of the order of half a msec[1,9]. The difference can be accounted for by the conduction time from the motoneurone to the point of stimulation of the ventral root, which in this case can be approximated to 0.4 msec and the initiation time of the action potential which is more difficult to evaluate but can be expected to vary between 0.3 and 0.9 msec[9].

The material consists of 6 dynamic and 15 static γ-motoneurones. None of the dynamic γ-motoneurones were activated by stimulation of the ipsilateral ventrolateral funicle, but all static were, with a segmental latency varying between 1.0 and 1.6 msec in 10 cases and longer for the 5 others. These values show that the activation of static γ-motoneurones at least partly is monosynaptic. No short latency (below 10 msec) discharge has been found in the dynamic γ-motoneurones. It is reasonable to interpret the absence of descending effect on dynamic γ-motoneurones on stimulation of the lower thoracic cord as if no monosynaptic excitatory effect from the lower brain stem[1] is evoked in this type of γ-motoneurones. Our conclusion that this monosynaptic control from the lower brain stem is exerted on static γ-motoneurones does not exclude additional pathways, propriospinal or from other supraspinal regions with monosynaptic connection to static γ-motoneurones.

The monosynaptic connections to motoneurones are evoked from 2 regions in the lower brain stem: the Deiters' nucleus to extensor α-[10] and γ-motoneurones[1,9], and the medial part of the lower brain stem to flexor α-[11] and γ-motoneurones[1,9]. The present experiments were made on flexor γ-motoneurones. Hence the descending pathway with monosynaptic connection to the static γ-motoneurones investigated originates from the latter medial brain stem region. However, it is suggested that also the monosynaptic effect from Deiters' nucleus is evoked in static γ-motoneurones. The reason for this suggestion is the similarity in functional organization of the 2 systems revealed by previous investigations[10–13].

CARLI, DIETE-SPIFF and POMPEIANO[14,15] have recorded acceleration of group II afferents extensors on stimulation of the Deiters' nucleus. This means that static γ-motoneurones are accelerated[16,17] from this region. By afferent recording, it is not possible to decide whether a connection is monosynaptic, but it seems to be of short latency and to have comparatively little susceptibility to anaesthesia.

Résumé. Nous avons enregistré, dans les nerfs de muscles fléchisseurs, l'activité de neurones γ uniques, identifiés comme dynamiques ou statiques par leur comportement sous l'effet d'une injection i.v. de DOPA[3,4]. La stimulation du cordon antérolatéral ipsilatéral de la moelle, au niveau thoracique, a invariablement activé les neurones γ statiques. Dans 10 cas sur 15, la latence a été brève, indiquant une connexion monosynaptique. Par contre, les neurones γ dynamiques n'ont pas présenté d'activation dans ces conditions. Ces résultats permettent d'identifier à des neurones γ statiques la fraction de neurones γ recevant une connexion monosynaptique à partir de la région bulbaire[1].

J. BERGMANS[18] and S. GRILLNER

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Failure of the Pineal Body of Two Species of Birds (*Coturnix coturnix japonica* and *Passer domesticus*) to Show Electrical Responses to Illumination

While we were investigating the pineal body of the Japanese quail (*Coturnix coturnix japonica*) for evidence of direct responsiveness to light, a report by MORITA[1] appeared which described attempts to record electrical responses from the pineal of the pigeon (*Columbia livia*) to light. Direct illumination of the pineal or of the lateral eyes did not produce any electrical activity related to the onset or cessation of light. We have obtained similar negative results with the Japanese quail and English sparrow.

The pineals of a total of 25 quails, males and females, ranging in age from 7 days to 6 months, were prepared for electrical recording by a variety of techniques: (1) Birds were anesthetized with Nembutal, placed in a stereotaxic device and the exposed pineal was penetrated at various sites with tungsten microelectrodes. (2) Birds were decapitated, the pineal was dissected from the brain, placed in saline on a wax block, and then impaled by tungsten microelectrodes; the saline was drawn off and the preparation was covered with oil. (3) Pineals dissected in the manner just described were placed on a set of parallel tungsten wires for external recording and covered with oil. (4) Birds were decapitated, the top half of the head was removed by a coronal section, the cortex and cerebellum where then dissected away leaving the pineal attached to the meninges which adhered to the skull; the wick of a silver-silver chloride electrode (light shielded) was attached to the end of the pineal stalk, and an indifferent electrode was inserted into the meninges. (5) Tungsten wire, hook electrodes were placed under the stalk of pineals prepared as just described. A tungsten lamp in an illuminator equipped with a camera shutter

[1] Y. MORITA, Experientia *22*, 402 (1966).

was employed to provide light stimuli of varying durations to the pineal body. Electrical activity was monitered via a Tektronix 122 amplifier connected to a Tektronix 502 oscilloscope.

