A NEW SPECIES OF *KOMIA* KORDE AND THE SYSTEMATIC POSITION OF THE GENUS

by E. C. WILSON, R. H. WAINES, and A. H. COOGAN

ABSTRACT. Study of *Komia eganensis* sp. nov. from the Middle Pennsylvanian (Atokan) rocks of eastern Nevada suggests that the genus be assigned to the Stromatoporoidea (Kingdom Animalia) rather than the Rhodophyceae (Kingdom Plantae). *Komia* has been reported from rocks of Middle Carboniferous, Early Pennsylvanian, and Middle Pennsylvanian (Atokan and Desmoinesian) ages. *K. eganensis* and *Fusulinella acuminata* define a restricted biostratigraphic zone within the Middle Pennsylvanian (Atokan) rocks of eastern Nevada.

THE Palaeozoic fossil *Komia* Korde (1951, p. 181) has been reported from eastern Europe, central Japan, and western North America (Johnson 1960, p. 51; 1961, p. 86). The following historical résumé presents previous investigations concerning *Komia* and is intended to serve as background for consideration of the genus.

This study is one in the series on the stratigraphy and palaeontology of the Ely No. 3 Quadrangle, White Pine County, Nevada. A list of previous papers in this series may be found in Wilson and Langenheim (1962, p. 495).

Historical résumé. Korde (1951, p. 181) described the genus *Komia* with *Komia abundans* as the type species (loc. cit., text-figs. 4, 5; pl. 2, figs. 3, 4) and considered it to be a rhodophytean alga.

Maslov (1956, p. 21), in questioning the validity, in part, of Korde's (1951, pp. 175–82) study, suggested that *Komia* might be referable to the Echinodermata.

Johnson (1957, pp. 13, 80) cited *Komia* as a fossil alga. Later (1960, p. 45; 1961, p. 85) he placed *Komia* among several genera of calcareous red algae of uncertain affinity. He remarked (1960, p. 51; 1961, p. 86) that *Komia* has long been called '*Desmoinesia*' [*nomen nudum*] by certain North American geologists and that it occurs in the 'Middle Carboniferous of Russia, Lower Pennsylvanian of central Japan, Des Moines group (Pennsylvanian) of west Texas and New Mexico'. He also figured *Komia sp.* ? from the Pennsylvanian of southern New Mexico (1960, pl. 19; 1961, pl. 25).

Kordeophyton Rezak, apparently listed as a junior synonym of *Komia* Korde in Johnson (1961, p. 286), appears to be a *nomen nudum*. We have been unable to verify that it has ever been published elsewhere.

Illustrations (reconstructions?) labelled *Komia abundans* Korde appeared in Drushchits and Yakubovskaya (1961, pl. 2, fig. 10). They considered it (ibid., p. 44) to be a Middle Carboniferous rhodophytean alga.

Komia sp. was recorded, without description or figures, from the Pennsylvanian of Utah by Mollazal (1961, p. 26) and Wright (1961, p. 154). We have found no other reports of the genus.

SYSTEMATIC DESCRIPTION

The morphological terminology used is largely that of Galloway (1957, pp. 350–60). Type specimen and locality numbers refer to the collections of the Museum of Paleontology, University of California, Berkeley (abbreviated to UCMP).

[Palaeontology, Vol. 6, Part 2, 1963, pp. 246–53, pl. 34–35.]

Phylum COELENTERATA Frey and Leuckart 1847
Class HYDROZOA Owen 1843
Order STROMATOPOROIDEA Nicholson and Murie 1878
Family *Incertae sedis*
Genus KOMIA Korde 1951

Type species. Komia abundans Korde (1951, p. 181, text-figs. 4, 5; pl. 2, figs. 3, 4).

Diagnosis. Coenosteum small, cylindrical, ramose, composed of a broad outer region and a narrow axial cylinder; outer region formed of superposed, truncated cones of perforate laminae and interlaminar to continuous pillars with minutely trabeculate, *en jet d'eau* (Steiner 1932, pp. 24–28, text-figs. 3, 5) microstructure; axial cylinder composed of elongate grooves curving upwards and outwards from axis and partially enclosed abaxially by incomplete, perforate, distally thickening walls.

