EGGS OF MOTHS FROM ADDITIONAL SPECIES OF GEOMETRIDAE—LEPIDOPTERA[1]

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ABSTRACT

Eggs of the Geometridae have very few features typical of all species. The great majority are oval in shape and deposited on their sides. The eggs of a few species are vertical or at a 45° angle when deposited in clusters. As a rule they are not spherical or cone shaped as in Arctiidae and Notodontidae, or distinctly depressed and scale like with radiating ridges as in Noctuidae, or very flat overlapping masses as in Pyralidae and Tortricidae. One fact of significance is that eggs of species in a given genus usually resemble each other rather closely.

This report is a continuation of a study on some eggs of moths among the Geometridae presented in The Florida Entomologist, 1962, volume 45, pages 109-17. Since that date eggs from many additional species of geometrids have been seen. Most of them are presented in this publication.

The great majority of the eggs of the geometrids in this study came from females caught at "black lights" adjacent to a white cloth or in traps with a "black light" suspended over a metal funnel inserted in the top of a screened walkin cage or a screen covered, box-like container. The captured females were placed in polyethylene or paper bags or in polyethylene lined glass containers where they deposited their eggs on the polyethylene, paper, foliage, bark, or other objects placed in the deposition cages.

The following is a review of all eggs of the Geometridae seen to date. All references to figures reported on in 1962 will have a 62 before each numeral. The figures of the species and their descriptions are arranged in the same sequence as that found in J. McDunnough's 1938. Checklist of the Lepidoptera of Canada and the United States of America, Part 1, Macrolepidoptera. This arrangement was not used in the 1962 report.

Eggs of most species are oval and usually deposited on their sides, especially if the eggs are somewhat flattened (1, 8, 12, 21, 29, 37, 62-9). Rarely are they spherical or scale-like. Some species deposit their eggs in a vertical position (62-1, 62-22) or at a 45° angle (38, 62-2). Comparatively few deposit eggs in masses where they overlap (38, 39, 62-2, 62-5).

Most geometrid eggs possess an external transparent adhesive coating. Many are very adhesive and cannot be removed from the substrate to

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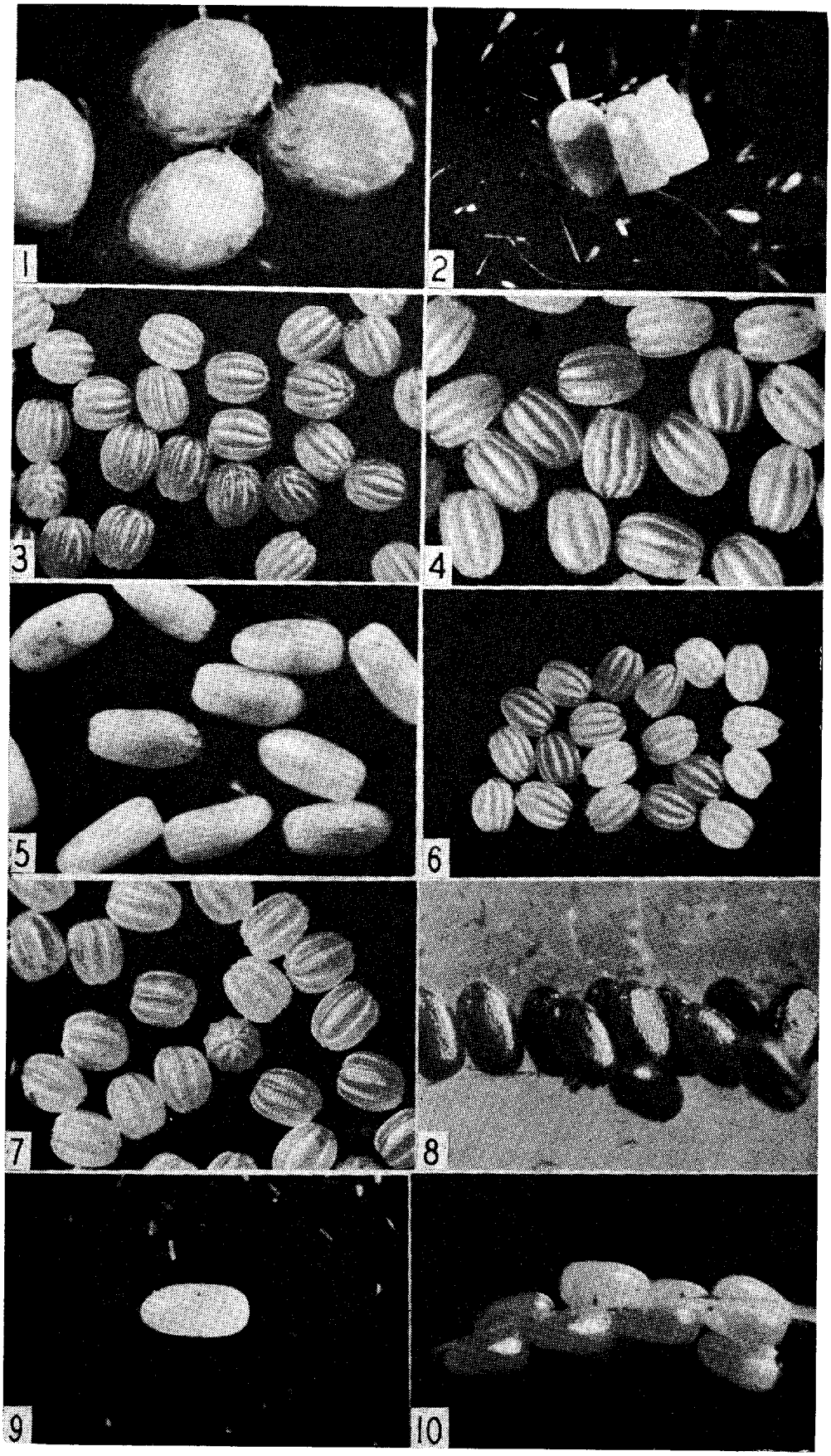
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which they are attached without breaking the chorion (21, 31, 38, 43, 62-9), especially if the substrate is rough and dry. The strength of the adhesive coating varies considerably. Many eggs, if deposited on a very smooth surface like polyethylene, can be removed without breaking the chorion, yet some of these eggs if deposited on paper toweling or bark are firmly attached and will break if one tries to disturb their position. The following are a few examples (19, 41, 42, 44, 62-12, 62-15, 62-22, 62-38),

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Fig. 1. *Nemoria darwiniata* Dyar. 1.0 x 0.75 x 0.5 mm. Color near white to yellowish and shiny. Upper flat surface possesses small irregular hexagonal reticulations. The flattened eggs are adhesive and deposited singly and close together. They resemble the eggs of *Synchlora denticularia* (Wlk), (62-10).

Fig. 2. *Chlorochlamys chloroleucaria* Gn., 0.65 x 0.4 x 0.25 mm. Color medium to light green and shiny. Surface with very fine irregular indentations. Eggs deposited singly or the flattened surfaces are adjacent to each other. Eggs of *Chlorochlamys indiscriminata* Wlk, (62-31) are somewhat similar to this species.

Fig. 3. *Xystrota rubromarginaria* Pack. 0.4 x 0.3 x 0.3 mm. Color near white to pink, Twelve plus conspicuous indented longitudinal ridges occur on the surface with prominent cross striae, 15 or more, between them. The longitudinal ridges terminate or join together near the two poles of the eggs. The eggs are slightly adhesive. They do not adhere to polyethylene.

Fig. 4. *Scopula enucleata* Gn. 0.5 x 0.3 x 0.3 mm. Color light yellowish white and shiny. Twelve plus conspicuous indented longitudinal ridges extend lengthwise from pole to pole with about 20 distinct cross striae between them. The eggs are nonadhesive and do not cling to each other.

