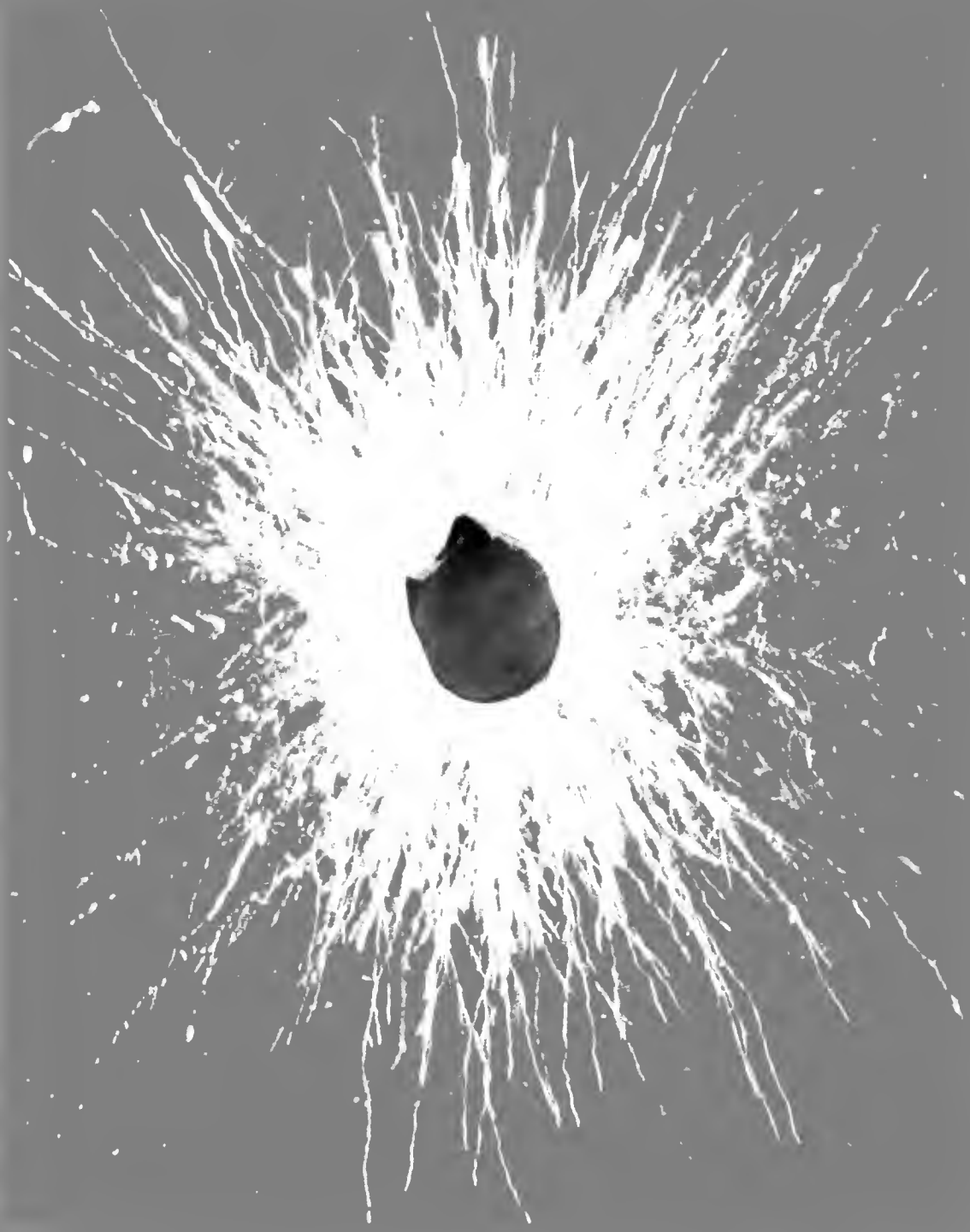
Fungi Colonizing Cysts of *Heterodera glycines*



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Cover illustration: Fungal mycelium growing from cyst of *Heterodera glycines*.

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Introduction

The soybean cyst nematode (*Heterodera glycines* Ichinohe) is generally considered the world's most serious threat to soybean production (Anonymous 1984). The nematode feeds on soybean roots, causing reduced vigor in parasitized plants. At maturity, the body of the female nematode becomes greatly enlarged and serves as a protective structure, termed a cyst, that contains 200-600 eggs. The hardened cuticle of the cyst provides protection from desiccation, chemicals, and other factors (Melton et al. 1985). Eggs within cysts may remain viable in soil for up to seven years (Sinclair 1982), making control of the nematode extremely difficult. Current methods of control involve the use of resistant soybean varieties, crop rotation, or nematicides. However, problems exist in the effective implementation of these strategies. A number of pathogenic races of the nematode exist, and the dominant race in each field must be identified in order to determine which resistant soybean variety will be effective. Another problem is that new races of the nematode, virulent on resistant varieties, tend to arise. The longevity of the nematode cysts complicates the use of crop rotation. Safety concerns and the potential for problems resulting from groundwater contamination limit the usefulness of nematicides, as does their expense. Clearly, new ways of dealing with this pest are needed.

In recent years much attention has been focussed on the possible use of fungi as biological control agents of cyst nematodes. As early as 1877, studies showed that fungi are capable of invading cysts and parasitizing the eggs (Tribe 1977). Kerry (1975) provided the first evidence of biological control of a cyst nematode when he demonstrated that naturally occurring fungal parasites were responsible for the widespread suppression of cereal cyst nematode (*H. avenae*) populations in Europe. More recently, Morgan-Jones and Rodriguez-Kabana (1985, and references therein) studied the fungi associated with cysts of *H. glycines* in the southeastern United States. They found 55 species of fungi-colonizing cysts, including a number of nematode parasites.

During 1983 through 1986, we studied the fungi associated with cysts of *H. glycines* in Illinois and isolated over 70 species, half of which had not been reported previously from this nematode. Identification of many of these fungi proved to be difficult because the taxonomic literature is scattered and often difficult to obtain. In addition, several undescribed species were encountered, and the cultural features of many known species had not been adequately described in the literature. In an attempt to help remedy the problems involved in identifying cyst-colonizing fungi, we have compiled the material in this publication. Included are keys for all the fungi presently known to occur in cysts of *H. glycines* and illustrations and descriptions for all known species from Illinois. We hope that including this material in one publication will simplify identification of these fungi by nontaxonomists and ultimately encourage further research on cyst-colonizing fungi and their potential use as biological control agents.

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Materials and Methods

Nematode cysts used in this study were from one soybean field near Sidney, Champaign County, in central Illinois, and another near Dix, Jefferson County, in southern Illinois. Race 3 of *H. glycines* was predominant at each location. In 1983 and 1984, the two locations were planted with a cultivar susceptible to *H. glycines*, Williams 82. In 1985, the Dix field was planted with cultivar Fayette, resistant to *H. glycines*, and the Sidney field again was planted with cultivar Williams 82.

Soil samples were taken at planting in May 1983, every 3 to 4 weeks through November, and from February through November 1984 and 1985. Soil samples were collected from the top 10 to 12 centimeters (cm) of soil. One sample was collected from each of five rows, each sample consisting of 20 individual soil plugs taken approximately every 75 cm from near the bases of soybean plants. Cysts were extracted from 250 cubic centimeter (cc) subsamples by a wet-sieving technique (Southey 1970). Intact, mature cysts were surface-sterilized for three minutes in 0.5 percent NaOCl, then rinsed three times with sterile deionized water. At each sampling, five cysts were placed on each of 20 9-cm diameter plastic plates containing water agar (Difco, Detroit, MI) with 100 micrograms/milliliter (μg/ml) streptomycin sulfate. Subcultures were made from fungal mycelia growing from cysts after 3 to 4 days. Cultures were maintained on Difco corn-meal agar (CMA) and subjected to fluorescent light (10 hours daily) on a lab bench at 22° to 26°C. The use of CMA resulted in an acceptable balance between mycelial growth and sporulation for most fungal species encountered.

Other media used to identify certain species included Difco potato dextrose agar (PDA), Czapek's agar (Pitt 1973), Difco malt extract agar (MEA), and oatmeal agar (OA) (Stevens 1974). Representative cultures were deposited with the American Type Culture Collection (ATCC), selected cultivars with the Northern Regional Research Laboratory at Peoria (NRRL), and the Universite Catholique de Louvain, Belgium (MUCL). Dried cultures were deposited with the Illinois Natural History Survey Mycological Herbarium (ILLS).

Colony morphology in petri dishes was studied under a stereomicroscope. Preparations for examination with a compound microscope were mounted in water, Melzer's reagent, lactophenol, or 70 percent ethanol. Measurements were made from water mounts and observations made with Olympus model BHS microscopes equipped for bright field or differential interference contrast microscopy. Photomicrographs were made using Kodak Technical Pan 2415 film (Eastman Kodak Company, Rochester, NY). Photomacrographs were made with a Wild M420 Photomakroscop using Kodak Panatomic-X film.

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Species Descriptions

Acremonium kiliense Grutz, Dermatol. Wachenschr. 80:774. 1925. Figs. 1-6, 356.

Fourteen-day-old colonies on CMA (Fig. 356) 6.0-6.3 cm diam, pale salmon, moist, aerial mycelium sparse, fasciculate when present; border even, reverse salmon. Conidiogenous cells (Figs. 1-3) phialidic, hyaline, smooth, cylindrical, tapering at apex, basal septum, base not staining in aniline blue; simple or occasionally branched (Fig. 2); 3.2-49.6 μm long, 0.8-2.4 μm diam base, 0.8 μm diam apex; arising singly from submerged hyphae, or laterally on fasciculate aerial hyphae; occasionally proliferating percurrently (Fig. 3, arrow). Conidia (Fig. 4) hyaline, smooth, cylindrical with rounded ends, straight or curved, 1-celled, 3.2-7.2 × 0.8-1.6 μm; forming gloeoid head at conidiogenous locus, dispersing readily in water. Chlamydospores (Fig. 5) hyaline, globose to pyriform, smooth, walls up to 1.0 μm thick, staining deeply in aniline blue (Fig. 6); 5.6-9.6 μm diam; terminal or intercalary, immersed in agar, single or in chains (of up to 4).
Isolates Examined: S-1-8-4, isolated 30.V.1983; D-6-2-2 (ATCC 62171), isolated 8.IX.1983.

Acremonium sclerotigenum (F. & V. Moriau ex Volenta) W. Gams, Cephalosporium-artige Schimmelpilze, p. 45. 1971. Figs. 7-9, 357.
Seven-day-old colonies on CMA (Fig. 357) 1.5-2.0 cm diam, white, woolly to funiculose, border irregular, reverse uncolored. Conidiogenous cells (Fig. 7) phialidic, hyaline, faintly roughened, cylindrical, tapering apex, basal septum, base staining deeply in aniline blue (Fig. 8), 31.2-56.0 μm long, 1.6-2.4 μm wide base, 0.8 μm wide apex; apical collarette less than 0.5 μm long, slightly flared; arising laterally on aerial mycelium. Conidia (Fig. 9) hyaline, smooth, cylindrical with rounded ends, 1-celled, 4.8-12.0 × 1.6-3.2 μm. Forming gloeoid head at conidiogenous locus. Sclerotium-like structures hyaline, irregularly shaped, up to 140 μm diam, formed on PDA.
Isolates Examined: S-2-1-11, isolated 12.VI.1985; D-9-3-17 (ILLS 45617, ATCC 62182), isolated 25.VII.1985.

Alternaria alternata (Fr.) Keissler, Beih. Bot. Zbl. 29:434. 1912. Figs. 10-13, 358.

Seven-day-old colonies on CMA (Fig. 358) 2.3-7.0 cm diam, white to pale gray, woolly to funiculose, border even, reverse pale gray. Conidiophores (Fig. 11) macronematous, brown, smooth, cylindrical, straight, curved or geniculate, 0-7-septate, arising laterally and singly in aerial mycelium; 7.4-60.0 × 2.6-5.1 μm. Conidiogenous cells tretic, brown, smooth, integrated, terminal or intercalary, with conspicuous pore; 4.8-11.2 × 3.2-4.0 μm. Conidia (Figs. 12, 13) brown, verrucose (Fig. 10), thick-walled, ellipsoidal, conical to pyriform, tapering into beak up to 1/3 total length of conidium, occasionally swollen at tip; up to 7 transverse septa and several longitudinal and oblique septa; 11.5-44.0 μm long, 10.0-16.0 μm diam at widest part, 3.0-4.0 μm wide at beak; formed in long chains (Fig. 13).
Isolate Examined: S-7-15-2 (ILLS 45618, ATCC 62183), isolated 29.IX.1983.

Aphanocladium album (Preuss) W. Gams, Cephalosporium-artige Schimmelpilze, p. 196. 1971. Figs. 14, 15, 359.
Seven-day-old colonies on CMA (Fig. 359) 1.5-1.7 cm diam, white, aerial mycelium loose, cottony, border even, reverse pale pink. Conidiogenous cells (Figs. 14, 15) holoblastic, hyaline, smooth, obpyriform with elongate, narrow necks, 4.8-9.6 μm long, 1.6-2.4 μm wide base, 0.5 μm wide apex; arising laterally or terminally on ascendent hyphae, single or whorled, frequently on short, lateral branches; collapsing at maturity. Conidia (Fig. 14) hyaline, smooth, obovoid to ovoid, 1-celled, 2.4-5.6 × 1.6-2.4 μm; formed singly.
Isolate Examined: S-6-12-5 (ILLS 45619, ATCC 62346), isolated 15.IX.1983.
Comments: *Aphanocladium* species are characterized by "aphanophialides" (Gams 1971) — conidiogenous cells that are severely narrowed at the neck, produce solitary conidia, and often collapse to become thread-like at maturity. Although the small size of the conidiogenous cells in *A. album* precludes definitive characterization of conidial ontogeny with light microscopy, the consistent production of solitary conidia suggests that these conidiogenous cells are not true phialides.

Arthrobotrys oligospora Fres., Beitr. Mykol. 1:10. 1850. Figs. 24-27, 360.
Seven-day-old colonies on CMA (Fig. 360) 4.5 cm diam, pale pink, downy, border effuse, reverse pale pink. Colonies covering plate at 1 month, becoming effuse, conidiophores abundant. Conidiophores (Figs. 24, 27) macronematous, hyaline, smooth, erect, cylindrical, multiseptate, unbranched, 80.0-540.0 × 2.8-4.0 μm; each with apical cluster of short, blunt denticles (1.6-2.4 μm long) (Fig. 26); proliferating sympodially, occasionally forming additional conidiogenous nodes. Conidia (Fig. 25) hyaline, smooth, obovoid, 1-septate, broadest in apical cell, 17.6-30.0 μm long, 7.2-9.6 μm wide at basal cell. Chlamydospores golden brown, smooth, thick-walled (1.1-2.8 μm thick), globose to ovoid, intercalary or terminal, 17.6-23.7 × 17.6-27.4 μm.
Isolates Examined:D-3-12-3, isolated 7.VIII.1983; S-7-5-19 (ILLS 45620, ATCC 62172), isolated 27.IX.1984.

Arthrocladium caudatum Papendorf, Trans. Br. Mycol. Soc. 52: 483. 1969. Figs. 16-19, 361.
Seven-day-old colonies on CMA (Fig. 361) 0.3-0.9 cm diam, dark gray, aerial mycelium pale gray, cottony, immersed mycelium dark brown, constricted, up to 5.5 μm diam; border even, reverse dark gray. Conidiophores (Figs. 16, 17) semi-macronematous, pale brown, smooth, variable shape, ranging from reduced and peg-like (Fig. 16) to long and tapering (Fig. 17); up to 30 μm long, 2.0-3.0 μm wide. Conidia (Figs. 18, 19) pale brown, smooth, narrowly obclavate, 2-3 inflated basal cells, disarticulating at first septum (Fig. 19), apex septate and attenuated, often flexuous; 27.5-93.5 μm long, 2.8-6.1 μm wide at base, 1.0-2.0 μm wide at apex; occasionally proliferating from basal cells; solitary or fasciculate, lateral or terminal on aerial hyphae.
Isolate Examined: D-5-3-14, isolated 6.VII.1984.

Aureobasidium pullulans (de Bary) Arnaud, Ann. Mycol. 8: 475. 1910. Figs. 20-23, 362.
Seven-day-old colonies on CMA (Fig. 362) 1.8 cm diam, creamy white to pale pink, turning dark black-brown, mycelium immersed, arachnoid, sporulation abundant, clusters of conidia forming in agar, slimy layer of conidia forming on agar surface. Hyphae hyaline, smooth, thin-walled, 2.4-6.4 μm wide; becoming dark, thick-walled, and constricted at septa in older cultures. Conidiogenous cells (Figs. 21, 23) holoblastic, hyaline, smooth, lateral, intercalary or terminal; or clavate, lateral, with short, blunt denticles (0.7-1.4 μm long, 0.7 μm wide). Conidia (Figs. 20, 22) hyaline, smooth, ellipsoidal with obliquely flattened to apiculate ends, 1-celled, 5.6-13.6 × 3.2-6.4 μm. Secondary conidia (Fig. 20) frequently produced from ends of conidia, smaller than primary conidia.
Isolates Examined: D-3-4-9, isolated 1.VII.1985; D-4-4-13, D-4-5-20, isolated 16.VIII.1985; S-6-5-5, D-6-3-3 (ILLS 45622, ATCC 62184), isolated 2.X.1985; D-7-3-12, isolated 27.IX.1984.

Botryotrichum piluliferum Sacc. and March., Bull. Soc. R. Bot. Belg. 24: 66. 1885. Figs. 28-32, 363, 367.
Ten-day-old colonies on PDA 2.8-3.2 cm diam; covering plate by 5 wk (Figs. 363, 367). Two types of colony morphology present: either brown to orange (Fig. 363), aerial mycelium cottony, border even, reverse brown; or buff-colored (Fig. 367), aerial mycelium felty, with funiculose setae and hyphae, sporodochium-like masses of brown conidia present, agar becoming deeply buckled, border white, even; reverse pale brown, concentrically zonate; odor faintly sweet. Conidia dimorphic, first kind holoblastic, hyaline to brown (Figs. 28-30), smooth, globose to obclavate, 1-celled, 7.2-16.0 μm diam; formed on hyphae or cylindrical conidiogenous cells up to 20 μm long, 2-6 μm wide; on aerial mycelium or immersed in agar; single or in racemose clusters (Fig. 28); second kind produced from phialides (Fig. 31), hyaline, smooth, fusiform, 1-celled, 3.2-4.8 × 1.6-2.4 μm; formed in chains. Conidiogenous cells (Fig. 31) phialidic, hyaline, smooth, lageniform, tapering, with narrow necks, 12.0-20.0 × 2.4-3.2 μm, 0.8 μm wide at apex; lateral or terminal on aerial mycelium. Setae (Fig. 32) brown, rough-walled, multiseptate, up to 960 μm long, 2.4-4.8 μm wide at base, 1.6-2.0 μm wide at apex; formed singly or in clusters in association with coils of hyaline hyphae resembling ascocarp initials.
Isolates Examined: S-4-3-8 (ILLS 45623), D-4-4-18, isolated 16.VII.1985; ATCC 18983.
Comments: Downing (1953) described the holoblastic conidia in *B. piluliferum* as hyaline, surrounded by a hyaline membrane that commonly separated from the main spore wall. In the *H. glycines* isolates, this material is dark brown, but the conidia released upon its rupture are hyaline to subhyaline.

We compared our isolates with *B. piluliferum*, ATCC 18983. The ATCC isolate produced blastic conidia similar to those of the fungi isolated in this study. Spores of the ATCC isolate were also pale to medium brown although this character has not been noted previously for *B. piluliferum*. No phialidic state was

observed in the ATCC isolate. Colony morphology in the ATCC isolate closely resembled S-4-3-8 (Fig. 367), and both isolates produced a faintly sweet odor.

Camposporium pellucidum (Grove) Hughes, Mycol. Pap. 36: 9. 1951. Figs. 33-37, 364.
Seven-day-old colonies on CMA (Fig. 364) 2.6-3.0 cm diam, white, pale orange to pale gray, mycelium mostly appressed, aerial mycelium sparse, cottony; border even, reverse white, pale orange, or gray. Conidiophores (Figs. 33, 34) macronematous, pale brown, smooth, erect, lateral, straight to flexuous, occasionally branched, 1-7-septate, 36-94 × 6-8 μm. Conidiogenous cells polyblastic, pale to medium brown, terminal; proliferating sympodially, forming conidia on short, subhyaline pedicels 8-12 × 2 μm; pedicel frequently remaining attached to conidium base (Fig. 36). Conidia (Figs. 35-37) pale brown, smooth, cylindrical, base truncate or with fragment of pedicel attached, 7-11-septate, 80-114 × 10-12 μm; frequently tapering into hyaline, septate, apical appendage, 31.0-154.0 × 1.3-2.6 μm (Figs. 36, 37).
Isolates Examined: S-1-7-3, S-1-15-3, isolated 19.IV.1984; S-9-4-1 (ILLS 45624), isolated 17.XI.1984; S-5-2-9 (ATCC 62185), isolated 30.VIII.1985.

Chaetomium cochliodes Pall., North Amer. Flora 3:61. 1910. Figs. 278-283, 415.
Fourteen-day-old colonies on CMA (Fig. 415) covering plate, white with abundant dull green perithecia, mycelium thin, appressed, reverse uncolored. Perithecia (Fig. 278) subglobose, peridium dark brown, *textura intricata* to *epidermoidea* (Fig. 279), covered with perithecial hairs; rhizoidal hyphae present; 184-296 × 120-240 μm. Perithecial hairs dark brown, paler towards apices, ornamentation cupulate to globulate (*fide* Hawksworth and Wells 1973) (Fig. 280); septate, straight or coiled up to 6 times, up to 520 μm long, 4-5 μm wide at base, 2 μm wide at apex. Asci (Figs. 281, 282) clavate, thin-walled, 8-spored, deliquescent, 46.4-54.4 × 12.0-14.4 μm. Ascospores (Fig. 283) brown, smooth, 1-celled, 1 apical germ pore, subglobose to widely ellipsoidal, bilaterally symmetrical, frequently collapsing at maturity, ends umbulate, 9.6-10.4 × 6.0-8.0 μm; extruded in cirrhi.
Isolate Examined: S-2-14-5 (ILLS 45625, ATCC 62174), isolated 16.VI.1983.

Chaetomium histoplasmoides Carris & Glawe, Mycotaxon 29:451. 1987. Figs. 289-299, 416-418.
Fourteen-day-old colonies on CMA (Figs. 416-418) 4.4-6.7 cm diam, white, frequently appearing vinaceous because of abundant conidia, aerial mycelium dense, uniformly woolly or with concentric ring-like zones; pale brown mycelial hairs present in some isolates; conidial production sparse to abundant, border even, reverse uncolored, center occasionally darkened. Perithecia (Fig. 289) dark brown, ovate, ostiole bluntly rounded, bordered by hyaline pseudoparenchymatous cells; covered with hairs; peridium (Fig. 290) dark brown, *textura angularis* to *epidermoidea*; 128-224 × 96-200 μm. Perithecial hairs (Figs. 291, 292)

brown, septate, ornamentation cupulate to globulate (*fide* Hawksworth and Wells 1973), terminal and lateral, straight to coiled; 34-450 × 1.6-4.0 μm. Asci (Fig. 293) clavate, thin-walled, 8-spored, deliquescent, ascospores irregularly biseriate; 27 × 10 μm (immature). Ascospores (Fig. 295) medium brown, ellipsoidal to narrowly ellipsoidal, smooth, 1-celled, with 1 apical germ pore (Fig. 294); often collapsing to form longitudinal furrow (*fide* Ames 1961); 11.2-16.0 × 7.2-9.6 μm. Conidia (Figs. 296-298) formed blastically, hyaline to reddish-brown, vinaceous in mass, smooth to distinctly tuberculate (tubercles hyaline, globose, collapsing, 1.6-8.8 × 1.6-8.0 μm); globose to pyriform, 1-celled, thick-walled, 4.0-14.4 × 4.0-12.0 μm; single or in chains of 2; sessile or on lateral cylindrical to inflated conidiogenous cells up to 14.4 μm long, 4.0-7.2 μm wide. Mycelial hairs pale brown, cylindrical, tapering to bluntly rounded apices, septate, finely roughened, 16.0-630.0 × 2.4-4.8 μm; repent in aerial mycelium or in clusters arising from hyphal knots (Fig. 299).

Isolates Examined: S-6-1-20, S-6-2-5, S-6-4-9, isolated 30.VIII.1984; S-7-5-5, isolated 20.IX.1984; S-3-11-1, S-3-13-5, isolated 31.I.1985 from stored soil collected 7.VII.1983.

Comments: This fungus appears to be heterothallic. Single isolates produce only the distinctive tuberculate conidia. Perithecia form at the juncture between paired isolates (Carris and Glawe 1987). The anamorph bears some similarity to the genera *Histoplasma, Chrysosporium,* and *Myceliophthora* (Carris and Glawe 1987).

Chaetomium perlucidum Sergejeva, Bot. Mat., Bot. Instit., Moscow, Leningrad 11:108. 1956. Figs. 284-288, 419.

Seven-day-old colonies on CMA (Fig. 419) 4.0-4.5 cm diam, white; dull green perithecia developing in center; aerial mycelium woolly, border even, reverse white. Perithecia (Fig. 284) olive green in mass, globose to ovoid; peridium dark brown, *textura epidermoidea*; covered with hairs, rhizoids reduced or absent; 74-110 × 56-100 μm; forming in aerial hyphae or at surface of agar. Perithecial hairs dark brown, forming large, spreading heads; ornamentation cupulate (*fide* Hawksworth and Wells 1973) (Fig. 285), straight or coiled up to 12 times, coils becoming smaller towards apex; up to 540 μm long, 3.2-4.0 μm wide at base, 1.6 μm wide at apex. Asci (Fig. 286) clavate, thin-walled, 8-spored, deliquescent, 25.6-28.0 × 1.20 μm. Ascospores (Fig. 287) medium brown, smooth, 1-celled, ellipsoidal, slightly flattened, ends bluntly rounded, with 1 subapical germ pore (Fig. 288, arrow), 10.4-14.4 × 6.4 μm.

Isolate Examined: S-C-2 (ILLS 45626, ATCC 62174), isolated 14.VI.1983.

Chalara heteroderae Carris & Glawe, Mycotaxon 21:441. 1984. Figs. 38-43, 365.

Eight-day-old colonies on CMA (Fig. 365) 2.8-5.8 cm diam, white, center woolly, dense, border effuse, reverse uncolored. Mycelium superficial and immersed, septate, hyaline, smooth or verrucose (Fig. 39), 2-5 μm diam. Conidiogenous cells (Figs. 38, 40) phialidic, hyaline, smooth, subcylindrical to lageniform, with gradual transition from venter to collarette, often with periclinal thickenings (Fig. 38, arrow); (12.7-) 19.3 to 35.8 μm long, 3.3-5.5

(-7.2) μm wide venter, 2.8-3.9 μm wide apex; arising usually from lateral spheroidal cells, or laterally from hyphae, or sometimes terminally. Conidia (Figs. 41-43) hyaline, smooth, 1-celled, thin-walled; dimorphic, either cylindrical with truncate to rounded ends or ranging from ellipsoidal or globose to pyriform; cylindrical conidia (Fig. 42) 6.6-11.6(-16.5) × 2.8-4.4 μm; ellipsoidal to pyriform conidia (Figs. 41, 43) 5.0-12.7 × 3.3-8.8(-12.0) μm; extruded singly or in chains.

Isolates Examined: S-7-16-4 (ILLS 44303, MUCL 28624, living culture deposited in ATCC), isolated 9.X.1983; S-4-20-4, S-4-C-6, isolated 5.VIII.1983.

Comments: For further details on conidial ontogeny and dimorphism, see Carris and Glawe (1984).

Cladosporium cladosporiodes (Fres.) de Vries, Contribution to the knowledge of the genus *Cladosporium* Link ex Fr., p. 57. 1952. Figs. 44-47, 366.

Seven-day-old colonies on CMA (Fig. 366) 3.2-3.4 cm diam, dark olivaceous-brown, aerial mycelium dense woolly, border white, even; reverse dark olivaceous-brown. Conidiophores (Fig. 46) macronematous, brown, roughened (Fig. 47), erect, cylindrical, apically branched, septate; 47.0-134.0 × 3.8-4.0 μm. Conidiogenous cells polyblastic, brown, smooth, irregularly cylindrical, cicatrized scars distinct; 10.2-19.2 × 3.8-5.1 μm. Conidia (Fig. 44) brown, smooth, 1-celled, ellipsoidal to pyriform, with distinct basal and/or apical scars; 3.8-7.7 × 2.6-5.1 μm; in branched and unbranched chains; separating readily, frequently producing secondary conidia (Fig. 45).

Isolates Examined: D-5-W8-3 (ATCC 62295), D-5-W4-4, isolated 23.VIII.1983; D-7-1-19, isolated 20.IX.1984.

Corynespora cassiicola (Berk. & Curt.) Wei, Mycol. Pap. 34:5. 1950. Figs. 53-58, 368.

Seven-day-old colonies on CMA 1.2-1.5 cm diam, white with gray center, dense cottony, border effuse, reverse gray with white border. Covering plate in 5 wk (Fig. 368), forming abundant clusters of dark conidia. Conidiophores (Fig. 53) macronematous, brown, smooth, cylindrical (Fig. 58), 0-7-septate, erect; 24-205 × 4-12 μm; single or in fascicles, rarely dichotomously branched. Conidiogenous cells tretic, brown, smooth, integrated, terminal, proliferating percurrently through apical pore; often with pale brown spheroidal vesicle (Fig. 54) of 16-24 μm diam apex. Conidia (Figs. 56, 57) pale to medium brown, walls faintly roughened (Fig. 55), 0.8-6.0 μm thick but thinning at spore ends; obclavate to cylindrical, straight to curved, bases darkened and truncate; 4-18-distoseptate, 64-296 × 12-19 μm; solitary or more frequently in chains of 2-6 (Fig. 57), germinating readily on water agar with single germ tubes from 1 or both ends.

Isolates Examined: D-5-5-2 (deposited in ILLS, ATCC), isolated 19.VIII.1983; D-5-2-5, isolated 21.VIII.1985; S-2-5, isolated 12.VI.1985; S-3-5-7, isolated 25.VI.1985; S-4-3-5, isolated 16.VII.1985.

