

of the dried bean. The range of light frequencies responsible is now being studied, and apparatus has been constructed for the determination of moisture content and desorption isotherms using a wet- and dry-bulb technique with recirculated air flow. Two full-scale driers for use on wet groundnuts were designed and tested for the National Institute of Agricultural Engineering and the Tanganyika Agricultural Corporation.

Work on the production of vitreous bowls should now permit costs of production to be estimated. Successful large-scale trials of locally made refractory bricks and bonding cement for setting them in locomotive fire-boxes are reported. Much work was done on the elimination of arsenic from cement copper prepared from an ore containing arsenic and on the production of high-grade silicophosphatic fertilizer by the low-soda process.

PART-TIME WORK FOR WOMEN GRADUATES

IN 1956, as an experiment, an agency was started in the London area to put women graduates in touch with any suitable part-time work. From the beginning it was hoped that the agency might not only help to canalize existing opportunities but also increase them. Many potential employers are prejudiced against part-time workers; it was felt that they might have more confidence if they could interview not one but a number of suitable candidates for each vacancy, and feel that they could call on a reserve if the need arose.

Some types of work, such as highly responsible administrative posts, could not be adapted to part-time hours, but other types could: teaching, research assistance, information work, indexing, cataloguing, translation, abstracting, statistical work all seemed possible to arrange in this way. It also seemed clear that much of this work could be done at home and that it would be greatly welcomed, especially by mothers of young children. The growth of the agency has recently been described by Mrs. D. D. Furley (*Univ. Rev.*, 31, No. 2; February 1959).

The agency started in a modest way with a nucleus of about twenty graduates in London who were in search of part-time work. At first, few vacancies were notified to the agency. After the appearance of one or two letters to the Press from people who had heard of the scheme, about three hundred graduates registered as potential part-time workers in the London area and letters were received from about five hundred others living outside the London area who were seeking work, but did not realize that the scheme applied only to London.

Many employers were sympathetic to the idea and more jobs gradually became available.

In the first eighteen months, 378 jobs were notified to the agency, and 260 of them were filled by graduates registered with it. In the following twelve months, 440 jobs were notified, and 303 were filled. The majority of these jobs were in teaching, research of one kind or another and editorial or secretarial work. The figures included both temporary and

permanent jobs; several women who started by filling some temporary vacancy have later been found permanent part-time jobs by the same employer.

It is impossible to fill some of the vacancies notified to the agency. There are many reasons: part-time science teachers are as rare as full-time ones; there is more demand than supply for good secretaries; the pay offered is sometimes, and particularly in social work, unattractive; and vacancies are often separated from the likeliest candidates by a journey of impossible complexity and length.

Fewer permanent than temporary jobs are filled. This seems to reflect a general reluctance on the part of married women to commit themselves to permanent work. Women who have not held a job since marriage or since having children are sometimes uncertain how it will work out. Mothers are always reluctant to commit themselves to working during school holidays and permanent jobs which conform to school holidays are very hard to find.

In May 1957 a similar agency was opened in Manchester. Although similar to the London agency, in one way it differs from it. As Manchester is a smaller and non-metropolitan city, it was thought advisable not to confine the agency to graduates, but to use it for other women with comparable qualifications—diplomas, teachers' training certificates, or knowledge of foreign languages. Eighteen months experience in Manchester bear out the findings of the London agency.

Altogether, more than a thousand women, about 800 of them married, have registered with the London agency since its inception. Although about 40 per cent of them have been 'housebound' by children, illness or elderly relatives, approximately half of them have found work through the agency. In Manchester more than one hundred women have registered, all but nine of whom are married; sixty of these have a university degree, twenty-three a diploma of one kind or another. Forty-six of these have found temporary or permanent work through the agency.

MIGRATION AND DISPERSAL OF NEW ZEALAND GANNETS

ATOTAL of 3,999 gannet chicks was banded at Plateau station, Cape Kidnappers, Hawke's Bay, and Horuhoru station, Hauraki Gulf, New Zealand, between 1951 and 1957. Up to March 31, 1957, 207 recoveries were made. These recoveries include 26 chicks which had not left the gannetry, 146 birds recovered outside the gannetry, and 35 live sub-adult birds caught on their return to Plateau gan-

netry. An account of the investigation has been given by Kazimierz Wodzicki and Peter Stein (*Emu*, 58, Part 4; September 1958).

The percentage of recovery for the whole period was 3.1 (3.3 from Plateau and 2.9 from Horuhoru). This distribution of recoveries throughout the year shows two periods of increased mortality; one affecting first-year birds within the first few months

of their independent life and associated with the crossing of the Tasman Sea; another peak occurring in late spring and summer and comprising one- to two-year-old birds.

It was found that fully fledged chicks leave the gannetry at the age of 15½ weeks. The majority of Plateau gannets take a northern route towards the North Cape; others migrate along the eastern coast of North Island and reach Australia through Cook Strait. Recoveries of Horuhoru gannets show an almost exclusive use of the northern route. At the age of 24 weeks all but sickly or late chicks cross the Tasman Sea with an average speed of up to 240 miles a day.