Fig. 5. *Scopula inductata* Gn. 0.6 x 0.3 x 0.3 mm. Color light cream to near white. Sixteen faint slightly indented ridges extend from the obtuse end to the smaller rounded end with very few or no cross striae between them. The eggs are slightly adhesive. Also see *Scopula aemulata* (Hlst.) (62-22).

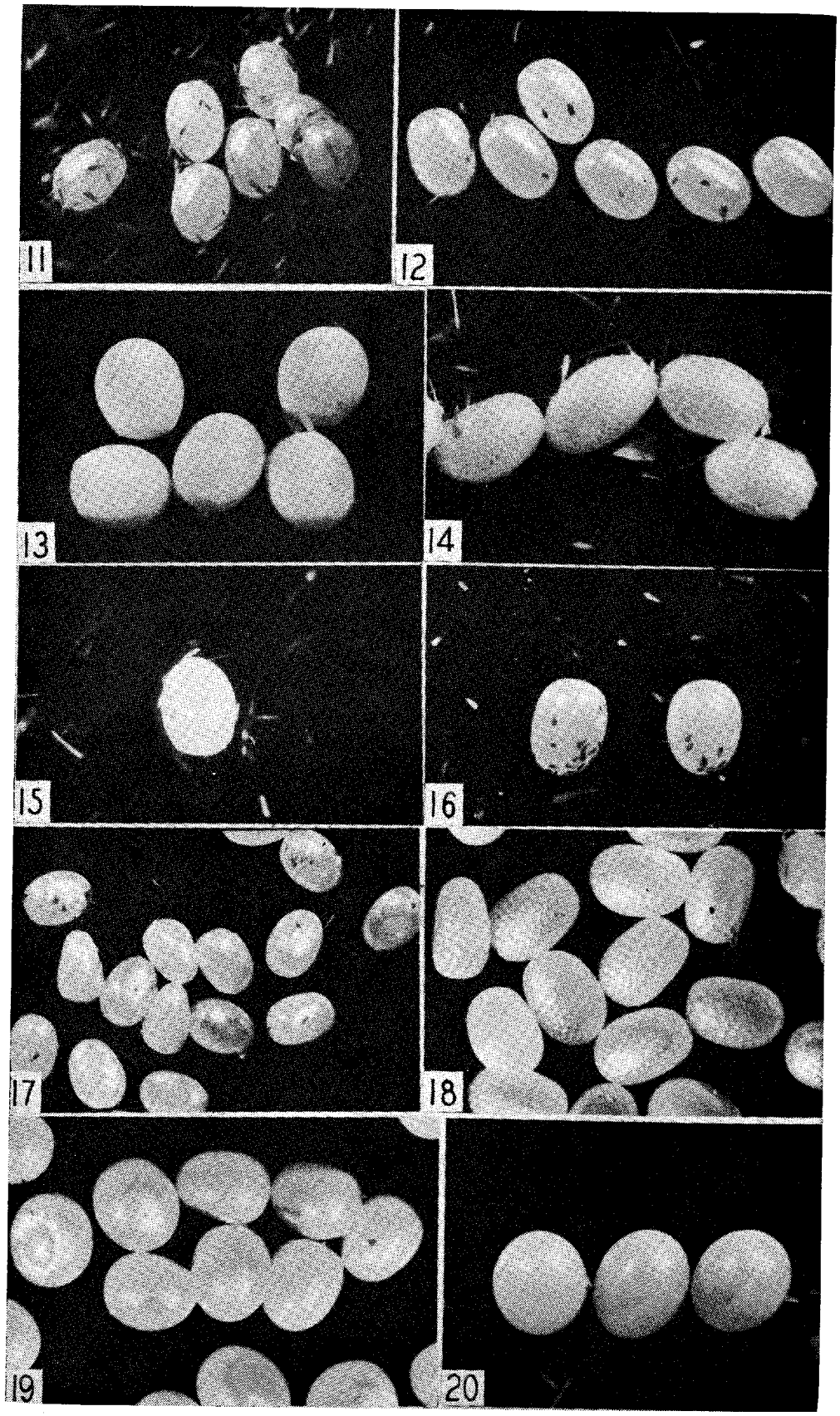
Fig. 6. *Euphenolia pallimedia* Grossb. 0.3 x 0.2 x 0.2 mm. Color near white to pink. Ten plus conspicuous nearly smooth longitudinal ridges extend lengthwise and possess about 16 prominent cross striae in the deep depressions between the ridges. The eggs are non-adhesive.

Fig. 7. *Sterrha flavescens* Hlst. 0.4 x 0.3 x 0.3 mm. Color yellow to orange. Ten plus distinct indented ridges extend lengthwise on the eggs and possess 15 plus prominent cross striae in the depressions between the ridges. Eggs are nonadhesive. Also see *S. demissaria* (Hbn). (62-21).

Fig. 8. *Haematopis grataria* Fab. 0.5 x 0.3 x 0.25 mm. Color shiny light tan to brown. Flattened surface of chorion possesses rounded to hexagonal reticulations with no ridges or striae. Eggs are adhesive and may cling to each other in clusters.

Fig. 9. *Cosymbia packardi* Prout. 0.5 x 0.25 x 0.25 mm. Color cream-like and shiny with irregular hexagonal reticulations on adhesive surface of eggs. Deposited singly on polythylene.

Fig. 10. *Eupithecia* sp. 0.5 x 0.25 x 0.25 mm. Color cream-like to near white smooth and shiny. Adhesive eggs deposited in clusters on polyethylene.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A number of species have eggs that are completely or nearly non-adhesive (3, 4, 6, 7, 45, 62-21).

The external texture of the chorion of geometrid eggs varies greatly. Some possess a smooth shiny surface with no signs of tiny depressions or reticulations (10, 12, 19, 20, 40, 62-33, 62-36). Other species are smooth and shiny yet under considerable magnification, 25 X plus, show tiny and very faint reticulations (15, 16, 41, 42, 44, 62-27, 62-32). Some of these may be within the eggs and visible through the transparent or translucent chorion. Many eggs of the Geometridae show on their exterior distinct and prominent depressions surrounded by hexagonal or irregular ridges producing a reticulated or net-like appearance. (18, 25, 29, 33, 34, 35, 62-5, 62-6, 62-11 to 17). Frequently these depressions are distributed in longitudinal rows. A few of these species may possess tiny, light colored, puff-like projections on the margins of the reticulations (23, 29).

Among species in several genera and most species in a given genus prominent longitudinal ridges occur between the two ends of the oval or nearly spherical eggs. Cross striae or lines are present between the

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Fig. 11. *Eupithecia miserulata* Grt., 0.5 x 0.35 x 0.3 mm. Color near white to cream. Surface adhesive, shiny, smooth and somewhat granulated. Deposited singly or in clusters on paper or polyethylene.

Fig. 12. *Eupithecia flavigutta* Hlst., 0.5 x 0.35 x 0.35 mm. Color near white, smooth and shiny. Adhesive eggs are deposited in loose clusters on polyethylene.

Fig. 13. *Lygris molliculata* Wlk. 0.6 x 0.5 x 0.5 mm. Color near white with a chalk-like surface. Deposited on polyethylene in small clusters, near each other and lightly adhesive.

Fig. 14. *Stamnodes cassinoi* Swett. 0.7 x 0.45 x 0.4 mm. Color near white with very small elevated bumps on surface. Eggs are adhesive and deposited in small clusters on polyethylene.

Fig. 15. *Xanthorhoe ferrugata* Clerk, 0.45 x 0.35 x 0.35 mm. Color near white, surface shiny and possess small faint reticulations especially at one end. Deposited singly on polyethylene.