Remarks. In this study we have chosen to consider the Order Stromatoporoidea in the broad concept presented by Lecompte (1956, p. F127). The combined features of *Komia* appear so singular that it has been impossible to compare the genus closely with other stromatoporoid genera except on the basis of individual characters. For this reason we have not placed *Komia* in a family. Furthermore, we do not wish to erect a new family on the basis of one genus and two species.

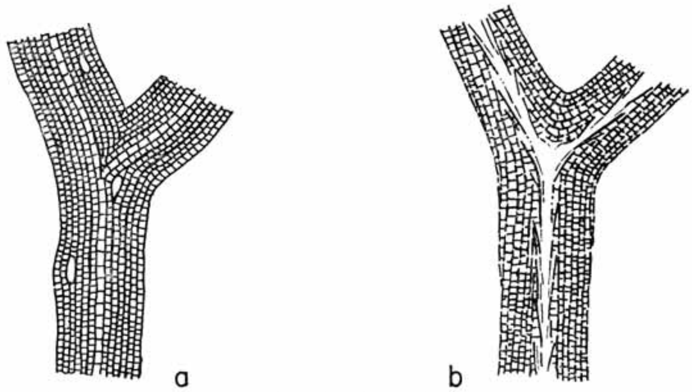
In its cylindrical and ramose form, in its possession of a differentiated axial region, and in its possession of regular laminae and pillars, *Komia* most closely resembles two Middle Devonian stromatoporoids, *Idiostroma* and *Dendrostroma* (see Galloway 1957, pp. 443–4, pl. 34, figs. 8, 9). *Komia* differs significantly from these two genera in the nature of the pillar microstructure, the relatively small size of the coenosteum, the comparatively close spacing of the skeletal elements, the structure of the axial region, and the coarsely porous nature of the laminae. Although differing in most characters, *Komia* resembles the Permo-Triassic stromatoporoid *Disjectopora* (see Lecompte 1956, p. F138, text-figs. 111, 112) in the presence of a rectilinear perforate network of laminae and pillars. The microstructure of the pillars of *Komia* most closely approaches that of Mesozoic stromatoporoids such as *Steinerella* (see Lecompte 1956, p. F138, text-fig. 2*c*) and *Dehornella* and *Astroporina* (see Hudson 1960, pl. 26).

In summary, *Komia* closely resembles the Middle Palaeozoic stromatoporoids mentioned above in its ramose and cylindrical form and in the relative regularity of its pillars and laminae. It more closely resembles the Mesozoic and Late Palaeozoic stromatoporoids in the more open and porous nature of the laminae, in the microstructure of the pillars, and, to a lesser degree, in the relatively minute dimensions of the skeletal framework.

Korde (1951, p. 181) interpreted *Komia* as an alga with a decidedly branched cylindrical thallus formed of a hypothallus of a small bundle of elongate, cellular filaments and a thick perithallus of dichotomously branching, cellular filaments. Our study demonstrates that *Komia* is a stromatoporoid with a non-cellular coenosteum formed of (1) an outer region (= perithallus of Korde) composed of trabeculate pillars and perforate, conical laminae, and (2) an axial cylinder (= hypothallus of Korde) composed of elongate, abaxially walled grooves. To our knowledge, this combination of structures is not known to occur in undoubted algae (Paul C. Silva, oral communication to Wilson and

Waines, July 1962, agrees). Calcareous algal skeletons are composed of cells or fine tubules, or are gross as in some of the Cyanophyta, or are uniquely specialized as in the Dasycladaceae and Charophyta. *Komia* is like none of these. On the other hand, the presence of coarsely perforate laminae and trabeculate pillars strongly suggests affinities with some of the Late Palaeozoic and Mesozoic stromatoporoids.

