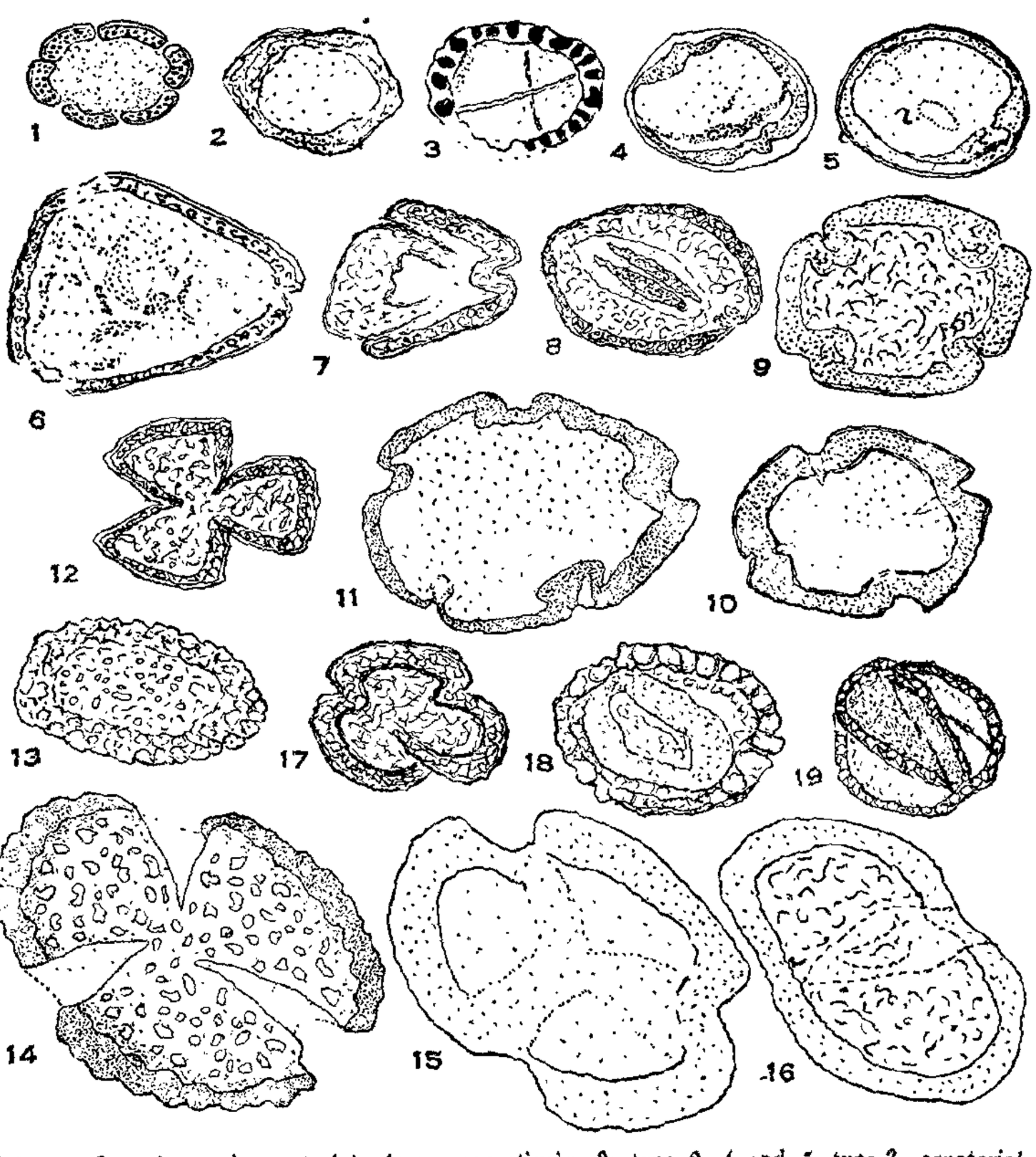
PLANT MICROFOSSILS FROM PALANA LIGNITE EOCENE, BIKANER

A. R. RAO AND K. P. VIMAL
Botany Department, Lucknow University

SOME samples of lignite from Palana (? Eocene) in Bikaner* on analysis, were found to contain carbonised wood, plant cuticles and other microfossils. Examination of the recently macerated material of this *lignite* showed at least ten different types of microfossils which are briefly described here.

