

probably the most important component of the respiratory system in insects and other organisms<sup>12</sup>, is similarly influenced, and it is hoped to investigate this aspect by the use of spectroscopic techniques.

When we come to examine more complex insecticidal systems, it is clear that similarity in biological response may merely indicate a coincidence in the dynamic chain of metabolic changes initiated at different links in the chain. For example, pyrethrins I and II are complex unsaturated ketonic esters which differ completely in molecular structure from the relatively simple inert fat-soluble D.D.T.<sup>1</sup>. Yet similarity in insecticidal action is shown by a dispersant action on the cuticle and internal tissue lipoids, and the lethal stages of poisoning reveal an increase in the phenoloxidase activity of tissue and hæmolymp. The minute nature of the lethal dosages is consistent with an adsorption process on the tissue receptors; but it is unlikely that narcosis or death is directly related to primary insecticide-tissue combination. A contributory factor may be the accumulation of reactive *o*-quinones which would block essential substrate access to the whole complex of enzyme systems normally associated with the tissue components. This narcotic stage would be followed by death when the further dispersant action of the insecticides resulted in the accumulation of lethal concentrations of toxic quinonoid metabolites in the tissues. Richter<sup>13</sup> has shown the general similarity between the catechol oxidases in plants, fungi and insects, and has found that oxygen uptake is greatly reduced by the *o*-quinone reaction products, which combine with the available catechol oxidase. However, these more specific factors in insecticidal action are beyond the scope of the present article and will be considered elsewhere.

This account is based on an investigation into the fundamental mode of action of insecticides and drugs which is being carried out by me at the Department of Colloid Science, Cambridge. I wish to express my deep indebtedness to Prof. E. K. Rideal and to Dr. J. H. Schulman for much helpful advice and stimulating discussion, especially on the physico-chemical aspects of the work.

<sup>1</sup> Langer, P., Martin, H., and Muller, P., *Helv. Chim. Acta*, **27**, 892 (1944).

<sup>2</sup> Hurst, H., *Nature*, **145**, 462 (1940).

<sup>3</sup> Hurst, H., *Trans. Farad. Soc.*, **39**, 390 (1943).

<sup>4</sup> Pryor, M. G. M., *Proc. Roy. Soc., B*, **128**, 378 (1940).

<sup>5</sup> Wigglesworth, V. B., *Bull. Ent. Res.*, **33**, 205 (1942).

<sup>6</sup> Fraenkel, G., and Rudall, K. M., *Proc. Roy. Soc., B*, **129**, 1 (1940).

<sup>7</sup> Chargaff, E., and Ziff, J., *J. Biol. Chem.*, **131**, 25 (1939).

<sup>8</sup> Dennell, R., *Nature*, **154**, 57 (1944).

<sup>9</sup> Keilin, D., and Mann, T., *Proc. Roy. Soc., B*, **122**, 119 (1937).

<sup>10</sup> Wigglesworth, V. B., *Nature*, **153**, 493 (1944); **154**, 333 (1944).

<sup>11</sup> Raper, H. S., *Biochem. J.*, **20**, 735 (1926); **21**, 89 (1927).

<sup>12</sup> Keilin, D., *Ergeb. Enzymforsch.*, **2**, 239 (1933).

<sup>13</sup> Richter, D., *Biochem. J.*, **28**, 901 (1934).

organization and training of many generations of science students at Girton and Newnham Colleges.

In the early days of the higher education of women at Cambridge, the University lectures were not open to women and the teaching of science was left entirely to the women's colleges to provide as best they might. Friends of the women helped when they could, but there was no help from the University as such. Very soon after Miss Saunders had taken her Tripos she was appointed demonstrator in biology at Newnham College and taught the students of both Girton and Newnham Colleges; later she became a lecturer, and together with the late Mrs. Bidder (Marion Greenwood) helped to organize all the practical work in biology and botany given in what came to be known as the Balfour Laboratory. This building, a former Nonconformist chapel given to Newnham College by the generosity of Mrs. Sidgwick and Miss Balfour in memory of their brother Francis Maitland Balfour, the zoologist, was converted into the Balfour Laboratory under the direction of Miss Greenwood and Miss Saunders, and here Miss Saunders taught for many years, becoming its director after Miss Greenwood's marriage to Dr. Bidder.

She always set before her pupils a high standard, and much excellent work was carried out by them there. Even after many University professors and lecturers opened their lectures to women, all the practical work for Part I of the Tripos was still organized and carried out by her, until the new University Laboratories were built and accommodation provided in them for the women students.

There must be many women employed in scientific work in universities, colleges, schools and other places all over the world who know that they owe their present position and success largely to the stimulus of Miss Saunders' teaching and the high quality of the work on which she insisted.

G. L. ELLES.

ETHEL SHAKESPEAR.

THE main writings of Miss E. R. Saunders relate to floral morphology. The most important of them were issued between 1923 and 1936 in the *Annals of Botany*, the *New Phytologist*, the *Journal and the Proceedings of the Linnean Society*, the *Journal of Botany* and the *Journal of Genetics*, and in two volumes published by Messrs. Heffer and Sons. The earliest of them furnished a factual basis for a new and interesting outlook on gynoecial morphology; the later documents elaborated a theory of carpel polymorphism and brought to focus important problems of systematic and evolutionary interest which are still unsolved.

The first of these writings appeared at a time when some rendering of the classical conception of a monomorphic carpellary 'leaf' gave contentment to many inquirers. They looked on such an organ as the basic unit of gynoecial construction in all groups of flowering plants and thought of it as possessed of a median style and a distal stigma. Whatever was their mode of approach to floral matters, their common purpose was to settle long-standing differences of opinion regarding the 'basic numbers', arrangements and forms of such 'leaves' for all types of 'syncarpous' gynoecia and to furnish for each alliance a 'fundamental ground-plan of floral construction'.

Few indeed were prepared to describe precisely the 'foliar' prototypes of which they spoke; but many

## OBITUARIES

### Miss E. R. Saunders

WHEN Edith Rebecca Saunders died on June 6 at the age of eighty as the result of a bicycling accident in Cambridge, there passed one to whom many scientific women owe a great debt for her labours on their behalf in the early days of the higher education of women. Others have written of the value of her botanical research work, but not the least valuable part of her services was the