Our differences with Korde (1951, text-fig. 5) in the interpretation of the axial section of *Komia* are illustrated, very diagrammatically, in text-fig. 1. The conceptacle (?) chambers in Korde's reconstruction (see text-fig. 1*a*) were neither mentioned nor otherwise illustrated by her (Korde 1951) and were not observed by us in our material. Since Korde



TEXT-FIG. 1. Diagrammatic representations of axial sections of *Komia* Korde showing differing structural interpretations. *a*, after Korde; *b*, present paper.

(*in litt.*, May 1962), after examination of a thin section of *K. eganensis*, found our fossils closely similar to her *K. abundans*, we discount the possibility that our widely differing interpretations are both correct and founded on non-related fossils.

Maslov's (1956, p. 21) passing suggestion of similarities between *Komia* and some echinoderms seems invalid since the discrete skeletal units do not behave as single calcite crystals in polarized light, but are composed of microcrystalline fibres.

The two undescribed illustrations labelled *Komia abundans* by Drushchits and Yakubovskaya (1961, pl. 2, fig. 10) appear, possibly in agreement with our observations, to be less cellular than the reconstruction of Korde (1951, p. 181, text-fig. 5). However, the inclination of the laminae is totally different from that described in Korde (loc. cit.) and in this study. Furthermore, the transverse section lacks the characteristic concentric

EXPLANATION OF PLATE 34

Photographs not retouched; figs. 1 and 5 photographed by transmitted light, figs. 2, 3, and 4 by reflected light.

Figs. 1–5. *Komia eganensis* sp. nov. 1, 2, Axial section of holotype UCMP 30781 and transverse sections of two other specimens, ×28. 3, 4, Transverse section of paratype UCMP 30782; 3, ×88; 4, ×28. 5, Transverse section of paratype UCMP 30783, ×30. Twin central zones in figs. 4 and 5 indicate sections were cut just below a dichotomous branch.

nature of the laminae of *Komia* and the structure of the inner zone is very obscure. Because these important inconsistencies were not justified by Drushchits and Yakubovskaya (1961) we feel that their figures either may represent fossils which are not referable to *Komia* or else may be erroneously executed reconstructions. We therefore have elected to disregard them as accurate representations of *Komia*.

Komia eganensis sp. nov.

[by Wilson and Waines]

Plate 34, figs. 1–5; Plate 35, figs. 1–4

External features (Pl. 35, fig. 3). Coenosteum ramose, uniformly cylindrical in mature portions, tapering distally to blunt conical tips, exceeding 5·2 mm. in length, up to 1·7 mm. in diameter; surface very minutely granulate; basal region of growth not observed.

Transverse section (Pl. 34, figs. 1, 2 in part, 3–5; Pl. 35, fig. 1). Coenosteum circular, varying from 0·2 to 1·7 mm. in diameter, formed of an outer zone of concentrically arranged laminae and radially arranged pillars and a central zone of irregular construction.

Outer zone. Laminae concentric, usually complete but in places incomplete and merging with subjacent laminae, regularly spaced, numbering 6 to 7 in 0·33 mm., varying respectively from 1 to 13 with coenosteal diameters of 0·2 to 1·7 mm., irregular in thickness, varying from 0·015 mm. between pillars to 0·035 mm. in vicinity of pillars, in many places uniperforate between pillars with pores varying from 0·005 to 0·03 mm. or more in width (best observed in tangential section); pillars generally spool-shaped between laminae, less frequently expanding abaxially and tapering axially, occasionally irregular or incomplete, confined to one interlamina or continuous or superposed through 2 to 5 or more interlaminae, generally from 0·01 to 0·035 mm. in width, numbering from 5 to 7 in 0·33 mm.; galleries generally circular, less frequently semicircular or horizontally rectangular with vertical constrictions, generally 0·01 to 0·035 mm. in height, varying from 0·01 to 0·165 mm. in width though averaging from 0·015 to 0·035 mm.; filaments (possibly representing incompletely developed pillars) occasional, irregular, generally vertically disposed, confined to interlaminae, generally less than 0·005 mm. in width; microstructure of pillars fibrous with fibres curving upwards and outwards from central portions of pillars (Pl. 35, fig. 2).