Fig. 16. *Mesoleuca ruficillata* Gn. 0.7 x 0.5 x 0.45 mm. Cream colored. Surface shiny with very faint tiny reticulations, Deposited singly on polythylene.

Fig. 17. *Euphyia centrostrigaria* Woll., 0.5 x 0.4 x 0.4 mm. Color near white to yellow. Surface smooth, shiny and some specimens slightly pointed, adhesive eggs deposited loosely on polyethylene.

Fig. 18. *Hammaptera parinotata* Zell. 0.65 x 0.45 x 0.35 mm. Color near white to light green. Chorion surface possesses conspicuous irregular reticulations with deep depressions. Eggs slightly adhesive and somewhat scattered on polyethylene.

Fig. 19. *Camptogramma stellata* Gn., 0.6 x 0.45 x 0.45 mm. Color near white. Surface smooth, shiny, adhesive and cling to each other when in clusters.

Fig. 20. *Eudule unicolor* Rob. 0.65 x 0.5 x 0.5 mm. Color near white. Surface smooth, shiny and adhesive. Deposited singly or in small clusters on polyethylene.

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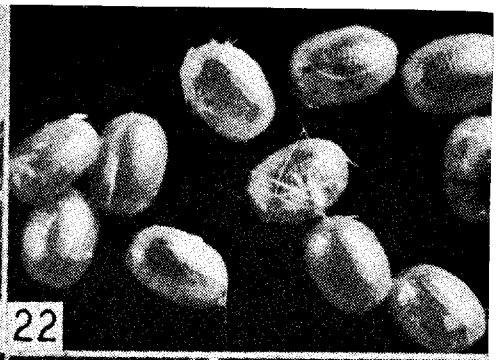
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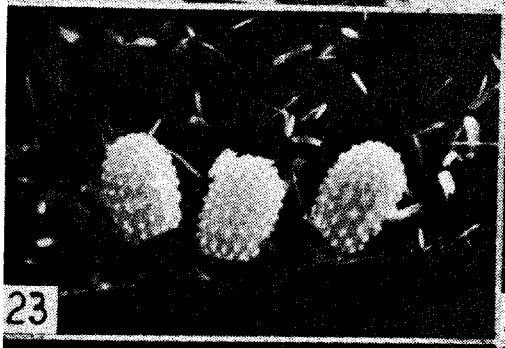
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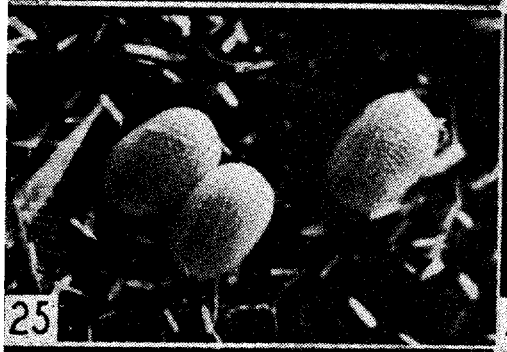
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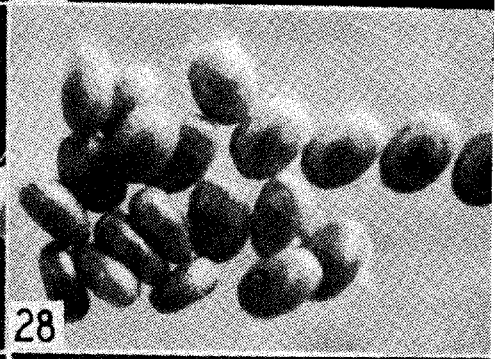
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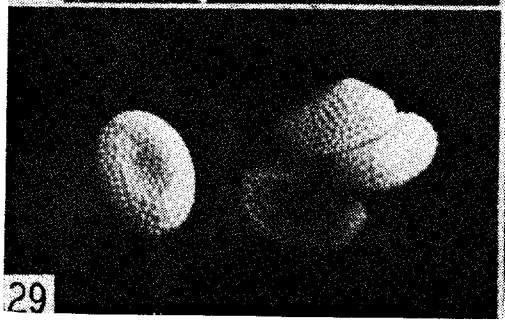
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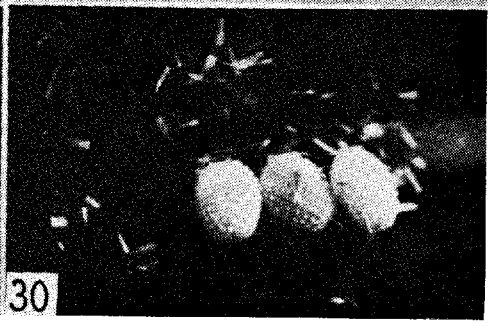
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ridges (3, 4, 6, 7, 45, 62-21, 62-22). Other eggs have a chalk-like, smooth surface (13) or a granulated texture (12). A few eggs possess an obtuse end (7, 23, 33, 34, 35, 38, 39, 43, 62-1, 62-2, 62-22) which may be the top (62-1, 62-2) or the bottom (62-22). Eggs of a few geometrids have a circular cap like top which comes off or is chewed off when the larva hatches (39, 45-48, 62-1, 62-2).

Among the species seen and studied to date some interesting and significant structural similarities exist. The eggs of most species among the *Xystrota* (3), *Scopula* (4), *Euphenolia* (6), and *Sterrha* (7, 62-21) resemble each other closely, all possessing distinct longitudinal ridges.

Fig. 21. *Delinia erythemaria* Gn. 0.8 x 0.4 x 0.4 mm. Color medium brown and shiny. Side view shows 10 plus slightly elevated, longitudinal ridges which extend from the rounded to the somewhat obtuse end. Eggs are adhesive and deposited in somewhat irregular clusters on polyethylene.

Fig. 22. *Chloraspilates bicoloraria* Pach. 0.65 x 0.4 x 3.5 mm. Color light green and shiny. A side view shows 10 plus faint longitudinal parallel rows of depressions extending lengthwise on the egg. Eggs are adhesive and deposited on loose clusters in polyethylene.

Fig. 23. *Physostegania pustularia* Gn. 0.6 x 0.4 x 0.25 mm. Color grey to pink. Entire chorion covered with faint diamond-shaped elevations with conspicuous near white knobs occurring at most of the corners of the diamond areas. Eggs are adhesive and deposited singly on polyethylene.

Fig. 24. *Semiothisa bisignata* Wlk., 0.75 x 0.5 x 0.4 mm. Color light green. Chorion with rough elevations most distinct near one end and near the margin from a side view. Eggs are adhesive and deposited singly or in irregular clusters on polyethylene.

Fig. 25. *Seimothisa pallidata* Pack. 0.6 x 0.4 x 0.3 mm. Color light pale green. Entire surface possesses moderately faint hexagonal to irregular reticulations. Eggs are adhesive and deposited singly or in clusters on polyethylene.

Fig. 26. *Semiothisa colorata* Grt., 0.6 x 0.4 x 0.25 mm. Color light green. Entire surface of chorion possesses small irregular depressions frequently in longitudinal rows. Eggs are adhesive and deposited in clusters usually on their narrow sides and in rows on polyethylene.

Fig. 27. *Semiothisa continuata* Wlk., 0.6 x 0.4 x 0.3 mm. Color light green and shiny. Surface of chorion possesses many very tiny elevations close together and irregular in their distribution. Eggs are adhesive and deposited in small clusters on polyethylene.

Fig. 28. *Semiothisa hypaethrata* Grt. 0.7 x 0.45 x 0.3 mm. Color light green. Surface of chorion possesses minute irregular depressions frequently most prominent along margin. Eggs are adhesive and usually deposited in irregular clusters on polyethylene.

