PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

General Discussion

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General Discussion

. Cruzeiro-Hansson (*Department of Mathematics, Heriot-Watt University, Edinburgh, UK*). I think there are two essential uestions regarding conformational changes. One is whether they take place by random fluctuations (thermal activa-on) or in a more deterministic fashion, as is implied by the rigid-like motion usually seen in dynamical animations. A econd question is whether classical potentials are enough to explain conformational changes or whether quantum echanical interactions are needed. I am convinced that proteins have a quantum stage. In the case of conformational hanges triggered by the hydrolysis of ATP, this is trivial. The hydrolysis of ATP is a quantum process and the nmediate outcome of a quantum process is a quantum state. So, the question is not whether proteins have a quantum age but what form it takes, how long it lasts and what it does. I suggest that this quantum stage is a vibrational excited ate (more specifically, an amide I vibration), it can last for picoseconds or nanoseconds and its role is to transfer nergy, with 100% efficiency, from the active sites to other regions of the protein where the energy is used to perform ork. I have been collaborating with David Klug (IC), Mike Anson and David Trentham (NIMR) to detect amide I in yosin S1 and with Luca Turin (UCL) to detect amide I in F_oF_1 ATP synthase. Luca Turin has measured an emission om uncoupled F_oF_1 which we think is a spectral signature of amide I. We propose an alternative model for F_oF_1 in hich F_o does not rotate.

. Crompton (*Fairways, East Harptree, Bristol, UK*). (A participant behind me had postulated quantum energies releasing otion in myosin).

. M. Block (*Princeton University, NJ, USA*). You cannot get any energy higher than *kT* and the speed of a quantum change too fast for myosin.

. Crompton. You have been arguing about sequential events upon quite different time-scales. The quantum transition etween coherent electrons that I was describing yesterday to explain the intramolecular sliding of myosin along actin akes place, of course, on a fast quantum scale—Eccles, in describing the neuronal junction, stated the principle 'a uantum system can have an energy debt provided the debt is immediately repaid'—the immediate energy repayment or myosin is made by creatine phosphate and this high energy phosphate is in turn repaid by ATP and this is on a iochemical time-scale. The ATP is then regenerated by the F_1 ATPase system as has been described. Similar events ave been described in coherent systems by many other scientists that would be described as impossible by Dr Block.

. M. Block. Who and what organization?

. Crompton. For the past three years, scientists from all over the country have been describing such biological events t Greenwich University symposia organized by the Cybernetic Machine Group of the British Computer Society, and is August a wide range of such symposia in the noetic sciences will be held at the University of Liège organized by the entre for Hyperincursion and Anticipation in Ordered Systems with participants from all over Europe and Edgar litchell ScD from NASA.