STUDIES OF SLEEP AND ANIMAL HYPNOSIS

Section 1

BEHAVIOURAL AND ELECTROPHYSIOLOGICAL STUDIES OF SLEEP AND ANIMAL HYPNOSIS

By

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SCOPE AND CONTENTS: EEG, EMG, and single cell activity were examined under states of animal hypnosis, sleep, and wakefulness. Rabbits and chickens were repetitively hypnotized to determine whether animal hypnosis was caused by a fear reaction. Differential susceptibility of chickens and rabbits to animal hypnosis suggests that more than a "paralysis of terror" is involved in causing this state. There was a difference in theta frequency in records from moving and still animals, and a 13-18 Hz component appeared on many records during synchronized and desynchronized sleep. A large number of cells fired with respect to certain EEG conditions rather than to a behavioural state. EEG and single cell activity obtained during early hypnosis were very similar to those appearing in an animal that was sitting alert.

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Introduction

Animal hypnosis is a condition characterized by immobilization and unresponsiveness to external stimulation brought about in certain animals by restraint in a bizarre position. This trance-like state has been variously termed cataplexy, tonic immobility, death feigning, mesmerism, immobilization reflex, or still reaction. An animal in this state remains perfectly quiet, seemingly unaware of events around him, until a sufficiently strong stimulus arouses him, always suddenly, back into a normal state. The term animal hypnosis is perhaps a misnomer, since it bears no relation to the trance state in humans called hypnosis.

Animal hypnosis may be induced in a number of ways. Most frequently restraint plays a major role, but especially restraint in a bizaare position, such as inversion. In addition, repetitive application of sensory stimulation, such as stroking a rooster's comb (Mowrer, 1932), or stroking a pig's hide (Marcuse & Moore, 1944), visual fixation with a shiny object or swinging an animal back and forth (Volgysei, 1963),have historically been used to induce the trance. Barratt (1965) has used a loud noise and sudden flash of light to induce tonic immobility in the opposum. Exerting pressure on a body part is sometimes sufficient to cause the trance (Minami & Dallenbach, 1946); restraint has also been used to extend the duration of the trance. Klemm (1965), for example, has used a chute like box to exert some pressure on body parts to lengthen the trance, and it has been found in this laboratory (Schaub, 1963) that extending the beak of a bird behind a block (which almost certainly exerts pressure on the neck region) also extends the duration of the state.

Throughout the experimental history of animal hypnosis investigations have frequently employed procedures for induction of the trance which appear to contain elements of superstitious behaviour. For example, a common barnyard trick (initiated by Kircher, a seventeenth century investigator) to hypnotize a chicken is to force his head on the ground, and draw a chaulked line directly on the floor in front of his eyes, starting from his beak. Moll (1910), however, notes that the chaulked line is irrelevant for the procedure; simple restraint with the head held on the ground is sufficient to induce the trance. Volgyesi (1963) was able to obtain immobilization in a lion by staring into the lion's eyes; however, it was essential to grab the lion by the head and pull it back until the lion's eyes met the experimenter's. Obviously restraint (not least on the part of the lion) is probably a large factor in this induction procedure as well.

Animal hypnosis has been reported to exist in a large number of species from insects to man. In recent years most of the experimental work has been concentrated on common animals such as the rabbit (Silva et al, 1959), guinea pig (Lieberson, 1948, Bayard, 1957), chicken, (Gilman, Marcuse & Moore 1950, Westlake, 1965, Schaub, 1963, Salzen, 1963), opossum, (Baratt, 1965), and frog (Schwartz & Bickford, 1956). However, some of the earlier work has been done on such species as the pig (Marcuse & Moore, 1944), lizard (Hoagland, 1928), mantis and caterpillar (Volgyesi, 1963), cockroach (Minami & Dallenbach, 1946, and water scorpion (Holmes, 1906). A similar state has been described in the monkey (Foley, 1938, Volgyesi, 1963) and man (Hoagland, 1928).

In man, Hoagland notes, the phenomenon can be induced by bending the body through a 90 degree angle, taking a deep breath, and then tossing the body backwards, similar, he says, to inverting rabbits or other animals to the dorsal position.

There is some question whether animals in tonic immobility are analgesic. Marcuse and Moore (1944) describe a situation in which a hypnotized pig was cut, drawing blood, with no reaction from the animal. These reports, however, are difficult to interpret, since the only means of measuring the painfulness of the stimuli is by some reaction, and animal hypnosis may be a motor inhibition rather than a sensory suppression. Klemm (1966) suggests a study of the evoked response to applied stimuli in order to distinguish whether this state is primarily a motor or sensory effect.

The literature gives varied reports on heart rate during animal hypnosis. Barratt (1965) notes that opposums in trance states have heart rates which are higher than those found when the animals are awake and exploring. Klemm (1966), however, reports a slight decrease in the heart rate of rabbits during hypnosis, while Gilman, Marcuse and Moore report no change in the heart rate of chickens during the trance. Rijlant (1933) also found no change in the heart rate of the hypnotized rabbit. Perhaps some of the discrepancy could be resolved if these investigators had reported in what stage of the hypnotic trance the cardiac measurements were taken; most animals are rather excited when they are handled and turned on their backs, and consequently if measurements are taken immediately after the onset of immobilization in this way, the heart rate will almost certainly be accelerated, while this may not be true after ten minutes of immobilization.

Muscle activity has been described in the literature as being both tonic and atonic in hypnotized animals. In general, lower animals have been reported to exhibit hypertonic musculature; Volgyesi (1963) has demonstrated that a cataleptic mantis can, if suspended like a bridge between supports at its head and feet, withstand the weight of rather heavy objects placed on its mid-position. Schwartz and Bickford (1956) indicate that the frog and guinea pig are hypertonic, and Dearborn (1900) found extreme hypertonicity in the crayfish. Higher orders of animals usually demonstrate a hypertonicity and then a gradual relaxation; Silva et al (1959), Schaub (1963), Ratner and Thompson (1960) have found this with birds. Klemm (1966) records nuchal EMG from the rabbit and reports an immediate reduction after immobilization, with no phasic activity.

The Paralysis of Terror Hypothesis

The most usual explanation of animal hypnosis is that the state is a result of a paralysis of terror. The animal, according to this hypothesis, is so afraid of being restrained, or inverted, or manipulated by any of the techniques previously mentioned, that his reaction is one of immobility. In natural situations the animal, suddenly overwhelmed by a powerful physical or emotional force, may react in a variety of ways, including total cataplexy.

In the face of a predator, it is argued that this reaction would have an obvious Darwinian adaptive value; if the animal appears to be dead some predators may ignore it either because they do not see it,because it does not move or because they do not like to eat dead animals. Alternatively, the sudden recovery that is characteristic of animal hypnosis may allow an escape that is otherwise impossible.

There is a fair amount of evidence to support the "paralysis of terror" interpretation. Gilman, Marcuse & Moore (1950), for example, have shown that chickens which are immobilized repeatedly for a number of trials will gradually go into the trance less frequently and for shorter periods of time. The authors hypothesize that the chickens became less afraid of the handling and, their fear having been abated, did not go into the trance or did not stay in their trances for a long period of time at the end of many trials. Similarly, it has been demonstrated that taming the chickens reduces the time spent under hypnosis and decreases the probability that the birds will enter the trance. Moreover, we have observed in this lab that sudden noises after a chicken has been adapted to hypnosis (that is, will not enter the hypnotic trance) will cause the bird to again go into hypnosis.

Further evidence that animal hypnosis is a paralysis of terror comes from studies of the ontological development of the response. Ratner & Thompson (1960) have shown that the trance state is absent in chicks until 7 or 9 days of age after which the bird will go into the state for the maximum arbitrary time used in the study (12 minutes). This development of the immobility reaction parallels the development of fear reactions in other birds. Moreover, Ratner & Thompson also found evidence that prior handling reduced the duration of immobility at all ages.

Salzen (1963) has confirmed Thompson's finding that a seven or eight day development is necessary for the hypnosis reaction to appear, and, in addition, has found that chicks raised in isolation tend not to show the reaction at all. Socially raised chicks tended to show the reaction when tested in isolation as opposed to being tested within sight of their litter (rooster) mates. The notion here is that there is sudden fear developed in socially raised chicks after the sudden loss of their companions. In line with this hypothesis, Guiton (1959) has demonstrated that a considerable amount of distress and fear accompany separation of a socially raised chick from his fellows. Observations of 4-5 day old chicks in groups of 6 showed that the grouped chicks showed few signs of emotionality, however, signs of agitation and distress calls appeared when one chick was isolated from his group.

Thus, there is considerable evidence that, at least in birds, animal hypnosis probably represents a paralysis of terror. Yet there is some evidence that this "paralysis of terror" may not be the causative mechanism in other species. Lieberson (1948), for instance, has shown that guinea pigs can be trained to go into the trance for increasing periods of time. It is unlikely that this can be interpreted in terms of a paralysis of terror.

Hypnosis as Sleep

The second hypothesis which has gained favour as a mechanism of animal hypnosis is that it is some form of sleep state. Superficially, the similarity is obvious; the animal is unresponsive to the environment, occasionally the eyes are closed (especially in the rabbit), breathing is deep, the heart rate is sometimes decelerated, and the animal wakens from the state suddenly, just as in sleep.

Klemm (1965), noting the external similarity of hypnosis to sleep, has electrically stimulated specific brain sites during hypnosis which Hess (1944), Akert et al (1952) and Akert (1961) have found to give rise to sleep with certain parameters of frequency and current density. Klemm supposed that if such stimulation did produce sleep then it should also cause a prolongation of the hypnotic trance. He found,indeed,that either high or low frequency stimulation of the pontine reticular or thalamic sites, or even whole head stimulation did increase the duration of animal hypnosis, whereas stimulation of the caudate nucleus, amygdala and hippocampus were ineffective. Klemm argues that since stimulation of these sites produces sleep and also prolongs the hypnotic trance,therefore, hypnosis must be similar to sleep. Obviously, this is a very tenuous inference. It would have been very easy to try to get normal sleep by stimulation of the sites that he sampled, but for some reason this was not done. Moreover, there are reports that low frequency stimulation of the caudate (Akert, 1965) will produce sleep, and Klemm's study did not find prolongation of the trance from stimulation of that locus. In addition, the reports of sleep obtained by high frequency stimulation are extremely rare; typically the effect is one of arousal rather than sleep.

By far the most common similarity that is mentioned by investigators who believe that hypnosis is a sleep state, however, is the development of slow waves in the electroencephalographic activity of various brain sites. Since light sleep is also characterized by large slow waves, the argument continues, then animal hypnosis must be a sleep state.

Svorad (1957) recorded cortical EEG activity under ether narcosis, natural sleep, and animal hypnosis. He reports that although the initial reaction on the cortical leads is one of alertness, slow waves later develop which are similar to natural sleep. There is, however, occasional spontaneous alerting of the EEG later in the trance. Since the EEG is capable of being aroused either spontaneously or by natural stimulation, Svorad argues that the reticular activating system of Magoun must be intact; since the slow waves develop later than the onset of hypnosis, he also argues for a subcortical origin of the state. Only the hypnosis and waking records are presented in this study; no sleep data appeared.

Silva et al (1959) recorded from a variety of cortical and subcortical structures in the tero bird and rabbit. From visual inspection of their records they concluded that, in the alert rabbit, EEG activity is characterized by 4-8 Hz activity in subcortical structures with 6 Hz especially prominent in the hippocampus. During late hypnosis there was increased 1.5 - 3.5 Hz activity with a breakup of the 6 Hz hippocampal theta. On immediate hypnosis there was EEG activity similar to that in the alert animal; moreover, the EEG could be brought back into the alert state from deep hypnosis with adequate arousing stimuli.

Van Reeth (1963) and Klemm (1966) have also noted alert EEG activity from hypnotized animals. In addition to the alert cortical and subcortical records, Klemm also noted large seizure like waves, especially from the hippocampal structures, although no motor activity was observed. He also found that administration of seizure producing drugs caused similar seizure activity without motor activity. No records of EEG activity during sleep were presented in this study.

Barratt (1965) is the only investigator who presents sleep data along with the EEG records obtained during hypnosis. He found that opposums would go into the trance after a loud noise and sudden flash of light, and compared these trance recordings from frontal and occipital cortex and amygdala with recordings taken while the animals were sitting alert, exploring, visually fixating and sleeping. The study indicated that EEG activity of the sleeping animal was characterized by large slow synchronous waves similar to stage 4 sleep in man, and the EEG while the animal was searching consisted of low voltage fast activity. The rhythms present when the animal was sitting still were in the alpha range. During hypnosis or tonic immobility the EEG consisted of low voltage fast activity similar to that seen when the animal was exploring.

One reason why no one (with the exception of Barratt) presents sleep records along with hypnosis EEG activity and also why sleep is not a particularly powerful argument as a causative mechanism for animal hypnosis, is that those animals which are most easily hypnotized do not sleep very much. The tero bird which Silva et al (1959) studied hypnotizes well, but does not appear to sleep (Silva, pp 175). The pigeon hypnotizes easily, but one has to go to great lengths to demonstrate even minute traces of sleep (Klein et al 1964 ; Travoldi 1966 ; Ookawa & Gotoh 1965). Hobson (1967) has found no trace of sleep in the frog although it also hypnotizes well. Faure (1965) finds that the deepest stage of sleep is not seen in the male rabbit until at least a week of adaptation in the laboratory.

The investigators mentioned so far have concentrated their attention on the similarity between animal hypnosis and sleep on the large synchronized slow waves that develop in the cortex and in other sites of the brain. A synchronized slow wave EEG, however, does not necessarily mean that the animal is behaviourally asleep. Feldman and Waller (1962) have demonstrated that one can have behavioural wakefulness with a slow synchronized EEG in an animal with midbrain reticular lesions, and on the other hand, have a behaviourally comatose animal with an alert EEG with posterior hypothalamic damage. There appear to be two mechanisms operating; one for EEG synchrony, and another for behavioural wakefulness. In most cases the two mechanisms overlap in their operation. One can, however, dissociate the two by making lesions, by injecting large doses of atropine, or by letting the animal inhale ether. Atropine produces a slow wave synchronized EEG in an animal that is clearly behaviourally alert (Wikler, 1952), while ether causes a desynchronized activated EEG in an animal that is clearly not responsive to his environment. Rossi and Zirondoli (1955) have demonstrated that this latter effect is dependent on the integrity of reticular substance lying between a cerveau isole transection and a midpontine pretrigeminal section in the cat, since a cerveau isole preparation will give rise to continuous slow waves despite continuous ether administration over a long period of time, whereas a pretrigeminal cut will be activated by a similar administration of ether. In both these brain transections the sensory input is equivalent; only olfaction and vision are intact.

EEG Studies of Sleep Mechanisms

The sleep state referred to so far is that which has been classically called sleep, i.e., state characterized by large slow synchronous waves appearing in both the cortex and subcortical centres, together with occasional 14-16 Hz spindle activity. Sleep of this type is normally accompanied by reduced heart rate, decreased muscle tone, and little eye movement. There is a state of sleep, however, which has totally different characteristics and which demonstrates a naturally occurring dissociation between EEG activity and behaviour. This sleep is characterized by desynchronized cortical activity together with very fast theta from the limbic structures, loss of muscle tone, rapid eye movements, varied heart rate, phasic twitches in peripheral limbs, and monophasic spikes from pontine and lateral geniculate structures. It has been described in humans by Dement (1957) and has been studied extensively by Jouvet in a series of studies (1962, 1965) in the cat. It has been observed in a number of species ranging from the chicken and pigeon (Klein, 1964) to man. This stage of sleep has come to be described as (1) Rapid Eye Movement or REM sleep because of the striking ocular phenomena during the condition; (2) paradoxical sleep, since paradoxically the EEG from the brain structures looks very much like an alert EEG although the animal is obviously asleep; (3) dream sleep, since humans, when wakened during this stage invariably report oniric activity or (4) simply desynchronized sleep. REM sleep occurs cyclically throughout the sleeping time of a large number of species. In man it occurs roughly every 90 minutes during a night's sleep (Dement and Kleitman, 1957).

Thus, sleep is not electrophysiologically a unitary phenomenon. Although it may have an underlying continuity, on a large number of physiological measures the two stages of sleep have vastly different characteristics: the EEG is entirely different, muscle tone is lost in one case, but only reduced in the other, while phasic twitching, rapid eye movements and tremendous variability of the heart rate are all peculiar to the paradoxical stage of sleep and not to slow wave sleep.

Two implications follow from this discussion. First, all sleep is not characterized by slow waves, and secondly, as has been shown from the dissociation data, slow waves are not necessarily indicative of a sleep state. If one is to say that a hypnosis state is similar to sleep, it is essential to specify what kind of sleep is implied. If a similarity to light sleep is indicated, adequate precautions must be taken that the comparison includes a recognition of slow wave dissociation mechanisms.

The second part of this thesis was designed to investigate some of the similarities of animal hypnosis to the natural stages of sleep and wakefulness that have been discussed. The problem of what brain sites it would be most profitable to record from arises here.

It is beyond the scope of this discussion to review historically all the brain and other body sites that have been postulated as sleep centres. These have been adequately discussed by others (Moruzzi, 1963, 1964; Akert, 1965; Routenberg, 1966) and require little further comment. A brief mention, however, should be made of the present state of knowledge of the processes thought to be involved in sleep and cortical synchronization. Suffice it to say, historically, that the idea of causative mechanisms for sleep has developed from a belief that this state was the result of sensory withdrawal to a notion that it was a passive result, not of sensory withdrawal, but of tonic influences of the reticular activating system of Moruzzi and Magoun (1949). From this it has developed to the present belief that it is a condition which is produced actively by synchronizing mechanisms residing principally in the brain stem which act antagonistically on the reticular activating system (Moruzzi, 1963). The posterior hypothalamus is thought to play a large role in sleep production as well (Feldman & Waller, 1962) and this acts in turn in opposition to the anterior hypothalamus which is thought to give rise to agitation (Akert, 1965; Nauta, 1946). A number of sites in the forebrain such as the preoptic area, caudate nucleus and intralaminar nuclei group of the thalamus also are thought to play a role in sleep production (Hess, 1944, Sterman and Clemente, 1962; a, b; Akert, 1965). In addition,there are structures in the pons which give rise to the activated paradoxical stage of sleep (Jouvet, 1962). The location of these structures and the possible pathways used will be discussed later.

The evidence for these generalizations are derived chiefly by brain transections at different levels, differential anesthesia at appropriate areas of the brain stem, and electrical stimulation. Throughout this discussion one must keep in mind that there should be maintained a distinction between cortical synchronization and slow wave sleep. In most cases the two coincide, but occasionally they do not overlap.

Morruzi and his group have pointed to the existence of a brain stem synchronizing system near the level of the solitary nucleus. If one transects at the midbrain precollicular level, the result is a cortex dominated by synchronous slow waves which cannot be aroused by peripheral stimuli (cerveau isole, Bremer, 1935). A cut further caudally, at the level of Cl (encephale isole, Bremer, 1937), results in EEG records that alternate between periods of sleep and wakefulness. If one cuts at the level of the mid pons, immediately before the trigeminal nerve, the result is a predominately activated cortical EEG (Batini et al, 1959a, 1959b). This preparation frequently gives rise to desynchronization in the cortex (90% of the time as opposed to 20-55% of the time for an encephale isole preparation, Batini et al, 1959a). There are a variety of ocular phenomena which suggest that true wakening exists during the desynchronized stages of the mid pontine pretrigeminal preparation. Moruzzi (1963) notes, among other observations, that the cats are capable of visual following with eye movements, that pupillarly dilation occurs to sudden visual presentation (Batini et al, 1959), that the mydriatic response to darkness is present, and that visual accomodation to near objects is also present. All of these signs are absent in the cerveau isole preparation.

There is evidence, then, for a synchronizing mechanism between these two brain transections. In view of the evidence presented by Magni (1959), it appears that the results are not just due to irritation arising from the cuts. He demonstrated that, by shunting the blood supply of the rostral pons from the vertebral to the carotid system, intracarotid injections of thiopental would lead to EEG synchronization whereas intra vertebral injections lead to an activated EEG.

A number of investigators have probed through this bit of tissue, attempting to find what crucial areas are responsible for this powerful synchronization. Presently the crucial area seems to be in the region of the solitary nucleus since electrical stimulation near the nucleus will cause the slow wave synchronization (Magnes et al, 1961). In addition, bilateral lesions which include this nucleus (Bonvallet &

Allen, 1963) increase both spontaneous EEG desynchronization and Edinger-Westphal inhibition (a classic autonomic indicator of reticular activation). Thus, an area in this region of the solitary nucleus seems to be involved in suppressing the reticular activating system and hence freeing the thalamus to exert its synchronizing influence on cortical structures.

Hess (1944) and a number of other investigators (Akert et al, 1952) have demonstrated that certain sites in the diencephalon, when subjected to low frequency stimulation (4-8 Hz), also give rise to slow wave synchronization and sleep. These points include the intralaminar nuclei of the thalamus, the caudate nucleus, and the preoptic area (Hess, 1944). Sterman and Clemente (1962a,b) have also defined a forebrain inhibitory centre capable of synchronizing the cortex and also of causing behavioural sleep upon stimulation of either high (150 Hz) or low (5 Hz) frequency current (Clemente, Sterman, & Wyrwicka, 1963). This area extended from the region of the diagonal band to the preoptic area of the hypothalamus, and also included an area in the basal amygdala. It is not clear, since these experiments were not carried out on encephale isole cats, whether the synchronization and sleep result from an indirect effect of another nature. For example, it has been demonstrated that a severe fall in blood pressure accompanies septal stimulation (Covian, 1967), and it has been demonstrated (Bonvallet et al, 1954) that such changes in pressure can cause sleep. This still does not detract very much from their importance, since stimulation, and stimulation in a very defined area, does produce the state of sleep. However, some of the areas sampled in the Sterman and Clemente (1962b) study included points in the optic chiasma (pp 95). Pompeiano and Swett (1962a, b) have demonstrated slow wave development and sleep by stimulation of cutaneous nerves at Hess type frequencies. Oswald (1962) was able to induce sleep by massive flashing light stimulation to human subjects with their eyes taped open! It appears that overwhelming stimulation at certain parameters exerts a sleep inducing effect on some central structures. Morruzi (1964) supposes these structures to be located in the medulla and to act on the reticular system.

Jouvet (1962) has demonstrated that paradoxical sleep is entirely dependent on the integrity of the nucleus pontis caudalis within the pontine reticular formation. Destruction of this nucleus through lesions causes permanent loss of the REM stage, and frequently leads to hallucinatory activity in the cats while slow wave sleep seems to be unaffected. Jouvet initially proposed that the Nauta limbic forebrain circuit (Nauta, 1958) was the ascending system for this stage of sleep since ventral lesions and septal lesions prevented REM sleep from appearing. Subsequent studies (Carli, Armengol, & Zanchetti, 1953; Hobson, 1965), however, have demonstrated that lesions which destroy large areas of the origin of this circuit (rostral pons, nuclei of Gudden and Bekterew, anterior part of the nucleus reticularis pontis oralis) do not prevent the appearance of REM sleep; neither does septal coagulation, although fast theta, one of the chief characteristics of the paradoxical stage disappears when the septal pacemakers are lesioned. Hobson (1965) performed a large number of partial lesions in the ponto-mesencephalic regions without total loss of paradoxical sleep. When all these lesions are superimposed, they cover almost the entire brain stem! Apparently, the impulses for REM sleep are conducted to the forebrain by diffuse pathways.

Hernandez-Peon et al (1963) have demonstrated the existence of a circuit, points of which when stimulated cholinergically, cause both light and REM sleep. This circuit extends from the orbital and frontal cortex, medial forebrain bundle, preoptic region, lateral hypothalamus, nuclei of Gudden and Bekterew, and includes points along the medulla and spinal cord. Cholinergic stimulation of the circuit can be blocked by either atropine or with electrolytic lesions caudal to the stimulated point, lending credence to the belief that it is a descending system.

In this discussion of sleep circuits and sites that have been found to be important for that state, we have been looking for those sites from which it would be most useful to obtain EEG recordings. A few of these stand out--the ascending reticular formation, the pontine reticular structures, the intralaminar nuclei group of the thalamus, the septum, caudate nucleus, and preoptic area.

Studies of Sleep Mechanisms Using Microelectrodes

Early studies on single cell activity of unanesthetized animals in natural conditions were concerned with the problem of whether the cells in the brain went to sleep when the body went to sleep. The first experiments demonstrated this not to be true. Hubel (1959), recording from the striate cortex of unrestrained cats, found indeed that some cells fired even faster during REM sleep than during an awake alert state. Moreover, the pattern of discharge changed, the cells discharging in bursts in slow wave sleep. Some units showed arrest on arousal or waking.

A change in the pattern of firing is a very frequent observation in a number of the studies of cortical cells during sleep and wakefulness; occasionally the patterning of responses is more specific to the state than the rate of firing. Cruedtzfeldt and Jung (1961) found similar changes in the firing of units during the spontaneous EEG alterations in the encephale isole cat. Intermittent groups and bursts of discharges replaced continuous sequences of spikes after the change from the alert state to slow wave sleep. These groups consisted of doublets or triplets of spikes (2 or 3 spikes firing very rapidly with the interspike interval very short) or short bursts of very high frequency. The authors report that the grouping effect was seen more frequently with neurones of faster rate (above 5/sec); slower neurones were less markedly changed, frequently showing only an increase in doublets.

Evarts (1964, 1965a, 1967) has also noticed a separation in patterns of response of fast and slow cells. He studied 177 neurones in awake unanesthetized cats with eyes occluded. Ninety-five of these cells discharged more rapidly during sleep than waking, 80 discharged more rapidly during waking than sleep and two fired at the same rate under both conditions. There was no significant difference between means, but individual neurones did change dramatically in their patterns. In general, those cells with low spontaneous rates during sleep discharged more slowly during waking; those cells with high rates during sleep were more active under waking conditions.

Evarts also studied unit activity from cortical visual neurones under situations in which the cat was actively looking about his environment and during REM sleep conditions. Thirty-four of 36 cells sampled fired faster when the cat was awake and looking around than when it was in slow wave sleep. In the group of 177 neurones examined earlier, more than half of the neurones were more active during sleep than when the animal was awake with eyes occluded. REM sleep rates were almost identical to those occurring when the animal was awake and looking around, that is, both rates were very fast.

Evarts (1965b) has also related cell size to rates of firing during sleep states. He inferred cell size of pyramidal motor neurones by antidromic latency to stimulation of the pyramidal tract and found that large cells tended to be inactive during waking and to increase in frequency during sleep, while small cells were active during waking and inactive during sleep.

The most striking difference in activity between waking, slow wave sleep and REM sleep for both cortical and pyramidal tract motor neurones, however, was the pattern of discharges. Although rates were not much different for visual cortical cells while awake (eyes occluded) and for cells under a slow wave sleep condition, cells in both areas tended to fire in bursts. This tendency was even more extreme in pyramidal tract motor neurones, which tended to fire extremely regularly during waking conditions, but to discharge in clusters during slow sleep. During REM sleep the clustering became even more marked, with bursts of very short interspike intervals and long pauses in firing.

Bizzi (1966) studied the activity of the lateral geniculate. His findings were similar to those of Hubel (1960); some cells fired very rapidly in bursts during REM sleep. Moreover, he found a relation between the monophasic waves that appear in the lateral geniculate with gross EEG electrodes and the bursts of firing.

Since the areas around the reticular formation have been found to be so crucial for sleep and wakefulness, a number of studies have concentrated on activity in that region. Moruzzi (1964) has speculated that three types of cells might be found there. One type, which he associates with the activating reticular system of Moruzzi and Magoun (1949), would fire very rapidly on arousal, but be quiescent during sleep. Another type would slow in firing during arousal, but increase in firing during slow wave sleep; these would belong to the synchronizing structures discussed earlier which are near the solitary tract. A third type, which Moruzzi proposed would be found in the pontine nuclei, would fire very rapidly during REM sleep but be quiet during the two other stages.

There are only a few studies on reticular neurone activity during sleep and wakefulness. Caspers (1961) found what would be called the first type of cell in the reticular formation of the rat. These cells fired faster during conditions of arousal during slow wave sleep. Huttenlocher (1961) found an increase in spontaneous rate of discharge in some reticular formation cells during slow wave sleep, and a decrease in rate during arousal. However, he also found cells that fired in long bursts in REM sleep. Strumwasser (1958) also recorded from reticular cells that increased with light sleep and stopped on arousal.
One thing that has become apparent throughout these reticular studies, however, as Huttenlocher points out, is that the reticular system is a very complicated system composed of very specialized parts. Therefore, one has to be very careful about attributing functions to an ascending system or a desynchronizing system wothout specifying anatomical guidelines.

Purpose of the Study

The present thesis is an ivestigation of the two hypotheses proposed. The first study is an attempt to examine the adaptation to immobilization of chickens and rabbits to see whether the "paralysis of fear" hypothesis is supported by studies of mammals. The second is more complex and involves an examination of the electrical activity of the brain during hypnosis and sleep. We have attempted to measure the EEG activity during wakefulness, sleep, and hypnosis by making a precise measurement of the frequencies of the electrical activity of the brain. In addition, we have compared the behaviour of single units during these same conditions. In this way, we hoped to be able to give a definite answer to the question of whether there was a different brain activity under the two conditions. In addition, it was hoped that the data would provide information relevant to the general problem of sleep and wakefulness.

On the whole, the structures we have recorded from are those involved in sleep behaviour. In addition, we have examined some structures in the brain which are concerned with movement since hypnosis probably involves interference with the mechanisms of movement. Klemm (1966), for example, has found that, although seizure activity appeared in the hippocampal record after drug administration to the hypnotized animal, no external movement or EMG change was noticed. Peripheral motor effects were observed when the animal was awake and under the effect of the seizure producing drug. Vanderwolf (1962) has demonstrated that the medial thalamus is important for voluntary movement since rats with medial thalamic damage have difficulty in initiating an avoidance response. The difficulty seems to be one of starting to move, rather than one of learning the fear process.

Vanderwolf and Heron (1964) have demonstrated, as well, that theta activity accompanies voluntary movement. Theta activity is particularly prominent in the hippocampus, and some cells in the septum have been found to pace theta (Pestche and Stumpf, 1962). Moreover, septal lesions have been found to abolish the medial thalamic damage effect (Vanderwolf, 1964). There is a possibility, then, that movement may be related in some way to the medial thalamus, septum, and hippocampus. These are areas, in addition to those structures concerned with sleep, which will be examined in this study.

CHAPTER 2

Experiment 1

We saw in chapter 1 that animals exhibit decreased susceptibility to animal hypnosis after repeated trials, and that taming also decreases this susceptibility. Because of these and other findings, a "paralysis of terror" is frequently invoked as a causative mechanism for the condition.

It has been observed in this laboratory, however, that rabbits will continue to enter the hypnotic trance even after hundreds of hypnotic trials and months of testing involving considerable handling. The possibility exists that these animals may differ from birds in their adaptation patterns to hypnosis; a "paralysis of terror" hypothesis may not be the most likely explanation. The first experiment to be described was designed to test this hypothesis. Rabbits and chickens were hypnotized on a number of occasions to see whether adaptation to handling and to the procedure, which would presumably reduce the fear or emotional reactions, would result in a reduction in the incidence of hypnosis. The first experiment to be described, which involves repetitive hypnotizing of rabbits and chickens, was designed to test this hypothesis.

Method

Ten New Zealand white rabbits weighing 2.5 - 3.0 kg and 10 White Leghorn chickens weighing 1.2 - 1.4 kg were used in this study. The rabbits were hypnotized by grasping the bridge of the nose in the right hand and the underbelly in the left hand and rapidly inverting the animal backwards into an apparatus described by Klemm (1965) (See Fig. 1c). The animals were held for 15 seconds and then carefully released.

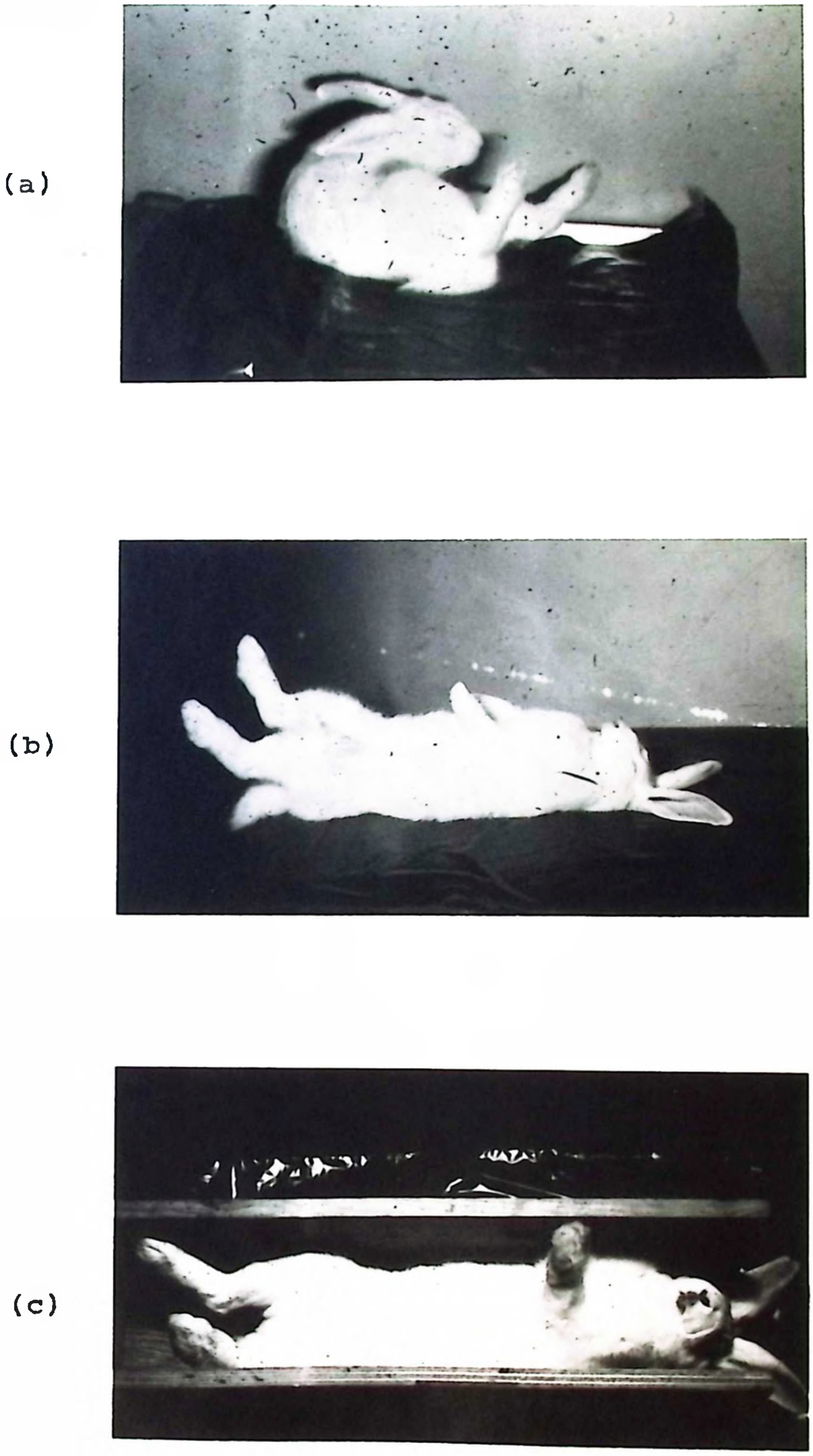

Figure 1 (a) Rabbit hypnotized in sitting position. (b) Rabbit hypnotized by inversion alone. (c) Rabbit hypnotized in Klemm box.

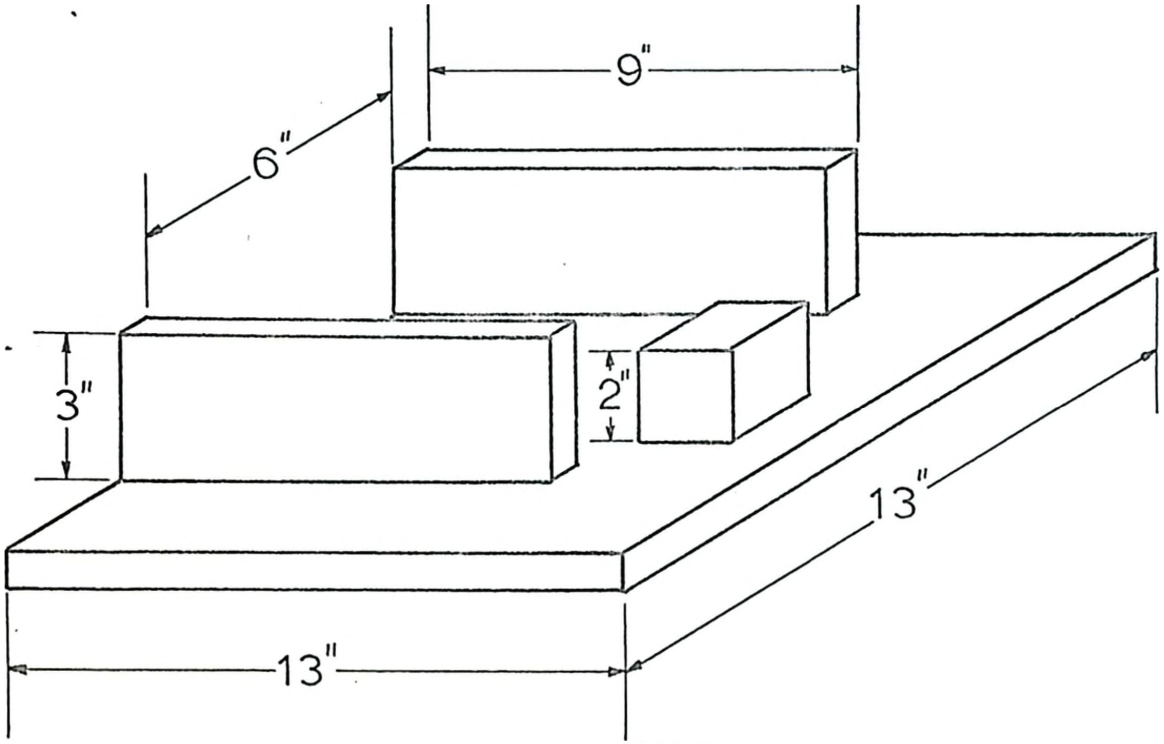

Figure 2 Diagram of apparatus used for hypnotizing chickens

Waking of the animal was indicated by a spontaneous return to the upright position. If an animal had not awakened from the trance at the end of 4 minutes, the trial was terminated with a loud noise. The intertrial interval was 2 minutes; 4 trials a day were given. A 2 minute habituation period was given when the animal first entered the room.

The chickens were hypnotized in a similar fashion, that is, by turning them upside down in an apparatus that provided some restraint on either side; their beaks were also brought behind a block (See Fig. 2). The number of trials and the intertrial intervals were identical to those of the rabbits. Test trials were carried out for 35 days.

Two measures of susceptibility to hypnosis were taken: the number of unsuccessful attempts to hypnotize the animals and the total duration of the trance on successful hypnosis attempts.

Results

The failures of the attempts to hypnotize the chickens and rabbits are shown in Figure 3. The graph indicates that there is an increasing number of failures as the chickens are repeatedly tested; however, there is no change in the number of times that rabbits fail to go into the trance.

The median total time spent under the trance for all animals during daily testing is shown in Figure 4. It may

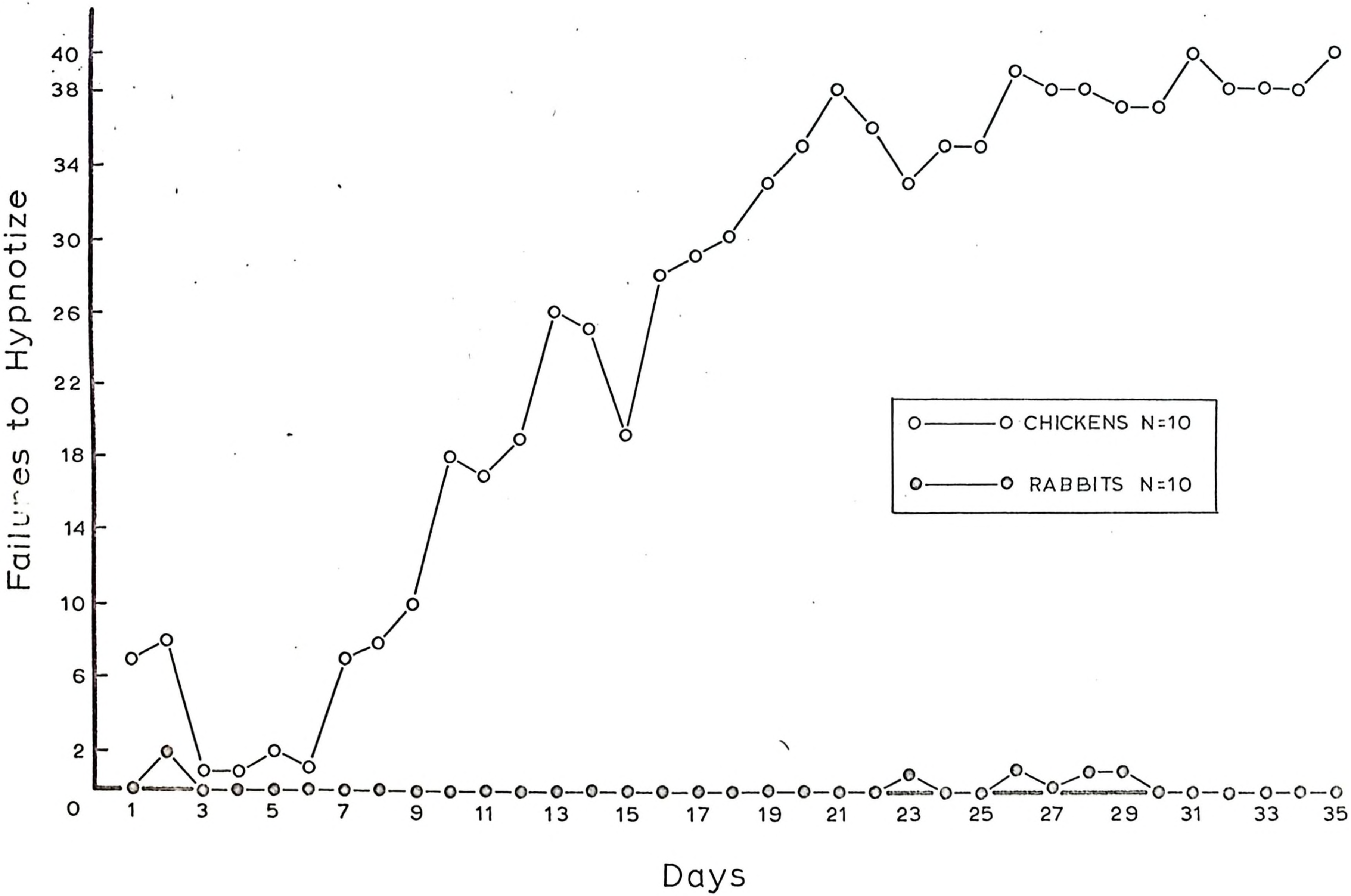

Figure 3 Failures of rabbits and chickens to hypnotize over days.

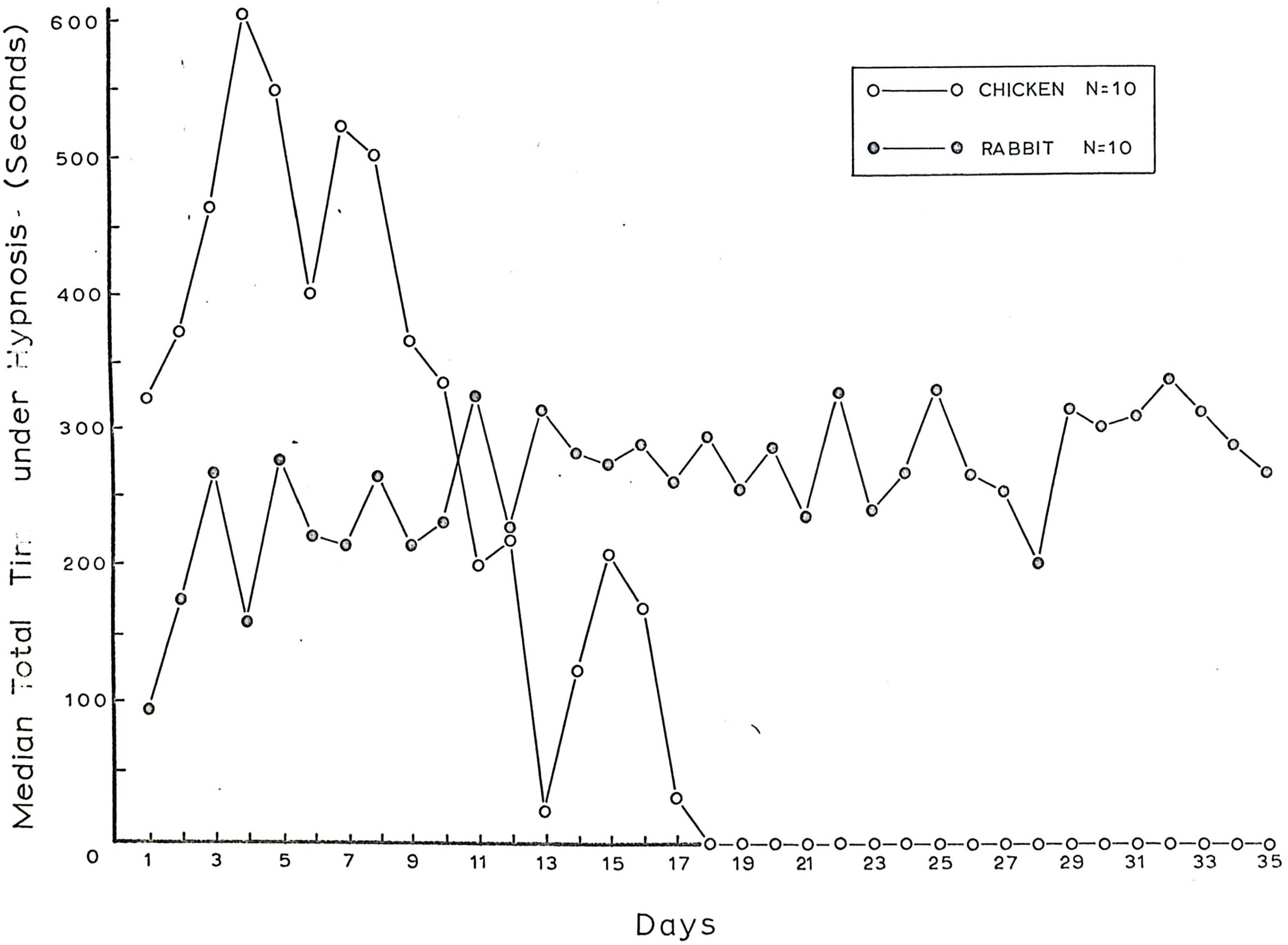

Figure 4 Median total time under hypnosis over days.

be seen that there is an initial increase in time spent under hypnosis for all animals followed by a gradual decline over days for the birds. This initial U shaped function is significant ($P < .01$, Ferguson's Nonparametric Trend Analysis, Ferguson, 1966), and the overall decline is also significant ($P < .001$). A similar finding has been reported by Bayard (1957) for guinea pigs. The rabbits, as the graph indicates, show an initial increase which levels off.

Testing continued for 35 days. The chickens had adapted almost completely by days 12-14. That is, after 12 days they would not enter the trance, or would remain in the trance for only a short period of time. The rabbits never showed any such adaptation, although they showed every evidence of having been tamed by the middle of the testing period; they would nibble on one's hand, actively explore the testing area and generally act rather calmly. These animals, however, would readily go into the hypnotic trance, occasionally as soon as they were grasped.

These experiments support the findings of Gilman, Marcuse and Moore (1950) and of Westlake (1965) that repeated hypnosis of chickens with appropriately interspaced trials will result in a decline in the amount of time spent under the trance and will decrease the susceptibility to induction. However, the ease with which a rabbit enters hypnosis even after weeks of repeated hypnosis tests, and the amount of time spent in these trances suggest that some mechanism is operating other than a paralysis of terror.

CHAPTER 3

Experiment 2

It was clear from the historical review that a number of investigators have postulated that animal hypnosis is some form of sleep state. This is not surprising since the animal's eyes are usually closed and the animal is lying down. Also the unresponsiveness to external stimuli, the slow breathing, the spontaneous recovery, and, most crucially, the development of large slow waves from brain structures all bear some degree of similarity to natural light sleep.

Most of these observations and comparisons of hypnosis states were made rather superficially, however. No one who has called hypnosis a sleep state on the basis of brain wave activity has included a sample of sleep activity for comparison. In addition, it has been very well established by Jouvet, Dement, and others that sleep is not a unitary phenomenon. Not only are there variations in what has come to be called light sleep, but also there exists another stage of sleep that is so different from what is normally termed sleep on any physiological dimension-EEG activity, breathing, blood pressure, heart rate, muscle tone, peripheral movements, that to say simply that a condition is like a sleep state is virtually meaningless.