The only potentials observed having a pineal origin were sustained, low amplitude spikes with a frequency of 5–10/sec which were detected when a wick electrode was on the most basal remnant of the pineal stalk. They were not in any way influenced by changes of illumination. MORITA[1] described similar trains of impulses from ventral positions in the pigeon pineal.

The pineals of 12 English sparrows (*Passer domesticus*), 30–120 days of age, prepared according to methods 3 and 4 above, failed to show any activity relatable to changes of illumination but did with wick electrode recordings exhibit spontaneous spikes like those of the quail pineal.

There appears to be a correlation between recordable electrical activity and degree of development of presumed photoreceptors in pineal complexes. This is best supported by studies of frogs, whose pineals are electrically responsive to light[2,3] and contain recognizable photoreceptor units similar to those of the vertebrate lateral eye[4]. The evidence from light microscopy concerning the possibility of photoreceptors in bird pineal bodies is conflicting[5,6]. Electron micrographs reveal the presence of receptor-like structures, but they do not appear to be typical photoreceptors. They generally are described as rudimentary[7,8] and as lacking a well-developed outer segment[9–11]. However, the negative findings to date are an inadequate sample on which to base conclusions and do not exclude the possibility that some birds may have pineals that are photoreceptive in the conventional sense. Within other phyla there are great variations in the degrees of development of the pineal complex. This is notably true in Reptilia, some of which have highly differentiated photoreceptive units[12] as part of their pineal complex while in others a pineal may be absent[13,14].

Résumé. Dans l'épiphyse de 2 espèces d'oiseaux il n'a pas été possible de démontrer une relation entre le potentiel électrique et les variations d'illumination. On peut en conclure que chez ces oiseaux l'épiphyse n'est pas un photorécepteur dans le sens conventionnel.

C. L. RALPH and D. C. DAWSON

Department of Biology, University of Pittsburgh, Pittsburgh (Pennsylvania 15213, USA),
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Free Amino Acids in Blood Serum of Hedgehogs in Deep Hypothermia and after Spontaneous Arousals[1]

Very little information is available concerning the relation of nitrogen metabolism to natural mammalian hibernation. In general, no 'disturbances' are considered to occur, but a quantitative reduction is evident in hibernating animals[2]. In recent years more attention has been paid to the periodicity of mammalian hibernation and many of the older data overlooking this point have had to be rechecked. With controlled experiments it appeared that the non-protein nitrogen (NPN) of the blood was lowest in animals (*Citellus lateralis*) in deepest hibernation, but a gradual increase of NPN towards the end of the hypothermia period was not observed[3]. No rise of the blood urea level could be demonstrated during the hypothermia period at the approach of spontaneous arousal or in aroused hedgehogs (*Erinaceus europaeus* L.)[4]. Changes in blood creatine levels have been demonstrated during the hibernation cycle[5].

The present report describes the blood serum free amino acid levels found in hedgehog in midwinter in deep hypothermia and after spontaneous arousal as well as in active, awake animals outside the hibernation season.

Hibernating animals were caged in a constant ambient temperature of 4 °C. The animals were transferred in this hibernaculum on October 27. No food or water was available to them. The hibernation was supervised by continuous body temperature measurements from each animal via chronically implanted thermocouples[6]. Sampling was done in midwinter after about $2^1/_2$ months hibernation. At that time the animals had undergone 15–18 undisturbed, spontaneous arousals and entries into deep hypothermia. The hypothermic group was killed after 3–4 days in deep hypothermia. Blood samples from spontaneously aroused animals with 'normal' body temperature were withdrawn 3 h after the increasing body temperature had reached 15 °C. The control group of normothermic animals was composed of animals awake

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