TABLE I
Histidine—Average values for R.B.C. and hæmoglobin

	Histidine group			Histidine deficient group		
	Days		Increase	Days		Increase
	0	12	%	0	12	%
R.B.C.	2·99	6·62	121·4	2·99	4·89	63·4
Hæmoglobin	7·24	13·89	91·8	7·13	10·30	44·4

TABLE II
Statistical analysis

No. of animals	Histidine group 6		Histidine deficient group 6		$\frac{X_1 - X_2}{\sqrt{\epsilon_1^2 \quad \epsilon_2^2}}$
	Mean increase X_1	Standard error of mean ϵ_1	Mean increase X_2	Standard error of mean ϵ_2	
R.B.C.	3·63	·1219	1·92	·1581	7·76
Hæmoglobin	6·65	·2247	3·13	·3818	7·95

Similar experiments carried out with tyrosine, the results of which are tabulated below, show that this amino-acid plays no essential role in hæmopoiesis.

TABLE III
Tyrosine—Average values for R.B.C. and hæmoglobin

	Tyrosine Group			Tyrosine deficient group		
	Days		Increase	Days		Increase
	0	12	%	0	12	%
R.B.C.	3·35	6·18	86·1	3·31	6·24	88·5
Hæmoglobin	8·06	13·18	63·5	8·14	13·07	60·5

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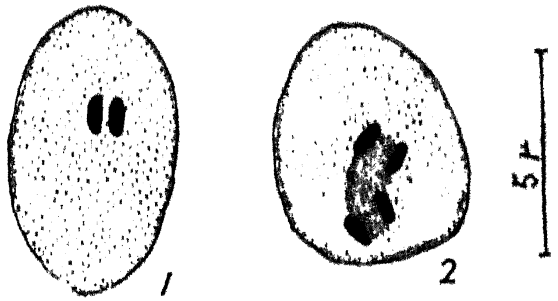
MITOSIS DURING BUDDING IN *SACCHAROMYCES CEREVISIAE*

THERE is little agreement as to whether during budding the nucleus of *S. cerevisiae* divides by mitosis (Kater,[1] Beams *et al.*,[2] Richards,[3] Henrici[4]). Guilliermond classifies yeasts as haplo- and diplobiontic depending on whether meiosis takes place after or before zygote formation. This is based solely on the assumption that "since nuclear reduction occurs in higher Ascomycetes, in yeasts also 'meiosis must occur within the ascus'". Any advance in our knowledge of the cytogenetics of the yeasts depends on a demonstration first of mitotic division during budding. Bohan[5] observed during budding two chromosomes which split longitudinally to give rise to two daughter-nuclei but Guilliermond is disinclined to accept his conclusions. Darlington[6] states that "the effective test of a nucleus is not so much in its chemical and physical properties, but in its behaviour: *a nucleus is a cell-body which arises or reproduces by mitosis*". Strict application of the above test to yeasts renders doubtful even the identification of a particular structure in the yeast-cell as the nucleus.

Every text-book on Cytology warns the reader of the caution to be exercised in interpreting certain appearances as amitosis. Re-investigations in many cases with improved technique have resulted in demonstration of mitosis in cells which have previously been thought to divide by amitosis and Darlington mentions "that the apparent contradiction to genetic principles in the occurrence of amitosis need no longer be taken seriously."

It was thought therefore, that a careful investigation of the behaviour of the nucleus during budding was an essential introduction to a study of the cytogenesis of the yeasts.

The strain of *S. cerevisiae* (*N.C.T.C.* 3007) employed by us was SC 9 in the National Collection of Type Cultures, India. Wort cultures were made from wort-agar slants and conditions were standardized so that in a smear



almost all cells were practically at the same stage of development. Systematic examination demonstrated that vital changes take place in the nucleus at definite intervals and that the whole process of division of the nucleus takes only about 20 minutes. Indeed, the anaphase stage is passed through so quickly that unless one is very careful it may be missed completely.

Among the various fixatives and stains tried, smears fixed in Carnoy and stained with

Heidenhain's hæmatoxylin were found to give excellent pictures. No particular treatment was found necessary to remove the metachromatic granules from the cells. In smears fixed for 60 minutes in Carnoy's fluid, mordanted overnight in iron-alum and kept in hæmatoxylin for 24 to 36 hours, careful differentiation gives only pictures of the chromosome stages. We have smears where large number of cells are at particular phases of the mitotic cycle.