We examined a number of physiological indices of animal hypnosis in this study, and directly compared this condition to sleep states and various natural stages of wakefulness.

Method

This experiment was carried out in two parts. In the first part the EEG from the various structures was examined, and some peripheral indices such as heart rate, muscle tone, and eye movement were studied during wakefulness, sleep and hypnosis. The second part of the study attempted to quantify some of the EEG activity and looked further into the changes that took place during prolonged hypnosis.

Subjects, Electrodes and Surgical Methods

Twenty-one male New Zealand white rabbits weighing 2.5 - 3.0kg and 2 white leghorn chickens weighing 1.2 - 1.4 kg were used in this experiment.

The rabbits were anesthetized with sodium pentobarbital (Nembutal) 30 mg/kg, which was injected intravenuously. Supplementary doses of 10 mg/kg were given as needed during the operation. In addition, atropine (.5 mg/kg) was administered intramuscularly, and Xyclocaine was injected subcutaneously over the entire surface of the animal's skull. The animal was placed in a Kopf stereotaxic instrument with an adaptor which held him by the front incisors and zygomatic arch. The skull was bared, burr holes 2 mm in diameter were drilled in the bone to receive the electrodes, and at least 12 stainless steel screws were inserted into the skull.

The EEG electrodes were made from twisted .010" formvar insulated nichrome wire (Driver Harris Co., Harrison, N.J.) soldered to Amphenol 17-765-02 pins. In addition to the factory applied formvar insulation, the electrodes were coated with epoxylite and baked three times to prevent leakage. The tips were then bared .5 mm and spread 1 mm from each other. Referring to the atlas of Monnier and Gangloff (1961) or that of Sawyer (1954), the electrodes were lowered stereotaxically into the sensori motor cortex, limbic cortex, dorsal hippocampus, medial thalamus, septum, caudate nucleus, midbrain reticular formation, and red nucleus. Electrodes were not placed in all of these structures in every animal, but each animal did have cortical, medial thalamic, hippocampal, and midbrain reticular electrodes. The EKG electrodes were implanted by the technique developed by de Toledo and Black (1965). It consisted of placing Grass disc electrodes under the skin of the animal down to the chest region. The neck EMG electrodes consisted of two 6 cm pieces of teflon insulated stranded stainless steel wire (Electrodyne Corp., Toronto); each piece was soldered to Amphenol connector pins. Six millimeters of each wire were bared at the end opposite to the pins and bent so as to form a loop. These loops were then sewn into the midline neck muscles of the rabbit approximately 2 mm apart. The electrodes used to record eye movements consisted of 2 pieces of .010" formvar coated nichrome wire which were soldered to Amphenol connector pins. The ends of these wires were bared and bent into a hook. The hooks were then slipped under the superior orbital ridge (see Fig. 5) in such a way as to pick up the large slow potentials generated by the eye moving as a dipole in space. This electrode inadvertently picked up a large amount of EMG activity from muscles about the eye. It was found in the first part of the study that loss of muscle tone from these muscles was as reliable an indicator of REM sleep as the loss of tone from nuchal muscles. Consequently, in the second part of this study it was used as an EMG electrode as well as an indicator of eye movements. The ground electrode was made by soldering .010" nichrome wire to a connector pin at one end and to a stainless steel screw at the other. The screw was then inserted into the frontal bone near the sagittal sinus. The male Amphenol pins were inserted into a connector (17-20250) which was embedded in dental cement.

Animals were given 100,000 units of penicillin daily for 3 days post operatively. At least three weeks were allowed for recovery before testing began.

The chickens were implanted with the aid of the atlas of Van Tienhoven and JuHasz (1962). Electrodes were placed in the cortical area, the medial thalamus, and the hippocampus. Neck EMG and eye movement electrodes were also implanted, but no EKG electrodes were used. Surgical procedures were identical to those used with the rabbits.

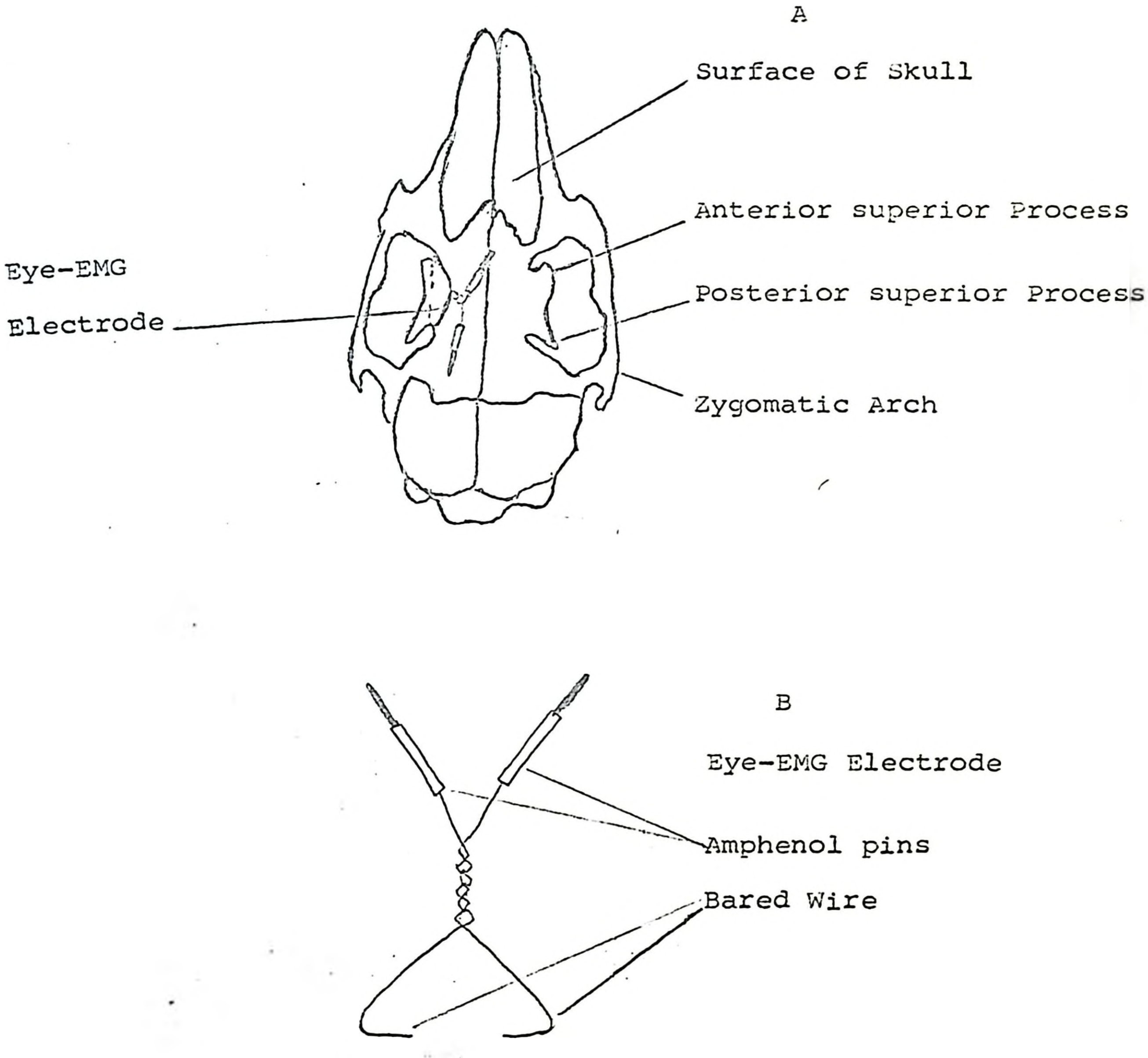

Figure 5. Diagram of eye-emg electrode. The electrode is shown inserted under the superior orbital process (A) ; the structure of the electrode is shown below (B).

After testing had been completed, all animals were sacrificed. A small D.C. current was passed through the EEG electrode tips, and the brains were perfused with 10% formalin and potassium ferrocyanide solution. The brains were then frozen, coronal sections were cut at 40 u, and these sections were stained with thionin.

<u>Experimental Procedure</u>

Recordings were made under the following conditions:

1. Alert. A condition in which the animal stands very still and is very alert.
2. Moving. A state in which the animal moves about. The movements include both whole body and partial body movements, such as head movements.
3. Synchronized or slow wave sleep. A sleep state in which the animal lies quietly with large slow wave and spindle activity on the EEG records. These samples were taken during 2 minute periods immediately preceding paradoxical sleep.
4. REM, paradoxical, or desynchronized sleep. Sleep in which the animal lies limp and exhibits sudden twitches. The EEG exhibits long streams of rapid theta activity, muscle tone decreases, and rapid eye movements appear.
5. Hypnosis. Hypnosis tests were carried out by inverting the animals into the Klemm box described in Experiment 1. The animals were allowed to awake spontaneously. If they did not awaken within 20 minutes after the onset of hypnosis they were awakened by the experimenter.

In the first part of the experiment, EEG, EMG, EKG, and eye movement records were taken from 10 rabbits and two birds on a Grass Model IV polygraph by sampling the EEG for 40 seconds every 10 minutes over a period of 3 days. REM sleep samples were not taken from the chickens.

In the second part of the study, seven rabbits were sleep deprived for 3 days using a shuttle box technique. They received 1½ ma foot shock if they did not shift from one end of the box to the other in 60 seconds. This was done so as to get large samples of REM sleep, which is otherwise only 5-10% of the total sleeping time of rabbits (Faure, 1965). Also, we were curious to know what effects sleep deprivation had on animal hypnosis. After three days of deprivation, the animals were placed in their cages, and nearly continuous recordings were taken for the next 10 hours, or until at least three REM sessions were obtained.

The EEG from the brain structures, together with the EKG and the activity from the combined EMG and eye movement electrode were amplified by a Beckman type R Dynograph and written on paper. The electrical activity of the cortex, medial thalamus, hippocampus, and combined EMG and eye movement were continuously monitored on an oscilloscope and were taped on an Ampex SP 300 four channel FM tape recorder for further processing. The band pass filters on the polygraph were set at 0.53 Hz and 22 Hz (3 db down) for the EEG channels and at 5.3 Hz and 150 Hz for the EKG and EMG channels.

At least four weeks after the sleep deprived session, the seven rabbits were again tested during hypnosis in a non sleep deprived condition.

In addition to these 7 animals which were tested after sleep deprivation, two animals with no deprivation whatsoever were tested by adapting them to the laboratory situation, and watching them until they entered the REM stage. Recording procedures were identical to those for the sleep deprived animals: after several sessions of REM sleep had been observed, hypnosis sessions were carried out. Recordings were also taped from the septum, caudate nucleus, and reticular formation of these two rabbits. In the earlier animals, recordings from these areas were only written on paper.

Using the university IBM 7040 computer, the EEG data were subjected to power spectral analysis. This gave a quantitative measure of the relative amount of power contributed by each frequency component to the total power of the signal. The technique is most adequately described by Blackman and Tukey (1958) and its specific application to neurophysiology is described by Brazier (1960) and Walter (1963).

One minute samples of the taped record from each condition were sampled at 100 times per second by a 6 bit successive approximation analog to digital converter and written on computer tape; these selections were normalized and subjected to autocorrelation with 100 lags with a .01 second increment per lag. The power spectra were subsequently obtained by a Fourier transform of the autocovariance and were printed and plotted in both linear and log scales in .5 Hz increments from 0.0 to 50.0 Hz.

The computer programs, written in Fortran IV and Macro Assembly Program,were extensively modified from a Biomedical program, BMD02T, obtained from the Health Sciences Computing Facility of the University of California at Los Angeles.

At least two samples were taken from each condition on two different occasions.

Results

Normal sleep and wakefulness. The most striking characteristic of the electrical activity of the brain of the rabbit is the predominance of theta rhythms, that is, synchronous activity between 4 and 8 cycles per second. Of all the structures recorded from, only the sensori-motor cortex and the septum were to any extent free of this rhythm, and even these occasionally exhibited theta activity. Consequently, the analysis has tended to concentrate on this activity and on the structures which exhibit these rhythms.

When the animal is moving, rapid theta is recorded. This is shown in Figure 6, and may also be seen in the records from various structures in Figures 7 to 52 of the Appendix[3]. The power spectra for the medial thalamus of Rabbit 56 (Figure 7a) show that there is a peak of activity at between 7 and 8 Hz. Records from the cortex show desynchronized activity (Figure 16, bottom) and,

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[3] Only samples of the records and power spectra are shown in the text. Power spectra estimates for all animals are found in Tables 2 to 43 of the Appendix. Additional EEG records from the next experiment which support the findings of this study are found in Figures 7 to 52 of the Appendix.

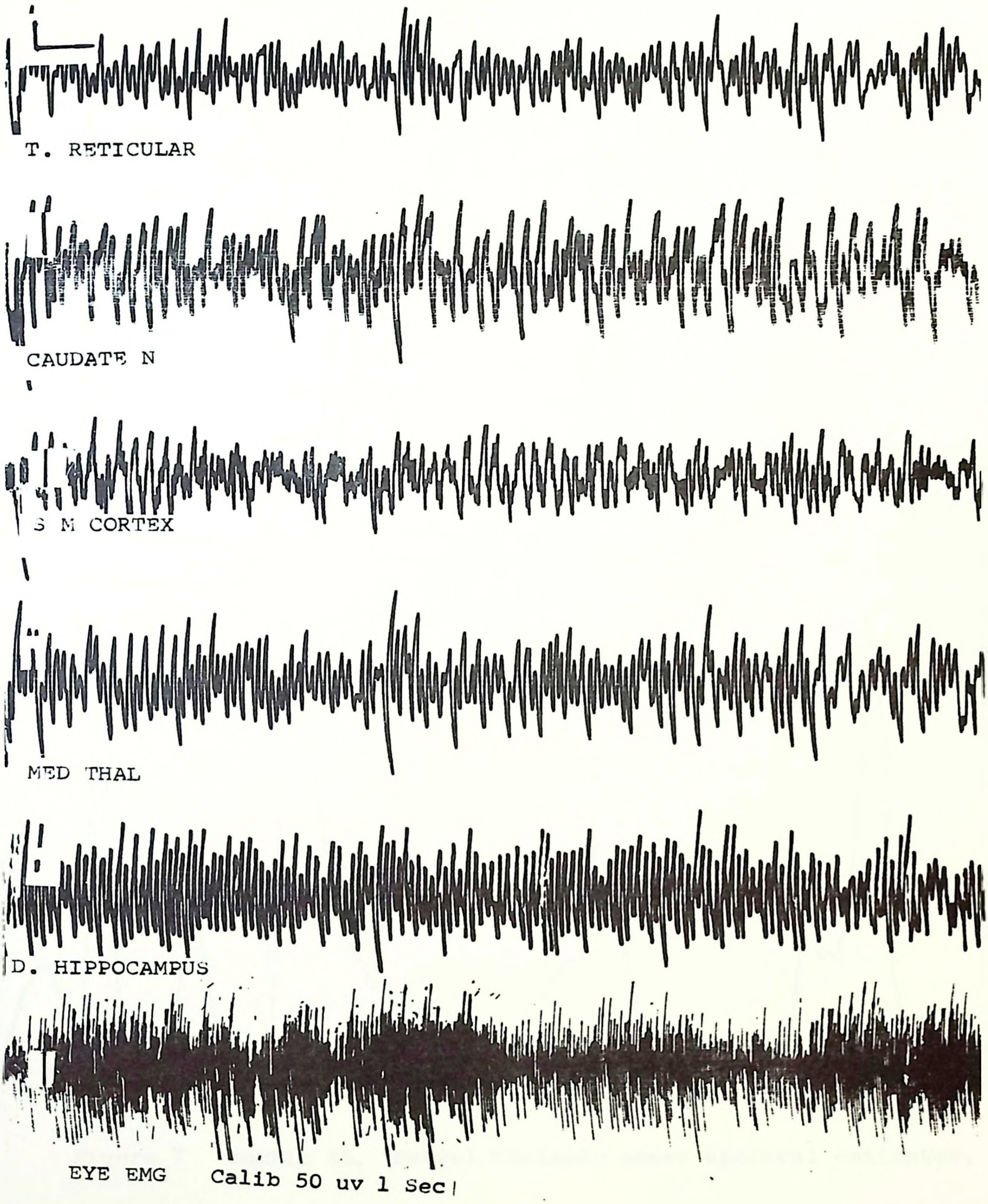


Figure 6 Rabbit 56 Alert, Moving

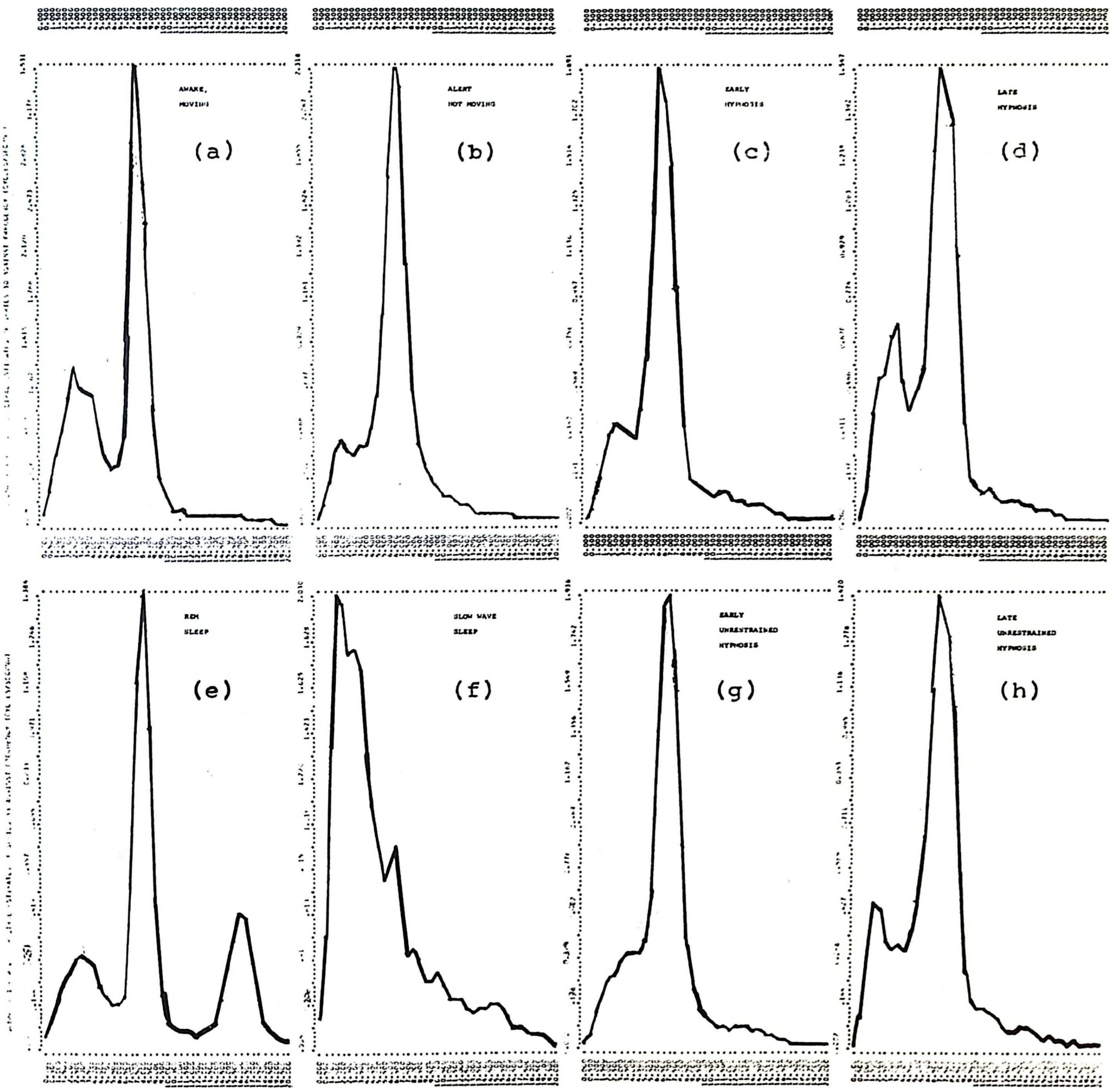


Figure 7 Rabbit 56. Medial thalamic power spectral estimates.

if the electrodes are deep in the cortex, some theta activity as well (Figure 6). The medial thalamic and reticular records suggest slow activity superimposed on the dominant theta rhythms, and this is confirmed by the power spectra data which reveal it to be around 1.5-2.5 Hz (Figures 7a, 8a). An even greater amount of slow wave activity is seen on the caudate power spectra (Figure 9a) during the moving condition.

When the animal is alert, but not moving, the subcortical structures are dominated by theta of a lower frequency (Figure 10). The power spectra show that the energy now peaks at 5 - 6.5 Hz (Figures 7b, 8b).

As the animal becomes more relaxed, more slow waves develop; this is seen in Figure 11. The EEG is characterized by large slow waves without spindles.

As the animal enters synchronized sleep, the slow (1-2 Hz) waves increase in number and amplitude and 14-16 Hz spindle bursts also appear. These develop in all subcortical and cortical sites (Figure 12). In addition to these large amplitude slow waves, which tend to dominate the record so as to obscure other activity, the spectral analysis indicates a small amount of energy in the low frequency theta range as well, as for example, in Figures 7f and 8f.

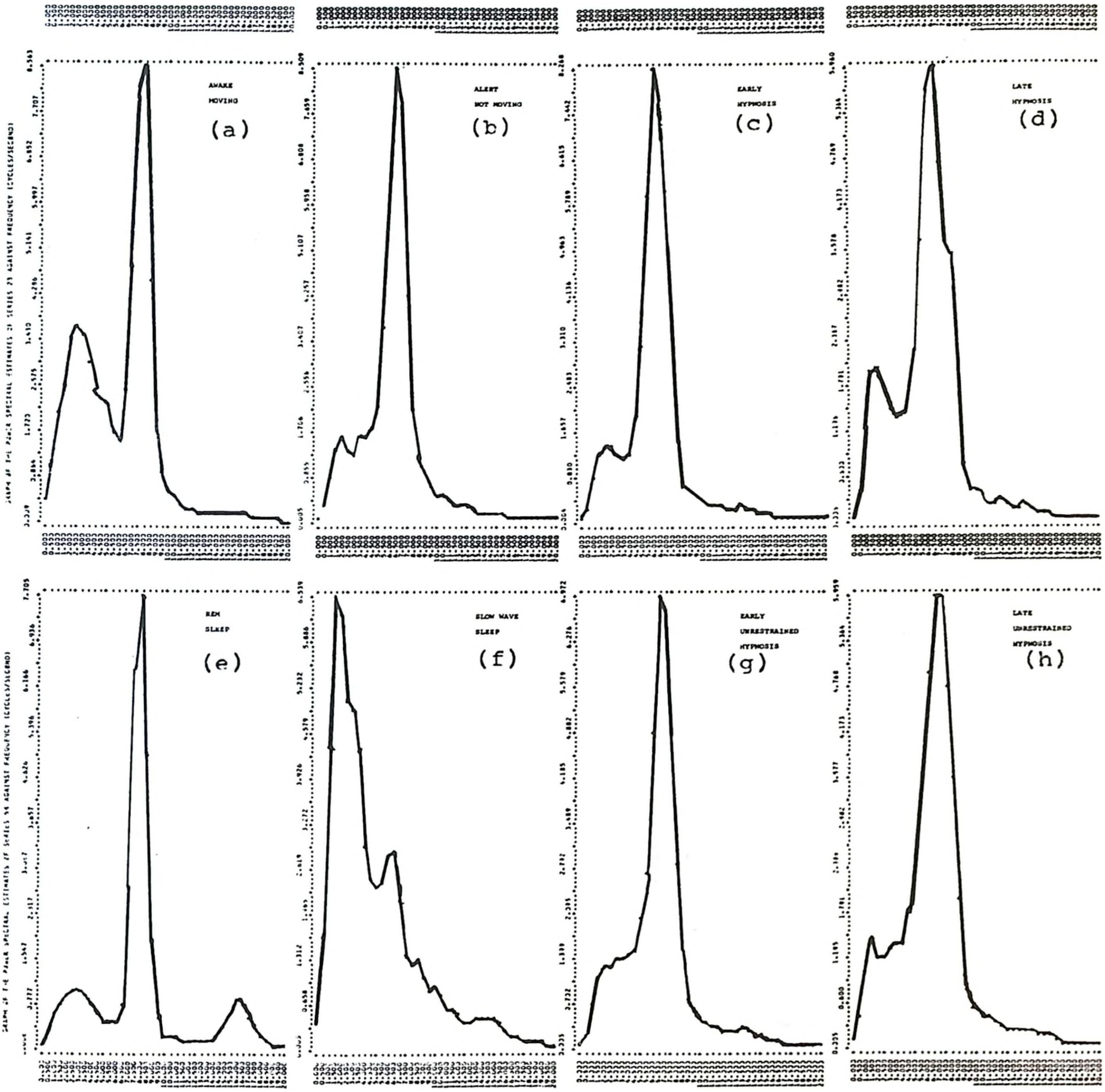


Figure 8 Rabbit 56. Tegmental Reticular formation spectral estimates

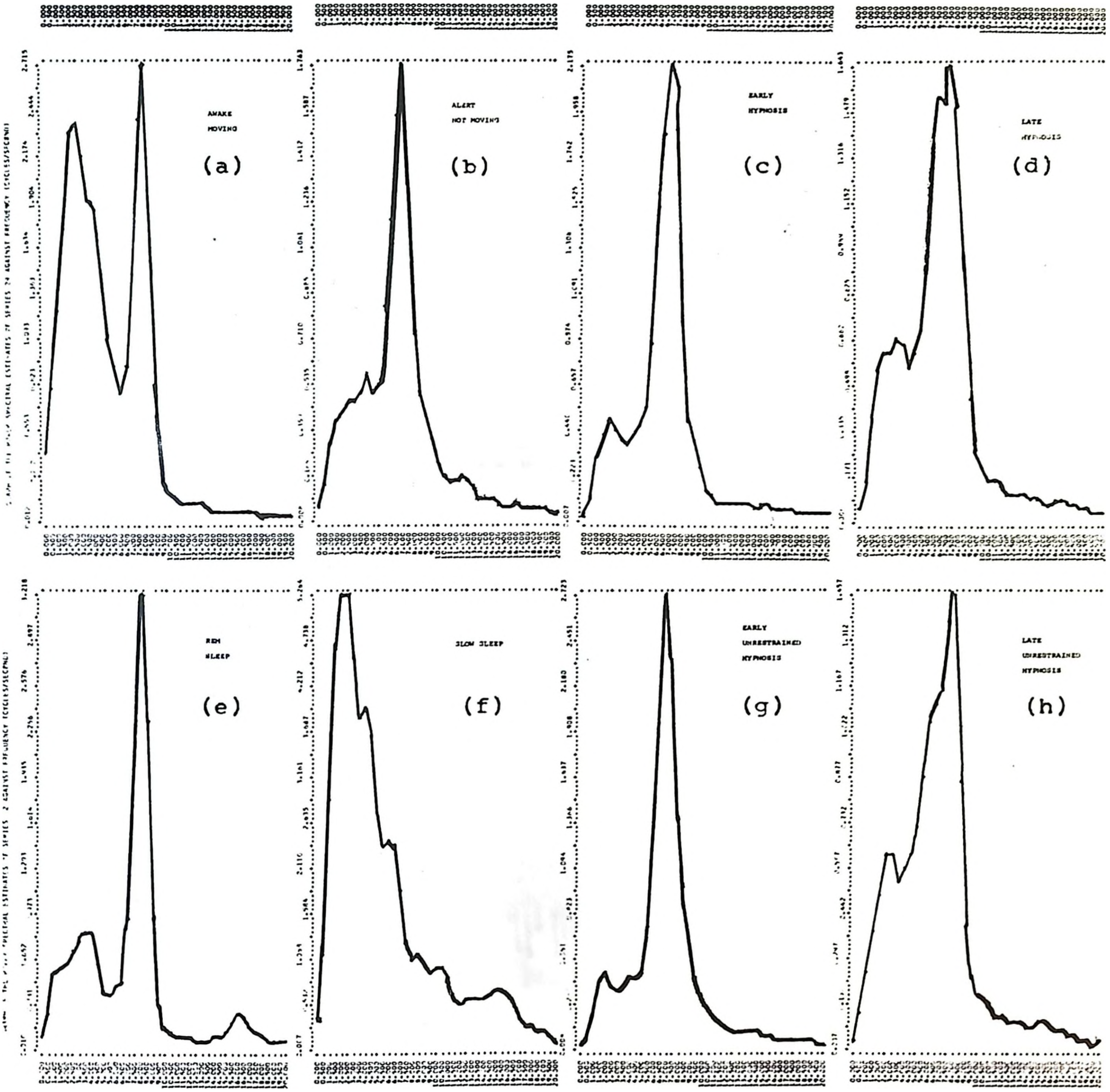


Figure 9 Rabbit 56. Caudate nucleus power spectral estimates.

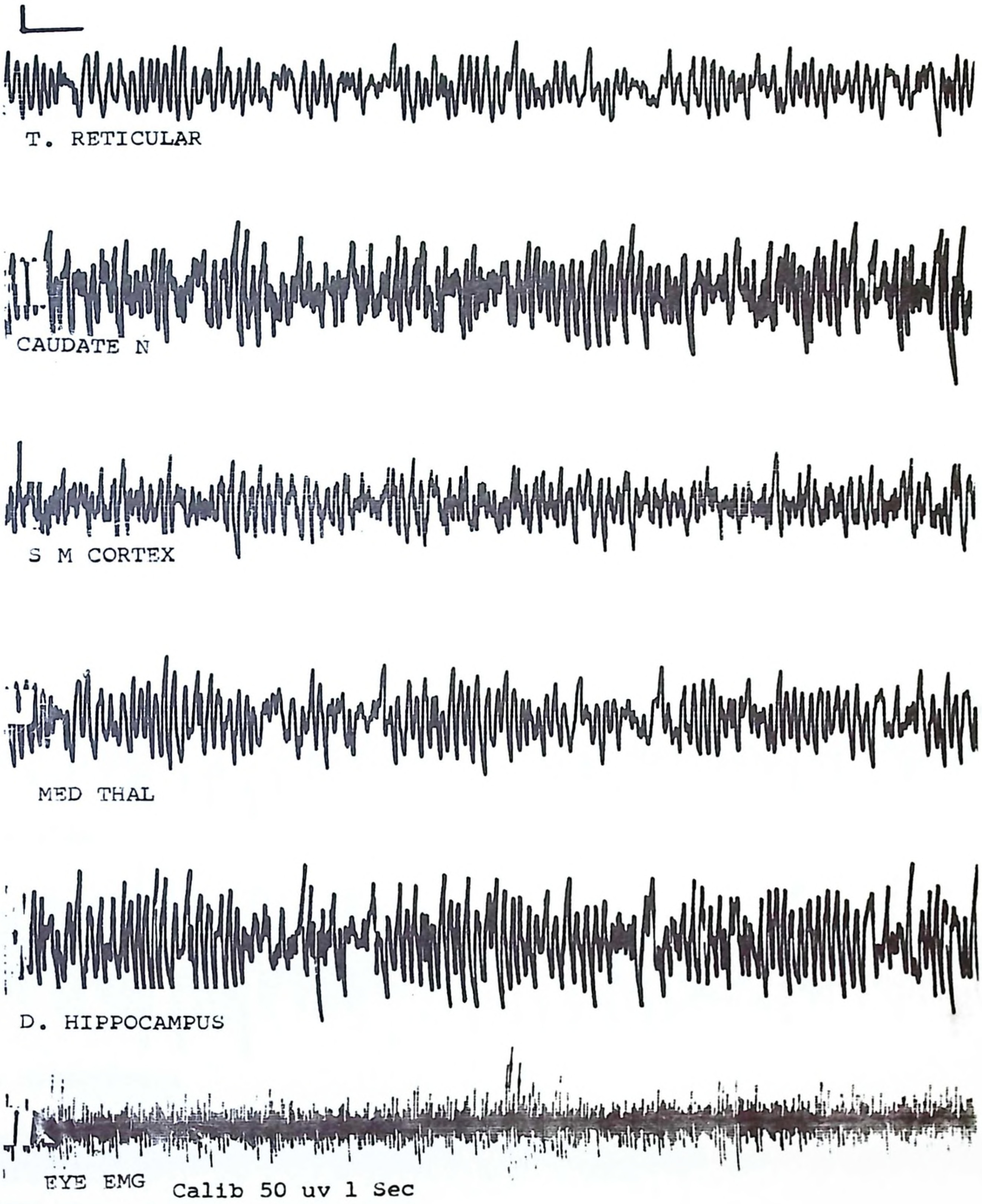
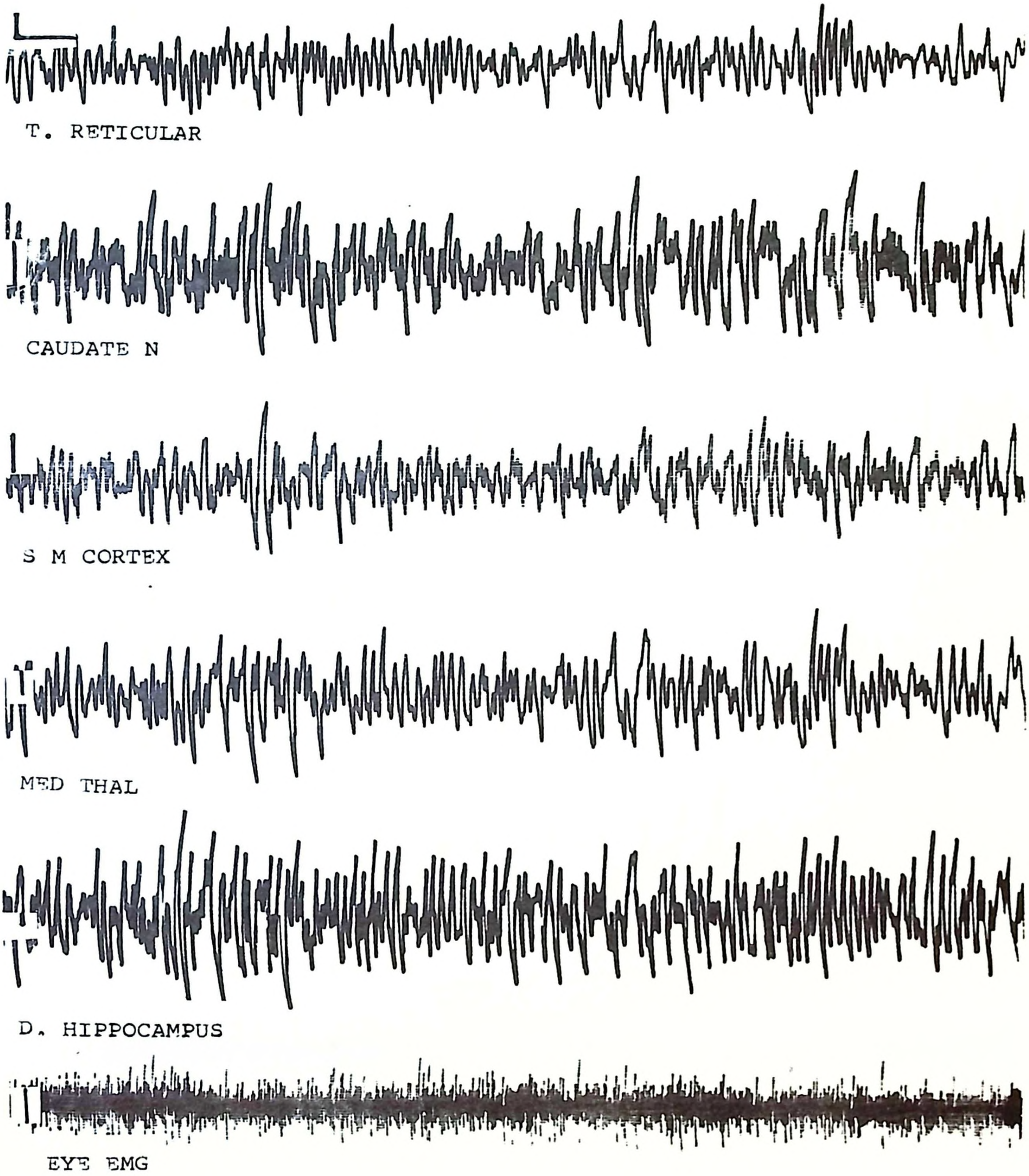


Figure 10 Rabbit 56 Alert, not moving



Calib 50 uv 1 Sec

Figure 11 Rabbit 56 Animal sitting very relaxed

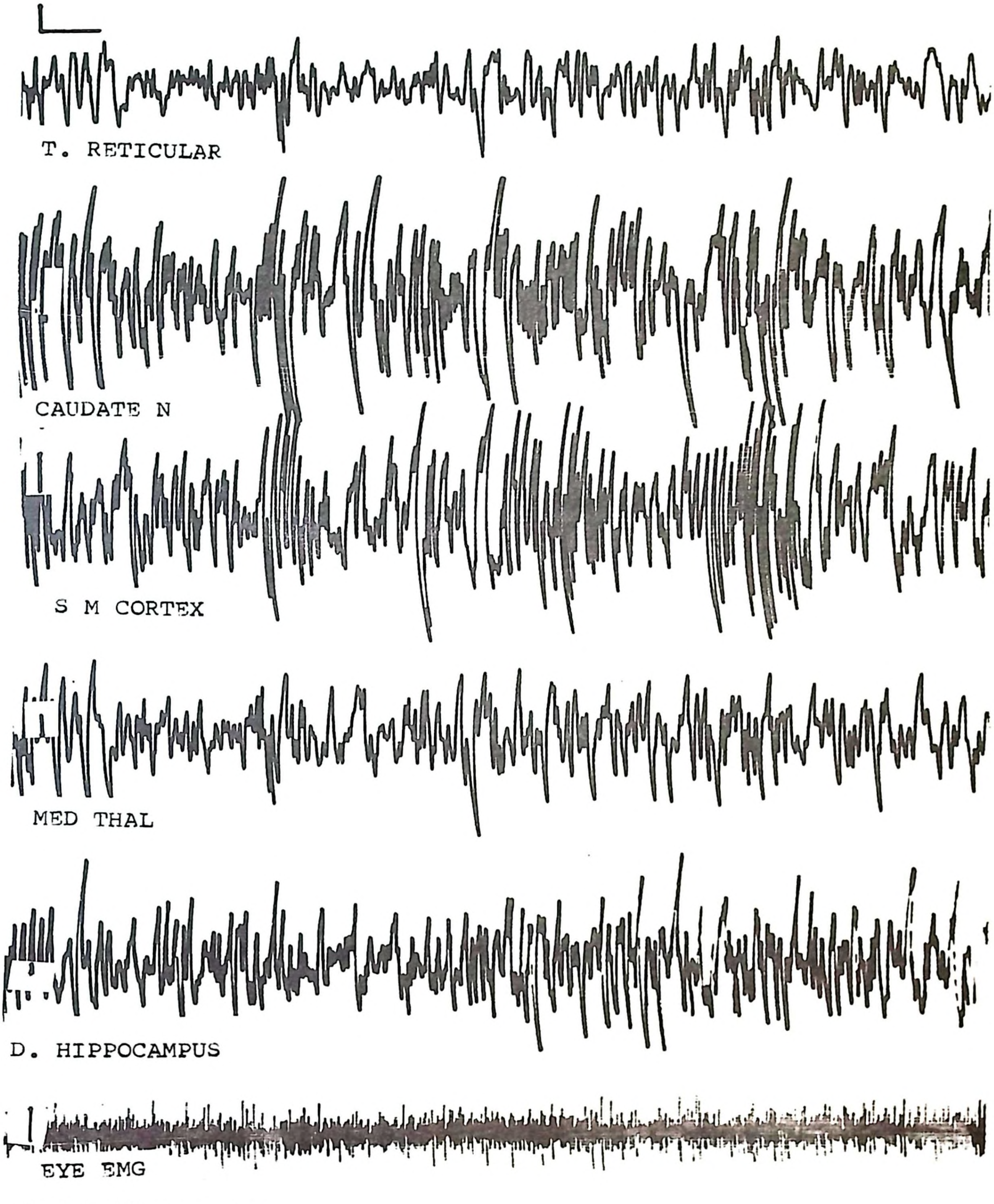


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Figure 12 Rabbit 56 Slow wave sleep

The stage of deep sleep (paradoxical or rapid eye movement sleep) is marked by long streams of very rapid theta (7.0-9.0 Hz) from the subcortical sites together with a desynchronized cortex. This is seen in Figures 13 and 16 (top) as well as in Figures 7 to 52 of the Appendix.

Another striking finding during sleep, and especially during REM sleep, is the increased development of a band of activity at 13-18 Hz. This is readily apparent in the REM power spectra for the medial thalamus of Rabbit 56 in Figure 7e and in the dorsal hippocampus of the same rabbit in Figure 14e. It appeared as well in records from the sleep deprived animals, for example, Figure 18d from Rabbit 23, and in computed power spectra for other animals, such as Rabbit 57, Appendix tables 38 and 39 . This band of activity is not prominent in the records which have a similar peak frequency, such as those from an animal that is moving (7.0-8.0 Hz), or in records taken while the animals were still, for example, Figures 14a and b. The EEG from the moving rabbit and the rabbit in REM sleep (Figures 6 and 13, Figure 16, Figures 7 to 52 of the Appendix) are rather similar on visual inspection, since the rapid theta tends to mask other activity. One can, however, discern a trace of a high frequency component on the record.

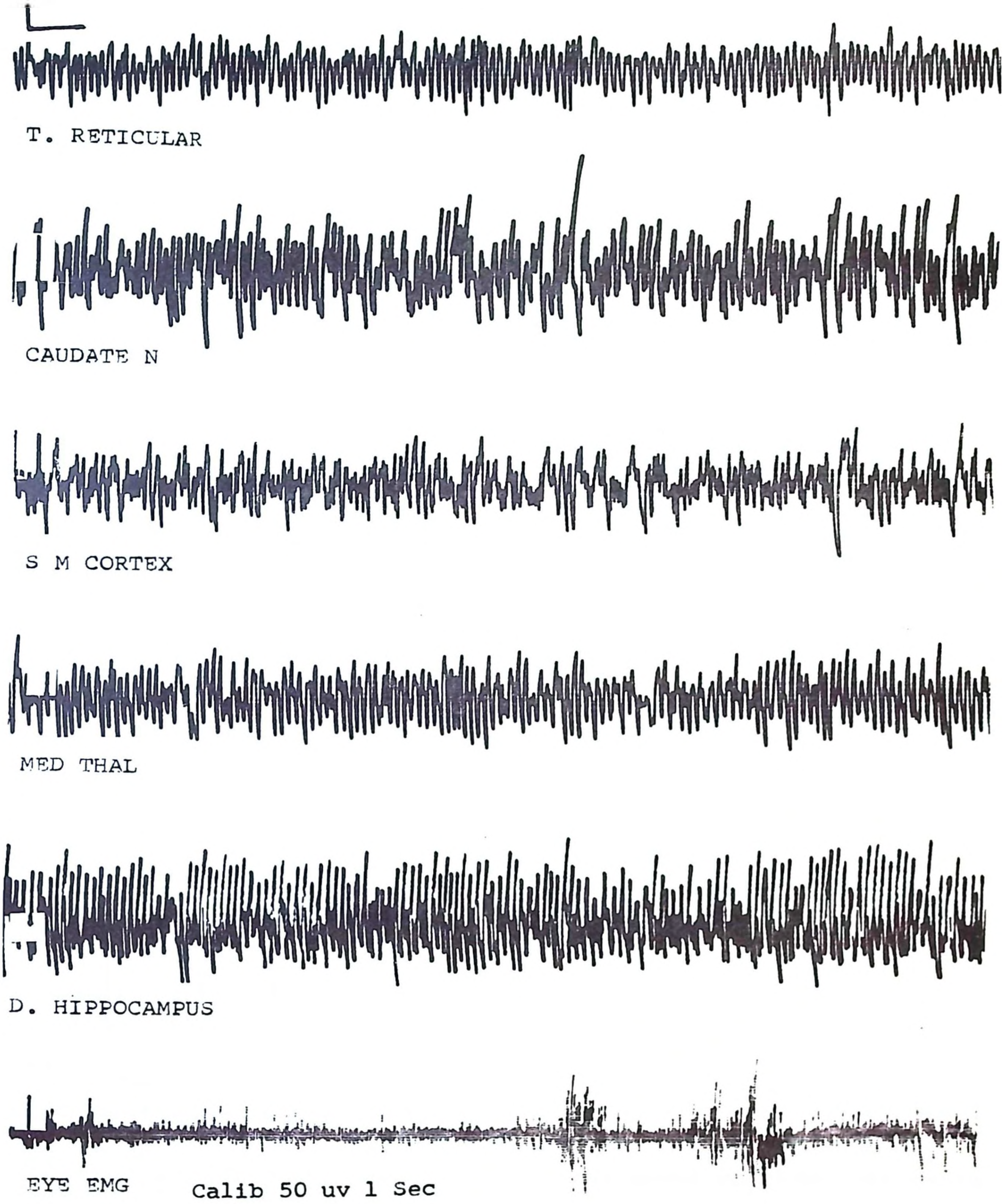

Figure 13 Rabbit 56 Paradoxical Sleep

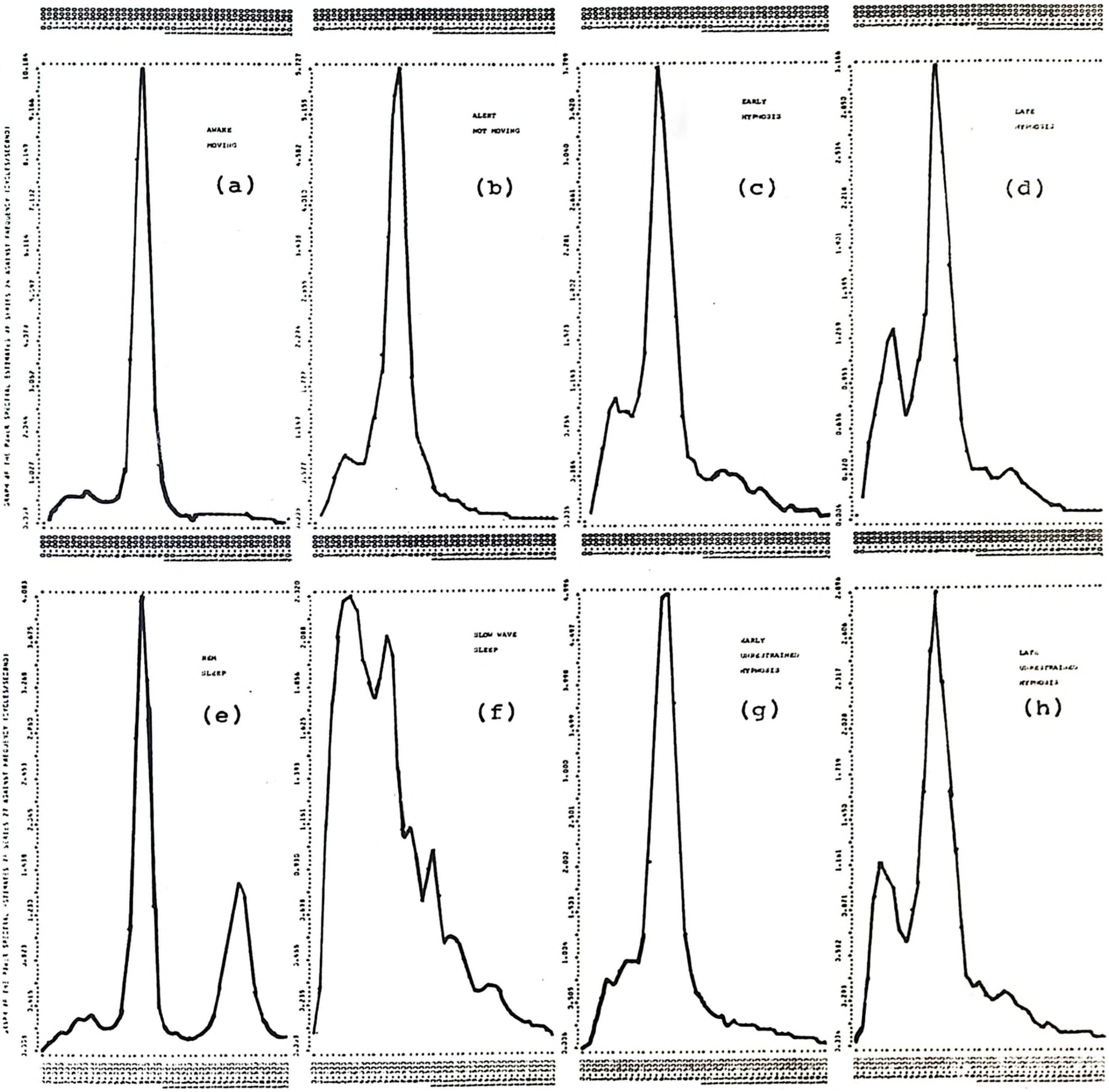

Figure 14 Rabbit 56. Dorsal hippocampal power spectral estimates.