Comments: *Corynespora cassiicola* is a soybean pathogen occurring in leaves, stems, and roots (Ellis and Holliday 1971). Pathogenicity to soybean (Carris *et al.* 1986) was demonstrated for nematode isolate D-5-5-2.

Cristaspora arxii Fort & Guarro, Mycologia 76:1115. 1984. Figs. 300-305, 420.

Seven-day-old colonies on CMA 0.3-0.5 cm diam, white, dense, woolly, forming yellow guttation drops; border even, reverse uncolored. Colonies 2.3 cm diam after 21 days (Fig. 420), white, woolly, forming numerous red guttation drops; border even, reverse pale red. Cleistothecia (Fig. 300) pale red, globose; peridium smooth, *textura angularis* (Fig. 301); cells 6.4-20.0 μm diam, with overlying weft of hyphae (Fig. 302); 168-440 μm diam; formed superficially on agar under dense mycelial mat. Asci (Fig. 303) globose to subglobose, 8-spored, deliquescent, catenate (Fig. 305), 4.8-12.0 × 4.8-8.0 μm; formed at various levels throughout cleistothecia. Ascospores (Fig. 304) hyaline, finely rugose, lenticular, with equatorial furrow (Fig. 304, arrow), 2.4-3.2 × 1.6-3.2 μm.

Isolates Examined: S-4-1-19, S-3-4-2-1, S-4-2-2, S-4-3-9, S-4-3-12, S-4-3-15, isolated 19.VIII.1984; S-5-2-8, S-5-3-2, S-5-5-18, isolated 6.VIII.1984; S-6-5-14, isolated 30.VIII.1984.

Comments: This is the first report of *C. arxii* from nematode cysts, and the first report of the fungus since it was described by Fort and Guarro (1984) from soil in Spain.

Cylindrocarpon destructans (Zins.) Scholten, Neth. J. Plant Path. 70, Suppl. 2:9. 1964. Figs. 59-63, 369.

Seven-day-old colonies on CMA (Fig. 369) 1.5-4.4 cm diam, white to golden yellow, aerial mycelium mostly appressed, occasionally woolly, conidia abundant, in slimy masses in central portion of colony, border effuse, even, reverse uncolored to yellow. Conidiophores (Figs. 59, 62) macronematous, hyaline, smooth, cylindrical, branched or unbranched, up to 63.3 μm long, 3.0-4.0 μm diam. Conidiogenous cells phialidic, hyaline, smooth, cylindrical, apex tapering; with periclinal thickenings and collarettes; 12.0-34.4 × 3.2-4.8 μm. Conidia (Figs. 60, 63) of 2 types: microconidia (Fig. 60) hyaline, smooth, cylindrical with rounded ends, 0-1-septate, 5.1-16.0 × 2.6-4.0 μm; macroconidia (Fig. 63) hyaline, smooth, cylindrical with rounded ends, straight or curved, 0-4-septate, 36.0-52.0 × 5.5-7.7 μm. Chlamydospores (Fig. 61) brown, smooth, globose to subglobose, intercalary or terminal, single or in chains of 2-3, 8.8-15.4 μm diam.

Isolates Examined: S-2-5-10, isolated 7.VI.1984; S-7-1-13 (ILLS 45628, ATCC 62187), S-7-2-12, S-7-5-15, isolated 20.IX.1984; S-3-5-9, isolated 25.VI.1985; S-5-1-17, S-5-3-1, isolated 22.VIII.1985.

Cylindrocarpon fusiforme Matsushima, Icones microfungorum a Matsushima Lectorum, p. 144. 1975. Figs. 64-68, 370.

Twenty-one-day-old colonies on CMA (Fig. 370) 3.5-4.2 cm diam, white, aerial mycelium dense, ropey, appressed in central region where conidiophores are abundant; border even, reverse uncolored. Conidiophores (Fig. 65) macronematous, hyaline, smooth, cylindrical, erect, unbranched, solitary, 1-5-septate, 96.0-268.0 μm long, 2.8-6.4 μm wide at base, 2.4-3.2 μm wide at apex. Conidiogenous cells (Fig. 64) phialidic, hyaline, smooth, terminal, integrated; collarettes 2.4-4.0 × 1.2-4.0 μm with periclinal thickenings (Fig. 64, arrow); often proliferating percurrently. Conidia (Fig. 66) hyaline, smooth, cylindrical-fusiform,

often with constricted ends, 3-5-septate, 36.0-56.8 × 6.4-8.8 μm; adhering in imbricate chains (Fig. 67). Chlamydospores (Fig. 68) golden yellow, smooth or roughened, thick-walled (0.8-1.6 μm thick), globose to ovoid, intercalary or terminal, solitary or in chains; 8.8-27.2 μm diam.
Isolate Examined: S-1-5-9 (ILLS 45629), isolated 25.II.1985.

Cylindrocarpon magnusianum Wollenw., Z. Parasit Kde. 1:164. 1928. Figs. 69-73, 371.
Seven-day-old colonies on CMA 2.4 cm diam, orange to yellow, woolly, border even, reverse yellow. One-mo-old colonies on PDA (Fig. 371), up to 7.8 cm diam, pale yellow and orange, woolly to felty, numerous orange-red sclerotial bodies forming concentrically on agar surface; border effuse, even, reverse orange-red. Sclerotia (Fig. 69) orange-red, erumpent, dome-shaped, pseudoparenchymatous (Fig. 70), up to 350 μm diam and 280 μm long; covered with a felty to funiculose mycelial mat, or a dense layer of conidiophores. Conidiophores (Fig. 72) macronematous, hyaline, smooth, branched; single, or aggregates producing white conidial columns on agar surface. Conidiogenous cells (Fig. 71) phialidic, hyaline, smooth, cylindrical to slightly inflated, forming periclinal thickenings (Fig. 71, arrows), 15.2-28.0 × 2.4-3.2 μm. Conidia of 2 types (Fig. 73): microconidia hyaline, smooth, ellipsoidal, 1-celled, 5.6-10.4 × 3.2-4.0 μm, formed abundantly in gloeoid heads on surface of sclerotial bodies or in aerial mycelium; macroconidia hyaline, smooth, 1-3-septate (mostly 1-septate), cylindrical with rounded ends, apical end slightly oblique, 19.2-24.0 × 4.0-4.8 μm; fracturing readily at middle septum; formed in dry columns.
Isolate Examined: S-1-1-8, (ILLS 45630), isolated 25.II.1985.
Comments: In culture on PDA (and to a lesser extent on CMA), this fungus forms large, orange sclerotia, often covered with slimy masses of microconidia. When first isolated from a cyst of *H. glycines*, this fungus also produced erect, white columns of mostly 1-celled macroconidia; following repeated subculturing, only microconidia were formed.

Dactylaria acerosa Matsushima, Icones microfungorum a Matsushima Lectorum, p. 48. 1975. Figs. 74-78, 372.
Seven-day-old colonies on CMA 1.3 cm diam, white, mycelium funiculose in central portion, appressed and slimy towards border, border even, reverse uncolored. One-mo-old colonies on MEA (Fig. 372), 4.5-4.8 cm diam, white, woolly to funiculose, agar buckling in center; border appressed, even, reverse uncolored. Conidiophores (Figs. 74-77) hyaline, smooth, cylindrical to clavate, proliferating sympodially, bearing scattered, blunt denticles near apex; 8.0-42.4 × 2.4-3.2 μm; arising laterally from appressed or aerial mycelium. Conidia (Fig. 78) hyaline, smooth, cylindrical, ends slightly tapered, bluntly rounded, 1-3-septate, 27.2-41.0 × 1.6-2.4 μm; produced abundantly throughout colony.
Isolate Examined: S-2-2-12, isolated 4.VI.1985.

Dendryphion nanum (Nees) Hughes, Can. J. Bot. 36:761. 1958. Figs. 79-85, 374.
Seven-day-old colonies on CMA (Fig. 374) 1.1-2.0 cm diam,

white to pale gray, woolly, sporulation sparse, border even, reverse uncolored. Conidiophores (Figs. 79-81) macronematous, dark brown, smooth to faintly roughened, 0-5-septate, cylindrical, forming aerial mycelium, terminal or intercalary; 19.0-136.0 × 6.0-8.8 μm. Conidiogenous cells tretic, pore conspicuous (Fig. 82); dark brown, smooth to roughened, terminal, proliferating sympodially; 7.2-12.0 × 6.6-8.3 μm. Conidia (Figs. 83-85) dark brown, paler towards ends, roughened, cylindrical with rounded apex and truncate base, straight to curved, 3-14-septate, 34.0-110.0 × 10.0-11.0 μm; formed in chains.
Isolates Examined: S-7-2-3 (ILLS 45631), isolated 20.IX.1984; S-8-3-3, S-8-3-12, isolated 13.X.1984.

*Dictyochaeta heterodera*e (Morgan-Jones) Carris & Glawe, Mycotaxon 33:23. 1988. Figs. 48-52.
Seven-day-old colonies on CMA 1.4-2.0 cm diam, gray-green to orange, woolly, border even, reverse gray. Conidiophores (Figs. 48-50) macronematous, brown, smooth, cylindrical, straight or curved, lateral or terminal, septate, 34-231 × 4-6 μm; frequently with rhizoid-like hyphal branches at base (Fig. 48). Conidiogenous cells (Fig. 51) monophialidic or polyphialidic, pale brown, smooth, terminal, integrated, with distinct, flared collarettes, (3.2-4.8 μm wide at apex, 1.6-3.2 μm deep); often proliferating percurrently (Fig. 50, arrow). Conidia (Fig. 52) hyaline to subhyaline, smooth, suballantoid, 1-celled, 8.8-18.0 × 3.2-6.4 μm; adhering in gloeoid mass at conidiogenous locus.
Isolates Examined: S-5-9-2, isolated 31.VIII.1983; S-1 4-11, isolated 25.II.1985; S-7-2-7 (ILLS 45627, ATCC 62186), isolated 25.X.1985.
Comments: *Dictyochaeta heterodera*e originally was described from decayed cysts of *H. glycines* in the southeastern United States (Gintis *et al.* 1982) as *Codinaea heterodera*e Morgan-Jones. Gamundi *et al.* (1977) had previously reinstated *Dictyochaeta* as the legitimate name for this genus. Hence, a new combination is proposed for this species from nematode cysts.

*Diheterospora chlamydospori*a (Goddard) Barron & Onions, Can. J. Bot. 44:866. 1966. Figs. 90-93, 375.
Fourteen-day-old colonies on CMA (Fig. 375) 2.2-2.8 cm diam, white to pale yellow, woolly, dictyospores usually abundant. Conidiogenous cells (Fig. 90) phialidic, hyaline, cylindrical, apex tapering, borne laterally on aerial mycelium; single or in verticillate whorls of up to 5; 14.4-32.0 μm long, 1.6-2.4 μm wide at base, 0.8 μm wide at apex. Conidia of 2 types; amerospores (Fig. 90) hyaline, smooth, ovoid, 1-celled, thin-walled, 2.8-4.4 × 1.7-2.8 μm; adhering in gloeoid mass at phialide apex; dictyospores (Figs. 91-93) hyaline, becoming pale yellow, thin-walled becoming thick-walled with age, globose to irregular; 13.6-30.4 × 12.0-24.0 μm; formed holoblastically on short, lateral, cylindrical conidiophores, 16.0-29.6 × 1.6-2.4 μm.
Isolates Examined: S-1-20-4, isolated 25.V.1983; S-8-1-9, S-8-5-4, isolated 13.X.1984; D-1-1-5, isolated 25.II.1985; D-5-2-6 (ATCC 62189), S-5-4-9 (ILLS 45633), isolated 21.VIII.1985; D-6-5-5, isolated 26.IX.1985.

Drechslera avenae (Eidam) Schariff, Studies on graminicolous species of *Helminthosporium*, Teheran, p. 72. 1963. Figs. 86-89, 373. One-mo-old colonies on CMA (Fig. 373) covering plate, medium to dark gray-brown, woolly to floccose, sporulation abundant, reverse dark gray-green. Conidiophores (Figs. 86, 87) macronematous, pale brown, smooth, cylindrical, flexuous, up to 400 μm long, in aerial mycelium. Conidiogenous cells polyblastic, tretic, dark brown, faintly roughened, 2-6-septate, geniculate, 24.0-100.0 × 6.4-8.0 μm; conidial secession scars dark, circular, 3.2-4.0 μm diam. Conidia (Fig. 88) olive brown, thick-walled, faintly roughened (Fig. 89), cylindrical, ends rounded and slightly tapered, straight to curved, 3-8-distoseptate, 29.6-68.0 × 8.8-16.0 μm; basal hilum prominent, dark, 2.4-4.0 μm diam.
Isolate Examined: D-6-3-16 (ILLS 45632, ATCC 62190), isolated 2.X.1985.

Engyodontium album (Limber) de Hoog, Persoonia 10:53. 1978. Figs. 94-96, 376.
Seven-day-old colonies on CMA (Fig. 376) 1.4-2.0 cm diam, white, densely pulvinate, cottony, border even, reverse uncolored. Conidiophores (Fig. 94) micronematous, hyaline, smooth, cylindrical, often bearing whorls of 2-3 conidiogenous cells, ascendent, occasionally branched; up to 800 μm long, 1.1-1.7 μm diam. Conidiogenous cells (Figs. 94, 95) polyblastic, hyaline, smooth, proliferating sympodially to form geniculate rachis, lower portion subcylindrical, 11.0-24.8 × 1.1-1.7 μm; rachis 21.0-39.0 × 1.1 μm, with denticulate conidial secession scars. Conidia (Fig. 96) hyaline, smooth, ellipsoidal, base slightly apiculate, 1-celled, 2.2-2.8 × 1.1-1.7 μm.
Isolates Examined: D-3-15-2, isolated 15.VII.1983; S-4-14-2 (ILLS 45634, ATCC 62170), isolated 4.VIII.1983.

Epicoccum purpurascens Schlecht., Synop. Pl. Crypt. P. 136. 1824. Figs. 97-100, 377.
Seven-day-old colonies on CMA (Fig. 377) reaching 6.5 cm diam, off-white to pale salmon, floccose; forming pulvinate sporodochia (Fig. 97) up to 540 μm diam on surface or immersed in agar; border even, reverse uncolored. Conidiophores macronematous, pale brown, smooth, cylindrical, 12.0-17.5 × 2.4-3.2 μm; densely packed in sporodochia. Conidiogenous cells (Fig. 98) holoblastic, pale brown, roughened, terminal, integrated, 4.0-8.0 × 3.2-4.0 μm. Conidia (Figs. 99, 100) dark brown, verrucose, globose to pyriform, basal scar flattened, muriform, 16.8-25.6 μm diam.
Isolates Examined: D-5-W8-2 (ILLS 45635, ATCC 62191), isolated 19.VIII.1983; D-9-19-4, isolated 23.XI.1983; S-7-2-18, isolated 25.X.1985.

Exophiala pisciphila McGinnis & Ajello, Mycologia 66:518. 1974. Figs. 101-105, 378.
Seven-day-old colonies on CMA (Fig. 378) 0.3-1.0 cm diam, dark gray, dense woolly to funiculose, border even, reverse dark gray. Conidiogenous cells (Figs. 101-104) enteroblastic, subhyaline to pale brown, smooth, single or aggregated; intercalary, lateral, or terminal; proliferating percurrently; neck region frequently with annellations (Fig. 104, arrow); if intercalary, cylindrical to inflated,

neck lateral, 8.0-40.8 × 2.4-4.0 μm; if lateral, doliiform, neck elongate, 4.8-19.2 × 2.4-4.8 μm; if terminal, cylindrical to inflated, apex tapering into elongate neck, 5.8-28.0 × 2.4-4.8 μm. Conidia (Fig. 105) subhyaline, smooth, ellipsoidal to obovoid, base truncate, 1-celled, 4.0-12.0 × 2.4-5.6 μm.
Isolates Examined: D-3-11-3, isolated 7.VII.1983; S-9-4-4, isolated 17.XI.1983; S-10-15-5, isolated 3.II.1984; D-1-5-11 (ILLS 45637, ATCC 62192), isolated 25.II.1985.

Fusarium aquaeductuum Lagerh. var. *medium* Wollenw., Z. Parasit Kde. 3:298. 1931. Figs. 106-109, 379.

Seven-day-old colonies on CMA (Fig. 379) 0.9-1.3 cm diam, white to pale salmon, mycelium appressed, slimy, border even, reverse pale salmon. Conidiophores (Figs. 106-107) semi-macronematous, hyaline, smooth, elongate, multiseptate, 4.0 μm diam. Conidiogenous cells (Fig. 108) phialidic, hyaline, smooth, forming periclinal thickenings; either intercalary, with conidiogenous locus located below septa on conidiophores (Fig. 106, arrow), up to 4 μm long, 2.4 μm wide; or cylindrical, tapering at apex, terminal or lateral, 28.0-60.8 × 3.2-4.9 μm. Conidia (Fig. 109) hyaline, smooth, cylindrical, curved, narrowing towards ends, foot cell indistinct, 0-3-septate; 32.0-48.0 × 4.0-4.8 μm.
Isolates Examined: S-7-2-1 (ILLS 45638, ATCC 62193), D-7-5-9, isolated 25.X.1985.

Fusarium equiseti (Corda) Sacc. *sensu* Gordon, Can. J. Bot. 30:225. 1952. Figs. 110-113, 380.
Seven-day-old colonies on CMA 3.7-4.5 cm diam, dark pink to white border, woolly, conidia in slimy masses, border immersed, reverse dark pink. Covering plate by 14 days (Fig. 380), with discrete orange sporodochium-like clusters of conidia forming on surface and submerged in agar. Conidiophores (Fig. 110) semi-macronematous, hyaline, smooth, simple or branched, single or in dense sporodochium-like clusters. Conidiogenous cells phialidic, hyaline, smooth, narrowly awl-shaped, straight or curved, 5.6-44.0 × 2.4-4.8 μm; collarettes distinct (Fig. 110, arrow), 2.4-4.5 × 1.6-2.4 μm. Conidia of 2 types: microconidia (Fig. 111) infrequently formed, hyaline, ellipsoidal, smooth, 0-1-septate, 8.0-14.0 × 2.0-4.0 μm; macroconidia (Fig. 113) abundant, hyaline, 3-6-septate, falcate, strongly curved, basal cell distinctly foot-shaped, 32.8-82.4 × 3.2-5.6 μm. Chlamydospores (Fig. 112) hyaline, smooth to roughened, thick-walled, globose, single, intercalary, 12.0-16.0 μm diam.
Isolates Examined: D-7-3-1, isolated 20.IX.1984; D-4-2-11 (ILLS 45639), isolated 16.VII.1985.

Fusarium oxysporum Schlecht. *emend.* Sny. & Hans., Amer. J. Bot. 27:66. 1940. Figs. 114-119, 381.
Seven-day-old colonies on CMA (Fig. 381) 3.0-5.7 cm diam, white to pale pink, moderately woolly, sometimes becoming concentrically zonate, effuse towards border, border fringed, reverse uncolored to pale pink. Conidiogenous cells (Figs. 114-115) phialidic, hyaline, smooth, cylindrical to doliiform, forming periclinal thickenings (Fig. 115, arrow); single or in sporodochia; cells producing microconidia 4.8-20.0 × 2.4-4.0 μm; cells producing

macroconidia, 11.2-37.6 × 2.4-3.2 μm. Both types of conidiogenous cells arising laterally from aerial or appressed hyphae. Conidia of 2 kinds: microconidia (Fig. 116) hyaline, smooth, ellipsoidal to cylindrical, 0-1-septate, 3.9-14.4 × 2.2-4.8 μm; macroconidia (Fig. 117) hyaline, smooth, fusiform, ends curved, foot-cell present, 2-3-septate, 17.6-33.6 × 3.2-4.8 μm. Chlamydospores (Figs. 118, 119) hyaline to subhyaline, smooth or roughened, globose, 1-celled, single or in short chains, terminal or intercalary, 6.4-11.2 μm diam.

Isolates Examined: S-3-15-4, D-3-12-5, isolated 7.VII.1983; S-7-1-7, S-7-5-4, isolated 20.IX.1984; D-1-3-6 (ILLS 45640) and S-1-5-11 (ILLS 45641), isolated 25.II.1985.

Comments: *Fusarium oxysporum* was second only to *F. solani* in frequency of isolation during this study. It was also one of the most common fungi isolated from *H. glycines* cysts in the southeastern United States (Gintis *et al.* 1983) and Colombia (Morgan-Jones *et al.* 1984b), as well as from *H. schachtii* cysts in California (Nigh *et al.* 1980).

Fusarium solani (Mart.) Appel & Wollenw. *emend.* Sny. & Hans. Amer. J. Bot. 28:740. 1941. Figs. 120-125, 382.

Seven-day-old colonies on CMA (Fig. 382) 4.5-6.5 cm diam, white to pale yellow, cottony to appressed, border even, reverse white to pale yellow. Conidiogenous cells (Figs. 121, 122) phialidic, hyaline, smooth, cylindrical, tapering towards apices, forming periclinal thickenings and collarettes (Fig. 120, arrow), 0-8-septate, single or in sporodochia, 76.0-320.0 μm long, 4 μm wide at base, 2 μm wide at apex. Conidia of 2 types: microconidia (Fig. 124) hyaline, smooth, ellipsoidal to cylindrical, 0-1-septate, 5.6-28.0 × 2.0-6.4 μm, forming gloeoid heads; macroconidia (Fig. 123) hyaline, smooth, cylindrical, ends tapering and curved, foot-cell not well-defined, 2-4-septate, 28.0-44.0 × 5.0-7.2 μm. Chlamydospores (Fig. 125) hyaline, smooth, globose, single or in pairs, terminal or intercalary, often forming in cell of conidium; 6-8 μm diam.

Isolates Examined: S-3-3-4, isolated 7.VII.1983; S-1-2-8, S-1-1-5 (ILLS 45642), D-1-2-15 (ILLS 45643), all isolated 25.II.1985; D-3-20-2, isolated 25.VI.1985.

Comments: *Fusarium solani*, the most frequently isolated species in this study, also predominated in the *H. glycines* cyst mycota in the southeastern United States (Gintis *et al.* 1983) and Colombia (Morgan-Jones *et al.* 1984b). In addition, it was isolated from cysts of *Globodera rostochiensis* and *G. pallida* in Germany (Goswami and Rumpenhorst 1978).

Geniculosporium taxonomic species Figs. 126-128, 383, 387.

One-mo-old colonies on CMA (Fig. 387) covering plate, white, floccose, dark clumps of hyphae widely scattered on agar surface, reverse uncolored. One-mo-old colonies on PDA (Fig. 383), 7.0-8.0 cm diam, with dark brown stromatic aggregations of hyphae in central regions of colonies, aerial mycelium white, felty; irregular patches of gray-green hyphae scattered throughout colony; border dark brown, immersed, deeply scalloped; reverse coloration dark brown and pale reddish brown; agar uniformly pigmented pale reddish-brown. Conidiophores (Fig. 126) macro-

nematous, brown, smooth, erect, branched, terminating in dense head of geniculate conidiogenous cells; up to 320 μm long, 3.2-4.0 μm wide. Conidiogenous cells (Fig. 127) polyblastic, proliferating sympodially, brown, smooth, cylindrical to geniculate, bearing numerous circular scars (0.8-1.2 μm diam), 4.8-52.8 × 3.2-4.0 μm. Conidia (Fig. 128) subhyaline, becoming brown with age, smooth, obovate, rounded at apex, base truncate, slightly concave, 1-celled; 4.0-7.2 × 3.2-4.0 μm.

Isolates Examined: D-5-2-6 (ILLS 45644, ATCC 62194), D-5-2-10, isolated 6.VIII.1984.

Comments: *Geniculosporium* was erected by Chesters and Greenhalgh (1964) for the conidial state of *Hypoxylon serpens* (Pers. ex Fr.) Kickx. The conidiophores of the nematode isolates resemble those described for *Geniculosporium* (Greenhalgh and Chesters 1968), but the conidia are larger than those produced by *G. serpens*. Identification of *Hypoxylon* species is difficult or impossible when based solely on conidial states in culture (Jong and Rogers 1972; Barron 1968). The ascigerous state of the nematode isolates is unknown. Until *Geniculosporium* is monographed, it probably will not be possible to identify this fungus more precisely.

Gliocladium catenulatum Gilm. & Abbott, Iowa St. J. Sci. 1:303. 1927. Figs. 129-131, 384.

Seven-day-old colonies on CMA (Fig. 384) 2.2-4.2 cm diam, mycelium white, immersed, with abundant erect, dull green conidiophores and conidial heads; border white, even; reverse uncolored. Conidiophores (Figs. 129, 130) macronematous, hyaline, smooth, cylindrical, 0-3-septate, arising from submerged and aerial mycelium; branching verticillately (primary), or penicillately (secondary); 11.0-88.0 × 2.4-4.0 μm. Primary conidiogenous cells (Fig. 129) phialidic, hyaline, smooth, cylindrical, tapering; 11.0-34.4 × 1.7-2.8 μm. Secondary conidiogenous cells (Fig. 130) phialidic, hyaline, smooth, awl-shaped, 6.1-24.8 × 2.2-3.3 μm. Conidia (Fig. 131) hyaline, green in mass, smooth, asymmetrically ellipsoidal, 1-celled, 3.9-8.8 × 2.2-4.0 μm, in gloeoid heads.

Isolates Examined: D-8-1-1, D-8-13-4, isolated 20.X.1983; D-8-4-16, isolated 13.X.1984; D-2-1-2, D-2-1-16 (ILLS 45645, ATCC 62195), isolated 4.VI.1985.

Gliocladium roseum Bain., Bull Soc. Mycol. Fr. 23:111. 1907. Figs. 132-134, 388.

Seven-day-old colonies on CMA (Fig. 388) 2.3-5.5 cm diam, pale yellow or salmon, mycelium white, immersed, with abundant erect conidiophores; border even, reverse uncolored. Conidiophores (Figs. 132, 133) macronematous, hyaline, smooth, cylindrical, arising from submerged and aerial mycelium, branching verticillately (primary), or penicillately (secondary); primary conidiophores (Fig. 133) 130-263 × 3-4 μm, secondary conidiophores (Fig. 132) 104-306 × 3-4 μm. Primary conidiogenous cells phialidic, hyaline, smooth, cylindrical, tapering, 24.0-48.0 × 2.0-3.2 μm. Secondary conidiogenous cells phialidic, hyaline, smooth, awl-shaped with slightly inflated bases, 9.6-24.0 × 2.0-3.2 μm. Conidia (Fig. 134) hyaline, yellow to salmon in mass, smooth, ellipsoidal to obovoid, flattened on 1 side, apex

rounded, base bluntly apiculate, 1-celled; 4.0-6.4 × 2.4-3.8 μm; in gloeoid masses.
Isolates Examined: S-1-24-3, isolated 31.V.1983; S-1-4-15 (ILLS 45646), D-1-1-19 (ILLS 45647), isolated 25.II.1985; D-6-1-2, S-6-3-14 (ATCC 62196), isolated 26.IX.1985.

Gonytrichum macrocladium (Sacc.) Hughes, Trans. Br. Mycol. Soc. 34:565. 1951. Figs. 135-139, 385.
Seven-day-old colonies on CMA 0.8 cm diam, white, woolly, border even, reverse white. Ten-day-old colonies (Fig. 385) developing dark gray-brown concentric zones due to abundant conidiophore production. Conidiophores (Figs. 135-139) macronematous, dark brown, paler towards apex, smooth, cylindrical, tapering, 0-6-septate, arising singly, erect, 20.0-180.0 × 3.0-4.0 μm. Conidiogenous cells (Figs. 137, 138) phialidic, pale brown, smooth, awl-shaped, straight to curved, collarette present, terminal or borne in whorls of up to 5, encircling main axis of conidiophore, 14.0-22.0 μm long, 2.0-3.0 μm diam at base, 1.0-2.0 μm at apex; proliferating percurrently (Fig. 136, arrow). Conidia subhyaline to pale brown, smooth, ellipsoidal to obovoid, 1-celled, 3.2-4.0 × 2.4-3.2 μm; in gloeoid masses at apices of conidiogenous cells.
Isolate Examined: S-7- 1-3 (ILLS 45648), isolated 1.XI.1985.

Humicola fuscoatra Traaen, Nyt. Mag. Naturvid 32:33. 1914. Figs. 140-144, 386.
Seven-day-old colonies on CMA (Fig. 386) 3.2 cm diam, white, becoming pale gray-brown, woolly, border even, reverse uncolored. Conidiogenous cells monoblastic, hyaline, reduced or cylindrical, up to 21.0 μm long, 2.8 μm diam. Conidia (Figs. 140-144) hyaline, becoming brown, smooth, subglobose to globose, occasionally cylindrical to pyriform, walls thickening with age, single or in chains of 2; 7.6-9.6 μm diam; lateral or intercalary on aerial mycelium, or immersed in agar.
Isolates Examined: S-1-19-1, isolated 24.V.1983; D-4-1-20 (ILLS 45649, ATCC 62175), isolated 4.VIII.1984.

Lecythophora hoffmannii (van Beyma) W. Gams & McGinnis, Mycologia 75:985. 1983. Figs. 145-148, 389.
Seven-day-old colonies on CMA (Fig. 389) 0.5-2.5 cm diam, pale orange to pink, mycelium mostly appressed, slimy, border even, reverse pale orange or pink. Conidiogenous cells (Figs. 145-147) phialidic, hyaline, smooth, reduced and peg-like or narrow flask-shaped, straight to curved, single, lateral on appressed hyphae, occasionally terminal; usually lacking basal septum; 7.2-33.6 × 1.6-3.2 μm; collarette (Figs. 145 and 146, arrows) straight or flared, 0.8-1.6 μm long. Conidia (Fig. 148) hyaline, smooth, cylindrical with ends bluntly rounded, 1-celled; 5.6-10.4 × 2.4-3.2 μm; adhering in gloeoid masses.
Isolates Examined: S-2-1-13, isolated 4.VI.1985; S-6-5-17 (ILLS 45650), isolated 26.IX.1985.

Mariannaea elegans (Corda) Samson, Stud. Mycol. 6:75. 1974. Figs. 149-152, 390.
Seven-day-old colonies on CMA (Fig. 390) 1.9-2.8 cm diam, dark

pink, aerial mycelium white, cottony; border even; reverse dark pink. Conidiophores (Fig. 149) macronematous, hyaline, base roughened (Fig. 150), cylindrical, arising from immersed hyphae, branched dichotomously or whorled; 200-800 × 6-12 μm. Conidiogenous cells phialidic, hyaline, smooth, narrow, flask-shaped, 11.0-22.0 μm long, 2.2-3.2 μm wide at base, 1.1-1.7 μm wide at apex. Conidia (Fig. 151) hyaline, white in mass, smooth, ellipsoidal, ends apiculate, 4.4-6.1 × 2.8-3.3 μm; in dry, imbricate chains (Fig. 152).
Isolates Examined: S-10-15-4 (ATCC 62197), isolated 9.II.1984; S-8-3-2, S-8-5-2, isolated 13.X.1984; S-1-3-14 (ILLS 45651), isolated 25.II.1985.

