sible that *nd* and *leu-5* are exceptional cases it would be surprising, because the phenotypic effects are so similar, to find that ageing in these species did not occur in the same way.

It is interesting that the *leu-5* auxotroph has mutator activity, for it has been suggested many times that ageing could be the result of deleterious effects which might build up if spontaneous mutations accumulated in both dividing and non-dividing cells[18,19]. It has been shown that the spontaneous mutation rate in the micronucleus of *Paramecium* increases with age[20]. Damage accumulating in the cell nucleus, which is ultimately required to exercise control over the whole cell, might be expected to lead to cellular inefficiency. These results with *leu-5* suggest that Orgel's theory and this theory of somatic mutation may not be as diametrically opposed as they seem.

We thank Mrs G. Tarrant for help with enzyme assays, and Dr F. J. de Serres for *ad-3B Neurospora* stocks.

C. M. Lewis
R. Holliday

National Institute for Medical Research,
Mill Hill,
London NW7.

Received June 10, 1970.

[1] Orgel, L. E., *Proc. US Nat. Acad. Sci.*, **49**, 517 (1963).
[2] Crestfield, A. M., Stein, W. H., and Moore, S., *J. Biol. Chem.*, **238**, 2413 (1963).
[3] Richmond, M. H., *J. Mol. Biol.*, **6**, 284 (1963).
[4] Printz, D. B., and Gross, S. R., *Genetics*, **55**, 451 (1967).
[5] Sheng, T. C., *Genetics*, **36**, 199 (1951).
[6] Holliday, R., *Nature*, **221**, 1224 (1969).
[7] Harrison, B. J., and Holliday, R., *Nature*, **213**, 990 (1967).
[8] Fincham, J. R. S., *J. Mol. Biol.*, **4**, 257 (1962).
[9] Roberts, D. B., and Pateman, J. A., *J. Gen. Microbiol.*, **34**, 295 (1964).
[10] Roberts, D. B., *J. Bact.*, **91**, 1888 (1966).
[11] Langridge, J., *J. Bact.*, **96**, 1711 (1968).
[12] Langridge, J., *Molec. Gen. Genet.*, **103**, 116 (1968).
[13] Drake, J. W., Preparata, R. M., Allen, E. F., Forsberg, S. A., and Greening, E. O., *Nature*, **221**, 1128 (1969).
[14] Speyer, J. F., Karam, J. D., and Lenney, A. B., *Cold Spring Harbor Symp. Quant. Biol.*, **31**, 693 (1966).
[15] Malling, H. V., and de Serres, F. J., *Mut. Res.*, **5**, 359 (1968).
[16] Yanofsky, C., *Bact. Rev.*, **24**, 221 (1960).
[17] Tatum, E. L., Barratt, R. W., Fries, N., and Bonner, D. M., *Amer. J. Bot.*, **37**, 38 (1950).
[18] Szilard, L., *Proc. US Nat. Acad. Sci.*, **45**, 30 (1959).
[19] Curtis, H. J., *Science*, **141**, 686 (1963).
[20] Sonneborn, T. M., and Schneller, M., *J. Protozool.*, **2**, Suppl. 6 (1955).

Megagametophyte containing Twin Ova

Reports of multiple eggs within a single embryo sac are few. Strasburger[1] reported their occurrence in *Santalum album* L. and *Sinningia Lindleyi* Schauer. Gerassimova[2] reported multiple eggs in the embryo sacs of *Crepis capillaris* (L.) Wallr.

In the present report two well developed ova, each associated with two polar nuclei, were observed in a single macrogametophyte of *Phalaris tuberosa* var. Stenoptera Hack (Fig. 1). The phenomenon was of low frequency, being observed only once in 227 sectioned megagametophytes collected from five plants. This anomaly may have resulted from additional mitosis in the micropylar region or migration of nuclei from the chalazal region.

Several reviews of embryo sac anomalies and polyembryony have been published[3,4,5] indicating that supernumerary embryos may develop from maternal tissues, multiple embryo sacs, the synergids and the antipodals. Cleavage of the zygote may also result in multiple embryos. Often twin seedlings are heteroploid and can be a valuable source of haploid plants[6]. Heteroploid twin seedlings could be derived from the megagametophyte described here as follows. Fertilization of one of the eggs and its associated polar nuclei would permit development of normal endosperm and a $2n$ embryo. Should the other egg be stimulated to develop without fertilization, heteroploid twin seedlings would result, one diploid and one haploid.

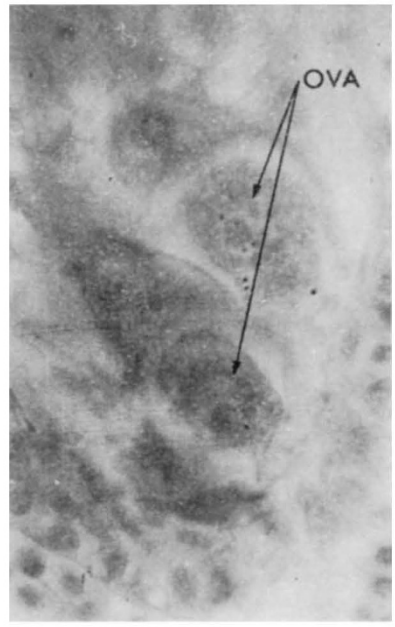

Fig. 1. Embryo sac containing twin eggs each associated with two polar nuclei.

Frequently interspecific hybridization in the grasses fails as a consequence of endosperm abortion[7]. A megagametophyte such as that described here would afford an opportunity for fusion of a foreign sperm with four polar nuclei forming a pentaploid endosperm. With the alien genetic complement in lesser proportion than in the usual $3n$ endosperm, development may be less aberrant, permitting successful embryogeny. Alternatively, fertilization of one egg and its polar nuclei might stimulate fusion of the two remaining polar nuclei to form a diploid non-hybrid endosperm. Such a diploid endosperm might compete with and replace the $3n$ hybrid endosperm, or might integrate with it, forming a mixoploid endosperm with adequate functional capability.

T. E. Devine

Plant Industry Station,
Beltsville, Maryland.

J. L. Starling

Tysom Building,
Pennsylvania State University,
University Park, Pennsylvania.

Received July 30, 1970.

[1] Strasburger, E., *Ueber Befruchtung and Zelltheilung*, Jena (1878).
[2] Gerassimova, H., *Cellule*, **42**, 103 (1933).
[3] Lebegue, A., *Bull. Soc. Bot. Fr.*, **99**, 329 (1952).
[4] Maheshwari, P., and Sachar, R. C., in *Recent Advances in the Embryology of Angiosperms* (edit. by Maheshwari, P.) (Catholic Press, Ranchi, India, 1963).
[5] Webber, J. M., *Bot. Rev.*, **6**, 575 (1940).
[6] Muntzing, A., *Cytol. Fujii Jub.*, 211 227 (1937).
[7] Brink, R. A., and Cooper, D. C., *Bot. Rev.*, **13**, 423 (1947).

Effect of Ambient Carbon Dioxide Concentration on the Rate of Transpiration of *Agave americana* in the Dark

The leaves of *Agave americana* are remarkable for their ability to assimilate CO_2 in the dark. The maximum dark influx of CO_2 (from normal air of about 320 v.p.m.)