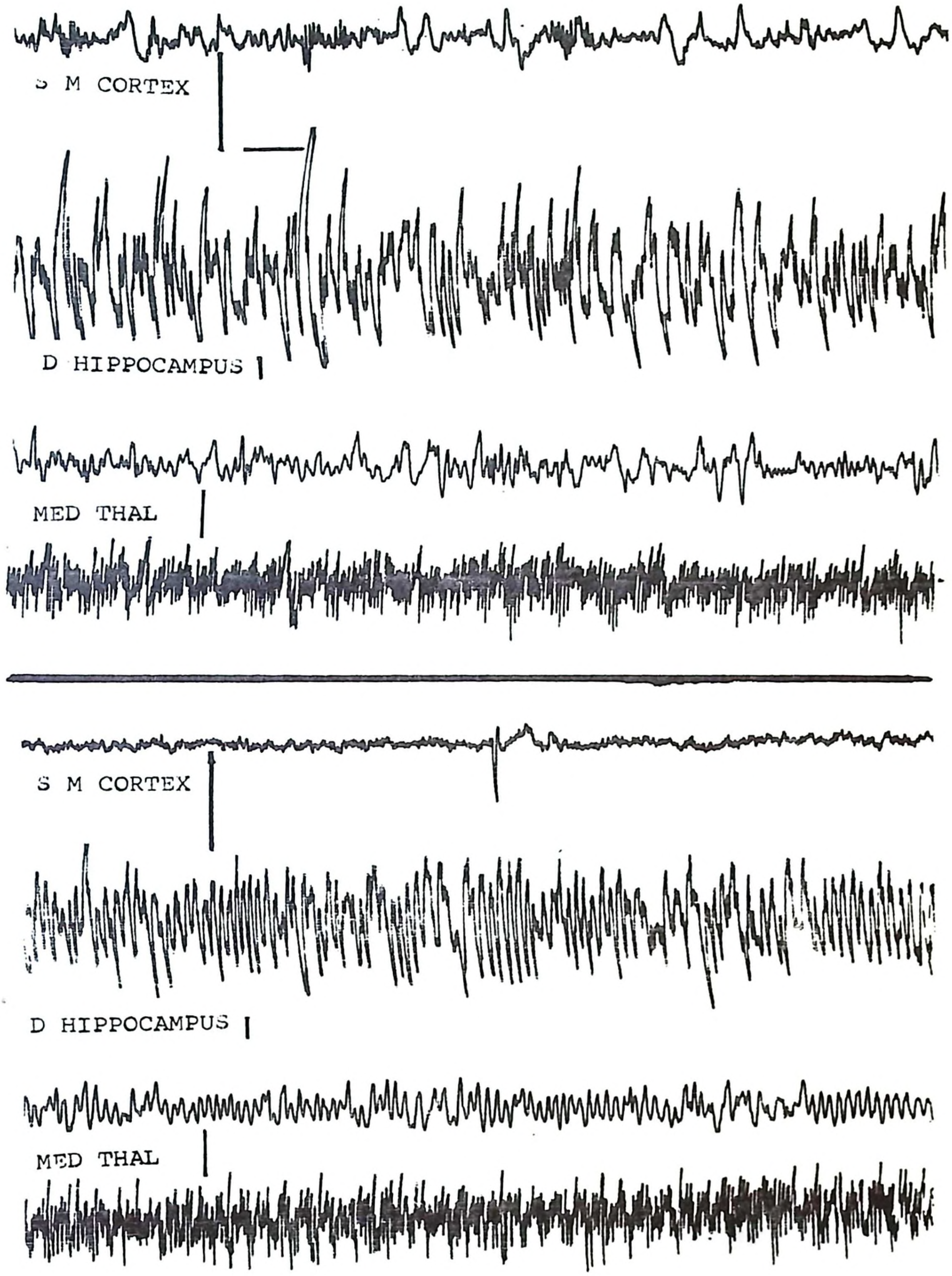

Figure 15 Rabbit 16, sleep deprived animal. Slow wave sleep (Top) and alert still (Bottom) records. Calib 100 uv 1 Sec

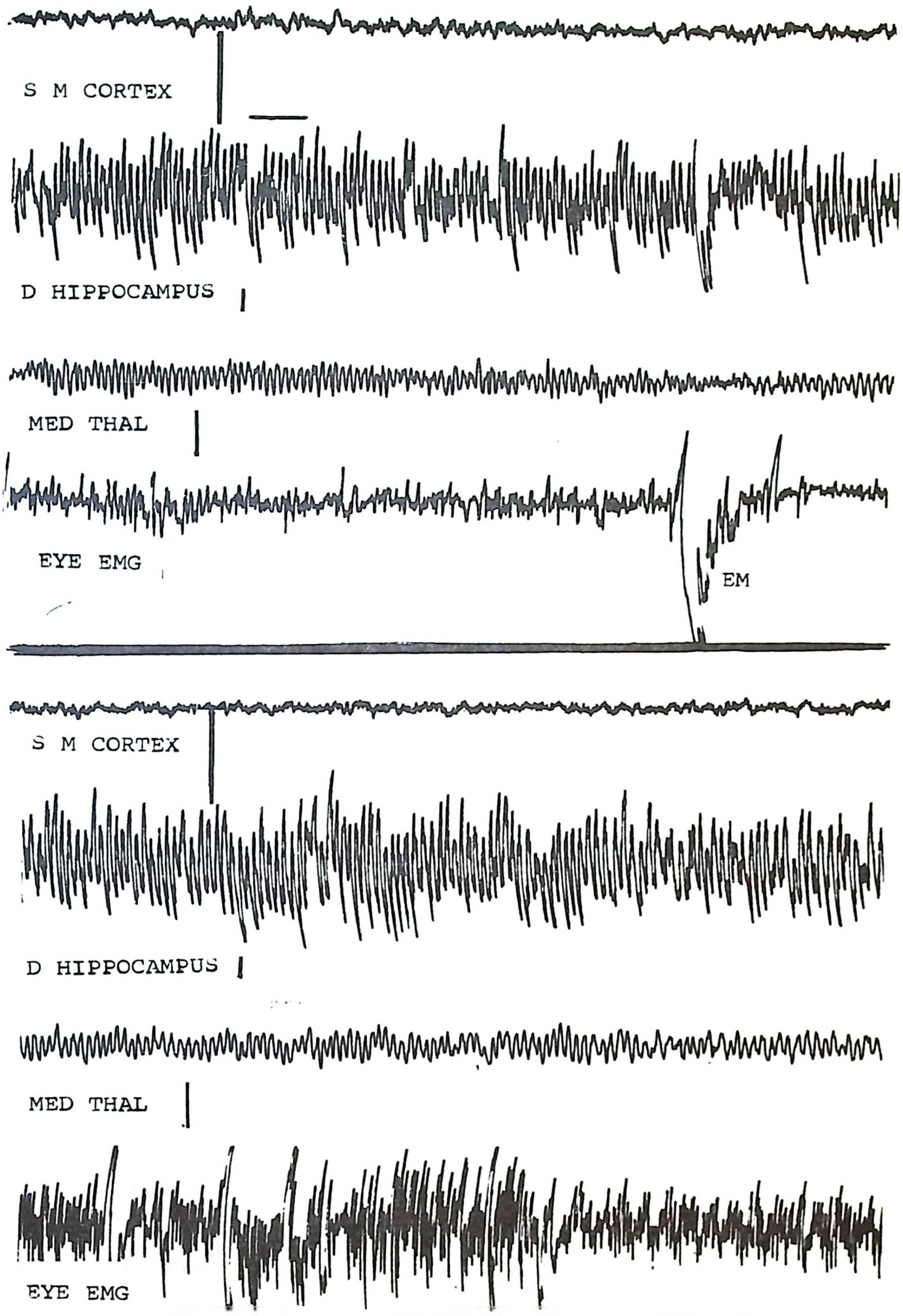

Figure 16 Rabbit 16, sleep deprived animal. Paradoxical sleep (Top) and moving (Bottom) records. Calib 100 uv 1 Sec

Sleep deprived animals. Some animals, it will be remembered, were tested while they were sleep deprived. The EEG tracings and power spectra indicate that the electrical activity during the various phases of sleep was similar (Figures 15 and 16 vs. 6, 10, 11, 12). Of course, when the animals were awake, there was some tendency for slow wave activity to appear, as might be expected, though on the whole the power spectra showed the same general pattern (Figures 18 and 19). Further evidence for this may be found by examining the spectral analysis of the rabbits' records three weeks after the deprivation period (Tables 2 to 43).

Unfortunately, for this group of animals the power spectra for the very low frequencies (below 1 Hz) are more difficult to interpret, since the analog to digital converter was not initially DC coupled; hence, there is an appreciable amount of power usually registered at 0.0 Hz. Tables 7 and 21 include power spectra for one minute samples of an unchanging DC signal to indicate this problem.

Effects of hypnosis. The rabbit which is immobilized at first shows the typical EEG pattern of an alert animal. For example, Figure 22 demonstrates the same prevalence of low frequency theta from the subcortical structures as was seen in the alert record, Figure 10. The power spectra

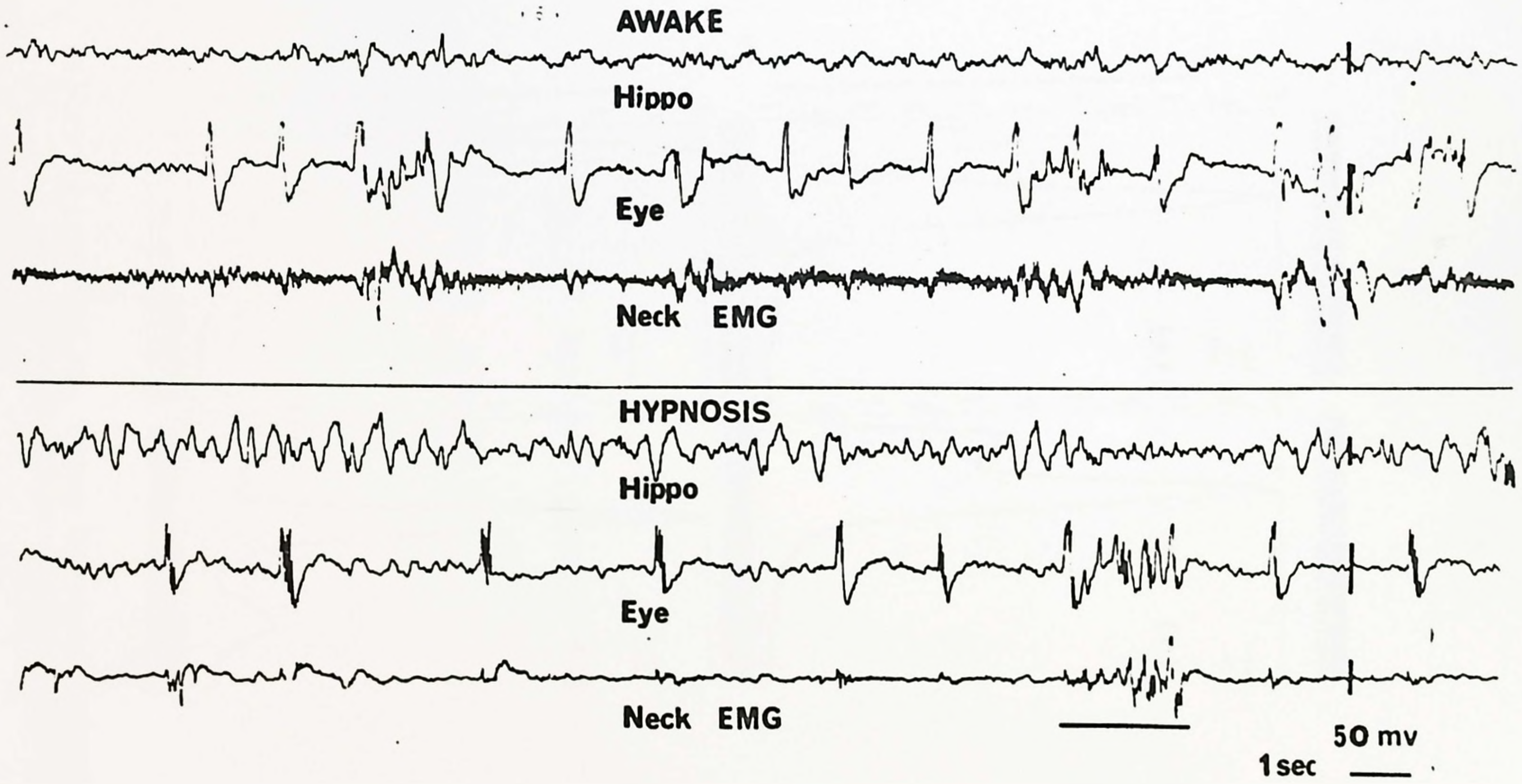

Figure 17 Pigeon EEG, EMG, and eye movement records while alert and under animal hypnosis.

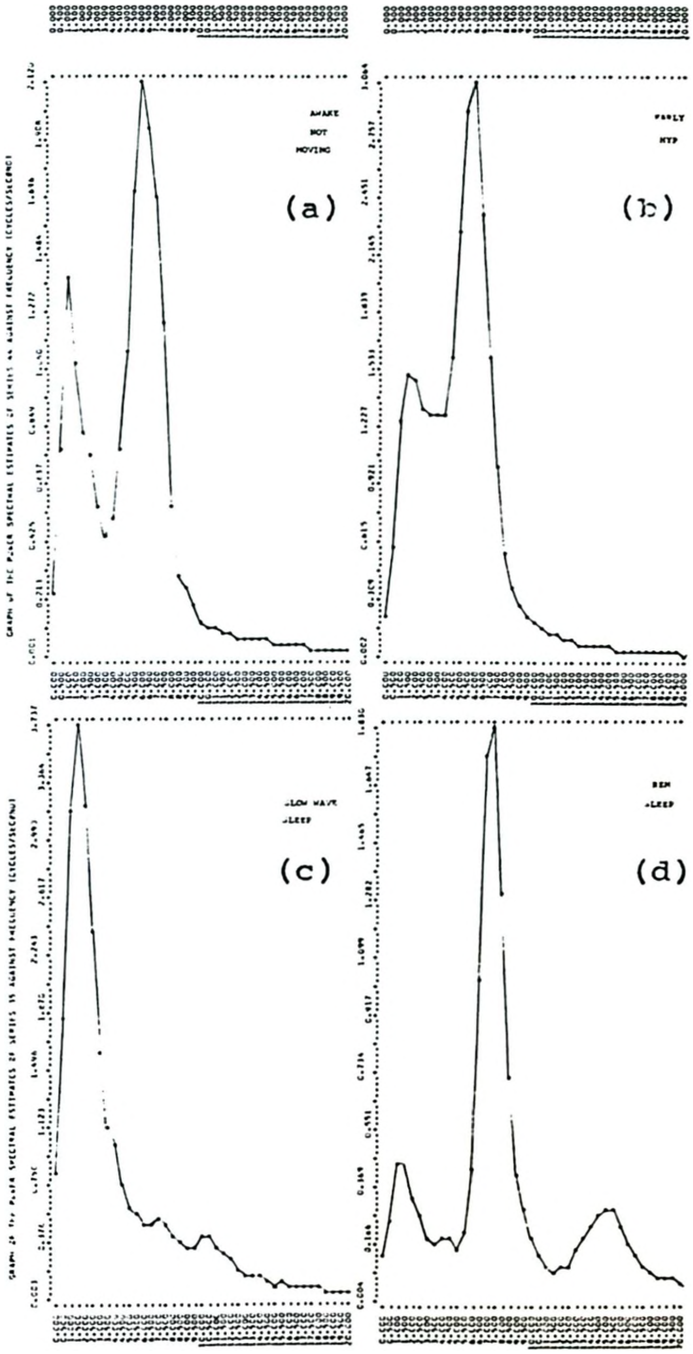

Figure 18. Rabbit 23, sleep deprived animal. Dorsal hippocampal power spectral estimates.

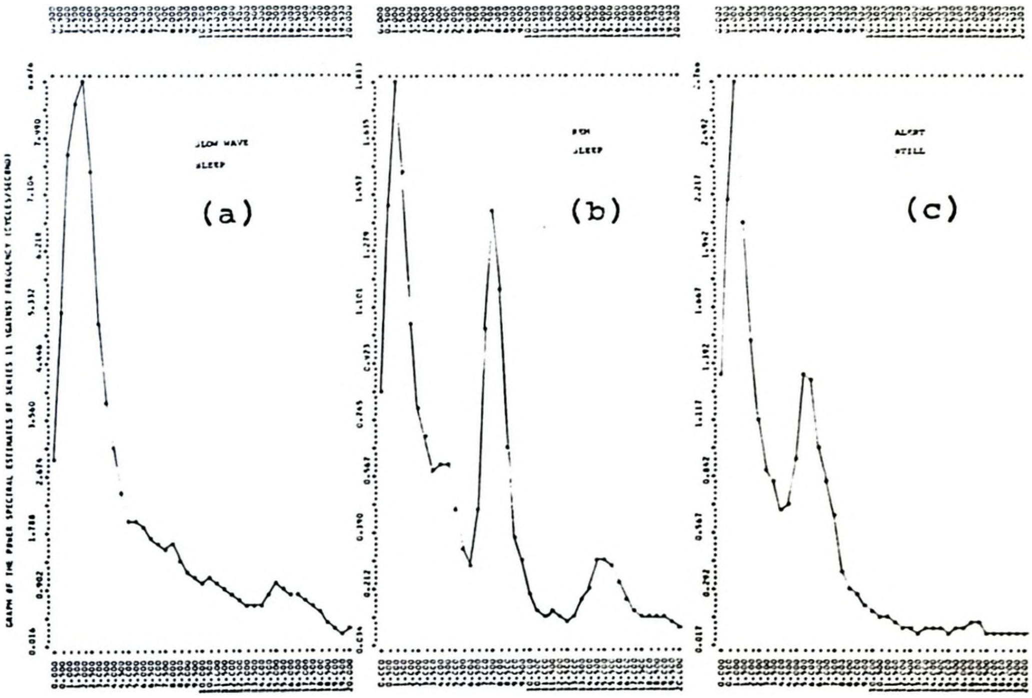

Figure 19. Rabbit 23, a sleep deprived animal. Medial thalamic power spectral estimates.

confirm this. Figures 14b and c demonstrate that the same general distribution of power is very similar for both alert and early hypnosis states in the dorsal hippocampus. Figures 7b and c demonstrate that this is true also for the medial thalamus. The occasional slow wave appears between the bursts of theta activity (Figure 22), but this also appears in the record of the normal alert rabbit (Figure 10).

As hypnosis continues, slow wave activity tends to appear. The power spectral analysis of this phenomenon is shown in Figures 7d, 8d, and 14d, and this slow wave activity occasionally may come to dominate the record as in Figure 24, a record similar to the record taken while the animal was very relaxed (Figure 11). The slow waves alternately appeared and disappeared on this record. A large amount of theta was always intermixed with these lower frequencies, as can be seen in the record, and in the power spectra Figures 7d and 8d. The gradual development of slow waves in an animal that was particularly susceptible to hypnosis is seen in Figure 25. In addition, spindles may develop as in Figure 26. When these spindles appeared, it was impossible to discern any differences between the hypnosis record and the record of the animal in synchronized sleep. This is reflected in the power spectra. One can compare, for

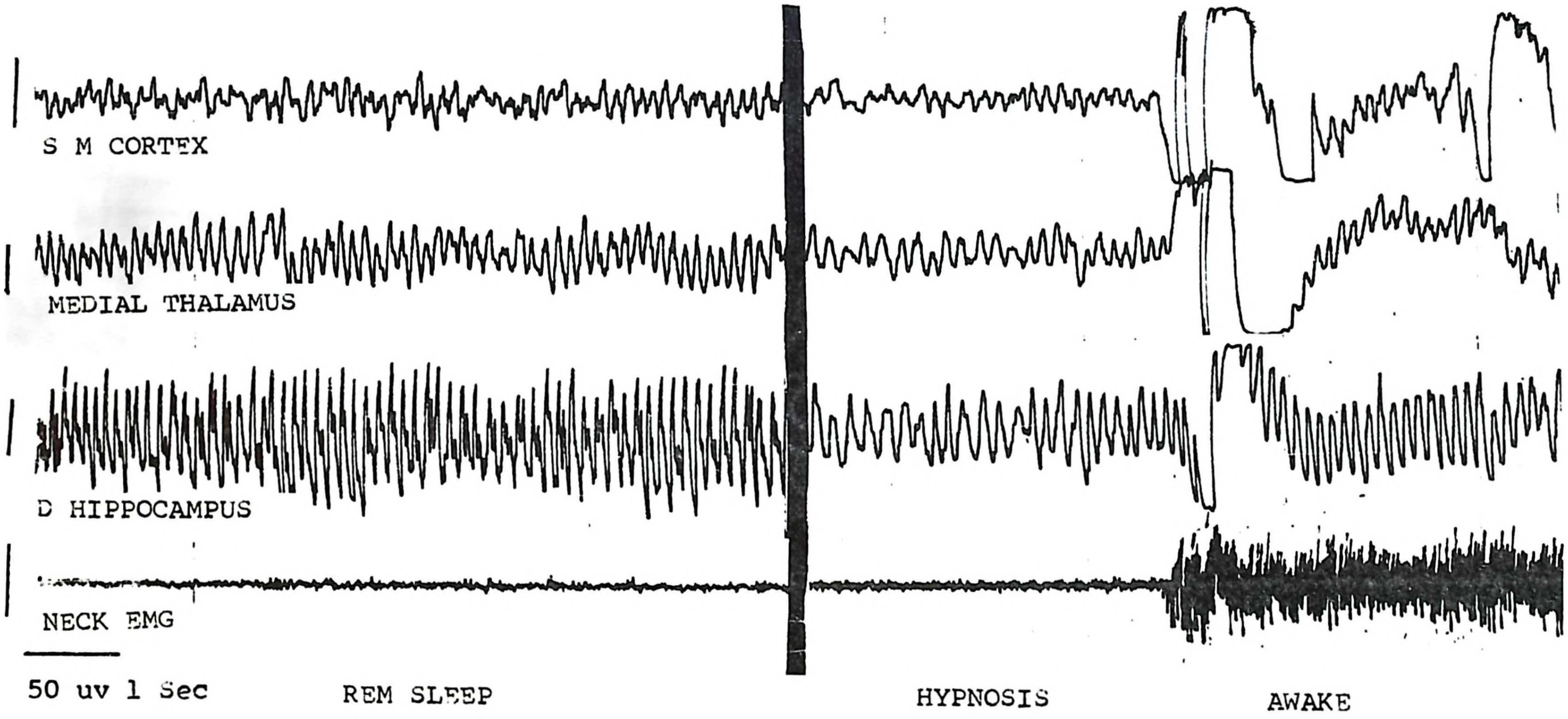

Figure 20 Rabbit 9. Neck EMG and EEG activity during REM sleep, hypnosis, and awake states.

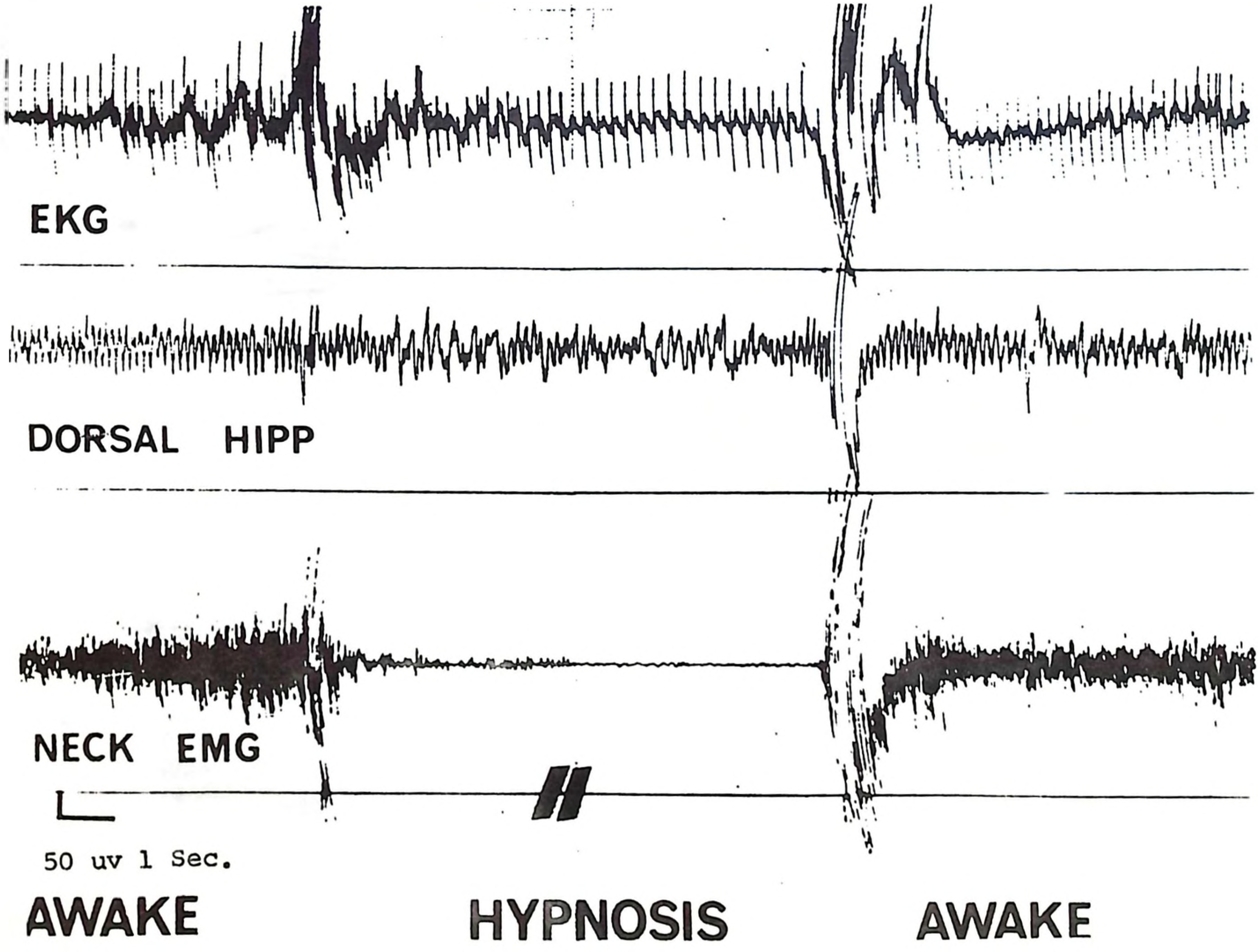

Figure 21 Neck EMG, hippocampal EEG, and EKG activity during alert and hypnotized conditions. Only the first and final 5 seconds of the hypnosis record are presented.

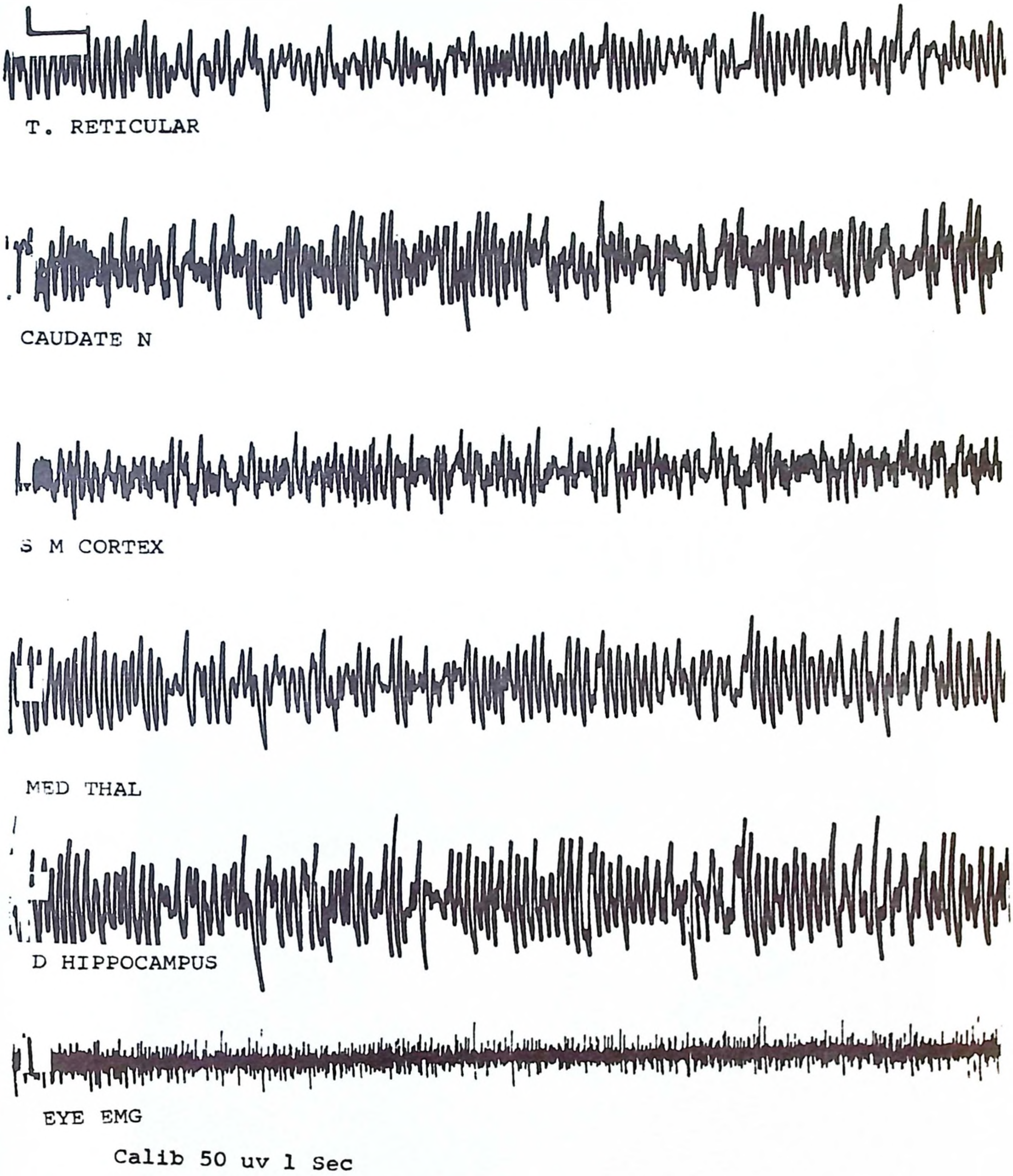

Figure 22. Rabbit 56. Early hypnosis.

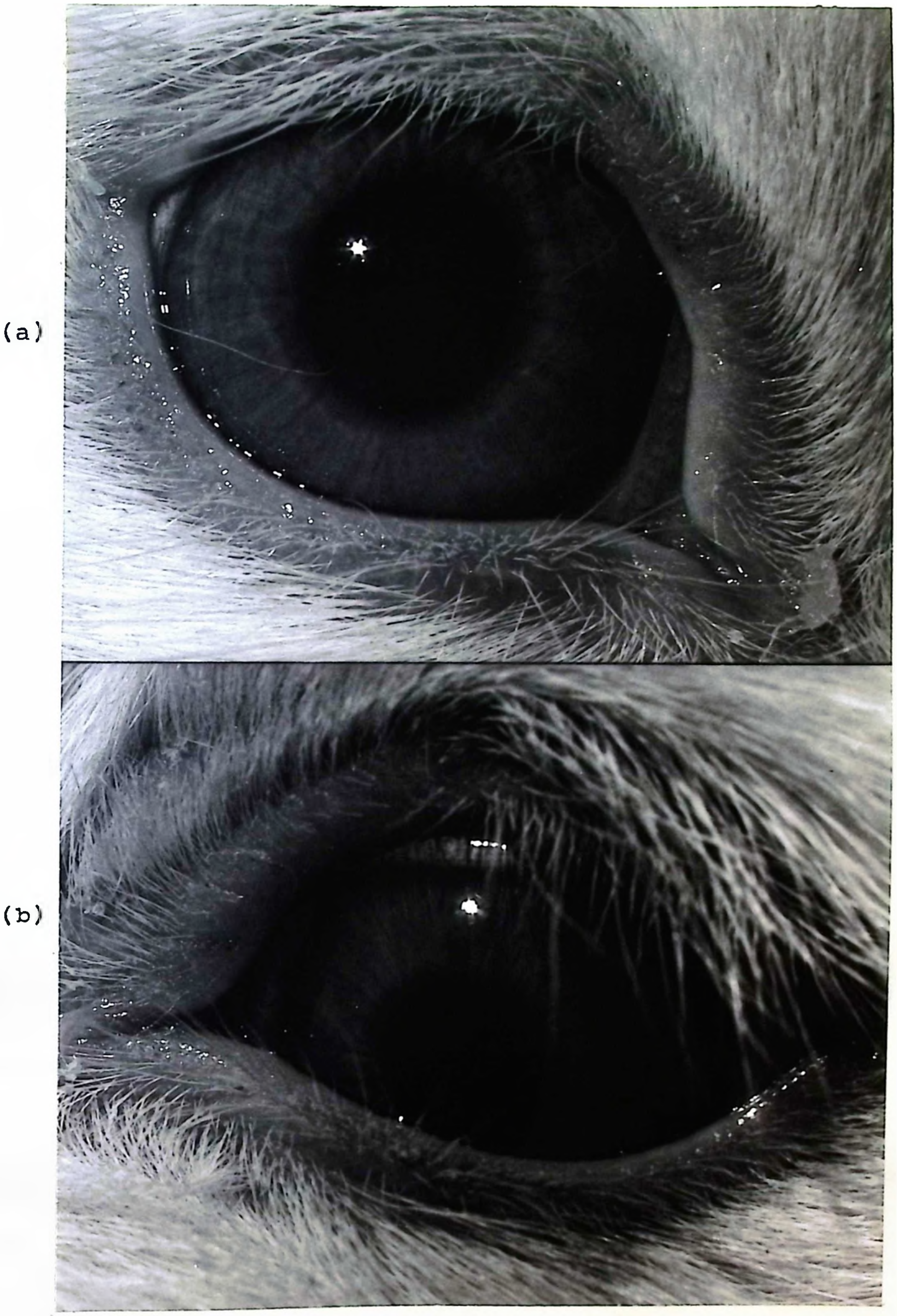

Figure 23 Pupil size during alert (a) and hypnosis (b) states. Identical light conditions.

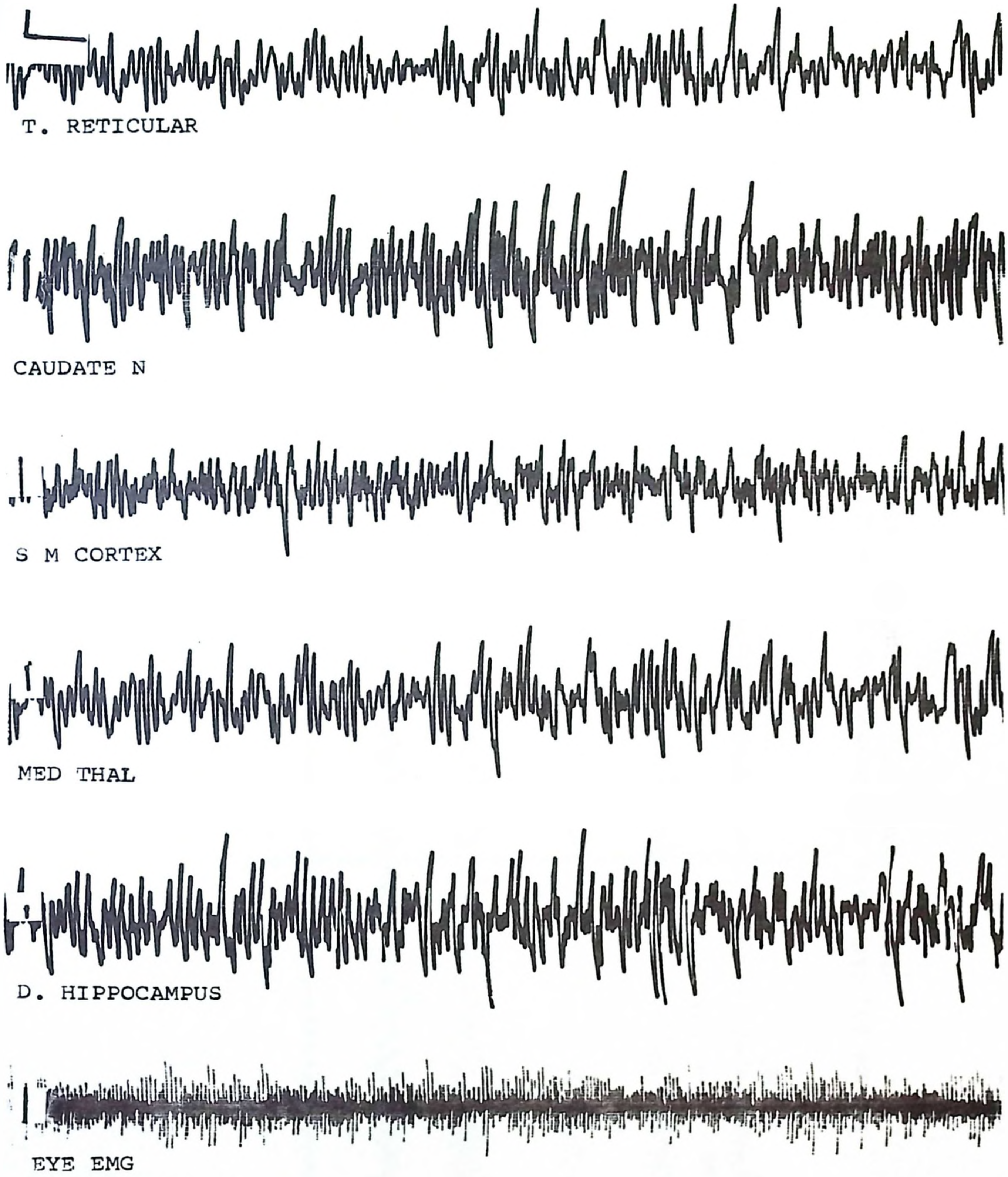

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Figure 24 Rabbit 56 Late Hypnosis with slow waves.

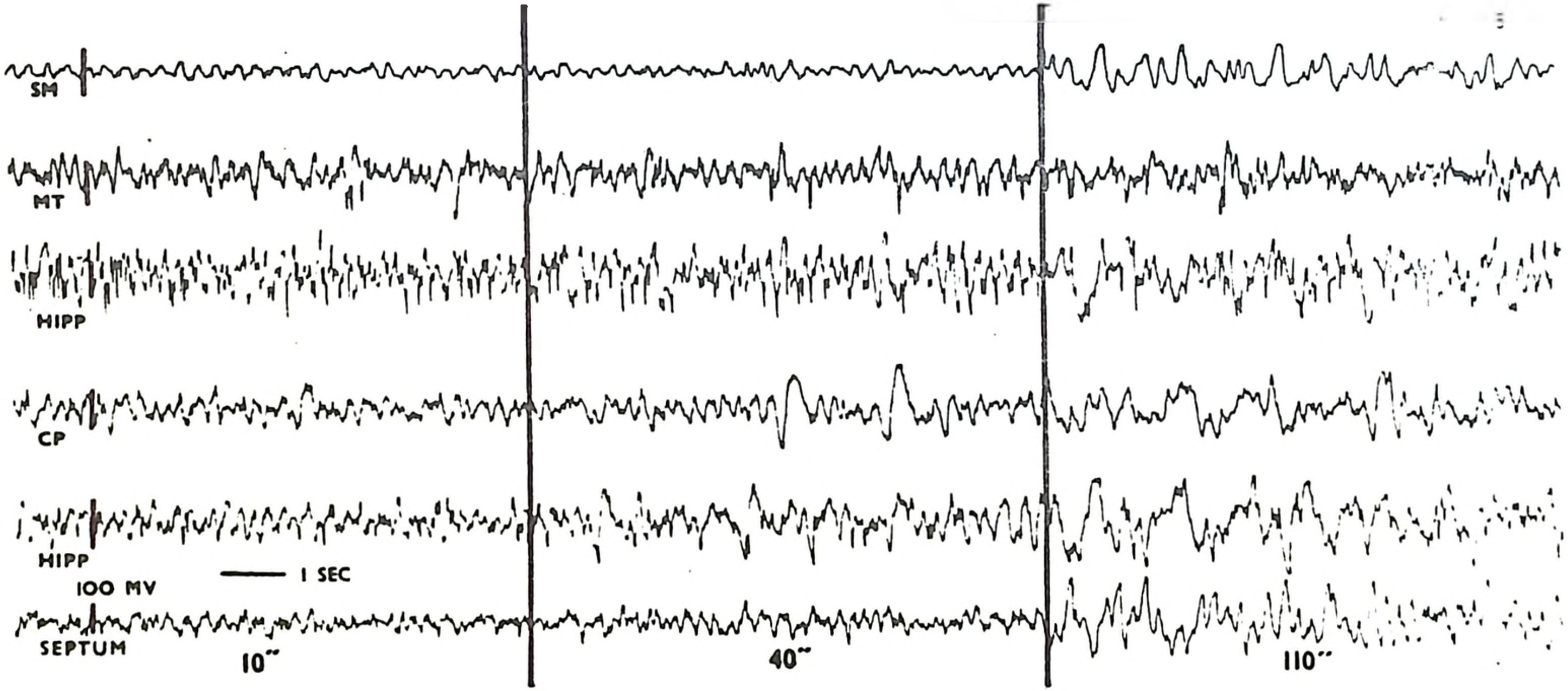

Figure 25. Slow wave development on the rabbit EEG during hypnosis.
Samples taken 10", 40" and 110" after onset of trance.

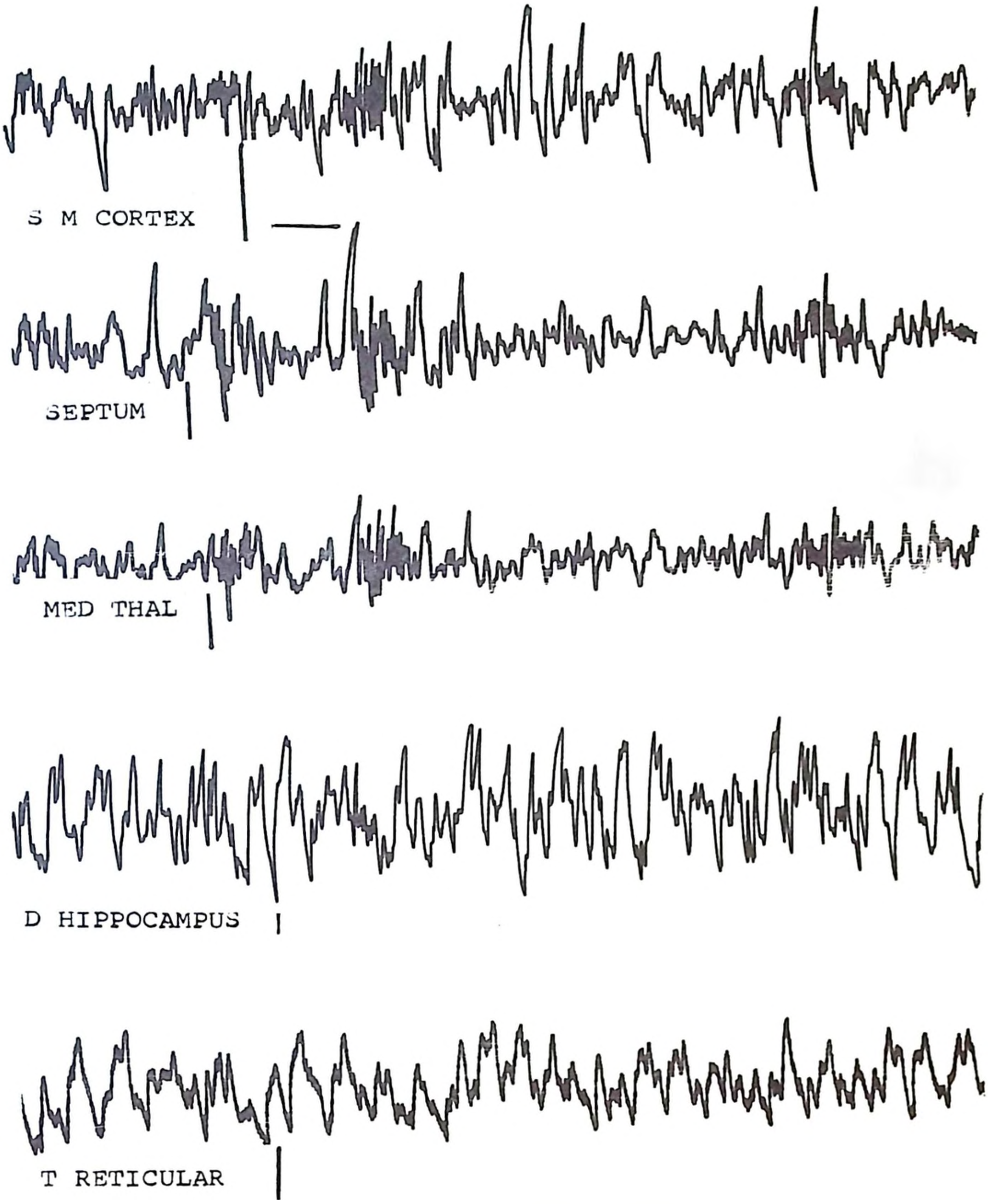

Figure 26 Rabbit 21. Slow waves and spindles on prolonged hypnosis record. Sample taken one month after sleep deprivation. Calib 50 uv 1 Sec

example, Figure 18c, the hippocampal power spectral estimates taken during normal sleep, with Figures 33d and e taken while the animal was hypnotized. Similarly, one can compare the medial thalamic power spectral estimates, Figure 19a, with Figure 29d, the estimates of records with slow waves and spindles taken while the animal was hypnotized.

This development of slow waves does not always occur, however. Indeed, one frequently sees the same low frequency theta intermixed with occasional slow waves that was characteristic of early hypnosis. This can be seen in Figure 27 which is an example of hypnosis 10 minutes after initiation of the state and Figure 30 (bottom) which was taken 11 minutes after onset of hypnosis. There are numerous examples in the Appendix Figures 7 to 52 showing late hypnosis records which are very similar to those of early hypnosis and to those of the normal alert animal. Even if slow waves develop, a return to the early hypnosis pattern can be brought about by an arousing stimulus. For example, Figure 28 demonstrates the return of low frequency theta typical of the alert rabbit after a loud noise had been made by the experimenter, even though the rabbit was still hypnotized. This alert pattern may be maintained over a considerable period. Figure 29a shows the power spectrum for a hypnotized rabbit that was stimulated after it had developed slow wave activity.