Fig. 29. *Itame fulvaria* Vill., 0.6 x 0.4 x 0.25 mm. Color light green, Entire surface covered with numerous tiny, white, rounded, pufflike dots frequently in circles of seven. Eggs are adhesive and may be attached to each other.

Fig. 30. *Itame coortaria* Hlst., 0.6 x 0.4 x 0.25 mm. Color greenish to cream. Most of the surface possesses rounded to hexagonal depressions with white, knob-like puffs about the depressions similar to those seen in Fig. 23. Eggs are adhesive and cling to polyethylene.

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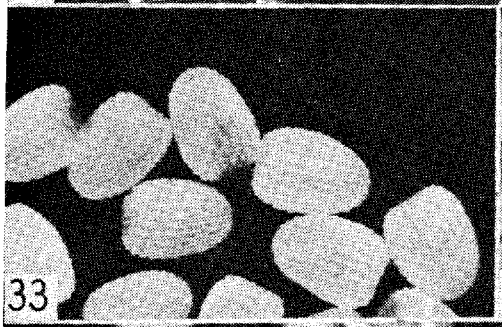
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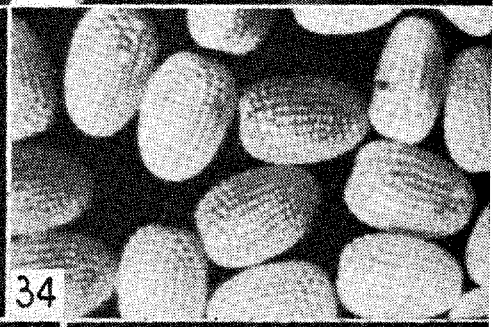
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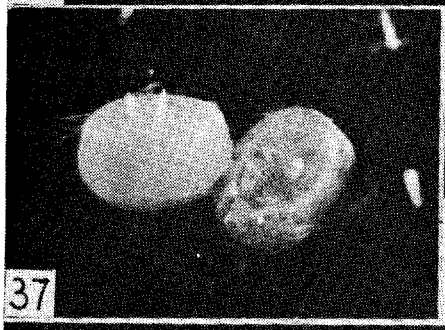
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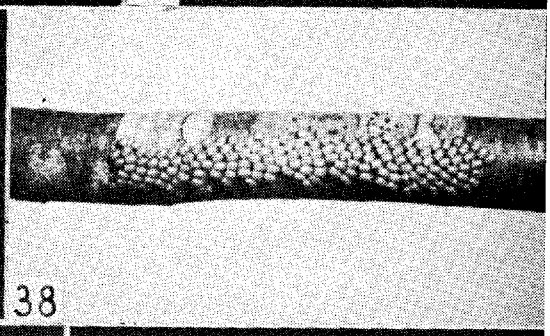
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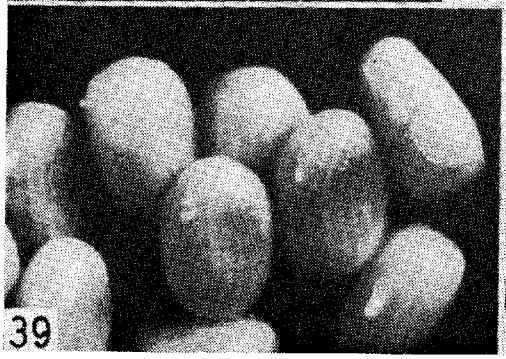
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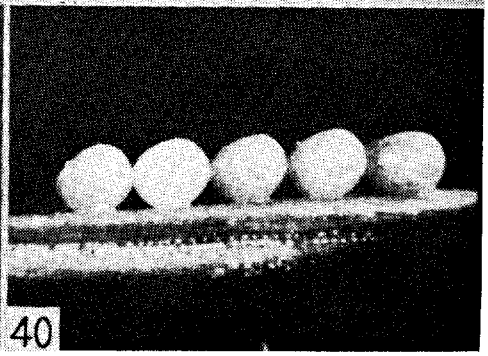
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Also species in each of the following and respective genera look much alike, *Eupithecia* (10, 11, 12), *Semiothisa* (24 to 28, 62-17, 62-25, 62-26), *Itame* (29, 30), *Euchlaena* (62-11 to 14), and *Lambdina* (42, 62-27).

Hatching of the larva among some species of geometrids has been observed. In most cases the larva chews out an escape opening, usually

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Fig. 31. *Tornos scolopacinarius spodius* Rindge, 0.65 x 0.4 x 0.35 mm. Color deep green and shiny. Side view with 10 plus longitudinal rows of medium ridges possessing between them many striae creating oblong depression. Eggs are adhesive and close together, mostly in a flattened mass.

Fig. 32. *Holochroa dissociarius* Hlst. 0.8 x 0.7 x 0.7 mm. Color cream to light brown. An egg is nearly spherical with a circle of 22 to 25 dots around the top-end. Eggs are adhesive and deposited in a single layer of 20 or more ova on a flat substrate.

Fig. 33 *Vinemina opacaria* Hlst., 0.7 x 0.45 x 0.4 mm. Color light green with an obtuse end frequently reddish. Broad side of egg possesses 10 plus longitudinal rows of irregular ridges with distinct irregular cross striae between them resulting in deep depressions covering the entire surface. Eggs are adhesive, and deposited in loose clusters on polyethylene.

Fig. 34. *Stenopropia anastomosaria* Grossb. 0.8 x 0.5 x 0.45 mm. Color cream to pinkish grey and shiny. Side view possesses 10 to 12 somewhat zig zag longitudinal ridges with distinct cross striae between them resulting in tiny pits. Near the obtuse end small, white knobs occur about the pits. Eggs are adhesive and are deposited in loose flat masses on polyethylene.

Fig. 35. *Anacamptodes larvaria* Gn., 0.7 x 0.45 x 0.55 mm. Color pale green. Twelve or more bumpy longitudinal ridges occur in a side view with cross striae between them. The ridges project beyond the obtuse end and converge near the rounded end. The eggs are adhesive and adhere to their substrate. This species differs from eggs of *A. defectaria* (62-7) and *A. humaria* (Gm) (62-8)

Fig. 36. *Priocycla armataria* H-S., 0.7 x 0.5 x 0.4 mm. Color light yellowish green and shiny. Surface smooth and possess very tiny reticulations. Eggs are adhesive and deposited singly on polyethylene.

Fig. 37. *Metanema inatomaria* Gn. 0.75 x 0.55 x 0.5 mm. Color yellow to deep orange and may show red spots within the egg. Entire egg possesses small, faint, hexagonal or irregular reticulations not arranged in a definite pattern. The eggs are adhesive and deposited singly or in small clusters.

Fig. 38. *Ennomos subsignarius* Hbn. elm spanworm. View of an entire egg mass on a twig. For an enlarged view and description of eggs see Fla. Entomol. 1962, Fig. 2, p. 110, 115.

Fig. 39. *Plataea trilinearia* Pack. 0.8 x 0.65 x 0.5 mm. Color grey to bluish and shiny. Side view shows about 12 faint longitudinal ridges with many tiny cross striae producing narrow, oblong areas between the ridges. A plain, caplike top occurs at the blunt end. The adhesive eggs may occur in irregular clusters and adjacent to each other when deposited on polyethylene.

Fig. 40. *Caripeta divisata* Wlk. 0.85 x 0.65 x 0.6 mm. Color green to light brown with red flecks scattered within the embryo. A round, cap-like area occurs at one end. The chorion is smooth, shiny and adhesive. Eggs are deposited in rows or clusters on polyethylene.