The microfossils appear to be mostly pollen grains, with no trace of pteridophytic spores with trirdiate marks. Types 5, 7, 9 and 10 appear to be tricolpate in form; Type 6 is generally tetra-



1 and 2; type I, polar and equatorial views respectively. 3; type 2. 4 and 5; type 3, equatorial views at different foci; the clear elliptic areas seen in fig. 5 may be germ pores. 6; type 4, polar view 7-8; oblique polar and equatorial views respectively of the tricolpate type 5. 9-10; polar views at two different foci of the tetracolpate type 6. 11; a pentacolpate grain belonging to the same type. 12; polar view of the tricolpate type 7. 13; type 8. 14-15, polar views at different foci of the tricolpate type 9. 16; equatorial view of the same. 17-19; ype 10. 17, polar view. 18; equatorial view with two flanges in focus, 19; with only one flange in focus. All figures magnified 675 times.

* Collected in 1948, by Mr. S. S. Misra, M.Sc., and kindly placed at our disposal by Prof. S. R. Narayana Rao.

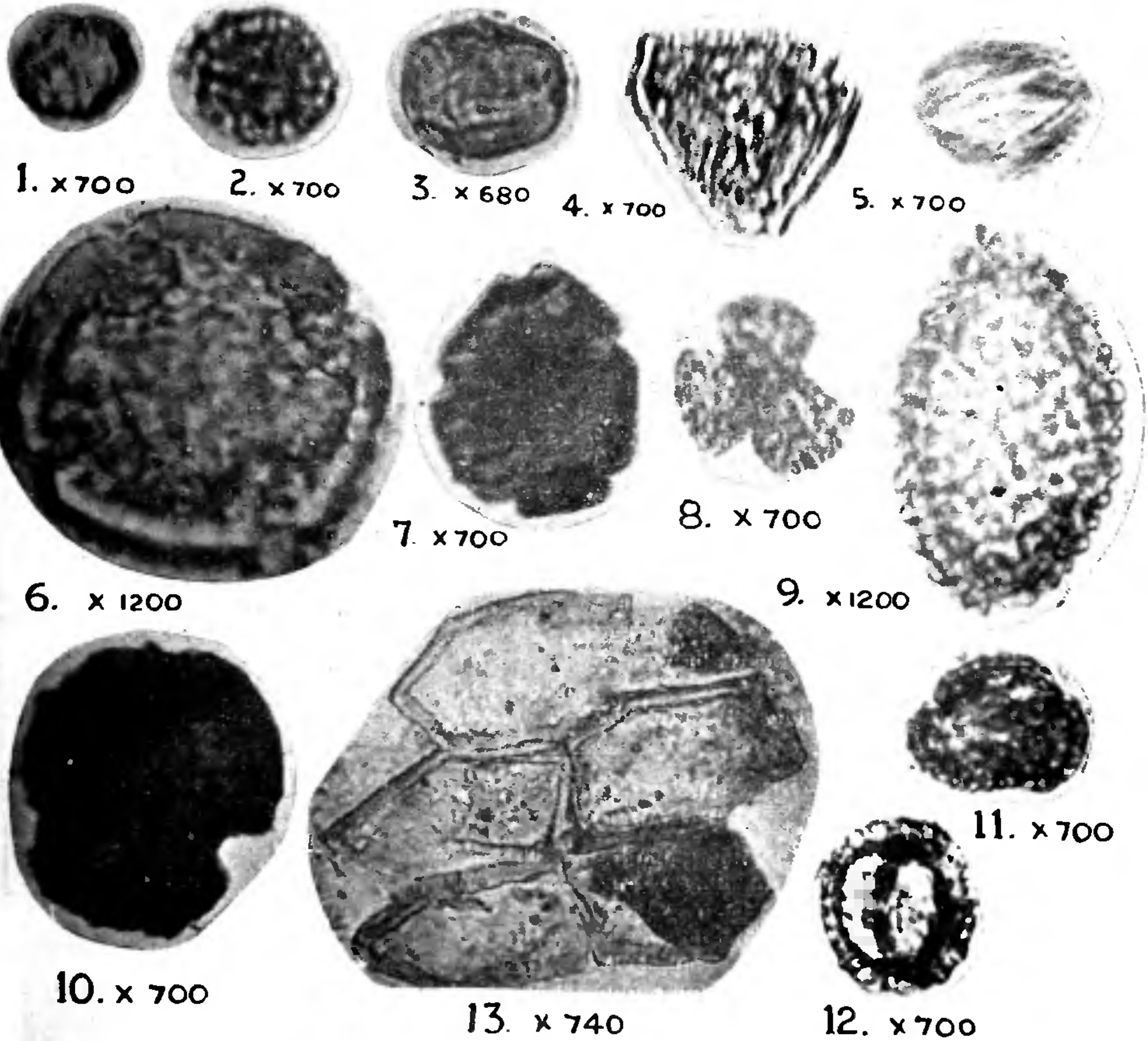
colpate and probably pentacolpate also. Type 1 appears to be hexacolpate, but its structure is still obscure. Types 9 and 10 correspond to the brachytrilistrium type of Naumova.[1] Type 8 without any pores or furrows can be classed under Aporina of the same author. The structure of type 2 could not be clearly made out.