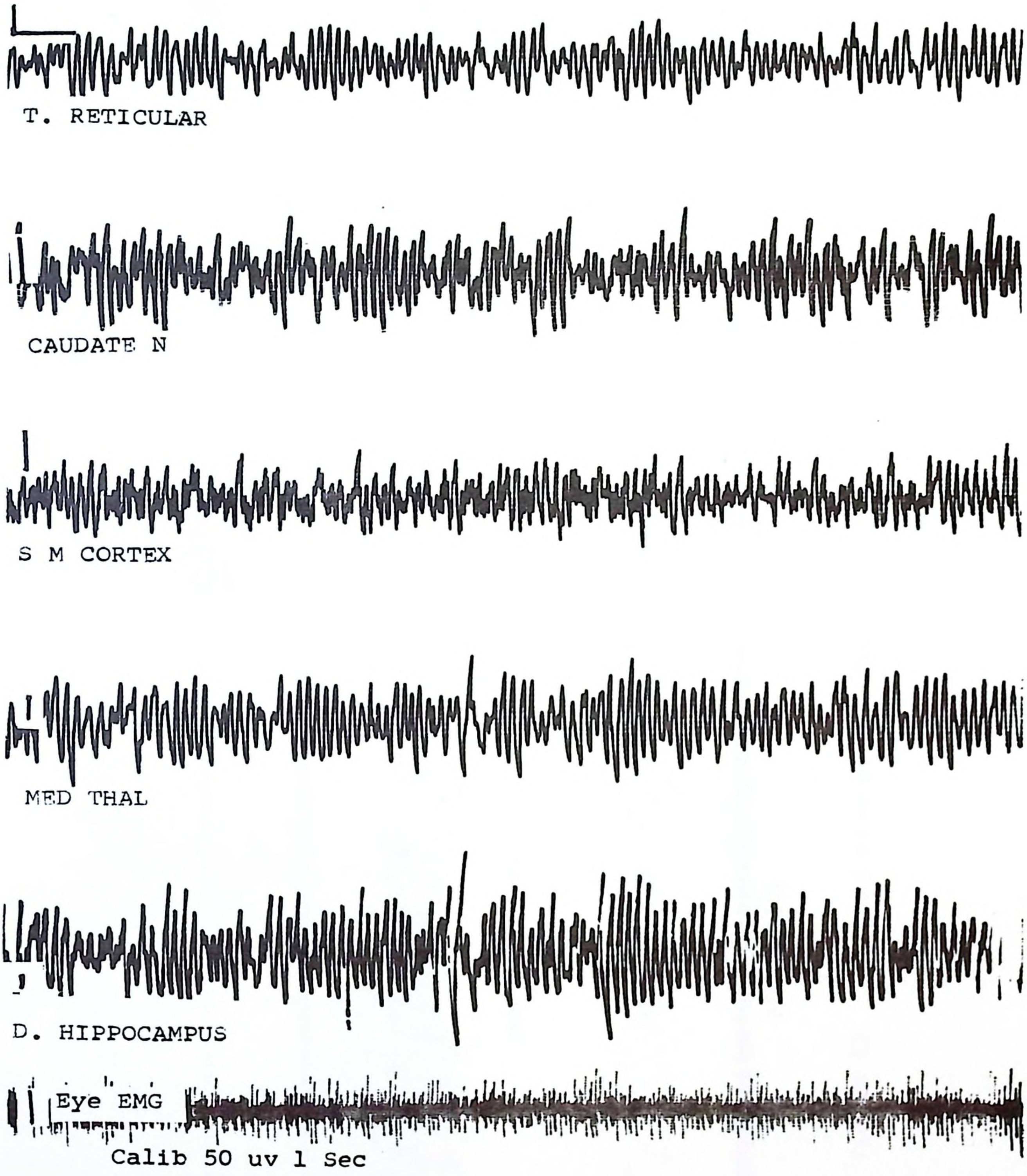

Figure 27. Rabbit 56 Late Hypnosis without slow waves

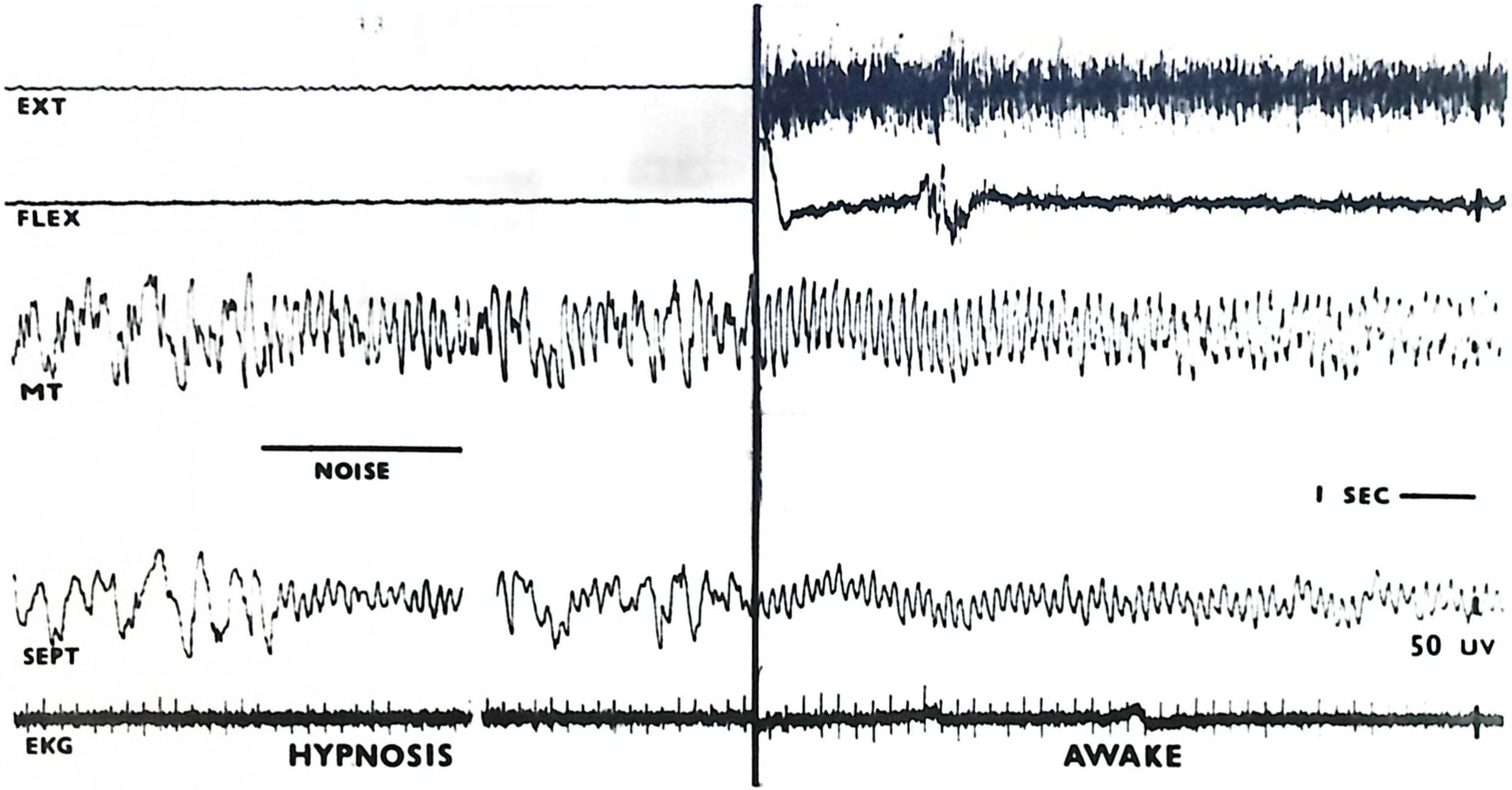

Figure 28 Alerting reaction on rabbit EEG during noise presentation.

Hypnosis in the sleep deprived animal. If a sleep deprived animal is hypnotized, similar patterns to those already mentioned are observed. For example, Figure 30 (top) for Rabbit 16 indicates that the early hypnosis records are similar to records from an alert animal (Figure 15). These same patterns can be seen even after prolonged hypnosis (Figure 30, bottom). However, in some sessions, particularly those that were very prolonged, the EEG patterns would pass from those of an alert animal to that of a drowsy animal, to full slow waves and spindle bursts characteristic of synchronized sleep, and, finally, the rapid theta characteristic of REM sleep. This is seen in Figures 31 and 32 which successively show stages of early hypnosis, hypnosis with slow waves and spindles and, finally, REM sleep, all conditions being exhibited while the animal was immobilized. In this respect, the sleep deprived rabbits differed from the non-sleep deprived, in that the latter never showed EEG patterns similar to REM sleep. One can see that the hippocampal power spectral estimates of REM sleep records under hypnosis (Figure 33f) are very similar to those estimates taken during normal REM sleep, (Figure 18b). This is true also for the medial thalamic spectral estimates shown in Figures 29f and 19d. Following REM sleep, the EEG exhibited patterns that approximated those of an alert animal, but had a band of activity at

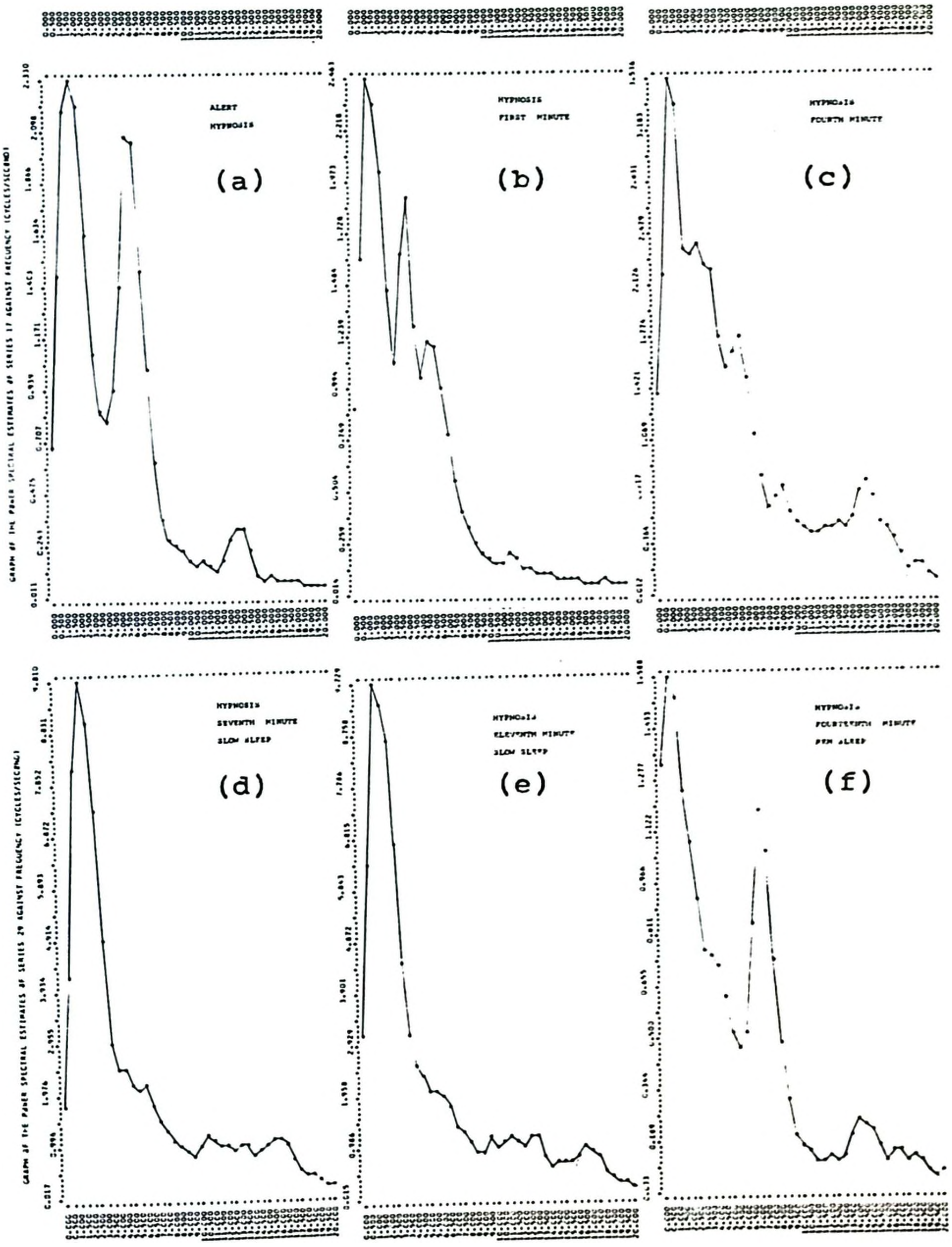

Figure 29 Rabbit 23, a sleep deprived animal. Medial thalamic power spectral estimates during prolonged hypnosis session.

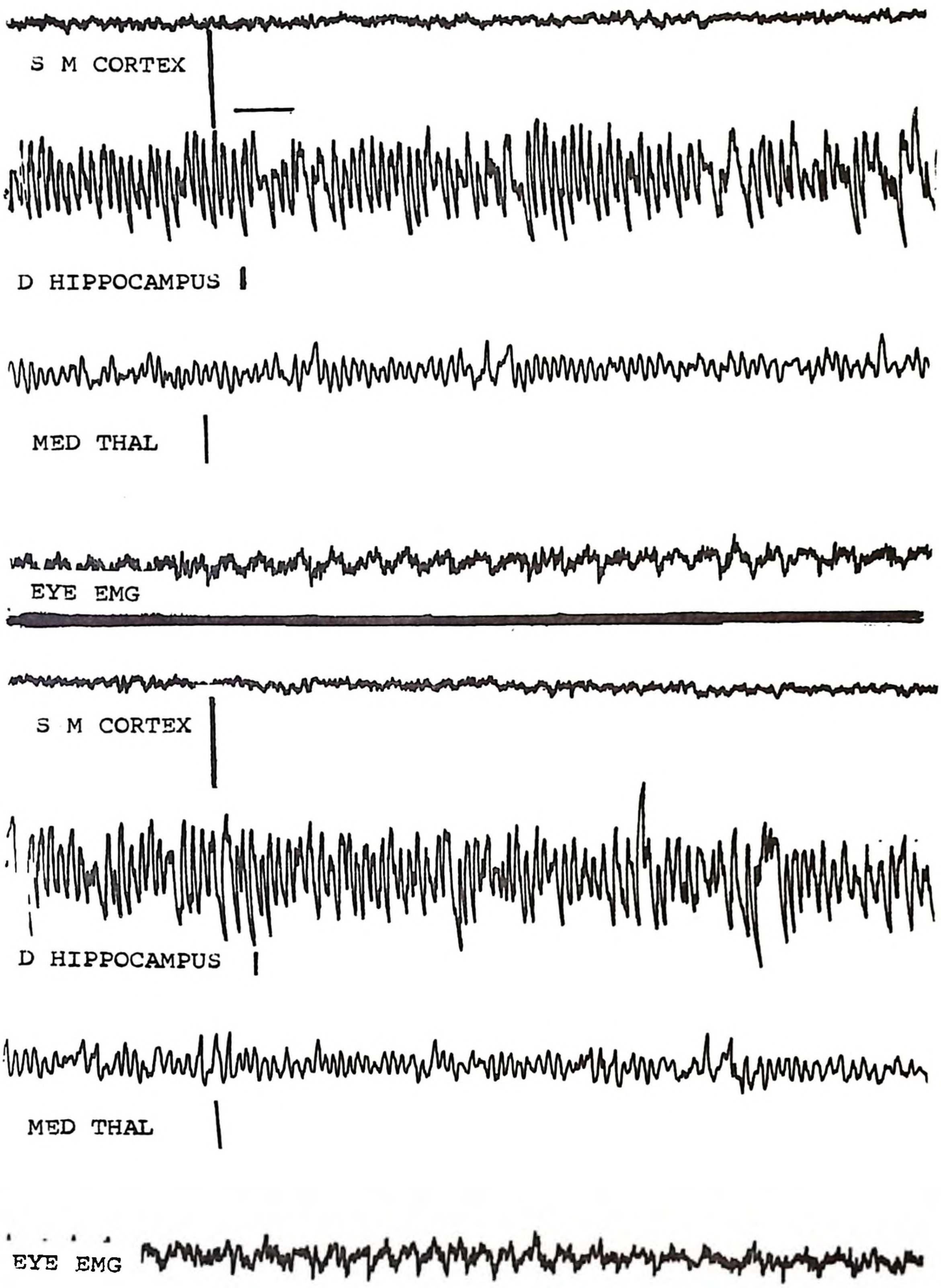

Figure 30 Rabbit 16, sleep deprived animal. Early hypnosis (Top) and late hypnosis (Bottom) records. Calib 100 uv 1 Sec

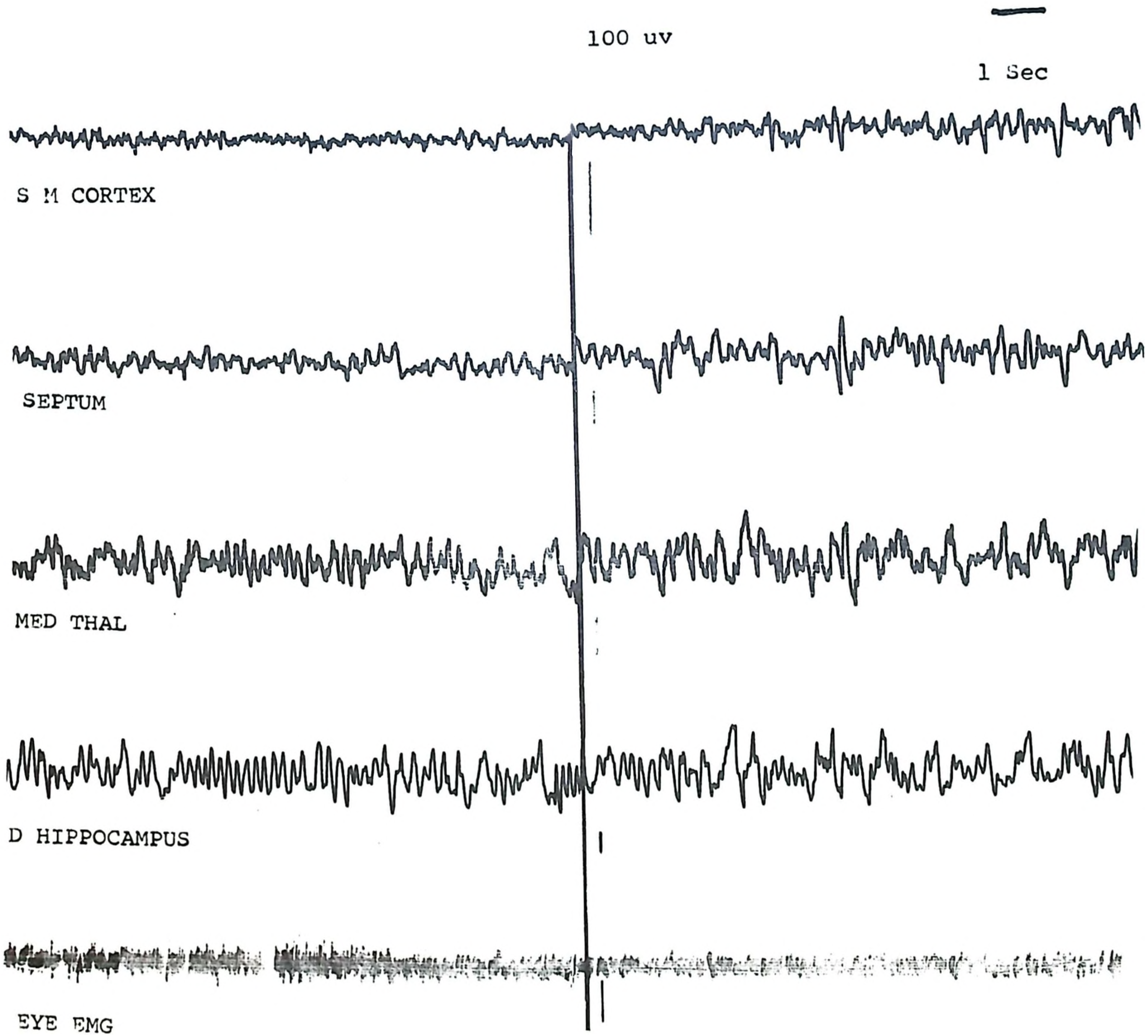

Figure 31 Rabbit 23. Records taken at initiation of hypnosis (A) and 2 minutes after onset (B) indicating increased slow waves, with no spindles in this late section.

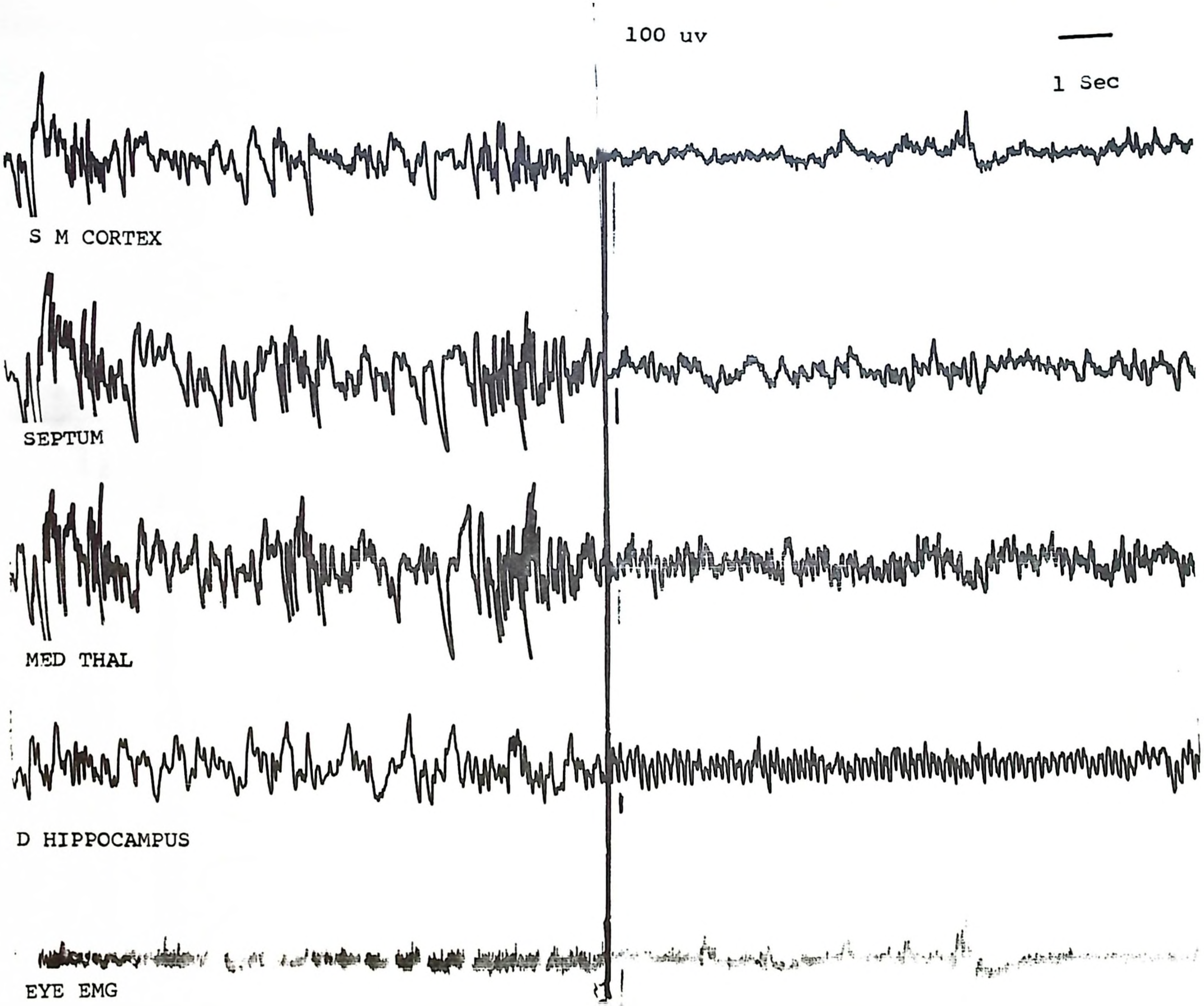

Figure 32 Animal 23. Slow wave sleep (A) and REM sleep (B) while animal is immobilized. These records are continued from the previous figure.

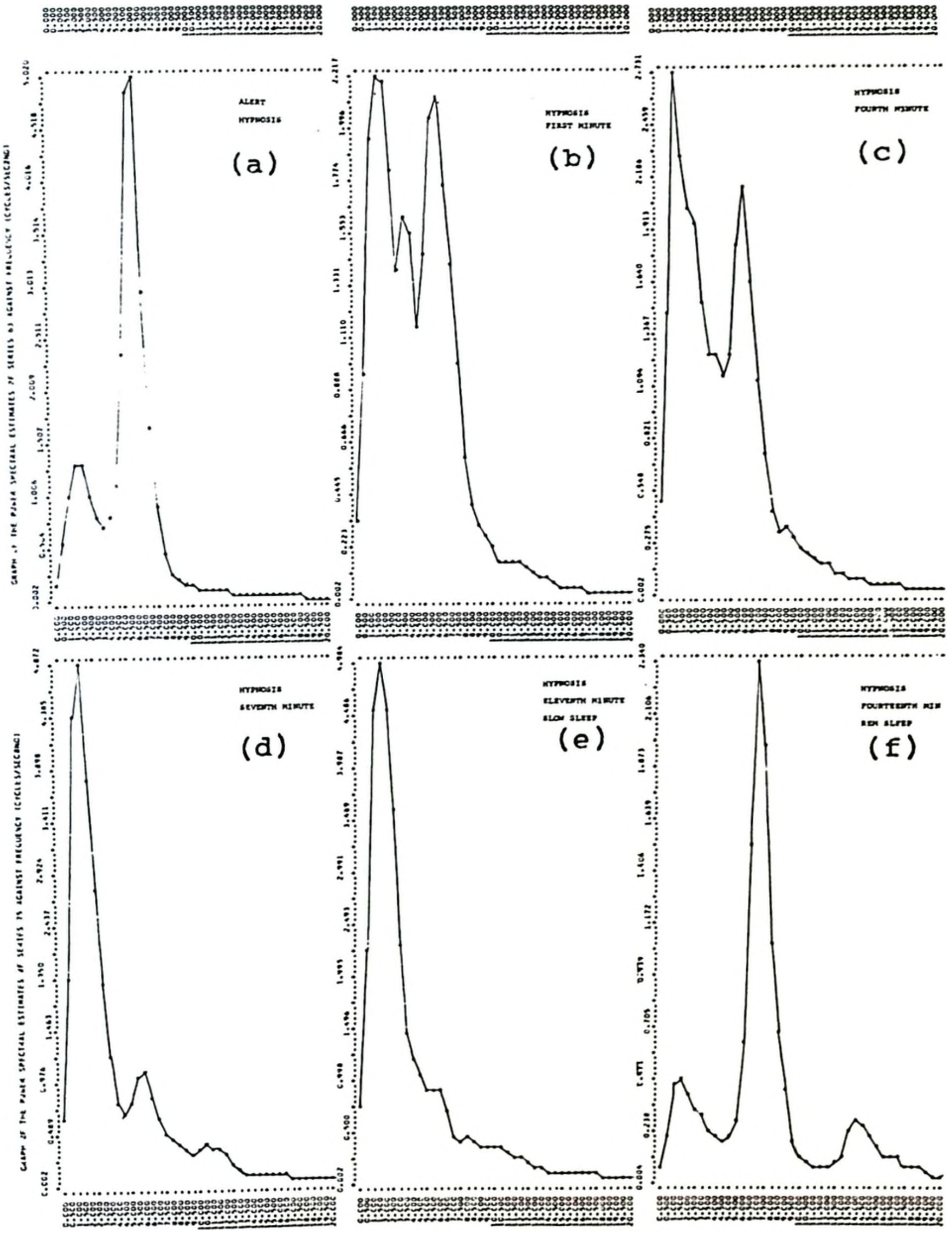

Figure 33 Power Spectral Estimates, Rabbit 23, Dorsal Hippocampus, Sleep deprived animal. Prolonged hypnosis session.

13-15 Hz (Figure 29a on the record. The EEG then gradually changed to patterns of slow waves and spindles, again while the animal was still in the hypnosis box.

In both normal and sleep deprived rabbits, the relationship between hypnosis and normal states of arousal was clear; initially, hypnotized animals exhibited the patterns, and particularly the theta rhythms, of an alert animal. These patterns of activity might, or might not, develop into increased slow waves. If one plots a scattergram of the various conditions over all animals for peak theta frequencies (Table 1), it can plainly be seen that the theta peaks for alert and early hypnosis records tend to be slow (5.0-6.5 Hz) and similar while those for REM sleep and moving conditions tend to be faster (7-9 Hz) and similar. This shift in theta frequency happened in every animal (see Appendix tables

In addition to the EEG records, there were some other physiological observations which were made.

In hypnosis, the activity of the neck muscles, which is greatest while the animal is moving around (Figure 6) and decreases through the alert state (Figure 10) to synchronized sleep (Figure 12), becomes entirely abolished, and is similar to that observed during REM sleep (Figures 13, 20, and 21). However, it should be noted that the hypnotized rabbit is lying on his back and this position may be responsible for the drop in muscle activity. Support

Table 1

Scattergram - peak theta component in medial thalamus over conditions

	Frequency (Hz)								
	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
ALERT	1	11	111	111					
HYPNOSIS		1	111 111	11					
MOVING					111 11	11	11		
REM SLEEP					111	111	11		1

for this view comes from records of the muscle activity of the orbital ridge, which decrease drastically during REM sleep but do not show as great a decrease during hypnosis (Figures 13 and 22).

As far as the heart rate is concerned, there appears to be little change between that of the resting animal and the hypnotized one. There is an initial rise in heart rate at the beginning of the immobilization period, but this is probably due to the handling necessary to produce hypnosis.

The pupils of the rabbits' eyes become constricted during hypnosis as shown in Figure 23

Hypnosis in Chickens. The EEG records of the two chickens exhibited increased slow wave activity during hypnosis. In addition, the eye movements became very regular and occurred less frequently than in the waking condition (Figure 17). There were occasional phasic tremblings in the musculature (underscored in Figure 17) which were accompanied by a rapid dilation and contraction of the pupil.

Summary and Conclusions.

1. There is a shift in theta frequency with changes from the moving to alert states. Theta appearing in REM sleep is similar to that from the moving animal; during synchronized sleep and REM sleep there is a 13-18 Hz component on the record.

2. During hypnosis the same EEG patterns as seen in the alert animal are observed. Power spectral estimates are very similar except during late hypnosis, in which there is an increased slow wave component. Slow waves and spindles may develop in late hypnosis to give an identical pattern to slow wave sleep.

3. There is an unusual appearance of REM sleep patterns in the prolonged hypnosis records of sleep deprived animals. Of course, one difficulty which confronts us here is whether the sleep deprived animals were asleep or hypnotized. As far as it was possible to observe, there did not appear to be any difference in the behaviour of the hypnotized sleep deprived animals in REM sleep, and the behaviour of the sleep deprived animals in normal REM sleep.

In short, it is fair to say that the EEG patterns similar to all those stages in the continuum from slow wave sleep to wakefulness seen in the normal rabbit can also be observed in the hypnotized animal. If we accept the data from the sleep deprived animals, it appears that the EEG patterns of REM sleep may also be observed.

CHAPTER 4

EXPERIMENT 3

In the last experiment, there was little evidence of any difference between the electrical activity of the brain during hypnosis and the activity while the rabbit was in various stages of sleep or wakefulness. Large electrodes, however, give only a picture of the gross activity. Thus, there might be changes in the behaviour of individual neurones during the hypnotic period which might go undetected.

Accordingly, we decided to record from single neurons, using chronically implanted microelectrodes. Such a procedure might be expected not only to be a more sensitive indicator of changes which occur during hypnosis, but might be expected to throw light on the behaviour of cells during sleep, an area in which information is sadly lacking, except for cortical cells. Further, some information about the relation between gross electrical activity and the discharge of neurons could be achieved by injecting drugs which produce synchronized activity but no changes in behaviour.

Method

Subjects

Twenty-five male and female New Zealand white rabbits were used in this study, all weighing between 2.5 - 3.5 kg at the time of the operation.

Surgical Procedure

This was similar to the procedure in the previous experiment. However, the only large electrodes that were implanted were those for monitoring combined EMG and eye movements. Chronic flexible microelectrodes of the type described by Strumwasser (1958) and Bouma and O'Keefe (1967) were implanted in the same brain structures that were examined in Experiment 2.

These electrodes were made of .0023" formvar insulated nichrome V wire[1] soldered to Amphenol pins (17-765-02) using a flux composed of a mixture of aniline phosphate[2] and ethylene glycol.

The procedure for implanation varied, depending on whether the structure to be recorded from was close to the surface of the cortex or not. If the structure to be examined was relatively close, such as the cortex itself, or the hippocampus, then the spray of wires were bound together at one end with dental cement and the electrodes cut off at an appropriate length. The dura was then removed, and the electrodes were lowered stereotaxically to the appropriate structure (See Fig. 34 A).

If the electrodes are aimed at a deep structure,

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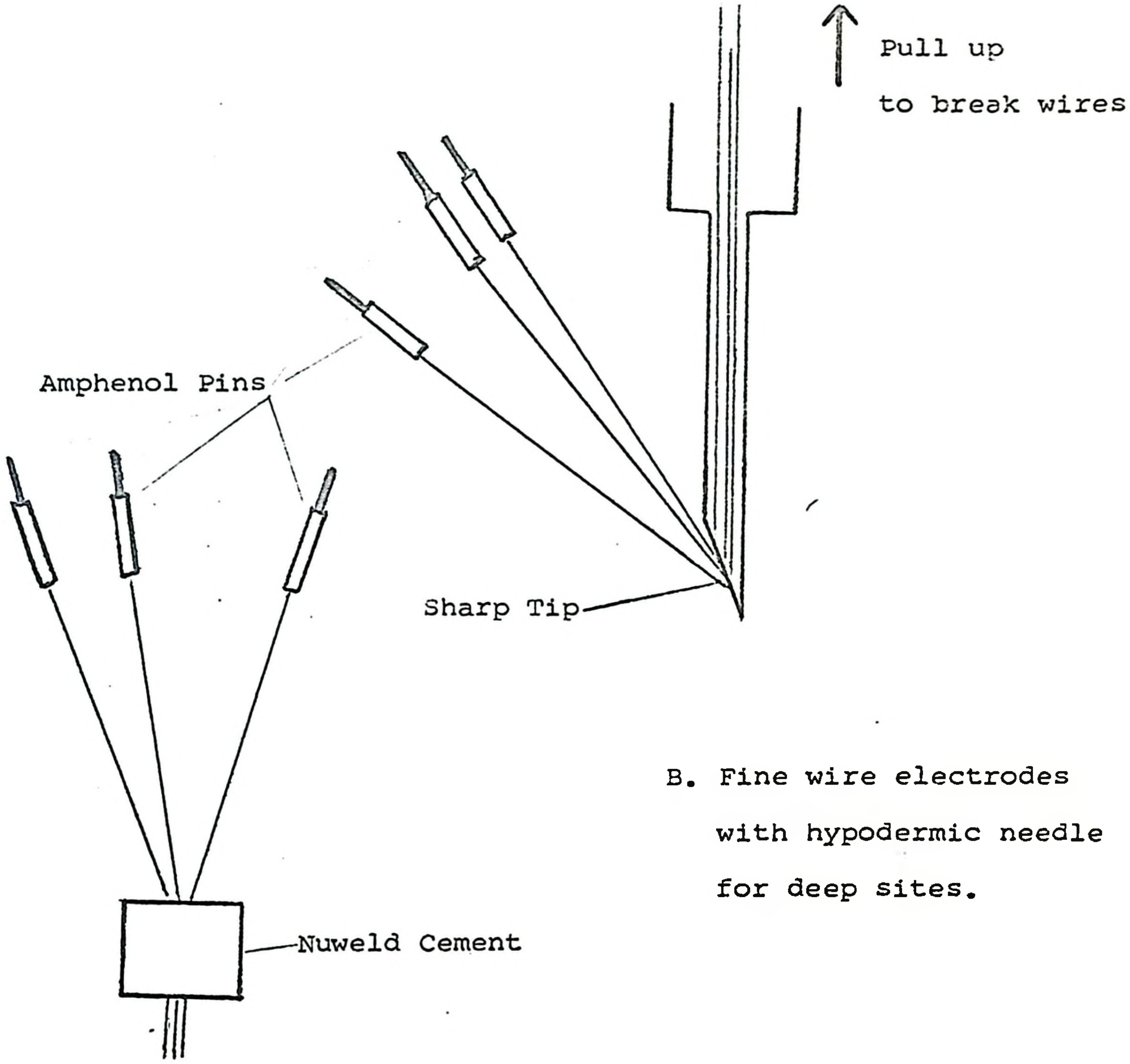
[1] Driver Harris Co., Harrison, N.J.

[2] City Chemical Corp., 132 West 22nd St., N.Y., 11, N.Y.



B. Fine wire electrodes with hypodermic needle for deep sites.

A. Fine wire electrodes for shallow sites.

Figure 34. Diagram of the two types of electrodes used in this study.

however, this procedure is unsatisfactory, since the wires are very flexible. Consequently, the wires, soldered to amphenol pins, were inserted through the tip of a stainless steel hypodermic needle (18 gauge), and the needle and wires lowered stereotaxically to the site to be recorded from. The wires inside the hypodermic needle were then pulled up in order to cut them on the sharp needle tip (see Fig. 34 B).

Using the appropriate procedure, 17 electrodes were implanted in groups of 9 and 8, two different sites being selected for each animal. The pins were then fixed in an Amphenol 17-20250 connector which was cemented to the animals'skull with NUweld cement.

Recording Procedures

The impedance of these electrodes was sufficiently low (100,000 ohms at 1 kc) that cathode followers were not necessary. Spike activity was amplified on Grass 7P5A amplifiers with filters ½ amplitude down at 10 and 80,000Hz and filtered with either variable capacitance boxes or a Krohn Hite band pass filter[3] with filters at 400 and 6000 Hz. The EEG was recorded simultaneously from the same fine wire electrode with half amplitude filters at 1 and 35 Hz, and continuously written on the Polygraph. The unit activity, eye muscle and EEG activity was taped on an Ampex SP300 recorder along with a continuous running commentary on the animals behaviour. Unit activity was constantly monitored

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[3] Krohn-Hite Corp., Cambridge, Mass.

on an oscilloscope.

Test Procedures

After the operation, records from each implanted wire were examined for cells over a period of days. If this initial screening found a cell that could easily be distinguished from the background noise (any cell that was at least three times the height of the noise level), the animals were brought into the test room for three days of adaptation. If, at the end of the three days of adaptation cells were still found from this animal, he was placed in a pasteboard box in a screened room and testing began.

All tests on a cell were carried out in a single session, which lasted approximately 10 hours. The monitored spike activity was constantly checked for any changes in pattern of discharge or in spike shape or height which would indicate that a different cell was being recorded.

During the testing session, the animal's behaviour was continuously observed through a hole in the pasteboard box, and comments on his behaviour were noted on tape. After at least two slow wave sleep and REM periods had been sampled (using the same criteria for sleep as in Experiment 2), recordings were taken while the animal was sitting alert, moving about, and hypnotized. A few animals were also administered 3mg/kg atropine intravenously. In this drug state records were taken 20 minutes after the injection while the animals were sitting alert.

The remaining electrodes of the tested rabbits were checked occasionally over a two month period to determine whether any new cells had appeared. If such cells did appear the animals were again adapted to the room and tested. After this, the rabbits were sacrificed, a small D.C. current was passed through the electrode tip (anode at tip) and the brains were perfused with a saturated solution of potassium ferrocyanide in 10% formalin. The brains were frozen, coronal sections at 40 u were cut, and these sections were stained with thionin.

Analysis was carried out on the taped records as follows: the spikes were separated from the noise level and from distant cells by means of a variable threshold gate which created a standard pulse. This pulse was first used to trigger a Mnemontron computer of average transients to compute an interval distribution, and also was used to trigger a Tektronix waveform generator and pulse former to form a pulse sufficiently long to cause an effective deflection of a polygraph pen. The cell spikes and the triggered standard pulses were simultaneously displayed on an oscilloscope. During selected samples of behaviour, the output pulse from the waveform generators together with the taped EEG were written on paper by a Beckman Dynograph.

Since the pen deflection indicated only whether a spike was present or not, the absolute amplitude of the deflection carried no information. The polygraph pens were limited in their high frequency response, and, hence, were not able to follow very closely spaced spikes. Occasionally the pen would deflect further whenever 2 or 3 spikes occurred very closely together.

For rate measurements, the number of spikes in at least twenty successive 10 second samples for each condition were counted on a Hewlett Packard electronic counter. The mean rate per second and the variance were calculated from these 10 second samples. On a few occasions, only 150 seconds of some conditions, especially the moving condition, could be obtained.

Results

Since recording chronically from cells by means of fine wires is a relatively new technique, some technical data on the success of obtaining cells may be helpful. Twenty-six animals were implanted with 425 wires, most of them having 17 of these electrodes.

Records were taken from 80 cells. A large number of these had to be discarded because of small spike size, because of the inability to discriminate one set of action potentials clearly, or because of extranous noise introduced by cable movement or magnetic tape flaws. Thus, only 46 acceptable cells have been recorded from these 425 wires--indicating that roughly one in nine of the wires was completely successful.

In some animals no cells at all were recorded. In others, records from as many as four cells were obtained. It was, of course, easier to get cells from some structures than others. It was extremely easy to get hippocampal cells but very difficult to get cortical ones (those that were obtained were all from the deep cortex). We probably would have been more successful if we had used wire of a smaller diameter than 60 microns. Bouma and O'Keefe (1967) recommend 25 u wire held together by Carbo wax (which melts at body temperature) for obtaining cortical cells.

Bouma and O'Keefe also report that one can record cells immediately after the operation with the finer wires. The earliest we have found cells with the larger wire is 5 days after the operation. Normally, we had no difficulty in holding a cell over the ten hour testing session. Indeed, the same cell (as identified by patterns of firing and spike shape) occasionally remained for a period of three days or more. This is rather remarkable since the animals were completely unrestrained and were on occasion very active--some even had fits of sneezing, yet the cells remained. Seven cells, however, were lost a few hours after they were first observed; this usually occurred after some violent movement of the animal.

General Results

We have considered two aspects of the discharges obtained from the units: rate of firing and pattern of firing. The data on rate of discharge is shown in Table 2, while the patterns are shown in Figures 7 to 52 of the appendix. Table 2 shows means and standard deviations of the rate of discharge (spikes/sec) of the units in various structures.

If we consider all the cells from the various structures, the fastest rates of firing occurred while the animal was moving or in REM sleep. A Friedman analysis of variance by ranks (Siegel, 1956) was carried out on these data. This

Table 2

Means and standard deviations of firing rates (spikes/second) The first row for each cell gives the mean; the second row gives the standard deviation. "REM" is paradoxical sleep, "Hyp" is animal hypnosis, and "Atrop" is the atropine state.

Rabbit	Slow Sleep	REM	Still	Moving	Atrop	Hyp
Limbic cortex						
31-20	5.54	7.82	4.16			7.04
	1.20	1.68	1.18			1.46
34	8.5	27.9	9.7	10.3		8.2
	1.9	9.1	2.55	2.59		1.0
S M Cortex						
40-2	4.74	2.48	3.64	9.48		3.86
	.98	.59	.11	1.91		.96
40-5	1.55	5.56	2.72	3.04		1.02
	.42	3.02	1.35	1.54		.65
40-7	4.52	6.59	7.17	5.26		2.58
	1.06	1.75	1.61	2.02		1.16
46-2	2.10	3.4	2.67	3.48	3.01	4.31
	.35	1.31	1.10	.58	.83	1.27
46-5	1.2	2.15	1.09	2.89	1.82	1.53
	.71	1.27	.51	1.19	.79	.49
Pontine Reticular						
50-5	3.1	.55	4.37	5.50		5.0
	.29	.38	.51	.86		.27
50-18	11.4	10.5	14.7	18.5	14.5	15.0
	2.46	1.99	.94	2.32	.98	.82
53-20	4.51	6.95	4.87	13.75	7.82	5.58
	.67	2.78	.75	2.05	1.11	.85

Table 2 (Cont)

Rabbit	Slow Sleep	REM	Still	Moving	Atrop	Hyp
Medial Thalamus						
31-4	4.76 1.8	6.07 2.2	5.23 1.4	6.67 2.7	5.84 1.5	5.43 1.1
31-7	4.3 1.1	12.7 5.2	22.9 3.8	29.9 3.3		24.1 3.1
32-5	2.47 .83	6.69 4.18	1.73 2.01	1.27 1.29		2.72 .71
44-2	7.3 1.73	5.3 1.0	7.0 .91	8.6 .95	6.4 1.32	5.5 .97
44-4	9.0 1.63	7.09 1.76	9.69 1.53	10.0 1.59	8.29 1.08	6.4 .76
47-10	22.67 3.02	16.54 6.4	22.7 4.9	29.2 5.8	31.97 7.47	16.69 5.89
50-2	.49 .29	.33 .27	2.16 .85	3.69 .85	1.49 1.0	2.93 .63
50-4	3.08 .63	4.25 1.58	5.74 1.19	15.5 3.67	3.39 1.13	7.0 2.15
Central Grey						
45-7	6.67 .688	11.57 3.49	9.89 1.48	11.97 4.17	7.08 1.03	9.63 3.4

Table 2 (Cont)

Rabbit	Slow Sleep	REM	Still	Moving	Atrop	Hyp
Septum						
35-2	14.9 2.13	14.1 4.29	12.1 1.27	12.0 1.54	14.1 1.77	13.86 1.85
35-4	2.92 1.15	1.59 1.06	.54 .37	1.3 .52	1.4 .67	.31 .20
35-7	7.93 1.27	4.71 1.98	4.94 1.8	3.53 1.0	4.54 .96	1.25 .69
35-1	4.94 .54	7.25 .86	4.81 .57	4.05 1.03		4.80 .57
Corpus Callosum						
51-4	13.0 2.6	18.9 3.17	21.04 3.84	25.6 4.6	11.7 2.07	20.0 2.68
51-7	5.6 5.7	3.2 10.2	1.65 3.34	3.69 6.7	4.2 4.2	.78 .96
51-16	11.2 1.17	24.4 5.57	16.2 5.1	25.9 4.08	11.7 1.87	15.4 1.45
Anterior Thalamus						
43-2	.64 .41	10.6 4.7	7.96 2.27	13.64 3.07		7.37 1.94
43-5	1.7 .56	12.5 4.1	5.28 2.1	12.6 3.1		8.11 2.6
43-7	1.7 .37	13.1 3.3	8.56 2.2	14.3 3.8		9.1 2.2
43-12	.81 .548	12.1 4.29	14.5 2.93	14.9 2.06	.98 .53	13.8 3.7

Table 2 (Cont)

Rabbit	Slow Sleep	REM	Still	Moving	Atrop	Hyp
Hippocampus						
25	3.43		2.46	1.74		2.45
	.80		.76	.74		.46
27-7	1.19	.40	1.18	5.39		2.2
	.56	.56	.86	3.07		.89
31-21	2.45	2.5	.47	.79		2.67
	1.8	2.3	.36	.62		1.21
36	1.97	.99	1.44	1.22		1.31
	.62	.34	.61	.55		.34
52-4	14.15	22.68	8.9	11.58	29.37	7.54
	2.04	7.49	1.94	2.86	5.06	1.29
53-3	1.28	.92	.32	2.3	.43	.31
	.53	.76	.34	1.63	.22	.494
53-5	36.8	44.8	14.9	14.6	35.8	11.35
	9.5	7.0	2.21	3.89	8.74	2.76
53-7	7.7	18.6	7.29	10.5	4.5	7.9
	1.49	5.39	1.89	4.17	1.27	1.82
55-3	30.4	41.5	22.8	37.4	25.8	16.9
	5.69	3.24	1.80	4.82	4.42	2.35
55-6	33.0	47.2	4.4	40.2	22.8	2.3
	14.4	11.9	2.5	9.2	10.8	1.2
Tegmental Reticular						
48-2	26.05	29.15	26.0	26.2	21.6	23.8
	1.72	2.2	1.2	1.9	1.6	1.1
48-4	16.15	24.45	20.9	23.6	17.2	20.4
	2.5	1.96	1.57	12.9	.86	2.4
49-5	1.47	3.41	3.34	6.7		3.56
	.77	.88	.78	1.29		.60
49-7	10.65	16.53	14.76	19.93		1.5
	2.27	1.16	3.60	1.42		.97
52-2	50.9	89.47	68.73	98.27	45.4	72.9
	10.7	19.0	7.84	8.75	6.2	6.24

Table 2 (Cont)

Rabbit	Slow Sleep	REM	Still	Moving	Atrop	Hyp
Tegmental Reticular (Cont)						
58-2	2.39 .66	4.58 2.4	1.37 .57	4.98 2.6	2.54 .66	2.15 .46

analysis assigns ranks to each score; in the following example the fastest rate is assigned a rank of one, while the slowest rate is assigned a rank of five. A chi square probability for the sum of ranks over each condition is computed by the Friedman procedure.

Table 3

Sum of ranks for cell rates over all conditions

Slow Sleep	REM Sleep	Still	Moving	Hypnosis
158	115	149	83	115

The probability of the ranks distributing themselves in such a way is less than .001.

If we consider just REM sleep, slow wave sleep and the alert condition, and submit these to the Friedman test, the firing under the REM condition is clearly seen to be faster than the other states.

Table 4

Sum of ranks for Friedman analysis of variance

REM	Slow Sleep	Still	$x^2 = 26.45$
76	96	95	$P < .001$

Obviously, the fastest rates occurred for the most part during paradoxical sleep and when the rabbit was moving about; if one considers rate as a measure of overall activity, then the greatest activity occurs during these two states. This similarity of activity is particularly striking for some cells such as Rabbit 55, channel 6, in the following figure (Fig. 35).

Evarts (1967) has noticed that there is usually a reduction in the extremes of firing in the transition from the awake still state to slow wave sleep; that is, fast neurones fire slower in light sleep, and slow neurones fire faster. Using the criteria he adopts for slow neurones (those firing less than 3/sec) and fast neurones (firing more than 18/sec), we categorized these cells into slow cells or fast cells and looked at the direction of change in the rate from the alert to the sleeping state.

Table 5

Number of cells which change in rate from alert to Synchronized Sleep

	Slow Cells		Fast Cells	
	Alert	S Sleep	Alert	S Sleep
Faster	3	10	5	2

Although it is generally true that the cells which fire at extreme rates do tend to become less extreme in their firing patterns, this change is much less dramatic than Evarts finds, for example, with pyramidal cells.