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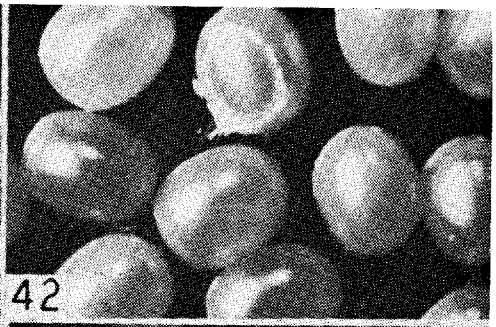
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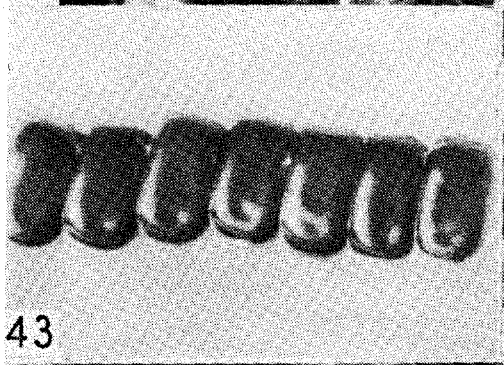
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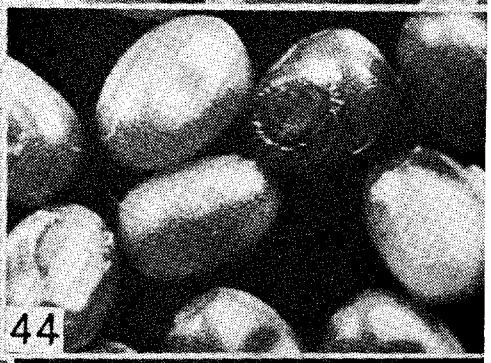
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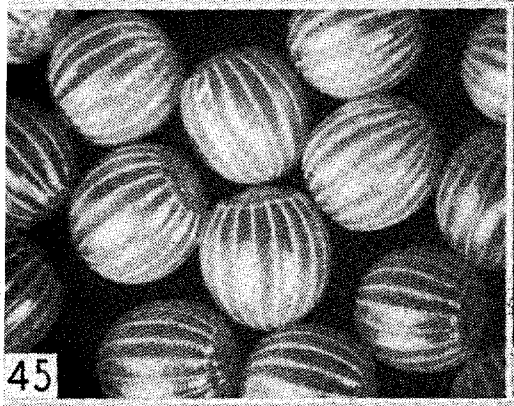
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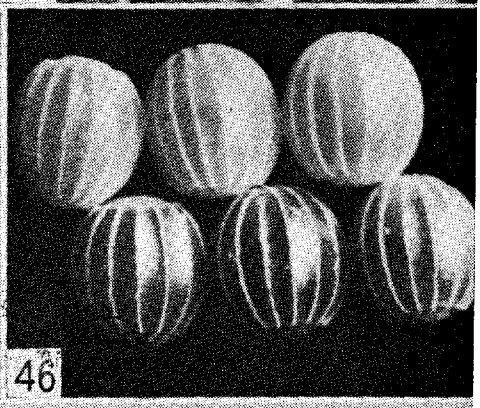
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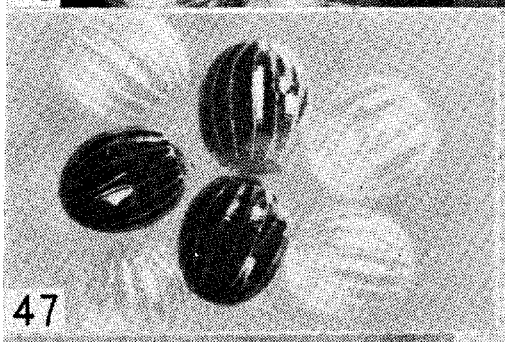
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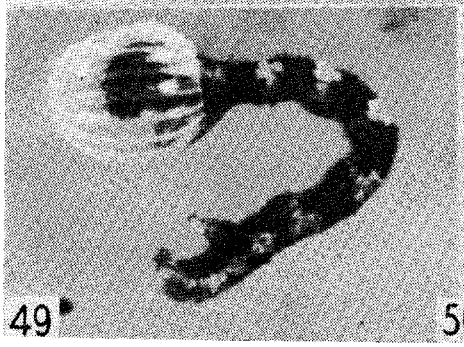
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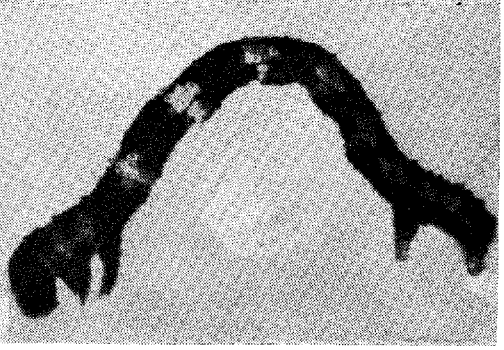
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at one end or on a side. Among a few species there appears to be a round cap-like top (operculum) present at one-end (39, 40, 45). Pressure by the larva within pushes off this cap and then the larva emerges. Hatching of *Apicia confusaria* Hbn. (45 to 50) has been observed several times. During incubation the color of the egg changes from a uniform green to a multicolored state (46). At prehatch time the near black larva fills the entire egg (47). The larva pushes itself out of the round opening (48). If the head comes out first the larva discards the empty translucent egg shell quickly. If the anal end emerges first the larva has a more difficult time to rid itself of the empty egg shell (49). Immediately after emergence the larva increases in size shown in figure 50.

Fig. 41. *Snowia montanaria* Newn. 1.15 x 0.75 x 0.6 mm. Color a deep green with red specks scattered through the embryonic tissue. Surface of chorion smooth, shiny, and adhesive, also possesses faint tiny reticulations. Some of the eggs torn away from the polyethylene show the adhesive layer.

Fig. 42. *Lambdina pultaria* (Gn.), 0.85 x 0.65 x 0.6 mm. Color slightly greenish grey, chorion surface smooth, shiny, and adhesive, also possess very tiny reticulations. Eggs are deposited singly or in loose clusters on polyethylene. The torn adhesive membrane visible in egg on upper row. Also see eggs of *L. pellucidaria* (G and R) (62-27).

Fig. 43. *Deuteronomos magnarius* (Gn.), 1.1 x 0.5 x 0.6 mm. Color a muddy brown. Eggs flattened out at one end and rounded at other. The adhesive eggs are deposited side by side in chains. These eggs were collected by Roy Rings. Hatched eggs of this species (62-4) were found in southern Florida on bark of gumbo-limbo. Similar eggs seen in collection at the U. S. National Museum, Washington D. C.

Fig. 44. *Prochoerodes transversata* Div., 0.9 x 0.6 x 0.6 mm. Color green to deep red, chorion surface smooth, shiny, adhesive, and possesses very faint reticulations. Eggs are deposited singly or in loose clusters on polyethylene.

Fig. 45-50. *Apicia confusaria* Hbn., 0.75 x 0.65 x 0.65 mm. Eggs, incubation, and hatch. Newly deposited eggs are light green and shiny. The exterior of the chorion possesses 20 to 21 distinct light colored, bead-like ridges that extend from the round end to the circular, cap-like structure at the opposite end. Faint line-like striae are present between the ridges. The eggs are nonadhesive and roll around freely when deposited in dry poleythylene bags or glass containers.

Fig. 45. Newly deposited nonadhesive green eggs showing ridges, striae, and cap-like ends

Fig. 46. During incubation color changes occur from green to reds to near black

Fig. 47. Eggs about to hatch show near black larvae within the egg shell. Hatched eggs are colorless and transulcent with an open end.

