, summer and fall, not uncommon.

Observations: This is the white-gilled variant in which the gills are not marginate and the pileus is generally smoke gray to mouse-colored. It is typical of the upland hardwood forests of the Great Lakes Region.



*Amanitopsis robusta* sp. nov. ?

Pileus 6-18(25) cm. latus, obtusus dein subolanus, glaber, viscidus, sulcate-striatus, subater; lamellae confertae, latae (1 cm. +), stipite approximatae sed liberae, pallidae et umbrino-marginatae; stipes 12-20 cm. longus, 1.5-2.5 cm. crassus, fartus dein cavus, cinereo=fibrillosus; volva ampla, lobata, crassitunicata; sporae globosae, \_ . Specimen typicum A. H. Smith n. 17236; legit prope Olympic Hot Springs, Olympic National Park, Wash. Oct. 15, 1941; in Herb. Univ. of Mich. conservatum.

Pileus 6-18(25) cm. broad, ovoid or merely obtuse when young, the margin appressed or convinent to the stipe, expanding to plane or the margin broadly recurved, glabrous and viscid, only occasionally with a gregment of adhering volva tissue, margin very coarsely plicate striate and splitting readily in expanded individuals, color "mummy brown" (blackish) over all when young, becoming "bister" to "Saccardo's umber" toward the margin; flesh white, thin, (5 mm. near the stipe in large caps), not markedly fragile, odor none.

Lamellae crowded, broad (1 cm. +), broadest near cap margin, thickish, reaching the stipe but free, white but with pale umber brown edges.

Stipe 12-20 cm. long, 1.5-2.5 cm. thick at apex, enlarged below, stuffed with a silky pith and then hollow, white within, fleshy and firm but brittle, surface pallid beneath a more or less reticulate or even covering of surface fibrils, apex finely



*Amanitopsis robusta* sp. nov. ?      Cont.

striate in some, (surface fibrils pale cinereous and often causing lower part of stipe to be dark to pale gray), base set in a thick fleshy membranous white volva, volva staining rusty brown over the exterior and breaking into 2-3 lobes, *annulus none*

Spores globose, apiculate, smooth, not amyloid, 10-13  $\mu$ ; basidia four-spored; cheilocystidia 36-58 x 15-20  $\mu$ , subcapitate to clavate, content hyaline or dark colored, thin-walled, easily collapsing; pleurocystidia not differentiated; gill trama nonamyloid with a central strand from which more or less inflated cells diverge; pileus trama not amyloid, floccose beneath a thick gelatinous pellicle.

Habit, habitat, and distribution: Singly to scattered under conifers, Siskiyou National Forest, Calif. Nov. 6, 1937 (8491); Noisy Creek, Baker Lake, Wash. Sept. 5, 1941 (16641); Elwha River, Olympics Wash. Oct. 15, H.V. Smith (A.H. Smith no. 17963); Mt. Angeles, Sept. 26 (17280); Olympic Hot Springs, Oct. 2 (17503-type); Mt. Angeles, Olympics, Oct. 20, 1941 (18072).

Observations: This species appears to be very similar to *A. velosa* Pk. in the development of its volva, but differs from that species in several secondary colors such as color, in having marginate gills, and in its characteristic glabrous pileus. In general appearance it is somewhat similar to *A. vaginata* var. *livida*, but the very thick volva, darker color and marginate gills appear to be sufficient to distinguish it.



*Amanitopsis inaurata* (Secr.) Peyod, Ann. Sci. Nat. 7 ser., 9:  
317. 1889.

*Amanita inaurata* Secrétan, Mycogr. Suisse, 1: 36. 1833.

*Agaricus solitarius strangulatus* Fries, Spicr. Syst. Myc.  
p. 6. 1836.

*Agaricus strangulatus* Fries, Hymen. Eur., p. 27. 1874.

*Amanita strangulata* Quelet, Champ. Jura et Vosges, 1: 66. 1872

*Amanita vaginata* var. *strangulata* Quelet, Enchir. Fung.,  
p. 5. 1886.

*Amanitopsis strangulata* (Sec) Karsten, Hattsv., p. 7. 1879.

*Agaricus bacilliae* Berkeley, Outl., p. 92. 1860.

Pileus 4-8(15) cm. broad, ovoid to convex when young, expanding to broadly convex, obtusely umbonate or plane, surface viscid, at first covered with grayish warts of universal veil tissue or veil remnants in the form of an irregular more or less broken grayish membrane, soon glabrescent, margin soon becoming plicate=striate, color evenly pale to dark lead color, nearly black when young and fresh; flesh thin and fragile, soft, odor and taste not distinctive.

Lamellae close, moderately broad, lamellulae very unequal in length and not regularly arranged, free from but almost reaching the stipe, pallid to white, edges somewhat fimbriate and pallid.

Stipe 6-8 cm. long, 10-12 mm. thick at apex, equal or evenly enlarged downward, hollow, surface covered over lower portions with cinereous appressed fibrils, apex pallid and silky, base



sunken into a white membranous volva with a distinct free limb, volva often somewhat rusty stained in age, *annulus none*.

*not* Spores white in mass, 10-14  $\mu$ , globose to subglobose, smooth amyloid; basidia four-spored, 42-60  $\times$  10-14  $\mu$ , content very granular, (many oil droplets present); pleurocystidia present as basidia-like cells up to 24  $\mu$  broad; cheilocystidia abundant to scattered, more or less saecate to globose above a short pedicel, 30-50  $\times$  12-20  $\mu$ ; gill trama of hyphae divergent from a central strand, subhymenium cellular; pileus trama with a gelatinous pellicle of interwoven hyphae 1.5-3  $\mu$  in diam., hyaline to sordid yellowish brown in KOH and gradually merging into a dark sordid yellowish brown hypoderm of somewhat broader hyphae, hyphae of flesh proper interwoven, hyaline and up to 25  $\mu$  in diam., clamp connections present on hyphae of pellicle.

Habit, habitat and distribution: Common in mixed conifer hardwood forests in northern Michigan, summer and early fall.

Observations:



*Amanita calyptroderma* Atk. & Ballen, Science, n.ser. 29: 944.  
June 11, 1909.

Pileus 10 - 18 (22) cm. broad, convex when young, expanding to nearly plane, viscid, usually with a large membranous patch of the universal veil adhering over the disc much in the manner of a skull cap, sometimes with several small patches and occasionally glabrous, viscid, the margin soon tuberculate striate, color variable, buttons "cinnamon-brown", "Dresden brown", "old gold" or "apricot yellow" (dark sordid yellowish brown to ochraceous orange or simply ochraceous), margin pale yellow at times ("picric yellow"); flesh thick, soft and cottony in texture, whitish or yellowish near the surface, odor none.

Lamellae broad, crowded, adnate and with a decurrent line, soon seceding and appearing free, white to pale yellowish, edges even.

Stipe (10) 12 - 20 cm. long, (or remaining shorter at higher elevations), 2 - 3 cm. thick at apex, equal but the base appearing bulbous because of the thick volval cup, hollow, whitish but with yellowish patches of matted fibrils up to the submedian to superior membranous annulus, above the annulus yellowish and long-striate from contact with the gills, annulus striate on upper surface, yellowish, cottony-fibrillose underneath; volva thick, white, rigid-submembranous but becoming flabby, adnate to the stipe below but with a



*Amanita calypetroderma* Atk. & Ballen, cont.

large, lobed, free margin which often appears to be double; base of fruiting body more or less pointed.

Spore deposit white, spores ellipsoid, (8) 9 - 11 x 5 - 6  $\mu$ , hyaline in KOH, pale yellow in iodine, smooth; basidia hyaline in KOH, 52 - 60 x 9 - 10  $\mu$ , four-spored; pleurocystidia none; cheilocystidia narrowly clavate to saccate-pedicellate, 42 - 56 (64) x (8) 9 - 16  $\mu$ , abundant; gill trama hyaline in KOH, hyphae divergent from a central strand, hyaline in KOH, subhymenium cellular; pileus trama with a thick gelatinous pellicle, the hyphae 2 - 3  $\mu$  in dia., remainder of flesh of floccose loosely interwoven hyphae (S-19973); clamp connections none.

Habit, habitat, and distribution: Scattered to gregarious under conifers and hardwoods. Some conifers have been present in all the habitats where I have found it - even those which at first sight appeared to be entirely of oak or madroña. Only second growth Douglas fir was present where the photograph was taken. It is said to fruit during both the spring and fall, and is more abundant in southern Oregon and northern California than northward.



*Amanita caesaria* Fr. ex Scop.

Pileus (4) 5 - 12 (30) cm. broad, oval when young, expanding to broadly convex or nearly plane, surface viscid, glabrous or rarely with a patch of membranous veil tissue over the disc, margins plicate-striate, disc scarlet to orange red, shading through orange to yellow to the margin; flesh yellowish under the cuticle, whitish to yellowish elsewhere, odor not distinctive.

Lamellae close, broad, free but not remote, light yellow, edges even to flocculose.

Stipe 8 - 15 cm. long, 1 - 2 cm. thick at apex, equal or evenly enlarged downward, hollow, base not bulbous, surface yellow smooth and shining; annulus yellow membranous, superior, pendant; volva white, thick, tough, attached at base of stipe and sheathing it, variously lobed.

Spores 8 - 10 (11) x 6 - 7.5 (8)  $\mu$ , elliptic to subglobose and with a prominent apiculous hyaline in Melzer's sol. (some immature spores bluish hyaline), thin-walled; basidia 40 - 55 x 9 - 12  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia vesiculose 10 - 25  $\mu$  in diam.; gill trama divergent from a central strand; pileus trama floccose beneath a gelatinous pellicle of narrow interwoven hyphae; clamp connections present.



*Amanita caesaria* Fr. ex Scop.

Habit, habitat and distribution: Solitary to scattered in open conifer or hardwood forests, most common in the southeastern states. As yet no authentic record of the species has been found for Michigan.

Observations: The immature spores appear to have faint thickenings in the wall which appear bluish in Melzer's sol. but I think this is a refraction phenomenon rather than a true amyloid reaction.

Spores 4 - 13  $\mu$  long, 2 - 3  $\mu$  thick, equal or nearly equal, hyaline, base not flattened, surface yellow smooth and shining; annulus yellow non-branched, superior, perforate; gills white, thick, tough, attached at base or slightly ascending, variously lobed.

Spores 4 - 13 (15)  $\mu$   $\times$  2 - 7.5 (8)  $\mu$ , elliptic to sub-globose and with a prominent apiculate beak in Melzer's sol. (more 1 rarely more bluish hyaline), thin-walled; annulus 10 - 25  $\mu$   $\times$  1 - 2  $\mu$ , 2-layered, hyaline in Mel; pleurocystidia 10 - 25  $\mu$   $\times$  10 - 25  $\mu$ , in dist.; gill trama different from a central strand; pileus from 10 - 25  $\mu$   $\times$  10 - 25  $\mu$ , pale yellow pallid or narrow intervals darker; stem annulations present.