Central zone. Generally circular, averaging 0·15 to 0·25 mm. in diameter, bounded by innermost lamina of outer zone, generally composed of three intergrading portions: innermost portion composed of an amoebiform complex of frequently interconnected galleries; galleries measuring up to 0·05 mm. in width, frequently intersected by pillar-like and filament-like structures with dimensions similar to those of comparable structures in outer zone; middle portion interfingering with gallery complex within and grading to more regularly constructed outer portion, composed of an irregular perforate network of galleries and pillar-like, lamina-like, and filament-like structures with dimensions similar to those of comparable structures in outer zone; outer portion generally interlamina-like with normal pillars and galleries as in outer zone.

Axial section (Pl. 34, figs. 1, 2). Coenosteum elongate, ramose, of uniform width in mature portions, tapering distally to blunt tips, greatly exceeding 5·0 mm. in length, up to 1·1 mm. in width, formed of an outer zone of regular laminae and pillars and a central zone of less regular construction.

Outer zone. Laminae generally inclined downwards and outwards about 15 degrees from the axis in inner portion of outer zone, becoming subparallel to parallel to surface of coenosteum in outer portion, successively emerging at surface in a recessively overlapping manner, terminating axially by merging indistinctly with elements of central zone and terminating unobtrusively on surface; complementary laminae on either side of central zone generally terminating in apposition axially, rarely terminating in apposition surficially; dimensions and mutual disposition of laminae, laminar pores, pillars, filaments, and galleries similar to comparable elements in outer zone of transverse section; microstructure of pillars similar to that of pillars in transverse section.

Central zone. Slender, elongate, continuous, averaging 0·2 mm. in width, generally composed of two intergrading portions: inner portion composed of a complex of irregular, perforate, indistinct filament-like structures gently curving upwards and outwards from axis and irregular, elongate, generally indistinct galleries frequently intersected by irregular filament-like structures and very rarely intersected by thin transverse structures; heights of galleries and widths of filament-like structures similar to those of comparable elements in transverse section; outer portion merging indistinctly with inner margin of outer zone, composed of a complex of thickening distal extremities of the curved filament-like structures of the inner portion, pillar-like and filament-like structures and round irregular galleries; dimensions of galleries and structural elements similar to those of comparable elements in outer zone.

Tangential section (Pl. 35, fig. 4). Pillars round to irregular, generally separate, occasionally coalescent; usually 0·015 to 0·030 mm. in diameter, numbering about 20 to 25 in 0·28 of a square mm., galleries coalescent about pillars; laminae appearing as irregular perforate areas; laminar pores generally round, usually 0·015 to 0·035 mm. in diameter, numbering about 15 in 0·28 of a square mm.

Documentation. Holotype 30781 and paratypes 30782 to 30790 are from locality B.4854. Approximately fifteen polished sections and eighteen thin sections, exhibiting a total of several hundred specimens of *K. eganensis*, were prepared and studied. In addition, serial photographs of successive transverse sections of one coenosteum served to reveal more fully the nature of the skeletal framework.

Name. The species is named after the Egan Range in eastern Nevada, from which many of the specimens of *K. eganensis* used in this study were obtained.

Occurrence. K. eganensis was collected from six localities in eastern Nevada, which are listed below.

Discussion. K. eganensis is similar to *K. abundans* in the overall form and size of the coenosteum and in the general spacing of the laminae. In the former species, less closely spaced pillars (5 to 7 in 0·33 mm. *vs.* 8 or more in the latter) and a larger diameter (0·2 *vs.* 0·08 mm.) of the axial cylinder are considered characteristic.

