afterwards I found that 40 per cent ethylene glycol – water extraction at −5° C. produced oscillating fibres in a matter of a few days. The significant fact about such fibres appears to be their high elastic modulus.

The frequency, 2·8 sec.$^{-1}$, was 1·75 times the free oscillation of the recording lever alone, while with fibre coupled in the absence of substrate, it was about twice. Since, however, the elastic modulus falls by a factor of more than three times in the presence of adenosine triphosphate alone, it seems that the tension generator is driving the system somewhat above its natural frequency, that is, under conditions of inertial load. The compliance of the system was such that the shortening during one cycle was only 0·1 mm., or 0·3 per cent of the length of the fibre. Thus if the feedback mechanism works through length (rather than tension), only a small change is required.

The interest of this phenomenon would appear to be twofold. First, it closely resembles the situation in the flight muscles of insects, studied by Pringle[2] and Boettiger and Furshpan[3]. Secondly, it supports the hypothesis of a direct action of lengthening on activation in muscle, which has been proposed[4] as a result of a study of activation[5] in intact muscle, where it is shown that auto-oscillations can then occur only with an inertial load. In this connexion the latency relaxation of Sandow[6] was considered to be an expression of essentially the same mechanism.

Auto-oscillations with another phosphate donor system have been found by Lorand and Moos (personal communication; see following communication), whose extraction procedure is also effective with the creatine phosphate system.

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In connexion with our studies on the relaxing effect of the pyruvate phosphokinase system[1], the following procedure was used for preparing the muscle fibres. Rabbit psoas is washed in 50 per cent (v/v) aqueous glycerol (as in the original treatment of Szent-Györgyi[2]) for two days at 0° C., then stripped into bundles of approximately ¼ mm. diameter and shaken at room temperature (about 25° C.) in 20 per cent (v/v) glycerol for various lengths of time. After one to two hours extraction, the fibres develop maximal isometric tension in a bath consisting of 0·1 *M* potassium chloride, 4 m*M* magnesium chloride, and 4 m*M* adenosine triphosphate, and there is no sign of spontaneous relaxation. However, addition of 10 m*M* phosphoenolpyruvate brings about immediate relaxation. Further details on the relaxation with phosphoenolpyruvate will be published elsewhere; here, we wish to report on the results obtained by extracting psoas fibres in 20 per cent (v/v) glycerol for at least 24 hr. If such an exhaustively washed fibre is placed in a bath containing the above concentrations of potassium and magnesium chlorides and adenosine triphosphate, maximal tension develops, and upon the addition of phosphoenolpyruvate a spontaneous oscillation occurs as shown in Fig. 1.

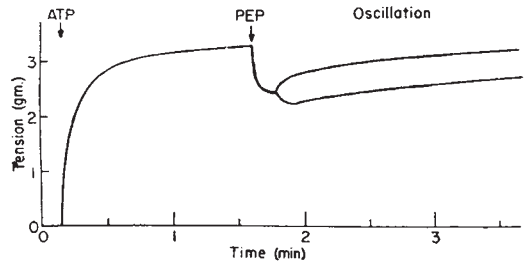

Fig. 1. Oscillating response of glycerinated psoas fibre in the presence of 0·1 *M* potassium chloride and 4 m*M* magnesium chloride. Bath at *p*H 7. ATP = addition of 4 m*M* final concentration of adenosine triphosphate. PEP = addition of 10 m*M* final concentration of phosphoenolpyruvate. Oscillation frequency, 2·8 c./s. Details are not resolved by slow kymograph drum. Double line represents envelope of oscillation

Phosphoenolpyruvate seems to be essential for maintaining the oscillation, as it stops if the fibre is transferred to a bath containing only potassium and magnesium chloride and adenosine triphosphate, but it starts anew in a bath having phosphoenolpyruvate as well. The frequency of oscillation is about 2·5–3 c./s., which in our case coincides approximately with the resonant frequency of the recording lever system loaded with the muscle fibre. In a batch of fibres washed in 20 per cent (v/v) glycerol for 24 hr., usually about 25 per cent of the fibres display the oscillating behaviour. An apparently identical phenomenon has been observed by Goodall (personal oommunication; see previous communication), who employed creatine phosphate instead of phosphoenolpyruvate.

By dialysing and freeze-drying the 20 per cent (v/v) glycerol solution used for the 24-hr. extraction of the muscle fibres, a preparation is obtained which stops the oscillations very effectively when added to the bath. Oscillations are resumed, however, if the fibre is transferred to a fresh bath without the muscle extract. An equally active preparation for stopping oscillations may be obtained by extracting freshly homogenized rabbit muscle with an equal volume of 0·15 *M* potassium chloride. The active factor (or factors ?) for inhibiting oscillation is non-dialysable and thermolabile.

This oscillation of glycerinated fibres is very reminiscent of the behaviour of the bumble bee wing muscle[3]. Indeed, one wonders if the oscillation observed in the insect muscles might not be due to the absence of a 'damping factor' similar to that shown here to exist in the rabbit psoas.

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