Fig. 48. A larva partially hatched. Usually the head end emerges first.

Fig. 49. A partially hatched larva with the head still within the translucent egg shell.

Fig. 50. A hatched larva adjacent to the empty egg shell. Upon emergence the newly hatched larva expands quickly in size and may show a remanent of the embryonic tissue attached to the caudal end.

The following descriptions of the forty-five additional species of the Geometridae presents for each the scientific name of the species, the size in millimeters, including length, width and depth, its over-all color, surface appearance and detailed features on the chorion, adhesiveness of the exterior, and manner of deposition.

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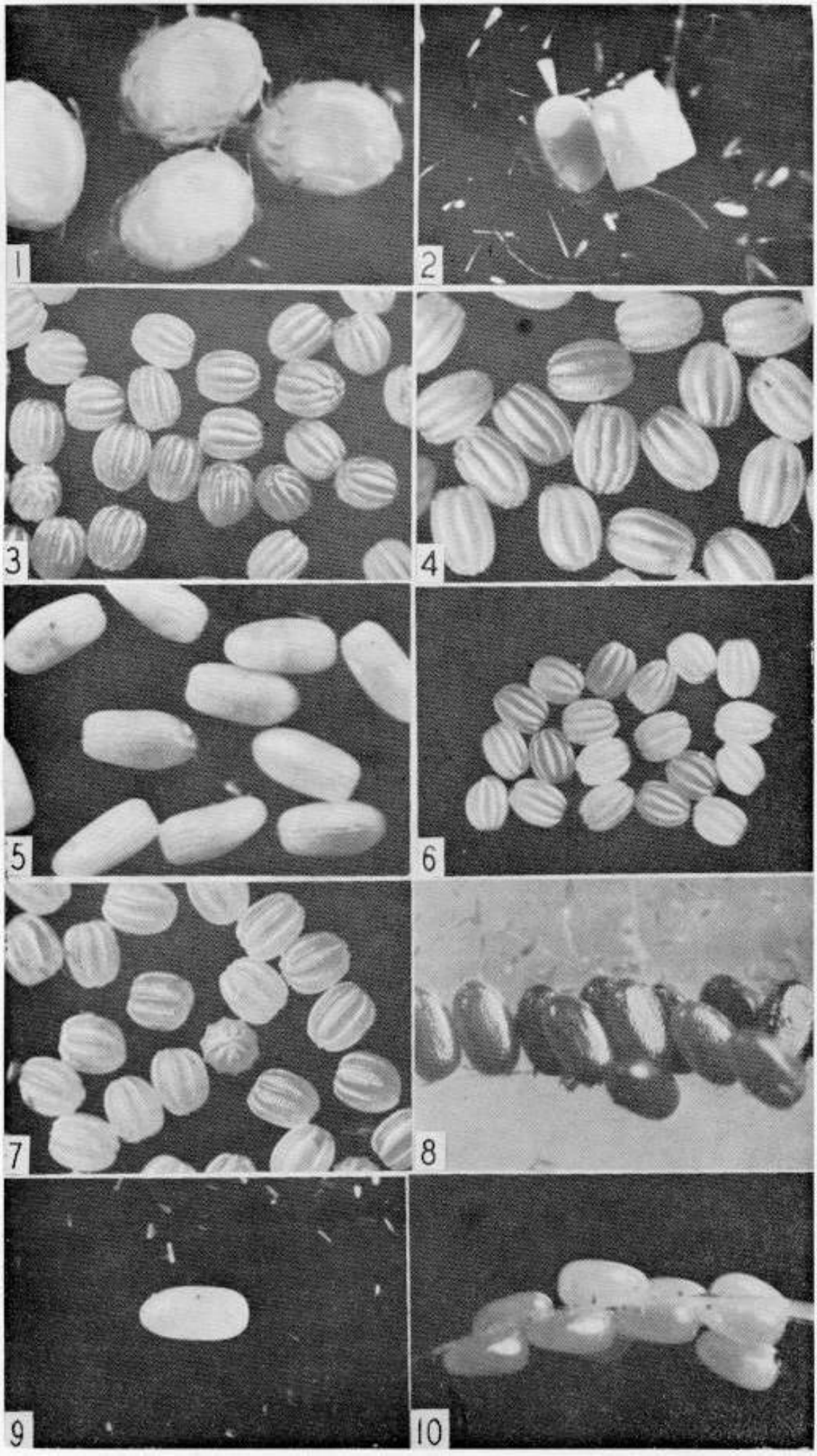
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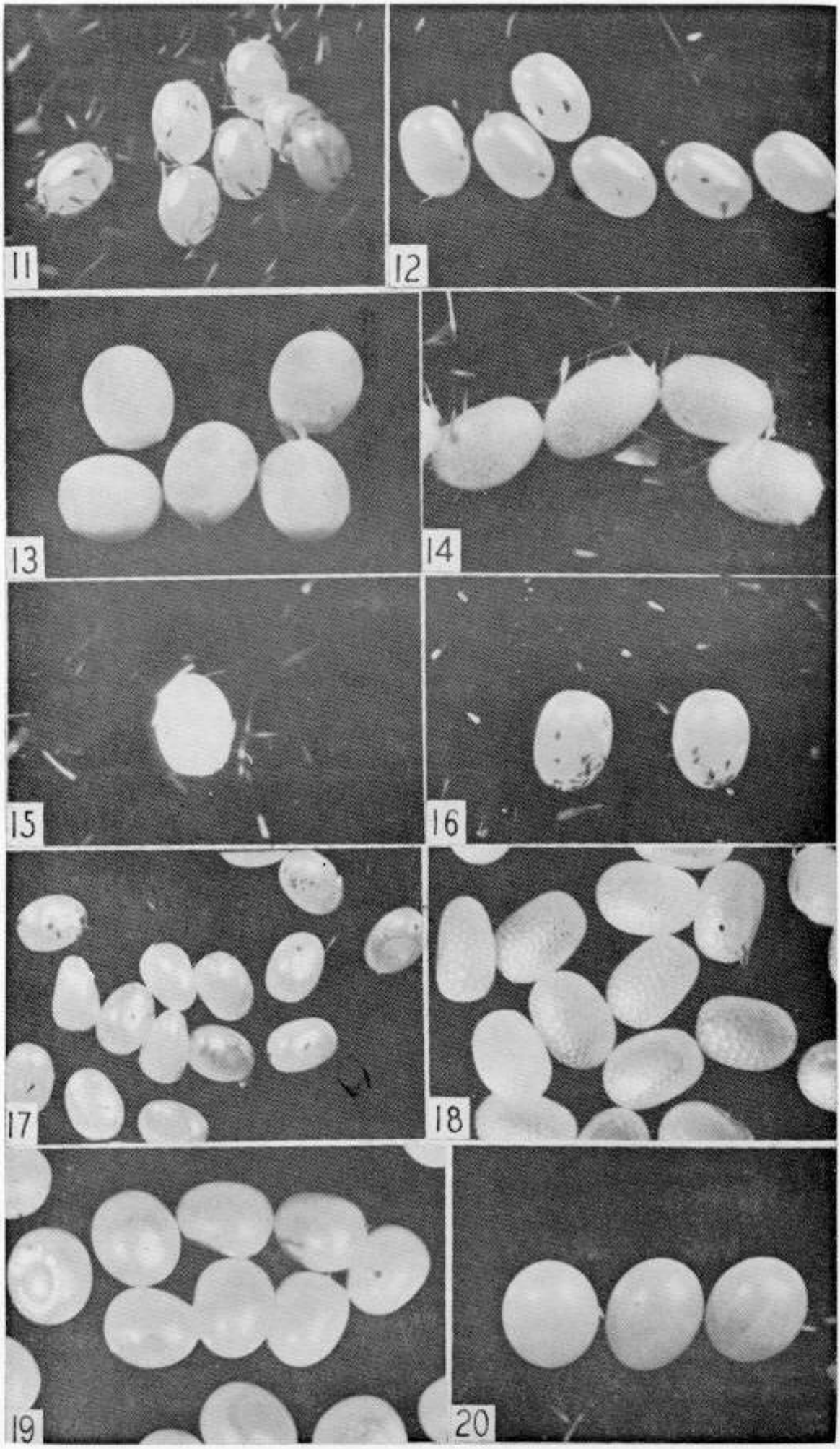
