that sex-segregation does not take place at meiosis. Dr. Cadman herself is of the opinion that in the two species of Mycetozoa she has investigated, *D. nigripes* var. *xanthopus* and *Reticularia Lycoperdon* (Bull.), "there is no difference, morphological or physiological, between the gametes in either species".

In conclusion, it may be said that anyone who has worked at the cytology of this group will appreciate the technical difficulties that are involved in its investigation. G. LISTER.

871 High Road, Leytonstone, E.11,
Dec. 13.

[1] *Trans. Roy. Soc. Edinburgh*, **56**, 93-142; 1931.
[2] "Untersuchungen über die Sexualität der Myxomyceten", *Planta*, **9**, 645-672; 1930.
[3] "Comp. Morph. and Biol. Fungi, etc.", Oxford Ed., p. 441; 1887.
[4] "Myxomycetenstudien 8", *Ber. Deutsch. Bot. Gericht*, **29**, 239; 1911.
[5] "Observations on Mycetozoa in the Genus *Didymium*", *Trans. Brit. Myc. Soc.*, **14**, 227-248; 1929.

Carbon/Nitrogen Ratios in Cacao Soils.

BY tabulating and comparing the results of a detailed laboratory examination of profile samples of cacao soils collected in January 1930, in the island of Tobago, British West Indies, one of us (G. G.) was able to demonstrate [1] a close correlation between the yielding capacity and the carbon/nitrogen ratio for the organic matter contained in the surface six-inch layer of soil. The mean ratio for 'good' soils yielding more than 8 bags (or 1320 lb.) of fermented and dried cacao beans per 1000 trees (pickets) is 8·3 (21 samples), and for 'bad' soils yielding less than 8 bags per 1000, 6·8 (10 samples). Statistically, this correlation is highly significant ($t=4{\cdot}5$), and the C/N ratio is not necessarily dependent on the total amount of organic matter present ($t=1{\cdot}1$). Although a complete explanation of this relationship is not yet forthcoming, the result implies that the nature of the organic matter present, rather than its total amount, is the primary factor concerned in the productivity of cacao soils under the climatic, cultural, and soil conditions that obtain in Tobago.

Afterwards, similar comparisons of yields and C/N ratios for cacao soil—profile samples collected in Trinidad and in Grenada, B.W.I.—have been established. The following additional results have been demonstrated:

	Mean C/N Ratios (Top 6 in. Soil).	
	'Good' Cacao Soils. (Yield, more than 8 Bags/1000.)	'Bad' Cacao Soils. (Yield, less than 8 Bags/1000.)
Trinidad . .	7·0 (54 samples)	5·7 (46 samples)
Grenada . .	8·0 (23 samples)	6·5 (12 samples)
(Tobago; for comparison) . .	8·3 (21 samples)	6·8 (10 samples)

Whilst these results substantiate the earlier Tobago result, the numerical values of the C/N ratios for the Trinidad and the Grenada soils are not identical with those for the Tobago soils, but they are of the same order of magnitude, and their differences are approximately the same.

A comparison of the climatic, cultural, and soil conditions within the three areas is instructive. The climatic differences are not very marked. Within each area, the annual rainfall (45 to 120 inches) is distributed between seven wet months (June to December) and five dry months. The cultural treatment is somewhat similar, except that leguminous shade trees (Immortel) are generally grown in the cacao fields of Trinidad and Tobago, but not in those of Grenada, whilst artificial manures are regularly employed in Grenada but not in the other islands. The soil types are markedly different. The cacao soils of Trinidad are mainly derived from Tertiary sedimentary rocks and from their recent alluvial representatives, but some alluvial soils of the Northern Range of mountains are derived from Palæozoic dynamo-metamorphosed sediments. The cacao soils of Tobago are about equally distributed between—(*a*) metamorphic sedimentary rock types, similar to those of northern Trinidad; (*b*) partly metamorphosed, intrusive basic igneous rock (epidiorite) types; and (*c*) alluvial equivalents of both. The cacao soils of Grenada are derived from Pleistocene basic volcanic rocks (hornblende and augite andesites and olivine basalts; lavas, intrusions, and fragmental rocks) or their alluvial derivatives. Detailed studies of all these soil types are now being prosecuted at the College, and include a special investigation of the transformations of their organic matter contents. It is hoped thereby to discover the true significance of the C/N ratio of soil organic matter in its relation to nutrition of the cacao tree.

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[1] Unpublished Thesis in part fulfilment of the requirements of the Associateship of the Imperial College of Tropical Agriculture, Trinidad, B.W.I., session 1929-30.

Raman Lines and Infra-Red Bands in Nitrous Oxide.

THE question whether or not the N_2O molecule is linear, and if so, whether the oxygen atom occupies a position between the two nitrogen atoms or at one end, was discussed by Snow [1] some time ago. The incomplete evidence then available seemed to favour the symmetrical configuration. We have, however, been able to show conclusively that the molecule is unsymmetrical, though linear.[2] The form of the bands and the spacing of the rotation lines is inconsistent with any but the linear model. The selection rules for vibrational transitions and for the appearance of zero branches, and the fact that all three fundamental frequencies are optically active, indicate the asymmetry.

The lowest frequency fundamental vibration, designated as ν_2, involves simultaneous displacements of the three atoms perpendicular to the linear axis, the central atom moving toward one side and the extreme atoms toward the other. Dennison [3] has shown that in the first excited state each atom executes a circle about its normal position as centre. The molecule thus becomes a very slender rotating triangle the lengths of the sides of which *do not vary*. Consequently there is no change in polarisability with phase, and, according to Placzek,[4] no Raman scattering. A second fundamental frequency, designated as ν_1, involves simultaneous displacements of the two extreme atoms towards and away from the centre, with rapid changes in polarisability, and should give an intense Raman line. We find this band in the infra-red at 1285 cm.$^{-1}$.

The third fundamental frequency, ν_3, which we find at 2224 cm.$^{-1}$, involves displacements of both extreme atoms in one direction along the axis and of the central atom in the opposite direction. If the molecule were symmetrical (both extreme atoms identical) the configurations at phases one-fourth and three-fourths would be mirror images of one another. At zero phase the polarisability would be either a maximum or a minimum, the sequence of values assumed during half of the period being repeated precisely during the next half period. Thus no Raman displacements of the fundamental frequency would occur. For the