Melanospora zamiae Corda, Icon. Fung. I:24. 1837. Figs. 306-309.
Seven-day-old colonies on CMA 2.0 cm diam, white, woolly, border effuse, reverse white. Perithecia (Fig. 306) pale yellow, base globose, smooth; venter elongate, cylindrical, terminated by fringe of erect setae; superficial or immersed in agar, solitary; total height 478-666 μm, base 208-270 μm diam, venter 270-395 × 75-96 μm. Asci deliquescent. Ascospores (Fig. 307) dark brown, smooth, ovoid, 1-celled, 1 germ pore at each end; 11.5-14.0 × 9.0-10.2 μm; extruded from ostiole in long cirrhi. Conidiogenous cells (Fig. 308) polyphialidic, hyaline, broadly flask-shaped, with narrow, elongate neck, 6.1-11.6 μm long, 3.3-6.6 μm wide at base, 1.7 μm wide at apex; solitary, or more typically in clusters on hyphal coils. Conidia hyaline, smooth, globose to subglobose, 1-celled, 3.3-4.4 × 2.2-3.9 μm. "Bulbils" (*sensu* Weresub and LeClair 1971) (Fig. 309) pale yellow, irregularly globose, composed of intertwining hyphal branches, numerous; 57-74 × 57-132 μm.
Isolate Examined: D-5-W8-2, isolated 19.VIII.1983 from immature (cream-colored) cyst of *H. glycines*.

Metarhizium anisopliae (Metsch.) Sorok. var. *anisopliae* Sorok., Plant Parasites of Man and Animals as Causes of Infectious Diseases 2:267. 1883. Figs. 153-156, 391.
Seven-day-old colonies on CMA (Fig. 391) 1.8 cm diam, usually with numerous secondary colonies, white, woolly, with dull green conidial columns; border even, effuse, reverse uncolored. Conidiophores (Fig. 154) macronematous, hyaline, smooth, erect, penicillately branched; 20.8-32.0 × 1.6-2.4 μm; in dense masses on flat stroma-like aggregations of hyphae. Conidiogenous cells (Fig. 153) phialidic, hyaline, smooth, cylindrical with bluntly tapered apices, 8.0-15.2 × 1.6-2.4 μm. Conidia (Fig. 155) pale green, dark green in mass, smooth, cylindrical with rounded to bluntly pointed ends, 1-celled; 5.1-8.8 × 2.0-2.6 μm; formed in chains, adhering in dry, angular columns (Fig. 156).
Isolate Examined: D-1-17-1 (ILLS 45652, ATCC 62176), isolated 27.V.1983.

Microsphaeropsis olivacea (Bonord.) Hoehnel, Hedwigia 59:267. 1917. Figs. 244-247, 409.
Seven-day-old colonies on CMA (Fig. 409) 1.3 to 3.0 cm diam, pale gray, often with brown sectors, woolly, border even, reverse pale gray. One-mo-old colonies covering plate, pale gray-brown,

aerial mycelium ropey, pycnidia abundant, in concentric rings; mycelium thinning towards edge, reverse pale gray-brown. Pycnidia (Fig. 244) dark brown; globose; papillate, setose ostioles, peridium *textura angularis*; 120-320 × 120-260 μm; solitary or coalescing, on surface or embedded in agar or in aerial mycelium. Conidiogenous cells (Figs. 245, 246) phialidic, hyaline, doliiform, sometimes developing periclinal thickenings, lining inner wall of pycnidium; 4.8-5.6 × 4.0-4.8 μm. Conidia (Fig. 247) medium brown, smooth, oval to ellipsoidal, 1-celled, thin-walled, 4.0-4.8 × 2.4 μm.
Isolate Examined: S-2-5-13 (ILLS 45653, ATCC 62198), isolated 4.VI.1985.

Mortierella elongata Linnem., Pflanzenforschung 23:43. 1941. Figs. 351-355, 428.
Seven-day-old colonies on CMA (Fig. 428) covering plate, white, aerial mycelium abundant, cottony, consisting of mostly aseptate, ascendent and prostrate hyphae, usually not uniformly dense; reverse uncolored; faint garlic or onion-like odor. Sporangiophores (Figs. 352, 353) hyaline, cylindrical, unbranched or branched at base, 60-300 μm long, 4-6 μm wide at base, 2-3 μm wide at apex; arising from both aerial and repent hyphae. Sporangia (Fig. 354) globose, smooth, with numerous spores, fracturing readily; 20-90 μm diam. Sporangiospores (Fig. 351) hyaline, smooth, ellipsoidal to cylindrical, straight to curved, 1-celled, 8-16 × 4-8 μm. Chlamydospores (Fig. 355) hyaline, smooth, variously shaped, numerous, 10-24 × 10-22 μm.
Isolate Examined: S-7-2-15 (ILLS 45654), isolated 25.X.1985.

Mycocentrospora acerina (Hartig) Deighton, Taxon 21:716. 1972. Figs. 157-162, 392.
Seven-day-old colonies on CMA (Fig. 392) 0.8-2.2 cm diam, white, becoming pale brown; woolly, border fringed, reverse uncolored. Hyphae hyaline to pale brown, mostly cylindrical, 2.6-5.1 μm diam; with torulose clusters of subhyaline to pale brown, smooth, thin-walled globose cells (Fig. 157) 9.0-21.8 μm diam. Conidiophores (Figs. 158-160) semi-macronematous, subhyaline, smooth, cylindrical, 0-4-septate, straight or geniculate, or bent up to 90° at conidiogenous loci (Fig. 160); up to 50 μm long, 3-4 μm wide; proliferating sympodially, separating readily at septa; lateral on aerial mycelium; conidiogenous scars circular, broad, evenly thickened, 1.6-2.4 μm diam. Conidia (Fig. 161) subhyaline, smooth, subulate, apex elongate, flexuous, 0-38-septate, 92.0-499.0 μm long, 2.6-3.8 μm wide at base, 3.8-6.4 μm wide at widest part; 1.3-2.6 μm wide at apex; rarely forming downwardly directed, awl-shaped basal appendages; forming in discrete clusters on conidiophores (Fig. 162).
Isolates Examined: S-3-10-1, isolated 7.VII.1983; D-1-9-3, S-1-17-1, isolated 11.IV.1984; S-9-5-7, isolated 28.VI.1984; D-4-3 (ATCC 62749), isolated 16.VII.1985.

Nectria taxonomic species Figs. 317-321, 421.
Seven-day-old colonies on CMA (Fig. 421) 1.7-1.9 cm diam, white to golden yellow, center darker, woolly to funiculose, border even, reverse uncolored to yellow. Perithecia (Fig. 317) nu-

merous, superficial or more typically immersed in agar (Fig. 318), orange-brown to yellow, globose to subglobose with slightly papillate ostiole; peridium smooth, textura angularis, 250-374 × 200-300 μm. Asci (Figs. 319, 320) clavate, 8-spored, spores biseriate, apices rounded; 84-86 × 24-30 μm. Ascospores (Fig. 321) hyaline, becoming golden yellow, smooth, bilaterally elliptical, each with a single medial septum, thick-walled, 26-32 × 10-13 μm; exuded in mass (Fig. 318, arrow).
Isolates Examined: D-8-19-1, isolated 20.X.1983; D-4-1-2, isolated 19.VII.1984; D-5-2-10 (ILLS 45655), isolated 21.VIII.1985.
Comments: The microscopic features and yellow-to-orange color of the perithecia suggest that this fungus has affinities with *Nectria*. Precise taxonomic disposition is difficult until more is known about the morphology of *Nectria* and allied genera in culture.

Neocosmospora vasinfecta E.F. Smith, Bull. U.S. Dept. Agric. 17:45. 1899. Figs. 322-328, 422.
Ten-day-old colonies on CMA 7.0 cm diam, white, mycelium thin, cottony, mostly appressed, numerous pale orange perithecia forming on surface of agar, border even, reverse uncolored. Colonies covering plate at 2 mo (Fig. 422), mycelium thin, white, mostly appressed, perithecia numerous throughout colony. Perithecia (Fig. 322) pale orange, obpyriform, glabrous, peridium translucent, *textura angularis* (Fig. 323), 320-460 × 260-380 μm. Asci (Fig. 328) cylindrical, 8-spored, uniseriate, apices bluntly rounded, 94-124 × 10-12 μm. Ascospores (Fig. 324) subhyaline to pale orange-brown, dark orange in mass, roughened, subglobose to ovoid, thick-walled, 13-15 × 9-12 μm. Anamorph *Acremonium*-like, fast-growing, forming in less than 7 days. Conidiogenous cells (Fig. 327) phialidic, hyaline, cylindrical, apices tapered, basal septum present or absent, 4.0-31.0 × 2.4-3.2 μm; lateral on appressed hyphae. Conidia hyaline, smooth, ellipsoidal to fusiform, 0-1-septate, 6.4-20.8 × 1.6-4.8 μm; numerous, adhering in gloeoid mass at apices of conidiogenous cells. Chlamydospores (Fig. 325) hyaline, smooth, thick-walled, globose to pyriform, 5.4-10.4 × 4.8-8.8 μm, wall 0.8-1.6 μm thick; terminal or intercalary.
Isolate Examined: E-8-8 (ILLS 45657, ATCC 62199), isolated 6.IV.1983, soil samples collected from soybean fields in Marion and Franklin counties, IL.

Nigrospora sphaerica (Sacc.) Mason, Trans. Br. Mycol. Soc. 12:158. 1927. Figs. 163-164.
Seven-day-old colonies on CMA covering plate, pale gray, cottony, reverse uncolored. Conidiogenous cells (Figs. 163, 164) monoblastic, hyaline, flask-shaped to globose, 8.4-12.0 μm diam; arising on short, lateral branches from vegetative hyphae. Conidia black, smooth, spherical, flattened dorsiventrally, each with equatorial slit; solitary, 1-celled, 12.8-19.2 × 14.1-21.8 μm.
Isolate Examined: D-5-16-1, isolated 23.VIII.1983.

Paecilomyces lilacinus (Thom) Samson, Stud. Mycol. 6:58. 1974. Figs. 165-168, 393.
Seven-day-old colonies on CMA (Fig. 393) 2.0-2.7 cm diam, vinaceous, floccose, conidial chains abundant; border effuse, even, white, reverse uncolored. Conidiophores (Figs. 165-166)

macronematous, subhyaline to pale yellow, smooth or rough-walled, cylindrical, flexuous; arising from immersed hyphae, 100-270 × 1.6-2.4 μm; or shorter, borne laterally on aerial hyphae, 8-60 × 1.6-2.4 μm; with dense clusters of metulae, 2-6 conidiogenous cells arising from each metula. Conidiogenous cells (Fig. 167) phialidic, subhyaline to pale yellow, smooth, narrowly flask-shaped with constricted, tapering necks; 7.2-10.4 μm long, 2.4-3.2 μm wide at base, 1.0 μm wide at apex. Conidia (Fig. 168) hyaline, purple in mass, smooth, ellipsoidal, 2.4-3.0 (-4.8) × 1.7-2.4 (-3.2) μm; dry chains.

Isolates Examined: S-5-2-5, S-5-1-14 (ILLS 45656, ATCC 62200), isolated 22.VIII.1985; D-6-5-2, isolated 26.IX.1985.

Comments: Rough-walled conidiophores said to be typical of *P. lilacinus* (Samson 1974) were not produced consistently; in addition, the conidiophores frequently formed as side-branches on aerial hyphae.

Paecilomyces marquandii (Massee) Hughes, Mycol. Pap. 45:30. 1951. Figs. 169, 170, 394.

Seven-day-old colonies on CMA (Fig. 394) 1.7-2.5 cm diam, vinaceous, floccose, conidial chains abundant; border thin, even; reverse coloration bright yellow. Conidiophores (Fig. 169) macronematous, hyaline, smooth, cylindrical, arising from submerged or aerial hyphae; branches lateral, verticillate, 2-4 conidiogenous cells per branch; up to 640 μm long, 2-5 μm diam. Conidiogenous cells phialidic, hyaline, smooth, narrow flask-shaped with tapering necks; 9.4-14.3 × 2.2-2.8 μm, approximately 1.0 μm wide at apex. Conidia (Fig. 170) hyaline, purple in mass, smooth, ellipsoidal, ends apiculate when immature, 2.6-3.2 × 1.9-2.6 μm; dry chains. Chlamydospores hyaline, smooth, globose, thin-walled, single, 3-4 μm diam.

Isolates Examined: S-3-12-4, isolated 15.VII.1983; S-6-2-13, isolated 30.VIII.1984; D-10-14-4, isolated 4.II.1984; S-1-2-14 (ILLS 45658), isolated 25.II.1985; S-7-4-11 (ATCC 62201), isolated 25.X.1985.

Papulaspora taxonomic species Figs. 171-175, 395.

Seven-day-old colonies on CMA (Fig. 395) 6.8-9.0 cm diam, white to pale brown, mostly immersed, aerial mycelium sparse, floccose; reverse uncolored. Papulaspores (Figs. 173-175) forming after 4 days on immersed hyphae, initially hyaline, becoming dark brown to black, subglobose to irregular, multi-celled, 40-100 μm diam; surface cells protruding moderately, central cells larger, darker, 10-20 μm diam; arising from intercalary cells on pale brown, immersed hyphae; primordia originating from widened hyphae or as blunt, lateral projections (Fig. 172) that enlarge and proliferate (Fig. 171), intertwine (Figs. 174, 175), and darken with age.

Isolates Examined: D-4-6-2, isolated 28.VII.1983; D-4-1-16 (ILLS 45659), isolated 16.VII.1985; D-7-5-11 (ATCC 62202), isolated 25.X.1985.

Comments: The papulaspores in this fungus are similar in shape and mode of formation to those described and illustrated by Hotson (1917) for *P. pallidula* Hotson. Hotson's species, however, had colorless papulaspores, while those seen during this study

became dark brown to black. These spores are also similar to those of *P. immersa* Hotson (as described in Domsch et al. 1980); but again, the spores of *P. immersa* are not darkened, and the central cells are larger than in the nematode isolates. Further studies are needed to determine whether this fungus should be recognized as a new species.

Paraphoma radicina (McAlp.) Morgan-Jones & White, Mycotaxon 18:60. 1983. Figs. 248-252, 410.

Seven-day-old colonies on CMA 1.5-2.5 cm diam; dull yellow, orange, or occasionally brown; often with concentric zones of yellow and orange; aerial mycelium hyaline to brown, woolly, border even, reverse dull yellow to orange; often producing yellow diffusible pigment and/or dark red crystals in agar. Pycnidia (Fig. 248) usually forming after 1 mo, dark brown, globose, setose, ostiole up to 20 μm diam; peridium *textura angularis*, up to 6 cells thick; 220-333 × 170-400 μm. Setae (Fig. 249) dark brown, smooth or verruculose, thick-walled, septate, branched, 120-220 × 1.6-4.0 μm. Conidiogenous cells (Figs. 250, 251) phialidic, hyaline, globose to elongate flask-shaped, collarette cylindrical to flaring, 4.0-8.0 × 2.4-5.6 μm, 1.6-2.4 μm wide at apex; arising from inner wall of pycnidium. Conidia (Fig. 252) hyaline, fusiform to obovate, guttulate, 1-celled, smooth, thin-walled, 4.0-5.6 × 2.4-3.2 μm.

Isolates Examined: S-5-1-20, S-5-2-2, isolated 22.VIII.1985; D-6-1-18, isolated 26.IX.1985; S-7-2-6 (ILLS 45661), D-7-3-14 (ILLS 45660, ATCC 62652), isolated 25.X.1985.

Penicillium oxalicum Currie & Thom, J. Biol. Chem. 22:289. 1915. Figs. 176-181, 396.

Seven-day-old colonies on CMA (Fig. 396) 2.0-3.3 cm diam, white to pale green, densely sporulating, center woolly, thinning to border, border even, reverse dull yellow. Ten-day-old colonies on 2 percent MEA 4.0-4.3 cm diam, dark blue-green with faint cinnamon-colored central region; uniformly dense with deep crust of conidia; border even, with thin zone of white mycelium; reverse orange-yellow; yellow pigment produced on both 2 percent MEA and Czapek's agar. Conidiophores (Figs. 176, 177) macronematous, 1- or 2-stage branched, hyaline, smooth, 24.8-160.0 × 2.4-4.0 μm. Branches in whorls of 2-3 elements, 12.8-20.0 × 3.2-4.0 μm; apices slightly enlarged. Conidiogenous cells (Figs. 178, 179) phialidic, hyaline, smooth, cylindrical, tapering to short, narrow neck; forming periclinal thickenings (Fig. 179, arrow); in whorls of 3-6; 10.4-12.8 × 2.4-4.0 μm, 1.6 μm wide at apex. Conidia (Fig. 181) pale green, dark blue-green in mass, walls roughened (Fig. 180); ellipsoidal; distinct, slightly darkened circular scars at both ends; formed in true chains with conspicuous connectives (Fig. 181); 4.8-5.6 × 3.2-4.8 μm.

Isolate Examined: S-4-5-5 (ILLS 45662), isolated 28.VII.1983.

Periconia macrospinosa Lefebvre & A.G. Johnson, Mycologia 41:417. 1949. Figs. 182-185, 397.

Seven-day-old colonies on CMA (Fig. 397) 2.4-4.5 cm diam, white, woolly, border even, effuse, reverse pale gray with white

border. Conidiophores (Fig. 182) macronematous, pale brown, smooth or roughened, multiseptate, bearing terminal and lateral branches of conidiogenous cells, up to 120 μm long, 4.0-8.0 μm wide. Conidiogenous cells (Fig. 183) polyblastic, pale brown, smooth or roughened, globose to obovoid, irregularly branched, 6.4-14.4 μm long, 2.4-4.0 μm wide at base, 3.2-6.4 μm wide at apex. Conidia (Fig. 184) dark brown, globose, muriform, with dense aggregations of spines 3.0-4.0 μm long; 5.6-18.4 μm diam; formed in acropetal chains, maturing retrogressively from apex. Chlamydospores (Fig. 185) subhyaline, smooth, globose to ellipsoidal, thin-walled, intercalary, in short chains; 12.8-22.4 μm diam.

Isolates Examined: D-6-13-2 (ATCC 62177), isolated 8.IX.1983; D-4-1-2 (ILLS 45663), isolated 16.VII.1985.

Phaeoisaria clematidis (Fuckel) Hughes, Can. J. Bot. 36:795. 1958. Figs. 186-189.

Seven-day-old colonies on CMA 0.6 cm diam, pale gray-green, dense cottony to funiculose, sporulating abundantly, border even, reverse gray-green. Conidiophores (Figs. 186-189) macronematous, pale to medium brown, smooth, straight to flexuous, cylindrical, 2-9-septate, 24.8-93.5 × 2.2-2.8 μm; formed singly on aerial hyphae towards border of colony, united into funiculose strands in center (Fig. 188). Conidiogenous cells (Fig. 189) proliferating sympodially; pale to medium brown, terminal, cylindrical and tapering at apex; 2.8-19.3 μm long, 2.8 μm wide at base; with subulate denticles 0.8-1.6 μm long forming at apex. Conidia hyaline to subhyaline, smooth, 1-celled, obovoid to cylindrical, 4.4-8.3 × 1.7-2.2 μm; dry, dislodging readily from denticles.

Isolate Examined: S-7-12-4, isolated 9.X.1983.

Phaeoramularia taxonomic species Figs. 190-194, 401.

Seven-day-old colonies on CMA (Fig. 401) <1.0 cm diam, dark gray, woolly, border even, reverse dark gray. Conidiophores (Figs. 190-193) macronematous, medium brown, smooth, irregularly cylindrical, straight to flexuous, 1-5-septate, 11.2-28.0 × 4.0-4.8 μm; forming singly, basal cell intercalary on aerial or appressed mycelium. Conidiogenous cells proliferating sympodially; pale brown, terminal; conidial secession scars slightly darkened, circular, 0.8-1.6 μm diam, protruding when young, becoming less evident with age. Conidia (Figs. 192, 194) medium brown, smooth, cylindrical, 3-10-septate, slightly constricted in center, apex bluntly rounded or with flattened scar, often in chains, 20.0-74.0 × 2.0-4.0 μm.

Isolate Examined: Ex-3-7 (ATCC 62203), isolated from *H. glycines* cyst in sample from Wayne County, IL; isolated 9.V.1983.

Comments: Species of *Phaeoramularia* are described largely on the basis of host, and none has been reported previously from nematodes. Our isolate resembles the tropical species *P. meridiana* (Chupp) Deighton in conidium and conidiophore morphology. Lacking a culture of *P. meridiana*, however, it was not possible to determine if the nematode isolate was conspecific with that fungus.

Phialophora gregata (Allington & Chamberl.) W. Gams, Cephalosporium-artige Schimmelpilze, p. 199. 1971. Figs. 195-197, 399.
Seven-day-old colonies on CMA (Fig. 399) 0.9-1.8 cm diam, white to pale gray, dense, with gloeoid clumps of conidia, center funiculose, border even, reverse uncolored. Conidiogenous cells (Figs. 195-197) phialidic, hyaline, lageniform, with distinct collarettes (Fig. 197, arrow); 6.4-12.0 × 2.2-4.8 μm; borne singly, laterally or terminally, more frequently in irregular clusters, arising from repent hyphae, hyphal coils, and aerial strands. Conidia (Fig. 196) hyaline, smooth, ovoid, slightly truncate bases, 1-celled, 3.3-6.6 × 2.2-3.2 μm.
Isolates Examined: S-1-15-2, (ILLS, NRRL 13198, ATCC 62204), isolated 19.IV.1984; S-8-9-1, isolated 13.X.1984; S-2-5-16, isolated 12.VI.1985.
Comments: *Phialophora gregata*, the causal agent of brown stem rot of soybean, is an important pathogen throughout the soybean-growing regions of the United States (Abel 1977). The species generally is considered to be restricted to only several leguminous plant hosts (Allington & Chamberlain 1948). Pathogenicity studies on soybeans using isolate S-1-15-2 demonstrated that the fungus retained pathogenicity to soybean (Carris *et al.* 1986).

Phoma medicaginis Malbr. & Roum. var. *pinodella* (L.K. Jones) Boerema, Neth. J. Pl. Path. 71:88. 1965. Figs. 253-258, 411.
Seven-day-old colonies on CMA 4.2 cm diam, white, mycelium mostly appressed, chlamydospores forming; border even, reverse uncolored. Seven-day-old colonies on PDA (Fig. 411) 5.0 cm diam, pale gray in center to white border, woolly, border even, reverse pale gray. Pycnidia (Figs. 253, 254) medium brown, glabrous, globose to subglobose, frequently with > 1 ostiole, peridium *textura angularis*; 120-200 μm diam; often aggregated and/or coalescing. Conidiogenous cells (Figs. 255, 256) phialidic, hyaline, doliiform, lining inner wall of pycnidium; 6.4-8.0 × 4.2-8.0 μm. Conidia (Fig. 258) hyaline, smooth, ellipsoidal, 1-celled, thin-walled, 4.8-8.8 × 2.4-4.0 μm. Chlamydospores (Fig. 257) golden to dark brown, smooth, globose to ellipsoidal, thick-walled (0.8 μm thick), intercalary; single, in chains or in clusters of 2-4; numerous; 11.2-20.0 × 9.6-16.8 μm; in aerial mycelium or immersed in agar.
Isolate Examined: D-7-3-17 (ILLS 45664, ATCC 62296), isolated 25.X.1985.

Plectosphaerella cucumerina (Lindf.) Kleb., Phytopath. Z. 1:43. 1930. Figs. 310-316.
Seven-day-old colonies on CMA 3.4-5.5 cm diam, white, mycelium dense, felty to silky, border even, reverse uncolored. Perithecia (Fig. 310) numerous, superficial or more typically immersed in agar; obpyriform, base medium brown, globose, smooth, peridium *textura angularis*, hyaline to pale brown; 189-231 μm long, 105-136 μm diam at base, venter 74-95 μm long, 44-53 μm wide. Perithecial hairs (Fig. 311) brown, smooth, cylindrical with bluntly rounded apices, arising from perithecial wall at transition between base and venter; 25.6-57.6 × 3.8-5.1 μm. Asci (Fig. 316) narrowly clavate, 8-spored, spores biseriate, apices

flat, with apical ring, 36-40 × 6-8 μm. Ascospores (Fig. 312) hyaline, roughened (Fig. 315), fusiform, 1-septate, 8.3-10.5 × 2.8 μm. Anamorph *Fusarium*-like. Conidiogenous cells (Fig. 313) phialidic, hyaline, smooth, erect, cylindrical, single, occasionally branched; forming collarettes; 7.7-15.4 × 2.6-3.8 μm. Conidia (Fig. 314) hyaline, smooth, cylindrical, ends bluntly rounded, 0-1-septate, 6.4-10.2 × 2.6-3.2 μm; in gloeoid masses.

Isolate Examined: S-1-8-4, isolated 1.VI.1983.

Comments: The hairs encircling the perithecial neck observed in isolate S-1-8-4 were described by Lindfor in the original description of this species. The hairs have not been reported by later authors (Domsch et al. 1980).

Pyrenochaeta terrestris (Hansen) Gorenz, Walker & Larson, Phytopathology 38:838. 1948. Figs. 259-270, 412.

Seven-day-old colonies on CMA 1.7-4.1 cm diam, pale to dark pink, woolly, border even, reverse pink. Three-wk-old colonies on CMA (Fig. 412), 6.6 cm diam, pink, woolly, with denser mycelium in concentric rings, center pale brown; pycnidia variable in number, border even, reverse dark pink; forming pink diffusible pigment in agar. Pycnidia (Figs. 259, 261) dark brown to black, globose to ovoid, frequently confluent and irregular in shape, neck setose, papillate to elongate and tortuous (Fig. 261); peridium smooth, *textura angularis*; 100-200 μm diam; solitary or more typically in aggregates, on surface or immersed in agar. Setae dark brown, septate, smooth to verrucose, 100-333 μm long, 1.6-5.1 μm diam. Conidiogenous cells (Figs. 262-264, 266-268) arising from cells lining wall of pycnidium; phialidic, occasionally proliferating percurrently (Fig. 266, arrow); hyaline, doliiform, and simple (Figs. 262, 263), or elongated, cylindrical, and integrated (Figs. 264, 266-268); doliiform cells 5.6-6.4 × 4.8-6.4 μm; cylindrical cells 6.4-36.0 × 2.4-4.0 μm; both 1.6-2.4 μm wide at apices. Conidia (Fig. 265) hyaline, smooth, fusiform to ovoid, 1-celled, thin-walled, 4.8-6.4 × 2.0-2.8 μm; abundant, extruded from pycnidia in white, gloeoid masses. Chlamydospores (Figs. 269, 270) pale to dark brown, smooth, globose to ovoid, thick-walled, solitary or in chains, 7.7-11.0 × 6.1-8.3 μm.

Isolates Examined: S-2-3-12, isolated 7.VI.1984; S-3-2-18, isolated 28.VI.1984; D-5-2-11, D-5-2-17 (ILLS 45666, ATCC 62205), D-5-3-9, S-5-3-7, isolated 22.VIII.1985; S-7-3-5 (ILLS 45665), isolated 25.X.1985.

Comments: Two types of conidiogenous cells were formed in pycnidia of *P. terrestris:* simple, obpyriform phialides; and cylindrical, elongate, septate conidiophores with integrated conidiogenous cells. Morgan-Jones and White (1983b) recommended transfer of *P. terrestris* into *Phoma* because the fungus resembles *Phoma leveillei* Boerema and Bollen. Both species produce setose pycnidia. However, Boerema and Bollen (1975) state "the conidia in *P. leveillei* are produced on undifferentiated parent cells and not on elongated septate conidiophores as in true species of *Pyrenochaeta* DeNot." As Figs. 262-264 and 266-268 illustrate, both kinds of conidiogenous cells are formed. This occurred regularly among the isolates examined in this study; therefore, we believe that they are best placed in *Pyrenochaeta terrestris*.

Ramichloridium schulzeri (Sacc.) de Hoog var. *schulzeri* de Hoog, Stud. Mycol. 15: 64. 1977. Figs. 198-205, 398, 400.
Seven-day-old colonies on CMA (Fig. 398) 1.0-2.4 cm diam, white to pale salmon, mycelium mostly appressed, center farinose due to conidiophore production, border even, reverse white. Colonies on PDA (Fig. 400) becoming densely woolly, pale brown due to abundant conidiophore production, border uneven, reverse orange. Conidiophores (Figs. 198-202) macronematous, polyblastic, proliferating sympodially, medium brown, cylindrical, often constricted at base (Fig. 200, arrow), straight, curved, or sharply bent; occasionally branched, 0-5-septate, 32.8-104.0 × 2.4-3.2 μm; upper 1/2 to 2/3 covered with blunt denticles 0.8-1.6 μm long, 0.8 μm wide (Fig. 201); arising terminally or laterally from aerial or appressed mycelium (Fig. 205), single or in clumps. Conidia (Figs. 203, 204) pale brown, faintly ridged (Fig. 204), obovoid, base apiculate, 1-celled, occasionally with hyaline perisporium extending beyond spore wall (Fig. 203, arrow); 7.2-12.8 × 2.8-4.0 μm; formed singly, readily dislodged from denticles.
Isolates Examined: S-8-20-2 (ILLS 45667, ATCC 62206), isolated 20.X.1983; D-4-4-7, isolated 16.VII.1985.

