

on the whole brought forward evidence contrary to that of Virtanen.

It may be generally assumed that the excretion and donation obtained by Virtanen are associated with some environmental factors not readily reproducible elsewhere.

In more recent experiments carried out at the Waite Institute, attempts have been made to grow peas and oats in association under a variety of conditions, which included variations in the amount of daylight and in the moisture content of the soil. It might be assumed that a reduction in the amount of photosynthesis in a well-established leguminous plant might result in an accumulation of nitrogen compounds above the needs of the plant, such excess being excreted and made available for any associated non-legume.

In these experiments in a series of pots, a mixture of oats and inoculated peas and oats alone were grown in pure sand under favourable conditions for a period of six weeks—the peas at the end of this period were vigorous and healthy. A differential treatment was then imposed for a further six weeks on half of the pots. These pots were allowed two hours of daylight only each day, between the hours of noon and 2 p.m. The atmospheric conditions favoured high transpiration.

Each pot contained either two oat plants alone or two oat plants and two pea plants.

TOTAL NITROGEN (MGM.) IN OAT PLANTS PER POT.

Replicate	Normal daylight, approx. 11 hours daily		Reduced daylight 2 hours daily		Mean
	Oats alone	Oats with	Oats alone	Oats with	
1	4.09	3.83	5.01	7.10	5.01
2	3.91	3.14	5.66	6.84	4.89
Mean	4.00	3.48	5.34	6.97	4.95

The standard error of a single observation is  $\pm 0.35$ .

The increases in the total nitrogen content of the oats brought about by shading or by association with peas are independently significant, statistically. The legume effect is significant when the effect of shading upon the oats alone is eliminated.

In no circumstances have we ever been able to obtain evidence of donation in controlled pot experiments under the normal growing conditions in Adelaide. It is of interest that we have been able to obtain evidence of apparent donation by some modification of the local environment.

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<sup>1</sup> Virtanen, A. I., and Laine, T., *J. Agric. Sci.*, **27**, 332 (1937), etc.

<sup>2</sup> Wilson, P. W., *NATURE*, **140**, 155 (1937).

<sup>3</sup> Bond, G., *Ann. Bot.*, n.s., **2**, 61 (1938).

<sup>4</sup> Trumble, H. C., and Strong, T. H., *C.S.I.R. (Aust.) Bull.*, **105**, 11-24 (1937).

### Respiration Changes following Irradiation with X-rays

In a study of respiratory changes prior to tumour formation after irradiation with X-rays, two disturbances in the oxidation processes of the affected tissues were observed. A group of sixteen mice were given local treatment of X-rays sufficient to produce a burn. At various intervals after irradiation (3 hours-50 days), mice were successively sacrificed and the respiration of the irradiated area compared to the respiration of an

equal control area on the same mouse. It was observed that, after the first day of irradiation, the respiration began to decrease, reaching a maximum depression, after about two weeks, of 60 per cent below the respiration of the control skin. Directly following this period of inhibition was a period of stimulation which brought the oxygen consumption of the irradiated area of skin about 35 per cent above that of the control. This stimulation continued over a period of about five weeks.

It has not been determined at this time whether the initial decrease in oxygen consumption is due to a degeneration and dying of the irradiated cells, and the subsequent stimulation of respiration due to an invasion of leucocytes and new tissue cells, or whether irradiation has more directly altered the respiratory mechanism of the cells.

These results are of particular interest in view of the experiments of Davis<sup>1</sup>, which show that the resistance or susceptibility of animals to cancer is dependent upon the respiration of the normal tissues of these animals. There also remains the possibility that a relationship exists between tissue respiration and lymphocytic invasion; for it has been demonstrated by Murphy *et al.*<sup>2</sup>, that when lymphocytosis is prevented by proper dosages of X-rays, the resistant state is abolished. Erythema doses (Murphy<sup>3</sup>), however, considerably reduce the percentage of 'takes' of autografts.

The fact that X-rays can both stimulate and depress tissue respiration may explain why X-rays can both decrease and increase the resistance of animals to transplantable tumours.

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<sup>1</sup> Davis, J. E., *Canadian Med. Assoc. J.*, **36**, 27-30 (1937).

<sup>2</sup> Murphy, James B., and Morton, John J., *J. Exp. Med.*, **22**, 204 (1915).

<sup>3</sup> Murphy, James B., Maisin, Joseph, and Sturm, Ernest, *J. Exp. Med.*, **33**, 645 (1923).

### Induction of Polyploidy by Pulp and Disintegrating Tissues from *Colchicum* sp.

INVESTIGATIONS of the active agents in Nature inducing chromosome alterations have shown that the most effective ones are abnormal temperatures<sup>1</sup> and obviously various parasites (cynipid wasps<sup>2</sup>, nematodes<sup>3</sup>, *Eryophyes*<sup>4</sup>, *Tetranychus*<sup>5</sup>, bacteria<sup>6</sup>, fungi<sup>7</sup>, viruses<sup>8</sup>, etc.). The latter induce abnormalities in the mitotic and meiotic processes chiefly by introducing various substances and partly by wounding, which further give rise to plants with altered chromosome complexes (including polyploidy<sup>9</sup>).

This type of work in connexion with the induction of chromosome alterations (chiefly polyploidy) by the alkaloid colchicine<sup>9</sup> obtained from *Colchicum autumnale* suggested the following experiments: (1) Does pulp from *Colchicum* bulbs induce chromosome alterations? (2) Do disintegrating pieces from the bulbs induce chromosome alterations and particularly polyploidy in seedlings from germinating seeds in the neighbourhood? Experiments performed showed that about two grams of pulp from *Colchicum* sp. bulb induced swellings (like low concentrations from colchicine-induced) in seedlings when seeds from *Triticum*, *Secale* and *Crepis* were germinating on the