*Amanita* Sm-37141 (cin. buff, on sand)

Pileus 3 - 7 (10) cm. broad, oval in button stages expanding to convex or plane or finally the margin recurved, glabrous or rarely with 1 - 2 irregular patches of volva-tissue, pale dingy watery alutaceous to dingy pinkish buff, margin becoming sulcate striate; flesh soft and fragile, odor pungent (chloride of lime) to lacking.

Lamellae merely close, broad in front, free and fairly remote, dull white, edges even or becoming eroded.

Stipe 7 - 11 cm. long, 10 - 15 mm. thick, equal above the oval bulb, readily separable from bulb, surface irregularly concentrically floccose from the separation of the surface layer, silky to floccose below or scaly from lacerated cuticle; annulus, whitish, narrow, superior; volva as in A. verna - membranous, 2 - 3 lobed, white, sheathing the bulb.

Spores 10 - 12 (15) x 8 - 9 (10)  $\mu$  ellipsoid to ovoid, smooth, yellowish hyaline in Melzer's (non-amyloid), smooth, thin-walled; basidia 4-spored, 50 - 60 x 10 - 15  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia 40 - 50 x 10 - 18  $\mu$ , clavate, thin-walled, readily collapsing; gill trama divergent from a central strand; pileus trama with a gelatinous pellicle of narrow (3 - 5  $\mu$ ) scarcely colored hyphae; indications of clamps rarely found but nothing convincing.



Amanita Sm-37141, cont.

Habit, habitat and distribution: Solitary to gregarious in sand along roads, etc.; Wolf Bog, Cheboygan County, Mich., July 30, 1951, Sm-37141.

Observations: The sulcate-striate cap at maturity, non-amyloid spores, membranous volva, and pale cinnamon buff color are distinctive. It is in the A. caesaria group.



*Amanita sprete* (Pk.) Saccardo. Syll. Fung., 5:12. 1887.

*Agaricus* (*Amanita*) *spretus* Peck. Ann. Rep. N. Y. State  
Mus., 32:24. 1879.

*Venenarius sprete* Murrill, Mycologia, 5:73. 1913.

Pileus 5-12 cm. broad, ovoid when young, soon obtusely conic to convex and finally plane or with a low umbo, surface viscid, margin becoming sulcate striate, glabrous or with an occasional membranous piece of the ruptured volva adhering somewhere on the surface, color pale to dark lead-color or grayish brown; flesh thin, soft and fragile, odor none, no color changes noted. Lamellae moderately close to subdistant in age, moderately broad, narrowed toward the stipe and attached to it by a line, white to creamy white, edges fimbriate.

Stipe 10-15 cm. long, 1-2 cm. thick at apex, equal or enlarged downward, stuffed becoming hollow, floccose-pruinose above the annulus and often striate, glabrous to somewhat fibrillose or lacerated below, white or pallid throughout, base inserted into a sheathing white thick membranous volva which is split into lobes as the cap expands; annulus superior, white above, tinged gray on under side or concolorous with upper surface, somewhat cottony floccose on under side and striate above.

Spores white in mass, smooth, not amyloid, broadly subovoid, 10-12  $\times$  6-7.5  $\mu$ ; basidia four-spored, 32-38  $\times$  10-12  $\mu$ ; cheilocystidia and pleurocystidia not differentiated; gill trama divergent from a central strand, not amyloid, subhymenium appearing



*Amanita sprete* (Pk.)      Cont.

cellular in sections; pileus trama homogeneous beneath a thin gelatinous pellicle of interwoven hyphae 2-3  $\mu$  in diam. region immediately beneath the pellicle rather compact and dark colored. (Yellowish when revived in KOH).

“abit, habitat, and distribution: Scattered to gregarious on sandy soil, in open woods, North Central, eastern and Southeastern United States, not uncommon,

Observations: The pale lead-colored pilei, stipe lacking a bulb, and presence of an annulus are distinctive. It is most likely to be confused with the series of variants around the old *Amanitopsis plumbea*.



18

*Amanita muscaria* (Fries) S.F.Gray, Nat. Arr. Brit. Plants 1:600.  
1821.

*Agaricus muscarius* Fries, Syst. Myc. 1: 16. 1821.

var. *muscaria*

Pileus 7-10(15) cm. broad, hemispheric when young, soon convex to broadly convex and in age nearly plane, surface viscid and at first covered by pallid to yellowish warts or irregular patches from the remains of the volva, pellicle blood red to orange red ("scarlet" to "scarlet red"), gradually fading to orange; flesh thick, pallid, odor not distinctive.

Gillae free or just touching the stipe and appearing decurrent by a line, broad, white to yellowish, edges even or floccose.

Stipe 8-12(15) cm. long, 10-25 mm. thick, stuffed, becoming hollow, base bulbous but nearly equal above the bulb, white to pale yellow between the annulus and bulb and more or less fibrillose near apex, bulb rounded, upper part covered by concentric rings of the torn intergrown universal veil tissue, hence no true distinct volva present, the zones usually yellow; annulus median to superior, deeply, pendent, margin usually frayed and with thickish yellowish floccose patches.

Spores white in deposit,  $9-11 \times 7-8 \mu$ , broadly ellipsoid, not amyloid, with a large central oil drop; basidia four-spored  $44-52 \times 7-9 \mu$ ; pleurocystidia none seen; cheilocystidia present,  $38-62 \times 8-10 \mu$ , consisting of a septate hypha of 2-4 cells, the terminal cell sacculate and broadest, each succeeding cell narrower;



*Amanita muscaria* (Fries)      Cont.

gill trama of divergent hyphae, not amyloid; pileus trama floccose beneath a gelatinous pellicle.

Habit, habitat and distribution: Gregarious under conifers not uncommon in the western states, rare in northern and eastern United States.

Observations: In its typical form, as represented by var. muscaria it is not easy to confuse with any other *Amanita*.



*Amanita muscaria* var. *formosa*.

Pileus 5-18 cm. broad, hemispheric to convex, expanding to plane or shallowly depressed, rarely with a low obtuse umbo, viscid, surface (pellicle) lemon yellow to orange, fading and in age frequently dingy-pallid, surface dotted with discrete warts from the ruptured universal veil, the warts subconic, whitish to yellow, about 5 mm. in diam. and about circular to angular in outline, margin even to short-striate; flesh white to yellowish, soft, odor not distinctive.

Lamellae white to creamy white, crowded, broad, free or connected by a line, edges floccose.

Stipe 10-20 cm. long, 1-2 cm. thick, at apex, enlarged downward to a clavate bulbous base 3-5 cm. thick, stuffed to hollow, cortex yellowish, furfuraceous to unpolished above the ring, somewhat floccose to squamulose below, near base with interrupted zones of the ingrown universal veil tissue and these often extending over upper part of bulb; annulus superior, pendant, yellow to whitish, margin often lacerated; volva lacking a free margin, ingrown with the stipe and showing as broken zones of tissue.

Spores 9-12 x 7-8  $\mu$ , not amyloid, ellipsoid.

Habit, habitat and distribution: Gregarious under conifers and aspens, spring and fall. Common in the Great Lakes Region and eastern North America generally.

Observations: Get good material and finish the description of the microscopic characters.



near muscaria but white.

*Amanita muscaria* var. *alba*.

Pileus 7-10 cm. broad, convex to obtuse when young, plane in age or remaining slightly arched, surface at first covered by a dense coating of pyramidal scales having convex bases (hence are in contact with the pileus only at the center point, the margins being raised up), scales pale brownish to avellaneous on and around the point and whitish around the margin, in age surface glabrous and the margin sulcate striate, veil often forming a fringe along the margin, color of surface beneath the scales "tillend buff" to dull white and evenly colored over all; flesh very thick and firm, white, odor none.

Lamellae close, broadest (1 cm.  $\pm$ ) near cap margin, tapered toward the stipe, almost reaching the stipe or attached to it by a line, edges serrulate to slightly eroded, white or creamy white throughout.

Stipe 8-12 cm. long, 1-2 cm. at apex, clavate bulbous bulb 3-4 cm. thick, cottony fibrillose above and the median to superior annulus and white, covered with white fibrillose scales below the ring, increasingly so toward the base, the bulb with concentric zones of adhering (intergrown) universal veil tissue as in A. muscaria stuffed with a white cottony pith within, whitish except for avellaneous remains of veil tissue at the base; annulus very ragged and evanescent.

Spores 10-12  $\times$  6-7  $\mu$ , broadly ellipsoid, smooth, not amyloid; basidia four-spored; cheilocystidia not distinct or merely more or less like sterile basidia; pleurocystidia none; gill



*Amanita muscaria* var. *alba*.

trama not amyloid, organization as in *A. muscaria*; pileus trama floccose beneath a thick gelatinous pellicle.

Habit, habitat, and distribution: Gregarious on sandy soil under oak, Dexter, Mich. Sept. 10, 1940 (15286), same locality again in 1942.

Observations: Since making these collections this <sup>white</sup>~~whole~~ form has been found in other localities in Michigan as well as in Idaho and Washington. *cln fm - 42274 The <sup>scute</sup> ~~water~~ formed by the universal veil remnants collapsed readily.*



Amanita Sm-45057

Pileus 4 - 10 (12) cm. broad, obtuse to convex expanding to plane, surface viscid and decorated with white soft friable warts much as in A. cothurnata, near the margin the veil remnants more pulverulent and patchlike, margin even or only faintly striate near very edge, color pinkish buff or grayer, disc dingy cinnamon buff in some; flesh white, soft, odor none.

Gills free, white, close, broad, approximate to the stipe, merely discoloring slightly in age.

Stipe 8 - 15 cm. long, 1 - 2.5 cm. thick near apex, evenly enlarged downward, white, smooth and silky or at times the cuticle broken up slightly; annulus median to superior, membranous, white, collapsing on the stipe; volva adhering to the oval bulb but with a free ragged margin which is not inrolled.

Spores 8 - 11 x 5.5 - 6.5  $\mu$  broadly ellipsoid, smooth, thin-walled, non-amyloid (yellowish hyaline in Melzer's); basidia 4-spored, 40 - 50 x 9 - 12  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate but very readily collapsing into an amorphous yellowish (in KOH) mass and not reviving; gill trama divergent from a central strand; pileus trama floccose beneath a thick gelatinous pellicle of yellowish narrow (3 - 5  $\mu$ ) hyphae; clamp connections none.