DESCRIPTION

Type 1 (*Fig.* 1-2, *Photo.* 1).—Polar view elliptic (Fig. 1 and Photo. 1), $20{\cdot}8\,\mu \times 22{\cdot}4\,\mu$, six lobed, exine thick with thin hyaline cuticle-like outside layer, inner layer 2½ time as broad, granular, surface smooth; equatorial view (Fig. 2) broadly elliptic, $24{\cdot}0\,\mu \times 12{\cdot}8\,\mu$, with the two poles likely thicker. In the equatorial view can be seen six thin slits coresponding to the five gaps in the exine seen in the polar view. These are not shown in the figure; they may be the germinal pores or furrows. Ligrt yellow in colour.

Type 2 (*Fig.* 3 *and Photo.* 2).—Equotorial view almost rotundate, $24{\cdot}0\,\mu \times 24{\cdot}0\,\mu$ (Fig. 3 and Photo. 2), exine thick, surface negatively reticulate, germ pores not clear. Two thin slits, one equatorial and the other vertical but a little to the right of the median line, are seen (Fig. 3). Light brown in colour.

Type 3 (*Figs.* 4, 5 *and Photo.* 3).—Probably



1—Polar view of type 1. 2—Equatorial view of type 2. 3—Probably equatorial view of type 3. 4—Equatorial view of type 4. 5—Oblique polar view of type 5. 6—Polar view of tetracolpate type 6. 7—Polar view of pentacolpate grain of same type. 8—Equatorial view of type 7. 9. Probably polar view of type 8. 10—Oblique polar view of the tricolpate type 9. 11—Polar view. 12—Equatorial view of type 10. 13—Surface view of cuticle.

equatorial view, oval 20·8 $\mu \times 32 \cdot 0 \mu$ (Fig. 4). exine thick with a thin cutin-like layer, exine further thickened at the poles, surface smooth; (Fig. 5) oval, the three oval translucent areas which appear along the equatorial line at a different focus, may be the germ pores. Brown in colour.

Type 4 (*Fig.* 6 *and Photo.* 4).—Equatorial view triangular, 44·8 $\mu \times 38 \cdot 4 \mu$, exine thick, granular with thin cuticle, pores three, one at each angle. Yellow in colour.

Type 5 (*Figs.* 7-8 *and Photo.* 5).—Tricolpate. Oblique polar view (Fig. 7) 28·8 $\mu \times 32 \cdot 0 \mu$; equatorial view (Fig. 8) 35·2 $\mu \times 30 \cdot 4 \mu$, the two median thickenings in Fig. 8 are perhaps the two ridges of the wall which are seen in the polar view. Exine thick, surface uneven, negatively reticulate. Brown in colour. The grain resembles in appearance but not in size the pollen grain of *Cornus amomum*.