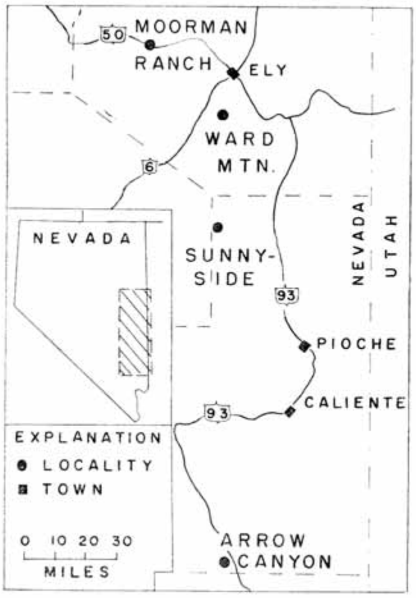
EXPLANATION OF PLATE 35

Photographs not retouched; figs. 1, 3, and 4 photographed by reflected light; fig. 2 by polarized light.

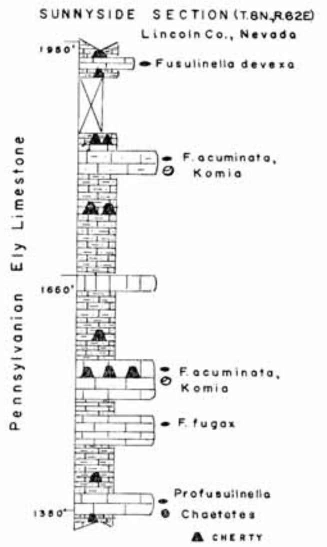
Figs. 1–4. *Komia eganensis* sp. nov. 1, Transverse section near distal extremity of coenosteum, ×105. 2, Microstructure of pillars, ×250. 3, Fragments of silicified coenostea, ×5·4. 4, Tangential section showing perforate lamina, paratype UCMP 30784, ×75.

Komia sp. ?, figured by Johnson (1960, pl. 19; 1961, pl. 25), is not described and is insufficiently well illustrated for specific comparison.

The material upon which the present study is based occurs as abundant, fragmentary, partially silicified coenostea in a medium grey-brown, fine-grained, biofragmental limestone. Due to some as yet unidentified character inherent in the structure of the unaltered skeletal elements, much more morphological detail was revealed by the study of polished and slightly acid-etched surfaces under oblique reflected light (e.g. Pl. 34, figs. 2–4; Pl. 35, figs. 1, 4) than was revealed by thin sections under transmitted light (e.g. Pl. 34, figs. 1, 5). The nature of the microstructure of the pillars, however, was best observed by means of the latter method. We recommend use of both methods in studying *Komia*. It is felt that observations limited only to transmitted light (e.g. Korde 1951, pl. 2, figs. 3, 4, text-fig. 4; and Johnson 1960, pl. 19; 1961, pl. 25) may have restricted some investigators' interpretations of the structure of *Komia*.



TEXT-FIG. 2. Map of part of eastern Nevada showing localities from which *Komia eganensis* sp. nov. was collected.



TEXT-FIG. 3. Generalized columnar section of part of the Ely Limestone near Sunnyside, Nevada, showing stratigraphic distribution of *Komia eganensis* in relation to some other fossils.

STRATIGRAPHIC DISTRIBUTION

Komia is widespread in the Pennsylvanian rocks of the western United States. Johnson (1960, p. 51) reported its presence in west Texas and New Mexico in rocks of Desmoinesian age. Mollazal (1961, p. 26) and Wright (1961, p. 154) reported it in rocks of Derryan

(= Atokan) age in the Ely Limestone of Millard County, Utah, and the Oquirrh Formation of Tooele County, Utah, respectively. Mollazal (1961, p. 26) further commented that he had observed *Komia* elsewhere 'in eastern Great Basin in Derryan to Desmoinesian limestones'. In the Ely Limestone of east-central Nevada and in the Bird Springs Formation of southern Nevada, *K. eganensis* occurs with *Fusulinella spp.* of Atokan age. Fragmentary remains with associated fusulinids and other bioclastic debris form coquinoid limestones. Korde (1951, p. 181) reported similarly that *Komia* together with foraminifera substantially make up many limestone beds along the Un'ya River in the northern Ural Mountains of Russia. Johnson (1960, p. 51) reported *Komia* in the Lower Pennsylvanian of central Japan, but did not further discuss its occurrence there.