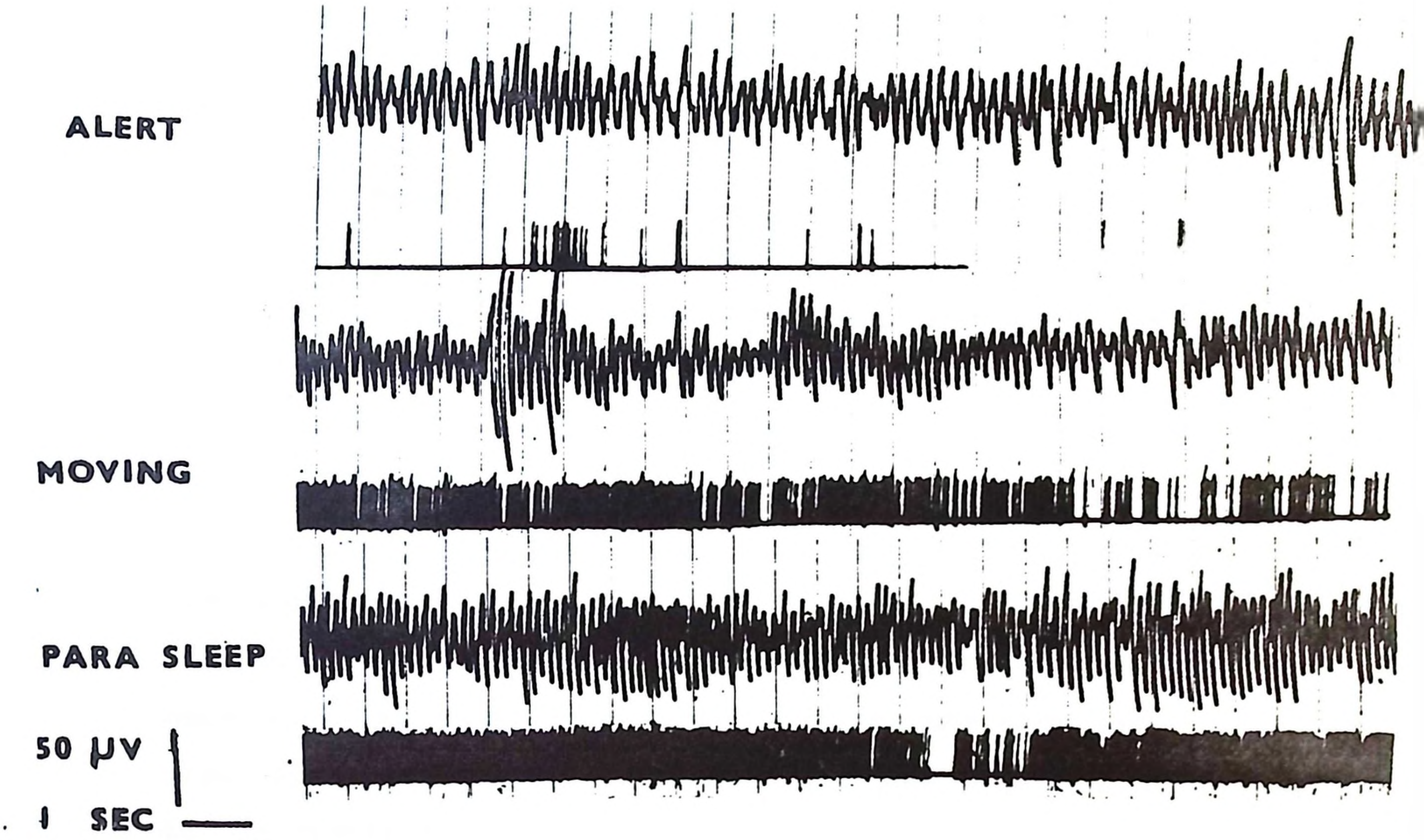

Figure 35. Records from Rabbit 55, channel 6 taken while animal was moving, in paradoxical sleep, and sitting still.

One can see from Table 2 that the change in rates is slight.

Rate is an important measure of the cells' activity over various conditions. However, the variances, as can be inferred from Table 2, were rather large for some cells. This is a reflection of the patterns of firing from some cells--under some conditions, especially slow wave sleep and REM sleep; they tended to fire in bursts. This, of course, changes the variance since there is a change in the number of long and short intervals. We can perhaps best demonstrate this by presenting rates and patterns from various structures. It should be made clear, however, that the number of cells per structure is small, and because of these small samples, only a few structures could be considered.

One cell that demonstrates this change in the pattern of bursts from the alert state to the slow wave sleep state is a medial thalamic cell, Cell 2 of Rabbit 44, in Figure 36.

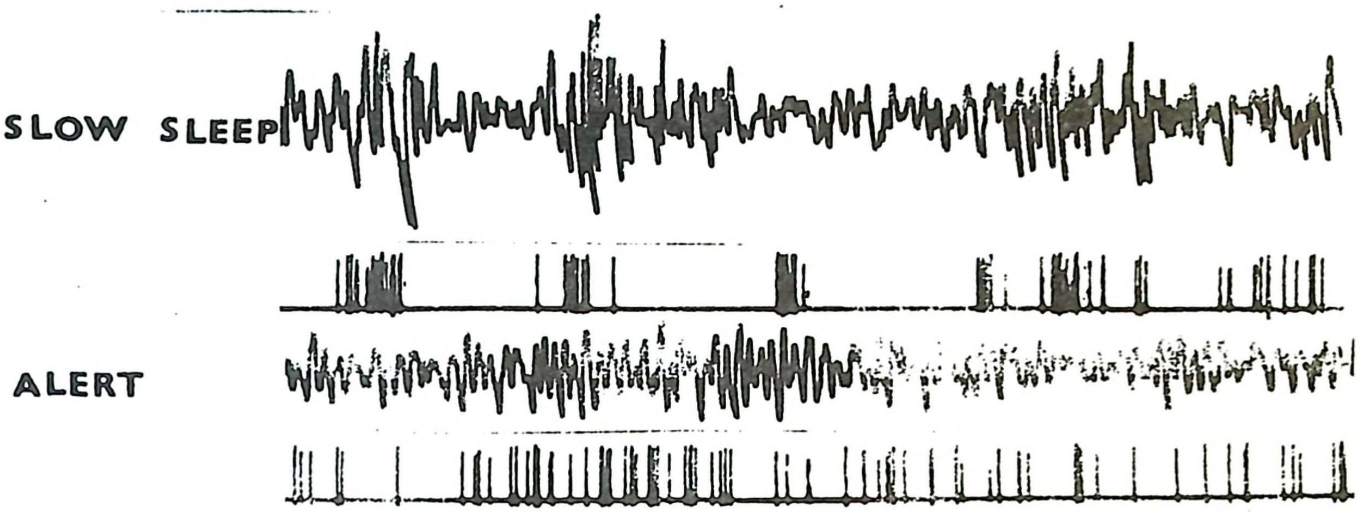

Figure 36. Records from Rabbit 44, cell 2 taken while animal was sitting alert and in synchronized sleep. (N. Paracentralis)

Although the mean rate for both the alert and slow wave sleep conditions are similar for this cell--7.0 spikes/sec vs. 7.3 spikes per second--the standard deviation for slow wave sleep is nearly double that for the alert state.

<u>Medial thalamus.</u> The results of ranking the rates of firing for medial thalamic cells are shown in Table 6.

Table 6

Ranks for mean rates of medial thalamic cells

Rabbit	Slow S.	REM S	Still	Moving
31-4	4	2	3	1
31-7	4	3	2	1
32-5	2	1	3	4
44-2	2	4	3	1
44-4	3	4	2	1
47-10	3	4	2	1
50-2	3	4	2	1
50-4	4	3	2	1
	22	21	17	10

$x^2 = 21.5$

P .001

The probability that the ranks would distribute themselves in this manner is less than .01 (Friedman non-parametric analysis of variance). The fastest rates generally occurred during movement of the rabbit. What is of particular interest, however, is the number of cases in which the slowest rate of firing occurred during REM sleep. It has been mentioned earlier that, in general, the cells fired very rapidly during the REM period. Here is a sample from Rabbit 44, channel 2 again.

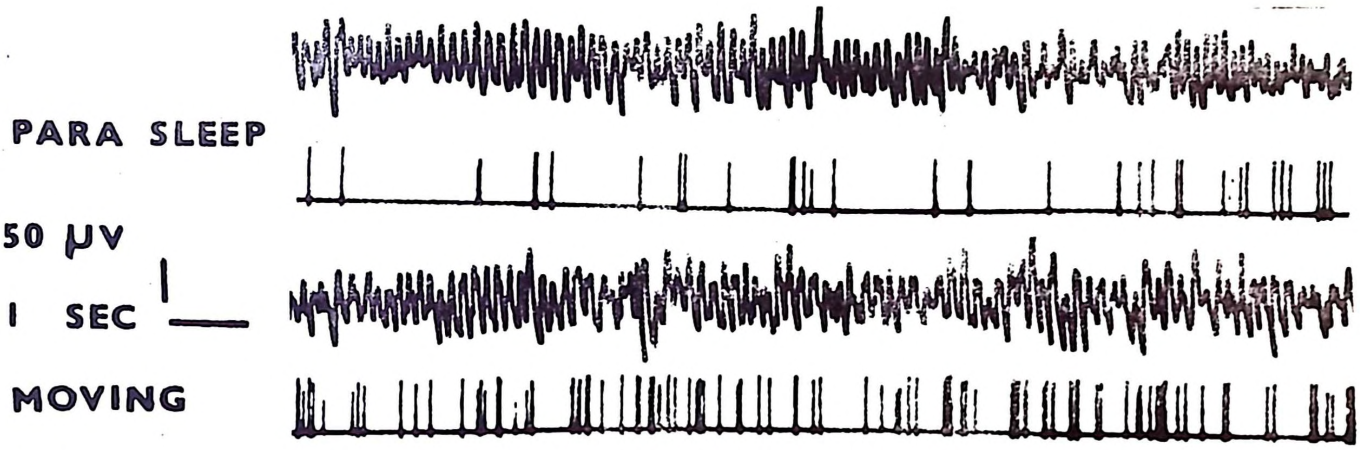

Figure 37. Records during paradoxical sleep and movement, Rabbit 44, channel 2. (N. Paracentralis)

Hippocampus. We found other cells that fired at their lowest rates during REM sleep in the hippocampus. The ranks for the hippocampal cells are in Table 7.

Table 7

Ranks for mean rates for hippocampal cells

Rabbit	Slow S.	REM S.	Still	Moving
27-2	2	4	3	1
31-21	2	1	4	3
36	1	4	2	3
52-4	2	1	4	3
53-3	2	3	4	1
53-5	2	1	3	4
53-7	3	1	4	2
55-3	3	1	4	2
55-6	3	1	4	2
	20	17	32	21

$\chi^2 = 8.6$

$P < .05$

Although two of the hippocampal cells fired slowest during REM sleep, six fired fastest during that state. This is at variance with the findings of Mink, Best & Olds (1967) who report that all of their hippocampal cells fired slowest during REM sleep. Figure 38 shows the record of one cell that did fire at its lowest rate during REM sleep. This cell fired only in the eye movement periods.

Figure 39 shows a record of one cell from the hippocampus which fired most rapidly during REM sleep. Figure 34 shows a similar record.

The hippocampal cells are also unique in that the lowest rates of firing usually occurred in the alert, still state. A sample of record from Rabbit 55, channel 6 demonstrates this pattern (Fig. 40).

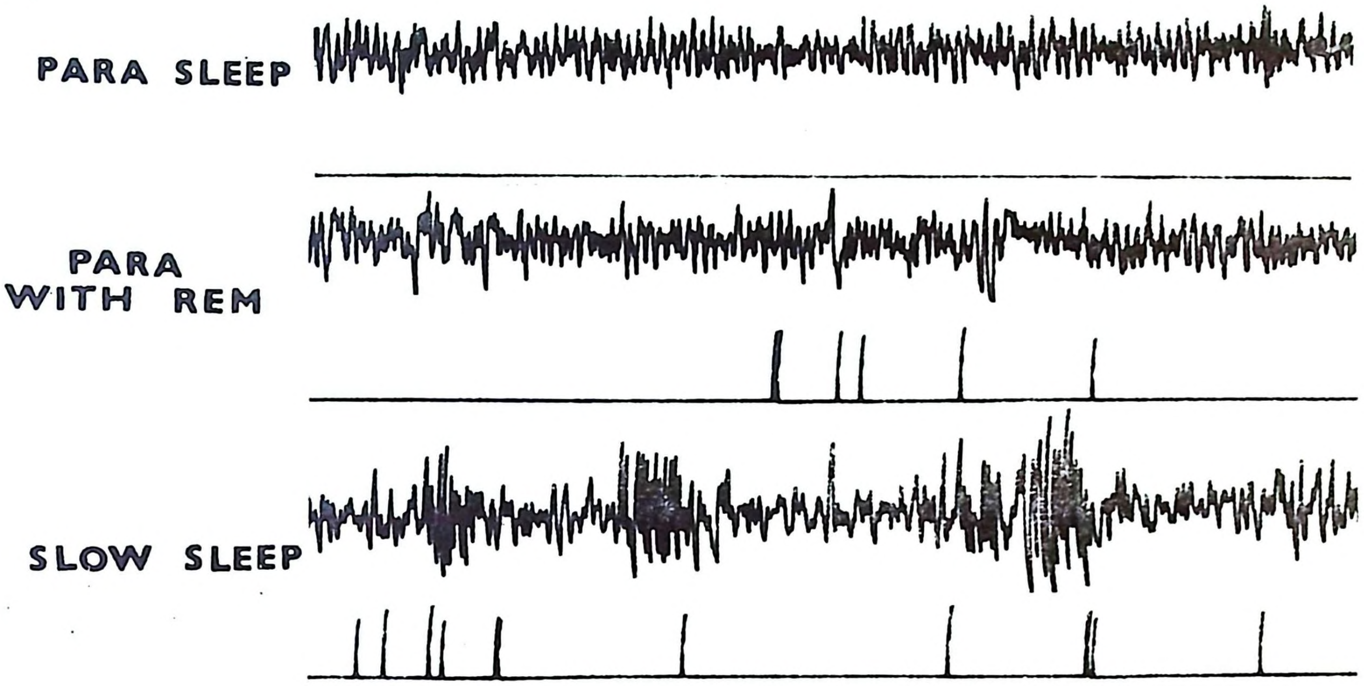

Figure 38. Slow wave sleep and paradoxical sleep with and without rapid eye movements. Rabbit 27, channel 7. (Dorsal hippocampus)

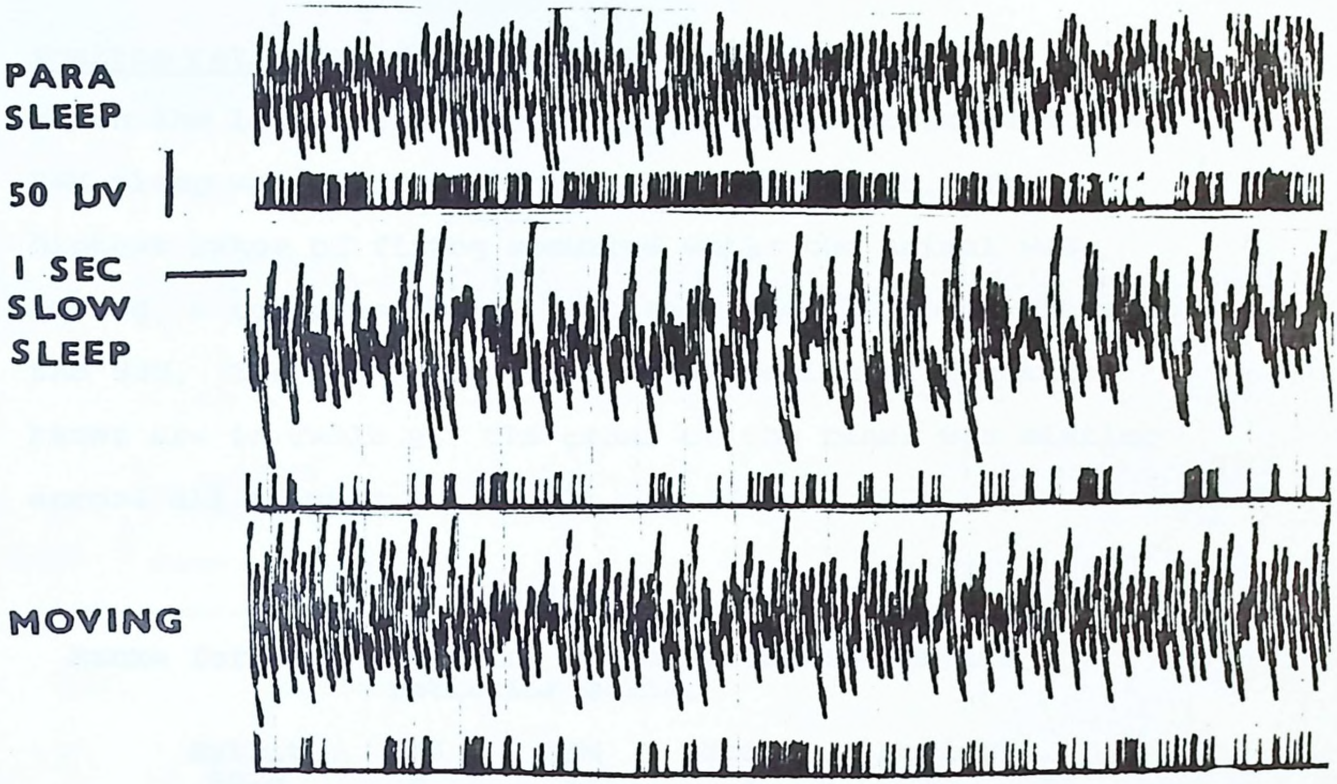

Figure 39. Rabbit 53, channel 7. Dorsal hippocampal records during paradoxical sleep, slow wave sleep, and movement. (Dorsal hippocampus)

Figure 40. Alert and movement records for Rabbit 55, channel 6.

Pontine reticular formation. Another structure in which the lowest rates of firing in cells occurred during REM sleep was the pontine reticular formation. The highest rates of firing occurred while the animal was moving, a condition which is also marked by rapid theta on the EEG. The ranks for the pontine reticular formation rates are in Table 8. The order of the ranks was similar across all animals.

Table 8

Ranks for mean rates for all conditions--pontine reticular cells.

Rabbit	SS	REM	Still	Moving
50-5	3	4	2	1
50-18	3	4	2	1
53-20	3	4	2	1
	9	12	6	3

$\chi^2 = 9.0$

$P < .05$

One of the cells was particularly interesting since it fired rather regularly in all conditions, except during REM sleep, in which the cell fired in bursts (Fig. 41).

Tegmental reticular formation. The tegmental reticular cells behave very much like the majority of all the cells: the rates are lowest during slow wave sleep, highest during movement, and next highest in REM sleep. The ranks are shown in Table 9.

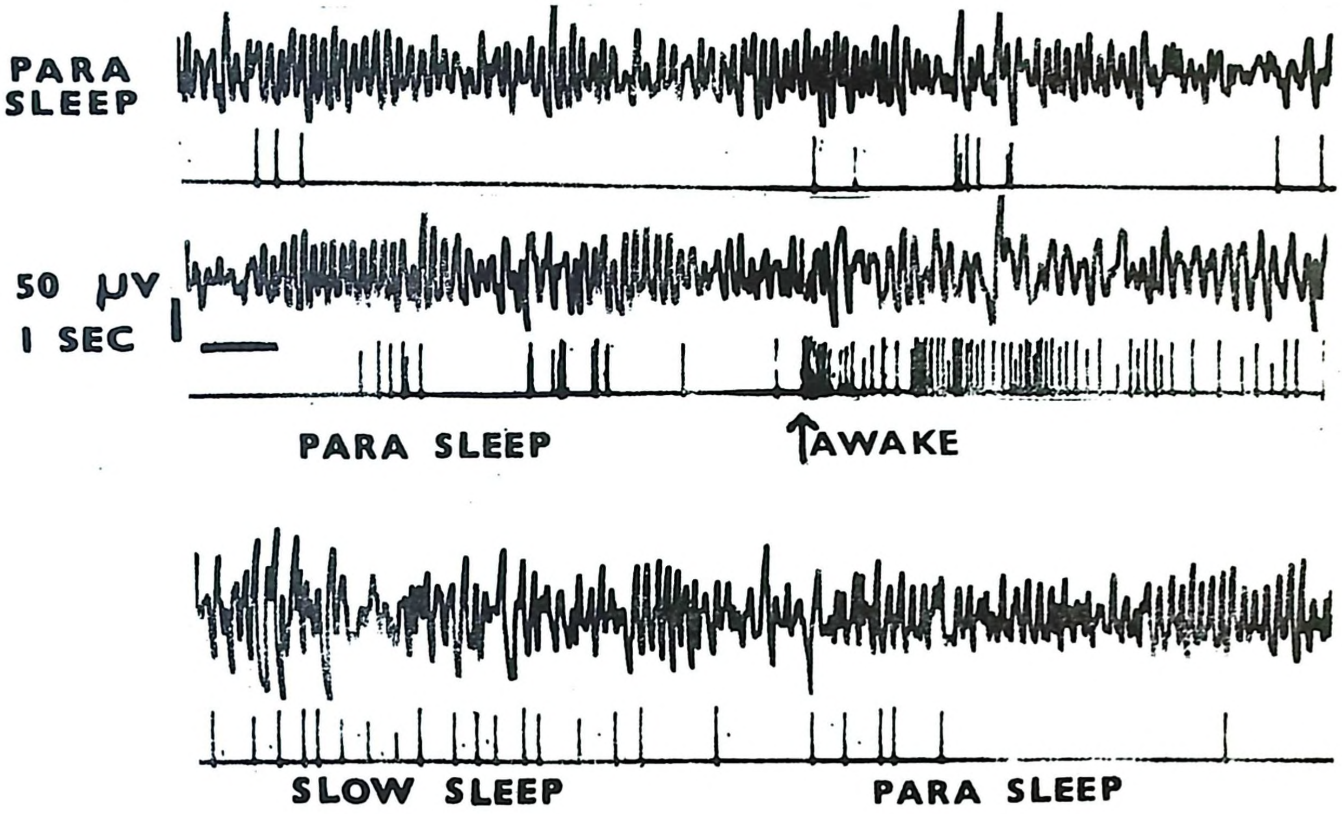

Figure 41. Rabbit 50, channel 5. Nucleus reticularis pontis cell firing in transition to,and from, paradoxical sleep.

Table 9

Ranks of mean rates for cells in tegmental reticular formation.

Animal	SS	REM	Still	Moving
48-2	3	1	4	2
48-4	4	1	3	2
49-5	4	2	3	1
49-7	4	2	3	1
52-2	4	2	3	1
58-2	3	2	4	1
	22	10	20	8

$x^2 = 14.8$

$P < .01$

The SM cortex cells (Table 10) did not display any clear pattern of rates across conditions, except that they tended to fire least during slow wave sleep and most while the rabbit was moving, when they tended to fire in bursts.

Table 10

Ranks for mean rates, SM cortex

Rabbit	Slow S.	REM S.	Still	Moving
40-2	2	4	3	1
40-5	4	1	3	2
40-7	4	2	1	3
46-2	4	2	3	1
46-5	3	2	4	1
	17	11	14	8

$x^2 = 12.0$

$P < .01$

The ranks for the cells from the anterior thalamus are presented in Table 11 below.

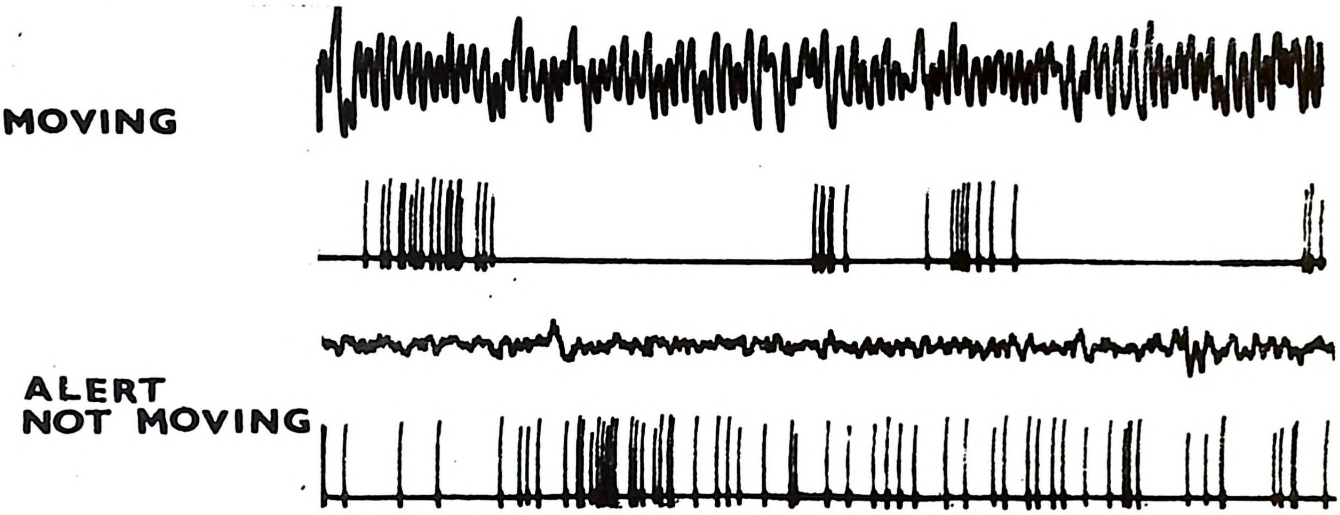

Figure 42. Records from Rabbit 40, channel 5 during alert and movement conditions.(S-M cortex)

Figure 43. Records from Rabbit 40, channel 7 during alert and movement conditions. (S-M cortex)

Table 11

Ranks for means of anterior thalamic cells over conditions

Rabbits	Slow S.	REM	Still	Moving
43-2	4	2	3	1
43-5	4	2	3	1
43-7	4	2	3	1
	4	3	2	1
	16	9	11	4

$x^2 = 11.1$

$P < .02$

These cells are characterized by very low firing rates during slow wave sleep, and bursts of activity during paradoxical sleep. A sample from one of the cells is in Figure 44.

The septal cells differed from cells in other structures in that they tended to fire slower when the rabbit was moving than at other times. The ranks for means of rates are in Table 12.

Table 12

Ranks for mean rates of firing for septal cells

Rabbit	Slow	REM	Still	Moving
35-2	1	2	3	4
35-4	1	2	4	3
35-7	1	3	2	4
35-1	2	1	3	4
	5	8	12	15

$x^2 = 8.7$

$P < .05$

The cells tended to fire at their highest rates during slow wave sleep, which is also unusual.

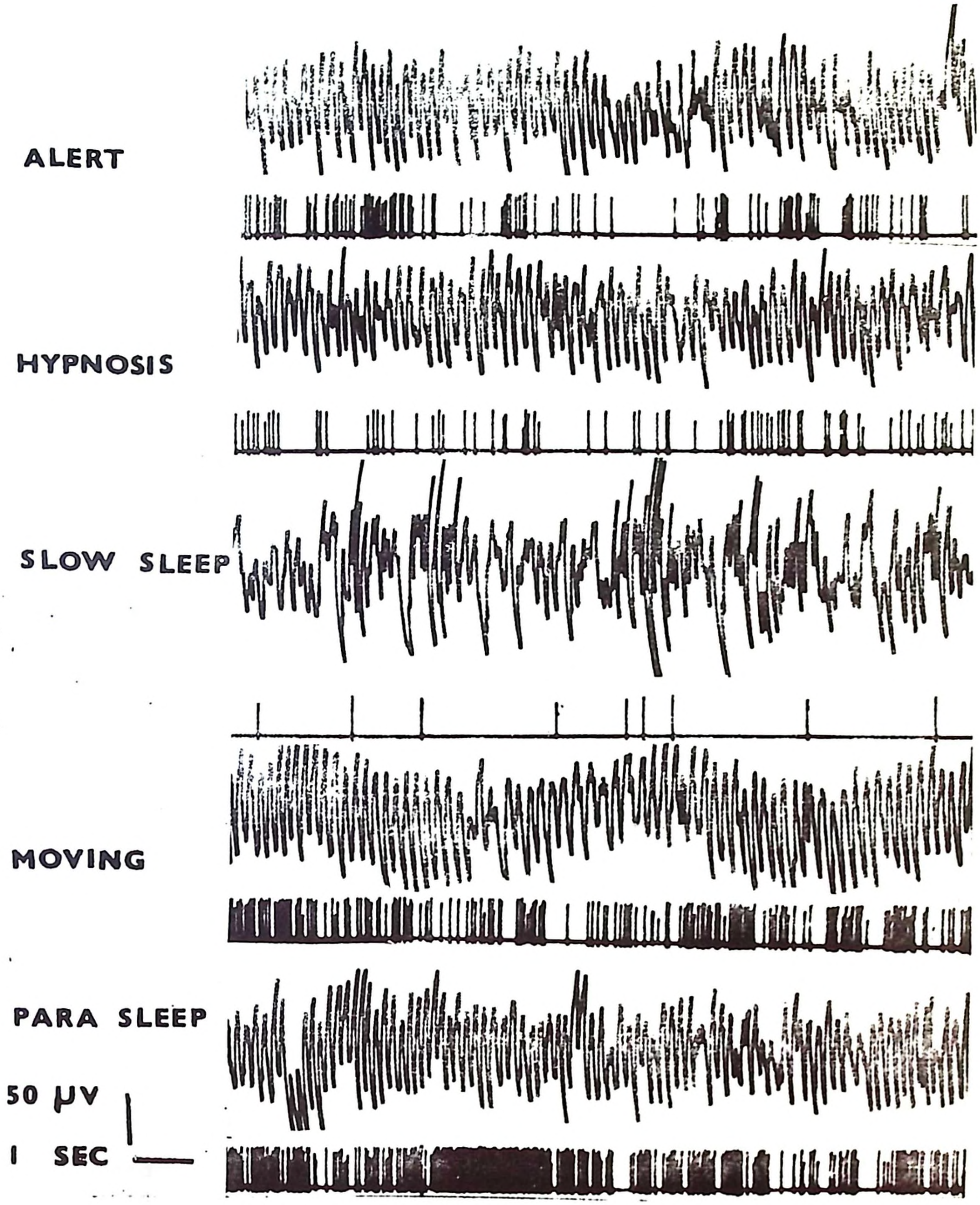

Figure 44.
Rabbit 43, Chan 2, Anterior Thalamus, (N. Ventralis Anterior bordering N. Antereomedialis)

In summary, most cells fired very rapidly during REM sleep and when the animal was moving about. However, we have seen that a few cells in the pons, hippocampus and medial thalamus fired at their lowest rates during desynchronized sleep. Cells frequently fired in bursts during both slow wave sleep and paradoxical sleep. Few cells fired at their lowest rate while the animal was moving, but occasionally this happened as well, for example, for Rabbit 32 channel 5, a cell in the medial thalamus and three of the septal cells. Hippocampal cells were rather peculiar in that they fired at their lowest rate when the rabbit was alert but not moving. The anterior thalamic cells exhibited very low rates of firing during slow wave sleep, while the septal cells fired at their highest rates during that condition.

Hypnosis. We have seen that the electrical activity of the brain of an animal in hypnosis, when there are no slow waves, is similar to that of an animal which is alert but not moving. Examination of Table 2 and inspection of Figures 7 to 52 in the Appendix[4], which

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[4] Throughout this section, references are made to records of individual cell firing patterns. Although an examination of the pattern of firing for individual cells is essential in light of some statements made in the thesis, it was too unwieldly to include all the records in this chapter. However, records for each cell are found in Appendix Figures 7 to 52.

show the discharge patterns of the cells, tend to bear this out on the whole.

There are, however, a few cells which do show some effects. There is a change in rate and/or pattern during hypnosis for these cells. To obtain some measure of the change of pattern of cell firing (it was impossible to complete the interspike interval distribution analysis because there was not enough time) three independent observers rated the discharge patterns of each cell as being similar or dissimilar while the animal was in the alert condition and while it was in hypnosis. Thirty-nine cells were rated as showing the same patterns of activity under both conditions, while seven were considered to behave differently. Figures 45, 46, and 47 show examples of cells whose firing patterns were rated as being similar in hypnosis and in the alert condition, while Figures 48 and 49 show cells whose firing patterns were rated as being different. Table 13 shows the cells whose behaviour differed significantly in rate or were judged to have different firing patterns, or both, under the two conditions.

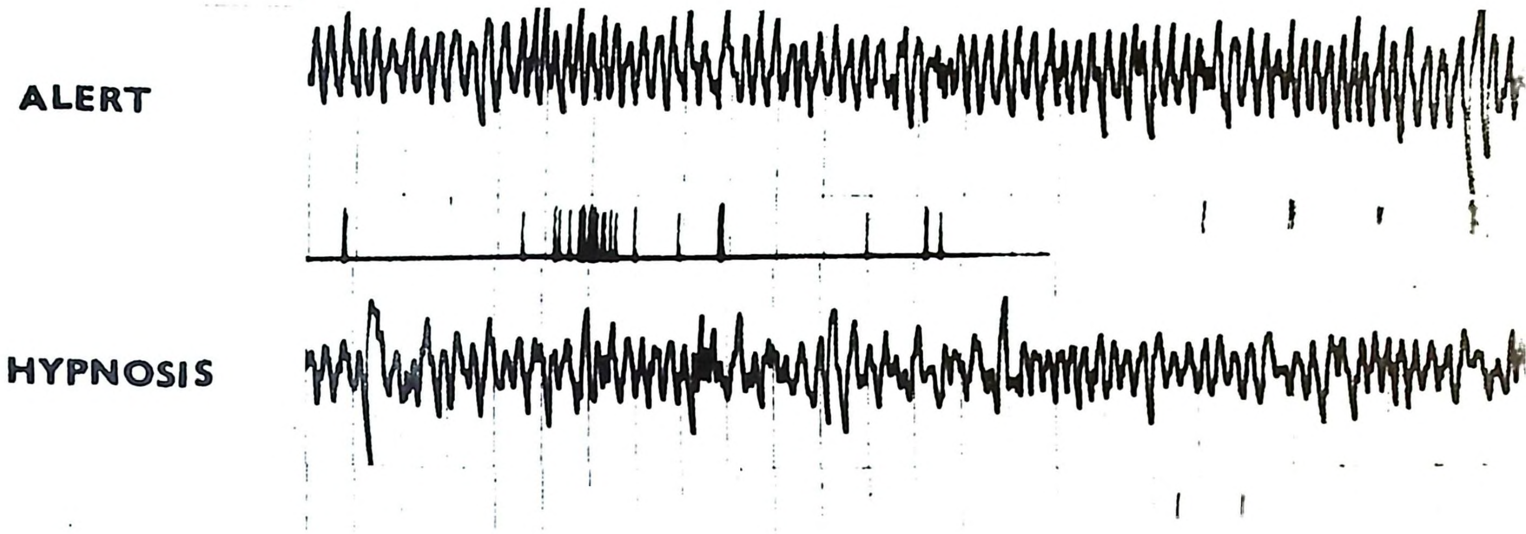

Figure 45. Hypnosis record rated as similar to an alert record. Rabbit 55, channel 6. (Hippocampus)

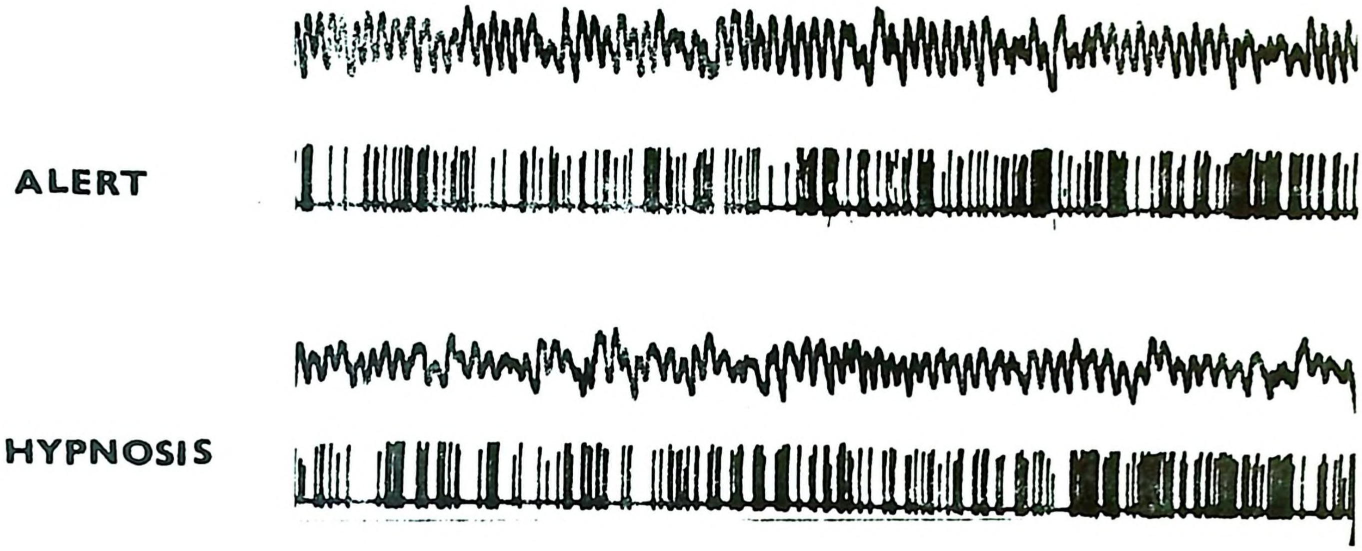

Figure 46. Alert and hypnosis records from Rabbit 43, channel 12. Cell in N. ventralis anterior bordering N. anteromedialis.

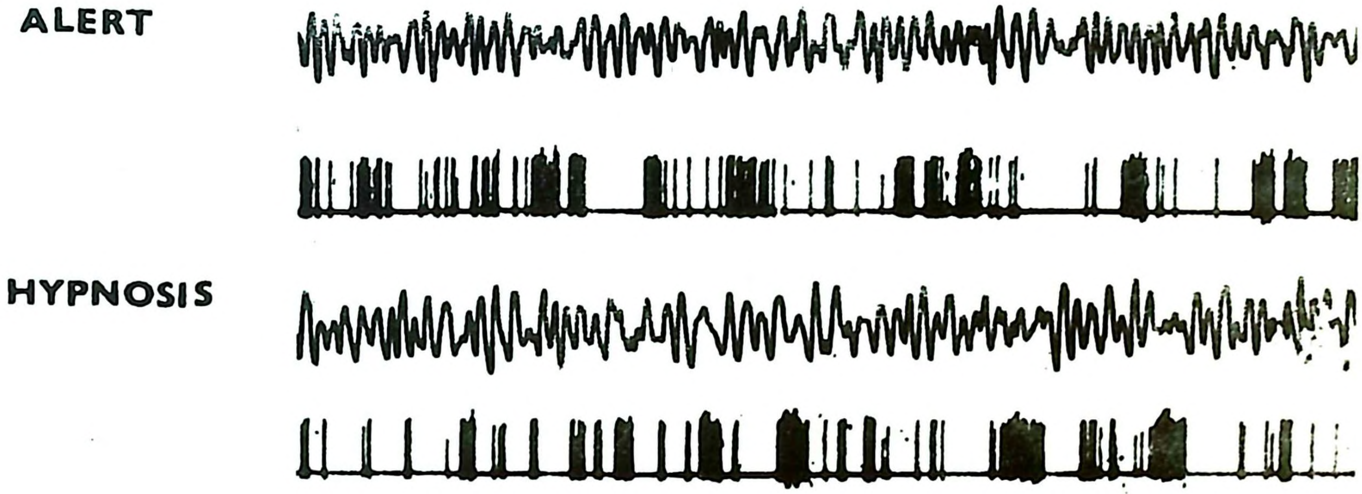

Figure 47. Alert and hypnosis records from Rabbit 47, channel 10. Cell in anterior ventralis bordering N. anteromedialis.

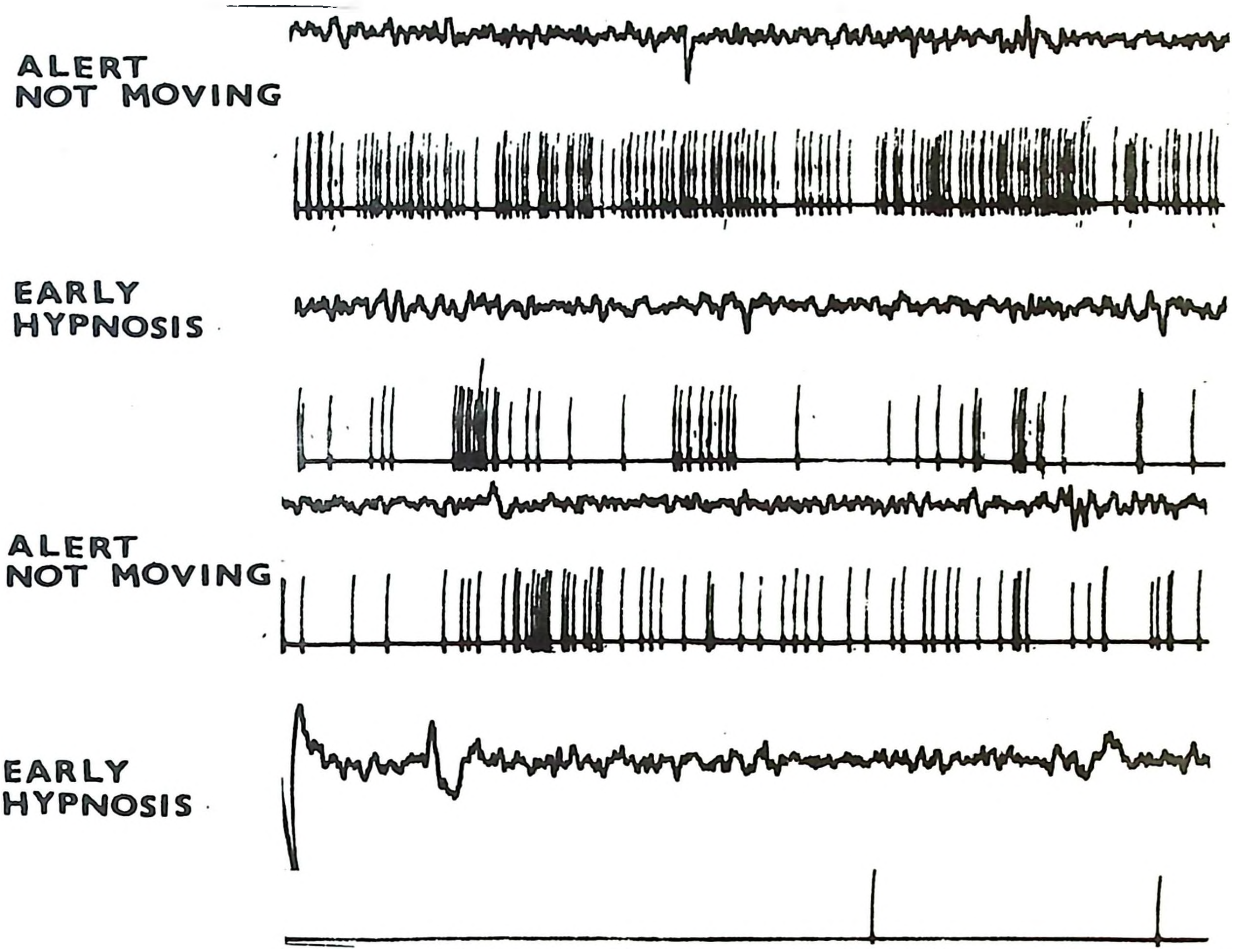

Figure 48. Cortical cells which had different firing patterns during hypnosis and alertness. Cell 40-5(top) and 40-7 (bottom).

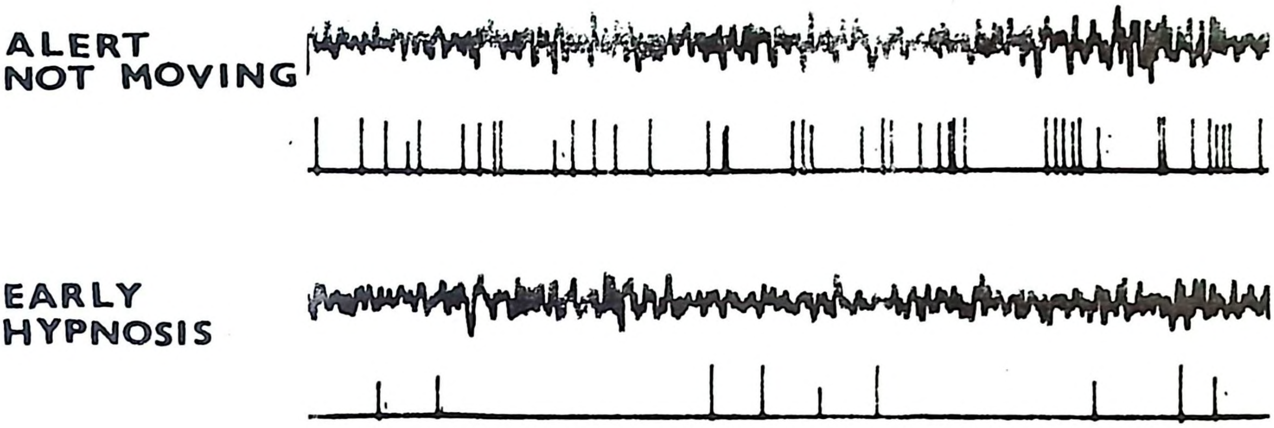

Figure 49. Septal cells firing in hypnosis and while animal was alert. Cell 35-7.

Table 13

Change in cell firing from alert to hypnosis

Cell	Structure	Rate Change (alert to Hypnosis)	Pattern Change
31-20	Limbic Cortex	Increase	No
31-21	Dorsal Hippocampus	Increase	Yes
40-5	S. M. Cortex	Decrease	Yes
40-7	S. M. Cortex	Decrease	Yes
35-4	Septum	Decrease	Yes
35-7	Septum	Decrease	Yes
46-5	S. M. Cortex	Same	Yes

Obviously, it would be of great interest to know whether cells behaved in the same way during early hypnosis, where the record resembled that of an alert animal, and during hypnosis with slow waves, where the record resembles that of synchronized sleep. However, in the present experiment we were unable to get a clear answer to this question. Unfortunately, few of the rabbits showed slow waves during the period in which they were hypnotized. In those animals that did, the cells were of the type that showed little difference in behaviour during the states of alertness, synchronized sleep, early hypnosis and hypnosis with slow sleep. Typical records are shown below. It can be seen that there is some suggestion that the cells in Figures 50 and 51 have patterns of discharge which are more similar to those of slow wave sleep during

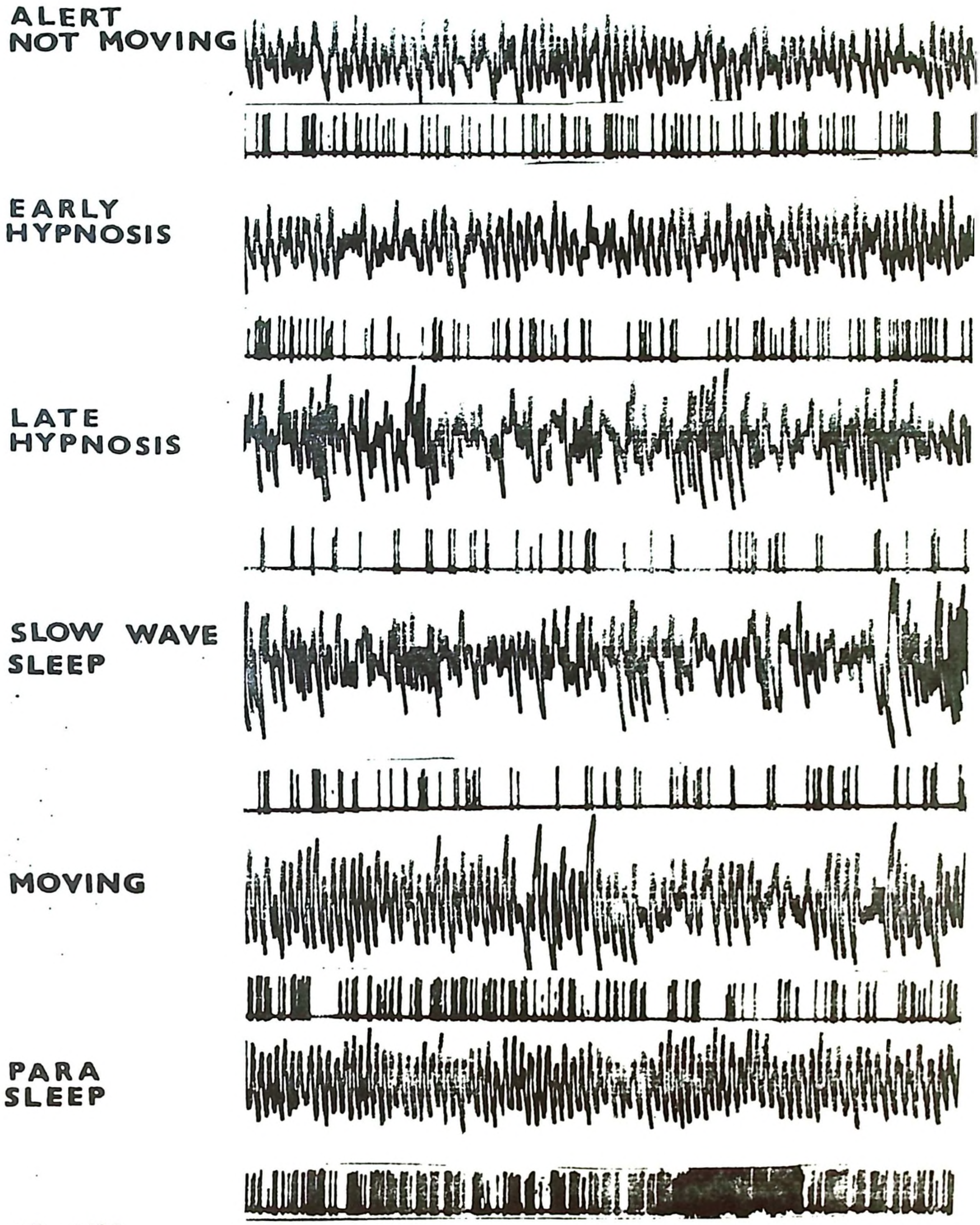

Figure 50 Slow wave development in hypnosis EEG. Rabbit 34, Channel 18, Limbic cortex

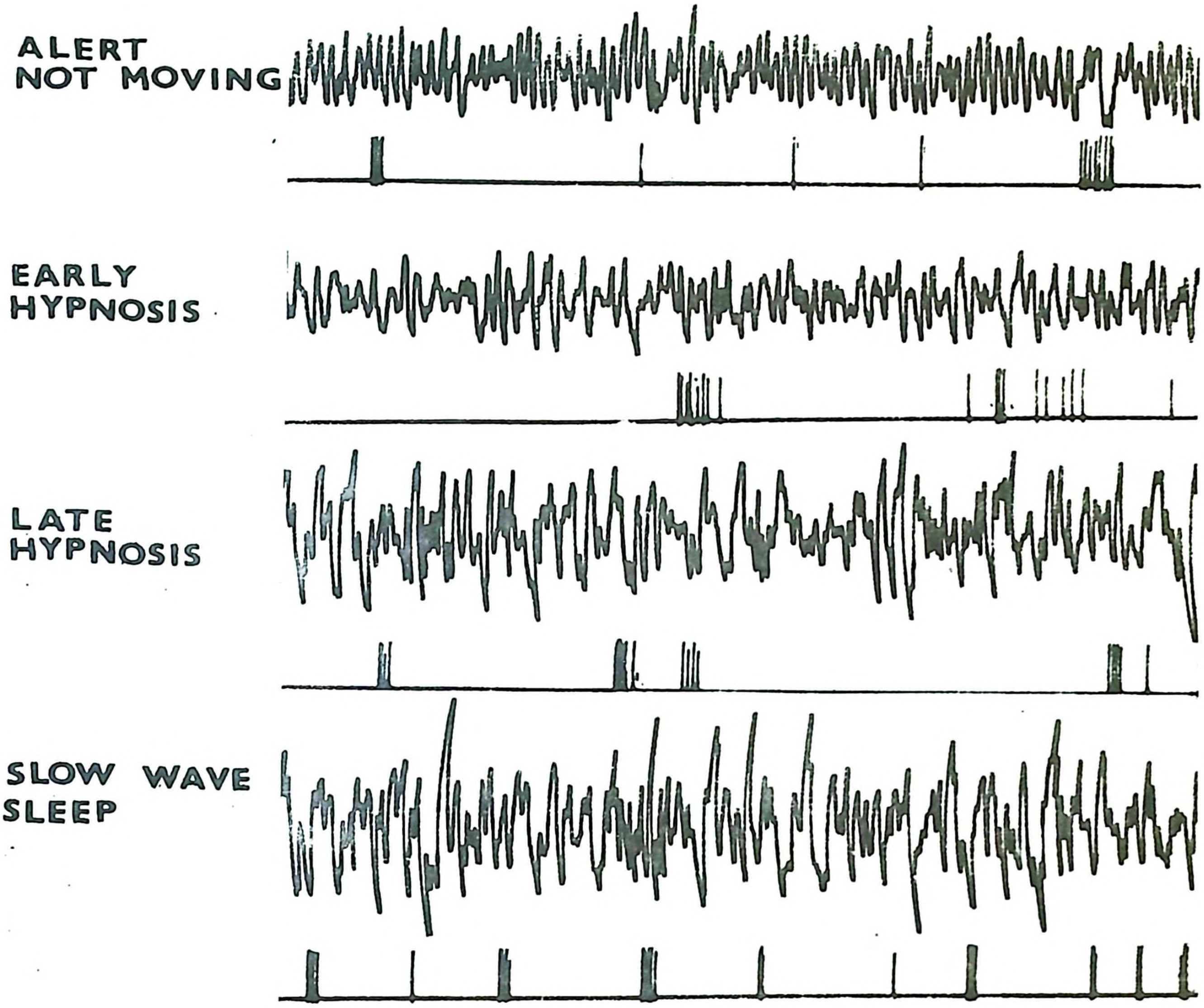

Figure 51. Slow wave development in hypnosis EEG record.
Rabbit 32-5, medial thalamus.