Type 6 (*Figs.* 9-10 *and Photo.* 6)—Tetracolpate. Polar view (Fig. 9), 38·4 $\mu \times 43 \cdot 2 \mu$, colpæ diagonally placed, walls folded inwards, germinal slits thin and narrow along the colpæ (Fig. 10), exine thick, surface smooth. Brown in colour A pentacolpate grain whose oblique polar view is seen in Fig. 11 and Photo. 7, belongs perhaps to the same type although there is some difference in size. The grain resembles in appearance and to a certain extent in size also, the pollen of *Tilia americana*.[3]

Type 7 (*Fig.* 12 *and Photo.* 8).—Tricolpate. Polar view (Fig. 12,), 35·5 $\mu \times 33 \cdot 6 \mu$, three lobed, clefts deep, exine thick, granular surface reticulate and sculptured. Light brown in colour.

***Type* 8 (*Fig.* 13 *and Photo.* 9).**—Probably equatorial view, elliptic, 25·6 $\mu \times 44 \cdot 8 \mu$, no furrow or germ pore seen. Photo. 9 shows the surface of the grain covered by dome-shaped structures which are responsible for the sscrobiculate sculpture of the exine. A comparison in appearance but not in size, can be made with the pollen grains of *Potamogeton natans*.[4] Wall dark brown in colour, body lighter.

Type 9 (*Figs.* 14, 15, 16 *and Photo* 10.)—Tricolpate, brachitrilistrium type. Oblique polar views (Figs. 14 and 15) at the higher and lower foci respectively, 57·6 $\mu \times 56 \cdot 0 \mu$, three flanged, flanges cleft upto the middle of the grain exine thick with reticulate thickenings. Equatorial view (Fig. 16), 56·0 $\mu \times 38 \cdot 4 \mu$. Dark brown in colour.

Type 10 (*Figs.* 17, 18, 19 *and Photos.* 11-12).—Tricolpate, brachitrilistrium type, polar view (Fig. 17 and Photo. 11), 28·8 $\mu \times 33 \cdot 6 \mu$, exine thick, surface with reticulate thickenings; equatorial view with the two flanges in focus (Fig 18 and Photo. 12) 33·6 $\mu \times 32 \cdot 0 \mu$; oblique equatorial view with one flange in focus (Fig. 19 28·0 $\mu \times 27 \cdot 2 \mu$) Light brown in colour.

Cuticle (Photo. 13) with epidermal cells measuring about 44·8 $\mu \times 24 \cdot 0 \mu$, average thickness of wall 4·0 μ. Yellow in colour.

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1. Naumova, S. N., "Spores and pollen oft he coals of U.S.S.R.," *Rep.* XVII, *International Geological Congress*, 1, 353-64. 2. Erdtman, G., *An Introduction to Pollen Analysis*, 1943, 85, fig. 143. 3.—, G., *Loc. cit.*, 123, fig. 359. 4. Wodehouse, R. P., *Pollen Grains*, 1935, 221, fig 8.

IRREGUALR SEGREGATIONS IN YEAST HYBRIDS

BALAJI D. MUNDKUR

DEVIATIONS in tetrad segregation from the 2:2 Mendelian expectation in heterozygous *Saccharomyces* hybrids have recently been attributed (Winge and Roberts[1]) to a degeneration of four nuclei from an initially 8-nucleate complement A chance survival of any four nuclei from among the gametic products of two successive mitoses (following a reduction of the hybrid nucleus) has been considered an explanation for 2 : 2, 3 : 1. 1 : 3, 4 : 0 and 0 : 4 ascus types. This view is based on their analysis of four 5- and 6-spored heterozygous asci genetically marked for one character only—the fermentation of maltose—and is adopted as an alternative explanation to that held by Winkler[2], Lindegren[3], and Mundkur[4].

The following considerations, based on data presented earlier, will indicate the inadequacy of employing a single genetical marker in investigating non-Mendelian inheritance.

1. Five different crosses involving from five to ten genetical markers (Mundkur[1]) yielded asci in which segregations of loci determining the fermentation of various sugars and the syntheses of a purine and some B vitamins were markedly disturbed. In spite of the extensive non-Mendelian ratios for such markers, segregations of mating type specificity (a and α segregants) conformed to the expected 2 : 2 Mendelian ratio in all but three of twenty-four 4-spored asci. Clones from the three exceptional asci mated with neither a nor α standard