Habit, habitat and distribution: Gregarious under conifers, Payette Lakes, Idaho, July 17, 1954, Sm-45057.



Amanita Sm-45057, cont.

Observations: This should be carefully compared with the A. cothurnata - pantherina series but the volva was not inrolled.



*Amanita cothurnata* (Sm-1550)

Pileus 3 - 8 cm. broad, convex, plane, or margin uplifted, viscid, margin tuberculate-striate, "cream color" to "massicot yellow" on disc at first, soon pure white, at first more or less covered by numerous small pyramidal white discrete scales; flesh white, soft, odor not distinctive.

Lamellae close, moderately broad, almost reaching the stipe, white, yellowish in age or on drying, edge scarcely uneven.

Stipe 8 - 14 cm. long, 9 - 15 mm. at apex, evenly enlarged down to the subglobose bulb, pure white, scaly below the annulus from laceration of outer layer, smooth above the annulus; annulus superior, white, membranous, well-formed, fringed on the margin, texture cottony; bulb white, rounded at the base; volva forming a single, close-fitting, flaring roll of tissue at apex of the bulb.

Spores drop-shaped in side view, ovate to elliptic in face view, 8 - 10 x 5.5 - 6.5  $\mu$ , yellowish hyaline in Melzer's sol., smooth, thin-walled; basidia 8- and 4-spored, 40 - 55 x 10 - 13  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate, slightly broader than the basidia; gill trama divergent from a central strand; pileus trama with a gelatinous pellicle yellowish in KOH, the hyphae 3 - 6  $\mu$  in diam., clamp connections present.



*Amanita cothurnata* (Sm-1550), cont.

Habit, habitat and distribution: Scattered to gregarious in open oak woods, Waterloo Rec. Area, Mich., July 12, 1935, Sm-1550.

Observations: Singer thought this was *A. gemmata* and it could equally well be *A. russuloides*. The whole *A. pantherina* group needs reevaluation.



*Amanita cothurnata* Atk. (Sm-9653)

Pileus 8 - 15 cm. broad, obtuse to convex, becoming plane or with the disc slightly depressed, surface viscid and covered with discrete cottony whitish warts of irregular shape and 3 - 5 mm. in diam., sometimes the warts poorly formed toward cap margin and at times veil remnants appearing as concentric cottony fibrillose patches, margin distinctly tuberculate-striate, white or whitish over marginal area disc grayish brown ("olive brown" young and fading to "buffy brown" - not yellow or creamy); flesh 6 - 8 mm. on the disc, tapering abruptly halfway to margin, odor faintly pungent.

Lamellae white, 7 - 8 m. broad near cap margin, narrowed toward the stipe, not crowded, remote from the stipe, edges crenulate.

Stipe 10 - 18 cm. long, 10 - 15 mm. thick at apex, stuffed becoming hollow, 15 - 20 mm. at the bulb, bulb pointed below and 2 - 3.5 cm. thick, with an inrolled collarlike roll of volva tissue around the base of the stipe where it enters the bulb, stipe surface above annulus white and minutely appressed-fibrillose, apex striate, white below the annulus and with coarse subconcentric zones of lacerate scales down to the bulb; annulus median, white or tinged avellaneous, pale creamy along the torn margin, appressed fibrillose above, cottony fibrillose below.



*Amanita cothurnata* Atk. (Sm-9653), cont.

Spores (8)  $9 - 11 \times 6 - 8 \mu$ , broadly ellipsoid, non-amyloid (yellowish hyaline in KOH); basidia 4-spored,  $38 - 50 \times 9 - 12 \mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia present as yellowish debris from partial veil; gill trama divergent from a central strand; pileus trama with a gelatinous pellicle of hyphae  $2 - 4 \mu$  in diam.; clamp connections absent.

Habit, habitat and distribution: Scattered to gregarious in a conifer-hardwood forest (hemlock) near Keener House, Great Smoky Mts. National Park, Tennessee, August 3, 1938, Sm-9653.

Observations: The gray-brown disc of the cap is against *A. cothurnata*. - *G. A. velatipes*



*Amanita pantherina* (Fr.) Quelet, Champ. Jura et Vosges, p. 68. 1872

*Agaricus pantherinus* Fries, Syst. Myc., 1: 16, 1821.

*Amanita pantherinoides* Murrill, Mycologia, 4: 262. 1912.

*Venenarius pantherinoides* Murrill, North Amer. Flora, 10;

72. 1914.

Pileus 5-10 cm. broad, convex, becoming broadly convex to nearly plane, surface viscid, at first covered by deciduous, pyramidal whitish to cream colored warts which develop convex bases, margin tuberculate striate, color variable, "raw sienna" and becoming "amber yellow", disc often more sordid yellowish to brown, sometimes "wood brown" to "avellaneous" on disc and near "vinaceous buff" on the margin (yellow to yellowish brown, cinnamon brown or avellaneous, often rather dark dull brown--near hister--on the disc); flesh moderately thick (near 1 cm. next to the stipe), tapered evenly almost to the margin and then abruptly thinner, whitish but often with a yellowish line near the pellicle, odor not distinctive.

Lamellae close to crowded but distinct, 1-2 tiers of lamellulae; broadest (up to 1 cm.) in front, at first attached to the stipe by a line but becoming remote in age, white to whitish, edges crenulate.

Stipe 6-10 cm. long, 1-2 cm. thick at apex, clavate, 2-3 cm. thick at base, stuffed, white and silky above the annulus, coarsely fibrillose below the ring and with 2-4 zones of volva tissue usually remaining near the base, volva adhering to the bulb as an adnate sheath and with a free collar-like roll at the



*Amanita pantherina* (Fr.)      Cont.

apex, volva remnants above the collar usually soon disappearing; annulus median to superior, floccose and torn along the margin, coarsely fibrillose on underside, cottony above, margin soon yellowish to avellaneous.

Spores 9-11 x 6.5-8  $\mu$ , smooth, broadly ellipsoid to somewhat ovoid, with a large oil globule, not amyloid; basidia 38-52 x 9-12  $\mu$ , clavate, four-spored; cheilocystidia abundant and variable, filamentous, irregular, clavate or saccate, 32-40 x 4-6  $\mu$  when filamentous, 24-36 x 6-12  $\mu$  in irregular or clavate individuals and 18-26 x 9-14  $\mu$  when saccate; pleurocystidia none seen; gill trama with the hyphae divergent from a central strand; pileus trama homogeneous beneath a thick gelatinous pellicle composed of narrow (3-4  $\mu$ ) hyphae, *clamp connections present*.

Habit, habitat and distribution: Scattered to gregarious under conifers, common in the Puget Sound District of Washington, rare elsewhere in the United States, Spring and fall.

Observations: The color is extremely variable in this species, just as in *A. muscaria*. The roll or collar of volval tissue at the apex of the bulb is a field character of some importance because, so far, most of the other species which bore this character do not occur in the area where *A. pantherina* has been found most abundantly.



*Amanita junquillea* Quélet

Pileus 4 - 6 (12) cm. broad, convex when young, becoming broadly convex to plane or the disc shallowly depressed as a result of the margin becoming slightly uplifted, margin becoming rather conspicuously tuberculate-striate, viscid, glutinous when wet, bright to dull yellow ("Naples yellow" to near "pinkish buff" in age, often "cream-buff" at first), when young covered with flat irregular patches of the broken volva 5 mm. to 2 cm. in dia., the volval remnants white at first but near "cinnamon-buff" in age, readily washed off the cap in wet weather and often present only along the margin of buttons or remaining attached to the debris through which the cap has been pushed; flesh thin, white, moderately firm, 5 mm.  $\pm$  near the stipe, tapered evenly to the margin, odor not distinctive, no color changes when bruised.

Lamellae close, 2 tiers of lamellulae, narrow (but becoming broad in large caps), broadest toward the cap margin, attached to the stipe by a line but becoming free in age, whitish to cream-color, edges even.

Stipe (6) 10 - 14 cm. long, 10 - 15 (20) mm. thick at apex, gradually enlarged downward, stuffed with a silky pith, whitish above the superior annulus and with short striations (impressions of the gills), unpolished,



*Amanita junquillea* Quélet, cont.

sordid creamy to whitish or rarely with a brownish tinge below the annulus, thinly fibrillose except near the bulb where the surface is frequently broken into concentric zones or scales, base rounded-bulbous, volva adnate to the bulb but with a free margin much as in *A. pantherina*; annulus superior, membranous, persistent, the margin often with scales from the remains of the volva, silky on upper surface, fibrillose on the under side.

Spores white in deposits, (8)  $9 - 11 \times 6 - 8 \mu$ , hyaline under the microscope in KOH, with a large oil drop, not amyloid (nearly hyaline in iodine), smooth, broadly ellipsoid to subglobose; basidia four-spored,  $46-57 \times 10 - 12 \mu$ , with large highly refractive oil drops, hyaline in KOH; pleurocystidia none; cheilocystidia abundant, saccate and  $10 - 20 \mu$  in dia., some clavate and  $18 - 26 \times 10 - 15 \mu$ , yellowish as revived in KOH; gill trama hyaline in KOH, of loosely divergent hyphae from a thin central strand, subhymenium cellular; pileus trama with a thick gelatinous pellicle, tissue beneath loosely floccose and hyaline in KOH (S-20261).

Habit, habitat, and Distribution: Usually scattered to gregarious in mixed forests, particularly in stream valleys. It is not rare during the fall in Washington, Oregon, and California.



16

*Amanita agglutinata* (B. & C.) Singer

Pileus 4 - 8 cm. broad, when young broadly ovoid, expanding to convex or nearly plane, rarely umbonate, surface at first covered by a coating of appressed fibrils or fibrillose patches, glabrescent, surface subviscid, margin densely cottony-fibrillose appendiculate from the ragged partial veil but soon denuded of such ornamentation, striate in age, white to pallid but soon dingy brownish over the disc and staining reddish where bruised; odor none, taste mild.

Lamellae white, crowded, broad, attached by a line at first (distant from stipe when mature - Coker) turning reddish where cut or bruised.

Stipe 9 - 11 (14) cm. long, 1 - 2.5 cm. thick, at apex enlarged downward, stuffed, surface whitish cottony-fibrillose to squamulose, becoming reddish to reddish brown where handled, drying grayish brown, with or without flocculent material of a thin partial veil - annulus seldom well-formed, apex merely fibrillose; volva tough, thick, membranous, dull white, rubescent where touched, upper portion free forming a very pronounced cup, base about 5 cm. thick.