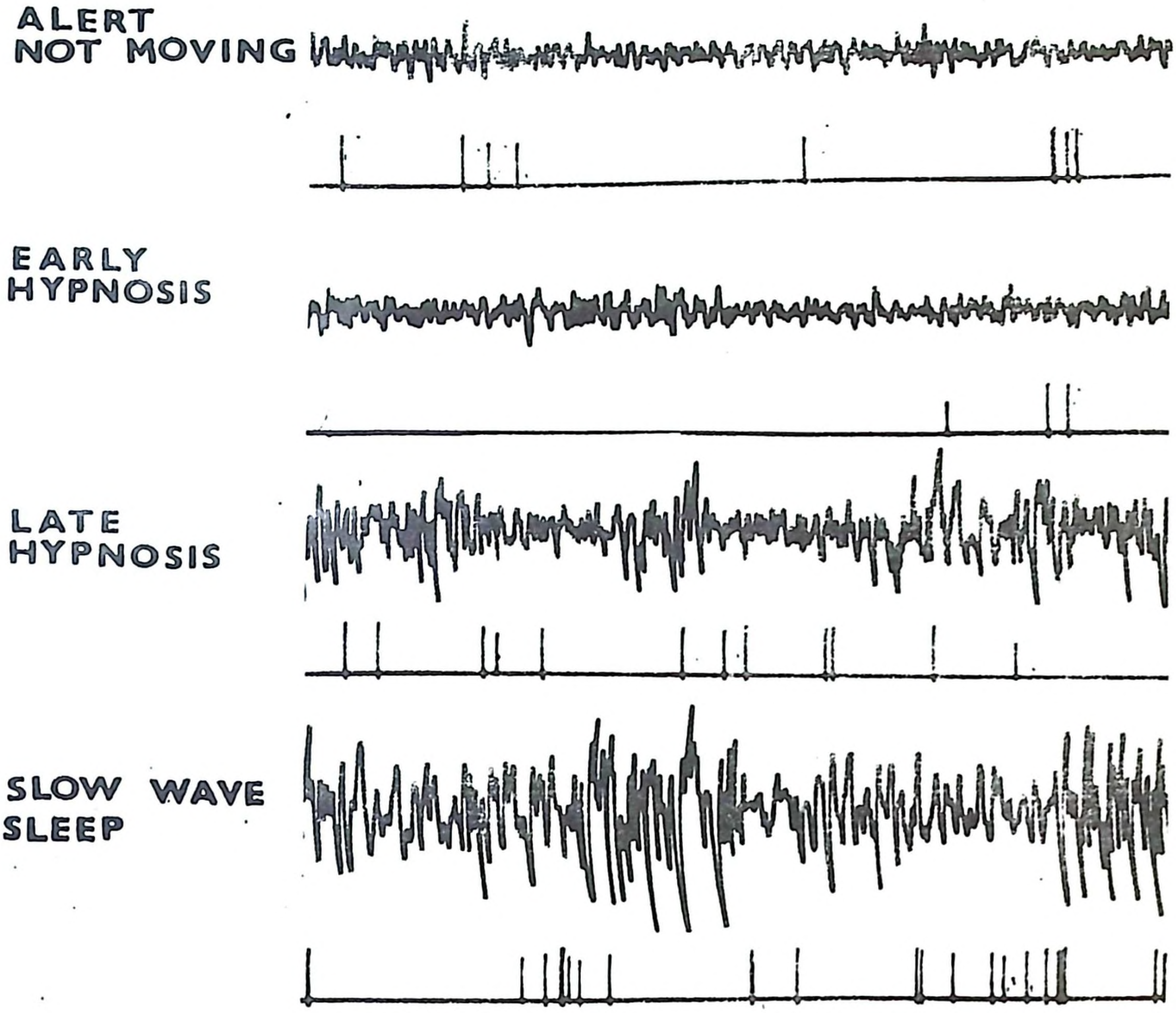

Figure 52. Slow wave development in hypnosis EEG record. Rabbit 35, channel 4, septum.

slow wave hypnosis than they are to the alert state or to early hypnosis. Thus, what little evidence there is suggests that these cells' firing is related more to gross electrical activity of the brain than to the behavioural state.

Dissociation of EEG and behaviour. These last observations raise a point of some interest. It has been known for some time that the present action of drugs such as atropine can produce synchronized activity in the brain of the type normally associated with sleep while the animal is still behaviourally awake (Wikler, 1952). Similar results can be produced by lesions (Feldman and Waller, 1962). However, little is known about the behaviour of single cells under these conditions where there is dissociation between the gross electrical activity and behaviour. The present study has a good deal of evidence bearing on this problem. The data on the behaviour of cells during desynchronized sleep and while the animal is moving are obviously relevant. Here we have conditions which, as we showed in the earlier part of the study, are characterized by very rapid theta with similar positions of the peaks of their power spectra. On the whole, as we have seen, the rates of discharge tend to be high under both conditions, and the pattern of discharge tends to be the same. However, examination of the means and standard deviations of Table 2, and a glance at Tables 6-10, show many exceptions. This is also indicated by the discharge patterns (e.g., Figures 53 and 54, and the records in Figures 7 to 52 of the appendix).

It appears,on the whole, that some cells in most structures show this dissociation of firing patterns. What is striking, however, is that such dissociation does not seem to be present in the pontine reticular formation and the medial thalamus.

To investigate the relation between discharge pattern and the EEG further, atropine was given to some of the rabbits. The slow waves and spindles from the EEG records of the alert atropinized animals were remarkably similar to those obtained from slow wave sleep records. Occasionally these characteristics of slow waves would disappear if the animal moved about the box, but the EEG would return immediately to slow waves after the movement had been completed.

Qualitative ratings from three independent observers on whether the patterns of unit activity under the atropine condition were similar to patterns exhibited during slow wave sleep resulted in 14 of the samples being classed as similar and 5 as dissimilar. A few samples of cell patterns during the atropine state which were considered as similar to the light sleep state are presented in Figures 55 and 56.

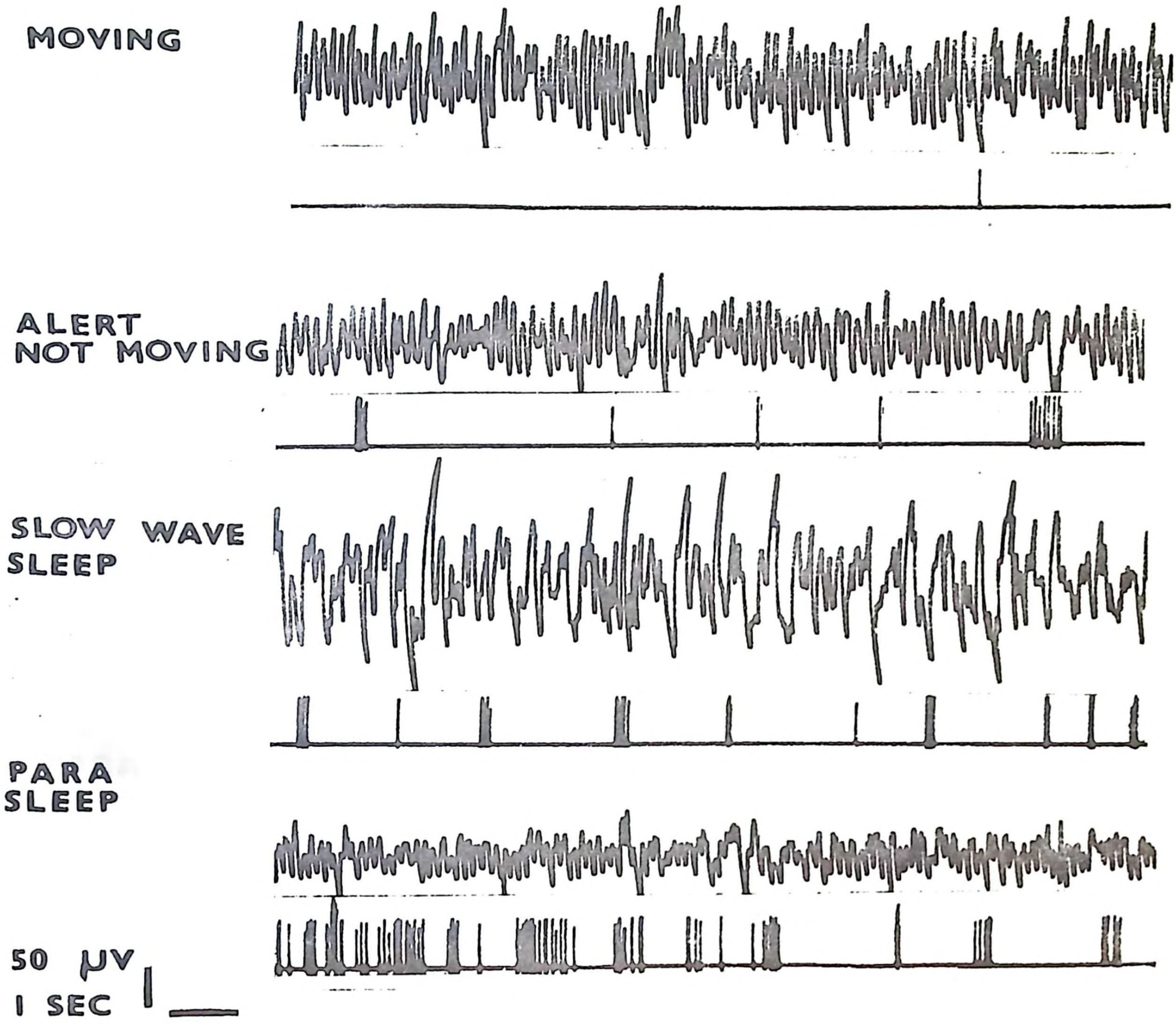

Figure 53. Rate of firing increases as animal goes through states from movement to deep sleep. Moving and REM records of unit activity are very different.

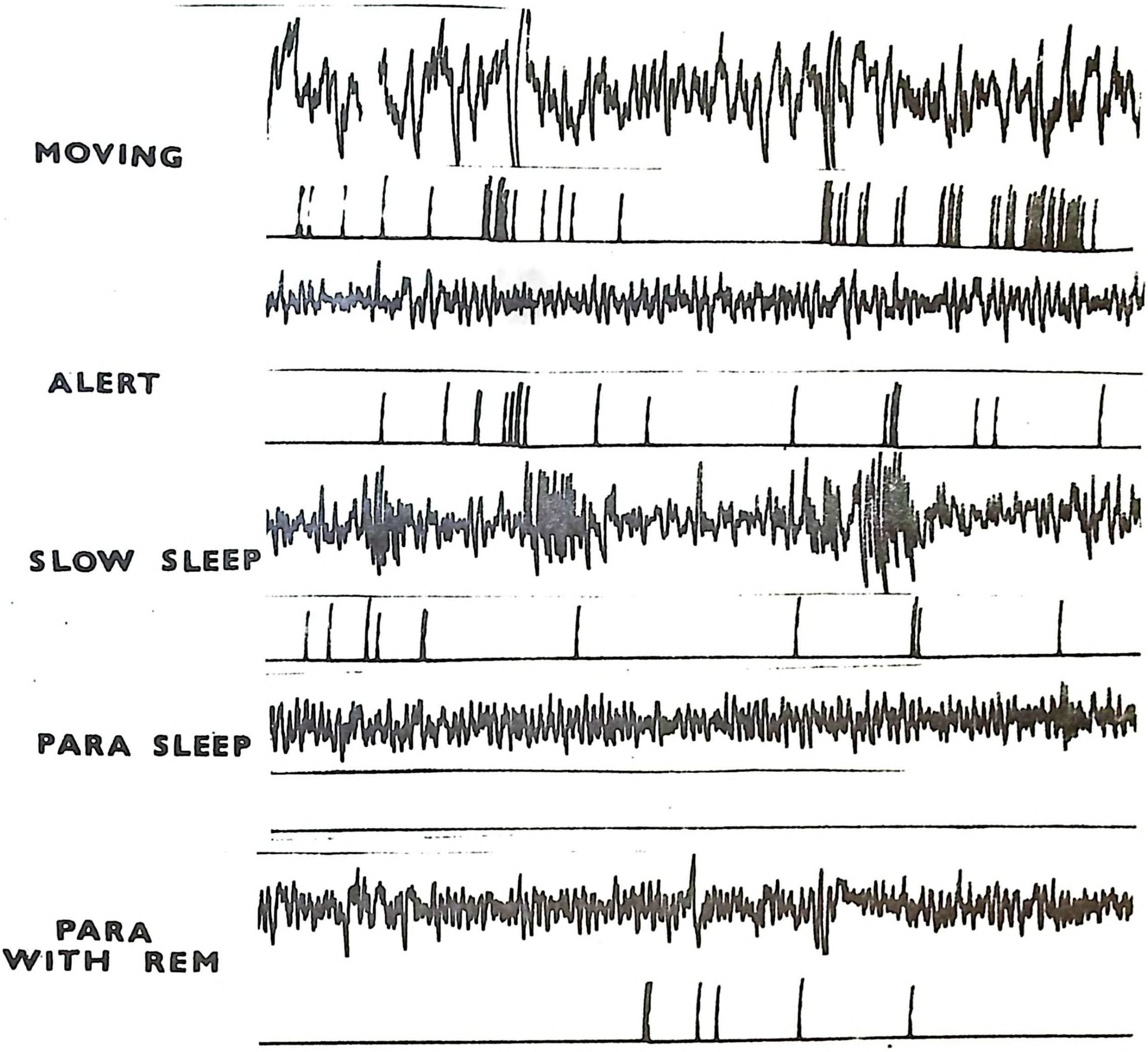

Figure 54. Rate of firing decreases as animal goes through states from movement to deep sleep. Moving and REM records of unit activity are different. Rabbit 27-7.

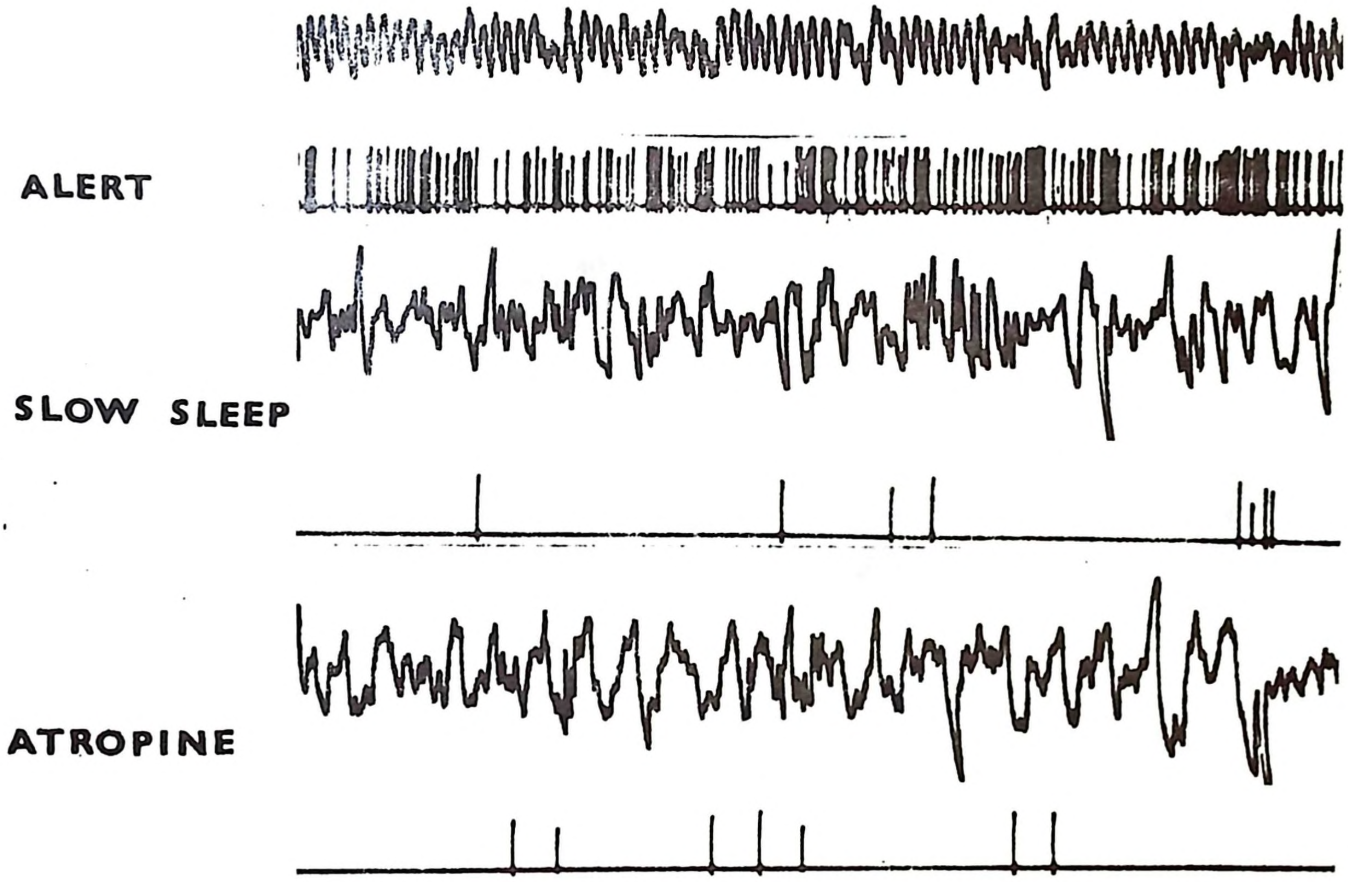

Figure 55. Records from cell 43-12 taken during alert, slow wave sleep and atropine conditions.

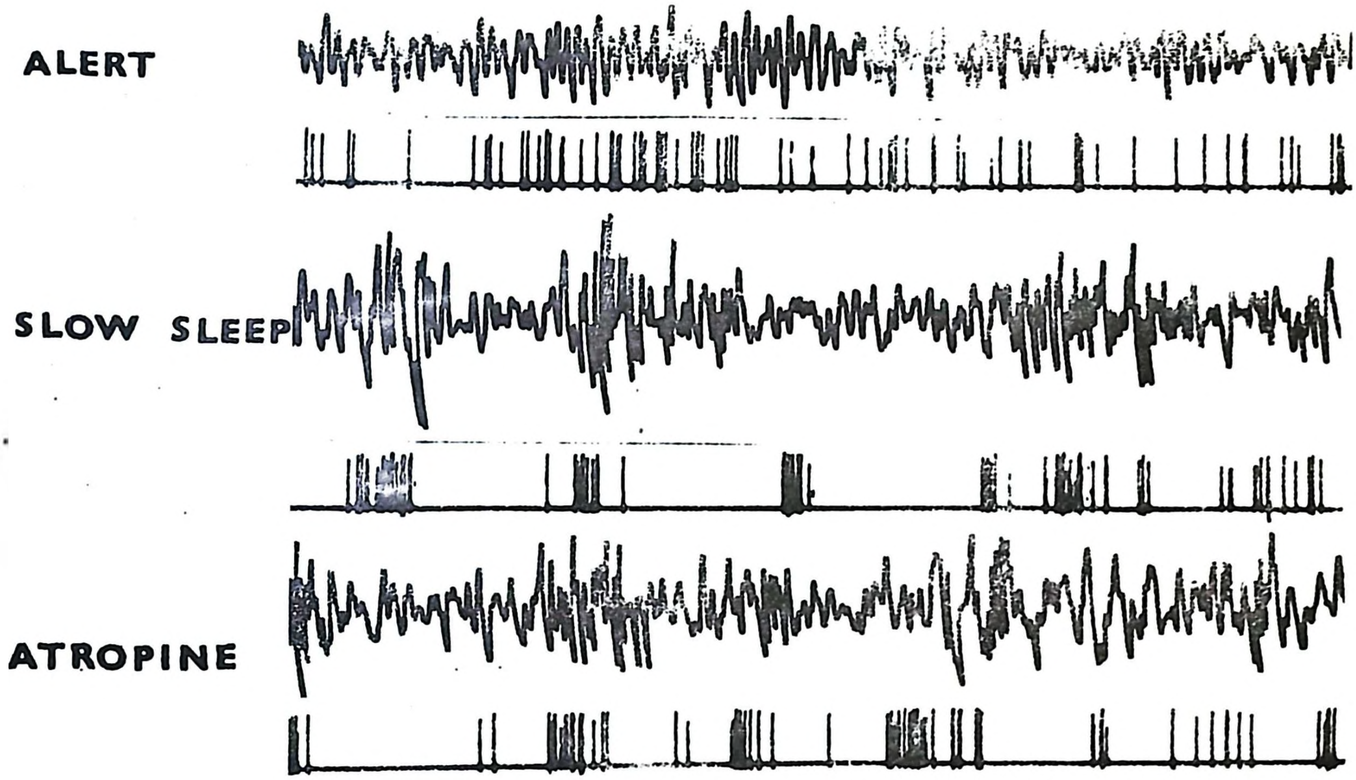

Figure 56. Cell 44-2. Records under alert, slow wave sleep, and atropine conditions.

Figure 57 presents samples from two records classified as having dissimilar patterns. Those cells rated as similar and dissimilar in their firing pattern are presented in Table 14.

Table 14

Firing Patterns of Cells Under Atropine

Similar Patterns		Similar Rates *	Dissimilar Patterns		Similar Rates *
43-12	Anterior Thalamus	Yes	46-2	S.M. Cortex	Yes
44-2	Medial Thalamus	Yes	47-10	Medial Thalamus	No
44-4	Medial Thalamus	Yes	49-5	Tegmental reticular	No
45-7	Central Grey	Yes	52-4	Hippocampus	No
46-5	S.M. Cortex	Yes	53-20	Pontine reticular	No
48-2	Tegmental reticular	No			
48-4	Tegmental reticular	Yes			
51-4	Corpus Callosum	Yes			
51-7	Corpus Callosum	Yes			
52-2	Tegmental reticular	Yes			
53-7	Hippocampus	No			
55-3	Hippocampus	Yes			
55-6	Hippocampus	Yes			
58-2	Tegmental reticular	Yes			

* Derived from Table 2.

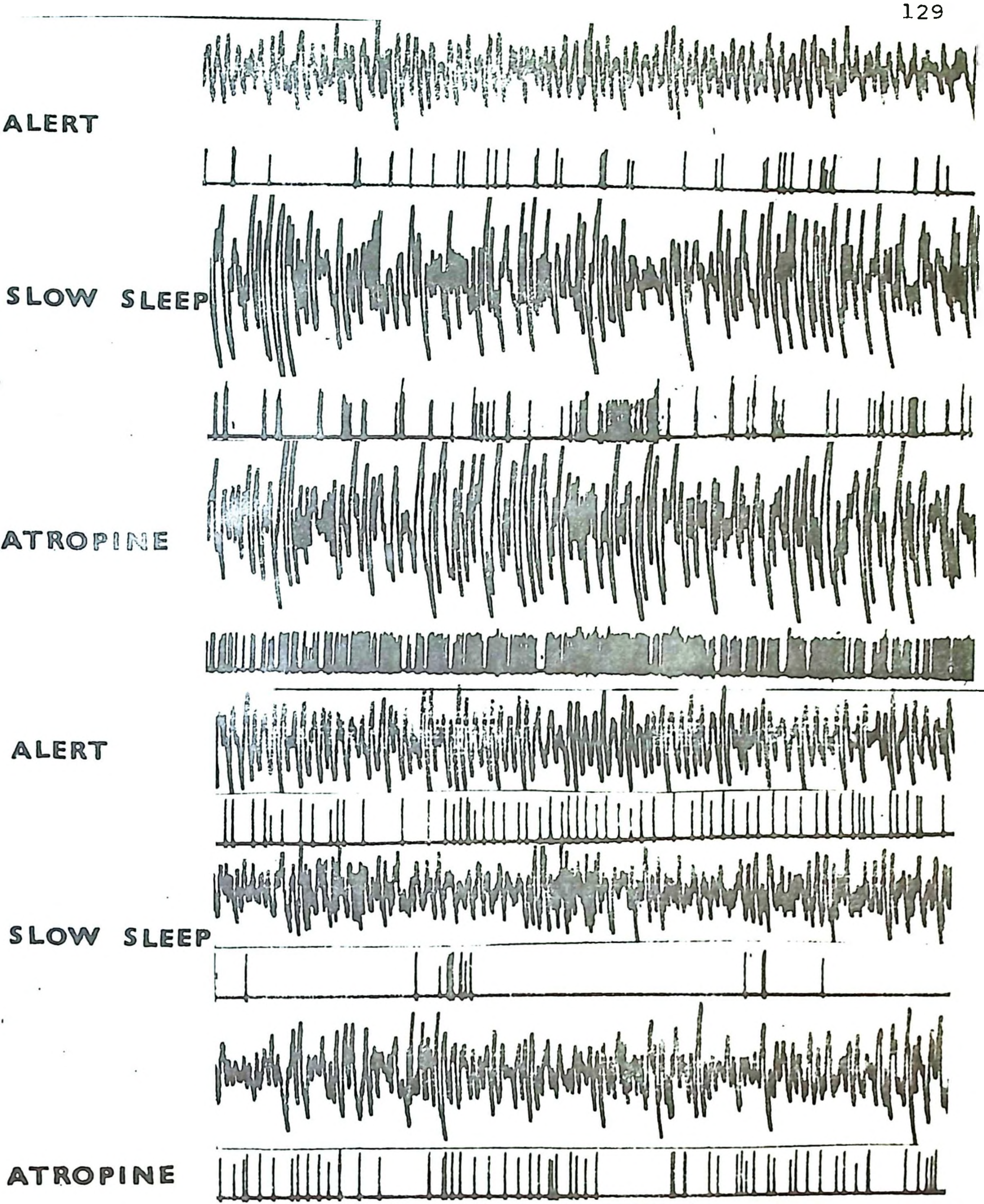

Figure 57. Rabbit 52-4 D. hippocampus (Top) and 49-5 tegmental reticular (Bottom). Cells in which the patterns were rated as dissimilar under slow sleep and atropine.

On the whole, then, as in the case of desynchronized sleep and conditions of movement, the majority of cells showed the same pattern and rate of response while slow waves were recorded from the EEG. However, in this case the cells which showed dissociation under the conditions of atropine and slow wave sleep did not appear to be concentrated in any particular structure.

Relationship of cell discharge to EEG waves. We have found some cells that are very closely related to theta activity; indeed, some are tied to specific components of the EEG wave. Theta, we have mentioned earlier, is particularly prominent in the rabbit brain, and appears to a degree even in slow wave sleep, as the power spectra from the previous experiment have indicated. We can see a very close relationship between a particular phase of the EEG wave and short bursts of spike activity in Figure 58; the top half of the figure was written on a faster time base.

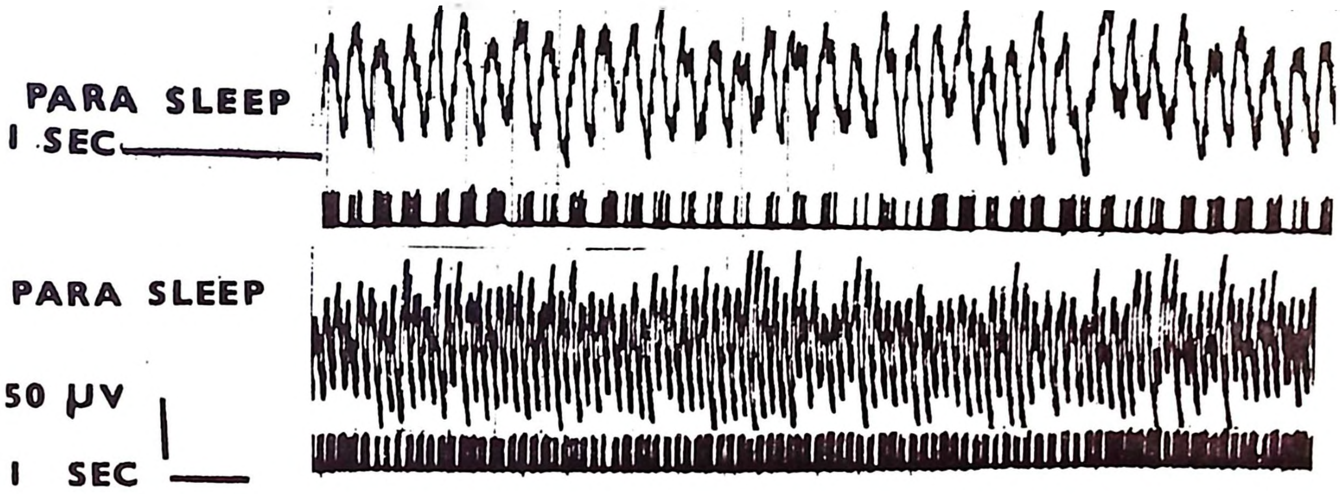

Figure 58. Cell firing that is closely related to a particular phase of the EEG wave.

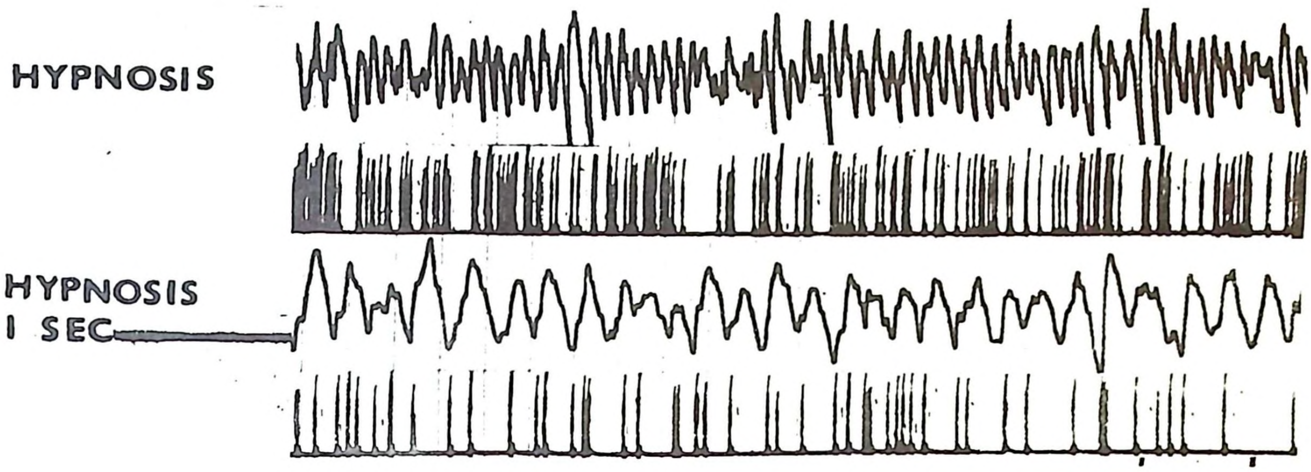

Figure 59. Cell firing related to a particular phase of the EEG wave. Cell 55-3.

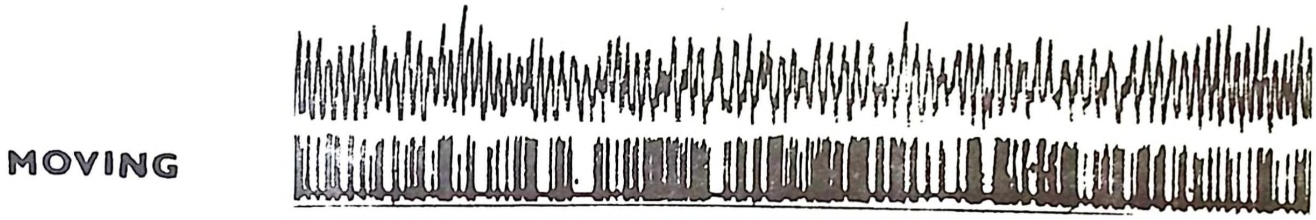

Figure 60. Anterior thalamic record, cell 43-12, related in burst activity to theta waves.

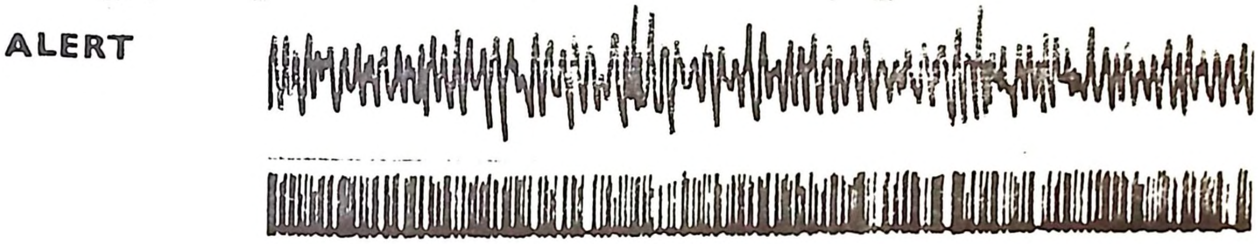

Figure 61. Tegmental reticular cell, 48-2, related in firing pattern to theta activity.

A close relationship between phase of the EEG wave and burst activity of the cell is also seen for another hippocampal cell in Figure 59. Some degree of relationship is also seen in an anterior thalamic record and a tegmental reticular cell record as well (Figures 60, 61).

Some cells did not fire to a particular phase of the EEG wave, but fired in a burst when a certain type of EEG activity occurred. For example, when rapid theta appeared on the EEG record for Rabbit 55, electrode 6, the cell from that electrode would fire in long bursts (Figure 62).

Special Observations. There were some response patterns observed which were considered interesting enough to bear special mention.

Rabbit 25, Cell 9, Dorsal hippocampus. This cell ceased firing whenever the animal was touched or stroked; it resumed firing when stimulation ceased. Unless the rabbit was touched in an unusually sensitive zone, such as the genitalia, adaptation would occur after a few strokes. The cell firing may have been tied to arousal or fast theta since occasionally it would cease to fire during head movements.

Rabbit 32, Cell 5, Medial thalamus. This animal on two different occasions, while it was being observed, chewed and swallowed food; the cell fired very rapidly during this activity. It did not fire, however, if he chewed at

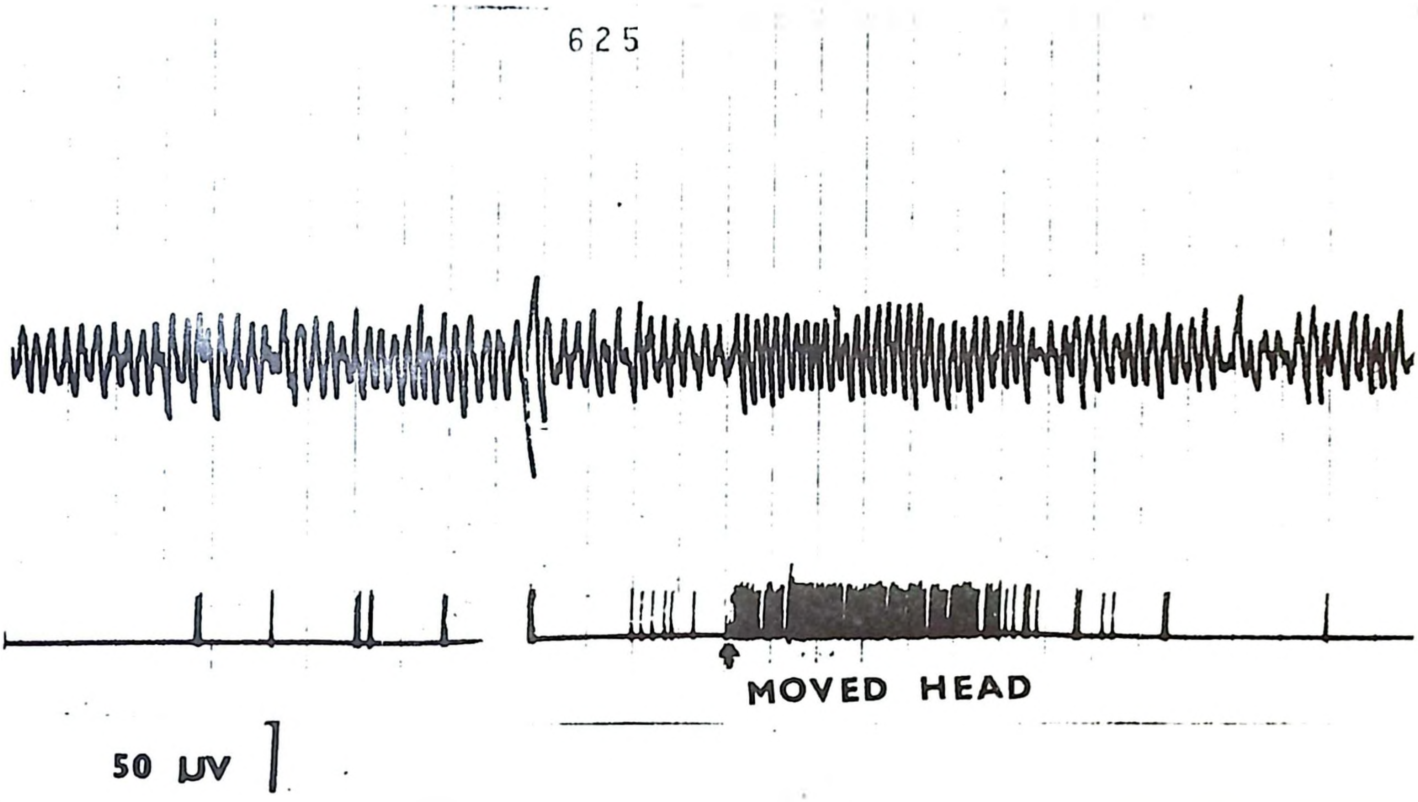

Figure 62. Hippocampal cell which fired during fast theta. Rabbit 55 Channel 6, Hippocampus

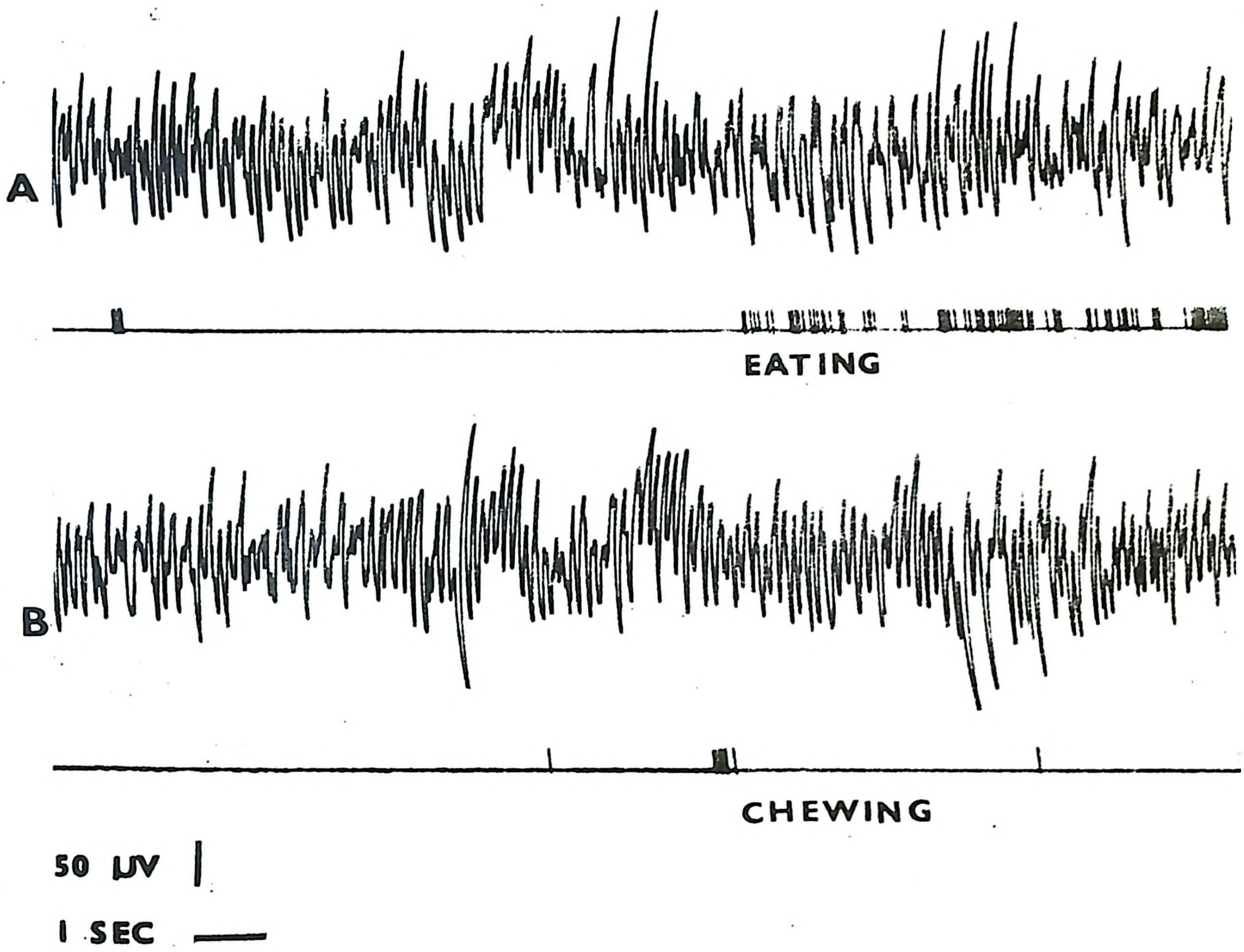

Figure 63.
Rabbit 32, Channel 5, Medial Thalamus

A. Eating (Chewing and swallowing food)

B. Chewing and pulling (with teeth) cardboard box his pasteboard box (Figure 63). Rates for standing alert were very low for this cell; moreover, it did not fire at all for the first 30 seconds of a hypnosis test.

Rabbit 50, Cell 5, Nucleus reticularis pontis. This was an extremely regular cell. During REM sleep, firing slowed and became irregularly distributed. When the animal awoke from REM sleep, the cell fired very rapidly, and then slowed to a normal waking rate.

Rabbit 51, Cell 7, Corpus callosum bordering hippocampous.

The firing pattern of this cell cannot be adequately described in terms of its average rate of discharge. In general, the alert, hypnosis, slow wave sleep and atropine conditions were characterized by short bursts of activity that were rather far apart in time. In the movement condition the bursts tended to be longer. In several sessions of REM sleep a similar pattern was observed; there would be no activity, then a long 8-9 second burst, then silence for a minute or more, and then possibly another long burst toward the end.

CHAPTER 5

Discussion

This study has examined hypnosis from the point of view of two of the most prevalent hypotheses concerning the nature of the phenomenon.

Paralysis of Terror Hypothesis. The first experiment showed that, while the hypothesis that animal immobilization may be due to some process related to fear might apply in the case of chickens, it clearly does not seem to be appropriate to explain the behaviour of rabbits, which, if anything, become more susceptible to hypnosis with repeated trials.

It is quite conceivable that if the rabbits were hypnotized daily for an indefinite period, they could possibly have become less susceptible to hypnosis. They were, however, tested several times a few months after this experiment, and all entered the state easily.

It is also possible that the particular test used in this experiment did not have enough range or sensitivity to demonstrate an adaptation by the rabbits. Perhaps a test in which it was rather difficult to hypnotize the rabbits, or a test in which they did not remain hypnotized for such a long period of time, would have been more appropriate. However, on occasion even with this test the animals did not hypnotize, and some did not stay in the trance for the full four minutes. A loss in duration of the trance should have manifested itself in a lessening of susceptibility to hypnosis.

These findings are in accord with those of Lieberson (1948) whose guinea pigs would go into longer and longer trances after training to hold a bizzare position. After seven days of training, the guinea pigs would still hold a bizzare position for several hours three months after the initial practice.

Whether these results mean that there is some other mechanism which applies across different species, or whether the implication is that different mechanisms are involved in producing the phenomenon in different species is, of course, not known at present, and must remain for future research to decide. In any case, what is clear is that the idea that hypnosis is a "paralysis of terror" has little generality, and cannot be invoked to cover the broad range of phenomena which some investigators (Gilman, Marcuse, & Moore, 1950) seem to feel it does.

Hypnosis as a sleep state--EEG study. When we consider the electrophysiological data which were obtained and which bear on the question of the relation of sleep and animal hypnosis, the situation is not clear. Perhaps the most striking feature of our data is that most of the records we obtained when the rabbit was in the hypnotized state resembled those records seen in the alert animal that was not moving, rather than those of a sleeping animal. Of course, slow waves did appear, and in some cases their development was so marked indeed that it was difficult to differentiate them from those observed in synchronized sleep. However, in the single cell experiment, in which we hoped to find out whether the cell firing during hypnosis was similar to that of sleep, or whether there was some pattern which was typical of the hypnotic state and was independent of the EEG, we had great difficulty in obtaining slow waves during the hypnotic state.

