tionable. In the majority of these units, or groups of units, the frequency of the firing increased following the sciatic shocks, but in some cases a diminution of the firing rate was observable. In one case this inhibition of the unit activity could be conditioned. In most cases we succeeded in holding the units in good condition for 20–60 min, and in many cells extinction and reconditioning were repeatedly performed. By conditioning the firing pattern of cortical units to splanchnic stimulation, we confirmed earlier data on conditioning of evoked potentials[1], as well as the data of other authors about alteration of unit activity by training[2–6].

Each neurone studied was responsive to sciatic stimulation but not to splanchnic stimulation, although the sensorimotor cortex has been described as the cortical projection area of both sciatic and the splanchnic afferents[7]. After training, however, using the splanchnic nerve stimulation as conditional, and the sciatic nerve stimulation as unconditional stimulus, some units also became responsive to a splanchnic stimulus. Thus, we obtained a relatively simply interoceptive conditioned response (that is, the conditional stimulus was a visceral afferent impulse).

These results may be interpreted as indicating that the neuronal basis of the process of learning might have its origin in a facilitatory state having some resemblance to post-tetanic potentiation[8,9], but clearly differing from it in the requirement for a specific time interval before the initiation of the conditional discharge. It is noteworthy that, after training, the conditional stimulus evokes a cell firing with the same delay as the unconditional stimulus previously applied. This precise timing in the delay of the conditional response may involve some as yet imperfectly understood excitation mechanism, perhaps related to such phenomena as long-lasting inhibitory postsynaptic potentials[10]. Our data do not indicate, however, whether these new neuronal responses arise in or are triggered from a particular cortico-subcortical system, or whether the generation of these delayed spikes is the property of all cortical or subcortical cells.

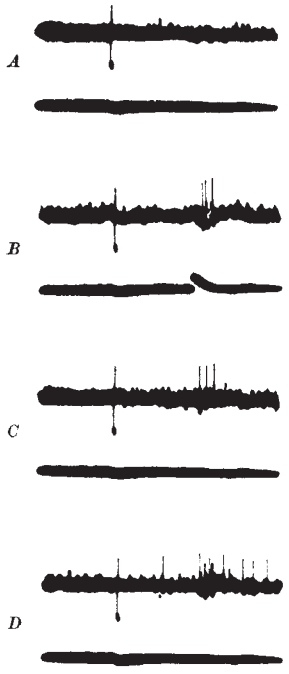

Fig. 1. Conditional responses of a group of cortical units. Conditional stimulus (to splanchnic nerve) appears as artefact in top trace in each case, and unconditional stimulus (to sciatic nerve) as notch in lower trace. Interstimulus interval 200 msec. *A*, Splanchnic stimulation alone initially produces no response. *B*, Paired stimulation of splanchnic and sciatic nerves, with group of 3 discharges to sciatic stimulus. *C* and *D*, Induction of responses to splanchnic stimulation alone after paired reinforcements

Such a function in the mammalian brain may be similar to that of the 'pacemaker neurones' described recently in invertebrates[11].

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Aerosol Deposition in the Lungs of Space Travellers

The deposition of aerosols in the lungs of man during breathing constitutes an important mechanism for the entry of toxins or pathogenic organisms to the body. The respiratory tract is protected by an efficient ciliary mechanism for the rapid removal of particles deposited in the upper airways. Particles reaching the alveolar regions are removed more slowly. There are three mechanisms whereby inhaled particles are deposited on the walls of the airways—inertial impaction, sedimentation by gravity, and diffusion due to Brownian motion. The dimensions of the airways are such that large particles are deposited in the upper airway and have no opportunity of reaching the alveoli.

In the absence of gravity, as in an orbiting spacecraft, one may anticipate that particles normally deposited in the lungs by sedimentation (principally those particles of 1–8μ diameter) will be exhaled again with no deposition. Under the conditions of a reduced gravitational field as on the Moon an important distinction arises. While the deposition of particles in the range 1–8μ diameter will be less than normal, the particles of this size which are deposited will do so in a deeper region of the airways than normal. One effect of a reduced gravitational field may thus be to allow the access of large particles to the non-ciliated alveolar region of the lung. Particles of this size are important in the airborne spread of infection because they include the droplet nuclei carrying bacteria which are produced by the act of coughing or talking. The importance of this hazard to astronauts remains to be established.

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Motor Unit in Old Age

Decrease of muscular efficiency, fatigue and slowness of motor reactions are considered to be typical consequences of old age. No convincing evidence, however, has been brought forward as yet for the assumption that these motor deficiencies in old age are due to regressive changes, such as loss of nerve cells, disturbances of neuromuscular transmission or to degenerative atrophy of the muscle fibres themselves[1,2].