In Australia young gannets disperse widely from subtropical waters in the south and to the Indian Ocean pelagic waters in the west. Horuhoru birds tend to go further south than those banded at Plateau. There seems to be no appreciable difference in geographical distribution among various age-groups of the sample. Sub-adult gannets remain in

Australian waters until they are two to three years old.

From that time an increasing number of recoveries is made in New Zealand, where the birds disperse around the coast, and there appears to be some difference in the geographical distribution of recoveries from the two stations.

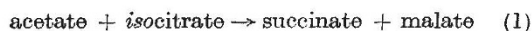
An analysis of live birds recovered at the gannetry shows that young gannets begin to reappear at their home-gannetry at the age of three years, first as 'roosting' or 'unemployed' birds; from the age of 4-5 years they commence to breed, but at the age of 6-7 years only about half of the birds are breeding.

In all three subspecies of the gannet there is a similar strong urge in juvenile birds to migrate to warmer seas; a similar maximum distance of about 4,000 miles may be flown by the three subspecies, but whereas North Atlantic and Cape gannets move towards the equator, New Zealand-bred Australasian gannets migrate westwards.

BIOSYNTHESIS OF CELL CONSTITUENTS FROM C₂-COMPOUNDS

Formation of Malate from Glycollate by *Pseudomonas ovalis* Chester

DURING the growth of micro-organisms, intermediates of the tricarboxylic acid cycle are utilized to provide the carbon skeletons of many cell constituents^{1,2}. When C₂-compounds are the sole source of carbon, means must exist whereby such intermediates, drained from the cycle, are replenished by ancillary reactions. When the C₂-substrate for growth is acetate, this is accomplished via the glyoxylate cycle³⁻⁵, in which the decarboxylative steps of the tricarboxylic acid cycle are replaced by the overall reaction:



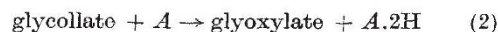
Reaction (1) is the sum of two reactions, catalysed respectively by isocitratase^{6,7} and by malate synthetase⁸. Experiments on the influence of growth substrates on the formation of isocitratase⁹ have shown, however, that this enzyme is formed only when acetate or a precursor of acetate (such as octanoate¹⁰) serves as growth substrate, and that cells grown on C₂-compounds other than acetate (such as glycollate, glycine or oxalate) contain only negligibly low amounts of isocitratase. Other routes must therefore exist for the necessary syntheses of tricarboxylic acid cycle intermediates from these C₂-compounds.

The purpose of this communication is to show that cells grown on glycollate contain enzymes capable of forming malate from glycollate, and to suggest a possible route (Fig. 1) for the formation of cell constituents from glycollate. The evidence for this suggestion rests on the following observations:

(1) Washed suspensions of *Pseudomonas ovalis* Chester grown on glycollate readily oxidized glycollate, glyoxylate, pyruvate and all intermediates of the tricarboxylic acid cycle, indicating the occurrence of that cycle under these conditions.

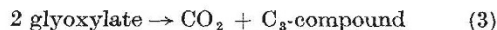
(2) Extracts of such cells, obtained by supersonic disintegration and centrifugation, readily catalysed the formation of glyoxylate from glycollate. Fractionation of such extracts with ammonium sulphate

indicated that this enzyme, which catalysed the reaction:



where *A* is an unknown electron acceptor, was largely concentrated in that fraction precipitable between 0 and 35 per cent saturation with ammonium sulphate. The bright yellow colour of this fraction, and the finding that its ability to oxidize glycollate was enhanced by the addition of phenazine methosulphate (0.1 per cent w/v), suggest that reaction (2) may be catalysed by a glycollic oxidase, possibly similar to that described in spinach leaves¹¹, in which case the electron acceptor *A* would be a flavoprotein.

(3) When glyoxylate was incubated anaerobically with crude sonic extracts of cells grown in glycollate, carbon dioxide was rapidly evolved. In order to establish the stoichiometry of this reaction, the crude extracts were fractionated with ammonium sulphate (35-50 per cent saturation), dialysed, and eluted from columns of diethylaminoethyl cellulose with portions of phosphate buffer, pH 7.5, of increasing strength. When the fraction eluted by 0.1 *M* buffer was incubated with 6.7 μmoles of glyoxylate, 3.4 μmoles of carbon dioxide were evolved; this is quantitatively in agreement with the following reaction:



observed by Krakow and Barkulis¹² with extracts of *E. coli* grown in glycollate. As described by these authors, maximal enzymic activity depended on the presence of magnesium ions and thiamine pyrophosphate.

(4) This purified cell fraction also catalysed the oxidation of reduced diphosphopyridine nucleotide in a reaction dependent on the presence of glyoxylate and enhanced by the addition of magnesium ions and thiamine pyrophosphate. The rate of oxidation of reduced diphosphopyridine nucleotide increased with time, and was more rapid after pre-incubation of the cell fraction with glyoxylate, magnesium ions and thiamine pyrophosphate than when it was present from the start. This suggested that the