Spores 8 - 11 x 5.5 - 6.5  $\mu$ , ellipsoid, bluish in Melzer's but appearing marbled with pallid spots in many; basidia 4-spored, 36 - 44 x 9 - 11  $\mu$ , hyaline in KOH to



*Amanita agglutinata* (B. & C.) Singer, cont.

slightly brownish; pleurocystidia none; cheilocystidia vesiculose and badly collapsed (resembled partial veil tissue in structure and I suspect that is what they are mainly); gill trama divergent; pileus trama with a gelatinous pellicle, no clamps found.

Habit, habitat and distribution: Solitary to scattered in open woods of hardwoods and mixed forests, southeastern United States; summer, generally uncommon but during warm wet summers frequent.

Observations: This species differs from A. peckiana in rubescent flesh, tougher volva, and coarser stature - both compared fresh. When dried the colors are grayish brown to near cinnamon brown - much as in A. rubescens. I doubt if the spores are truly roughened. The wall is so thin that particles just beneath it could produce the effect observed.



26a

*Agarita peckiana* Kauffman apud Peck, Mycologia, 5: 67. 1913.

Pileus 4-9 cm. broad, ovoid when young, becoming broadly convex and finally nearly plane, surface viscid and either glabrous or with one or two membranous patches of volval tissue; soon dry and appearing more or less fibrillose or somewhat scurfy, the minute squamules cream-colored or tinged pinkish, not striate or sulcate only along the margin, the margin dentate or lacerate fringed at the time the veil breaks, soon becoming more or less even, color whitish to pallid or tinged cream color (not becoming reddish spotted) in age sometimes pale avellaneous; flesh moderately thick, soft, white, odor none or only faintly pungent ("slightly of radish"--Kauff.); taste not recorded.

Lamellae free or reaching the stipe where they are attached by a line, broad, broadest in front and narrowed toward the stipe, white, or whitish, moderately close, edges usually flocculose.

Stipe short, 3-6 cm. long (9 or rarely up to 13 cm.--Kauff.), 1-2 cm. thick, stuffed by a loose pit and soon hollow, white, surface above the volva more or less floccose from the remains of the thin inner veil, apex silky (annulus usually evanescent); volva free limbed, thick and fleshy, white or whitish, usually breaking so as to form two or three lobes, usually double but the inner layer often quite inconspicuous; base of stipe equal when separated from volva and its flesh usually pinkish (but no conspicuous reddish stains were crushed).



*Amanita peckiana* Kauffman      Cont.

Spores white in mass, smooth, amyloid, cylindric or slightly curved in one view,  $13-16 \times 4.5-6 \mu$ ; basidia  $38-44 \times 8-9 \mu$ , clavate; cheilocystidia abundant,  $26-55 \times 9-14 \mu$ , saccate to pear shaped, thin-walled, hyaline; pleurocystidia none seen; gill trama not amyloid, divergent from a central strand, the divergent cells considerably enlarged, subhymenium moderately well developed and appearing cellular in sections; pileus trama homogeneous beneath a gelatinous pellicle of narrow ( $2-3.5 \mu$ ) radially arranged hyphae; clamp connections not seen.

Habit, habitat and distribution: Scattered to gregarious in thin hardwood stands, in the Great Lakes Region, usually on sandy soil.

Observations:



*Amanita* near *parcivolvata* (Mersch, N. Jersey) "*merschii* sp. nov."

Pileus 3 cm. broad, convex, surface glabrous, viscid, orange, not striate.

Lamellae crowded, narrow, attached to stipe by decurrent lines, buff when dried (yellowish fresh?), edges crenulate.

Stipe 6 cm. long, 4 mm. thick, equal above a basal bulb, yellowish (?) - it dried as if yellowish when fresh, scurfy above, glabrous or nearly so lower down, type of volva not evident.

Spores  $8 - 10 \times 6 - 7 \mu$ , broadly ellipsoid, amyloid (pale blue), thin-walled, smooth; basidia  $34 - 40 \times 10 - 12 \mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia vesiculose-pedicellate,  $20 - 40 \mu$  in diam., readily collapsing, hyaline in KOH; gill trama divergent from a central strand; pileus trama with a thick gelatinous pellicle (yellow in KOH, becoming hyaline); clamp connections none.

Observations: The single specimen was sent to me by Mersch from New Jersey. I have never seen fresh material. It apparently looks like *A. parcivolvata* but has amyloid spores.



*Amanita bisporigera* Atk., Bot. Gaz., 41:348. 1906.

Pileus (3)4-10(12) cm. broad, ovoid to subcylindric in button stages, expanding to campanulate or convex and finally becoming plane or nearly so, surface viscid and glabrous or appressed fibrillose beneath the pellicle as seen under a lens, pure white or in age discolored creamy on the disc at times, margin usually even; flesh white, moderately thick, odor pleasant to somewhat nauseous, taste not recorded, not changing color when bruised;

Lamellae free or attached by a line, moderately broad toward the margin of the cap, close to crowded, pure white, edges floccose;

Stipe 6-15(20) cm. long, 8-20 mm. thick at the apex, subequal or enlarged downward to an oval or round bulb, stuffed but soon hollow, soft and fragile, silky to silky floccose above the superior annulus, subfloccose to somewhat scaly below; annulus membranous, ample, pendant, white; volva membranous and splitting into two or three lobes, sheathing the bulb but free from it at least in the upper part, hence forming a true cup.

Spores white in mass, globose with a pronounced apiculus, smooth, amyloid,  $7-9(10) \mu$ ; basidia two-spored,  $32-36 \times 8-10 \mu$ ; cheilocystidia secdate,  $22-30 \times 10-18 \mu$ ; pleurocystidia none differentiated; gill trama divergent; pileus trama floccose beneath a thin gelatinous pellicle, not amyloid.

Habit, habitat and distribution: Common in the summer and fall in northern North America east of the Great Plains.



*Amanita bisporigera* Atk.      Cont.

Observations: A. verna is supposed to have ellipsoid instead of globose spores. Try out this difference to see if it works on 4-spored basidia also.



*Amanita* Sm-21805

Pileus 2 - 4 cm. broad, convex to obtuse when young, broadly convex to plane in age, viscid, fibrillose-streaked, surface with a few irregularly shaped warts of pallid veil tissue, ground color umber brown to pale gray; margin not striate.

Lamellae white, free, close, broad near cap margin, unchanging in age or when bruised.

Stipe 4 - 10 cm. long, 3 - 8 mm. thick at apex, equal, white, with an apical white membranous annulus, base surrounded by a membranous free-margined volva (as in *A. verna*) but no distinct bulb present.

Spores globose to subglobose, 7 - 9  $\mu$ , smooth, amyloid (bluish), thin-walled and readily collapsing; basidia 4-spored, 26 - 30 x 8 - 9  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia vesiculose to clavate, the pedicel broad and short, 18 - 30 x 15 - 25  $\mu$ , hyaline, thin-walled, readily collapsing; gill trama divergent from a central strand; pileus trama homogeneous beneath a gelatinous pellicle; clamp connections absent.

Habit, habitat and distribution: Scattered on humus under scrub oak, Douglas Lake, Michigan, July 22, 1946, Sm-21805.

Observations: I have had a tendency to consider this as a depauperate form of *A. brunnescens* but in 1953 Singer



Amanita Sm-21805, cont.

found it and thought it was a new species. He may be right. The spores and cap colors are those of brumescens and so far it has always come out after the main fruiting of brumescens. The lack of a broad, gray, marginate bulb and the A. verna-like volva are its best claims to distinction.

Stems 1-2 m. tall, 3-5 mm. thick at apex, equal, white, with a thin, white membranous sheath, base surrounded by a membranous five-margined volva (as in A. verna) but the sheath is present.

Spores 7-9  $\mu$ , smooth, ellipsoid (oblong), thin-walled and readily collapsing; basidia 4-spored, 30 x 5-9  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate to clavate, the pedicel broad and short, 15-20 x 15-25  $\mu$ , hyaline, thin-walled, readily collapsing; gill trama divergent from a central strand; pileus trama homogeneous beneath a gelatinous pellicle; clamp connections absent.

Habit, habitat and distribution: Scattered on lumps under scrub oak, Douglas Lake, Michigan, July 22, 1946, Sm-21805.

Observations: I have had a tendency to consider this as a separate form of A. brumescens but in 1953 Singer



*Amanita virosa* Fr.

Pileus 6 - 12 (15) cm. broad, obtuse to nearly convex when young, expanding to broadly convex or rarely with a low obscure umbo, rarely plano-depressed, surface glabrous, viscid, margin even or practically so, pure white and usually remaining so, rarely yellowish on the disc in age; flesh thickish, soft, white, odor nauseous.

Lamellae close, broad, just reaching the apex of the stipe at first, in age appearing more remote, ~~broad~~, white, floccose on edges.

Stipe 8 - 15 (20) cm. long, 1 - 2 cm. thick at apex, enlarged downward to the bulbous base, pure white, hollow, glabrous to floccose-scaly (from torn cuticle); annulus superior, white, pendant, ample; volva forming a true cup at first but finally collapsing on bulb, margin free, lobed, white, rather fleshy tough below, lobes membranous.

Spores globose to subglobose  $8.5 - 11 \mu$  or  $9 - 11 \times 7 - 9 \mu$ , smooth, amyloid, thin-walled; basidia 4-spored,  $45 - 55 \times 10 - 13 \mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate to vesiculose-pedicellate,  $30 - 40 \times 15 - 25 \mu$ , hyaline, thin-walled; gill trama divergent from a central strand; pileus trama homogeneous beneath a thin gelatinous pellicle; clamp connections absent.



*Amanita virosa* Fr., cont.

Habit, habitat and distribution: Scattered to gregarious in open oak, white birch or aspen woods - usually on sandy soil; late summer and early fall, common in Michigan.

Observations: This species has previously passed under the name A. verna. In Kauffman (1918) both his A. verna and A. virosa apply to the one species. A. verna as at present interpreted by Singer and others has ellipsoid spores and it is this concept which I am adopting.



*Amanita cylindrospora* Beardslee

gaur. Eli. Miley. lei loc.  
52:105-1936.

Pileus 4 - 8 cm. broad, convex expanding to plane surface slightly viscid, glabrous or with adhering irregular membranous patches.

Lamellae adnate, white, close, narrow to moderately broad, white to yellowish, rusty ochraceous dried.

Stipe 4 - 10 cm. long, 5 - 8 mm. thick near apex, white, unpolished, to somewhat fibrillose; annulus white, superior, flaring, texture rather soft; bulb fusiform-pointed, rooting, sheathed with a white membranous volva with a free-lobed margin much as in *A. virosa*.

Spores 11 - 15 x 4.5 - 5.5  $\mu$ , cylindric, amyloid, smooth; basidia 33 - 44 x 8 - 9  $\mu$ , 4-spored, hyaline in KOH; pellicle of pileus of interwoven subgelatinous hyphae.