Septonema chaetospira (Grove) Hughes, Naturalist Jan. - Mar.:9. 1952. Figs. 206-210, 402.
Seven-day-old colonies on CMA (Fig. 402) 0.5 cm diam, dark gray, aerial mycelium pale gray, woolly, border even, reverse dark gray. Conidiophores (Figs. 206, 207) micronematous, holoblastic; pale olivaceous, smooth, cylindrical, straight or curved, multiseptate, often branched; 20.0-130.0 × 3.0-4.0 μm; arising from aerial mycelium. Conidia (Figs. 208, 209) pale olivaceous, smooth, fusiform, tapering, ends truncate, 0-3-septate, 16.5-24.0 × 2.4-3.2 μm; formed acropetally in long, simple, or branched chains (Fig. 209); chains spirally twisted (Fig. 210), separating readily into individual cells.
Isolates Examined: S-3-13-3, isolated 7.VII.1983; S-9-9-3, isolated 23.XI.1983; S-1-14-2 (ATCC 62207), S-1-14-5 (ILLS 45668), isolated 11.IV.1984.
Comments: Hughes (1952) transferred this species from *Septocylindrium* to *Septonema*. *Septonema* is characterized by simple to branched, little differentiated conidiophores and branched chains of conidia (Barron 1968). Ellis (1976) later transferred this species to *Heteroconium*, describing the conidiophores and conidial chains as usually simple. However, isolates examined during this study exhibited frequent branching of both conidiophores and conidial chains, suggesting that *Septonema* is a more appropriate genus for this fungus.

Sistotrema brinkmannii (Bres.) John Erikss., K. Fysiogr. Sallsk. Lund. Forh. 18:17. 1948. Figs. 344-350, 426, 427.
Seven-day-old colonies on CMA (Fig. 426) 6.2-7.0 cm diam, white, cottony to funiculose, with numerous hyphal coils (60-140 μm diam); coarse hyphal strands in central portion of colony forming basidia; border thin, effuse, reverse uncolored. Covering plate by 3 wk (Fig. 427), irregularly funiculose, basidia and basidiospores abundant. Hyphae hyaline, 3.2-4.0 μm diam, with clamp connections (Fig. 344). Basidia (Figs. 345, 349) hyaline, clavate, 12.0-17.6 μm long, 3.2-4.8 μm diam at base, 4.0-4.8 μm diam at

apex; with 7-8 sterigmata (Fig. 346) 2.4 μm long; formed on aerial, branched hyphal clusters (Fig. 348). Basidiospores (Fig. 347) hyaline, inamyloid, smooth, allantoid, 4.0-4.8 × 2.4 μm. Anamorph *Ptychogaster*-like, forming abundantly in aerial mycelium and in dense cluster immersed in agar. Conidia (Fig. 350) hyaline to subhyaline, staining deeply in aniline blue, smooth, globose to ovoid, 12.8-19.2 × 9.6-14.4 μm; forming in acropetal, branched chains, clamp connections between each cell.
Isolate Examined: D-9-1-5 (ILLS 45669, living culture deposited with ATCC), isolated 23.XI.1983.

Stagonospora heteroderae Carris, Glawe & Morgan-Jones, Mycotaxon 29:451. 1987. Figs. 271-277, 413, 414.
Seven-day-old colonies on CMA 0.7-2.0 cm diam, white, pale gray to pink, woolly to funiculose, border even, reverse pale gray to pink. Ten-wk-old colonies on CMA (Figs. 413, 414) covering plates, pale gray, often with pink to red pigment in agar of central portion of colony, dark gray to black areas with chlamydospores and pycnidia forming irregularly in agar; felty, woolly to floccose; reverse pale gray to red, with dark gray to black areas. Pycnidia (Fig. 271) black, globose, setose, mostly immersed, solitary or aggregated; 208-460 μm diam; forming after 1-2 mo culture. Conidiogenous cells (Figs. 274-277) phialidic, hyaline, doliiform to globose, forming periclinal thickenings, occasionally proliferating percurrently (Figs. 276, 277, arrows), 6.4-11.2 × 3.2-5.6 μm; arising from inner wall of pycnidium, separating readily from wall in squash mounts. Conidia (Fig. 273) hyaline to subhyaline, rarely becoming pale brown, thin-walled, smooth, fusiform to cylindrical, mostly 3-septate, with numerous lipid drops; 18.4-27.6 × 4.0-6.4 μm. Chlamydospores (Fig. 272) subhyaline to dark brown, globose, thick-walled (0.8 μm thick), smooth to verruculose, intercalary, in chains; 7.2-12.0 μm diam; formed in clusters in agar, rarely in aerial mycelium.
Isolates Examined: D-1-6-3, isolated 6.VI.1983; D-5-14-2, D-5-19-3, isolated 23.VIII.1983; S-6-6-1, isolated 15.IX.1983; D-8-9-4, isolated 20.X.1983; D-2-4-8, isolated 14.VI.1984; D-3-1-1 (ILLS 45670), isolated 1.VII.1985; D-5-1 (ATCC 62860), S-5-1 (ATCC 62861), isolated 22.VIII.1985; D-7-1-8, isolated 25.X.1985.
Comments: This fungus was one of the predominant fungi isolated from *H. glycines* cysts in this study and by Morgan-Jones *et al.* (1981) in the southeastern United States. For further details, see Carris *et al.* (1987).

Staphylotrichum coccosporum J. Meyer & Nicot, Bull. trimest. Soc. Mycol. Fr. 72:323. 1957. Figs. 211-215, 403.
Twenty-one-day-old colonies on PDA (Fig. 403) 7.6 cm diam, mycelium orange, woolly, fading to pale orange border, white floccose mycelium in center with red exudate droplets; agar buckled in center, border effuse, reverse orange-red fading to golden yellow. Conidiophores (Figs. 211, 215) macronematous, dark brown, becoming paler towards apices, smooth, cylindrical, bases swollen, 2-16-septate, apical branching racemose, branches dehiscing readily; erect, caespitose, distribution denser towards center of colony; 434-840 μm long, 6.0-8.0 μm wide at base, 4.0-6.0 μm wide at apex. Conidia (Figs. 212-214) subhyaline, wall faintly roughened (Fig. 212), globose, obovate, or pedicillate,

1-celled, thick-walled (1.2-1.6 μm thick); 10.0-20.0 μm diam; formed on aerial or submerged mycelium or on conidiophores; terminal, solitary or catenate (Fig. 214); forming gloeoid masses on conidiophores.
Isolate Examined: S-7-1-7 (ILLS 45671, ATCC 62208), isolated 1.XI.1985.

Stilbella bulbicola P. Henn., Hedwigia 44:176. 1905. Figs. 216-219.
Seven-day-old colonies on CMA 1.4-2.5 cm diam, white to pale vinaceous, mycelium appressed, pale yellow synnemata forming in concentric zones; border even, reverse pale vinaceous. Conidiophores macronematous, synnematous. Synnemata (Fig. 216) erect, unbranched, creamy white to yellow; stipes smooth, heads capitate, gloeoid; 84-136 μm high, 8-16 μm wide at base, 6-8 μm wide at top of stipe, 32-70 μm wide at head. Conidiogenous cells (Figs. 217, 218) phialidic, hyaline, narrowly cylindrical, tapering neck, forming periclinal thickenings (Fig. 217, arrow) or collarettes (Fig. 218, arrow); discrete and verticillate, 2-3 cells per whorl, 18.4-36.0 × 1.6-2.4 μm. Conidia (Fig. 219) hyaline, smooth, ellipsoidal, 1-celled, 4.8-6.4 × 2.4-3.2 μm; adhering in creamy white to yellow gloeoid mass.
Isolates Examined: S-4-9-5, isolated 28.VII.1983; D-10-12-1, isolated 3.II.1984; D-1-12-1, isolated 11.IV.1984; D-4-1-17 (ILLS 45672), isolated 16.VII.1985.

Thielavia ovispora Pidoplichko, Kirilenko, & Zakharchenko, Mikrobiol. Zhurnal 35:724. 1974. Figs. 329-334, 423.
Seven-day-old colonies on CMA 1.6 cm diam, white with dark gray to black cleistothecia forming, immersed in central portion of colony; aerial mycelium sparse, cottony, border even, reverse uncolored. Ten-day-old colonies on OA (Fig. 423) 4.0 cm diam, medium gray, becoming paler towards border, border even, reverse pale gray. Cleistothecia (Fig. 329) dark brown to black, globose, glabrous, peridium *textura angularis* to *epidermoidea* (Fig. 330), 46-74 μm diam. Asci (Fig. 331) ovoid, thin-walled, 8-spored, spores irregularly biseriate, deliquescent, 18.4-22.4 × 10.4-14.4 μm. Ascospores (Fig. 332) brown, smooth, broadly obovoid, 1-celled, 1 apical germ pore in narrower end (Fig. 332, arrow), 8.0-10.4 × 5.6-7.2 μm. Conidia (Fig. 333) subhyaline, globose to obovate, smooth, 4.8-6.4 μm diam; single or in chains of 2-3, formed as blown-out ends of short, lateral branches on hyphae.
Isolate Examined: D-5-5-7 (ILLS 45673, ATCC 62178), isolated 22.VIII.1985.
Comments: *Thielavia ovispora* is a little-known species described from soil in Russia (Arx 1975). In culture, *T. ovispora* forms abundant cleistothecia (Fig. 334) at all depths in the agar, causing older colonies to appear gray-black.

Trematosphaeria fallax Mouton, Bull. Soc. Roy. Bot. Belg. 25:155. 1886. Figs. 335-343, 424, 425.
Two-mo-old colonies on CMA (Fig. 424) and OA (Fig. 425) covering plates, medium gray, woolly, with numerous small pseudothecia on surface of agar or appressed to bottom of plate, or adhering to sides; reverse gray-brown. Pseudothecia (Figs. 335, 336) globose to obovoid, 240-380 (-420) × 160-260 (-360) μm;

covered with straight dark brown hairs up to 140 μm long (Fig. 336) (mostly 70-80 μm), 1.6-3.2 μm diam; wall 50-64 μm thick, pale brown, *textura angularis* with overlying dark brown hyphae forming *textura intricata* (Fig. 341), pale brown cell layer 4-5 cells wide, dark brown cell layer 1-3 cells wide, cells thick-walled. Asci (Fig. 337) clavate, bitunicate, 8-spored, spores biseriate, 156-162 × 52-58 μm; vertical striations ("*nasse*") present in ascus apex (Fig. 342), pseudoparaphyses hyaline, septate, filiform, 1.6-3.2 μm wide. Ascospores (Figs. 338-340) dark brown with pale end cells, smooth, fusiform, straight to curved, thick-walled, 3-10-septate, 1 central cell often wider; 46-80 × 13-20 μm. Chlamydospores (Fig. 343) dark brown, smooth, globose to ovoid, thick-walled (0.8 μm wide), 6.4-12.0 × 7.2-12.0 μm; in branched and unbranched chains of up to 22 cells, intercalary, lateral and terminal, in aerial mycelium.

Isolate Examined: S-9-11-3 (ILLS 45674, ATCC 62209), isolated 23.IX.1983.

Comments: Pseudothecia formed in cultures grown on Difco CMA were thin-walled, small, and frequently did not produce ascospores. The few ascospores that were produced (Fig. 340) were smaller and more irregular in shape than those formed on homemade CMA, OA, and Difco PDA.

Tricellula inaequalis van Beverwijk, Antonie von Leeuwenhoek 20:15. 1954. Figs. 220-225, 404.

Three-wk-old colonies on CMA (Fig. 404) 3.0 cm diam, pale orange, slimy, mycelium mostly appressed, funiculose strands forming in center; border even, reverse pale orange. Conidiophores micronematous, hyaline, smooth, branched, indeterminate, 1.6-2.4 μm diam. Conidiogenous cells (Figs. 220-222) monoblastic or polyblastic, hyaline, smooth, ampulliform to ellipsoidal, terminal or lateral, usually in clusters of variable number, often forming dense heads (Fig. 222); 5.6-8.8 × 2.4-4.0 μm. Conidia (Figs. 223-225) subhyaline, pale orange in mass, smooth, 2-3-celled (1 basal, 1 apical, and 1 lateral); basal and apical cells triangular to ellipsoidal, lateral cell ellipsoidal to allantoid; individual cells 3.9-6.6 × 2.2-3.3 μm; total length of spore 9.6-13.6 μm, total width 4.8-7.2 μm.

Isolate Examined: WEP 11-4 (ILLS 45678, ATCC 62179), isolated 12.V.1983, Wayne County, IL.

Trichocladium opacum (Corda) Hughes, Trans. Br. Mycol. Soc. 35:154. 1952. Figs. 226-230, 405.

Seven-day-old colonies on CMA (Fig. 405) 1.5-2.0 cm diam, pale orange, aerial mycelium hyaline to pale gray, cottony, dark conidia forming in aerial mycelium and immersed in agar; border even, reverse pale orange to gray. Conidiogenous cells holoblastic, subhyaline to pale brown, 0-3-septate, smooth, cylindrical, widening towards spore, lipid drops conspicuous; lateral or terminal on aerial or immersed hyphae, frequently in clusters (Fig. 226); 7.2-16.0 × 2.4-7.2 μm. Conidia (Figs. 227-230) medium brown, darkening towards apex, smooth, thick-walled, clavate to irregularly cylindrical, straight to curved, lipid drops conspicuous; with marked differences between spores produced in aerial mycelium and immersed in agar: aerial conidia (Figs. 227, 228) 2-5 (-9)-septate, darker, 18.0-44.0 × 10.0-20.0 μm, often with pale

brown membraneous vesicle surrounding conidium (Fig. 227, arrow); immersed conidia (Figs. 229, 230) paler brown, 3-9-septate, 22.0-76.0 × 10.0-24.0 μm.
Isolates Examined: S-4-2-14 (ILLS 45675), isolated 19.VII.1984; D8-1-13, D-8-2-14, isolated 13.X.1984.

Trichoderma koningii Oudem., Archs. Neerl. Sci. 3(7):291. 1902.
Figs. 231-233, 406.
Seven-day-old colonies on CMA (Fig. 406) covering plate, white, mycelium appressed in center, becoming floccose towards border, forming green conidiophores abundantly at border; reverse uncolored to dull green. Conidiophores (Fig. 231) semi-macronematous, subhyaline, smooth, branched, erect, formed in tufts in ring-like zones, 6.4-38.4 × 3.2-4.0 μm. Conidiogenous cells (Fig. 232) phialidic, subhyaline, smooth, obpyriform with constricted bases, lateral or terminal, 4.8-8.0 × 3.2-4.0 μm. Conidia (Fig. 233) pale green, darker green in mass, smooth, ellipsoidal to subcylindrical, 1-celled, 4.0-4.8 × 2.4-3.2 μm; accumulating in dry masses at apices of phialides.
Isolate Examined: S-6-5-2 (ILLS 45672, ATCC 62210), isolated 26.IX.1985.

Tritirachium oryzae (Vincens) de Hoog, Stud. Mycol. 1:22. 1972.
Figs. 234-237, 407.
Seven-day-old colonies on CMA (Fig. 407) 0.4-2.0 cm diam, pink, pulvinate, aerial mycelium dense, cottony, conidiophores abundant, border even, reverse dull pink. Conidiophores (Figs. 234, 236) pink, smooth, cylindrical, tapering, bearing whorls of 2-3 conidiogenous cells, ascendent, up to 1227 μm long, 2.2 μm wide at base, 1.7 μm wide at apex. Conidiogenous cells (Figs. 235, 237) polyblastic, proliferating sympodially, pink, each consisting of smooth, tapering basal portion, 13.2-24.8 × 1.7-2.8 μm; geniculate rachis with flattened conidial secession scars, 24.0-29.1 × 1.7-2.2 μm. Conidia hyaline, smooth, broadly ellipsoidal, 1-celled, 1.7-2.8 × 1.1-2.2 μm.
Isolate Examined:D-3-15-2 (ATCC 62211), isolated 15.VII.1983.

Volutella ciliata (Alb. & Schw.) Fr., Syst. Mycol. vol. III: 467. 1832.
Figs. 238-243, 408.
Seven-day-old colonies on CMA (Fig. 408) 1.5-2.3 cm diam, white to pale yellow, mycelium mostly appressed, forming concentric ring-like zones, sporodochia forming in center; border even, reverse pale yellow. Conidiomata sporodochial (Figs. 238, 239), pale yellow, slimy, pulvinate, discrete or coalescing, surrounded by fringe of setae; 60-300 μm diam. Setae (Fig. 240) hyaline, smooth, subulate, thick-walled, curving over sporodochia; 100-500 × 4.0-10.0 μm. Conidiogenous cells (Figs. 241, 243) phialidic, hyaline, smooth, cylindrical with bluntly tapered apex, base often slightly constricted, collarette present (Fig. 243, arrow); in densely branched heads; 7.2-13.6 × 2.4-3.2 μm. Conidia (Fig. 242) hyaline, smooth, ellipsoidal to obovoid, 1-celled; 4.8-8.8 × 2.4-3.2 μm; accumulating in slimy, pale yellow masses on sporodochia.
Isolates Examined: D-9-5-16 (ILLS 45677, ATCC 62212), isolated 7.XI.1984; S-4-2-15, isolated 25.VII.1985.

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Photographs of Species

Figs. 1-6. *Acremonium kiliense.*

Figs. 1, 2. Conidiogenous cells. ×835.
Fig. 3. Conidiogenous cell proliferating at apex (arrow). ×2090.
Fig. 4. Conidia. ×2090.
Fig. 5. Chlamydospores. ×2090.
Fig. 6. Chlamydospores stained in aniline blue. ×2090.

Figs. 7-9. *Acremonium sclerotigenum.*

Fig. 7. Conidiogenous cell. ×2090.
Fig. 8. Base of roughened conidiogenous cell stained in aniline blue. ×2090.
Fig. 9. Conidia. ×2090.

Figs. 10-13. *Alternaria alternata.*

Fig. 10. Roughened wall of conidium. ×2090.
Fig. 11. Conidiogenous cell. ×2090.
Fig. 12. Conidium. ×2090.
Fig. 13. Conidial chain. ×835.

Figs. 14, 15. *Aphanocladium album.*

Fig. 14. Conidiogenous cells and conidia. Note narrowed neck on conidiogenous cell on right. ×2090.
Fig. 15. Conidiogenous cell and developing conidium. ×2090.

Figs. 16-19. *Arthrocladium caudatum.*

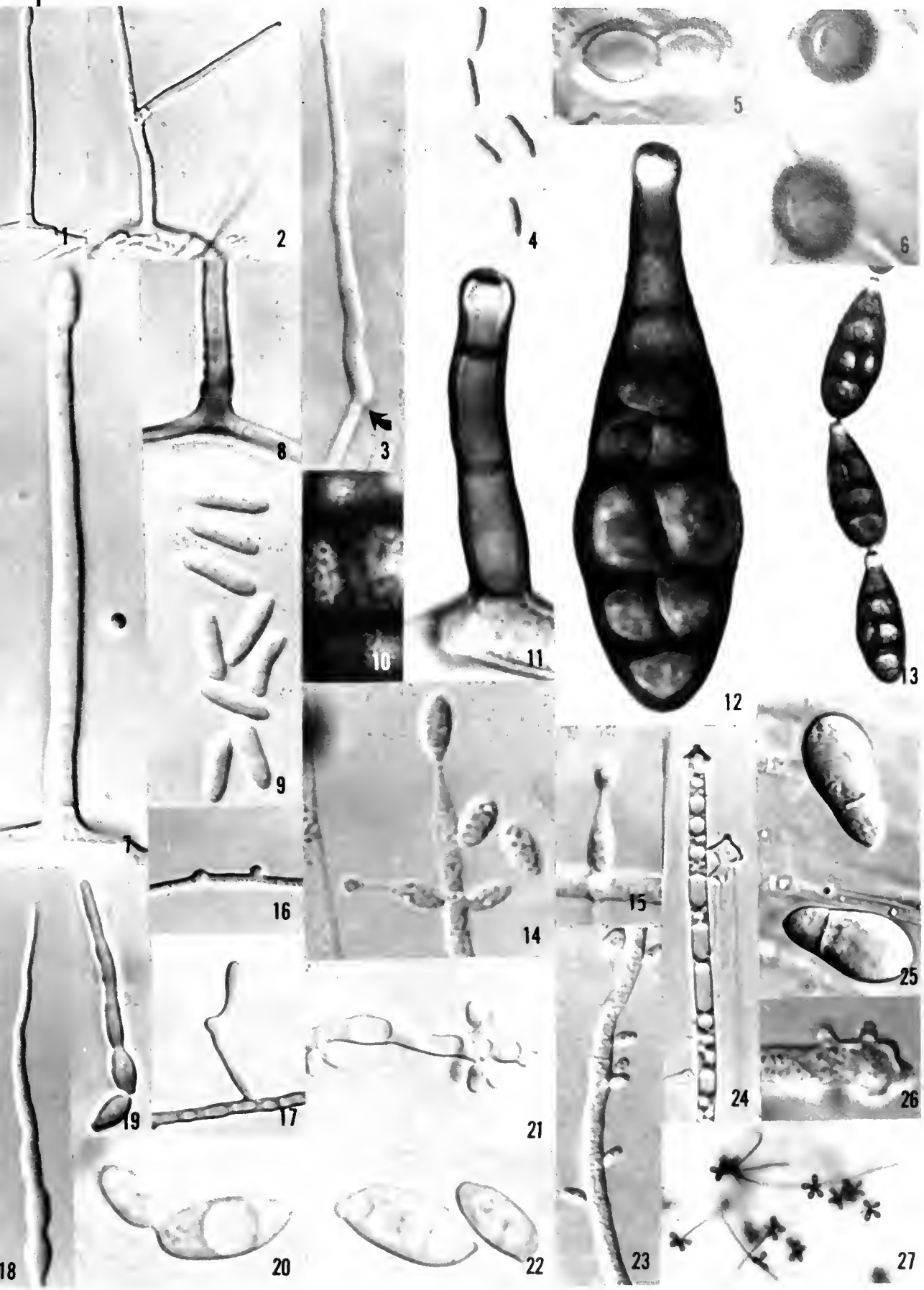
Fig. 16. Reduced conidiophores. ×835.
Fig. 17. Elongate conidiophore with developing conidium. ×835.
Fig. 18. Conidium. ×835.
Fig. 19. Conidium disarticulating at first septum. ×835.

Figs. 20-23. *Aureobasidium pullulans.*

Fig. 20. Secondary conidium developing from primary conidium. ×2090.
Fig. 21. Conidia forming from terminal conidiogenous cell. ×835.
Fig. 22. Conidia. ×2090.
Fig. 23. Conidia forming from undifferentiated intercalary conidiogenous cell. ×835.

Figs. 24-27. *Arthrobotrys oligospora.*

Fig. 24. Apex of conidiophore. ×835.
Fig. 25. Conidia. ×835.
Fig. 26. Conidiogenous node with blunt denticles. ×2090.
Fig. 27. Conidia in clusters on conidiophores in culture. ×80.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Figs. 28-32. *Botryotrichum piluliferum.*

Fig. 28. Cluster of conidia. ×2188.
Fig. 29. Darkened conidium. ×2188.
Fig. 30. Subhyaline conidium lacking dark membrane. ×2188.
Fig. 31. Phialide and conidia. ×2188.
Fig. 32. Ornamentation on seta. ×2188.

Figs. 33-37. *Camposporium pellucidum.*

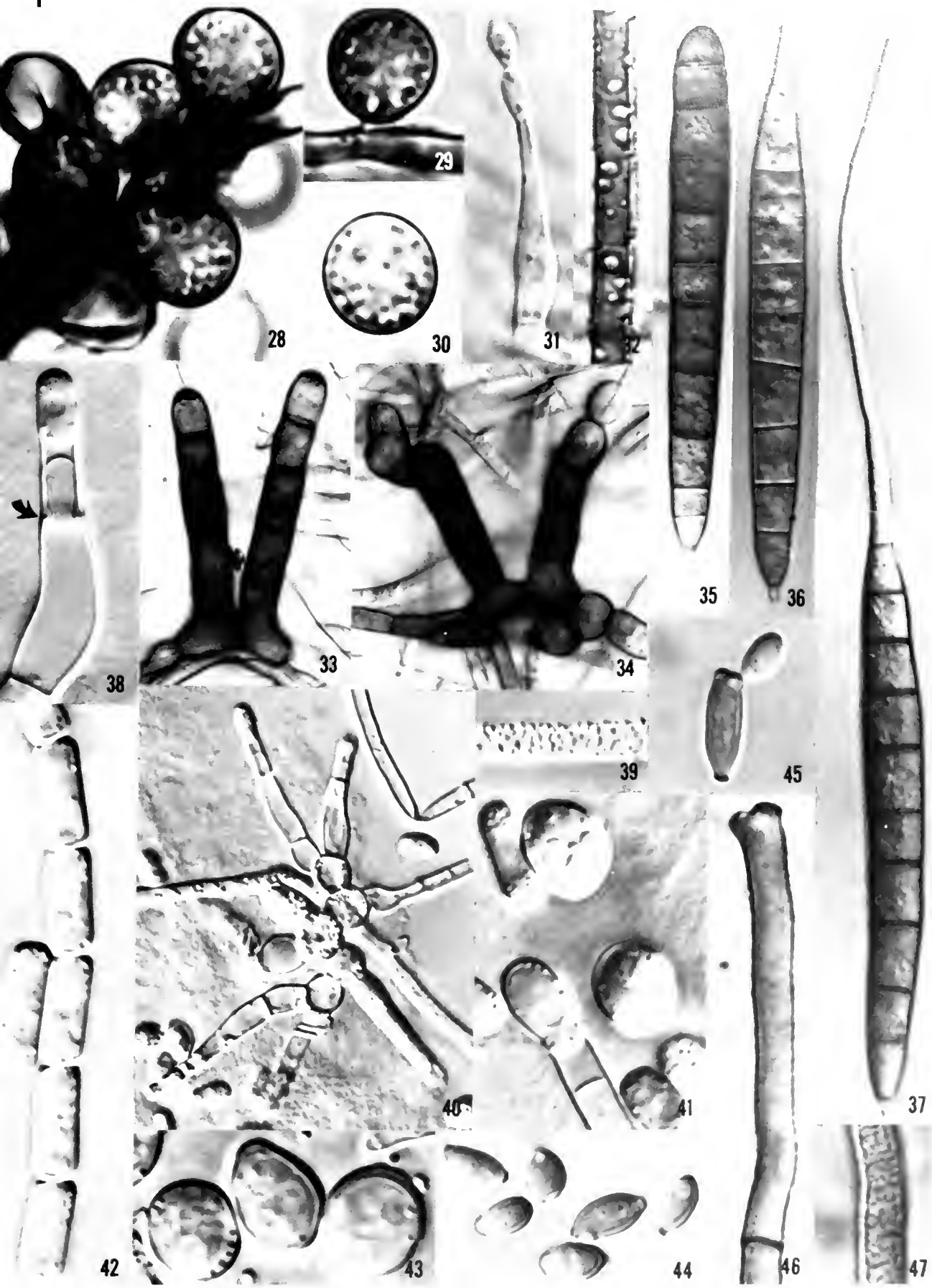
Figs. 33, 34. Conidiophores. ×835.
Fig. 35. Conidium with rounded apex. ×835.
Fig. 36. Conidium with short apical appendage. ×835.
Fig. 37. Conidium with long, flexuous appendage. ×835.

Figs. 38-43. *Chalara heteroderae.*

Fig. 38. Conidiogenous cell with periclinal thickening (arrow). ×2500.
Fig. 39. Verruculose hyphae. ×2500.
Fig. 40. Conidiogenous cells subtended by spheroidal cells. ×770.
Fig. 41. Pyriform, globose, and cylindrical conidia. ×2500.
Fig. 42. Cylindrical conidia in chain. ×2700.
Fig. 43. Globose conidia. ×2500.

Figs. 44-47. *Cladosporium cladosporioides.*

Fig. 44. Conidia. × 2090.
Fig. 45. Conidiogenous cell (detached). ×2090.
Fig. 46. Conidiophore. ×2090.
Fig. 47. Roughening on conidiophore. ×2090.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Figs. 48-52. *Dictyochaeta heteroderae.*

Fig. 48. Conidiophore with rhizoid-like basal branching. ×835.
Fig. 49. Conidiophores. ×835.
Fig. 50. Proliferating conidiogenous cell (arrow). ×835.
Fig. 51. Polyphialide. ×2188.
Fig. 52. Conidia. ×835.

Figs. 53-58. *Corynespora cassiicola.*

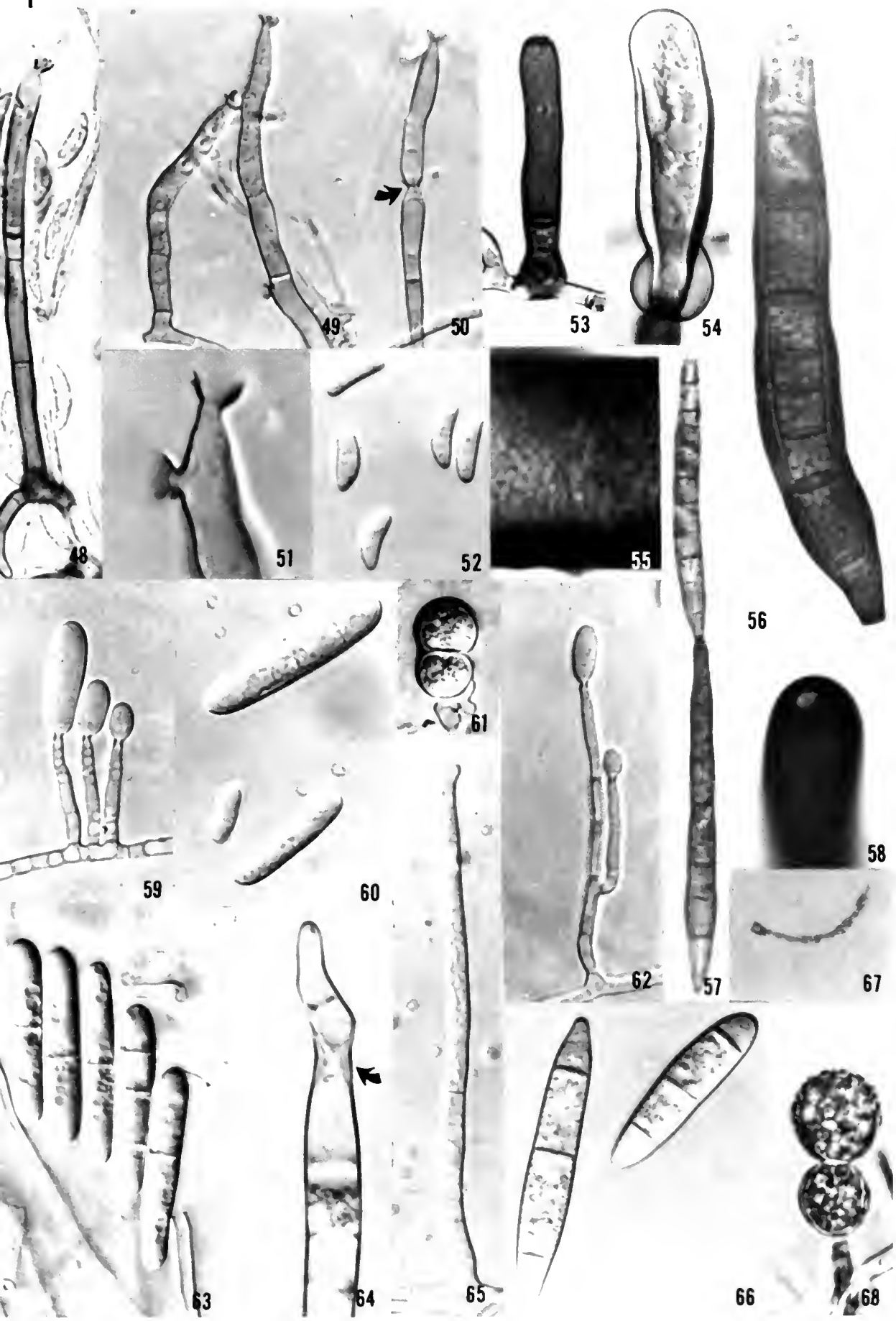
Fig. 53. Conidiophore. ×835.
Fig. 54. Vesicle developing at base of conidium. ×835.
Fig. 55. Conidial wall roughening. ×2188.
Fig. 56. Conidium. ×835.
Fig. 57. Conidia in chain. ×209.
Fig. 58. Pore at apex of conidiogenous cell. ×2188.