The dominant rhythm in the subcortical structures of the early hypnosis record was low frequency theta (usually 6 Hz) which was very similar to those obtained from an animal that was sitting alert. This pattern of slow theta persisted on occasion long after the onset of hypnosis--frequently 10 or more minutes after onset of the trance. This agrees with the reports of Van Reeth (1963), Gerebtzoff (1941), Klemm (1966), and Silva, et al (1959). All of these investigators have reported activated EEGs at one point or another during hypnosis; it appears from the data from this study that not only is the EEG activated, but it reflects records similar to those of a still animal that is very aroused.

In some cases, particularly in the sleep deprived animals, slow waves did develop which were similar to those waves occurring when the animals are drowsy, and these were followed by spindles. In fact, the animals would occasionally even show the EEG, EMG and rapid eye movements characteristic of desynchronized sleep while upside down in the hypnosis box. It is difficult to say whether the animals were still under hypnosis or whether the sleep states co-existed with the hypnotic state.

There is some evidence (though admittedly not conclusive) that the animals are indeed hypnotized throughout this period. We have noticed that the deprived rabbits which go into paradoxical sleep for several minutes (as opposed to short 10-15 second periods of such sleep) invariably wake up, look around, and usually groom and eat before going back into sleep again. The rabbits which were in prolonged hypnosis sessions did show an alert pattern on the EEG on coming out of desynchronized sleep, but they did not get out of the box. One could possibly argue, of course, that the animals awoke from desynchronized sleep, and immediately went back into hypnosis again. We did, however, find it very difficult to rouse the animals from the trance at the end of the prolonged session, that is, it was harder to arouse the deprived rabbit in hypnosis than the deprived rabbit in sleep. This suggests that more was involved in these prolonged hypnosis periods than merely sleep.

If the rabbits really were hypnotized when they gave these indications of paradoxical sleep during hypnosis (a result, incidentally, not previously reported by other investigators), this means that the rabbit's EEG can show indications of all stages of sleep during immobilization. In any case, we are sure that the rabbits (including the non-deprived ones) do show EEG signs which are similar to those of the animal in slow wave sleep, and to an alert animal which is not moving. This evidence, taken with the data from Klemm's laboratory (1966) which indicate that (after the injection of drugs) seizure activity can be recorded from many brain structures, especially the hippocampus, during hypnosis while no motor effects are observed (motor effects are seen if the animal is awake) suggest that the electrical activity of structures in the cortex, caudate nucleus, medial thalamus, hippocampus and reticular formation are not closely related to the immobilization. None the less, as Carli (unpublished experiments) has recently shown, spinal reflexes are inhibited during the hypnotic state. It is possible that this inhibition is mediated through lower brain stem structures.

Unit activity during hypnosis. The independence of the electrical activity of the higher brain centers and the hypnotic state is further borne out by the results from the microelectrode study. As it will be remembered, only rarely did slow waves develop on any of these records, despite the fact that the animals were under hypnosis on occasion for 20 minutes or more. The predominant activity again consisted of low frequency theta rhythms. This lack of development of slow waves is probably due to the fact that the animals were not handled nearly as much as the earlier animals. Consequently, the rabbits were probably more afraid when they were hypnotized and thus the EEG was activated.

The spontaneous activity of cells from nearly all sites in the brain that we sampled was very similar in rate and in pattern of activity to the alert condition. We did look more closely at those cells that fired in a different way under hypnosis than under the alert condition. Three of these cells were SM cortex cells, and two were septal cells. The burst pattern in the cortical cells was quite different under the two conditions; the septal cells fired much less often under hypnosis. This is much too small a sample from which to draw any definitive conclusions concerning the relation of hypnosis to the functions of these two areas; it is possible that both these areas are in some way connected with movement, since the septum is known to pace theta rhythms (Stumpf, 1962), and Vanderwolf (1968) has shown that theta is involved with voluntary movement. In addition, Vanderwolf has demonstrated that septal lesions affect inhibition of movement produced by lesions of the medial thalamus (1964).

However, even in the cases where units did show a change during hypnosis, we must be very cautious of an interpretation based solely on hypnosis effects. Particularly for cells in the motor cortex, one must remember that the rabbits were turned on their backs during hypnosis, and, hence, received different sensory stimulation. It was extremely difficult to control for this, however, because if the animal is inverted as a control for sensory stimulation, it immediately hypnotizes.

Pupillary behaviour. We have some indirect evidence that inhibition of the Edinger-Westphal nucleus is affected since peculiar changes were observed in the pupils of the rabbits and chickens. The pupils of the rabbits' eyes became constricted; the pupils of the chickens' eyes would rapidly dilate and constrict with the phasic contractions that occasionally came over the birds. Berlucci et al (1964) have demonstrated that pupils become constricted during synchronized sleep; the greater the synchronization the greater the constriction. Phasic dilatations and constrictions of the pupil occurred during paradoxical sleep. However, we were not able to photograph our rabbits' eyes during sleep.

EEG activity during sleep and wakefulness. The EEG from the various structures of the rabbit brain under normal conditions has been described in some detail by others (Stumpf, 1965; Monnier and Gangloff, 1956; Longo, 1961). The appearance of slow waves and spindles on the records during light sleep, the dominating presence of theta in subcortical areas, and the faster desynchronized activity in the cortical structures have all been described earlier and these findings have been supported in this study. We have, however, made some additional observations during wakefulness and sleep, and have been able to measure the EEG activity more precisely by spectral analysis.

We have found that there is a difference in the frequency of the theta rhythm, depending on whether the animal is sitting still, moving about, or entering paradoxical sleep. We have found the theta rhythms to be present in the subcortical areas to some degree, as indicated by power spectral analysis, in every stage of the rabbits' normal state that we sampled--even slow wave sleep. During slow wave sleep, of course, the written record is usually masked by the presence of large slow waves; however, a peak is usually seen to have developed in the theta region on the power spectral record.

There is a marked slowing of theta from 7-8 Hz to 5.5-6.5 Hz as the animal stops moving. The difference in theta frequency exhibited by an alert animal and a moving animal is usually 1.5 Hz and is occasionally 3 Hz. The association of theta with voluntary movement, and its frequency change while the animal is moving, have been noted by Vanderwolf and Heron (1964) and Vanderwolf (1968).

Vanderwolf's observations are based on recordings from the hippocampus and medial thalamus of the rat. He has found that there is a critical frequency of theta which is related to the "triggering" of movement. An asynchronous EEG record is usually recorded from the hippocampus of the alert rat which is not moving. As it prepares to move, low frequency theta appears; this theta increases in frequency until approximately 8 Hz, when the movement is "triggered," and may increase in frequency even more until the movement is completed. We have also found an increase in theta frequency with movement. The EEG shows considerable low frequency theta while the rabbit is sitting still; in a similar situation the records from a rat hippocampus would be asynchronous.

Long trains of theta rhythms are observed in subcortical structures, and particularly the hippocampus of the rabbit during paradoxical sleep; this also tends to be very rapid theta, as fast as, or faster than, the theta observed when the animal is moving about. Brown (1968), as well as others, have noticed a similar phenomenon in the cat.

We have found that there is a fairly large band of activity between 13-18 Hz which appears during REM sleep and is particularly prominent on the hippocampal records. This activity appears to have a frequency similar to that of the spindles which occur during slow wave sleep. From inspection of the records, it appears that the spindling activity is reduced in amplitude but becomes more continuous during REM sleep.

A number of investigators (Eidelberg et al, 1959; Monnier and Gangloff, 1956) have studied a faster desynchronous component in the rabbit hippocampus which appears to be independent of theta activity. Stumpf (1965) has investigated a 20-40 Hz component which is considerably faster than the band of activity in this study (13-18 Hz). Tokizane (1965), by means of a frequency analyzer, has demonstrated the prominence of activity in the 13-18 Hz range (his "I" range) during slow wave sleep which is contributed by the spindling activity. We have noted earlier the great differences in EEG activity between slow wave sleep and paradoxical sleep. If this activity during paradoxical sleep is actually the same activity which occurs in bursts of spindling, then this finding is of some interest, since it would be one form of EEG activity that is common to both these stages of sleep.

Unit activity during sleep and wakefulness. We have seen that the EEG records during paradoxical sleep resembled those from an animal which was awake and actively moving about. The unit activity from a variety of structures indicate that this is also true at a cellular level; we have found that activity, as indicated by rate, usually increased when the animal was moving or in REM sleep. Evarts (1965) has found that this is also true for cortical neurones; he observed that the states in which visual cortex cells fired most rapidly were occasions in which the animals were actively looking about or in paradoxical sleep. Hubel (1959), as well, has found rapid bursts of activity from cells in the visual cortex during REM sleep, and Huttenlocher (1961) has also reported that some cells in the reticular formation act in the same way. Investigators who have recorded the integrated unit activity from a large number of cells in various areas have reported similar findings with this measure of neuronal activity. Podvoll and Goodman (1967) have recorded multiple unit firing from reticular and thalamic sites and have found that such activity increases as the animal moves about or is in REM sleep.

The data clearly indicate that the brain is far from inactive while the animal is asleep. This is not too surprising, but what is surprising is that activity may be at its greatest during what behaviourally is the deepest stage of sleep.

All cells did not fire at these very rapid rates during REM sleep, however, and we have indicated that a few from various structures fired at their lowest rates during this condition. In fact, all cells from the pontine reticular, for example, fired at their lowest rates during this state, and so did two of the hippocampal cells.

It is interesting that, although two of the hippocampal cells fired in this way during REM sleep, six fired at their fastest rate during this sleep stage. Mink, Best, and Olds (1967), working with rats, have found that all of the hippocampal cells they sampled fired at their lowest rate during REM sleep, and have argued from this that the lack of firing probably contributes to a "clearing of reverberator memory processes thought to reside in that region." It is clear from our study that there are many diversified types of cells in the hippocampus and that these cells do not act uniformly across the conditions.

In a large number of cases, but by no means all, the firing rate was slowest during synchronized sleep. This was seen especially in the anterior and medial thalamus and tegmental reticular formation. This is exactly what Moruzzi (1964) would predict for cells from the classical activating pathways of the ascending reticular system through the thalamus. He suggests that units might be found in the synchronizing system of the brain stem which would be extremely active during light sleep while units in the activating system itself would be quiet. Unfortunately, no units were recorded from the vicinity of the solitary nucleus, where the synchronizing systems are proposed to exist, to test the other half of the hypothesis.

Evarts (1962) and Creudtzfeldt and Jung (1961) also report that many cortical cells have lower rates during light sleep; Evarts notes, however, that the greatest change occurs when one compares the cortical cell records of an animal that is looking about with the records from one that is in a synchronized sleep state. There is not much of a difference if the comparison is made with an awake animal with his eyes occluded. Frequently, however, the transition from waking to sleep states was marked by a tendency for the cells to fire in bursts. Verzeano and Calma (1954) also report a bursting of activity during synchronized sleep, especially when sleep spindles occur. This was also true for a large number of cells in our study.

An interval distribution is necessary to adequately demonstrate the change in burst pattern during synchronized sleep since, except for gross bursts, these changes cannot readily be seen on the polygraph record. There is sometimes an increase of doublet and triplet firing; that is, a cell might fire twice or three times in very rapid succession with long pauses between these short bursts; the polygraph pen usually cannot follow this adequately, though, of course, it can be seen on the oscilloscope. However, the appearance of relatively long bursts of firing during stages of sleep can easily be seen on the records; this, of course, is reflected in the increase in variance of the rates since in some cases there was an increase in the number of both long and short intervals.

Evarts (1965) has suggested that one effect on rate related to the onset of sleep is a reduction in the extremes of firing; that is, fast cells slow down in sleep and slow cells speed up. We have found this to be true as well for our neurones as a whole. This, however, is only a general trend; a number of cells did not behave in this way.

Unit firing during EEG and behavioural dissociation. There were, we have mentioned, cells that were more related to the EEG activity than to the level of behavioural arousal. These cells were of two types. The first type would fire in a particular pattern whenever a series of a certain kind of EEG wave appeared. The second type would fire to a specific aspect of the EEG, in this case a specific aspect of the theta wave.

One example of this first type was Cell 6 of Rabbit 55 which fired in bursts whenever rapid theta appeared on the record; another case was Cell 4 of Rabbit 44 which appeared to fire in some relation to the appearance of spindles. Then, there are those cells which fired in a particular pattern whenever slow waves appeared, such as Cell 12 of Rabbit 43. This cell would fire in a particular pattern, a pattern characterized by very infrequent firing of single spikes rather than frequent occurrences of bursts of spikes. This firing pattern would appear regardless of whether the slow waves were caused by natural sleep or by administration of atropine. Finally, there were those cells, which we also classed as Type 1, which fired in a similar manner when the animal was in paradoxical sleep or when it was moving. The EEG records for these two states have much the same dominating peak EEG rhythms. We have already mentioned that the rates of cell firing for paradoxical sleep and moving conditions tended to be similar. On the basis of the rate data, it would appear that a great many cells we examined fired with respect to the EEG state rather than to the behavioural state. However, the clearest indication of the dissociation mainfested by cell firing in the paradoxical sleep and moving states comes from the pattern data. A particularly good example is Cell 6 of Rabbit 55.

The cell firing recorded after administration of atropine, except for a few cases, was remarkably similar to that seen under synchronized sleep, despite the fact that the animals were alert. This is contrary to what one would expect from Podvoll and Goodman's (1967) findings with integrated multiple unit recordings; they found a direct relationship between the degree of behavioural arousal and the amount of integrated activity from reticular and thalamic areas even when the animals were administered atropine. This may be true for the particular areas of the thalamus and reticular formation which they selected, or possibly for total integrated activity from all cells near these areas, but it certainly is not generally true of most of the cells sampled in this study, and particularly those cells from the anterior thalamus, medial thalamus, and hippocampus. Certain cells in the hippocampus and reticular formation, however, did not behave in a similar fashion when the animal was in synchronized sleep or had been administered atropine.

Routenberg (1968) has proposed that there are two activating systems in the brain; the classic reticular system of Moruzzi and Magoun (1949) which he calls Arousal I and a limbic system, Arousal II, which consists chiefly of the Nauta limbic forebrain circuit (Nauta, 1958). He proposes that Arousal I is responsible for the slow wave activity seen during sleep and atropine dissociation, while Arousal II is perhaps responsible for manifestations of paradoxical sleep as well as the behavioural sleep seen in interruptions of the Nauta circuit, as, for example, in Feldman & Waller's experiments (1962).

If one accepts this proposal as a suitable model of the arousal systems in the brain, then a large number of the units sampled under slow wave sleep and atropine appear to belong to the Arousal I system since the behaviour of most cells under atropine was remarkably similar to that under sleep. There were exceptions, however, and these cells possibly belonged to a class of structures primarily concerned with the behavioural manifestations of sleep.

The best examples of the Type 2 cells, which fired to a specific aspect of the EEG wave, are Cell 7 of Rabbit

53 and Cell 3 of Rabbit 55. Both of these cells are hippocampal cells. Pestche and Stumpf (1962) have demonstrated similar firing patterns to these Type 2 cells from some units in the medial septum. The medial septum seems to be essential for theta production, since lesions at that area, or local cooling will abolish theta. The Type 2 cells in this study were from three areas, the hippocampus, anterior thalamus and pontine reticular. It is possible that the cells are firing as a result of the dramatic change in DC potential caused by the very large theta potentials (G. K. Smith, personal communication); it is also possible that these cells are pacing theta activity or contributing to its development in some other way. This, of course, is not to suggest that theta is an envelope of spikes.

Finding cells that burst in relation to theta waves in the pontine reticular was particularly interesting. It suggests that a considerable amount of rhythm in cell firing may be established in an ascending reticular structure well before the diagonal band of Broca, a structure which Petsche et al (1965) suggest is essential in transforming continuous streams of impulses from the reticular system to bursting patterns coincident with theta frequency.

Buchwald (1966) has examined multiple unit activity and concurrent EEG patterns from cortical and reticular areas and finds that the only case in which a correlation is found between the two measures is during the appearance of large amplitude rhythmic EEG waves. For the most part, the multiple unit activity and EEG activity varied independently of each other. The majority of investigators who monitor EEG with single cell firing find a similar lack of relationship. Li and Jasper (1953) report no relation in the firing pattern of their cortical cells and the concurrent EEG; neither does Hubel (1959). In most cases we found the same thing to be true; it was only in those areas which produced high voltage activity (either high voltage theta activity or slow wave activity) that we found a relationship between EEG and spike firing. However, we must point out that there was considerable high voltage theta in most of the areas that we recorded from, and most of the cells did not have this close relationship to the EEG waves.

Whatever the relationship between these firing patterns and theta may be, it is clear that these cells are following an EEG pattern rather than a behavioural state.

We did look at patterns of rate changes over conditions and found some cells that increased in rate with the degree of behavioural arousal (the extremes of this continuum being REM sleep and moving) and some that decreased; however, in most cases there was an interaction--a cell would be very active under REM sleep and moving--two behavioural states very different from one another--while it might be slow during the synchronized stage of sleep. Obviously, we cannot say that there is a direct relationship between the amount of firing and degree of behavioural arousal.

SUMMARY AND CONCLUSIONS

1. Chickens and rabbits were repetitively hypnotized to determine whether the hypnosis state could be solely caused by a fear reaction. It was found that the chickens became less susceptible to hypnosis while the rabbits continued to enter the state. The results do not support a "paralysis of terror" hypothesis for all species.
2. EEG, EMG, and single cell activity from various structures were examined during conditions of wakefulness and sleep and during animal hypnosis.
3. There was a shift in theta frequency with a change from the alert to the moving state. Theta appearing in desynchronized sleep was of a similar frequency to that appearing while the animal was moving.
4. A 13-18 Hz component appeared on records from several structures during synchronized and desynchronized sleep.
5. Cells fired most rapidly while the animal was actively moving about or in desynchronized sleep.
6. Most cells sampled from an alert animal which had been administered atropine fired in a pattern similar to that seen during synchronized sleep.
7. A number of cells fired to a certain aspect of the

EEG wave, or fired in a unique pattern whenever a train of certain EEG waves appeared.

8. It was found that the EEG and single cell activity from most brain structures during early hypnosis were very similar to those seen while the animal was alert, but not moving.

9. Slow waves and spindles occasionally developed during hypnosis, especially if the animal were sleep deprived. Paradoxical sleep patterns appeared on the prolonged hypnosis records of sleep deprived animals.

10. EMG activity disappeared from neck muscles and slightly decreased in orbital ridge muscles during hypnosis. The trance was also marked by a pupillary constriction.

11. It appears that animal hypnosis cannot be completely explained either as a "paralysis of terror" or as a sleep state. A suggestion is made that EEG patterns from a number of normal waking and sleep conditions can be seen in the cataleptic animal.

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APPENDIX

Table 1

Time in seconds under hypnosis over trials for chickens and rabbits

Day 1

Trial		1	2	3	4
Chicken	1	55	0	15	32
	2	48	0	20	45
	3	5	225	10	240
	4	240	90	10	10
	5	48	45	3	240
	6	0	10	240	16
	7	0	236	0	0
	8	68	0	240	240
	9	41	19	201	53
	10	159	7	221	37

Trial		1	2	3	4
Rabbit	1	20	6	2	20
	2	0	0	65	12
	3	36	3	45	7
	4	12	14	5	21
	5	7	2	240	3
	6	25	23	19	4
	7	15	20	115	26
	8	70	84	240	240
	9	14	30	24	33
	10	140	111	157	52

Day 2

Trial		1	2	3	4
Chicken	1	0	0	152	240
	2	5	6	0	12
	3	145	20	15	200
	4	15	14	240	240
	5	240	240	10	240
	6	0	0	32	178
	7	0	36	20	15
	8	38	44	38	165
	9	0	135	170	57
	10	32	240	240	202

Trial		1	2	3	4
Rabbit	1	4	72	140	15
	2	12	5	14	26
	3	70	47	44	20
	4	7	7	14	4
	5	15	21	11	5
	6	31	90	240	26
	7	7	3	110	45
	8	97	240	15	11
	9	12	15	38	5
	10	44	5	136	52

Table 1 (Continued)

Day 3

Trial		1	2	3	4
Chicken	1	21	36	240	20
	2	55	170	46	50
	3	40	16	47	5
	4	240	240	240	200
	5	25	240	240	240
	6	5	42	10	162
	7	0	31	91	24
	8	53	240	240	240
	9	64	92	220	240
	10	240	240	240	10

Trial		1	2	3	4
Rabbit	1	16	17	20	12
	2	7	3	3	15
	3	240	30	145	6
	4	55	20	15	127
	5	3	45	15	5
	6	128	0	34	238
	7	58	38	11	80
	8	80	240	120	25
	9	240	5	240	240
	10	124	240	240	240

Day 4

Trial		1	2	3	4
Chicken	1	240	240	240	126
	2	20	130	85	82
	3	130	5	110	225
	4	180	80	240	240
	5	210	240	240	180
	6	17	240	84	47
	7	11	11	4	8
	8	24	20	240	29
	9	20	21	230	26
	10	89	99	13	126

Trial		1	2	3	4
Rabbit	1	32	240	18	5
	2	5	5	45	15
	3	125	12	230	86
	4	73	5	15	80
	5	3	5	5	85
	6	89	24	92	31
	7	10	5	21	5
	8	18	27	7	23
	9	23	83	20	21
	10	103	77	57	12

Table 1 (Continued)

Day 5

Trial		1	2	3	4
Chicken	1	75	55	240	240
	2	145	120	56	78
	3	15	5	0	0
	4	240	240	240	240
	5	220	210	160	240
	6	20	5	185	240
	7	5	81	30	195
	8	36	152	172	23
	9	240	240	240	240
	10	20	181	201	240

Trial		1	2	3	4
Rabbit	1	50	12	3	33
	2	10	25	5	31
	3	123	105	55	64
	4	5	10	230	75
	5	10	26	12	20
	6	20	42	66	132
	7	5	5	11	27
	8	12	11	7	33
	9	22	148	83	41
	10	240	240	159	52

Day 6

Trial		1	2	3	4
Chicken	1	15	240	240	240
	2	34	30	44	122
	3	21	9	240	70
	4	240	240	240	10
	5	70	240	240	240
	6	22	5	42	240
	7	41	47	5	70
	8	5	240	240	240
	9	7	210	5	240
	10	0	72	240	5

Trial		1	2	3	4
Rabbit	1	5	16	10	50
	2	14	10	12	80
	3	75	181	20	120
	4	25	240	240	240
	5	10	15	40	12
	6	240	58	240	36
	7	18	120	5	124
	8	24	31	53	5
	9	27	110	28	17
	10	25	136	55	43

Table 1 (Continued)

Day 7

Trial		1	2	3	4
Chicken	1	56	240	240	240
	2	70	35	0	0
	3	0	0	3	6
	4	240	240	240	240
	5	240	52	240	240
	6	31	240	51	240
	7	60	0	0	0
	8	27	145	200	180
	9	10	5	60	15
	10	240	10	240	4

Trial		1	2	3	4
Rabbit	1	35	24	38	20
	2	20	88	8	26
	3	90	21	160	175
	4	240	110	240	240
	5	6	15	10	35
	6	30	240	240	24
	7	15	32	25	24
	8	29	35	55	15
	9	213	28	17	31
	10	129	65	44	54

Day 8

Trial		1	2	3	4
Chicken	1	19	205	240	240
	2	54	3	21	33
	3	3	4	0	0
	4	240	82	240	240
	5	230	240	240	235
	6	240	58	12	220
	7	0	0	0	0
	8	68	240	240	0
	9	6	98	5	5
	10	240	0	240	0

Trial		1	2	3	4
Rabbit	1	8	25	50	75
	2	31	15	4	50
	3	35	122	10	145
	4	20	122	240	240
	5	38	53	6	22
	6	240	240	20	55
	7	10	7	23	51
	8	131	45	10	34
	9	240	34	18	55
	10	35	140	97	70

Table 1 (Continued)

Day 9

Trial		1	2	3	4
Chicken	1	60	25	20	137
	2	3	11	44	93
	3	3	0	2	0
	4	240	240	240	240
	5	240	115	240	35
	6	240	175	115	180
	7	0	0	0	0
	8	0	0	240	240
	9	0	0	205	46
	10	165	120	166	151

Trial		1	2	3	4
Rabbit	1	18	45	10	20
	2	31	142	10	52
	3	30	67	24	12
	4	198	240	240	240
	5	13	20	75	86
	6	235	240	240	25
	7	48	5	36	29
	8	25	45	86	60
	9	15	240	30	90
	10	152	29	10	65

Day 10

Trial		1	2	3	4
Chicken	1	76	240	0	0
	2	15	0	98	0
	3	5	0	0	0
	4	176	240	240	25
	5	5	0	190	240
	6	240	240	240	240
	7	0	0	0	0
	8	80	240	35	0
	9	0	0	0	0
	10	168	168	0	230

Trial		1	2	3	4
Rabbit	1	55	77	56	10
	2	17	115	30	30
	3	42	44	20	20
	4	240	240	240	226
	5	16	142	22	88
	6	240	240	240	240
	7	18	45	17	26
	8	11	17	95	60
	9	55	240	90	29
	10	12	228	23	48

Table 1 (Continued)

Day 11

Trial		1	2	3	4
Chicken	1	222	240	208	200
	2	0	0	15	0
	3	0	0	0	0
	4	240	15	240	215
	5	0	18	0	11
	6	190	81	240	140
	7	0	30	35	0
	8	155	0	180	0
	9	0	0	0	0
	10	132	177	113	240

Trial		1	2	3	4
Rabbit	1	32	25	77	80
	2	26	32	12	175
	3	101	95	44	70
	4	240	96	240	240
	5	10	50	10	20
	6	25	240	240	240
	7	110	25	157	89
	8	33	12	35	20
	9	240	240	71	5
	10	170	25	97	38

Day 12

Trial		1	2	3	4
Chicken	1	126	15	240	94
	2	0	0	0	0
	3	12	0	40	0
	4	36	240	147	70
	5	33	24	0	240
	6	240	134	240	25
	7	0	93	0	0
	8	0	142	0	0
	9	0	0	0	0
	10	0	240	0	240

Trial		1	2	3	4
Rabbit	1	18	26	13	18
	2	25	47	30	37
	3	70	32	30	65
	4	240	206	240	240
	5	7	10	10	12
	6	240	240	240	114
	7	14	20	107	201
	8	12	67	17	48
	9	240	15	165	29
	10	126	48	45	23

Table 1 (Continued)

Day 13

Trial		1	2	3	4
Chicken	1	64	0	40	118
	2	0	0	0	0
	3	0	0	0	0
	4	240	240	0	240
	5	0	0	0	0
	6	109	240	154	0
	7	0	0	0	0
	8	46	0	0	0
	9	0	0	0	0
	10	5	188	90	240

Trial		1	2	3	4
Rabbit	1	65	29	48	32
	2	25	7	45	31
	3	160	142	135	90
	4	240	240	105	140
	5	81	10	12	12
	6	240	240	240	127
	7	143	68	66	129
	8	30	120	17	12
	9	240	49	36	63
	10	123	30	53	33

Day 14

Trial		1	2	3	4
Chicken	1	0	0	0	7
	2	0	0	0	0
	3	0	0	0	0
	4	240	240	240	240
	5	0	0	240	0
	6	205	143	240	150
	7	0	0	0	0
	8	0	73	0	181
	9	0	0	0	0
	10	0	240	240	168

Trial		1	2	3	4
Rabbit	1	130	61	20	67
	2	35	20	46	72
	3	20	95	100	10
	4	140	170	120	50
	5	20	45	20	10
	6	240	240	240	240
	7	20	240	25	20
	8	22	225	21	10
	9	240	225	15	20
	10	32	168	67	23

Table 1 (Continued)

Day 15

Trial		1	2	3	4
Chicken	1	0	0	35	0
	2	0	0	0	0
	3	10	120	0	0
	4	240	240	240	240
	5	20	240	0	240
	6	240	136	118	240
	7	0	0	173	0
	8	0	240	15	0
	9	0	0	0	0
	10	23	240	30	240

Trial		1	2	3	4
Rabbit	1	45	70	35	60
	2	25	17	5	82
	3	181	26	50	34
	4	240	183	62	155
	5	5	5	3	68
	6	240	240	145	205
	7	51	143	83	133
	8	107	65	53	40
	9	170	240	74	40
	10	52	137	6	66

Day 16

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	20	240	240	240
	5	240	0	0	0
	6	172	0	240	0
	7	0	0	0	0
	8	32	0	207	240
	9	0	0	0	0
	10	240	0	0	240

Trial		1	2	3	4
Rabbit	1	65	40	22	15
	2	25	33	15	35
	3	65	10	105	60
	4	40	90	240	55
	5	32	55	5	15
	6	240	240	240	240
	7	240	23	76	32
	8	77	25	24	44
	9	20	240	55	25
	10	192	41	95	61

Table 1 (Continued)

Day 17

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	9	0	0	0
	4	240	240	240	240
	5	0	240	0	0
	6	89	0	240	240
	7	0	0	0	0
	8	56	0	5	0
	9	0	0	0	0
	10	0	147	0	0

Trial		1	2	3	4
Rabbit	1	35	25	25	20
	2	57	17	66	71
	3	20	18	30	23
	4	150	39	49	20
	5	30	33	12	26
	6	240	240	240	165
	7	240	163	91	122
	8	108	25	119	12
	9	240	16	30	21
	10	141	75	72	126

Day 18

Trial		1	2	3	4
Chicken	1	0	0	12	0
	2	0	0	0	0
	3	0	0	0	0
	4	240	240	240	240
	5	0	0	0	0
	6	0	152	240	199
	7	0	0	0	0
	8	12	75	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	20	25	30	27
	2	52	5	71	20
	3	50	16	15	46
	4	240	25	42	40
	5	28	5	33	12
	6	240	240	218	20
	7	72	115	30	55
	8	163	30	96	20
	9	240	235	10	15
	10	158	193	82	56

Table 1 (Continued)

Day 19

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	31	0	0
	4	0	0	240	240
	5	0	0	0	30
	6	180	240	49	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	5	0	0	0

Trial		1	2	3	4
Rabbit	1	35	15	14	20
	2	78	12	77	39
	3	100	105	100	15
	4	97	66	75	76
	5	31	46	35	24
	6	190	240	240	218
	7	157	55	60	240
	8	23	18	18	13
	9	37	5	58	27
	10	181	42	65	20

Day 20

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	240	0
	5	0	0	0	0
	6	0	240	240	0
	7	0	0	0	0
	8	0	30	0	135
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	15	10	21	115
	2	78	230	5	15
	3	53	34	17	80
	4	240	60	29	12
	5	7	10	12	8
	6	240	240	24	240
	7	240	136	18	37
	8	200	20	18	37
	9	240	45	5	3
	10	56	91	41	63

Table 1 (Continued)

Day 21

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	50	0	0	0
	4	0	0	0	0
	5	0	0	0	0
	6	0	40	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	12	46	15	90
	2	15	54	112	55
	3	13	15	100	85
	4	105	93	151	180
	5	25	5	40	22
	6	240	52	240	42
	7	240	25	200	15
	8	37	36	15	67
	9	20	21	150	44
	10	64	52	138	135

Day 22

Trial		1	2	3	4
Chicken	1	0	0	0	3
	2	0	0	0	0
	3	240	240	0	0
	4	0	0	0	0
	5	0	0	0	240
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	25	20	60	7
	2	55	90	182	81
	3	17	13	19	48
	4	105	215	115	6
	5	17	10	11	13
	6	240	240	240	135
	7	177	117	167	18
	8	35	22	10	15
	9	240	90	91	117
	10	15	108	48	76

Table 1 (Continued)

Day 23

Trial		1	2	3	4
Chicken	1	0	240	0	0
	2	0	0	0	0
	3	0	70	0	240
	4	0	0	0	0
	5	240	0	240	0
	6	0	0	0	0
	7	0	0	0	0
	8	73	240	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	22	60	34	12
	2	12	16	225	60
	3	8	141	24	8
	4	10	40	190	10
	5	53	47	5	0
	6	240	240	240	240
	7	38	200	103	169
	8	18	12	10	11
	9	240	118	218	43
	10	55	68	45	61

Day 24

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	240	0
	4	240	0	0	240
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	22	0	0	30
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	240	112	61	5
	2	8	40	35	30
	3	35	35	110	38
	4	180	50	57	160
	5	23	30	57	19
	6	240	240	149	142
	7	240	240	45	40
	8	16	7	7	103
	9	240	115	57	15
	10	50	77	149	83

Table 1 (Continued)

Day 25

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	136	0	0
	4	0	0	0	0
	5	240	0	0	240
	6	0	0	0	0
	7	0	0	0	0
	8	7	16	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	30	25	115	30
	2	5	25	6	35
	3	240	10	82	12
	4	45	15	180	80
	5	55	16	85	12
	6	240	240	240	240
	7	240	225	105	228
	8	7	10	11	8
	9	225	218	60	15
	10	102	60	109	91

Day 26

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	5	10	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	77	56	62	23
	2	17	22	28	0
	3	30	35	10	240
	4	240	12	55	110
	5	5	32	91	15
	6	240	240	27	210
	7	240	175	193	55
	8	14	14	47	10
	9	240	33	225	25
	10	60	40	60	38

Table 1 (Continued)

Day 27

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	5	0	0	0	240
	6	0	0	0	0
	7	0	0	0	0
	8	0	165	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	104	17	17	50
	2	5	13	15	5
	3	10	240	36	43
	4	15	35	50	60
	5	60	5	5	12
	6	240	240	240	240
	7	10	200	130	161
	8	21	19	10	20
	9	240	35	46	16
	10	190	93	117	132

Day 28

Trial		1	2	3	4
Chicken	1	0	25	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	16
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	17	52	37	55
	2	17	18	30	18
	3	21	22	240	10
	4	35	12	10	30
	5	5	36	0	17
	6	240	240	170	84
	7	65	240	240	240
	8	45	25	24	17
	9	40	106	15	93
	10	120	107	35	60

Table 1 (Continued)

Day 29

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	240	240
	4	0	0	0	0
	5	240	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	5	100	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	42	93	32	33
	2	14	12	29	19
	3	49	135	75	235
	4	135	38	18	95
	5	8	48	13	0
	6	240	240	240	240
	7	92	11	42	200
	8	165	138	34	24
	9	240	91	114	30
	10	76	76	55	20

Day 30

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	240
	4	0	0	240	0
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	240	20	39	30
	2	38	36	31	25
	3	69	25	45	45
	4	15	15	240	240
	5	22	24	10	5
	6	240	240	240	202
	7	78	110	77	52
	8	13	25	15	240
	9	240	75	240	30
	10	44	55	67	30

Table 1 (Continued)

Day 31

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	20	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	12	100	85	25
	2	10	5	29	11
	3	10	25	25	20
	4	41	35	80	175
	5	240	18	10	21
	6	240	240	240	240
	7	187	85	117	68
	8	15	50	10	14
	9	15	240	240	73
	10	131	77	115	104

Day 32

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	240	0	0	240
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	31
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	76	70	70	5
	2	8	10	23	22
	3	32	240	15	40
	4	230	45	82	40
	5	6	5	10	25
	6	240	240	120	240
	7	93	185	180	25
	8	40	82	22	61
	9	38	240	240	120
	10	87	43	111	108

Table 1 (Continued)

Day 33

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	240	0
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	106
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	7	76	30	63
	2	5	5	15	24
	3	20	240	25	10
	4	50	240	20	86
	5	5	50	31	38
	6	240	240	240	240
	7	48	191	43	192
	8	17	24	16	37
	9	240	240	137	37
	10	90	67	151	40

Day 34

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	240
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	15	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	19	85	90	60
	2	18	5	25	6
	3	26	25	10	40
	4	240	50	145	35
	5	5	10	50	12
	6	240	240	240	150
	7	16	22	43	240
	8	15	27	83	47
	9	240	240	30	72
	10	93	35	62	168

Table 1 (Continued)

Day 35

Trial		1	2	3	4
Chicken	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	240
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0

Trial		1	2	3	4
Rabbit	1	84	75	30	17
	2	7	25	14	8
	3	30	19	5	65
	4	150	75	108	52
	5	60	7	0	5
	6	240	240	160	145
	7	240	141	240	196
	8	38	35	139	15
	9	240	26	139	207
	10	113	41	91	65

Table 2

Power Spectral Estimates, Rabbit 13, Dorsal Hippocampus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	2.4579	0.0115	1.3826	0.6148	1.6397	0.1208	0.000
0.500	1.5635	0.0231	0.8198	0.5865	1.2809	0.1879	0.500
1.000	0.7982	0.0329	0.3458	0.5051	0.9780	0.2820	1.000
1.500	0.7566	0.0455	0.2918	0.5320	1.0101	0.3526	1.500
2.000	0.7949	0.0585	0.2669	0.4964	0.8304	0.4129	2.000
2.500	0.7304	0.0659	0.2713	0.4051	0.5505	0.4417	2.500
3.000	0.5843	0.0739	0.2604	0.3727	0.4718	0.4192	3.000
3.500	0.5348	0.0732	0.2229	0.3647	0.5201	0.3809	3.500
4.000	0.4393	0.0655	0.2142	0.3401	0.4298	0.3188	4.000
4.500	0.3790	0.0765	0.1948	0.3023	0.3742	0.2685	4.500
5.000	0.4031	0.0966	0.1847	0.2770	0.3848	0.2804	5.000
5.500	0.4081	0.1089	0.1990	0.2720	0.3820	0.3081	5.500
6.000	0.3496	0.1032	0.2437	0.3282	0.4220	0.3578	6.000
6.500	0.3068	0.1309	0.2834	0.3889	0.3994	0.4232	6.500
7.000	0.3334	0.1520	0.3452	0.3406	0.3446	0.4033	7.000
7.500	0.3466	0.1499	0.4330	0.3263	0.3498	0.3031	7.500
8.000	0.3923	0.1368	0.4021	0.3272	0.3510	0.2249	8.000
8.500	0.4255	0.1316	0.2904	0.2958	0.3774	0.1690	8.500
9.000	0.3819	0.1135	0.2050	0.2679	0.4081	0.1333	9.000
9.500	0.3657	0.0997	0.1617	0.2520	0.3661	0.1541	9.500
10.000	0.4104	0.0921	0.1489	0.2366	0.3439	0.1880	10.000
10.500	0.4286	0.0883	0.1673	0.2704	0.3337	0.2058	10.500
11.000	0.3484	0.0810	0.1938	0.2858	0.3080	0.1691	11.000
11.500	0.2916	0.0887	0.1955	0.2724	0.2966	0.1210	11.500
12.000	0.2590	0.0760	0.1937	0.2927	0.2830	0.1051	12.000
12.500	0.2423	0.0660	0.2034	0.2994	0.2280	0.1185	12.500
13.000	0.2187	0.0725	0.1691	0.2752	0.1805	0.1136	13.000
13.500	0.1962	0.1050	0.1416	0.2381	0.1702	0.0932	13.500
14.000	0.1662	0.1093	0.1486	0.1951	0.1866	0.0853	14.000
14.500	0.1490	0.1091	0.1430	0.1964	0.2018	0.0811	14.500
15.000	0.1764	0.0956	0.1182	0.2125	0.1708	0.0743	15.000
15.500	0.1685	0.0935	0.1106	0.1994	0.1526	0.0654	15.500
16.000	0.1398	0.1004	0.1168	0.1768	0.1610	0.0588	16.000
16.500	0.1540	0.0972	0.1194	0.1407	0.1700	0.0481	16.500
17.000	0.1900	0.1114	0.1073	0.1274	0.1403	0.0427	17.000
17.500	0.2805	0.2472	0.2014	0.2342	0.1459	0.0545	17.500
18.000	0.2703	0.2615	0.2667	0.2911	0.1608	0.0629	18.000
18.500	0.1732	0.0979	0.1490	0.1878	0.1567	0.0480	18.500
19.000	0.1507	0.0657	0.1144	0.1385	0.1642	0.0416	19.000
19.500	0.1337	0.0533	0.1099	0.1245	0.1372	0.0333	19.500
20.000	0.1117	0.0445	0.0861	0.1214	0.1182	0.0317	20.000

Table 3

Power Spectral Estimates, Rabbit 13, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	1.4689	0.3013	0.7562	0.5375	0.6296	0.7078	0.000
0.500	3.4572	0.8335	1.1768	1.5365	1.6173	2.0371	0.500
1.000	5.9371	1.5042	2.3046	3.0761	3.0871	3.8207	1.000
1.500	6.9149	1.7926	3.3462	4.2735	3.3209	3.7489	1.500
2.000	7.4674	1.6979	3.2322	4.0575	2.8237	3.3751	2.000
2.500	6.5767	1.4023	2.1899	3.4990	2.6509	3.5732	2.500
3.000	4.2301	1.2554	1.5627	2.5754	2.6582	3.1901	3.000
3.500	2.7976	1.1546	1.7083	1.7864	3.5564	2.5080	3.500
4.000	2.4653	1.1194	2.0008	1.9434	3.2941	2.1885	4.000
4.500	2.3101	1.3249	2.2800	2.2650	2.9394	3.0862	4.500
5.000	2.7567	1.9409	2.9261	3.1234	3.9290	4.5607	5.000
5.500	3.0406	2.9707	3.5490	5.2860	4.8425	5.2634	5.500
6.000	2.6682	4.0354	4.2967	7.4536	5.0545	5.4968	6.000
6.500	2.1394	5.3303	6.0847	6.5170	4.8773	4.6393	6.500
7.000	2.1252	5.9395	8.4361	4.7539	4.4951	3.0533	7.000
7.500	2.4393	4.1000	9.6704	3.0944	3.5907	2.0363	7.500
8.000	2.7009	2.7655	7.8767	2.9994	2.7539	1.3376	8.000
8.500	2.2487	2.1838	4.1380	2.4359	1.9431	0.8955	8.500
9.000	1.8561	1.4616	1.4501	1.2116	1.1277	0.7320	9.000
9.500	1.9082	1.0363	0.9149	0.7475	0.5703	0.7218	9.500
10.000	1.9795	0.8518	0.6303	0.4941	0.4581	0.7264	10.000
10.500	1.6762	0.8479	0.4556	0.4579	0.4383	0.6564	10.500
11.000	1.2476	0.8454	0.4172	0.5313	0.4535	0.5642	11.000
11.500	0.9887	0.9794	0.4208	0.5186	0.4147	0.4630	11.500
12.000	0.8545	1.0345	0.3924	0.4338	0.4219	0.3713	12.000
12.500	0.7410	1.1288	0.4398	0.4191	0.3926	0.3554	12.500
13.000	0.6108	1.4394	0.4697	0.3902	0.3182	0.3068	13.000
13.500	0.4663	1.8510	0.4659	0.3298	0.2490	0.2935	13.500
14.000	0.3794	1.6347	0.4495	0.2728	0.2156	0.3273	14.000
14.500	0.3356	1.4207	0.4795	0.2407	0.1973	0.2987	14.500
15.000	0.3179	1.2416	0.4450	0.2345	0.1868	0.2302	15.000
15.500	0.2713	0.9733	0.4677	0.2253	0.1572	0.1989	15.500
16.000	0.2038	1.0255	0.4666	0.2443	0.1456	0.2048	16.000
16.500	0.1789	0.9198	0.4028	0.2072	0.1412	0.1788	16.500
17.000	0.1997	0.6485	0.3393	0.1557	0.1558	0.1535	17.000
17.500	0.1967	0.4623	0.2419	0.1616	0.1406	0.1357	17.500
18.000	0.2176	0.3657	0.1838	0.1664	0.1223	0.1262	18.000
18.500	0.1926	0.2815	0.1680	0.1239	0.1255	0.1181	18.500
19.000	0.1568	0.2744	0.1668	0.1106	0.1464	0.1149	19.000
19.500	0.1459	0.2471	0.2111	0.1269	0.1255	0.1327	19.500
20.000	0.1364	0.2460	0.2186	0.1310	0.1033	0.1416	20.000

Table 4

Power Spectral Estimates, Rabbit 14, Dorsal Hippocampus

Frequency (Hz)	Slow Sleep	REM Sleep	REM Sleep Under Hyp.	Awake Moving	Awake Still	Early Hyp..	Late Hyp	D.C. Potential	Frequency (Hz)
0.000	0.4499	0.0129	0.4742	0.9596	0.0078	0.0580	0.7708	0.0506	0.000
0.500	0.4809	0.0235	0.2971	0.5072	0.0252	0.0573	0.5365	0.0334	0.500
1.000	0.5903	0.0490	0.1621	0.2299	0.0638	0.0849	0.3721	0.0146	1.000
1.500	0.7013	0.0635	0.1648	0.2912	0.0878	0.1018	0.3529	0.0096	1.500
2.000	0.6052	0.0620	0.1609	0.2989	0.0989	0.1085	0.4029	0.0076	2.000
2.500	0.4985	0.0577	0.1542	0.3101	0.1074	0.1322	0.4393	0.0054	2.500
3.000	0.4524	0.0501	0.1258	0.3180	0.1045	0.1507	0.3673	0.0043	3.000
3.500	0.4055	0.0427	0.1065	0.2351	0.0963	0.1340	0.3004	0.0038	3.500
4.000	0.3148	0.0429	0.1347	0.1991	0.1031	0.1049	0.2535	0.0037	4.000
4.500	0.2512	0.0444	0.1463	0.1969	0.1229	0.0990	0.2319	0.0037	4.500
5.000	0.2325	0.0480	0.1594	0.2216	0.1647	0.1294	0.2290	0.0031	5.000
5.500	0.1872	0.0517	0.2465	0.3302	0.2157	0.1650	0.2977	0.0026	5.500
6.000	0.1413	0.0705	0.4137	0.4263	0.2176	0.1701	0.3412	0.0021	6.000
6.500	0.1262	0.0868	0.5259	0.4545	0.1863	0.2006	0.3214	0.0021	6.500
7.000	0.1171	0.1311	0.4762	0.5494	0.1472	0.1928	0.2696	0.0021	7.000
7.500	0.1015	0.2306	0.3270	0.5094	0.1286	0.1215	0.2137	0.0021	7.500
8.000	0.1066	0.3695	0.1531	0.3589	0.1119	0.0754	0.1576	0.0021	8.000
8.500	0.1058	0.5086	0.0764	0.2605	0.0666	0.0553	0.1182	0.0018	8.500
9.000	0.0770	0.5459	0.0711	0.1676	0.0326	0.0421	0.0954	0.0015	9.000
9.500	0.0578	0.3631	0.0801	0.1198	0.0257	0.0389	0.0771	0.0015	9.500
10.000	0.0651	0.1883	0.0808	0.0925	0.0201	0.0365	0.0771	0.0015	10.000
10.500	0.0639	0.1435	0.0727	0.0667	0.0192	0.0353	0.0773	0.0014	10.500
11.000	0.0494	0.1119	0.0552	0.0519	0.0180	0.0331	0.0818	0.0013	11.000
11.500	0.0458	0.0666	0.0494	0.0506	0.0189	0.0286	0.0714	0.0012	11.500
12.000	0.0395	0.0301	0.0513	0.0502	0.0169	0.0253	0.0601	0.0011	12.000
12.500	0.0340	0.0212	0.0445	0.0476	0.0151	0.0232	0.0568	0.0011	12.500
13.000	0.0294	0.0164	0.0369	0.0491	0.0129	0.0186	0.0526	0.0012	13.000
13.500	0.0284	0.0141	0.0438	0.0489	0.0163	0.0206	0.0491	0.0012	13.500
14.000	0.0280	0.0124	0.0510	0.0417	0.0164	0.0196	0.0495	0.0011	14.000
14.500	0.0257	0.0132	0.0490	0.0395	0.0161	0.0188	0.0479	0.0011	14.500
15.000	0.0279	0.0133	0.0476	0.0428	0.0145	0.0206	0.0464	0.0013	15.000
15.500	0.0304	0.0128	0.0489	0.0437	0.0147	0.0208	0.0462	0.0016	15.500
16.000	0.0701	0.0627	0.0570	0.0473	0.0323	0.0407	0.0669	0.0018	16.000
16.500	0.0901	0.1202	0.1008	0.0431	0.0986	0.0740	0.1108	0.0013	16.500
17.000	0.0386	0.0534	0.0933	0.0352	0.0792	0.0433	0.0815	0.0010	17.000
17.500	0.0237	0.0135	0.0461	0.0299	0.0193	0.0151	0.0375	0.0011	17.500
18.000	0.0230	0.0134	0.0392	0.0266	0.0138	0.0138	0.0281	0.0012	18.000
18.500	0.0180	0.0131	0.0336	0.0209	0.0101	0.0133	0.0268	0.0012	18.500
19.000	0.0142	0.0114	0.0283	0.0146	0.0091	0.0152	0.0298	0.0014	19.000
19.500	0.0148	0.0123	0.0270	0.0178	0.0083	0.0146	0.0248	0.0014	19.500
20.000	0.0143	0.0101	0.0339	0.0189	0.0086	0.0114	0.0230	0.0012	20.000