Habit, habitat and distribution: Known from southeastern United States, apparently uncommon.

Observations: Look up all the data on these narrow-spored species in Singer and Coker and work them out. Get complete notes on anything you find.



*Amanita "calyptraloides var. alba" Kauff., unpublished*

Pileus  $\pm$  12 cm. broad, companulate to plane, the margin finally elevated, slightly viscid, margin even, glabrous save for a large membranous patch of volval tissue covering the disc, pure white to dull white; flesh thin, soft, odor disagreeable (pungent, reminding one of hippuric acid - Kauff.).

Lamellae reaching the stem by a narrow strip and short decurrent by a line, crowded, thin, at length "ivory yellow", narrow (5 - 6 mm.), acuminate at anterior end, slightly crisped in age, white.

Stipe up to 19 cm. long, 1.8 cm. at dilated apex, equal downward or evenly enlarged after narrowing below apex, base with a large turbinate bulb covered by the adnate volva and  $\pm$  5 cm. thick, surface of stipe almost glabrous, white throughout; annulus superior,  $\pm$  2 cm. from apex, "ivory yellow", membranous, persistent, minutely pruinose,  $\pm$  striate above, pendant; universal veil membranous, thick, toughish, breaking circumscissily, the lower portion adherent to bulb (veil breaking at the rim of the marginate bulb); bulb rounded below.

Spores 9 - 12  $\times$  5.5 - 6.5  $\mu$ , oblong to ellipsoid, smooth, amyloid (dull blue in Melzers); basidia 4-spored, 35 - 50  $\times$  10 - 14  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia clavate to vesiculose, 12 - 20  $\mu$  broad; gill trama divergent from a central strand; pileus



Amanita "calyptraloides var. alba" Kauff., cont.

with a gelatinous pellicle of narrow (3 - 5  $\mu$ ) hyphae; lacking clamp connections.

Habit, habitat and distribution: Solitary on low ground under herbaceous material in a forest, Takoma Park, Maryland, Aug. 8, 1919, C. H. Kauffman.

Observations: This should be very close to A. verna in the sense of modern authors. It is also very likely the same as A. magnivelaris Fk.



*Amanita magnivelaris* Peck

Pileus 5 - 10 (12) cm. broad, ellipsoid to ovoid young, expanding to convex or broadly convex, nearly plane in age, surface glabrous, slightly viscid, chalky white to light cream color, margin even; flesh white, yellow in 15 per cent KOH, almost tasteless and odorless.

Lamellae light flesh colored, many tiers of lamellulae, close, broad, edges floccose.

Stipe 8 - 15 cm. long, 1 - 2.5 cm. thick midway, slightly enlarged downward, base only slightly bulbous, surface typically flocculent on upper half or nearly the whole length (wherever veil touched it), lacerated below at times, solid throughout; annulus very fragile, apical, ample pendant, (sometimes the veil adhering to cap margin), densely soft flocculent on lower side; volva thick, tough, leathery, persistent, usually splitting irregularly and remaining at base of stipe in large flaps, rarely approaching a perfect cup, occasionally a few flat pieces may adhere to the pileus.

Spores 8 - 11 x 5.5 - 7.5  $\mu$ , ellipsoid, amyloid, smooth; basidia 4-spored.

Observations: I have seen no specimens of this that I have recognized, but include it on data from Coker and Singer.



*Amanita hygroskopica* Coker, Jour. Elisha Mit. Sci. Soc.

33: 33. 1917.

Pileus 4.5 - 6 cm. broad, rounded or gibbous, expanding to broadly convex or plane, smooth, viscid and with a wet appearance, the margin even or (more rarely) with delicate striations, dull white except where appearing water-soaked, at times the disc straw color to near pinkish buff; flesh thin, whitish, no color changes, odor and taste none.

Lamellae moderately broad, close, rounded at the stipe and usually just reaching it, white but finally faintly flesh color and near ochraceous tawny dried, edges even.

Stipe 5 - 8 cm. long, 5 - 6 mm. thick near the apex, evenly enlarged downward to a distinct rounded bulb, white or with brownish stains below; annulus white, median to superior, pendant, often ragged; volva as in A. bisporigera - sheathing the bulb end with a lobed, free margin, white.

Spores 10 - 13 x 6.5 - 8  $\mu$ , ellipsoid to ovoid, amyloid, thin-walled; basidia 4-spored; pleurocystidia none; cheilocystidia vesiculose-pedicellate (if present); gill trama divergent; pileus trama with a gelatinous pellicle; clamp connections none (on the specimen studied - but try again on better material).



*Amanita hygroskopica* Coker, cont.

Habit, habitat and distribution: Scattered to gregarious on poor soil, Southeastern States and Michigan, rare in the north.

Observations: The water-soaked disc and ellipsoid spores are distinctive but I really wonder how distinct it is from the true *A. verna*?



*Amanita* Sm-38367

Pileus 3 - 9 cm. broad, convex, expanding to plane or margin arched slightly, surface only slightly viscid, dead white over all or disc tinged pinkish buff, glabrous or occasionally with a piece of the membranous volva adhering margin even; flesh white, soft, odor slightly pungent or lacking.

Lamellae adnate to apex of stipe, close, broad near the cap margin (as in *Russula*), white, yellowish on drying, edges crenulate.

Stipe 4 - 8 cm. long, 10 - 15 mm. thick at apex, solid, white over all and throughout, surface above and below the annulus white-floccose, base sunken in a large oval bulb; annulus membranous, superior to median, persistent in some specimens appearing double, silky and striate above, fibrillose below; volva membranous and 3 - 6 lobed, forming a cup which stands out away from the stipe and only in age collapses on it, white throughout.

Spores 9 - 12 x 6 - 7  $\mu$ , oblong-ellipsoid, smooth, thin-walled, bluish in Melzer's sol. (amyloid); basidia 4-spored, 35 - 45 x 9 - 12  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate, 25 - 40 x 12 - 22  $\mu$ , often rather broad at the basal septum; gill trama divergent from a central strand; pileus trama floccose, beneath a thin pellicle of subgelatinous hyphae 4 - 8  $\mu$  in diam.; clamp connections absent.



Amanita Sm-38367, cont.

Habit, habitat and distribution: Solitary to scattered in sand along fire lanes, Univ. of Mich. Biol. Station, Douglas Lake, Mich., Aug. 31, 1951, Sm-38367.

Observations: The shorter spores distinguish this from A. peckiana Kauff. It seems very close to what we have called A. verna in North America but the stipe is characteristically shorter and the bulb larger.



*Amanita elliptosperma* (?) Kauff. Md. Aug. 19, 1919.

Pileus about 5 cm. broad, nearly plane, pure white margin even, viscid; flesh thin; lamellae free, close, moderately broad, edges even; stipe 9 cm. long, bulbous, 5 mm. thick at apex, white over all and unpolished, with a superior membranous white annulus; annulus pendant; volva sheathing the base and membranous as in A. virosa, margin lobed, white.

Spores 10-14 x 6-7  $\mu$ , oblong, amyloid, dull bluish in Melzer's; pellicle gelatinous.

Habit, habitat and distribution: Cabin John Maryland, Aug. 19, 1919. Kauffman.

Observations: This was a single small specimen. It looks like A. virosa but has long spores.



*Amanita* <sup>oc</sup>~~oreata~~ sensu Rea H-192.

Pileus 5-7 cm. broad, convex to plane, viscid when moist white or slightly cream colored to pale orange, margin even or striate, glabrous or with a thin white volval patch on the disc; flesh white, 8-10 mm. thick next to the stipe, thinning gradually the margin.

Lamellae white, free or barely reaching the stipe, elliptic in outline or slightly broader in front, not broad, (2-8mm.), unequal, crowded, edges slightly flocculose.

Stipe 10-15.5 cm. long, 15-18 mm. thick at apex, equal or evenly enlarged downward to the bulb, white over all and throughout, solid, surface floccose except at the extreme apex where it is striate from the lines of the lamellae; annulus superior, broad, white or faintly yellowish, usually persisting; bulb 2-3.5 cm. broad and long, usually ovate and pointed below; volva white, thin, adnate to the bulb, with a free limb 1.5-4 cm. long and usually entire, either flaring or with its rim adhering to the stipe.

Spores 9-11 x 7-8.5  $\mu$ , broadly ovoid to broadly ellipsoid, amyloid, (dingy blue in Melzer's), under oil appearing to have a faint amyloid reticulation but this may be just within the spore, appearing smooth, wall very thin; basidia 4-spored, 30-46 x 10-14  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate to vesiculose, 10-20  $\mu$  broad, often merely slightly larger than basidia; gill trama divergent from a central strand; pileus trama with a viscid pellicle of subgelatinous hyphae; clamp connections none.



Observations: Notes by Rea indicate that the volval patch on the cap is accidental, as in others with this type of veil.



*Amanita porphyria* (Fr.) Secr.

Pileus 4 - 10 (12) cm. broad, obtuse to convex expanding to broadly convex or nearly plane, rarely with a low umbo, surface slightly viscid and evenly "drab" to near "wood brown" rarely with thin patches of u. veil material, more commonly with pulverulent appressed ash-colored floccose patches (veil much like that of A. straminea and leaving the same type of remnants), margin typically even; flesh white or grayish under the pellicle, odor not distinctive.

Lamellae narrow to moderately broad, close, usually narrowly attached to the stipe, pallid to cinereous and edges crenulate.

Stipe 5 - 10 cm. long, 10 - 15 mm. at apex, equal or enlarged down to the broad, rounded marginate bulb (3 - 4 cm. thick), stuffed to hollow, typically with the surface appressed fibrillose to fibrillose-pulverulent pale drab coating of fibrils above and below the annulus, becoming squamulose in some and pallid interior showing; annulus more or less median, ample membranous, thin, cinereous to drab on under side, somewhat striate above; volva cinereous to drab, adhering along the margin of the bulb or deciduous, texture pulverulent floccose.

Spores globose-apiculate, 7 - 10  $\mu$ , smooth, amyloid, thin-walled; basidia 4-spored, 35 - 45 (50)  $\times$  10 - 13  $\mu$ , hyaline; pleurocystidia none; cheilocystidia clavate-pedicellate



*Amanita porphyria* (Fr.) Secr., cont.

to vesiculose-pedicellate,  $25 - 35 \times 12 - 22 \mu$ , thin-walled and readily collapsing; pileus trama of floccose-interwoven hyphae over which is a thin pellicle of gelatinous narrow hyphae  $3 - 6 \mu$  in diam., and pale dingy ochraceous (in KOH); clamp connections none.