Figs. 59-63. *Cylindrocarpon destructans.*

Figs. 59, 62. Conidiophores. ×835.
Fig. 60. Microconidia and macroconidia. ×835.
Fig. 61. Chlamydospores. ×835.
Fig. 63. Macroconidia. ×835.

Figs. 64-68. *Cylindrocarpon fusiforme.*

Fig. 64. Conidiogenous cell with periclinal thickening (arrow). ×2090.
Fig. 65. Conidiophore. ×835.
Fig. 66. Conidia. ×2090.
Fig. 67. Conidia in imbricate chain. ×80.
Fig. 68. Chlamydospores with roughened walls. ×2090.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Figs. 69-73. *Cylindrocarpon magnusianum.*

Fig. 69. Sclerotial body produced in culture. ×250.
Fig. 70. Pseudoparenchymatous tissue composing sclerotial bodies. ×835.
Fig. 71. Conidiogenous cells with periclinal thickenings (arrows). ×2090.
Fig. 72. Conidiophore. ×835.
Fig. 73. Macroconidia and microconidia. ×2090.

Figs. 74-78. *Dactylaria acerosa.*

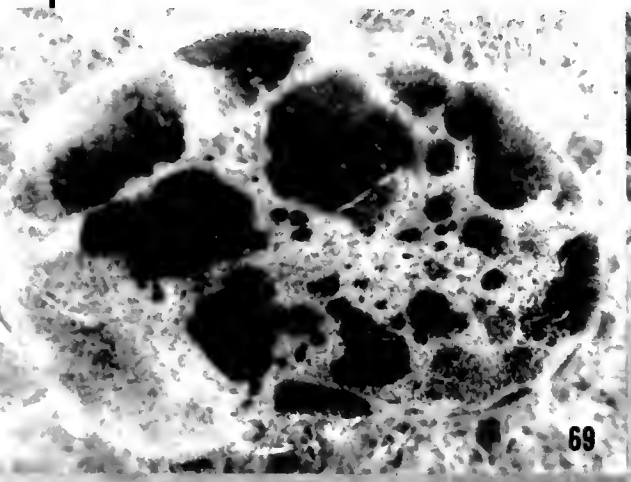
Figs. 74-77. Conidiophores. ×2188.
Fig. 78. Conidia. ×2188.

Figs. 79-85. *Dendryphion nanum.*

Figs. 79-81. Conidiophores. ×835.
Fig. 82. Pore in apex of conidiophore. ×2188.
Figs. 83-85. Conidia. ×835.

Figs. 86-89. *Drechslera avenae.*

Figs. 86, 87. Conidiophores. ×835.
Fig. 88. Conidia. ×835.
Fig. 89. Roughening on wall of conidium. ×2188.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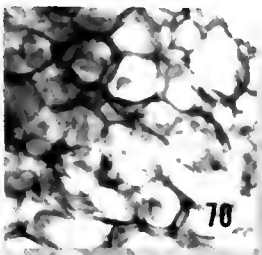
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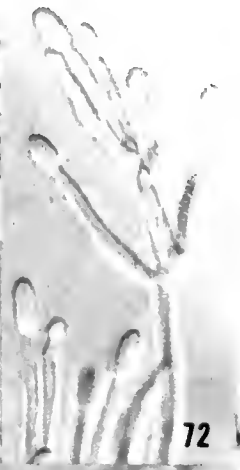
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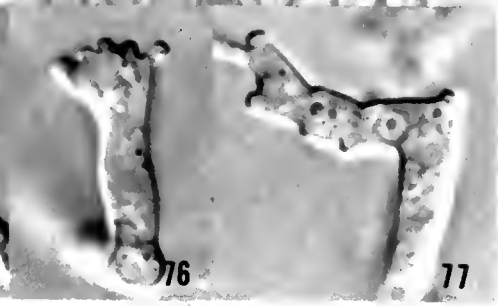
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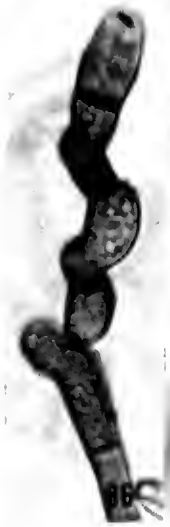
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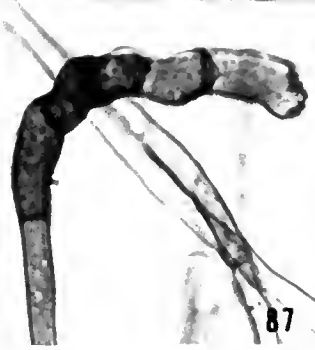
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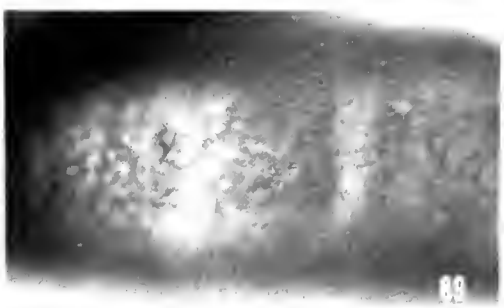
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Figs. 90-93. *Diheterospora chlamydosporia.*

Fig. 90. Conidiogenous cells and conidia. ×2188.
Figs. 91, 92. Developing dictyospores. ×2188.
Fig. 93. Mature dictyospore. ×2188.

Figs. 94-96. *Engyodontium album.*

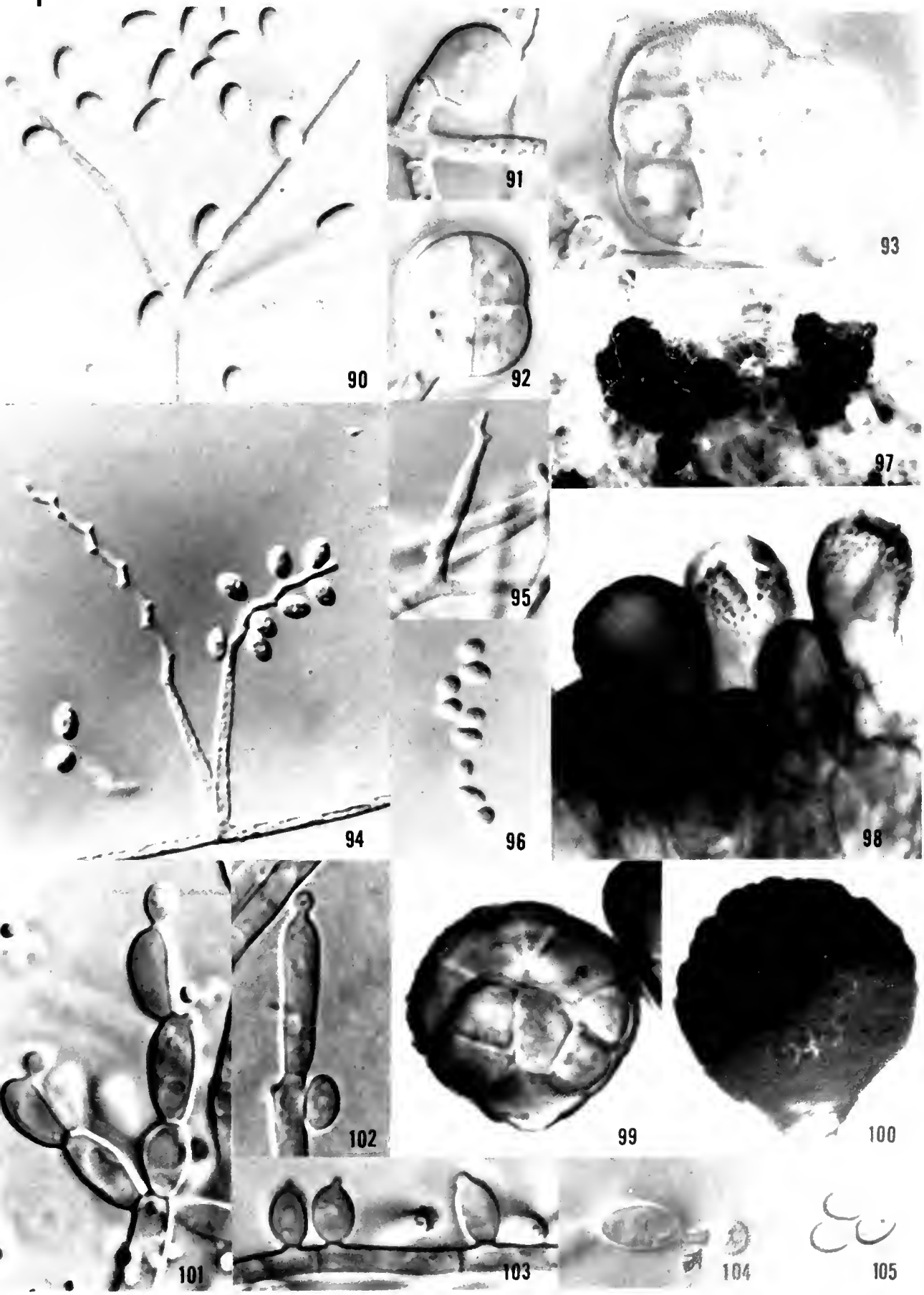
Figs. 94, 95. Conidiogenous cells. ×2188.
Fig. 96. Conidia. ×2188.

Figs. 97-100. *Epicoccum purpurascens.*

Fig. 97. Sporodochia in culture. ×20.
Fig. 98. Conidiogenous cells. ×2090.
Fig. 99. Conidium bleached with NaOCl to show septation. ×2090.
Fig. 100. Conidium. ×2090.

Figs. 101-105. *Exophiala pisciphila.*

Figs. 101-103. Conidiogenous cells. ×2188.
Fig. 104. Conidiogenous cell with annellated neck region (arrow). ×2188.
Fig. 105. Conidia. ×2188.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Figs. 106-109. *Fusarium aquaeductuum* var. *medium*.

Fig. 106. Conidiophore with reduced conidiogenous loci (arrow). ×835.
Fig. 107. Conidiophore. ×835.
Fig. 108. Conidiogenous cells. ×2090.
Fig. 109. Conidia. ×835.

Figs. 110-113. *Fusarium equiseti*.

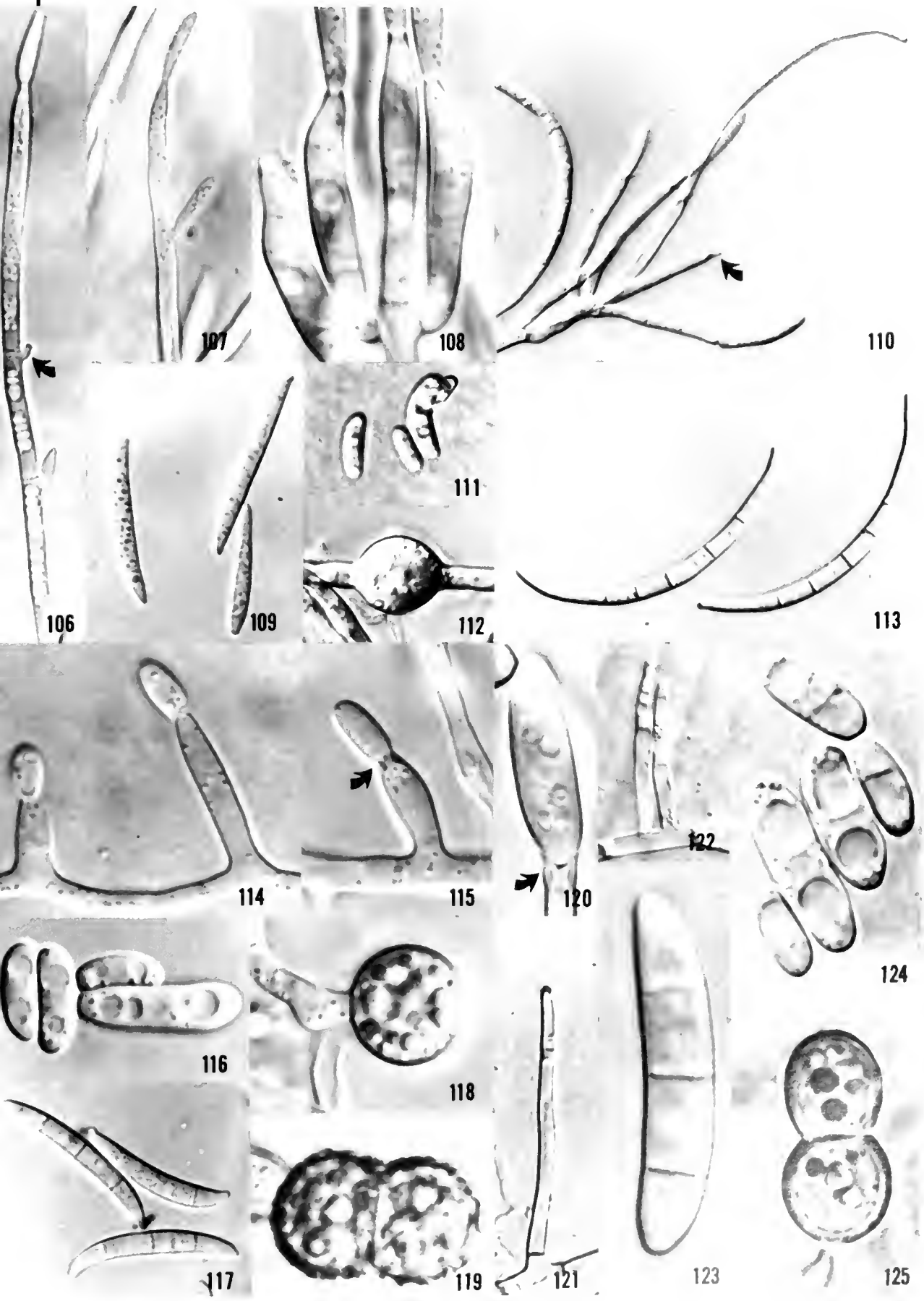
Fig. 110. Conidiophores. Arrow indicates collarette. ×835.
Fig. 111. Microconidia. ×835.
Fig. 112. Chlamydospore. ×836.
Fig. 113. Macroconidia. ×835.

Figs. 114-119. *Fusarium oxysporum*.

Figs. 114, 115. Conidiogenous cells. Arrow indicates periclinal thickening. ×2188.
Fig. 116. Microconidia. ×2188.
Fig. 117. Macroconidia. ×835.
Fig. 118. Smooth-walled chlamydospore. ×2188.
Fig. 119. Rough-walled chlamydospores. ×2188.

Figs. 120-125. *Fusarium solani*.

Fig. 120. Conidiogenous cell with periclinal thickening (arrow). ×2188.
Figs. 121, 122. Conidiophores. ×835.
Fig. 123. Macroconidium. ×2188.
Fig. 124. Microconidia. ×2188.
Fig. 125. Chlamydospores. ×2188.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Figs. 126-128. *Geniculosporium* sp.

Fig. 126. Conidiophores. ×209.
Fig. 127. Conidiogenous cell. Note circular scars. ×2090.
Fig. 128. Conidia. ×2090.

Figs. 129-131. *Gliocladium catenulatum.*

Fig. 129. Primary conidiophore. ×835.
Fig. 130. Secondary conidiophore. ×835.
Fig. 131. Conidia. ×2188.

Figs. 132-134. *Gliocladium roseum.*

Fig. 132. Secondary conidiophore. ×835.
Fig. 133. Primary conidiophores. ×209.
Fig. 134. Conidia. ×2188.

Figs. 135-139. *Gonytrichum macrocladium.*

Fig. 135. Conidiophores. ×835.
Fig. 136. Proliferating conidiophore (arrow). ×835.
Fig. 137. Collar hyphae. ×835.
Fig. 138. Conidiogenous cell. ×2188.
Fig. 139. Conidiophores on aerial hyphae. ×80.

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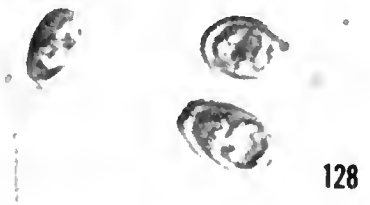

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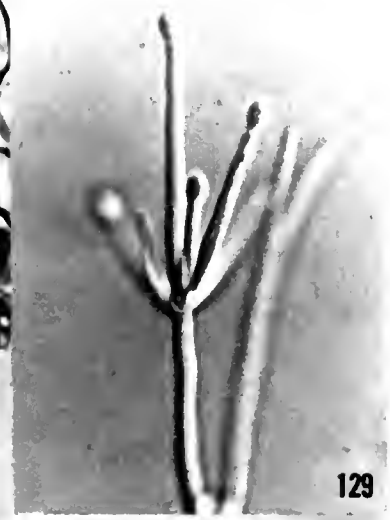

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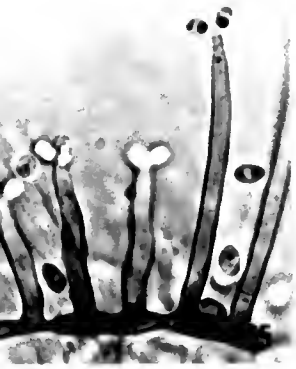

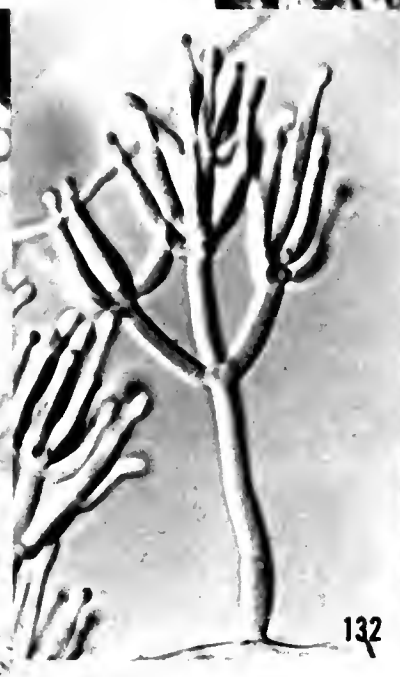

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Figs. 140-144. *Humicola fuscoatra*. Subhyaline and darkened conidia. ×2090.

Figs. 145-148. *Lecythophora hoffmannii*.

Figs. 145-147. Conidiogenous cells. Arrows indicate collarettes. ×2090.
Fig. 148. Conidia. ×2090.

Figs. 149-152. *Mariannaea elegans*.

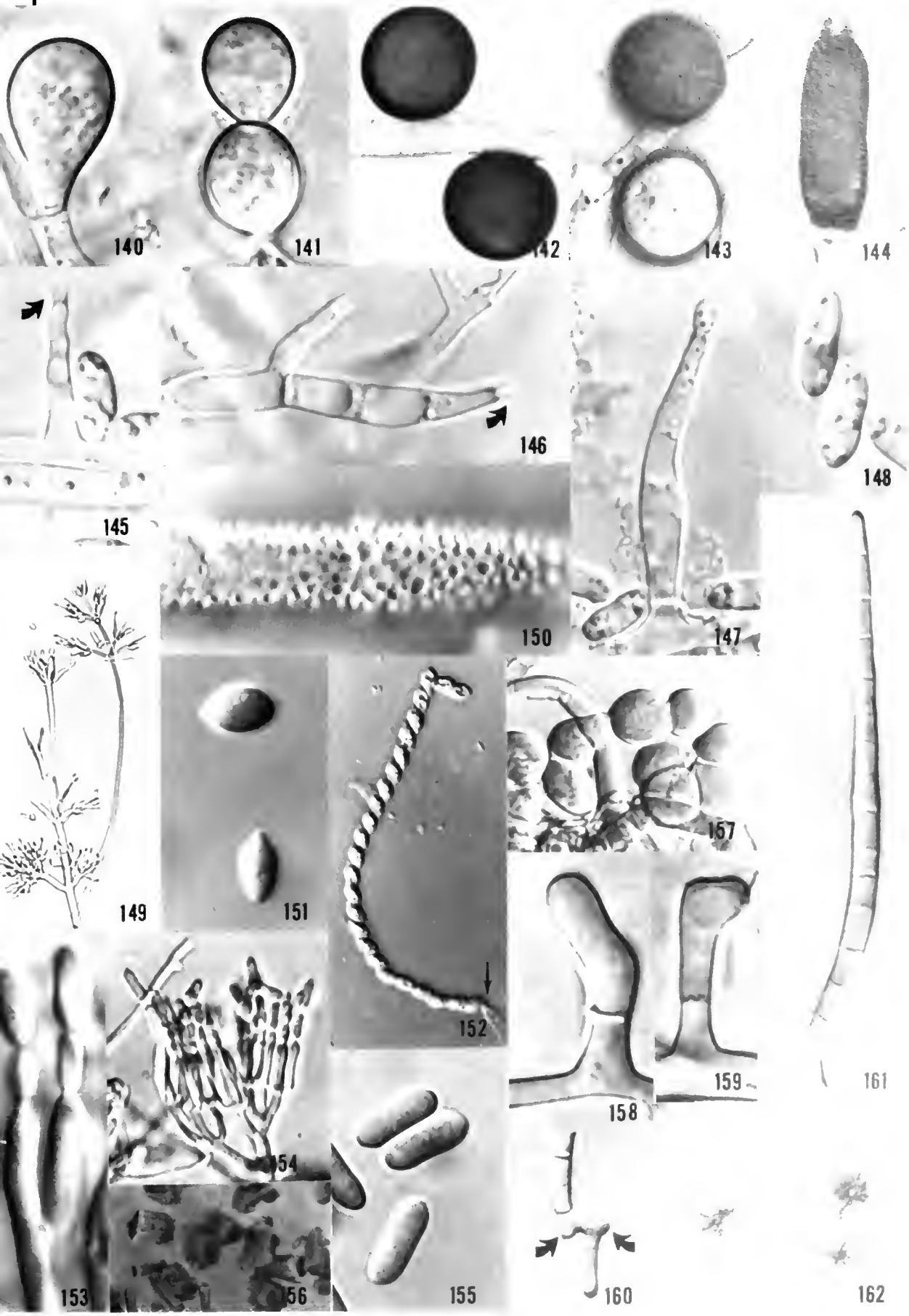
Fig. 149. Conidiophores. ×209.
Fig. 150. Roughened base of conidiophore. ×2090.
Fig. 151. Conidia. ×2090.
Fig. 152. Imbricate chain of conidia. Arrow indicates conidiogenous locus. ×835.

Figs. 153-156. *Metarhizium anisopliae*.

Fig. 153. Conidiogenous cells. ×2188.
Fig. 154. Conidiophores. ×875.
Fig. 155. Conidia. ×2188.
Fig. 156. Angular columns of conidia in culture. ×80.

Figs. 157-162. *Mycocentrospora acerina*.

Fig. 157. Torulose clusters of cells. ×835.
Figs. 158, 159. Conidiophores. ×2090.
Fig. 160. Detached conidiophore. Arrows indicate sympodial proliferations. ×835.
Fig. 161. Conidium. ×835.
Fig. 162. Clusters of conidia in culture. ×50.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Figs. 163-164. *Nigrospora sphaerica*. Conidiogenous cells and conidia. ×835.

Figs. 165-168. *Paecilomyces lilacinus*.

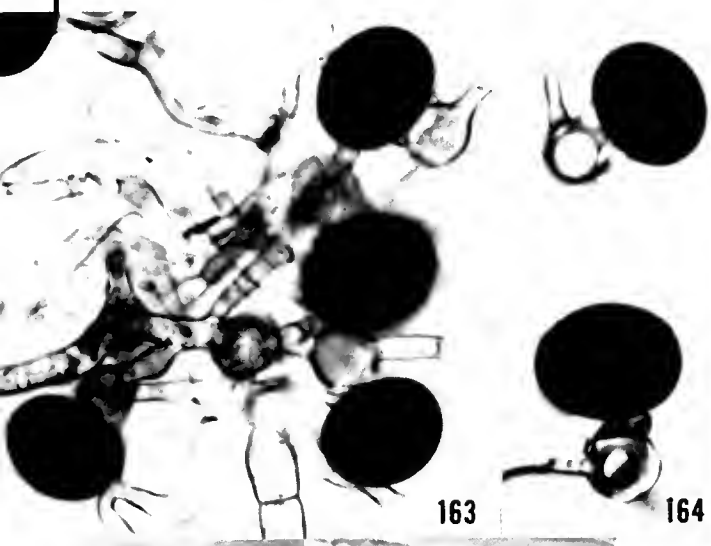
Fig. 165. Conidiophore. ×835.
Fig. 166. Conidiophore on aerial hypha. ×835.
Fig. 167. Conidiogenous cells. ×2090.
Fig. 168. Conidia. ×2090.

Figs. 169, 170. *Paecilomyces marquandii*.

Fig. 169. Conidiophore. ×835.
Fig. 170. Chain of conidia. ×2090.

Figs. 171-175. *Papulaspora* sp.

Fig. 171. Enlarging cells of papulaspore primordium. ×835.
Fig. 172. Papulaspore primordium. ×835.
Fig. 173. Mature papulaspore. ×835.
Fig. 174. Papulaspore bleached in NaOCl to show central cells. ×835.
Fig. 175. Sheathing cells of papulaspore. ×835.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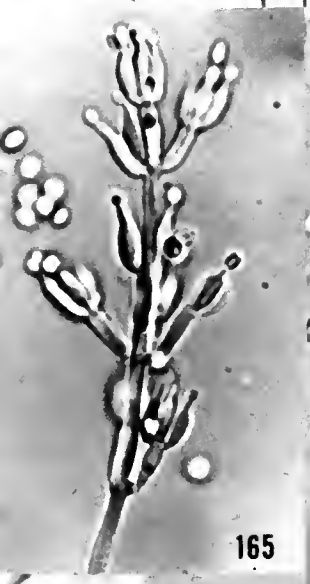
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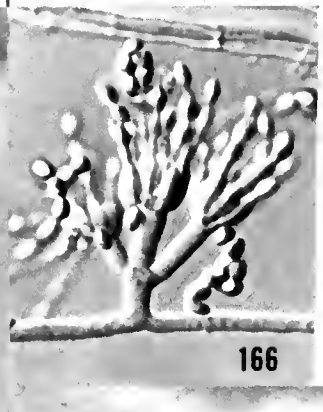
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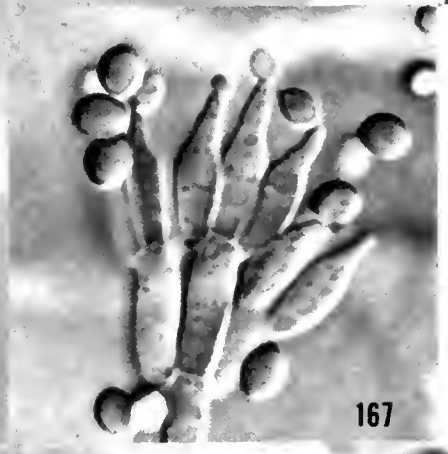
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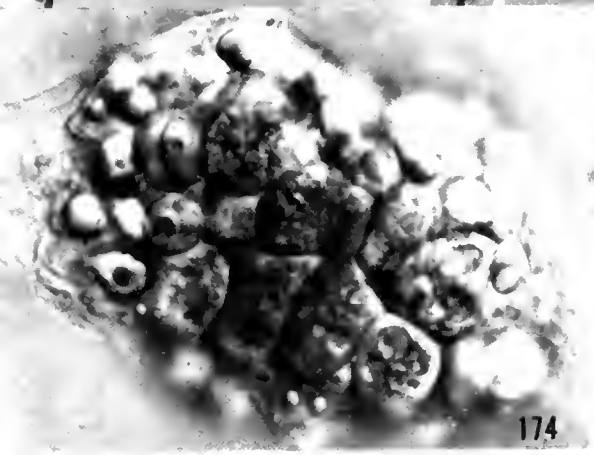
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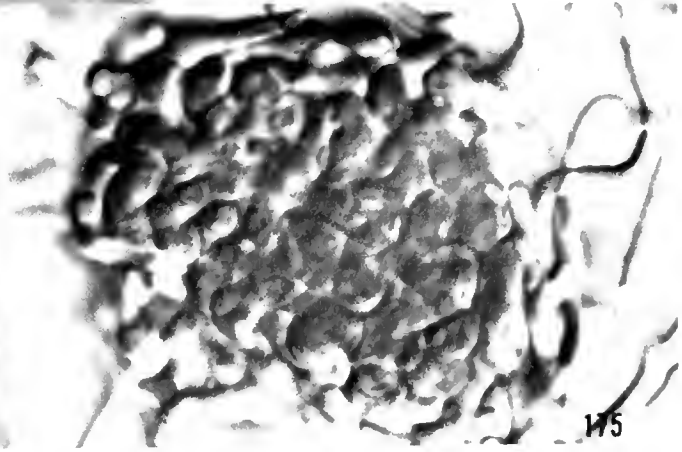
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Figs. 176-181. *Penicillium oxalicum.*

Figs. 176, 177. Conidiophores. ×835.
Fig. 178. Conidiogenous cells and chains of conidia. ×2090.
Fig. 179. Conidiogenous cells with periclinal thickening (arrow). ×2090.
Fig. 180. Wall roughenings on conidia. Arrow indicates scar on conidium. ×2090.
Fig. 181. Conidia joined by connective (arrow). ×2090.