There are only two chromosomes, both identical in appearance (Fig. 1). The measurements of the two chromosomes in four cells at the same stage of the cycle are as follows:— (1) 1·33 μ/0·33 μ, 1·33 μ/0·4 μ; (2) 1·33 μ/0·4 μ, 1·33 μ/0·27 μ; (3) 1·33 μ/0·33 μ, 1·00 μ/0·33 μ; (4) 1·00 μ/0·33 μ, 1·00 μ/0·33 μ. At anaphase shown in Fig. 2 they measure 1·00 μ/0·33 μ.

Badian's paper has evoked contradictory opinions. While Gulliermond rejects Badian's interpretations, Henrici considers that "the two chromosomes described by him are more definite than the vague accumulations of minute chromatin granules described by Guillermond". It appears as if Badian saw structures missed by the other workers. *S. cerevisiæ* does not form an exception to the general rule, for, nuclear division during budding is by mitosis.

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ON THE FOOD OF MULLETS*

MULLETS are a group of food-fishes found in seas, backwaters and estuaries of our country. The food of twelve species of Mullets is described by examining their stomach-contents. (1) *Mugil klunzingeri* Day. (30 specimens, 8-13 cms.): *Amphora, Cymbella, Pleurosigma, Eremosphæra, Copepods* and sand grains. (2) *Mugil jerdoni* Day. (15 specimens, 8-10 cms.): *Biddulphia, Coscinodiscus, Cymbella, Fragillaria, Pleurosigma, Rhizosolenia, Eremosphæra, Peridinians,* larval bivalves, larval gastropods, fish-eggs, fish scales and sand grains. (3) *Mugil dussumieri* Cuv. & Val. (25 specimens, 8-10 cms.): *Coscinodiscus, Cymbella, Fragillaria, Gomphonema, Navicula, Nitzschia, Pinnularia, Pleurosigma* and sand grains. (4) *Mugil cœur* Forskal (12 specimens, 9-10 cms.): *Biddulphia, Coscinodiscus, Navicula, Nitzschia* and sand grains. (5) *Mugil sehali* Forskal. (61 specimens, 9-21 cms.): Algal filaments, *Bacteriastrum, Biddulphia, Coscinodiscus, Fragillaria, Nitzschia, Pleurosigma, Rhizosolenia, Thalassiothrix, Trichodesmium,* larval polychætes and sand grains. (6) *Mugil crenilabris* Forskal. (20 specimens, 10-15 cms.): *Coscinodiscus, Navicula, Pinnularia, Pleurosigma, Tabellaria,* larval polychætes and sand grains. (7) *Mugil cœruleo-maculatus* Lacep. (30 specimens, 9-12 cms.): *Biddulphia, Chætoceras, Coscinodiscus, Navicula, Pinnularia, Pleurosigma, larval* polychætes, *Tabellaria* and sand grains. (8) *Mugil amarulus* Cuv. & Val. (5 specimens, 5-8 cms.): *Coscinodiscus, Eremosphæra* and sand grains. (9) *Mugil labiosus* Cuv. & Val. (5 specimens, 5-8 cms.): Algal filaments, *Coscinodiscus* and sand grains. (10) *Mugil olivaceus* Day. (20 specimens, 7-9 cms.): *Bacillaria, Coscinodiscus, Fragillaria, Navicula, Pleurosigma* and sand grains. (11) *Mugil troschelii* Bleeker (123 specimens, 10-35 cms.): Algal filaments, sea-weed (*Caulerpa* sp.), *Chætoceras, Chroococcus, Cœlosphærium, Coscinodiscus, Eremosphæra, Glœocapsa, Hemidiscus, Navicula, Nitzschia, Pleurosigma, Rhizosolenia, Tabellaria, Thalassiothrix,* Foraminifers. *Tintinnus,* larval polychætes, Nauplius larvæ, Ostracods and sand grains. (12) *Mugil waigiensis* Quoy. and Gaim. (126 specimens, 10-45 cms.): Algal filaments, *Bacteriastrum, Biddulphia, Coscinodiscus, Detonula, Eremosphæra, Fragillaria, Gœlenkinia, Hemidiscus, Navicula, Nitzschia, Pleurosigma, Rhizosolenia, Tabellaria, Thalassiothrix, Trichodesmium, Dinophysis,* Foraminifers, *Tintinus,* larval polychætes, Copepods, Amphipods, Ostracods, larval gastropods and sand grains.

Discussion.—Mullets are chiefly plankton-feeders, diatoms and larval bristle-worms forming the major portion of their food. They, however, supplement their diet by browsing at the water margin on vegetable matter, and this accounts for the presence of sand grains in their stomachs. The presence of fish-eggs in a few specimens of *Mugil jerdoni* Day. is considered accidental.

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