In a characteristic section near Sunnyside, Nye County, Nevada (text-fig. 3), *Komia eganensis* is associated with *Fusulinella acuminata* Thompson in the Ely Limestone from about 1,500 to 1,820 feet above the base. Its lowest occurrence is 150 feet above the *Chaetetes–Profusulinella* faunizone. *Komia* is not known to occur with *Profusulinella*, *Fusulinella devexa* Thompson, or younger faunas in this area.

In the Ely Limestone at Moorman Ranch, White Pine County, Nevada, *K. eganensis* occurs 375 feet above *Caninia torquia* (Owen) and 150 feet above the *Chaetetes–Profusulinella* faunizone. In the Arrow Canyon Mountains, Clark County, Nevada, *K. eganensis* and *Fusulinella acuminata* are present 1,375 feet above the base of the Bird Spring Formation and 40 feet above the *Chaetetes–Profusulinella* faunizone. The association of *K. eganensis* and *F. acuminata* Thompson apparently characterizes a restricted biostratigraphic zone in eastern Nevada.

LOCALITIES

The abbreviations T. 00 N., R. 00 E. appearing below represent Township 00 North, Range 00 East, Mt. Diablo Base and Meridian.

B.4851. Bird Spring Formation, Arrow Canyon Quadrangle, Clark County, Nevada. Two- to three-foot resistant limestone ledge 1,285 feet above base of formation near red painted number 26 and yellow painted 'C'. The outcrop is in Arrow Canyon, accessible from U.S. Highway 93 by turning west past a ranch house 12 miles north of Glendale Junction on to a dirt road which passes through a dump and into the canyon. Collected by Coogan.

B.4853. Ely Limestone, Illipah Quadrangle, White Pine County, Nevada. 'Moorman Ranch' locality. *Komia* occurs with fusulinids 1,360 feet above base of Ely Limestone exposed on a spur overlooking U.S. Highway 50 (north side). The line of traverse is marked with many wooden stakes. *Komia* can be collected at the stake with a brass ring numbered 485, approximately 150 feet above a well-defined bed with silicified *Chaetetes*. Collected by Coogan.

B.4852. Ely Limestone, T. 8 N., R. 62 E., Lincoln County, Nevada, near Sunnyside. Locality is 1,490 feet above base of Ely Limestone in section due east of Silver Spring, which lies a short distance north of Shingle Pass road at the base of the west side of the Egan Range. Collected by Coogan.

B.7873. Same section as B.4852, 20 feet higher.

B.7874. Same section as B.4852, about 310 feet higher and 10 feet below a red number 7 painted on the rocks.

B.4854. Ely Limestone, Ely No. 3 Quadrangle, White Pine County, Nevada. Locality lies in T. 14 N., R. 62 E. just south of crest of ridge bordering north side of south fork of Willow Creek near 9040-foot contour line as shown on USGS Advance Sheet for the SE. quarter of the Ely No. 3 Quadrangle, 1958 Edition. Grey limestone unit with *K. eganensis*, *Chaetetes favosus*, *Multithecopora hypatiae*, and Atokan fusulinids. Collected by R. L. Langenheim, Jr.

Acknowledgements. J. Harlan Johnson (of the Colorado School of Mines), Wayne L. Fry, and Paul C. Silva (paleobotanist and botanist, respectively, of the University of California, Berkeley), kindly examined some of our specimens and discussed possible algal affinities. Drs. Fry and Silva also read the manuscript and suggested apposite changes. K. B. Korde, of the Paleontological Institute, U.S.S.R. Academy of Sciences (Moscow), graciously examined one of our thin sections of *Komia eganensis* and agreed that it was properly placed in her genus. Thanks are due to J. Wyatt Durham of the University of California (Berkeley) for criticisms and suggestions made during this study and for reading the manuscript. R. L. Langenheim, Jr., of the University of Illinois, supplied the fossils which instigated this study and contributed locality and stratigraphic data for his material.