Figs. 182-185. *Periconia macrospinosa.*

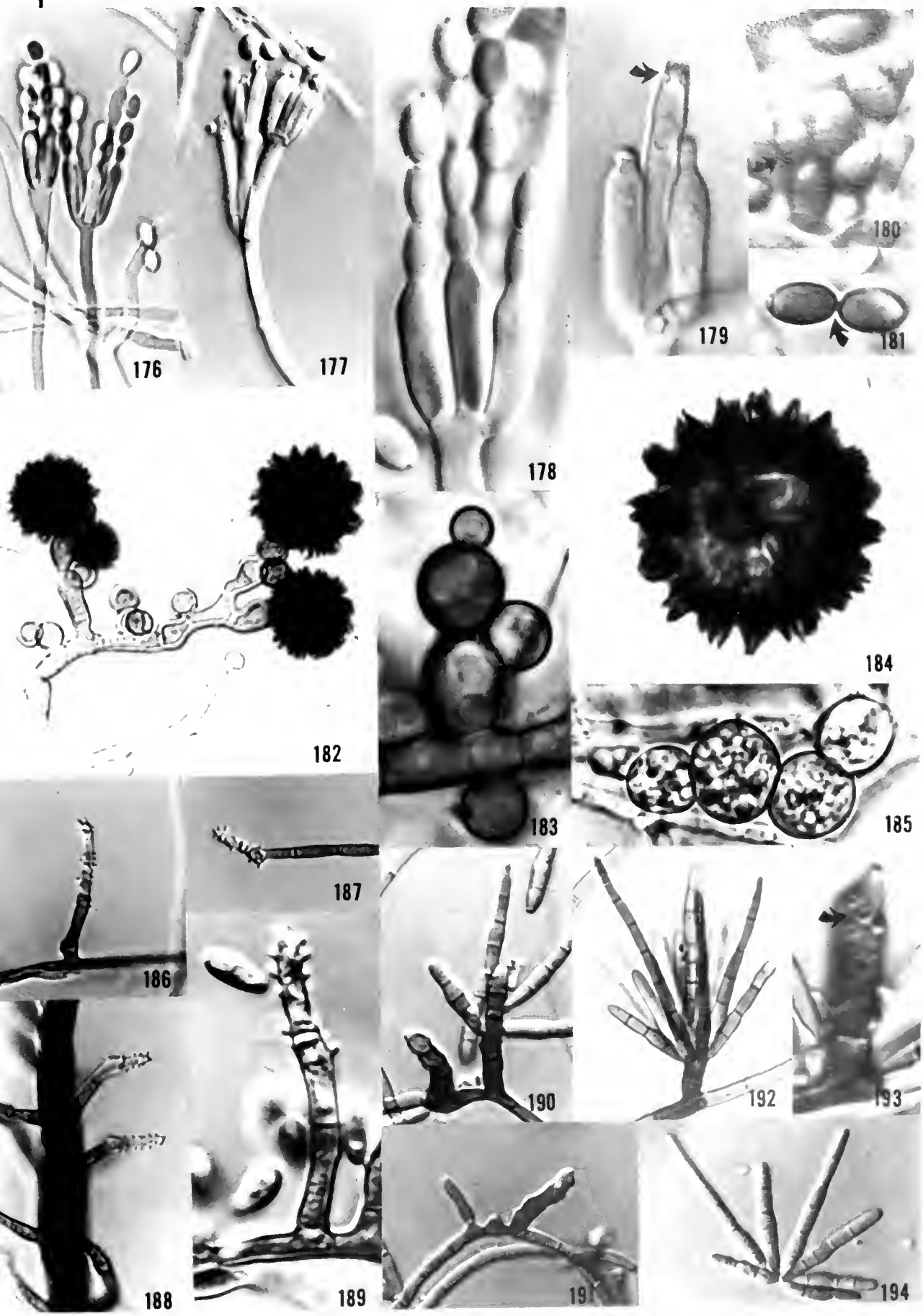
Fig. 182. Conidiophore. ×835.
Fig. 183. Conidiogenous cells. ×2090.
Fig. 184. Conidium. ×2090.
Fig. 185. Chlamydospores. ×2090.

Figs. 186-189. *Phaeoisaria clematidis.*

Figs. 186, 187. Conidiophores. ×835.
Fig. 188. Conidiophores on funiculose hyphae. ×835.
Fig. 189. Conidiophore showing denticles and developing conidium. ×2090.

Figs. 190-194. *Phaeoramularia* sp.

Figs. 190-192. Conidiophores. ×835.
Fig. 193. Conidiogenous cell with circular conidiogenous scars (arrow). ×2090.
Fig. 194. Cluster of conidia. ×835.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Figs. 195-197. *Phialophora gregata.*

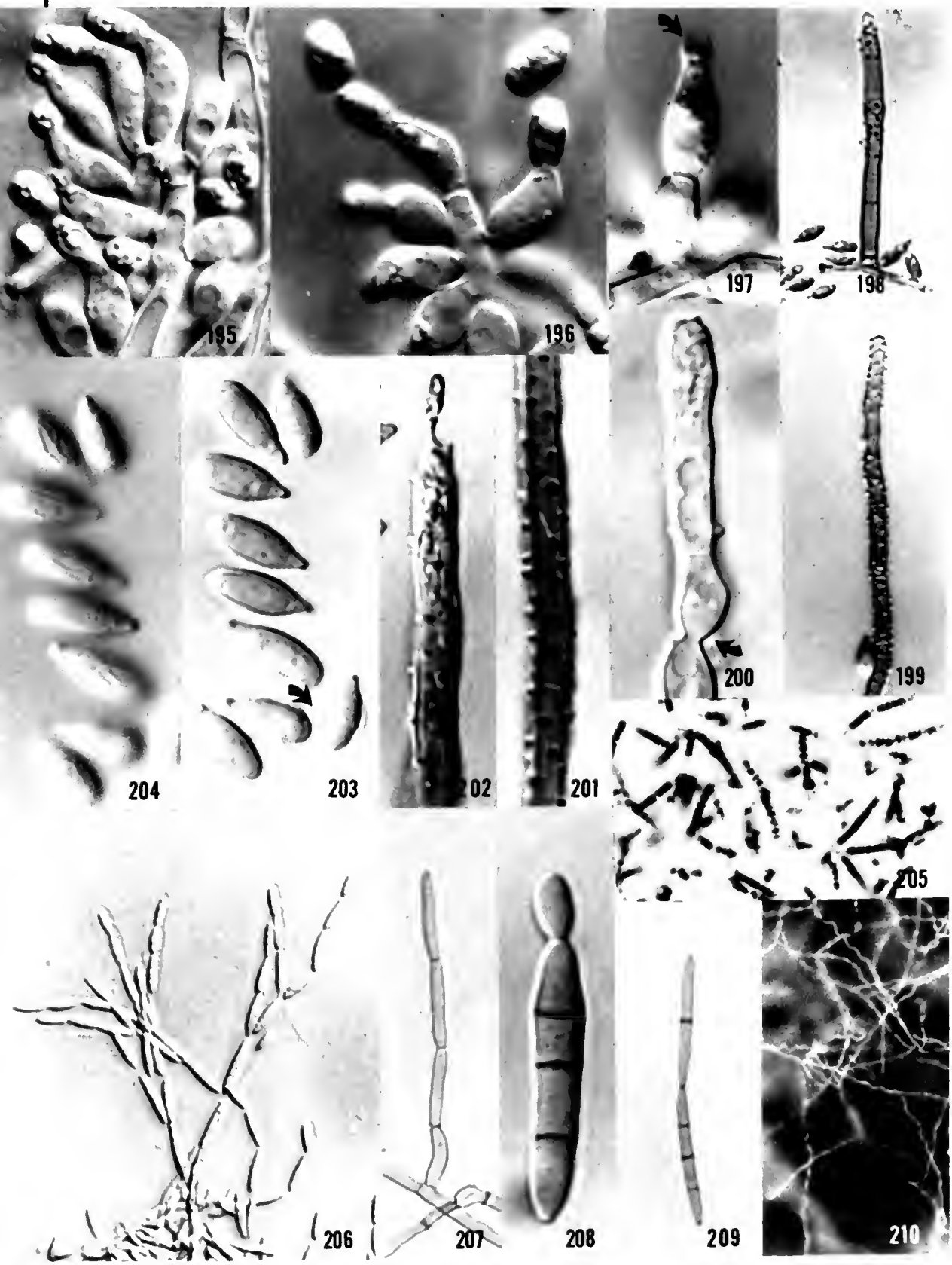
Fig. 195. Cluster of conidiogenous cells. ×2090.
Fig. 196. Conidiogenous cells and conidia. ×2090.
Fig. 197. Conidiogenous cell with collarette (arrow). ×2090.

Figs. 198-205. *Ramichloridium schulzeri* var. *schulzeri.*

Figs. 198-199. Conidiophores. ×835.
Fig. 200. Conidiophore constricted at base (arrow). ×2090.
Fig. 201. Denticles on conidiophore. ×2090.
Fig. 202. Conidiogenous apex and developing conidium. ×2090.
Fig. 203. Conidia. Arrow indicates hyaline perisporium. ×2090.
Fig. 204. Conidial wall ornamentation. ×2090.
Fig. 205. Conidiophores covered with conidia in culture. ×200.

Figs. 206-210. *Septonema chaetospira.*

Fig. 206. Conidiophore and branched chains of conidia. ×835.
Fig. 207. Conidiophore. ×835.
Fig. 208. Conidium with new conidium forming at apex. ×2090.
Fig. 209. Conidia. ×835.
Fig. 210. Spirally twisted chains of conidia in culture. ×100.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Figs. 211-215. *Staphylotrichum coccosporum.*

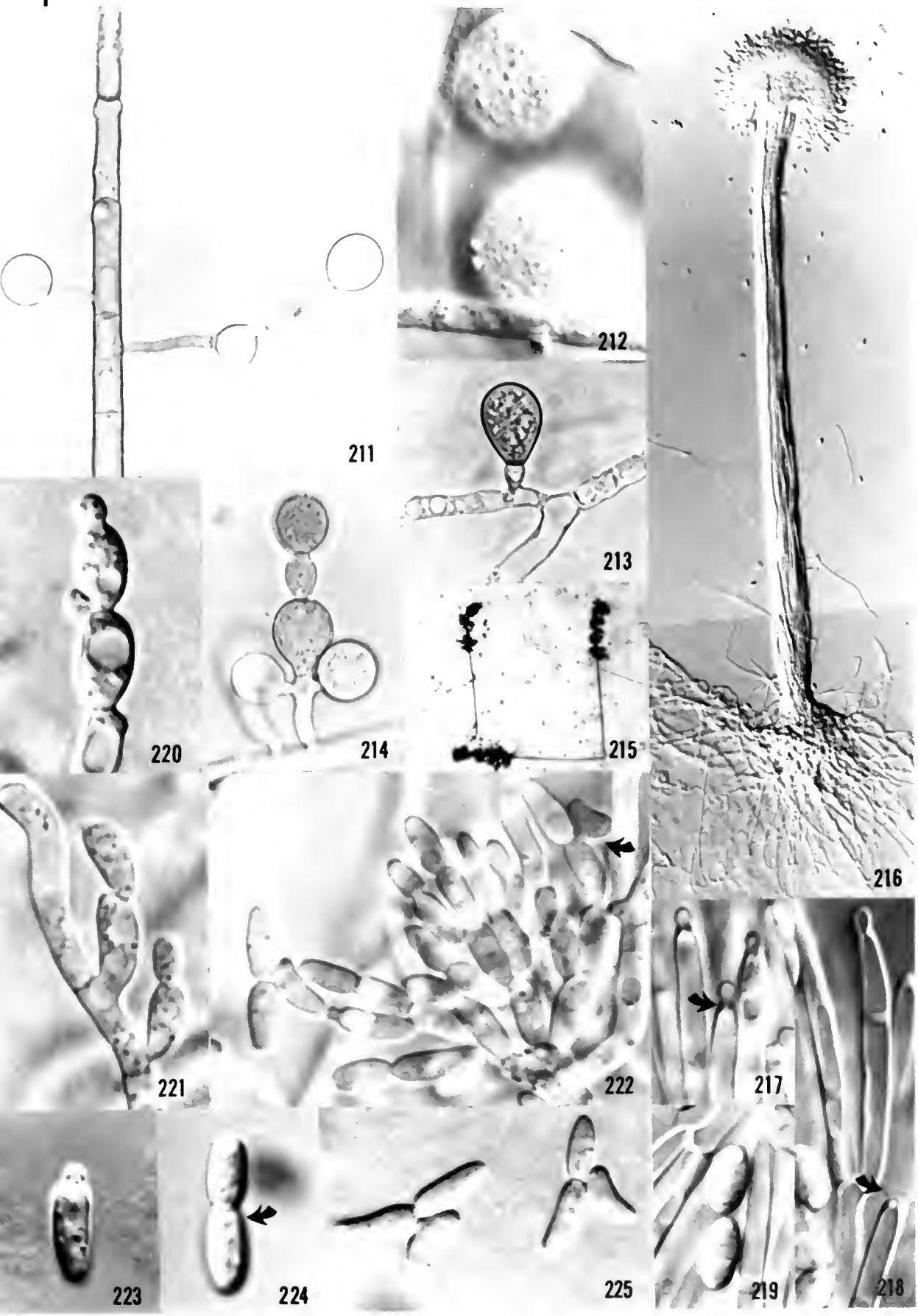
Fig. 211. Branch of conidiophore. ×835.
Fig. 212. Roughenings on conidial walls. ×2090.
Fig. 213. Mycelial conidium. ×835.
Fig. 214. Catenate conidia. ×835.
Fig. 215. Conidiophores and conidia in culture. ×40.

Figs. 216-219. *Stilbella bulbicola.*

Fig. 216. Synnema. ×209.
Fig. 217. Conidiogenous cells with periclinal thickening (arrow). ×209.
Fig. 218. Conidiogenous cells with collarette (arrow). ×2090.
Fig. 219. Conidia. ×2090.

Figs. 220-225. *Tricellula inaequalis.*

Figs. 220-222. Conidiogenous cells. Arrow indicates developing conidium. ×2090.
Figs. 223, 224. Developing conidia. Arrow indicates primary cell. ×2090.
Fig. 225. Mature conidia. ×2090.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Figs. 226-230. *Trichocladium opacum.*

Fig. 226. Cluster of conidia forming in agar. ×50.
Fig. 227. Aerial conidium with membranous vesicle (arrow). ×835.
Fig. 228. Aerial conidium. ×835.
Figs. 229, 230. Conidia formed in agar. ×835.

Figs. 231-233. *Trichoderma koningii.*

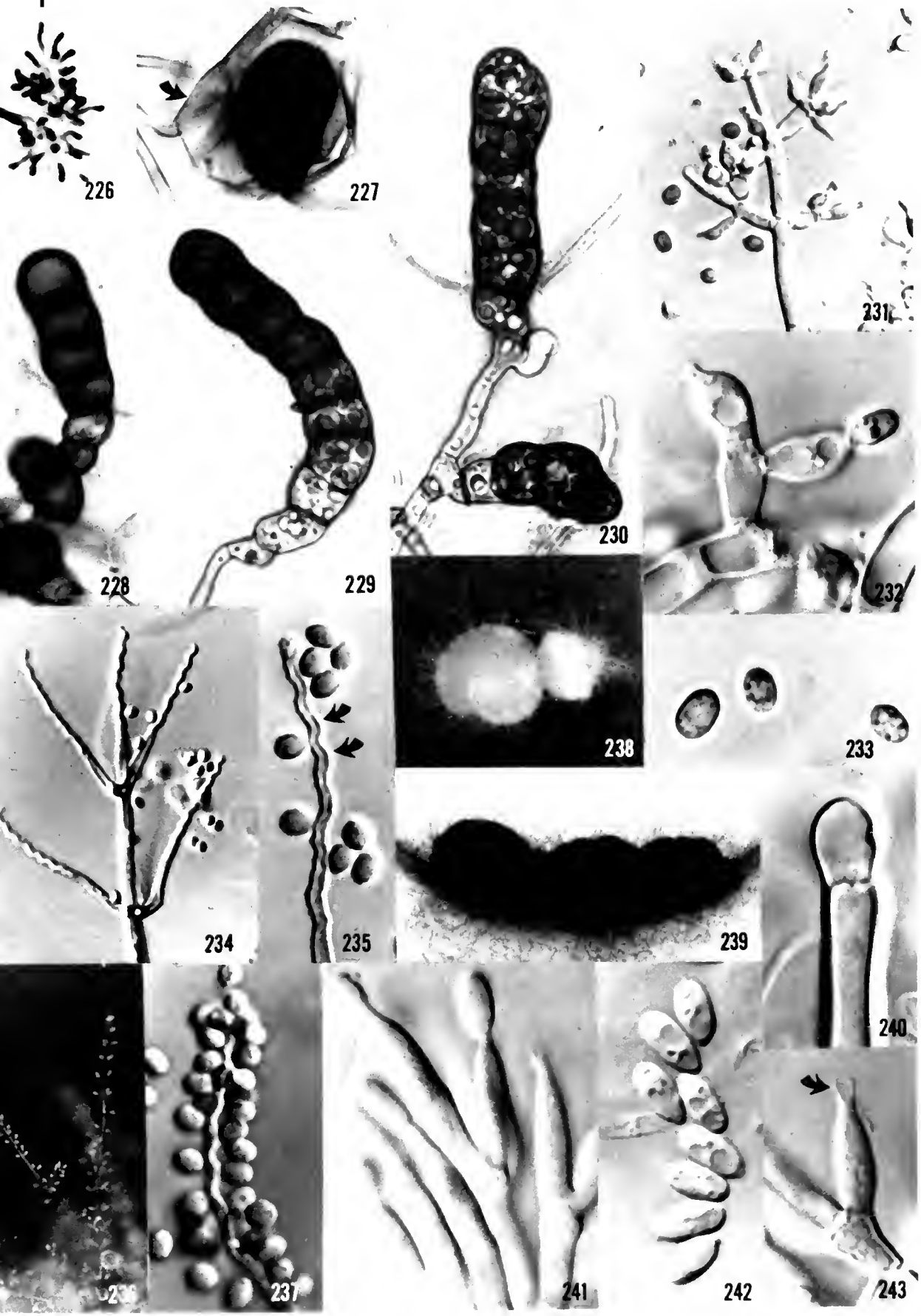
Fig. 231. Conidiophore. ×835.
Fig. 232. Conidiogenous cells. ×2090.
Fig. 233. Conidia. ×2090.

Figs. 234-237. *Tritirachium oryzae.*

Fig. 234. Apical portion of whorled conidiophore. ×875.
Fig. 235. Conidiogenous cell. Arrows indicate flattened conidial secession scars. ×2188.
Fig. 236. Conidiophores in culture. ×60.
Fig. 237. Conidiogenous cell and conidia. ×2188.

Figs. 238-243. *Volutella ciliata.*

Figs. 238, 239. Sporodochia in culture. Note fringes of setae. ×75.
Fig. 240. Apex of seta showing thickened walls. ×2090.
Fig. 241. Conidiogenous cells. ×2090.
Fig. 242. Conidia. ×2090.
Fig. 243. Conidiogenous cell with collarette (arrow). ×2090.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Figs. 244-247. *Microsphaeropsis olivacea.*

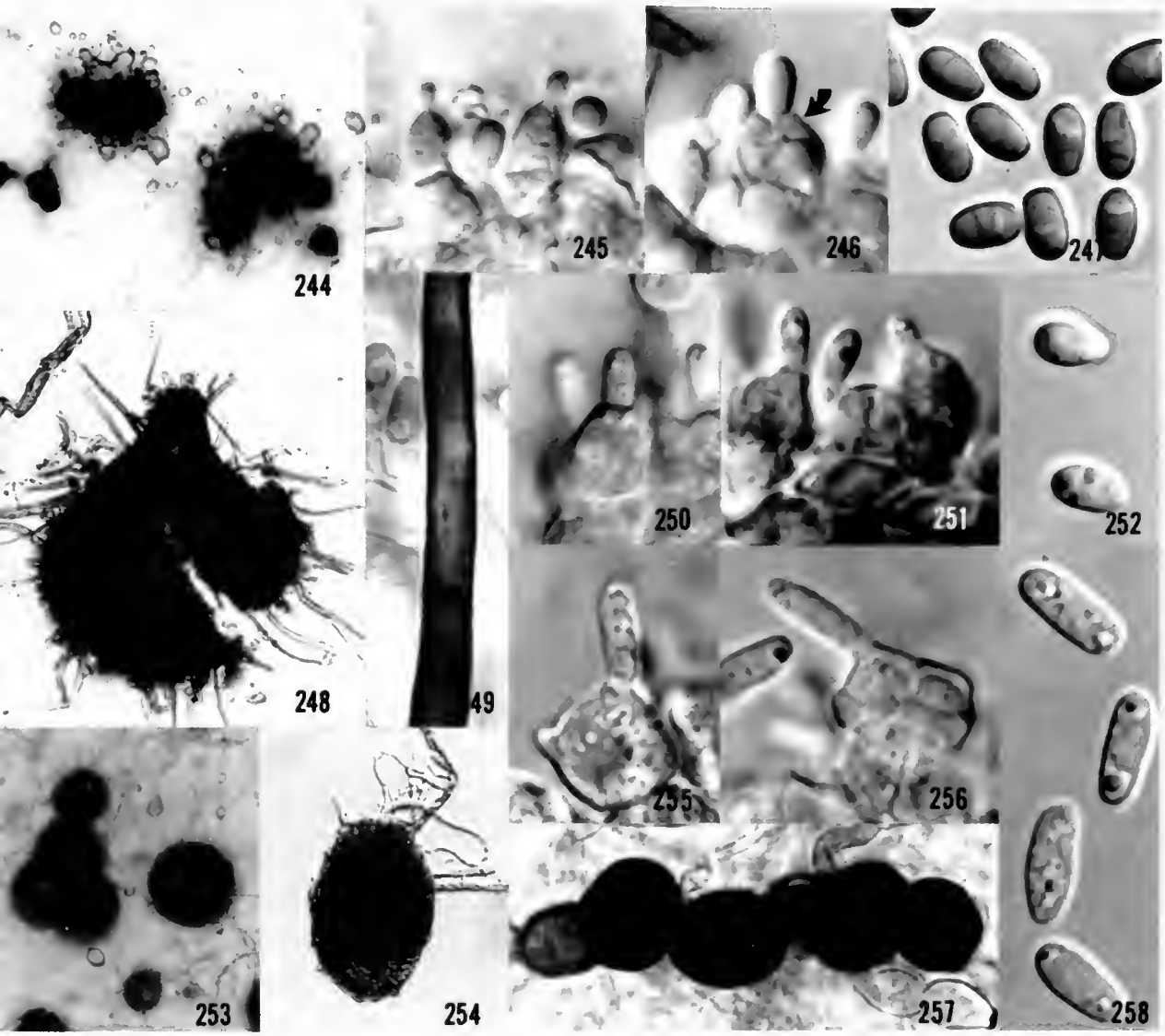
Fig. 244. Pycnidia in culture. ×30.
Figs. 245, 246. Conidiogenous cells. Arrow indicates periclinal thickening. ×2090.
Fig. 247. Conidia. ×2090.

Figs. 248-252. *Paraphoma radicina.*

Fig. 248. Pycnidium. ×150.
Fig. 249. Pycnidial hair. ×2090.
Fig. 250, 251. Conidiogenous cells. ×2090.
Fig. 252. Conidia. ×2090.

Figs. 253-258. *Phoma medacaginis* var. *pinodella.*

Fig. 253. Pycnidia in culture. Note 2 ostioles on pycnidium on right. ×60.
Fig. 254. Pycnidium. ×209.
Figs. 255-256. Conidiogenous cells. ×2090.
Fig. 257. Chlamydospores. ×835.
Fig. 258. Conidia. ×2090.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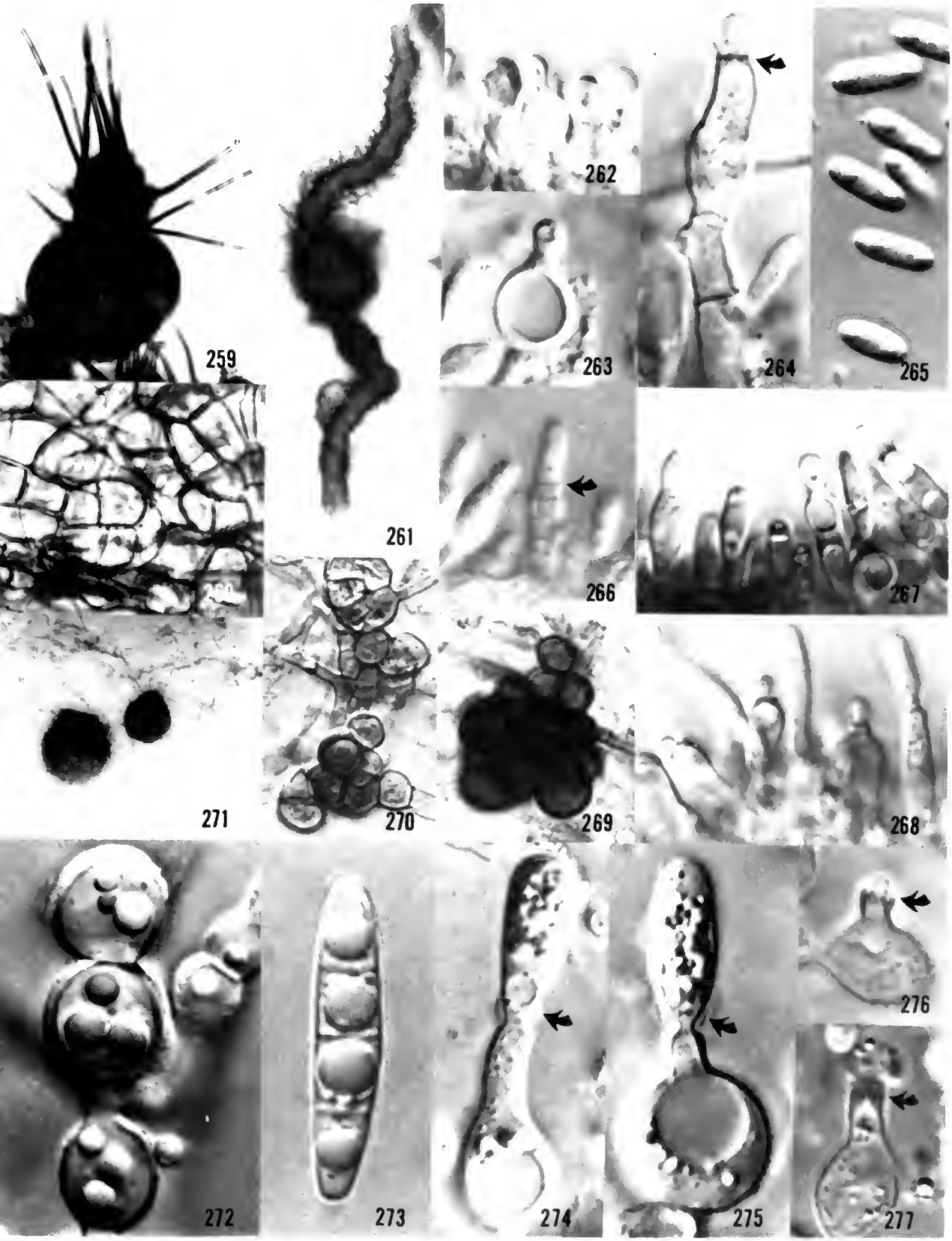
Figs. 259-270. *Pyrenochaeta terrestris.*

Fig. 259. Pycnidium with setose neck region. ×209.
Fig. 260. Peridium. ×835.
Fig. 261. Pycnidium with 2 elongate necks. ×100.
Figs. 262, 263. Simple conidiogenous cells. ×2090.
Fig. 264. Septate conidiophore. Arrow indicates periclinal thickening. ×2090.
Fig. 265. Conidia. ×2090.
Fig. 266. Conidiogenous cell with annellations (arrow). ×2090.
Fig. 267. Conidiogenous cells. ×2090.
Fig. 268. Conidiogenous cells with periclinal thickenings (on left) and annellations (on right). ×2090.
Figs. 269, 270. Chlamydospores. ×2090.

Figs. 271-277. *Stagonospora heteroderae.*

Fig. 271. Pycnidia in culture. ×40.
Fig. 272. Chlamydospores. ×2090.
Fig. 273. Conidium. ×2090.
Figs. 274, 275. Conidiogenous cells. Arrows indicate hyaline gelatinous material at base of conidia. ×2090.
Figs. 276, 277. Conidiogenous cells with periclinal thickenings (arrows). ×2090.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Figs. 278-283. *Chaetomium cochliodes.*

Fig. 278. Perithecium with coiled hairs. ×100.
Fig. 279. Peridium with *textura intricata*. ×2090.
Fig. 280. Ornamentation on perithecial hair. ×2090.
Figs. 281-282. Asci. ×835.
Fig. 283. Ascospore. ×2090.

Figs. 284-288. *Chaetomium perlucidum.*

Fig. 284. Perithecium with coiled hairs. ×100.
Fig. 285. Ornamentation on perithecial hair. ×2090.
Fig. 286. Asci. ×835.
Fig. 287. Ascospore. ×2090.
Fig. 288. Ascospore with subapical pore (arrow). ×2090.