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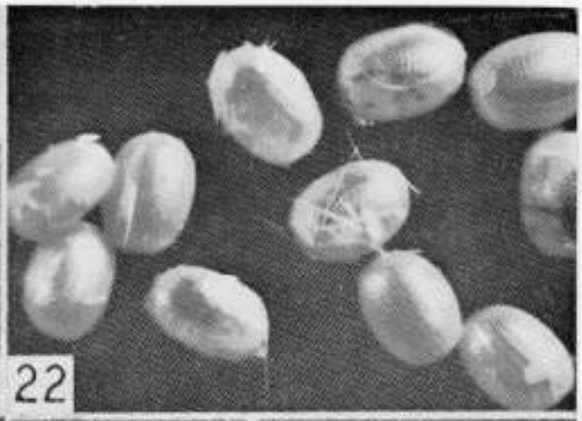
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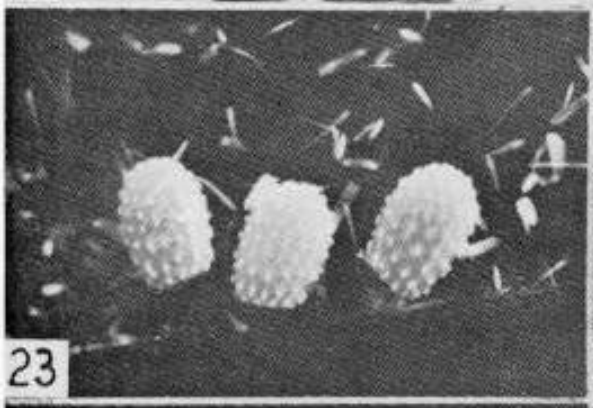
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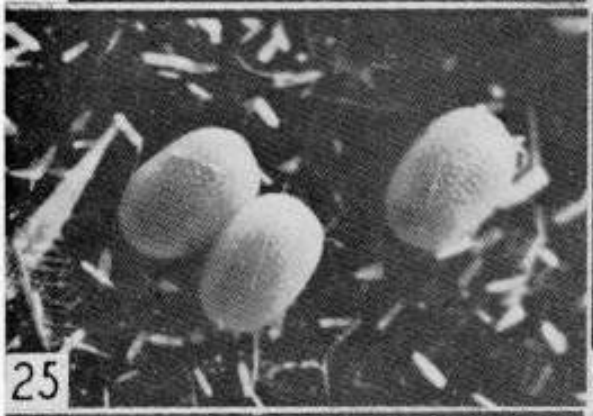
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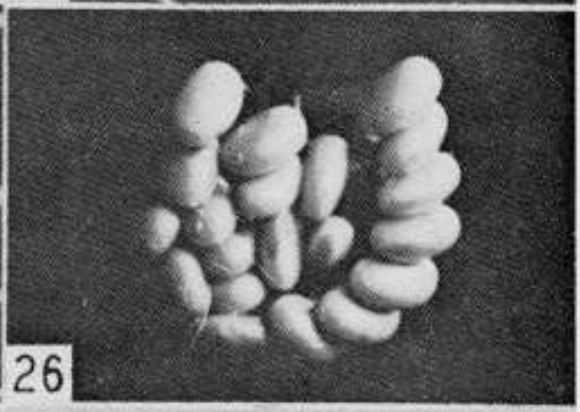
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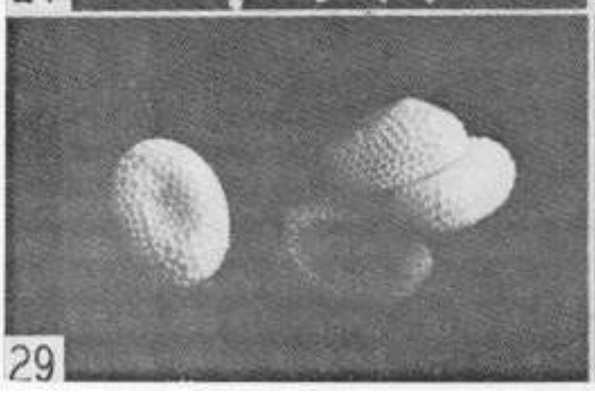
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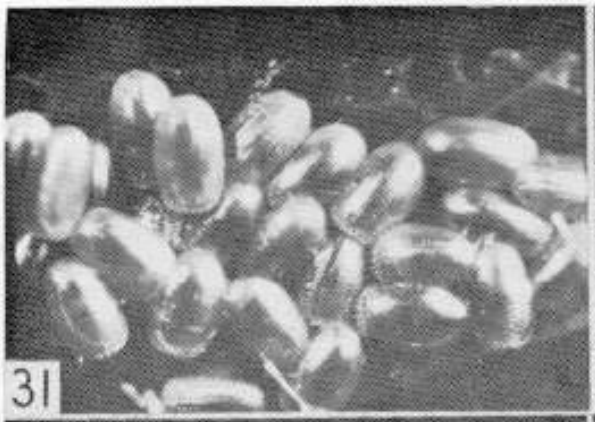
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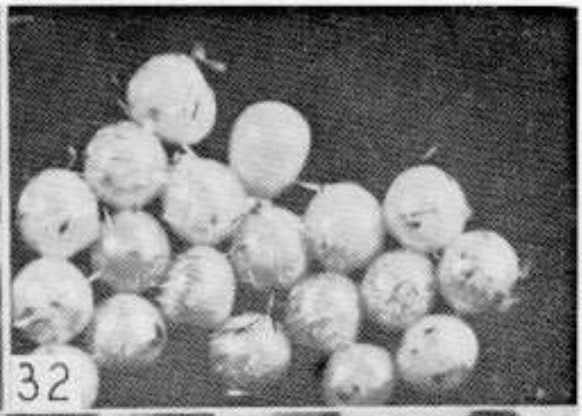
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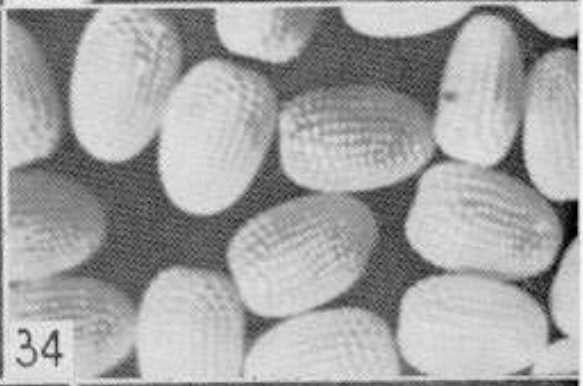
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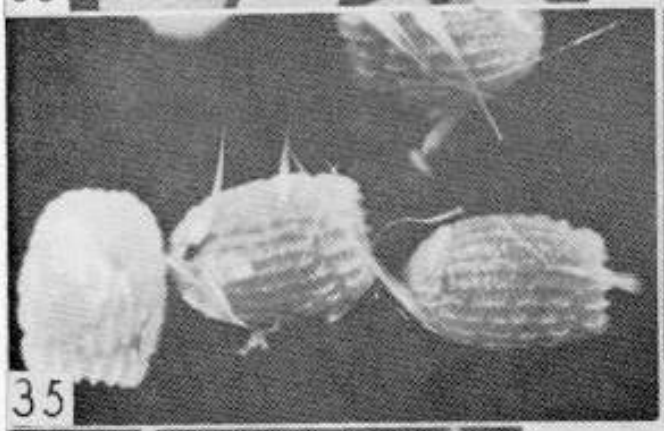