Habit, habitat and distribution: Solitary to scattered on rich humus, especially in hemlock forests, frequent in its habitat in northern and western United States.

Observations: This is the dark umber brown to drab *Amanita* of our hemlock forests in the Great Lakes Region. The broad, marginate bulb reminds one of citrina and brunneescens. The cinereous veil remnants and the evenly or dark-colored pileus distinguish porphyria from brunneescens since in the latter the margin soon becomes pallid. The

surface appears fibrillose to fibrillose-pulverulent; pale drab coating of fibrils above and below the annulus, becoming squamulose in size and pallid interior showing; annulus more or less nodose, scale nodose, thin, cinereous to drab on under side, whitish fibrillose above; bulb cinereous to drab, whitish along the margin of the bulb at base; trama pulverulent floccose.

Spores globose-ellipsoid,  $7 - 14 \mu$ , smooth, amyloid, thin-walled, pedicellate,  $15 - 25 (30) \times 10 - 13 \mu$ , hyaline; lamprospores rare; cheilocystidia clavate-pedicellate



*Amanita citrina* (S. F. Gray)

Pileus 5 - 10 (15) cm. broad, hemispheric to obtuse, expanding to broadly convex or nearly plane, the margin usually remaining somewhat decurved, surface viscid beneath a thin coating of universal veil remnants usually broken up into thin, appressed patches of fibrillose texture, never truly warty, disc often covered by rather large patchlike areas, somewhat glabrescent in age, margin often with shreds of u. veil tissue adhering to it, color "pale greenish yellow" ("light chalcedony yellow" to "Marguerite yellow") over all beneath veil material, (the latter "pale olive buff" or yellower or in thickest patches near avellaneous), margin even; flesh thick, white, soft, odor usually faint but penetrating and reminding one of chloride of lime.

Lamellae crowded, (125 - 133 reach stipe, 2 - 3 tiers of lamellulae), moderately broad to broad, broadest near cap margin, rounded near the stipe and close or just reaching the apex of it, evenly ivory yellow when mature, edges crenulate.

Stipe 6 - 12 (15) cm. long, 1 - 1.5 cm. thick at apex, with a rounded bulb 2 - 3.5 cm. in diam., concolorous with the gills, with a thin coating of appressed fibrils above the superior annulus, in age this layer may break up into concentric zones, apex striate at times, below

that species. I am inclined to agree with Singer ( )  
However that it is an autonomous taxon in its own right.



*Amanita citrina*, cont.

the annulus, sparsely fibrillose; annulus almost concolorous with pileus, membranous, ample, superior, edges often ragged; bulb white, spongy, terminating above in a broad, free somewhat lobed cup (marginate bulbous), rim at times decorated with rather large irregular membranous patches of u. veil remnants (volva not truly membranous as in verna group).

Spores 7 - 9  $\mu$ , globose, apiculus inconspicuous, smooth, pale blue in Melzer's sol.; basidia 4-spored, 30 - 40 x 8 - 9  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia 20 - 30 x 8 - 15 (20)  $\mu$ , clavate to almost vesiculose, readily collapsing; gill trama divergent from a central strand; pileus of floccose-filamentous hyphae beneath a gelatinous pellicle of narrow (3 - 8  $\mu$ ) slightly smoky-ochraceous (in KOH) hyphae; clamp connections absent.

Habit, habitat and distribution: Scattered to gregarious on rich humus, especially bordering woodland pools in oak woods, not uncommon; summer and fall, (Sm-11066, Sept. 24, 1938, George Reserve, Pinckney, Mich.)

Observations: The large marginate bulb is much like that found in brunnescens and porphyria; the pale greenish yellow of the pileus, however, readily distinguishes it from both. It most closely resembles the pallid form of A. brunnescens, and Gilbert considered it to be a form of that species. I am inclined to agree with Singer ( ) however that it is an autonomous taxon in its own right.



*Amanita aestivalis* Singer

*Amanita brunnescens* var. *pallida* Krieger, Mycologia 19:

308. 1927.

Pileus 4 - 9 (12) cm. broad, obtuse when young, expanding to broadly convex or nearly plane, very frequently the disc slightly umbonate and the margin slightly raised or arched to produce a shallow depression around the umbo, surface slightly viscid and often covered with small floccose whitish warts of universal veil remnants, color pallid with only a tinge of umber-brown (typical variety rather dark umber-brown over the disc), often nearly pure white in age; flesh thin, soft, fragile, odor not distinctive.

Lamellae close, approximate to the stipe, broad (up to 10 mm. in large caps), white to whitish, edges even to slightly crenulate.

Stipe (5) 6 - 12 cm. long, 8 - 15 mm. at apex, hollow, slightly enlarged downward to a greatly enlarged marginate bulb, nearly always furnished with one or more longitudinal clefts, surface above the bulb floccose squamulose to merely appressed fibrillose, above the apical to superior annulus silky and white, annulus membranous and pallid to white, bulb and lower half of stipe yellowish to white and eventually staining sordid rusty brown from being bruised or handled.



*Amanita aestivalis* Singer, cont.

*Amanita brunnescens* var. *pallida* Krieger, cont.

Spores white in deposits, globose,  $8 - 10 \mu$ , smooth, amyloid; basidia four-spored,  $33 - 37 \times 9 - 10 \mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia scattered, saccate to globose-pedicellate,  $18 - 25 \times 9 - 15 \mu$ , thin-walled, hyaline and readily collapsing; gill trama of hyphae divergent from a central strand (bilateral), hyaline in KOH; pileus trama with a pellicle of narrow ( $2 - 4 \mu$ ) hyaline gelatinose hyphae, tissue beneath the pellicle of hyaline floccose hyphae, the cells  $10 - 20 \mu$  broad (S-18410).

Habit, habitat, and distribution: Single, scattered or gregarious in groups of three to six, rarely more. On humus in open oak woods locally, but occurring in various stands of mixed hardwoods containing sassafras, hornbeam, maple and aspen. Both the typical and pale varieties are common locally during wet weather in July and August. Both var. pallida and var. typica are known to occur throughout the central and eastern United States.



*Amanita brunneescens* Atkinson, Proc. Amer. Phil. Soc., 57:354. 1918.

Pileus 4-10(12) cm. broad, obtuse when young, soon expanding to broadly convex or retaining a low obtuse umbo, at times plane, occasionally the margin uplifted in age, surface viscid, glabrous or with scattered floccose irregular patches of the remains of the volva, even or becoming striate along the margin and sometimes appearing streaked with dark fibrils around the disc, color variable, dark "olive brown" to "natal brown" around the disc and paler toward the margin, at times "dark olive buff" to "deep olive buff" (dark olivaceous brown to pale olivaceous brown or more or less smoky umber at least on the disc--the colors dark at first and quite pale in age); flesh white, odor faintly pungent, no pronounced color change when bruised.

Lamellae close, moderately broad, narrowed toward the stipe and attached by a line, white to creamy white.

Stipe 6-12 cm. long, 1-2 cm. thick at apex, evenly enlarged to the large abruptly bulbous base, bulb up to 4 cm. thick, rounded below and marginate above, surface of stipe silky to subfloccose and white or faintly tinged with the color of the pileus, the bulb frequently split radially into several large lobes.

Spores white in mass, globose, 8-10  $\mu$ , amyloid, smooth; basidia 32-38  $\times$  10-11  $\mu$ , four-spored; cheilocystidia abundant, sessate above a narrow pedicel, 22-30  $\times$  8-12  $\mu$ , hyaline, thin walled; pleurocystidia none; gill trama of divergent hyphae; pileus trama floccose beneath a thin gelatinous pellicle of narrow hyphae (3-5  $\mu$  in diam.), (18,429).



*Amanita brunneescens* Atkinson

Cont.

Habit, habitat and distribution: Common early in the summer throughout the scrub oak country of Michigan.

Observations: The broad bulb which soon becomes split and the sombre colors are distinctive.



*Amanita abrupta* Peck

Pileus 4 - 10 cm. broad, obtuse to convex, expanding to broadly convex, slightly viscid moist, white over all or disc tinged yellowish, adorned with small sharply conic warts often arranged in rows, glabrescent in age or when rain-washed, margin even or only faintly striate; flesh thin to thick (in disc), white, odorless.

Lamellae white, close, almost reaching the apex of the stipe but free or connected by a line, broad, edges even to floccose.

Stipe 6 - 12 cm. long, 5 - 12 mm. thick above the bulb, equal or narrowed upward, bulb abrupt and large (4 - 5 cm.), white, flesh firm, stuffed, surface above bulb floccose to glabrous; bulb rounded below, not rooting, sometimes rimose as in A. brunnescens; annulus superior to apical, delicate, pendant, often fibrillose below; volva usually merely a zone of veil remnants along margin of the bulb.

Spores 9 - 11 x 6.5 - 8.8  $\mu$ , broadly ellipsoid to subglobose, varying to broadly ovate, smooth, thin-walled, blue in Melzer's sol. (amyloid); basidia 4-spored, 40 - 50 x 10 - 13  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate to vesiculose (apparently the remains of partial veil material); gill trama divergent from a central strand; pileus trama homogeneous beneath a thin scarcely gelatinous pellicle; clamp connections present.



*Amanita abrupta* Peck, cont.

Habit, habitat and distribution: Solitary to scattered on rich humus, Cades Cove, Great Smoky Mts. National Park, Tennessee, Sm-10356.

Observations: This is a member of the white series with a friable universal veil leaving delicate conic warts on the cap, amyloid spores, and a broad bulb much as in *A. porphyria* and *brunnescens*.

Stipe 4-6 cm. long, 5-8 mm. thick above the bulb, equal or somewhat enlarged, bulbous, smooth, white, flesh firm, stuffed, surface above bulb floccose to glabrous; bulb rounded below, not rooting, sometimes rimmed at base; annulus superior to middle, whitish, distinct, often fibrillose below; veil usually mostly above of veil remnants along margin of the bulb.

Spores 4-6  $\mu$  x 5.5-6.5  $\mu$ , broadly ellipsoid to oblong, varying to rarely ovate, smooth, thin-walled, hyaline, sterile; basidia 4-spored, 20-30 x 10-12  $\mu$ , cylindric to subcylindric; pleurocystidia none; cheilocystidia clavate to subclavate (apparently the result of partial veil extension); gill trama divergent from a central strand; stipe trama homogeneous beneath a thin granular gelatinous peridium; clamp connections present.



*Amanita strobiliformis* sensu Coker. Sm. 9797.

Pileus 6-12 cm. broad, globose to convex, becoming broadly convex, finally nearly plane, surface dry, covered by umbricate more or less erect innate warts or (near the margin) scales, ground color whitish, fibrils and scales creamy or tinged avellaneous, warts dingy buff; flesh thick white, firm odor fragrant (not of chloride of lime).