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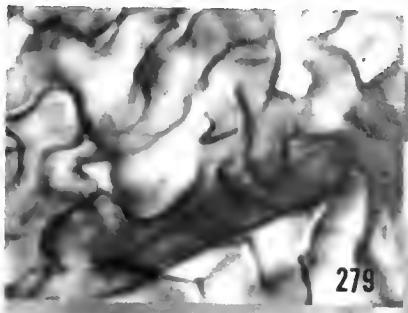
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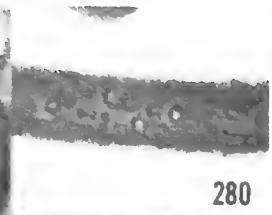
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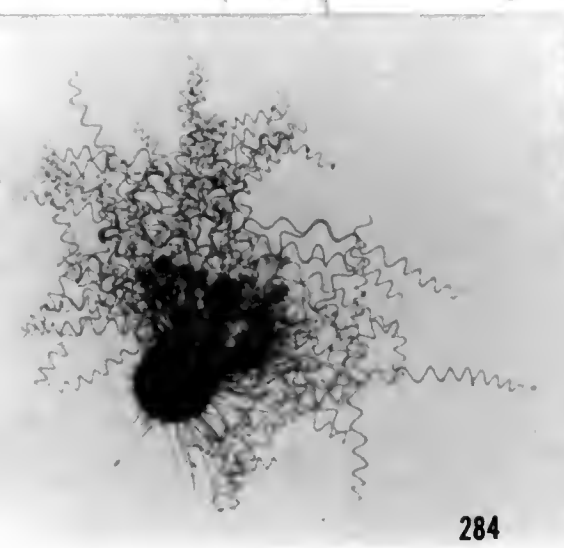
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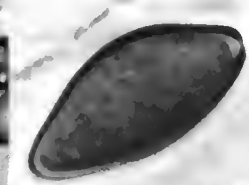
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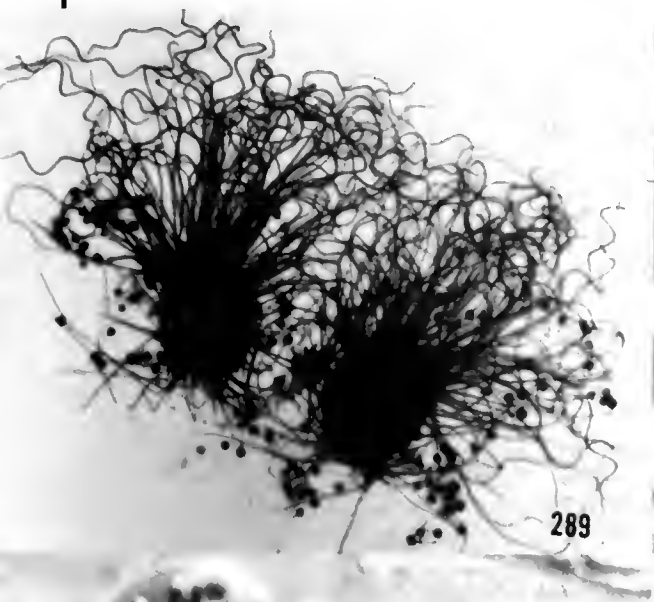
Figs. 289-299. *Chaetomium histoplasmoides.*

Fig. 289. Perithecia with coiled hairs. ×209.
Fig. 290. Peridium. ×835.
Fig. 291. Perithecium in culture. ×100.
Fig. 292. Ornamentation on perithecial hairs. ×2090.
Fig. 293. Developing asci. ×2090.
Fig. 294. Apical pore on ascospore (arrow). ×2090.
Fig. 295. Ascospores. ×835.
Fig. 296. Smooth-walled conidium. ×2090.
Figs. 297-298. Tuberculate conidia. ×2090.
Fig. 299. Mycelial hairs ("setae") in clusters on hyphal coils. ×40.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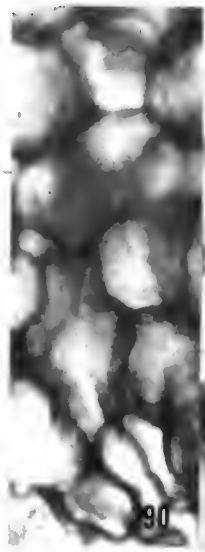
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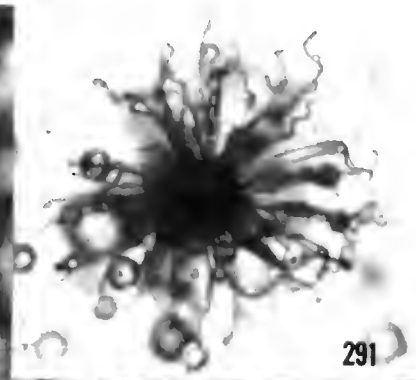
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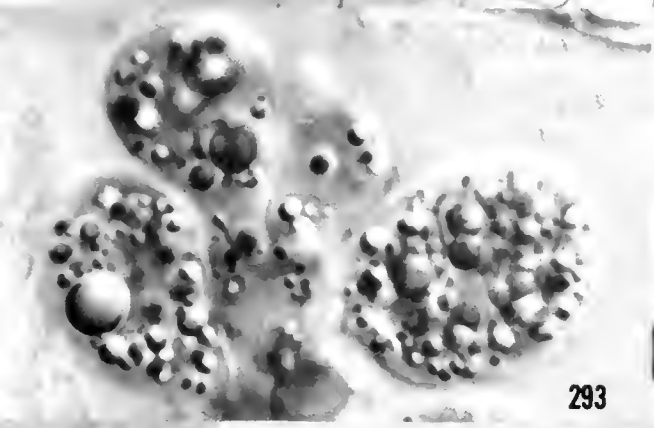
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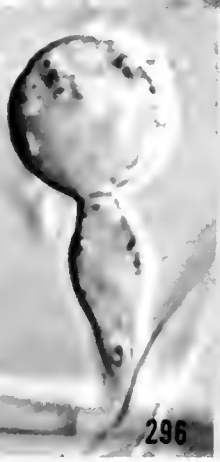
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Figs. 300-305. *Cristaspora arxii.*

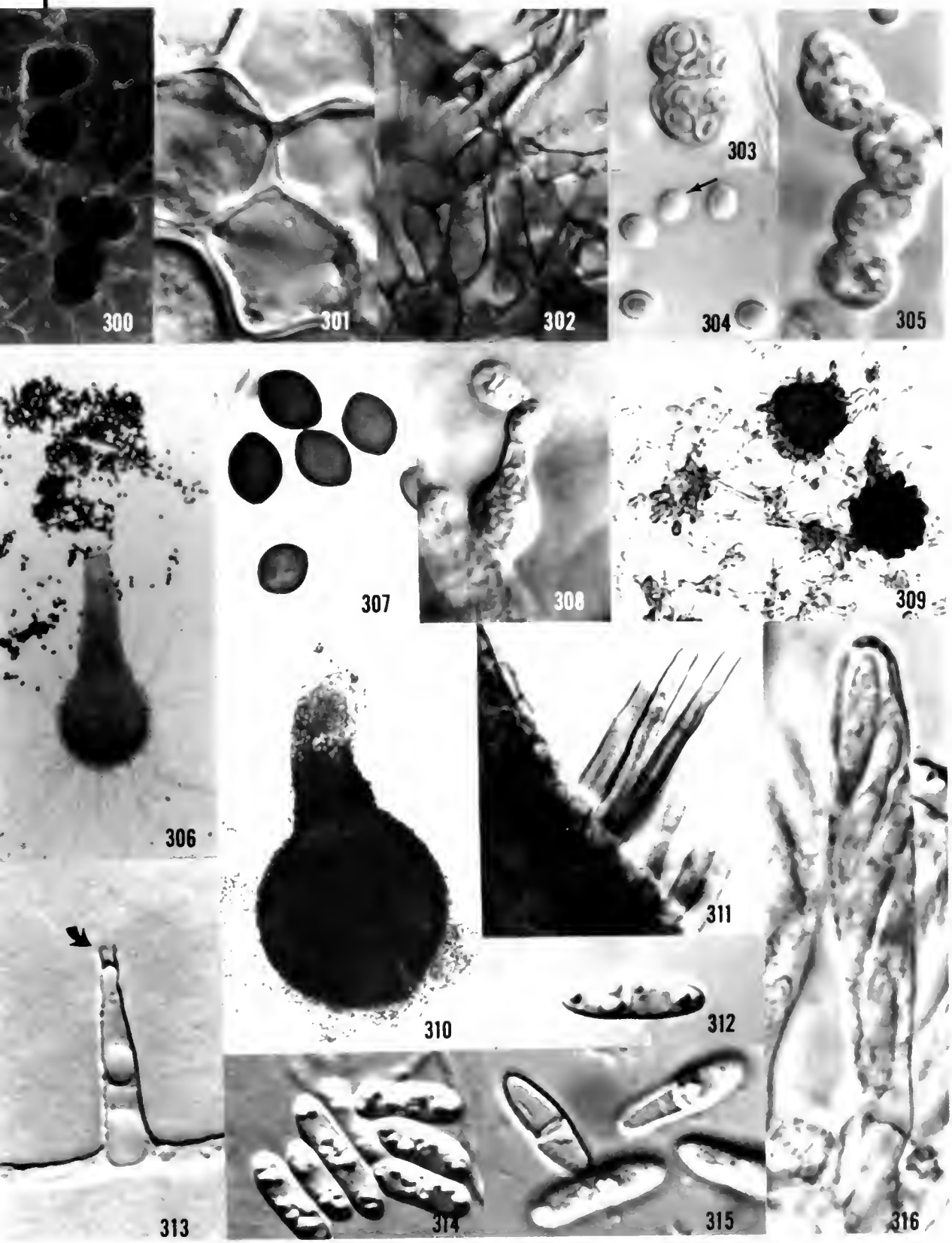
Fig. 300. Cleistothecia in culture. ×50.
Fig. 301. Peridium. ×2090.
Fig. 302. Overlaying hyphae on peridium. ×2090.
Fig. 303. Asci. ×2090.
Fig. 304. Ascospores with equatorial furrow (arrow). ×2090.
Fig. 305. Catenate asci. ×2090.

Figs. 306-309. *Melanospora zamiae.*

Fig. 306. Perithecium. ×70.
Fig. 307. Ascospores. ×835.
Fig. 308. Conidiogenous cell of anamorph. ×2090.
Fig. 309. Bulbil-like structures in culture. ×209.

Figs. 310-316. *Plectosphaerella cucumerina.*

Fig. 310. Perithecium. ×300.
Fig. 311. Perithecial hairs. ×835.
Fig. 312. Ascospore. ×2090.
Fig. 313. Conidiogenous cell of anamorph. ×2090.
Fig. 314. Conidia. ×2090.
Fig. 315. Roughening on ascospore walls. ×2090.
Fig. 316. Ascus. ×2090.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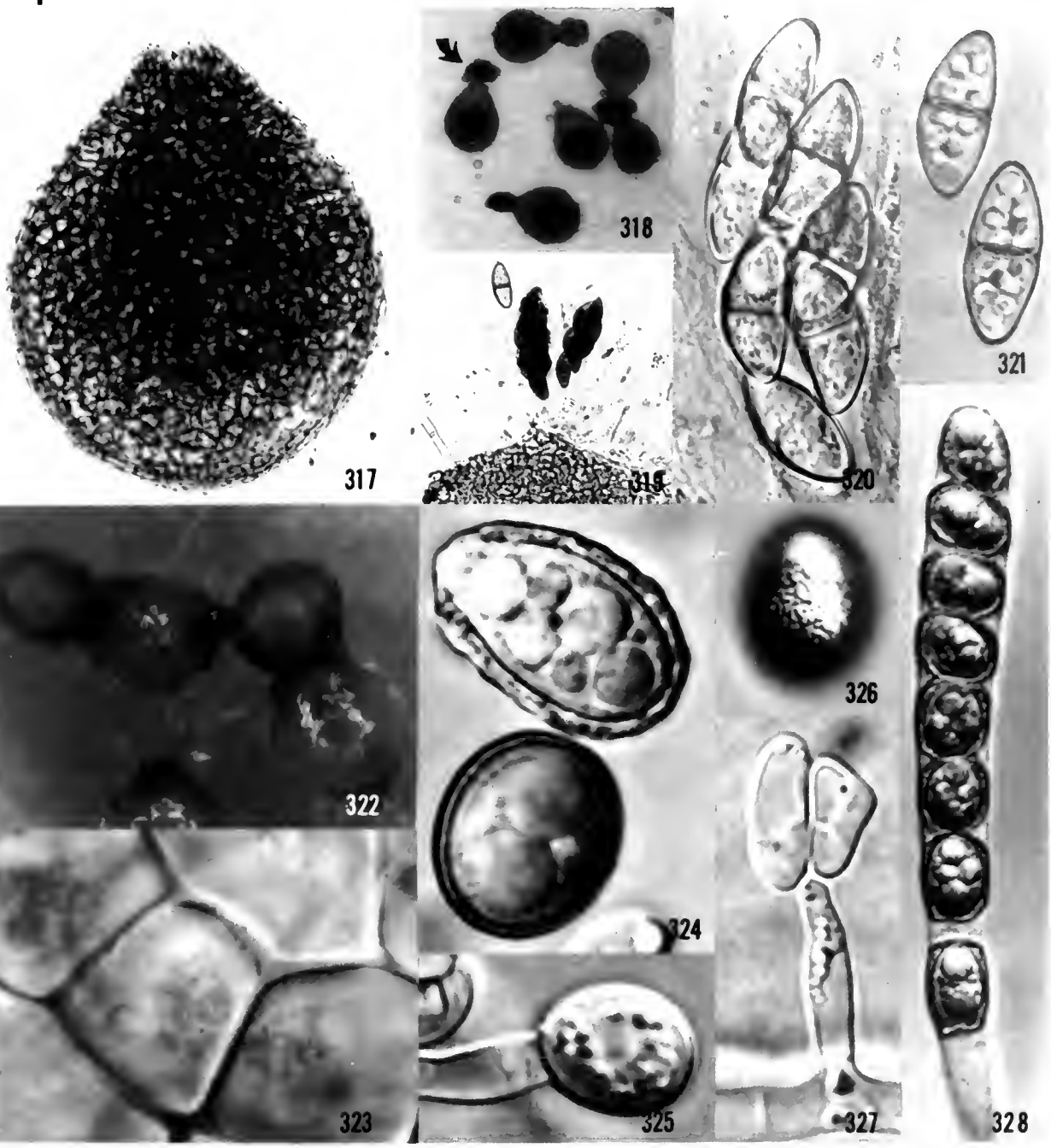
Figs. 317-321. *Nectria* sp.

Fig. 317. Perithecium. ×230.
Fig. 318. Perithecia in culture with ascospores in masses at ostioles (arrow). ×40.
Fig. 319. Asci. ×207.
Fig. 320. Ascus. ×835.
Fig. 321. Ascospores. ×835.

Figs. 322-328. *Neocosmospora vasinfecta*.

Fig. 322. Perithecia in culture with ascospores in masses at ostioles. ×70.
Fig. 323. Peridium. ×2164.
Fig. 324. Ascospores. ×2090.
Fig. 325. Chlamydospore. ×2090.
Fig. 326. Wall roughening on ascospore. ×2090.
Fig. 327. Conidiogenous cell and conidia of anamorph. ×2090.
Fig. 328. Ascus. ×835.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Figs. 329-334. *Thielavia ovispora.*

Fig. 329. Cleistothecia. ×835.
Fig. 330. Peridium. ×2090.
Fig. 331. Ascus. ×2090.
Fig. 332. Ascospores. Arrow indicates apical pore. ×2090.
Fig. 333. Conidia of anamorph. ×835.
Fig. 334. Cleistothecia in culture. ×60.

Figs. 335-343. *Trematosphaeria fallax.*

Fig. 335. Mature pseudothecia. ×75.
Fig. 336. Developing pseudothecium with hairs. ×40.
Fig. 337. Ascus (stained in cotton blue). ×209.
Figs. 338, 339. Ascospores. ×835.
Fig. 340. Ascospore on CMA. ×835.
Fig. 341. Peridium. ×2353.
Fig. 342. "Nassee" in ascus apex. ×2353.
Fig. 343. Chlamydospores. ×835.


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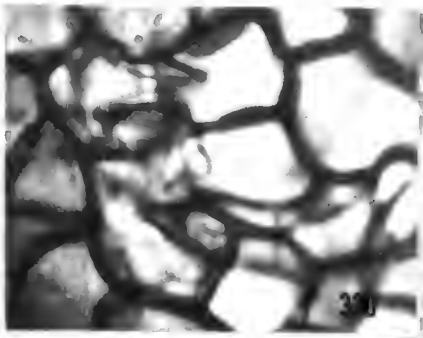
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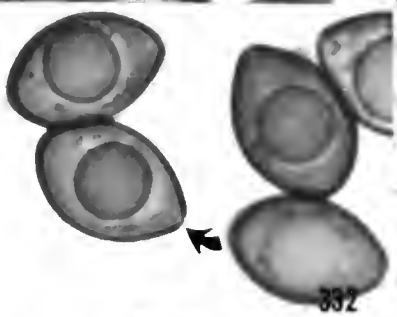
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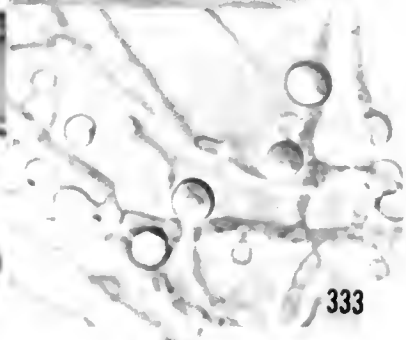
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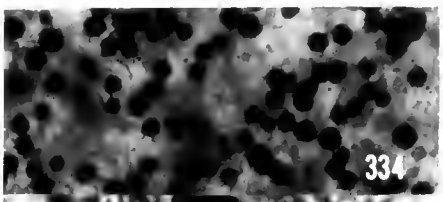
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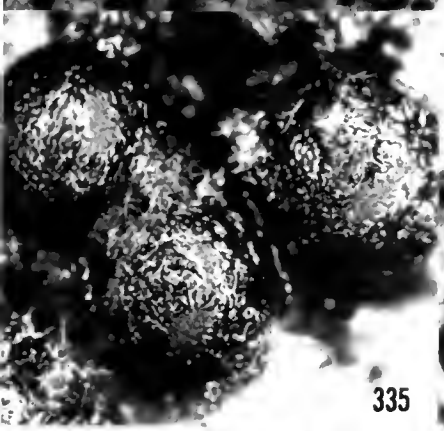
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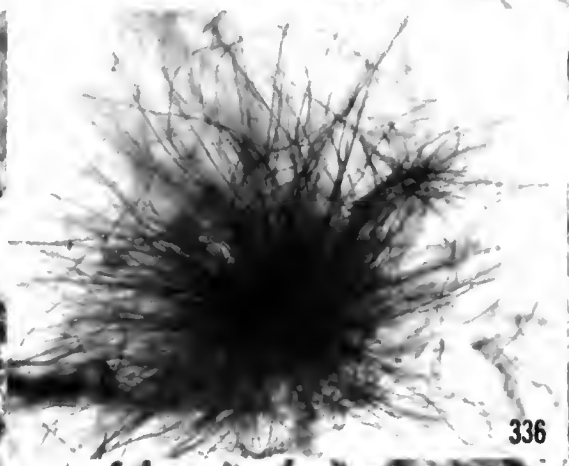
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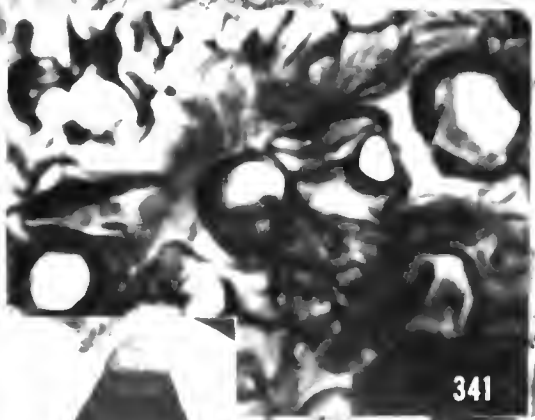
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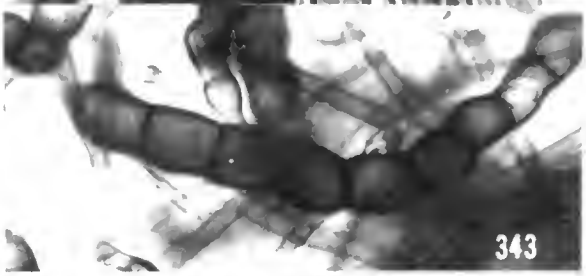
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Figs. 344-350. *Sistotrema brinkmannii*.

Fig. 344. Clamp connections. ×2090.
Fig. 345. Basidia. ×835.
Fig. 346. Seven-sterigmate basidium with basidiospores. ×2090.
Fig. 347. Basidiospores. ×2090.
Fig. 348. Aerial clusters of hyphae. ×50.
Fig. 349. Basidium and basidiospores. ×2090.
Fig. 350. *Ptychogaster*-like anamorph. Note clamp connections between cells. ×2090.

Figs. 351-355. *Mortierella elongata*.

Fig. 351. Sporangiospores. ×2090.
Fig. 352. Sporangiophore. ×835.
Fig. 353. Apex of sporangiophore. ×2090.
Fig. 354. Sporangium. ×2090.
Fig. 355. Chlamydospores. ×835.

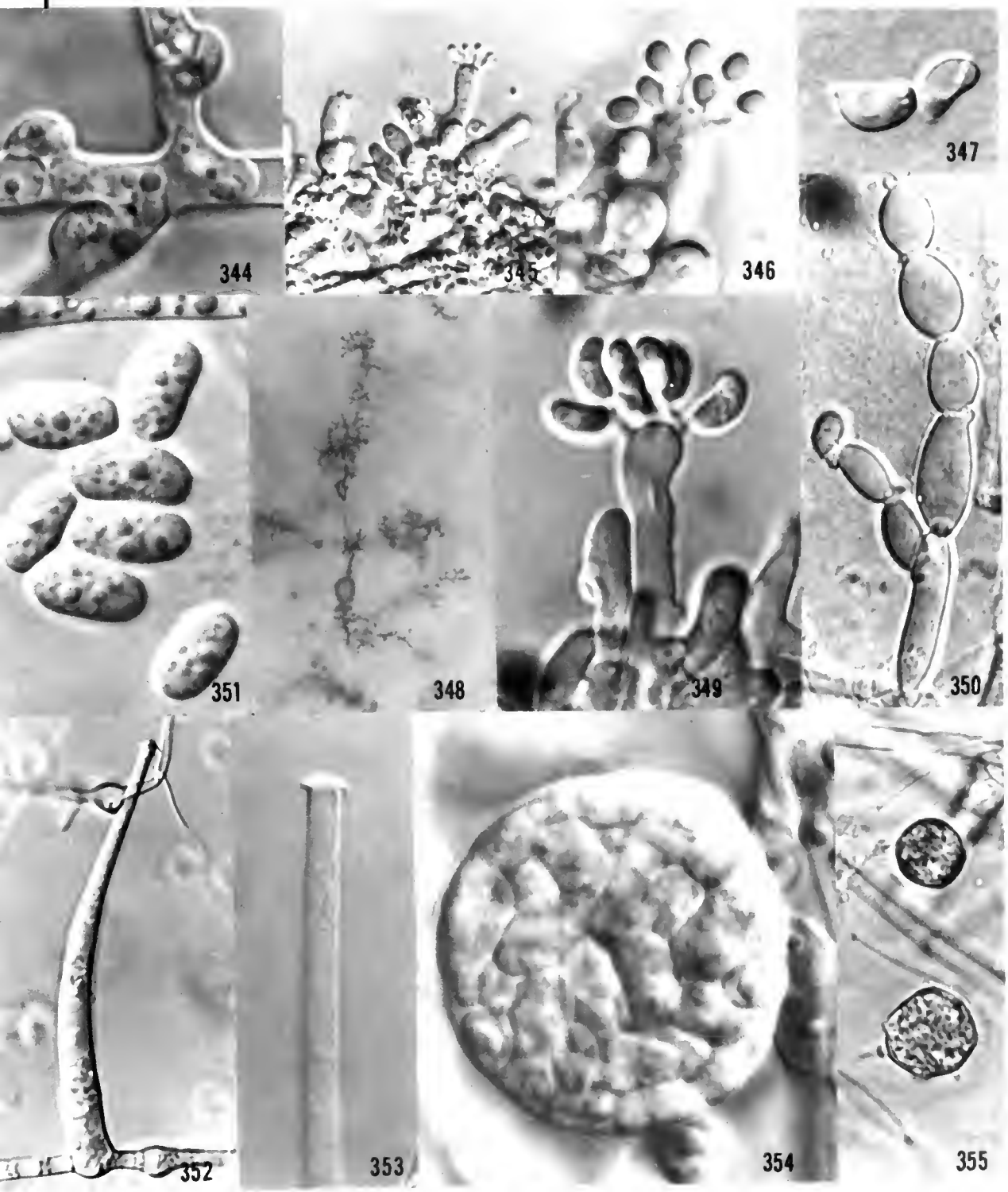
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Fig. 356. *Acremonium kiliense*. Fourteen days on CMA. ×0.90.
Fig. 357. *A. sclerotigenum*. Seven days on CMA. ×0.90.
Fig. 358. *Alternaria alternata*. Seven days on CMA. ×0.90.
Fig. 359. *Aphanocladium album*. Seven days on CMA. ×0.90.
Fig. 360. *Arthrobotrys oligospora*. One mo on CMA. ×0.80.
Fig. 361. *Arthrocladium caudatum*. Seven days on CMA. ×0.90.
Fig. 362. *Aureobasidium pullulans*. Seven days on CMA. ×0.80.
Fig. 363. *Botryotrichum piluliferum*. Five wk on PDA. ×0.80.
Fig. 364. *Camposporium pellucidum*. Seven days on CMA. ×0.90.
Fig. 365. *Chalara heteroderae*. Seven days on CMA. ×0.90.
Fig. 366. *Cladosporium cladosporioides*. Seven days on CMA. ×0.90.
Fig. 367. *Botryotrichum piluliferum*. Five wk on PDA. ×0.80.

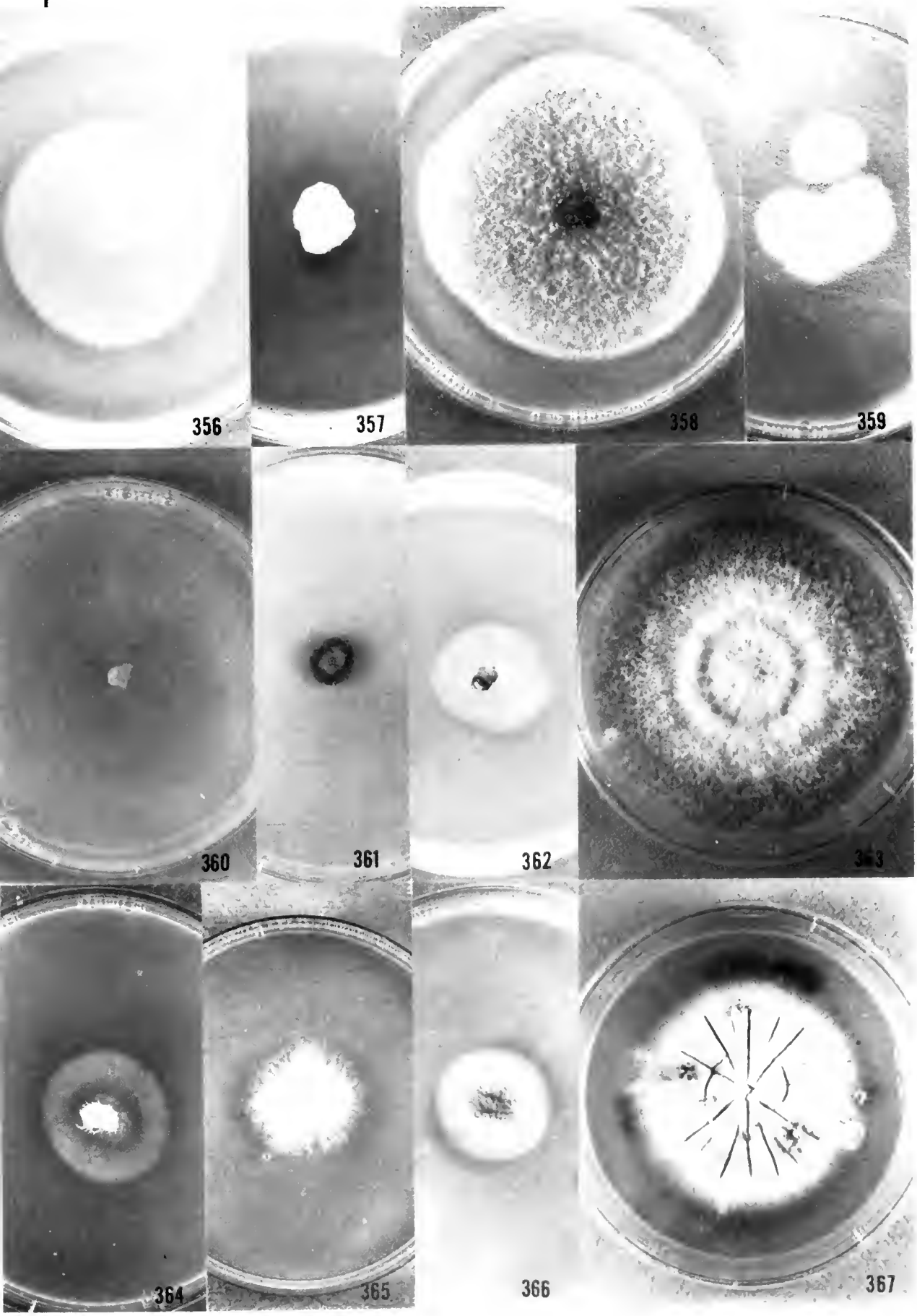
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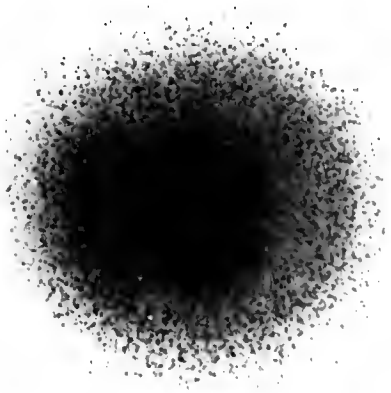
Fig. 368. *Corynespora cassiicola*. Five wk on CMA. ×0.90.
Fig. 369. *Cylindrocarpon destructans*. Seven days on CMA. ×0.80.
Fig. 370. *C. fusiforme*. Twenty-one days on CMA. ×0.90.
Fig. 371. *C. magnusianum*. One mo on CMA. ×0.90.
Fig. 372. *Dactylaria acerosa*. One mo on MEA. ×0.90.
Fig. 373. *Drechslera avenae*. One mo on CMA. ×0.86.
Fig. 374. *Dendryphion nanum*. Seven days on CMA. ×0.80.
Fig. 375. *Diheterospora chlamydosporia*. Fourteen days on CMA. ×0.90.
Fig. 376. *Engyodontium album*. Seven days on CMA. ×0.86.
Fig. 377. *Epicoccum purpurascens*. Seven days on CMA. ×0.86.



