(phenol / water; butanol / N hydrochloric acid) and Kjeldahl nitrogen analyses (7·75 per cent; theor. 7·73 per cent). The radioactivity of the isolated tyrosine was localized exclusively in the carboxyl group as it was entirely in the carbon dioxide evolved by ninhydrin decarboxylation (Table 1).

From these results, it is concluded that phenylalanine is converted to tyrosine by the silkworm and that the conversion is a fairly direct one, since the radioactivity was exclusively localized in the carboxyl group of the injected phenylalanine and the isolated tyrosine. About 15 per cent of the injected phenylalanine radioactivity was found in the tyrosine of the silk fibroin.

On the other hand, the carboxyl carbon of phenylalanine is not utilized for the synthesis of alanine or glycine of the silk by *Bombyx mori*; the tyrosine results make it very unlikely that the phenylalanine could not reach the site where such transformation occurs.

This work was nearly completed when Fukuda published results[6] showing that he had isolated radioactive tyrosine from silk after injection of 2-^{14}C-phenylalanine into silkworms; he found only a very small activity in glycine and alanine.

We wish to thank Ch. Jeuniaux for his help in looking after the silkworms and injecting them with the radioactive compound.

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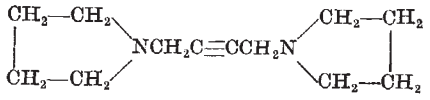
[1] Bergmann, M., Stern, F., and Witte, C., *Lieb. Ann.*, **449**, 277 (1926).
[2] Stein, W. H., and Moore, S., *J. Biol. Chem.*, **176**, 337 (1948).
[3] Van Slyke, D. D., Dillon, R. T., MacFadyen, D. A., and Hamilton, P., *J. Biol. Chem.*, **141**, 627 (1941). Van Slyke, D. D., MacFadyen, D. A., and Hamilton, P., *J. Biol. Chem.*, **141**, 671 (1941).
[4] Dunn, M. S., Camien, M. N., Rockland, L. B., Shankman, S., and Goldberg, S. C., *J. Biol. Chem.*, **155**, 591 (1944).
[5] Stein, W. H., and Moore, S., "Biochemical Preparations", **1**, 9 (Wiley, 1949).
[6] Fukuda, T., *Nature*, **177**, 429 (1956).

Tremor produced by Drugs

In the routine screening of drugs in mice, we have found only ten out of ten thousand compounds which produce sustained tremor. One of these, 1-4 di-pyrrolidino-2-butyne, 'Tremorine',



in doses of 5–20 mgm./kgm. produces tremor, salivation, meiosis, slight muscular weakness and rigidity lasting several hours. The effects are similar in mice, rats, guinea pigs, cats, dogs and monkeys. In the last-named species the picture is strikingly similar to human Parkinsonism. The antagonism of these effects is complete with various drugs used for treating Parkinsonism. Atropine, scopolamine and others are highly effective in small doses of 1–2 mgm./kgm. In contrast, hypnotics, anticonvulsants and ganglionic blocking agents were without effect on tremor in doses below those causing marked depression. It thus offers a specific method for the testing of possible anti-Parkinson agents.

Methantheline ('Banthine') controlled the parasympathetic signs of salivation and diarrhœa but had no effect on the tremor, demonstrating the distinct peripheral and central actions. The tremor appears to be primarily of subcortical origin. Decerebrate animals develop tremor after 'Tremorine'. The drug also causes a profound fall in body temperature. The chemical structure producing tremor is highly specific within this chemical type. Twenty analogues showed no such action. Other tremor-producing drugs are of widely diverse chemical structures. Nicotine tremor has been studied by Bovet *et al.*[1] and suggested as a test method for anti-Parkinson drugs. While this method is useful, the nicotine tremor is fleeting, has both central and peripheral components and is blocked by a number of drugs not effective in Parkinsonism[2]. Another drug, 'Harmaline', produces sustained tremors but no signs of parasympathetic involvement, and is not antagonized by a variety of anti-Parkinson drugs, blocking agents or sedatives.

It is hoped that the discovery of 'Tremorine' and its further study will reveal it to be a useful tool in the investigation of tremor and the search for more effective agents against Parkinsonism.

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[1] Bovet, D., and Longo, V. G., *J. Pharmacol. and Exp. Therap.*, **102**, 22 (1951).
[2] Cahen, Raymond L., and Lynes, Thomas E., *J. Pharmacol. and Exp. Therap.*, **103**, 44 (1953). Cahen, Raymond L., Thomas, Joan M., and Tvede, Kristen M., *J. Pharmacol. and Exp. Therap.*, **107**, 424 (1953). Cahen, Raymond L., *Proc. Soc. Exp. Biol. and Med.*, **84**, 474 (1953).

Auto-oscillations in Extracted Muscle Fibre Systems

In the course of work on relaxing factors[1], Goodall and A. G. Szent-Györgyi[1] observed that with fibres showing less than maximal activity for the creatine phosphate – adenosine triphosphate relaxing system, an auto-oscillation of tension developed if the creatine phosphate was increased to 30–100 mM. These oscillations (Fig. 1) were observed on several occasions under the above conditions. They are independent of a pH change from 6·8 to 5·9 which produces a 50 per cent fall of tension, as compared to 90 per cent for 'active' fibres. However, it is not certain that this 'deactivation' is an essential part of the extraction procedure;

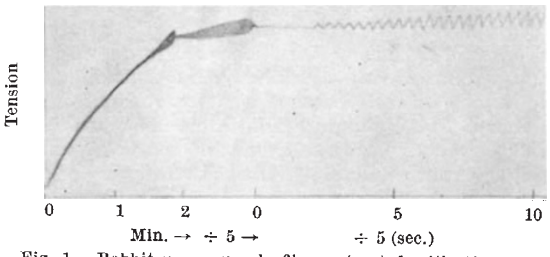

Fig. 1. Rabbit psoas muscle fibre extracted with 40 per cent ethylene glycol – water for seven days, developing oscillations in 4 mM adenosine triphosphate, 100 mM sodium creatine phosphate, 4 mM magnesium chloride, at pH 7·0. Drum-speed increased five times at each break in record