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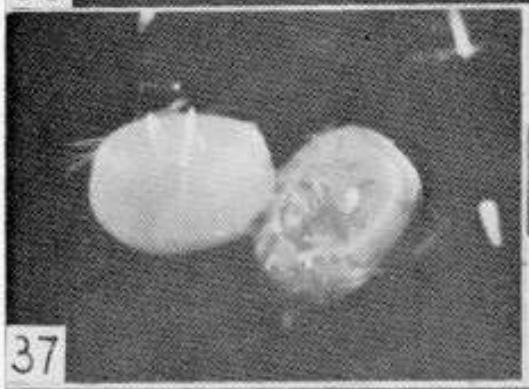
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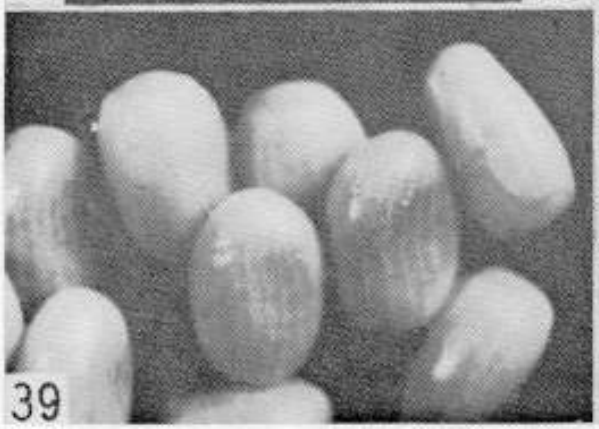
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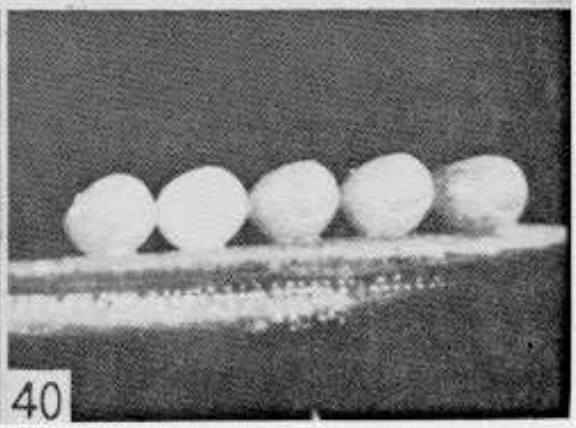
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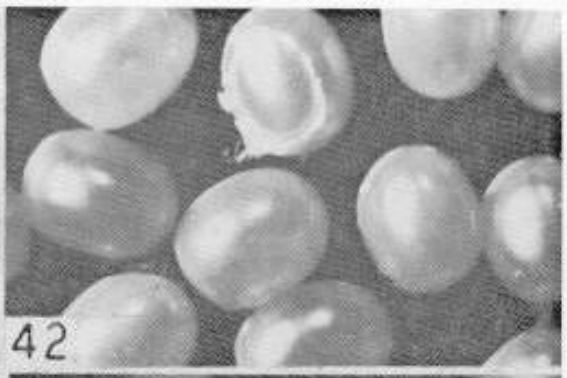
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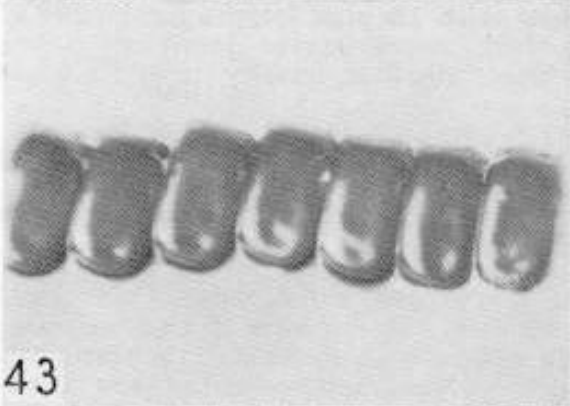
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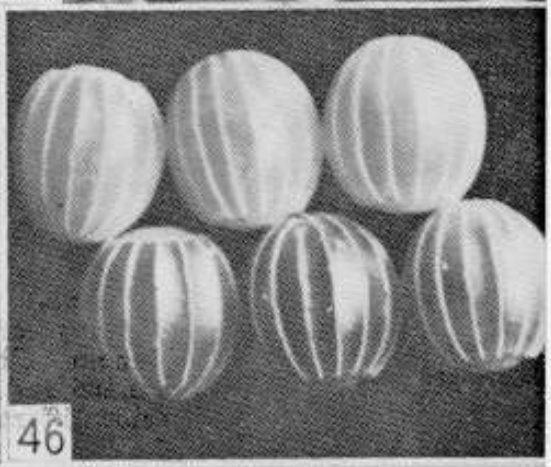
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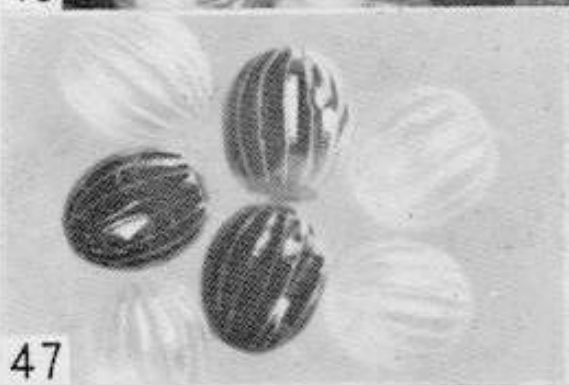
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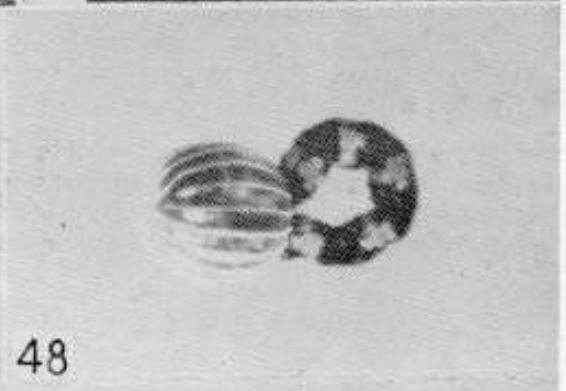
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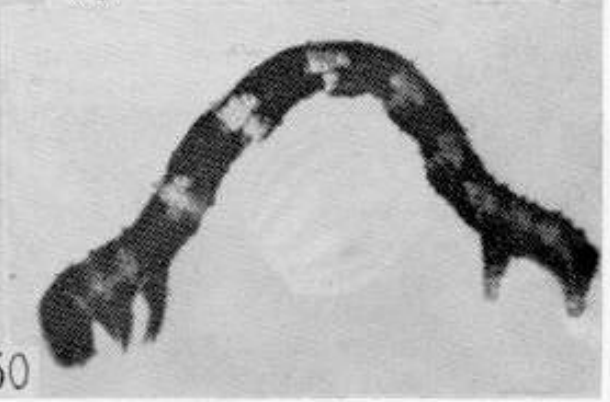
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