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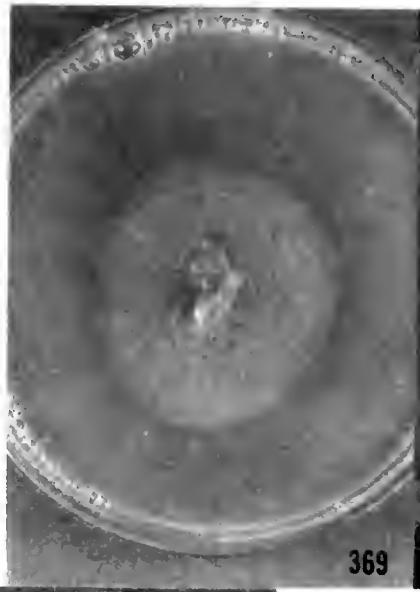

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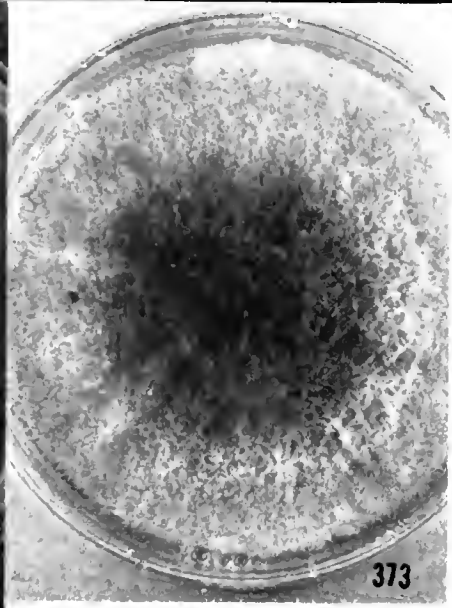

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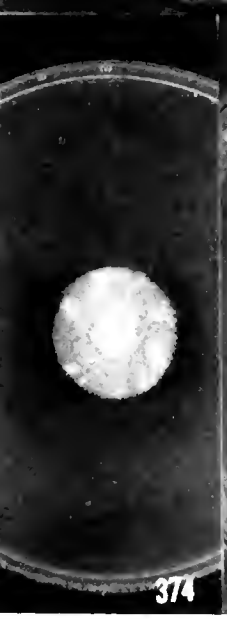

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Fig. 378. *Exophiala pisciphila*. Seven days on CMA. ×0.80.
Fig. 379. *Fusarium aquaeductuum* var. *medium*. Seven days on CMA. ×0.90.
Fig. 380. *F. equiseti*. Fourteen days on CMA. ×0.90.
Fig. 381. *F. oxysporum*. Seven days on CMA. ×0.90.
Fig. 382. *F. solani*. Seven days on CMA. ×0.80.
Fig. 383. *Geniculosporium* sp. One mo on CMA. ×0.90.
Fig. 384. *Gliocladium catenulatum*. Seven days on CMA. ×0.90.
Fig. 385. *Gonytrichum macrocladium*. Ten days on CMA. ×0.80.
Fig. 386. *Humicola fuscoatra*. Seven days on CMA. ×0.90.
Fig. 387. *Geniculosporium* sp. One mo on PDA. ×0.90.
Fig. 388. *Gliocladium roseum*. Seven days on CMA. ×0.90.

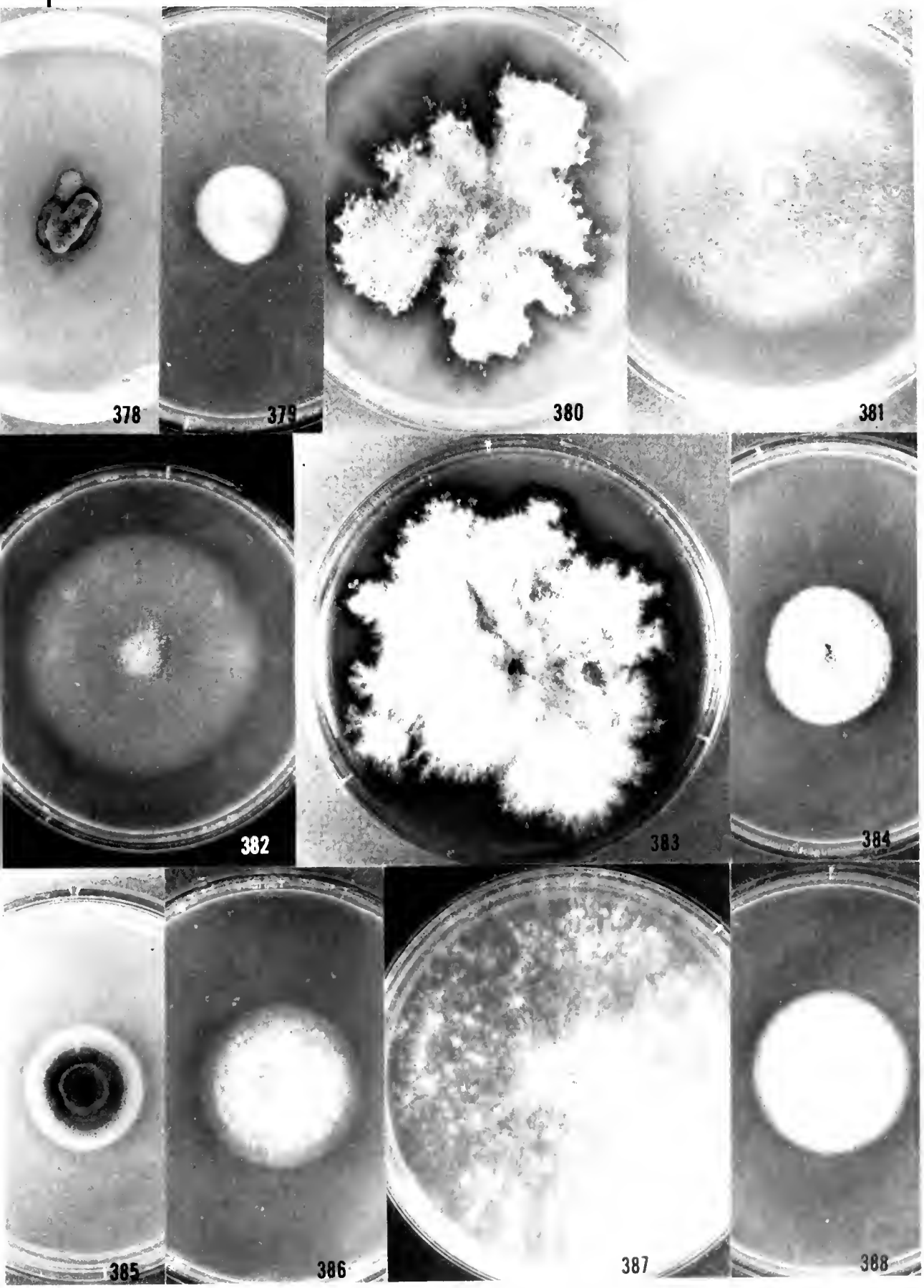
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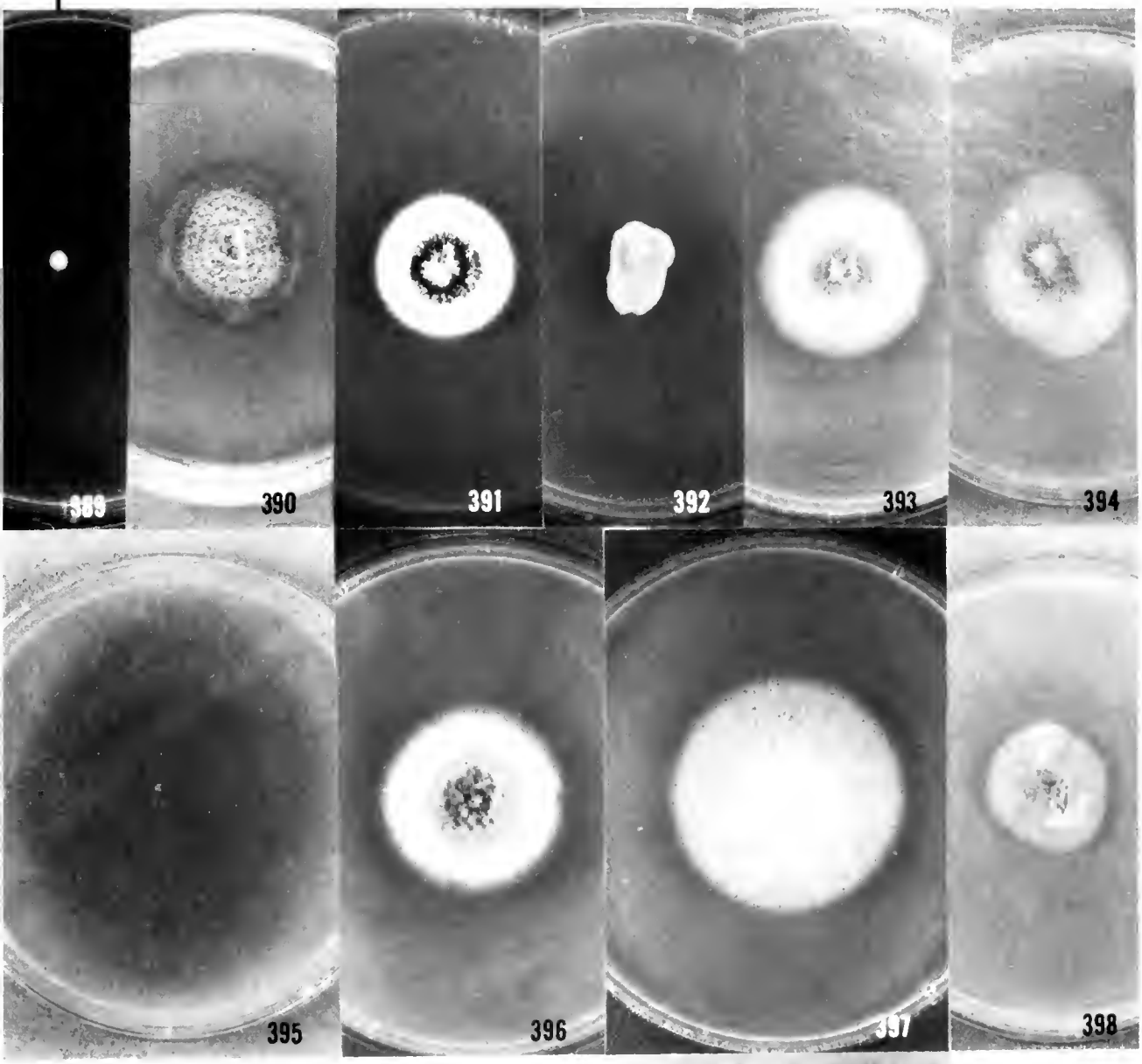
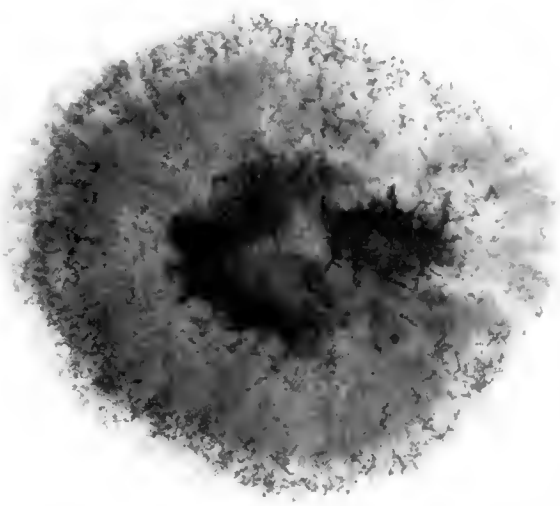
Fig. 389. *Lecythophora hoffmannii*. Seven days on CMA. ×0.90.
Fig. 390. *Mariannaea elegans*. Seven days on CMA. ×0.80.
Fig. 391. *Metarhizium anisopliae*. Seven days on CMA. ×0.90.
Fig. 392. *Mycocentrospora acerina*. Seven days on CMA. ×0.90.
Fig. 393. *Paecilomyces lilacinus*. Seven days on CMA. ×0.90.
Fig. 394. *P. marquandii*. Seven days on CMA. ×0.80.
Fig. 395. *Papulaspora* sp. Seven days on CMA. ×0.80.
Fig. 396. *Penicillium oxalicum*. Seven days on CMA. ×0.90.
Fig. 397. *Periconia macrospinosa*. Seven days on CMA. ×0.90.
Fig. 398. *Ramichloridium schulzeri* var. *schulzeri*. Seven days on CMA. ×0.80.
Fig. 399. *Phialophora gregata*. Seven days on CMA. ×5.00.
Fig. 400. *Ramichloridium schulzeri* var. *schulzeri*. Five wk on PDA. ×0.80.
Fig. 401. *Phaeoramularia* sp. Seven days on CMA. ×0.90.





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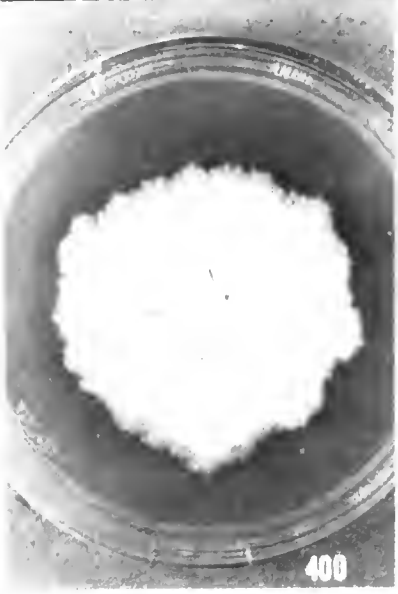

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Fig. 402. *Septonema chaetospira*. Seven days on CMA. ×0.90.
Fig. 403. *Staphylotrichum coccosporum*. Three wk on PDA. ×0.90.
Fig. 404. *Tricellula inaequalis*. Three wk on CMA. ×0.86.
Fig. 405. *Trichocladium opacum*. Seven days on CMA. ×0.90.
Fig. 406. *Trichoderma koningii*. Seven days on CMA. ×0.90.
Fig. 407. *Tritirachium oryzae*. Seven days on CMA. ×0.90.
Fig. 408. *Volutella ciliata*. Seven days on CMA. ×0.80.
Fig. 409. *Microsphaeropsis olivacea*. Seven days on CMA. ×0.80.
Fig. 410. *Paraphoma radicina*. Two mo on CMA. ×0.90.
Fig. 411. *Phoma medicaginis* var. *pinodella*. Seven days on PDA. ×0.80.
Fig. 412. *Pyrenochaeta terrestris*. Three wk on CMA. ×0.80.

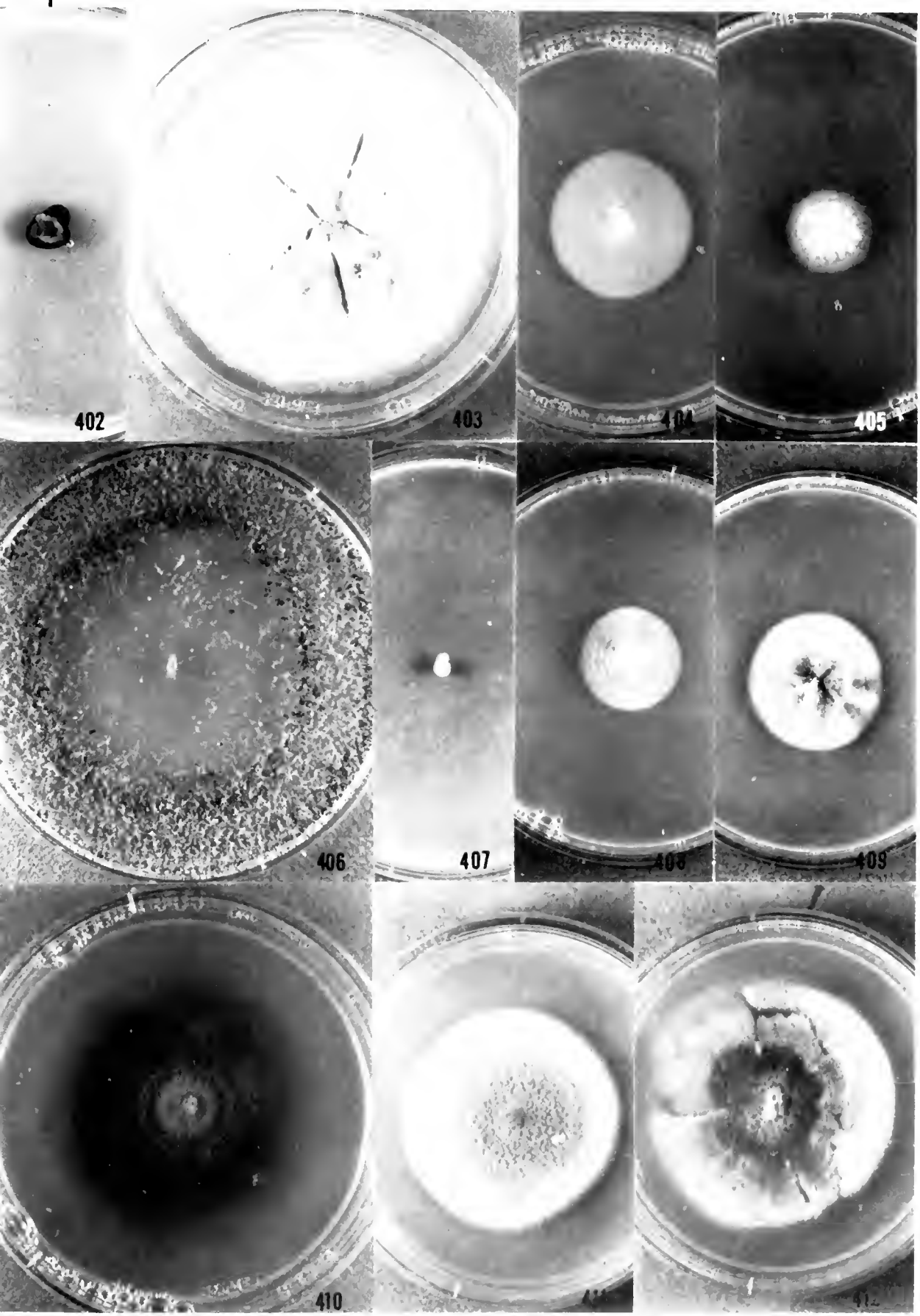
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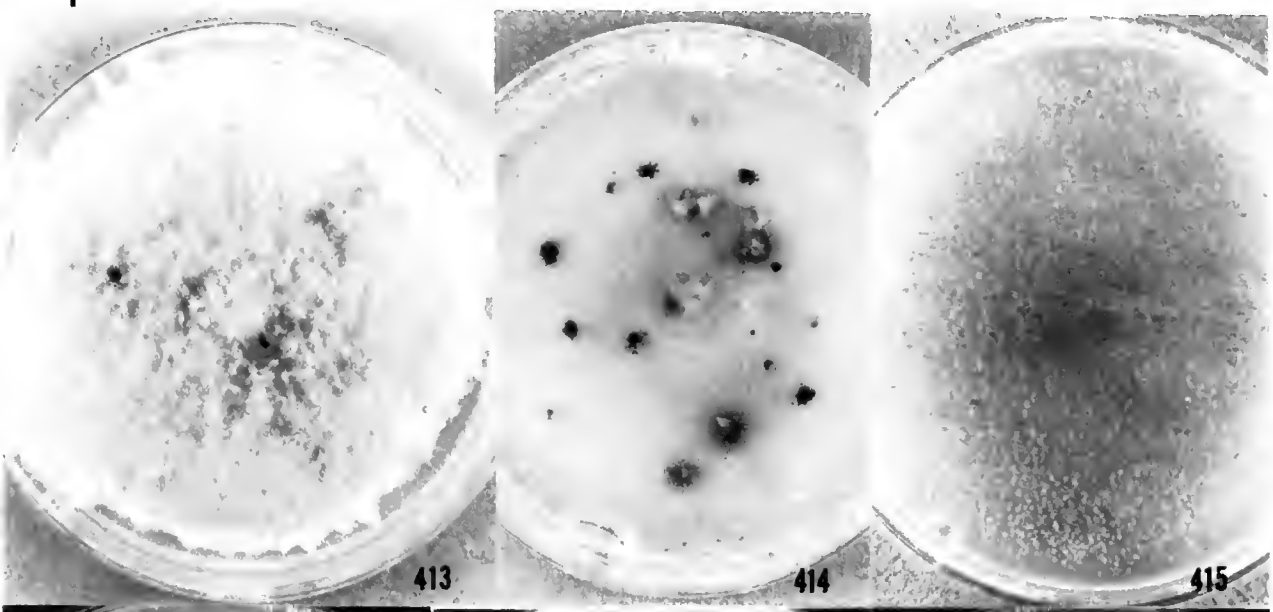
Fig. 413. *Stagonospora heteroderae*. Ten wk on CMA. ×0.86.
Fig. 414. *S. heteroderae*. Ten wk on CMA. ×0.86.
Fig. 415. *Chaetomium cochliodes*. Two wk on CMA. ×0.90.
Fig. 416. *C. histoplasmoides*. Two wk on CMA. ×0.90.
Fig. 417. *C. histoplasmoides*. Two wk on CMA. ×0.90.
Fig. 418. *C. histoplasmoides*. Two wk on CMA. ×0.90.
Fig. 419. *C. perlucidum*. One wk on CMA. ×0.90.
Fig. 420. *Cristaspora arxii*. Three wk on CMA. ×0.80.
Fig. 421. *Nectria* sp. One wk on CMA. ×0.80.
Fig. 422. *Neocosmospora vasinfecta*. Two mo on CMA. ×0.86.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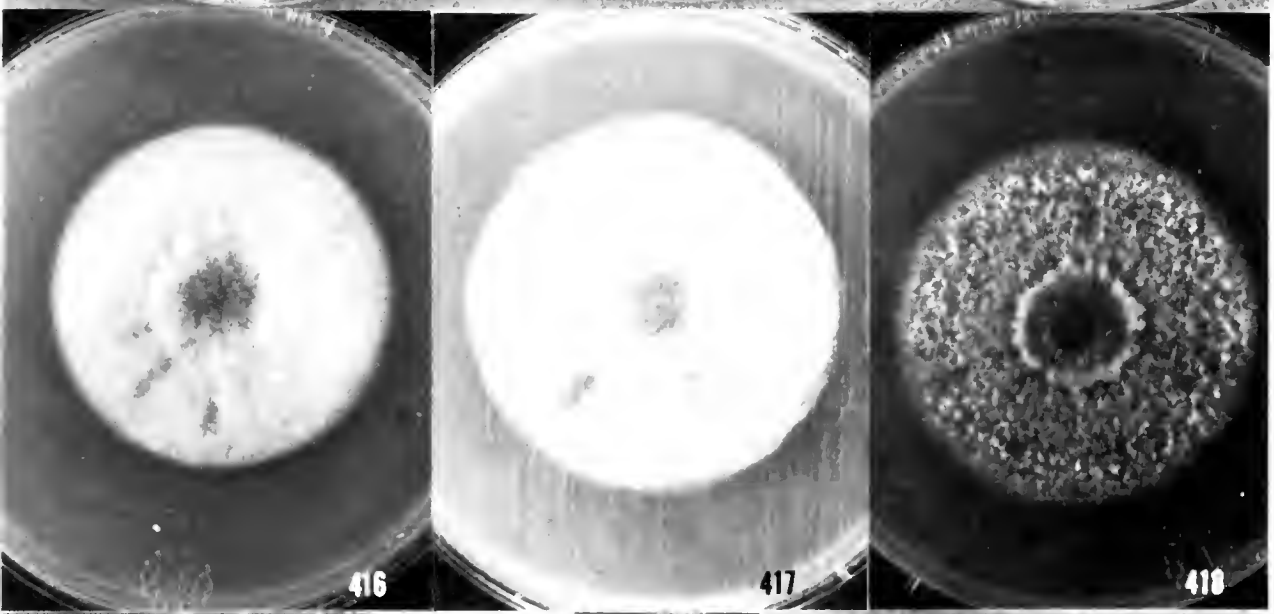
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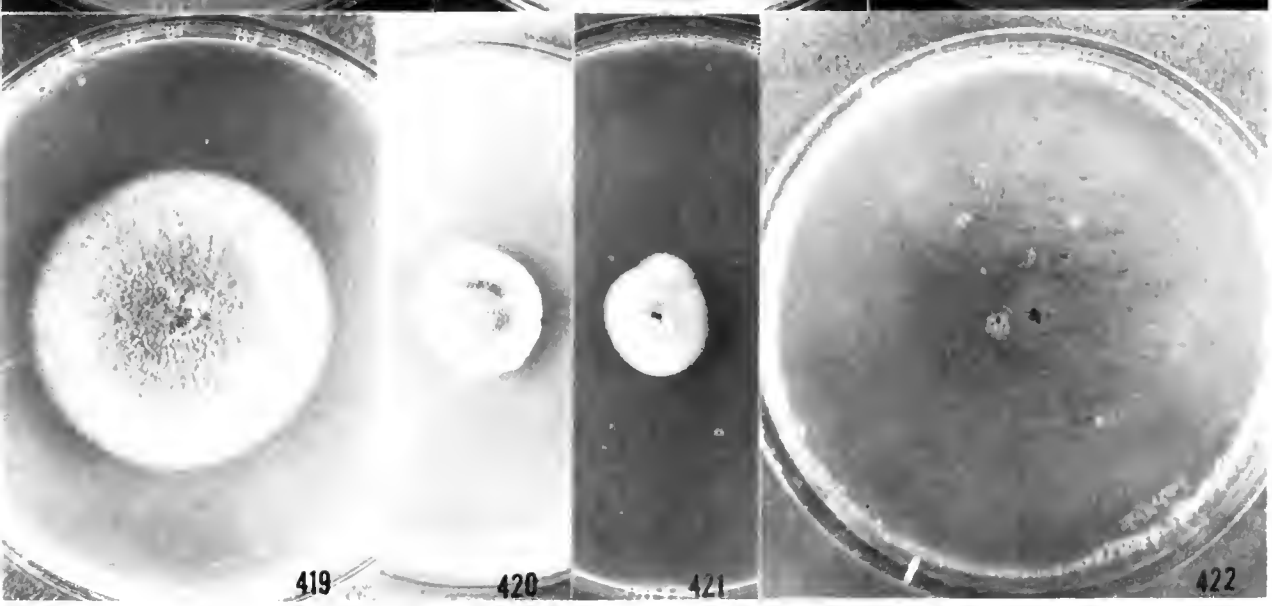
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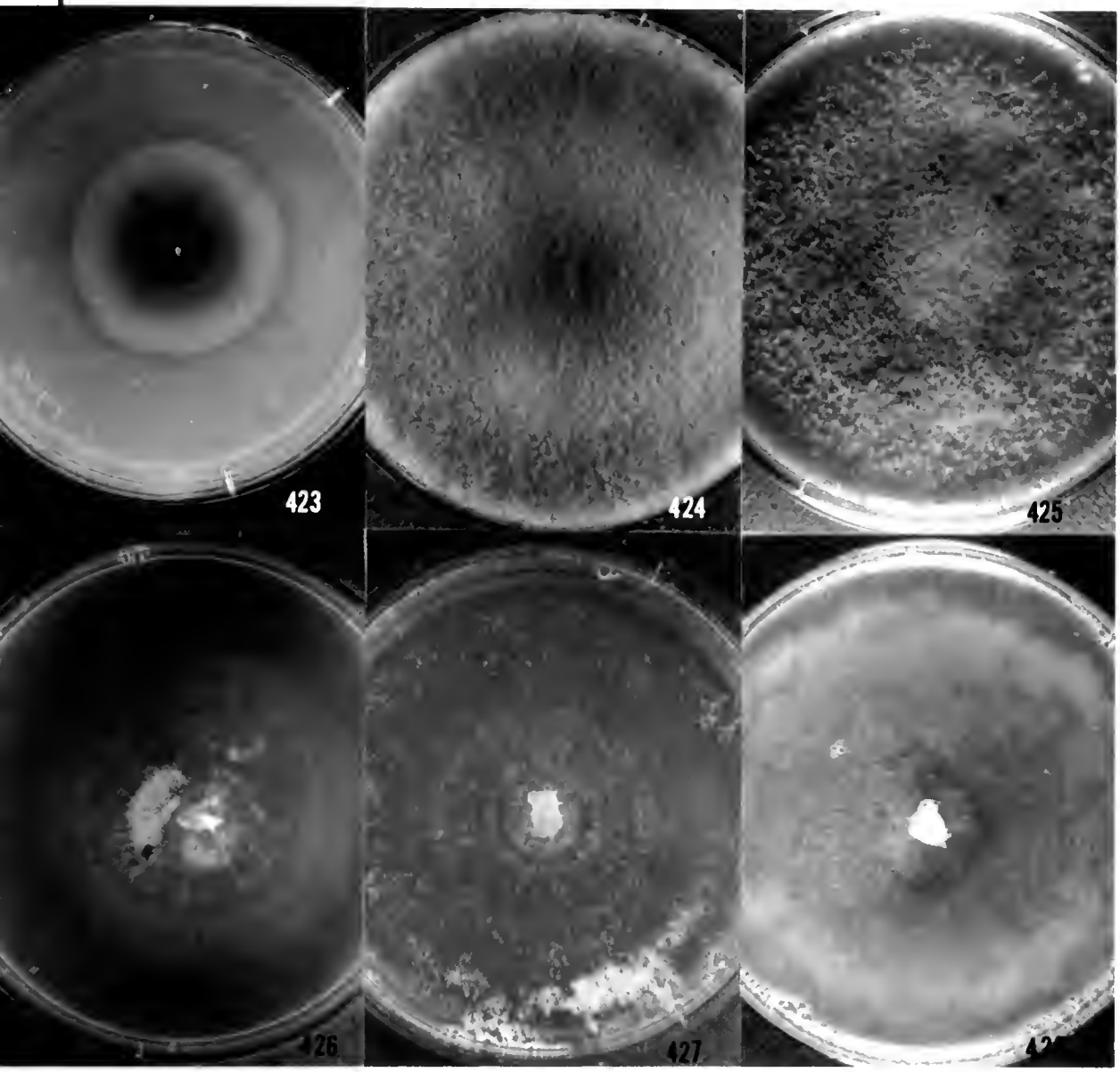
Fig. 423. *Thielavia ovispora*. Ten days on CMA. ×0.80.
Fig. 424. *Trematosphaeria fallax*. Two mo on CMA. ×0.90.
Fig. 425. *T. fallax*. Two mo on CMA. ×0.90.
Fig. 426. *Sistotrema brinkmannii*. Seven days on CMA. ×0.86.
Fig. 427. *S. brinkmannii*. Three wk on CMA. ×0.90.
Fig. 428. *Mortierella elongata*. One wk on CMA. ×0.90.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