Coogan contributed specimens from and information regarding localities B.4851–3 and B.7873–4, text-figs. 1 and 3, and the section entitled Stratigraphic Distribution. In addition, he assisted with translations. Wilson and Waines are responsible for the remainder of the paper, including the description of *K. eganensis* sp. nov.

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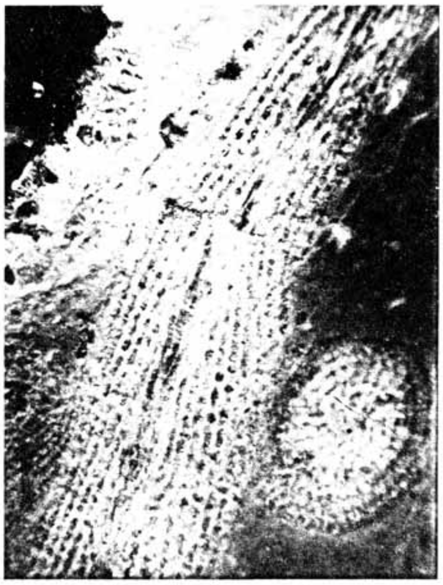

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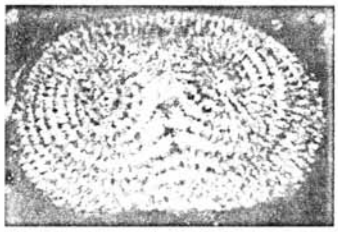

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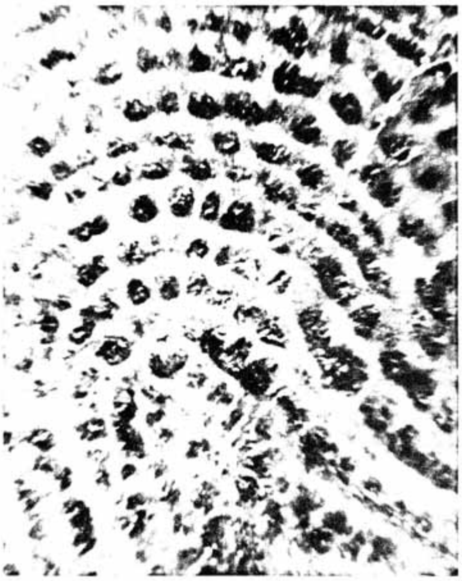

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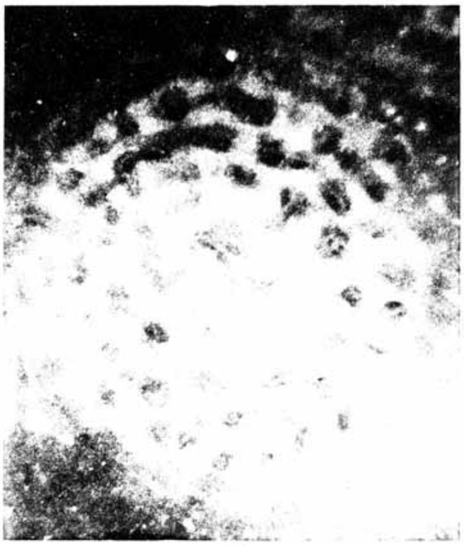
WILSON, WAINES and COOGAN, *Komia*



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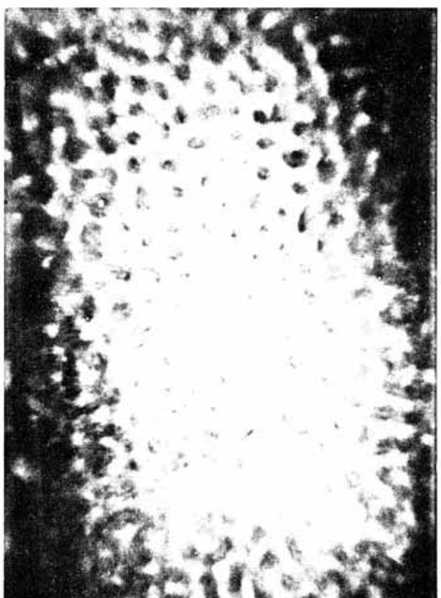

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