Lamellae close but distinct, not reaching the stipe, broad (plus 1 cm.), dark cream color, edges even.

Stipe 10-20 cm. long, 1-2.5 cm. thick at apex, enlarged to a massive clavate base 11 cm. x 6 cm. (largest ones), massive basal part covered by umbricate scales with free margins pointing up and out, or surface variously areolate-cracked or grooved irregularly, usually glabrous, below the ground level, scales avellaneous, above the bulb up to the annulus with scattered lacerate avellaneous scales on a white background, these scales varying from well-formed to indistinct, near the apex white and cottony fibrillose; annulus superior, fragile, with a thick areolate-cracked outer (underside) layer, fibrillose and white on upper surface; volva represented only by the innate scales near the ground-line; base of stipe long rooting (well-developed pseudorhiza).

Spores 7-9(10) x 5-5.5  $\mu$ , ellipsoid, weakly amyloid, (bluish in Melzer's), smooth, thin-walled; basidia 4-spored, 36-44 x 9-12  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia basidium-like; gill trama divergent from a central strand; pileus with an interwoven non-gelatinous cuticle of narrow (4-8  $\mu$  diam.) hyphae; clamp connections present.



Amanita strobiliformis sensu Coker. Sm-9797. Continued.

Habit, habitat and distribution: Gregarious under pine  
Cody's Cove, Great Smoky Mts. National Park, Tenn. Aug. 5, 1938.

Observations: I am continuing to use this name in the sense  
that Coker used it --- at least until such time as the liter-  
ature can be carefully evaluated in the light of Singer's Section  
Strobiliformes. He still uses the name for a fungus of this type,  
I certainly can't attach the species as described here to A.

Chlorinosma!



*Amanita solitaria* Fries.

Pileus 6-11 cm. broad, more or less hemispheric in button stages, soon expanding to very broadly convex and finally perfectly plane, surface slightly viscid to the touch when moist but soon change to "cinnamon-buff" (pallid buff) or "clay-color" (pale brownish), often merely floccose toward the ragged-appendiculate margin, glabrescent especially along the margin and in age the cuticle sometimes torn into broad flat somewhat recurved scales which also become brownish, generally white or whitish beneath the veil remnants but old caps often sordid; flesh thick, about 1 cm. thick near the stipe, white, soft and floccose, odor weak and slightly pungent but not of chloride of lime.

Lamellae close but not crowded,  $133 \pm$  reach the stipe, 1-2 tiers of lamellulae, attached to apex of stipe by a slight tooth, 6-10 mm. broad, broadest in the middle and in age slightly ventricose, white, edges even or very slightly crenulate.

Stipe 10-18 cm. long, 1-2.5 cm. thick at apex, often flared a bit at the apex, with a more or less napiform bulb up to 4.5 cm. thick at the base or the base nearly equal and pointed, solid, white, very ragged or scaly up to the apex, annulus superior to apical and ragged, soon evanescent; volva present as a ragged fringe at the apex of the bulb; in old carpophores the cuticle of the stipe often torn into large recurved scales and the apex coarsely white floccose.

Spores 9-11  $\times$  5-6  $\mu$ , almost perfectly ellipsoid, smooth, amyloid; basidia four-spored; pleurocystidia and cheilocystidia



*Amanita solitaria* Fries. Cont.

not differentiated or on the edge more or less basidia-like; gill trama of divergent hyphae from a central strand, compact, the hyphae narrow (5-9  $\mu$ ), not amyloid; pileus floccose beneath a thin gelatinous pellicle, not amyloid.

Habit, habitat and distribution: Solitary in coniferous and mixed forests, rare in North America.

Observations:



*Amanita chlorinasma* Peck, Torr. Bot. Club. Bull. 6: 1878.

Pileus (8) 10 - 15 (25) cm. broad, subglobose when young, expanding to convex or broadly convex, the margin at times uplifted in age, surface conspicuously decorated with veil remnants in the form of floccose to powdery material variously distributed but usually in the form of warts, in age at times areolate in addition to giving the impression of being truly scaly, margin usually heavily appendiculate with veil remnants, white over all or in age discolored to creamy or buff; flesh thick, compact, white, soft, odor disagreeable and pungent, reminding one somewhat of chloride of lime.

Gills close to the stipe and often narrowly attached, narrow but finally (in fully expanded caps) rather broad especially near the cap margin, white at first but cream-color in age, edges flocculose.

Stipe 6 - 12 (18) cm. long, 1 - 2.5 cm. thick above, equal to evenly enlarged down to a large napiform bulb (3 - 5 cm. thick) and usually conspicuously rooting, stuffed, cortex rather hard, white throughout or dingy, covered with floccose material up to the ragged annulus or actually squamulose, (the material distributed in various patterns); annulus superior, usually torn and ragged or adhering to the gills, white, texture soft; volva in the form of white to whitish floccose remnants in zones or patches of universal veil material over and just above the bulb, often mostly collapsed and dingy in age.



*Amanita chlorinesma* Peck, cont.

Spores  $10 - 13 \times 5.5 - 7 \mu$ , broadly ellipsoid, pale blue in Melzer's sol., smooth; basidia  $50 - 60 \times 10 - 13 \mu$ , hyaline in KOH, widest below apex, 4-spored; pleurocystidia none; cheilocystidia in the form of clavate septate hyphal tips (?) with apical cell  $10 - 15 \mu$  in diam. and ellipsoid to subglobose; gill trama divergent from a central strand; pileus trama of floccose-interwoven hyphae; cuticle of narrower ( $5 - 10 \mu$ ) hyphae and not particularly gelatinous in KOH; veil remnants of very broad ( $20 - 50 \mu$ ) globose to ellipsoid thin-walled readily collapsing cells, some ventricose-pedicellate because of localization of the enlargement in an otherwise long ( $50 - 150 \mu$ ) cell; clamp connections absent (as far as could be determined).

Habit, habitat and distribution: Solitary to caespitose on humus in mixed woods, along roadsides, etc.; typically rare to uncommon but some seasons rather frequent. Microscopic data taken from Smith-17933, Elwha River, below Lake Mills, Oct. 15, 1941.

Observations: The broadly ellipsoid amyloid spores, odor of chloride of lime, large bulb which is typically rooting and always pointed below, floccose-pulverulent universal veil and lack of pigment generally characterize this species.



*Amanita rubescens* (Fries) S.F.Gray, Nat. Arr. Brit. Plants, 1:  
600. 1821.

Agaricus rubescens Fries, Syst. Myc., 1:18. 1821.

Venenarius rubens Merrill, Mycologia, 5:75. 1913.

Pileus 5-12(15) cm. broad, ovoid at first, soon obtusely campanulate to broadly convex or nearly plane, often retaining a low broad umbo, viscid to subviscid or nearly dry, colors difficult to describe, brownish buff, reddish brown, avellaneous of grayish, reddish tinges usually developing in age, usually more or less avellaneous young but sometimes near "tawny olive" and retaining this color more or less when dried, surface usually covered with floccose patches or warts from the remains of the volva, the warts soft and pallid to grayish or stained reddish, the margin of the cap usually obscurely striate; flesh soft and fragile, thin, whitish but staining reddish when bruised or in age, odor not distinctive or merely slightly pungent, taste pleasant but not distinctive.

Lamellae moderately broad in front and narrowed toward the stipe, free or reaching the stipe only by a line, close, white or pallid, soon stained reddish or flushed with pink, edges slightly floccose.

Stipe 8-15(20) cm. long, 8-25 mm. thick, more or less equal above the clavate to rounded-bulbous base, stuffed, pallid within but staining reddish, surface silky to subfloccose above the annulus and sometimes striate, pale avellaneous or tinged pinkish below the annulus somewhat floccose to unpolished and sometimes darker than the apex, often merely pallid over all, staining



*Amanita rubescens* (Fries)      Cont.

reddish, bulb usually with scattered patches of the volva adhering at least to the upper part, bulb and volva remnants both staining reddish; annulus broad, superior, fragile, pallid but often stained, often striate above.

Spores white in mass, ellipsoid,  $8-10 \times 5-6 \mu$ , smooth, amyloid; basidia  $36-48 \times 8-10 \mu$ , four-spored; cheilocystidia abundant, often forming a sterile band along the gill edge, balloon-shaped but not capitate--i.e. tapered to the pedicel, thin walled, hyaline,  $24-42 \times 10-30 \mu$ ; gill trama more or less divergent from a central strand, the diverging hyphae relatively large, the subhymenium appearing cellular in section; the pileus tissue floccose beneath a gelatinous pellicle of narrow ( $3-4 \mu \pm$ ) radially arranged hyphae, numerous lactifers present in the flesh and visible under the microscope as highly refractive rather crooked hyphae (in KOH mounts).

Habit, habitat and distribution: Common in low moist deciduous woods in eastern North America, rare in the west.

Observations: The pale to dark umber brown pilei, friable volva and the tendency to stain red are distinctive field characters.



*Amanita flavorubescens* Atkinson.

Pileus 5-14 cm. broad, obtusely conic to convex expanding to broadly convex or nearly plane in age, at first covered by dense floccose "light cadmium" pyramidal warts or patches of such warts, color beneath "lemon chrome" to "apricot yellow", surface viscid, in age fading to "pinkish buff" on margin and near "tawny olive" on disc, often remaining straw color, assuming dull reddish tints in age, margin finally somewhat striate.

Lamellae moderately close, white, moderately broad, edge minutely crenulate.

Stipe 10-15 cm. long, 1-2 cm. thick, at apex solid, becoming hollow equal or subbulbous at the base, tapering upward, covered by lacerate-fibrillose patches or squamules below the ring, the fibrils white to yellow, silky at and near apex, annulus ample, superior, white, striate above, often with yellowish patches near the margin, in age at times dull yellowish; volva merely the powdery remains variously aggregated around the base of the stipe or adhering to the soil around it.

Spores 8-10 x 5-6  $\mu$ , ellipsoid, smooth, amyloid, (dull blue in Melzer's); basidia 4-spored, 35-45 x 9-11  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia none; (at times possibly with veil remnants adhering); gill trama divergent from a central strand; pileus trama homogeneous beneath a viscid pellicle; clamp connections none.

Habit, habitat and distribution: Gregarious to scattered in oak woods, usually evenly in the season (June 15 on), in Great Lakes Region. Sm-1593. (July 23, 1935).



Amanita flavorubescens Atkinson. Continued.

Observations: This species is usually larger than A. flavoconia and stains red as in A. rubescens.

Stipe: 1-2 in. tall, 1/2 in. thick, at apex white, becoming hollow equal or slightly above the base, tapering upward, covered by imbricate fibrils or scales or squamules below the apex, the fibrils white or yellow, silky at apex and apex.

Stipe: 1-2 in. tall, 1/2 in. thick, at apex white, becoming hollow equal or slightly above the base, tapering upward, covered by imbricate fibrils or scales or squamules below the apex, the fibrils white or yellow, silky at apex and apex. Stipe: 1-2 in. tall, 1/2 in. thick, at apex white, becoming hollow equal or slightly above the base, tapering upward, covered by imbricate fibrils or scales or squamules below the apex, the fibrils white or yellow, silky at apex and apex.

Spores: 4-6 x 2-3  $\mu$ , ellipsoid, smooth, hyaline, (oil drop visible). Basidia: 4-6 x 2-3  $\mu$ , ellipsoid, smooth, hyaline, (oil drop visible). Spores: 4-6 x 2-3  $\mu$ , ellipsoid, smooth, hyaline, (oil drop visible). Basidia: 4-6 x 2-3  $\mu$ , ellipsoid, smooth, hyaline, (oil drop visible).

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*Amantia flavoconica* Atkinson, Jour. Mycology, 8: 110. 1902.

Pileus 3-9 cm. broad, occasionally larger, convex and expanding to nearly plane, the margin usually remaining decurved, viscid, surface usually covered by soft floccose warts of universal veil tissue, warts pallid to yellowish and easily removed, sometimes absent as a result of excessive rain or of contact with debris, color over all (beneath the scales) orange, reddish-orange or pale yellow ("orange" to "pale orange yellow") fading only slightly, margin even or slightly striate; flesh thin, white, odor not distinctive, not changing color when bruised. Lamellae free, close, moderately broad, white to pale yellow (yellowish in forms with reddish-orange pilei) edges somewhat fimbriate.

Stipe 6-10 cm. long, 5-10 mm. thick, soon hollow, straight or curved slightly, equal or base more or less bulbous, sometimes distinctly bulbous, yellow pulverulent above the superior annulus, yellowish to orange below the annulus and somewhat unpolished to floccose, base usually surrounded by sulfur yellow friable particles of the universal veil; annulus membranous, bright yellow; volva bright yellow, often visible only as a few scattered remnants around the apex of the bulb and most of the remains usually adhering to the soil when the specimen is gathered.

Spores ellipsoid to broadly ellipsoid, smooth, amyloid,  $7-9 \times 5-6.5 \mu$ ; basidia four-spored,  $28-36 \times 7-9 \mu$ , clavate but broadest just below the apex (when furnished with sterigmata);



*Amanita flavoconica* Atkinson. Cont.

cheilocystidia abundant, 28-46 x 10-26  $\mu$ , balloon-shaped and thinwalled, more or less gradually narrowed to the pedicel, hyaline when revived in KOH; pleurocystidia absent; fill trama of large divergent hyphal cells from a central strand, not amyloid; pileus trama floccose beneath a gelatinous pellicle of very narrow (3-5 $\mu$ ) hyphae with orange contents, the color easily dissolved in water and quickly disappearing in material revived in KOH.

Habit, habitat and distribution: Not uncommon in the Great Lakes Region and eastern North America generally, in mixed conifer and hardwood as well as in pure stands of hardwoods---oak or maple or in mixed hardwoods, summer and fall.

Observations: The amyloid spores separate this from A. Frostiana.



*Amanita aspera* (Fr.) Quélet, sensu Smith

Pileus 4 - 8 cm. broad, obtuse to convex when young, plane or with a slight umbo in age, margin even or very short-striate, viscid, surface covered at first by "chamois" (dull yellow) pulverulent to floccose patches of universal veil tissue that become aggregated into deciduous scales and become sordid to grayish or brownish in age, color beneath the scales "raw umber" to "bister" or "Dresden brown" (dark sordid brown tinged with yellow) on the disc, "ocher-yellow" or more sordid grayish yellow toward the margin or at times "buckthorn brown"; flesh white or yellowish under the cuticle, moderately fragile, odor none, unchanging when cut.

Lamellae close, broad, approximate to the stipe or attached by a tooth, two tiers of lamellulae, white when young but soon assuming a yellowish cast near the cap margin or over all, edges slightly crenulate.

Stipe (4) 8 - 12 cm. long, 10 - 15 mm. thick at the apex, thickened downward to a more or less clavate bulb which is either pointed or flattened below, stuffed solid, striate and pale yellow to brownish yellow above the superior annulus, slightly pruinose, furnished with yellow furfuraceous zones below the annulus, glabrescent in age and then more or less silky, basal portion with rings of tissue left by the fragile universal veil, these remnants usually grayish on the surface and yellow underneath, base of bulb and the interior slowly staining reddish brown when cut or bruised;



*Amanita aspera* (Fr.) Quélet, sensu Smith

annulus double, pale yellow above, yellowish- or grayish-fibrillose to subscaly beneath.

Spores  $8 - 10 \times 6 - 7 \mu$ , broadly ellipsoid, smooth, hyaline in KOH, amyloid; basidia four-spored,  $36 - 43 \times 7.5 - 9 \mu$ , hyaline in KOH; pleurocystidia not differentiated; cheilocystidia scattered to abundant, subcapitate,  $36 - 48 \times 9 - 13 \mu$ , thin-walled and readily collapsing; gill trama of hyphae divergent from a central strand, the cells short and broad, not amyloid; pileus trama floccose beneath a thin gelatinous pellicle, not amyloid; remains of the volva composed of globose thin-walled cells up to  $60 \mu$  in dia. (G-694).

Habit, habitat and distribution: Scattered under conifers such as pine, balsam fir, hemlock, and redwood in Washington, Oregon and California. It is not rare late in the season.



*Amanita spissa* (Sm-10267)

Pileus 6 - 15 cm. broad, convex becoming plane, viscid, dark ashy gray on the disc, pallid to pale cinereous on the margin, margin even or faintly sulcate, surface at first covered by very small whitish irregular patches of the very friable universal veil, the margin usually glistening from the very fine flocculent remnants of the veil tissue; flesh white, soft, odorless or faintly of chlorine.

Lamellae moderately close, rather remote from the stipe, broad, white or tinged pallid-cinereous, edges crenulate.

Stipe 8 - 12 cm. long, 1 - 1.5 cm. thick at apex, clavate with an oval bulb, 3 - 4 cm. thick in the bulb, solid, white within, apex frosted-pruinose, below the annulus densely white floccose-scaly or with adhering cottony patches of tissue; annulus superior, pendent, white-frosted and striate above, margin with floccose grayish patches and on under side ragged and cottony-fibrillose; volva present as patches of cottony, friable universal veil remnants around the upper margin of the bulb.

Spores 7 - 9 x 5 - 5.5  $\mu$ , ellipsoid, amyloid (pale blue), thin-walled, smooth; basidia 4-spored, 30 - 40 x 7 - 9  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia vesiculose, 15 - 25  $\mu$ , hyaline and readily collapsing; gill trama divergent from a central strand; pileus trama with a gelatinous pellicle; clamp connections none.



[illegible]



*Amanita spissa* (Sm-38732)

Pileus 3 - 7 cm. broad, obtuse, expanding to plane or rarely slightly umbonate, surface viscid, fuscous to pale gray or brownish gray, at first decorated with copious cinereous pyramidal to blocklike scales representing veil remnants, glabrescent, margin even; flesh thin, soft, white, odor slightly pungent.

Lamellae close, reaching the stipe and extending down it with decurrent lines, broad, white, unspotted, edges minutely white crenulate.

Stipe 6 - 12 cm. long, 8 - 12 mm. at apex, enlarged downward to the oval to rounded bulb, soft-silky above the annulus, somewhat squamulose from above the bulb upward, squamules brownish to pallid; annulus superior, membranous white to brownish-cinereous; volva friable (crumbly) and adhering as powder and flakes around the bulb, cinereous.

Spores broadly ellipsoid 8 - 9 x 5 - 6  $\mu$ , thin-walled, pale blue in Melzer's, smooth, basidia 4-spored, 33 - 40 x 8 - 10  $\mu$ , hyaline in KOH; pleurocystidia none; cheilocystidia clavate-pedicellate, 30 - 40 x 10 - 20  $\mu$ , thin-walled and readily collapsing; gill trama divergent from a central strand; pileus trama of floccose-filamentous hyphae beneath a gelatinous pellicle which is brownish gray in KOH and of hyphae 4 - 8  $\mu$  in diam.; clamp connections absent as far as could be determined.



*Amanita spissa* (Sm-38732), cont.

Habit, habitat and distribution: Scattered to gregarious in a jack-pine bog on moss and among sedges, Tahquamen Falls State Park, Sept. 12, 1951, Leathers & Smith-38732.

Observations: The cinereous friable universal veil, lack of reddish stains and brownish gray pileus are distinctive. The bulb is not marginate as in *A. brunnescens* and the spores are not globose.



*Amanita cinereconia* Atkinson

Pileus 3 - 8 cm. broad, obtuse to convex, expanding to broadly convex or slightly umbonate, surface dry and covered with the remnants of the dark gray to umber universal veil in the form of soft warts or more or less evenly (toward the margin) distributed powder, pallid beneath the veil; flesh white, soft, 3 - 5 mm. thick in the disc, tasteless (Coker), odor of chlorine.

Lamellae rather close, broad, reaching the apex of the stipe and often barely attached, white, becoming creamy in age and near cinnamon buff on drying.

Stipe 5 - 10 cm. long, 6 - 12 mm. thick at apex, equal to enlarged downward, and typically with a short pseudorhiza, at times with a somewhat fusiform bulb, surface densely covered over lower portion with the grayish umber remains of the veil and at times coarsely squamulose with recurved gray scales, merely powdery upward; annulus imperfect and deciduous, of soft friable material, pallid above and with gray material on under side; volva soon obliterated or material intergrown with the scales over the lower part of the stipe, consisting of friable umber-gray material.

Spores 8 - 10 (11) x 5 - 6.5  $\mu$ , ellipsoid, blue in Melzer's sol. (amyloid), thin-walled; basidia 36 - 45 x 9 - 12  $\mu$ , 4-spored, hyaline in KOH; pleurocystidia none; cheilocystidia (material along gill-edge) consisting of



*Amanita cinereconia* Atkinson, cont.

vesiculose cells and filamentous debris from the partial veil; gill trama divergent from a central strand; pileus trama homogeneous beneath a thin pellicle of subgelatinous hyphae; veil elements of vesiculose cells with dark ochraceous-umber content in KOH; clamp connections absent.

Habit, habitat and distribution: On humus in woods, southeastern United States; not common; summer and early fall.

Observations: I agree with Coker that this is a distinct species and not a variant of Chlorinosma.