Table 5

Power Spectral Estimates, Rabbit 14, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	REM Sleep Under Hyp	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.6132	0.0245	0.0443	0.2310	0.0196	0.1759	0.0744	0.2106	0.000
0.500	0.7432	0.0536	0.1242	0.1535	0.0707	0.1513	0.2083	0.1140	0.500
1.000	1.0286	0.0980	0.2062	0.1155	0.2218	0.1679	0.5709	0.0423	1.000
1.500	1.2961	0.1118	0.1910	0.1360	0.3555	0.2160	0.8161	0.0355	1.500
2.000	1.3997	0.1018	0.1680	0.1587	0.3732	0.2475	0.7467	0.0286	2.000
2.500	1.1709	0.0890	0.1310	0.1808	0.3566	0.2570	0.5959	0.0237	2.500
3.000	0.9429	0.0901	0.1318	0.1596	0.3362	0.2536	0.5174	0.0181	3.000
3.500	0.6788	0.0825	0.1428	0.1272	0.2711	0.2057	0.3959	0.0163	3.500
4.000	0.4038	0.0822	0.1422	0.1063	0.2250	0.1714	0.3436	0.0155	4.000
4.500	0.3197	0.0803	0.1653	0.0972	0.2498	0.1903	0.3497	0.0121	4.500
5.000	0.3436	0.0643	0.2466	0.1168	0.3561	0.2959	0.3433	0.0108	5.000
5.500	0.3453	0.0482	0.4431	0.1505	0.5133	0.5352	0.3985	0.0124	5.500
6.000	0.2873	0.0674	0.7591	0.1701	0.6287	0.6412	0.5548	0.0126	6.000
6.500	0.2133	0.1036	1.0177	0.2035	0.6360	0.5967	0.5585	0.0109	6.500
7.000	0.1799	0.1634	1.0116	0.2394	0.4738	0.4539	0.4349	0.0102	7.000
7.500	0.1754	0.2587	0.6624	0.2069	0.3349	0.2792	0.2829	0.0091	7.500
8.000	0.1612	0.4256	0.2930	0.1581	0.2817	0.1644	0.1714	0.0084	8.000
8.500	0.1826	0.6160	0.1341	0.1177	0.1813	0.0931	0.1557	0.0085	8.500
9.000	0.1976	0.6687	0.0855	0.0703	0.1071	0.0705	0.1403	0.0085	9.000
9.500	0.1929	0.4853	0.0594	0.0448	0.0908	0.0696	0.1329	0.0063	9.500
10.000	0.2162	0.3324	0.0490	0.0413	0.0885	0.0587	0.1244	0.0049	10.000
10.500	0.1905	0.2661	0.0450	0.0347	0.0897	0.0482	0.1112	0.0053	10.500
11.000	0.1591	0.1793	0.0381	0.0263	0.0756	0.0490	0.0954	0.0050	11.000
11.500	0.1295	0.1126	0.0325	0.0223	0.0650	0.0450	0.0903	0.0053	11.500
12.000	0.1322	0.0611	0.0274	0.0218	0.0625	0.0382	0.0890	0.0054	12.000
12.500	0.1274	0.0456	0.0267	0.0206	0.0671	0.0366	0.0741	0.0055	12.500
13.000	0.0848	0.0317	0.0232	0.0157	0.0656	0.0381	0.0789	0.0055	13.000
13.500	0.0715	0.0260	0.0192	0.0138	0.0682	0.0383	0.1222	0.0053	13.500
14.000	0.0782	0.0240	0.0169	0.0183	0.0649	0.0368	0.1606	0.0048	14.000
14.500	0.0757	0.0269	0.0206	0.0309	0.0545	0.0343	0.1385	0.0048	14.500
15.000	0.0782	0.0282	0.0256	0.0352	0.0583	0.0377	0.0959	0.0052	15.000
15.500	0.0727	0.0344	0.0279	0.0437	0.0630	0.0373	0.0896	0.0051	15.500
16.000	0.0761	0.0696	0.0539	0.1144	0.0724	0.0897	0.1723	0.0051	16.000
16.500	0.0791	0.0971	0.1156	0.0944	0.1070	0.1277	0.2217	0.0051	16.500
17.000	0.0681	0.0929	0.0776	0.0333	0.0689	0.0595	0.1426	0.0046	17.000
17.500	0.0476	0.0919	0.0318	0.0331	0.0268	0.0281	0.1035	0.0041	17.500
18.000	0.0336	0.0794	0.0304	0.0192	0.0218	0.0253	0.0763	0.0039	18.000
18.500	0.0278	0.0589	0.0207	0.0121	0.0224	0.0215	0.0609	0.0045	18.500
19.000	0.0259	0.0464	0.0156	0.0123	0.0233	0.0166	0.0456	0.0046	19.000
19.500	0.0286	0.0385	0.0132	0.0144	0.0230	0.0144	0.0292	0.0044	19.500
20.000	0.0270	0.0315	0.0123	0.0147	0.0215	0.0139	0.0193	0.0040	20.000

Table 6

Power Spectral Estimates, Rabbit 14, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	REM Sleep	REM Sleep Under Hyp.	Awake Moving	Awake Still	Early Hyp.	Late Hyp	Frequency (Hz)
0.000	0.3611	0.0124	0.0134	1.4942	0.0150	0.0173	0.0238	0.000
0.500	0.1895	0.0227	0.0209	0.7494	0.0291	0.0277	0.0398	0.500
1.000	0.1392	0.0391	0.0339	0.1413	0.0506	0.0476	0.0752	1.000
1.500	0.2415	0.0462	0.0392	0.1052	0.0587	0.0582	0.1016	1.500
2.000	0.2199	0.0443	0.0335	0.0898	0.0600	0.0594	0.1254	2.000
2.500	0.1471	0.0341	0.0264	0.0553	0.0544	0.0598	0.1250	2.500
3.000	0.1138	0.0310	0.0294	0.0445	0.0499	0.0580	0.0976	3.000
3.500	0.1062	0.0292	0.0273	0.0366	0.0451	0.0479	0.0790	3.500
4.000	0.0813	0.0221	0.0182	0.0299	0.0337	0.0396	0.0699	4.000
4.500	0.0535	0.0176	0.0174	0.0255	0.0272	0.0368	0.0618	4.500
5.000	0.0415	0.0164	0.0195	0.0234	0.0215	0.0356	0.0633	5.000
5.500	0.0411	0.0153	0.0238	0.0239	0.0269	0.0281	0.0607	5.500
6.000	0.0476	0.0188	0.0231	0.0236	0.0375	0.0250	0.0543	6.000
6.500	0.0419	0.0193	0.0191	0.0201	0.0286	0.0275	0.0455	6.500
7.000	0.0297	0.0197	0.0157	0.0176	0.0201	0.0369	0.0406	7.000
7.500	0.0227	0.0173	0.0106	0.0162	0.0156	0.0343	0.0352	7.500
8.000	0.0225	0.0147	0.0089	0.0128	0.0153	0.0287	0.0318	8.000
8.500	0.0197	0.0139	0.0086	0.0103	0.0146	0.0198	0.0283	8.500
9.000	0.0171	0.0131	0.0068	0.0084	0.0124	0.0148	0.0305	9.000
9.500	0.0184	0.0108	0.0067	0.0075	0.0123	0.0132	0.0283	9.500
10.000	0.0183	0.0094	0.0088	0.0076	0.0135	0.0135	0.0262	10.000
10.500	0.0136	0.0096	0.0087	0.0087	0.0114	0.0114	0.0260	10.500
11.000	0.0123	0.0099	0.0089	0.0111	0.0099	0.0117	0.0212	11.000
11.500	0.0123	0.0082	0.0100	0.0099	0.0107	0.0095	0.0166	11.500
12.000	0.0119	0.0082	0.0079	0.0073	0.0120	0.0089	0.0166	12.000
12.500	0.0099	0.0065	0.0076	0.0067	0.0107	0.0070	0.0144	12.500
13.000	0.0097	0.0068	0.0088	0.0078	0.0111	0.0105	0.0161	13.000
13.500	0.0096	0.0054	0.0084	0.0096	0.0108	0.0089	0.0182	13.500
14.000	0.0116	0.0065	0.0093	0.0116	0.0090	0.0105	0.0247	14.000
14.500	0.0141	0.0084	0.0138	0.0152	0.0104	0.0213	0.0303	14.500
15.000	0.0175	0.0130	0.0230	0.0137	0.0147	0.0405	0.0361	15.000
15.500	0.0240	0.0157	0.0244	0.0307	0.0148	0.0406	0.0367	15.500
16.000	0.0818	0.0866	0.0908	0.0723	0.0561	0.1513	0.1592	16.000
16.500	0.0817	0.1247	0.1852	0.0529	0.0966	0.1907	0.2383	16.500
17.000	0.0219	0.0428	0.0883	0.0195	0.0407	0.0566	0.0765	17.000
17.500	0.0107	0.0141	0.0204	0.0126	0.0086	0.0291	0.0203	17.500
18.000	0.0077	0.0105	0.0212	0.0068	0.0085	0.0219	0.0227	18.000
18.500	0.0064	0.0059	0.0129	0.0042	0.0079	0.0094	0.0163	18.500
19.000	0.0053	0.0045	0.0080	0.0036	0.0058	0.0046	0.0074	19.000
19.500	0.0064	0.0052	0.0055	0.0035	0.0050	0.0055	0.0077	19.500
20.000	0.0045	0.0045	0.0049	0.0039	0.0047	0.0035	0.0063	20.000

Table 7

Power Spectral Estimates, Post Deprivation, Rabbit 14, Dorsal Hippocampus

Frequency (Hz)	Awake Still	Early Hypnosis	Late Hypnosis	D.C. Potential	Frequency (Hz)
0.000	0.0751	0.2784	0.5265	3.6307	0.000
0.500	0.1701	0.7054	0.7912	1.8065	0.500
1.000	0.3193	1.2410	0.9745	0.1983	1.000
1.500	0.4755	1.2050	1.1962	0.0396	1.500
2.000	0.6004	1.3022	1.5196	0.0198	2.000
2.500	0.6243	1.4948	2.4928	0.0132	2.500
3.000	0.5365	1.2470	2.6469	0.0094	3.000
3.500	0.4639	0.9120	1.2384	0.0074	3.500
4.000	0.3948	0.7581	0.6468	0.0049	4.000
4.500	0.4038	0.8756	0.5267	0.0044	4.500
5.000	0.4938	1.2516	0.5966	0.0033	5.000
5.500	0.5978	1.7576	0.7197	0.0030	5.500
6.000	0.7899	1.6670	0.7912	0.0023	6.000
6.500	0.9813	1.1916	0.8059	0.0023	6.500
7.000	0.7495	0.8061	0.7369	0.0018	7.000
7.500	0.4332	0.5304	0.5346	0.0018	7.500
8.000	0.2997	0.3561	0.3954	0.0014	8.000
8.500	0.2141	0.2933	0.3316	0.0015	8.500
9.000	0.2062	0.2855	0.2937	0.0013	9.000
9.500	0.1814	0.2363	0.2343	0.0012	9.500
10.000	0.1318	0.2175	0.1641	0.0010	10.000
10.500	0.1025	0.2273	0.1761	0.0011	10.500
11.000	0.0848	0.2171	0.1731	0.0010	11.000
11.500	0.0834	0.2325	0.1230	0.0010	11.500
12.000	0.0860	0.2415	0.1225	0.0008	12.000
12.500	0.0708	0.2170	0.1128	0.0008	12.500
13.000	0.0471	0.1769	0.1097	0.0007	13.000
13.500	0.0393	0.1555	0.1167	0.0008	13.500
14.000	0.0458	0.1762	0.0961	0.0007	14.000
14.500	0.0437	0.1770	0.0682	0.0007	14.500
15.000	0.0343	0.1687	0.0703	0.0006	15.000
15.500	0.0282	0.1511	0.0759	0.0006	15.500
16.000	0.0286	0.1916	0.0916	0.0006	16.000
16.500	0.0257	0.1879	0.1181	0.0006	16.500
17.000	0.0209	0.1031	0.1369	0.0006	17.000
17.500	0.0189	0.0747	0.1036	0.0006	17.500
18.000	0.0210	0.0658	0.0536	0.0006	18.000
18.500	0.0226	0.0623	0.0434	0.0007	18.500
19.000	0.0191	0.0493	0.0491	0.0009	19.000
19.500	0.0142	0.0350	0.0440	0.0012	19.500
20.000	0.0162	0.0241	0.0369	0.0008	20.000
					20.500

Table 8

Post Deprivation Hypnosis, Power Spectral Estimates, Rabbit 14, Medial Thalamus

Frequency (Hz)	Awake Still	Early Hypnosis	Late Hypnosis	Frequency (Hz)
0.000	0.1682	0.2101	0.4374	0.000
0.500	0.3851	0.4220	0.8521	0.500
1.000	0.6938	0.6403	1.3256	1.000
1.500	0.7814	0.7024	1.6588	1.500
2.000	0.7672	0.7401	1.8726	2.000
2.500	0.8356	0.7116	1.4632	2.500
3.000	0.8633	0.7225	1.0243	3.000
3.500	0.8251	0.6535	0.7500	3.500
4.000	0.6887	0.5066	0.6494	4.000
4.500	0.5425	0.4927	0.7075	4.500
5.000	0.8622	0.7603	0.9216	5.000
5.500	1.6155	1.6741	0.9877	5.500
6.000	2.0410	2.1060	0.6993	6.000
6.500	1.5949	1.4456	0.4859	6.500
7.000	0.8987	0.8036	0.4080	7.000
7.500	0.5727	0.4570	0.3332	7.500
8.000	0.3651	0.2990	0.2440	8.000
8.500	0.2313	0.2060	0.1843	8.500
9.000	0.1571	0.1708	0.1588	9.000
9.500	0.1198	0.1337	0.1552	9.500
10.000	0.1039	0.0970	0.1309	10.000
10.500	0.0807	0.0785	0.1135	10.500
11.000	0.0669	0.0748	0.1102	11.000
11.500	0.0720	0.0868	0.1135	11.500
12.000	0.0590	0.1095	0.1014	12.000
12.500	0.0528	0.1033	0.0995	12.500
13.000	0.0482	0.0904	0.1091	13.000
13.500	0.0436	0.0794	0.1213	13.500
14.000	0.0390	0.0715	0.1131	14.000
14.500	0.0389	0.0612	0.1303	14.500
15.000	0.0361	0.0510	0.1485	15.000
15.500	0.0330	0.0474	0.1871	15.500
16.000	0.0313	0.0504	0.2067	16.000
16.500	0.0316	0.0515	0.7193	16.500
17.000	0.0300	0.0498	1.2375	17.000
17.500	0.0361	0.0390	0.5111	17.500
18.000	0.0413	0.0305	0.1024	18.000
18.500	0.0294	0.0289	0.1100	18.500
19.000	0.0190	0.0307	0.1065	19.000
19.500	0.0188	0.0254	0.0947	19.500
20.000	0.0215	0.0236	0.0947	20.000

Table 9

Power Spectral Estimates, Post Deprivation, Rabbit 14, S-M Cortex

Frequency (Hz)	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.7392	1.0052	1.0105	0.000
0.500	0.9627	1.9089	1.9838	0.500
1.000	1.3383	2.4826	3.3488	1.000
1.500	1.7654	2.8365	4.4363	1.500
2.000	1.9862	3.3534	4.8456	2.000
2.500	1.3776	2.9725	3.7636	2.500
3.000	0.8475	2.4572	2.6324	3.000
3.500	0.7179	1.9101	2.4262	3.500
4.000	0.8234	1.8165	2.1867	4.000
4.500	0.8791	1.7258	2.0022	4.500
5.000	0.9271	1.3433	2.0016	5.000
5.500	0.9747	1.4170	1.7175	5.500
6.000	0.8806	1.6178	1.5519	6.000
6.500	0.6916	1.3959	1.4745	6.500
7.000	0.5805	1.5880	1.1359	7.000
7.500	0.4844	1.8124	1.0598	7.500
8.000	0.3277	1.2587	1.0780	8.000
8.500	0.2560	0.7960	1.0612	8.500
9.000	0.2130	0.8374	0.9278	9.000
9.500	0.2115	0.8355	0.8290	9.500
10.000	0.1936	0.8508	1.0735	10.000
10.500	0.1611	1.0558	1.1089	10.500
11.000	0.1527	1.1223	0.9581	11.000
11.500	0.1446	1.0258	0.8280	11.500
12.000	0.1575	0.9725	0.8697	12.000
12.500	0.1496	1.0338	0.9991	12.500
13.000	0.1431	0.8867	0.8646	13.000
13.500	0.1250	0.8412	0.7891	13.500
14.000	0.1271	0.8948	0.8414	14.000
14.500	0.1562	0.8465	0.9392	14.500
15.000	0.2079	0.9045	0.8161	15.000
15.500	0.2020	0.8393	0.7692	15.500
16.000	0.1580	0.6973	0.7402	16.000
16.500	0.5199	1.0895	1.1038	16.500
17.000	1.2929	1.4151	1.3238	17.000
17.500	0.8015	0.6917	0.5467	17.500
18.000	0.1583	0.3158	0.2662	18.000
18.500	0.1210	0.2665	0.2219	18.500
19.000	0.1048	0.1825	0.1993	19.000
19.500	0.1083	0.1576	0.1714	19.500
20.000	0.0872	0.1450	0.1406	20.000

Table .

Power Spectral Estimates, Rabbit 16, Hippocampus(Dentate)

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.0693	0.0705	0.0800	0.1367	0.1623	0.1024	0.000
0.500	0.0570	0.0459	0.0597	0.1101	0.1448	0.1038	0.500
1.000	0.0723	0.0274	0.0847	0.0929	0.1623	0.1713	1.000
1.500	0.1194	0.0289	0.1220	0.0906	0.2143	0.2634	1.500
2.000	0.1550	0.0288	0.1417	0.0858	0.2234	0.2416	2.000
2.500	0.1641	0.0288	0.1433	0.0783	0.2050	0.1778	2.500
3.000	0.1364	0.0271	0.1276	0.0616	0.1681	0.1576	3.000
3.500	0.1014	0.0260	0.0960	0.0461	0.1283	0.1714	3.500
4.000	0.0889	0.0236	0.0880	0.0450	0.1284	0.2234	4.000
4.500	0.0797	0.0214	0.0921	0.0654	0.1388	0.2431	4.500
5.000	0.0752	0.0218	0.1224	0.0844	0.1738	0.2506	5.000
5.500	0.0783	0.0239	0.1719	0.1145	0.2829	0.3550	5.500
6.000	0.0776	0.0312	0.3738	0.1468	0.5499	0.5286	6.000
6.500	0.0673	0.0521	0.6502	0.1241	0.7332	0.5769	6.500
7.000	0.0554	0.0893	0.7750	0.0842	0.5330	0.4723	7.000
7.500	0.0444	0.1225	0.6993	0.0650	0.2154	0.3246	7.500
8.000	0.0298	0.1498	0.5500	0.0486	0.0816	0.1673	8.000
8.500	0.0185	0.1286	0.4718	0.0289	0.0611	0.0789	8.500
9.000	0.0165	0.0767	0.2366	0.0192	0.0461	0.0542	9.000
9.500	0.0187	0.0404	0.0695	0.0174	0.0343	0.0431	9.500
10.000	0.0176	0.0194	0.0381	0.0151	0.0326	0.0317	10.000
10.500	0.0165	0.0126	0.0334	0.0114	0.0311	0.0309	10.500
11.000	0.0180	0.0090	0.0246	0.0103	0.0244	0.0274	11.000
11.500	0.0146	0.0077	0.0220	0.0107	0.0239	0.0234	11.500
12.000	0.0108	0.0075	0.0201	0.0104	0.0207	0.0212	12.000
12.500	0.0093	0.0067	0.0180	0.0080	0.0152	0.0189	12.500
13.000	0.0065	0.0058	0.0146	0.0073	0.0152	0.0155	13.000
13.500	0.0054	0.0053	0.0163	0.0065	0.0170	0.0135	13.500
14.000	0.0046	0.0053	0.0142	0.0053	0.0145	0.0128	14.000
14.500	0.0047	0.0066	0.0117	0.0043	0.0118	0.0123	14.500
15.000	0.0053	0.0057	0.0097	0.0045	0.0101	0.0102	15.000
15.500	0.0057	0.0057	0.0103	0.0042	0.0094	0.0088	15.500
16.000	0.0056	0.0063	0.0112	0.0036	0.0077	0.0072	16.000
16.500	0.0050	0.0073	0.0146	0.0033	0.0076	0.0063	16.500
17.000	0.0044	0.0063	0.0131	0.0036	0.0072	0.0076	17.000
17.500	0.0039	0.0057	0.0123	0.0039	0.0068	0.0085	17.500
18.000	0.0034	0.0052	0.0116	0.0037	0.0059	0.0084	18.000
18.500	0.0035	0.0044	0.0105	0.0030	0.0064	0.0089	18.500
19.000	0.0036	0.0043	0.0096	0.0029	0.0064	0.0083	19.000
19.500	0.0031	0.0039	0.0091	0.0030	0.0070	0.0064	19.500
20.000	0.0029	0.0034	0.0076	0.0034	0.0061	0.0068	20.000

Table 11

Power Spectral Estimates, Rabbit 16, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake. Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.2257	0.4511	0.3861	0.8266	0.9584	0.9271	0.000
0.500	0.3118	0.3668	0.2040	0.7566	0.7117	0.7183	0.500
1.000	0.7526	0.3773	0.0555	0.8415	0.4211	0.4044	1.000
1.500	1.3358	0.4416	0.0598	0.9555	0.2689	0.1946	1.500
2.000	1.6279	0.3981	0.0902	0.8877	0.1453	0.0819	2.000
2.500	1.7213	0.3605	0.1120	0.7784	0.0712	0.0468	2.500
3.000	1.7430	0.3303	0.1241	0.6142	0.0400	0.0379	3.000
3.500	1.2748	0.2689	0.1227	0.5078	0.0315	0.0263	3.500
4.000	0.7680	0.2493	0.0836	0.5143	0.0303	0.0208	4.000
4.500	0.6450	0.2542	0.0437	0.5956	0.0282	0.0277	4.500
5.000	0.8079	0.2761	0.0334	0.6983	0.0301	0.0355	5.000
5.500	0.8431	0.3047	0.0385	1.1741	0.0458	0.0554	5.500
6.000	0.7739	0.4028	0.0683	1.5188	0.0944	0.0921	6.000
6.500	0.6514	0.6260	0.1280	1.2207	0.1403	0.1095	6.500
7.000	0.5044	0.9029	0.1661	0.9286	0.1076	0.0943	7.000
7.500	0.4045	1.1900	0.1527	0.8340	0.0443	0.0597	7.500
8.000	0.3626	1.4204	0.1457	0.6033	0.0175	0.0307	8.000
8.500	0.3185	1.1544	0.1372	0.3368	0.0136	0.0170	8.500
9.000	0.2959	0.6770	0.0733	0.2227	0.0118	0.0131	9.000
9.500	0.3064	0.3657	0.0259	0.1728	0.0088	0.0106	9.500
10.000	0.3455	0.1743	0.0176	0.1372	0.0071	0.0082	10.000
10.500	0.3115	0.1084	0.0190	0.1079	0.0074	0.0072	10.500
11.000	0.3012	0.0864	0.0175	0.1209	0.0065	0.0068	11.000
11.500	0.3022	0.0776	0.0159	0.1159	0.0072	0.0061	11.500
12.000	0.2751	0.0827	0.0149	0.0972	0.0083	0.0057	12.000
12.500	0.2308	0.0857	0.0116	0.0770	0.0079	0.0056	12.500
13.000	0.1998	0.0765	0.0089	0.0747	0.0059	0.0052	13.000
13.500	0.2069	0.0769	0.0097	0.0728	0.0045	0.0052	13.500
14.000	0.1865	0.0861	0.0093	0.0639	0.0043	0.0057	14.000
14.500	0.1667	0.0973	0.0076	0.0525	0.0044	0.0057	14.500
15.000	0.1464	0.1056	0.0068	0.0500	0.0047	0.0051	15.000
15.500	0.1401	0.1100	0.0071	0.0479	0.0039	0.0043	15.500
16.000	0.1448	0.1139	0.0074	0.0504	0.0032	0.0035	16.000
16.500	0.1393	0.1042	0.0077	0.0495	0.0039	0.0027	16.500
17.000	0.1244	0.0871	0.0068	0.0456	0.0041	0.0026	17.000
17.500	0.1348	0.0750	0.0058	0.0396	0.0033	0.0027	17.500
18.000	0.1420	0.0679	0.0053	0.0343	0.0029	0.0026	18.000
18.500	0.1027	0.0589	0.0054	0.0300	0.0028	0.0031	18.500
19.000	0.0687	0.0461	0.0055	0.0254	0.0030	0.0028	19.000
19.500	0.0566	0.0407	0.0055	0.0222	0.0030	0.0028	19.500
20.000	0.0391	0.0347	0.0057	0.0188	0.0025	0.0026	20.000

Table 12

Power Spectral Estimates, Rabbit 16, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.4491	0.1095	0.3669	0.2600	0.4851	0.2962	0.000
0.500	0.4627	0.1543	1.1093	0.3113	0.5498	0.3402	0.500
1.000	0.4811	0.2979	2.1592	0.5052	0.6425	0.3821	1.000
1.500	0.4743	0.4278	2.4014	0.6202	0.6414	0.4402	1.500
2.000	0.4829	0.5072	2.2035	0.5374	0.5246	0.4930	2.000
2.500	0.4132	0.4378	1.9583	0.4399	0.3987	0.4515	2.500
3.000	0.2946	0.2810	1.7362	0.3895	0.3877	0.4252	3.000
3.500	0.2554	0.2574	1.8672	0.3292	0.3483	0.4132	3.500
4.000	0.2560	0.2572	1.6539	0.2437	0.2626	0.3059	4.000
4.500	0.2426	0.2469	1.0232	0.2024	0.2302	0.2400	4.500
5.000	0.1703	0.2202	0.8164	0.1840	0.2186	0.2011	5.000
5.500	0.1199	0.1802	0.7570	0.1379	0.1754	0.1906	5.500
6.000	0.1160	0.1468	0.6901	0.1135	0.1607	0.1954	6.000
6.500	0.1173	0.1177	0.5690	0.1038	0.1699	0.1808	6.500
7.000	0.1129	0.1170	0.4923	0.0885	0.1337	0.1421	7.000
7.500	0.1083	0.1128	0.6976	0.0804	0.0902	0.1140	7.500
8.000	0.0941	0.0987	0.7255	0.0816	0.0709	0.1035	8.000
8.500	0.0739	0.0923	0.4842	0.0752	0.0694	0.0957	8.500
9.000	0.0693	0.0756	0.4891	0.0726	0.0650	0.0863	9.000
9.500	0.0709	0.0600	0.5046	0.0600	0.0529	0.0731	9.500
10.000	0.0691	0.0440	0.4212	0.0496	0.0478	0.0689	10.000
10.500	0.0612	0.0379	0.3417	0.0418	0.0544	0.0650	10.500
11.000	0.0492	0.0395	0.2957	0.0395	0.0600	0.0518	11.000
11.500	0.0473	0.0404	0.2819	0.0354	0.0555	0.0419	11.500
12.000	0.0458	0.0429	0.3324	0.0322	0.0524	0.0399	12.000
12.500	0.0425	0.0421	0.2618	0.0320	0.0428	0.0416	12.500
13.000	0.0388	0.0332	0.1769	0.0356	0.0400	0.0400	13.000
13.500	0.0400	0.0289	0.1798	0.0348	0.0452	0.0400	13.500
14.000	0.0328	0.0249	0.1921	0.0301	0.0411	0.0369	14.000
14.500	0.0279	0.0220	0.1638	0.0254	0.0411	0.0357	14.500
15.000	0.0374	0.0253	0.1302	0.0283	0.0505	0.0471	15.000
15.500	0.0610	0.0283	0.1288	0.0325	0.0641	0.0764	15.500
16.000	0.0529	0.0358	0.1200	0.0405	0.0525	0.0661	16.000
16.500	0.0339	0.0525	0.0968	0.0514	0.0360	0.0342	16.500
17.000	0.0286	0.0458	0.0800	0.0363	0.0322	0.0238	17.000
17.500	0.0290	0.0328	0.0647	0.0254	0.0265	0.0215	17.500
18.000	0.0323	0.0284	0.0649	0.0265	0.0279	0.0237	18.000
18.500	0.0271	0.0272	0.0601	0.0270	0.0286	0.0243	18.500
19.000	0.0234	0.0233	0.0565	0.0235	0.0292	0.0250	19.000
19.500	0.0274	0.0225	0.0539	0.0194	0.0247	0.0242	19.500
20.000	0.0283	0.0230	0.0540	0.0174	0.0223	0.0258	20.000

Power Spectral Estimates, Rabbit 19, Dorsal Hippocampus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.0828	0.0459	0.1776	0.1269	0.0259	0.0396	0.2564	0.000
0.500	0.1511	0.0764	0.3797	0.1047	0.0923	0.1221	0.1761	0.500
1.000	0.2921	0.0991	0.6062	0.1123	0.2086	0.2854	0.0684	1.000
1.500	0.3616	0.0905	0.4572	0.1396	0.2260	0.3542	0.0254	1.500
2.000	0.3011	0.0626	0.2242	0.1385	0.1998	0.3072	0.0163	2.000
2.500	0.2428	0.0437	0.1635	0.1189	0.1634	0.2949	0.0111	2.500
3.000	0.1995	0.0439	0.1889	0.0808	0.1254	0.2804	0.0082	3.000
3.500	0.1691	0.0435	0.1859	0.0796	0.1484	0.1959	0.0073	3.500
4.000	0.1616	0.0394	0.1502	0.1103	0.1923	0.1485	0.0063	4.000
4.500	0.1615	0.0367	0.1446	0.1824	0.2051	0.1853	0.0051	4.500
5.000	0.1797	0.0385	0.1926	0.3839	0.2436	0.2361	0.0038	5.000
5.500	0.2318	0.0533	0.2573	0.5732	0.3025	0.2930	0.0035	5.500
6.000	0.2657	0.1178	0.3366	0.4198	0.3298	0.3413	0.0029	6.000
6.500	0.2348	0.3098	0.4788	0.2740	0.2717	0.3275	0.0025	6.500
7.000	0.1539	0.7481	0.6047	0.3050	0.1994	0.2746	0.0023	7.000
7.500	0.1015	1.0641	0.5497	0.3494	0.1446	0.2197	0.0021	7.500
8.000	0.0912	0.8041	0.3636	0.3106	0.0996	0.1478	0.0019	8.000
8.500	0.0773	0.4848	0.2170	0.1869	0.0768	0.0940	0.0018	8.500
9.000	0.0644	0.2957	0.1498	0.1094	0.0633	0.0911	0.0018	9.000
9.500	0.0541	0.1721	0.1155	0.0729	0.0515	0.0796	0.0016	9.500
10.000	0.0491	0.1348	0.0998	0.0742	0.0476	0.0698	0.0015	10.000
10.500	0.0486	0.1102	0.1021	0.0800	0.0487	0.0608	0.0019	10.500
11.000	0.0697	0.1032	0.1600	0.1086	0.0501	0.0676	0.0021	11.000
11.500	0.0635	0.0806	0.1361	0.1060	0.0372	0.0617	0.0018	11.500
12.000	0.0363	0.0458	0.0514	0.0569	0.0276	0.0403	0.0018	12.000
12.500	0.0280	0.0462	0.0364	0.0355	0.0277	0.0304	0.0017	12.500
13.000	0.0291	0.0668	0.0352	0.0334	0.0214	0.0294	0.0014	13.000
13.500	0.0280	0.0873	0.0373	0.0314	0.0155	0.0266	0.0014	13.500
14.000	0.0204	0.1182	0.0324	0.0320	0.0139	0.0208	0.0014	14.000
14.500	0.0217	0.1336	0.0291	0.0362	0.0156	0.0210	0.0012	14.500
15.000	0.0208	0.1242	0.0269	0.0427	0.0163	0.0221	0.0012	15.000
15.500	0.0211	0.1085	0.0263	0.0498	0.0165	0.0192	0.0014	15.500
16.000	0.0240	0.0995	0.0292	0.0556	0.0212	0.0235	0.0013	16.000
16.500	0.0183	0.0742	0.0291	0.0498	0.0166	0.0232	0.0012	16.500
17.000	0.0144	0.0475	0.0175	0.0372	0.0119	0.0141	0.0012	17.000
17.500	0.0147	0.0412	0.0168	0.0278	0.0107	0.0102	0.0011	17.500
18.000	0.0119	0.0304	0.0169	0.0154	0.0126	0.0105	0.0012	18.000
18.500	0.0108	0.0265	0.0176	0.0146	0.0129	0.0123	0.0015	18.500
19.000	0.0100	0.0250	0.0157	0.0154	0.0106	0.0119	0.0018	19.000
19.500	0.0095	0.0241	0.0142	0.0126	0.0095	0.0099	0.0016	19.500
20.000	0.0077	0.0251	0.0130	0.0111	0.0084	0.0103	0.0012	20.000

Table 14

Power Spectral Estimates, Rabbit 19, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.8793	0.1935	0.1078	1.4645	0.1154	0.1582	0.0349	0.000
0.500	1.7365	0.2263	0.1834	1.0151	0.2219	0.3445	0.0236	0.500
1.000	3.2387	0.2868	0.2609	0.6545	0.3173	0.8062	0.0117	1.000
1.500	3.6613	0.3283	0.2418	0.5285	0.3145	1.3226	0.0079	1.500
2.000	3.3044	0.2747	0.4072	0.4211	0.2692	1.4487	0.0064	2.000
2.500	2.9879	0.2294	0.6928	0.3806	0.2821	1.2492	0.0059	2.500
3.000	2.4474	0.2224	0.7785	0.3441	0.5618	1.0932	0.0048	3.000
3.500	1.8256	0.2042	0.5718	0.3212	0.9876	0.8822	0.0040	3.500
4.000	1.3117	0.1795	0.3852	0.3014	0.7306	0.6306	0.0040	4.000
4.500	1.1017	0.1517	0.2810	0.3383	0.3434	0.5808	0.0035	4.500
5.000	0.8480	0.1217	0.2305	0.5251	0.2831	0.6367	0.0031	5.000
5.500	0.7102	0.1154	0.2509	0.6696	0.4064	0.6085	0.0032	5.500
6.000	0.7540	0.1917	0.2930	0.4753	0.6461	0.6597	0.0027	6.000
6.500	0.6876	0.5188	0.3605	0.2878	0.6384	0.6197	0.0024	6.500
7.000	0.5159	0.7995	0.4004	0.2542	0.4273	0.4921	0.0022	7.000
7.500	0.4512	0.6537	0.3392	0.2461	0.2705	0.4101	0.0021	7.500
8.000	0.3878	0.3789	0.2058	0.2089	0.1648	0.3318	0.0020	8.000
8.500	0.2952	0.1621	0.1330	0.1286	0.1058	0.2293	0.0021	8.500
9.000	0.2955	0.0697	0.1102	0.0862	0.0794	0.1859	0.0020	9.000
9.500	0.3779	0.0451	0.0905	0.0710	0.0587	0.1691	0.0017	9.500
10.000	0.4829	0.0413	0.0718	0.0716	0.0459	0.1618	0.0018	10.000
10.500	0.4462	0.0398	0.0574	0.0626	0.0404	0.1783	0.0016	10.500
11.000	0.3515	0.0353	0.0443	0.0627	0.0378	0.1922	0.0016	11.000
11.500	0.2508	0.0380	0.0363	0.0571	0.0361	0.1849	0.0017	11.500
12.000	0.1784	0.0401	0.0318	0.0412	0.0316	0.1732	0.0015	12.000
12.500	0.2194	0.0444	0.0326	0.0354	0.0238	0.1314	0.0013	12.500
13.000	0.2717	0.0710	0.0314	0.0381	0.0222	0.1174	0.0014	13.000
13.500	0.2700	0.1067	0.0291	0.0359	0.0233	0.1302	0.0013	13.500
14.000	0.2579	0.1183	0.0254	0.0391	0.0224	0.0988	0.0014	14.000
14.500	0.2166	0.0950	0.0291	0.0388	0.0226	0.0820	0.0014	14.500
15.000	0.2002	0.0793	0.0255	0.0383	0.0233	0.0945	0.0013	15.000
15.500	0.2168	0.0722	0.0215	0.0380	0.0196	0.0890	0.0014	15.500
16.000	0.2248	0.0592	0.0208	0.0320	0.0170	0.0756	0.0015	16.000
16.500	0.1943	0.0412	0.0185	0.0327	0.0144	0.0828	0.0015	16.500
17.000	0.1398	0.0376	0.0156	0.0333	0.0146	0.0932	0.0015	17.000
17.500	0.1031	0.0329	0.0162	0.0264	0.0159	0.0841	0.0015	17.500
18.000	0.0935	0.0291	0.0161	0.0220	0.0152	0.0572	0.0013	18.000
18.500	0.0937	0.0314	0.0160	0.0206	0.0128	0.0374	0.0013	18.500
19.000	0.0874	0.0323	0.0133	0.0181	0.0124	0.0285	0.0011	19.000
19.500	0.0688	0.0236	0.0125	0.0171	0.0116	0.0232	0.0013	19.500
20.000	0.0496	0.0216	0.0129	0.0174	0.0104	0.0216	0.0015	20.000

Table 15

Power Spectral Estimates, Rabbit 19, Sensori-Motor Cortex

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.5157	0.1152	0.3093	1.1751	0.1350	0.1524	0.000
0.500	1.2601	0.1489	0.4808	2.0602	0.1407	0.2137	0.500
1.000	1.9070	0.1458	0.5897	2.3468	0.1655	0.2964	1.000
1.500	1.7644	0.1205	0.4885	1.0531	0.1665	0.3492	1.500
2.000	1.6211	0.0925	0.4876	0.3986	0.1416	0.4250	2.000
2.500	1.4815	0.0732	0.5997	0.3177	0.1381	0.5743	2.500
3.000	0.9852	0.0655	0.5222	0.3275	0.1504	0.5220	3.000
3.500	0.5479	0.0553	0.2986	0.4883	0.1328	0.3147	3.500
4.000	0.4719	0.0488	0.1491	0.3846	0.1300	0.1861	4.000
4.500	0.4012	0.0431	0.1015	0.1805	0.2164	0.1319	4.500
5.000	0.2690	0.0405	0.0830	0.1164	0.1897	0.1038	5.000
5.500	0.2167	0.0346	0.0582	0.0878	0.0812	0.0815	5.500
6.000	0.2288	0.0323	0.0428	0.0969	0.0500	0.0657	6.000
6.500	0.2207	0.0514	0.0409	0.0975	0.0376	0.0608	6.500
7.000	0.1651	0.0572	0.0369	0.0844	0.0315	0.0644	7.000
7.500	0.1154	0.0376	0.0318	0.0655	0.0260	0.0591	7.500
8.000	0.1025	0.0244	0.0237	0.0570	0.0251	0.0494	8.000
8.500	0.0819	0.0168	0.0197	0.0400	0.0227	0.0375	8.500
9.000	0.0652	0.0115	0.0177	0.0280	0.0199	0.0296	9.000
9.500	0.0546	0.0088	0.0137	0.0302	0.0168	0.0241	9.500
10.000	0.0549	0.0082	0.0137	0.0272	0.0178	0.0204	10.000
10.500	0.0439	0.0080	0.0115	0.0212	0.0159	0.0206	10.500
11.000	0.0376	0.0073	0.0092	0.0224	0.0102	0.0201	11.000
11.500	0.0461	0.0061	0.0095	0.0220	0.0091	0.0163	11.500
12.000	0.0468	0.0059	0.0097	0.0177	0.0110	0.0142	12.000
12.500	0.0349	0.0061	0.0083	0.0150	0.0099	0.0155	12.500
13.000	0.0366	0.0064	0.0088	0.0179	0.0080	0.0157	13.000
13.500	0.0389	0.0063	0.0076	0.0157	0.0071	0.0144	13.500
14.000	0.0363	0.0059	0.0061	0.0115	0.0078	0.0142	14.000
14.500	0.0357	0.0048	0.0064	0.0118	0.0070	0.0169	14.500
15.000	0.0306	0.0042	0.0061	0.0123	0.0067	0.0163	15.000
15.500	0.0244	0.0065	0.0063	0.0104	0.0082	0.0134	15.500
16.000	0.0236	0.0086	0.0086	0.0106	0.0087	0.0138	16.000
16.500	0.0231	0.0055	0.0071	0.0113	0.0067	0.0119	16.500
17.000	0.0192	0.0044	0.0048	0.0092	0.0059	0.0102	17.000
17.500	0.0137	0.0038	0.0039	0.0067	0.0049	0.0088	17.500
18.000	0.0122	0.0035	0.0040	0.0062	0.0046	0.0069	18.000
18.500	0.0117	0.0035	0.0036	0.0075	0.0047	0.0073	18.500
19.000	0.0117	0.0035	0.0033	0.0088	0.0053	0.0076	19.000
19.500	0.0087	0.0032	0.0034	0.0077	0.0055	0.0073	19.500
20.000	0.0065	0.0033	0.0034	0.0071	0.0050	0.0058	20.000

Table 16

Power Spectral Estimates, Post Deprivation, Rabbit 19, Dorsal Hippocampus

Frequency (Hz)	Awake Still	Early Hypnosis	Late Hypnosis	Frequency (Hz)
0.000	0.6527	0.2808	0.1572	0.000
0.500	0.7340	0.4978	0.3738	0.500
1.000	0.9168	0.6962	0.7377	1.000
1.500	0.9611	0.7852	0.8532	1.500
2.000	0.7720	0.7563	0.7092	2.000
2.500	0.5905	0.6470	0.6176	2.500
3.000	0.4564	0.5063	0.5788	3.000
3.500	0.4207	0.4102	0.4711	3.500
4.000	0.5363	0.3846	0.4889	4.000
4.500	0.7197	0.5081	0.6032	4.500
5.000	1.4169	0.8915	0.8007	5.000
5.500	1.9005	1.2578	0.9724	5.500
6.000	1.7469	1.0003	1.0064	6.000
6.500	1.3996	0.5330	0.8672	6.500
7.000	1.0012	0.3573	0.4927	7.000
7.500	0.6276	0.2803	0.2777	7.500
8.000	0.3337	0.1905	0.2132	8.000
8.500	0.2321	0.1386	0.1827	8.500
9.000	0.1843	0.1307	0.1515	9.000
9.500	0.1348	0.0903	0.1441	9.500
10.000	0.1110	0.0700	0.1276	10.000
10.500	0.1099	0.0654	0.1086	10.500
11.000	0.0911	0.0642	0.0995	11.000
11.500	0.0898	0.0514	0.0787	11.500
12.000	0.0896	0.0499	0.0727	12.000
12.500	0.0763	0.0541	0.0747	12.500
13.000	0.0566	0.0520	0.0656	13.000
13.500	0.0534	0.0460	0.0513	13.500
14.000	0.0516	0.0430	0.0458	14.000
14.500	0.0527	0.0383	0.0446	14.500
15.000	0.0531	0.0378	0.0462	15.000
15.500	0.0525	0.0325	0.0431	15.500
16.000	0.0586	0.0353	0.0425	16.000
16.500	0.0566	0.0354	0.0416	16.500
17.000	0.0430	0.0351	0.0450	17.000
17.500	0.0471	0.0326	0.0432	17.500
18.000	0.0824	0.0729	0.0847	18.000
18.500	0.1039	0.1079	0.1234	18.500
19.000	0.0913	0.1083	0.1004	19.000
19.500	0.0650	0.0739	0.0623	19.500
20.000	0.0389	0.0306	0.0263	20.000

Table 17

Power Spectral Estimates, Post Deprivation, Rabbit 19, Medial Thalamus

Frequency (Hz)	Awake Still	Early Hypnosis	Late Hypnosis	Frequency (Hz)
0.000	1.3732	1.1000	0.8312	0.000
0.500	1.6098	1.8429	1.5394	0.500
1.000	1.8075	2.2127	2.5841	1.000
1.500	1.7703	1.7452	2.6577	1.500
2.000	1.5090	1.3136	2.1907	2.000
2.500	0.9762	0.9918	1.8038	2.500
3.000	1.0806	0.9553	1.5657	3.000
3.500	2.2945	1.7417	1.6743	3.500
4.000	2.3855	1.6582	1.7035	4.000
4.500	1.7905	1.1822	1.6118	4.500
5.000	2.4922	2.0281	1.8306	5.000
5.500	2.9138	3.6006	1.9546	5.500
6.000	2.9299	2.9784	1.8101	6.000
6.500	2.6277	1.4038	1.3809	6.500
7.000	1.9699	1.0944	1.2409	7.000
7.500	1.1122	0.9202	1.0549	7.500
8.000	0.5934	0.4344	0.6514	8.000
8.500	0.4351	0.2724	0.4967	8.500
9.000	0.3186	0.2266	0.3368	9.000
9.500	0.2121	0.1624	0.2604	9.500
10.000	0.1856	0.1462	0.2702	10.000
10.500	0.1758	0.1670	0.2468	10.500
11.000	0.1313	0.1656	0.1843	11.000
11.500	0.1369	0.1359	0.1672	11.500
12.000	0.1478	0.1256	0.1485	12.000
12.500	0.1561	0.0905	0.1254	12.500
13.000	0.1411	0.0759	0.1012	13.000
13.500	0.1093	0.0753	0.0996	13.500
14.000	0.0834	0.0763	0.1006	14.000
14.500	0.0705	0.0622	0.1097	14.500
15.000	0.0590	0.0643	0.0834	15.000
15.500	0.0630	0.0591	0.0774	15.500
16.000	0.0613	0.0509	0.0908	16.000
16.500	0.0671	0.0501	0.0891	16.500
17.000	0.0606	0.0588	0.0973	17.000
17.500	0.0539	0.0500	0.0827	17.500
18.000	0.0518	0.0634	0.0725	18.000
18.500	0.0518	0.0619	0.0658	18.500
19.000	0.0529	0.0443	0.0448	19.000
19.500	0.0491	0.0355	0.0419	19.500
20.000	0.0443	0.0300	0.0396	20.000

Table 18

Power Spectral Estimates,Post Deprivation, Rabbit 19, S-M Cortex

Frequency (Hz)	Awake Still	Early Hypnosis	Late Hypnosis	Frequency (Hz)
0.000	0.3457	0.3176	0.8516	0.000
0.500	0.7425	0.5543	1.1453	0.500
1.000	1.6917	0.7139	1.3990	1.000
1.500	2.1221	0.5861	1.1559	1.500
2.000	1.7939	0.5506	0.9456	2.000
2.500	1.6056	0.5367	0.9663	2.500
3.000	1.6006	0.5712	1.0056	3.000
3.500	1.9801	0.8969	1.3516	3.500
4.000	1.9641	0.7576	1.2804	4.000
4.500	1.3213	0.5054	0.8249	4.500
5.000	0.9501	0.7947	0.7926	5.000
5.500	1.0219	1.3737	0.9672	5.500
6.000	1.0270	1.2672	1.1132	6.000
6.500	0.8306	0.7838	0.9993	6.500
7.000	0.8382	0.5928	0.8600	7.000
7.500	0.7601	0.5187	0.6438	7.500
8.000	0.6837	0.4346	0.5509	8.000
8.500	0.6822	0.3801	0.5582	8.500
9.000	0.5809	0.3092	0.4788	9.000
9.500	0.5143	0.2378	0.3845	9.500
10.000	0.4898	0.2818	0.3295	10.000
10.500	0.4375	0.2691	0.2922	10.500
11.000	0.4676	0.2453	0.3122	11.000
11.500	0.6670	0.2006	0.3591	11.500
12.000	0.5563	0.1793	0.3843	12.000
12.500	0.3997	0.1857	0.3694	12.500
13.000	0.4544	0.2193	0.3830	13.000
13.500	0.6743	0.2008	0.3357	13.500
14.000	0.7836	0.2255	0.3342	14.000
14.500	0.4816	0.2238	0.3016	14.500
15.000	0.3161	0.2367	0.3164	15.000
15.500	0.2826	0.2222	0.3355	15.500
16.000	0.2647	0.1990	0.3492	16.000
16.500	0.2998	0.1984	0.3400	16.500
17.000	0.3584	0.3304	0.3926	17.000
17.500	0.3457	0.3903	0.4217	17.500
18.000	0.6342	0.6926	0.8125	18.000
18.500	0.6939	0.7062	0.8459	18.500
19.000	0.4314	0.3442	0.4722	19.000
19.500	0.3153	0.2432	0.4008	19.500
20.000	0.2386	0.1901	0.3536	20.000

Table 19

Power Spectral Estimates, Rabbit 21, Hippocampus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	REM Under Hyp.	Frequency (Hz)
0.000	0.6215	0.1572	0.0364	0.4699	0.1542	0.0648	0.0380	0.000
0.500	0.9845	0.2943	0.1000	0.7357	0.1710	0.1906	0.0604	0.500
1.000	1.5655	0.4624	0.2600	1.7220	0.5901	0.5747	0.1337	1.000
1.500	2.2613	0.4397	0.4232	2.2041	1.4444	0.9756	0.1711	1.500
2.000	2.3373	0.4375	0.6016	1.3603	1.5831	1.4539	0.2747	2.000
2.500	1.7401	0.5310	0.7915	0.8996	1.1211	1.5390	0.3170	2.500
3.000	1.3337	0.4978	0.8847	0.7963	0.9625	1.2062	0.2890	3.000
3.500	1.2838	0.4520	1.0157	0.9183	1.1492	1.0394	0.2863	3.500
4.000	1.5437	0.6645	1.1369	1.2190	1.4070	1.2978	0.3517	4.000
4.500	1.5591	0.8943	1.4636	1.4953	1.9144	1.7404	0.3540	4.500
5.000	1.5351	1.1489	1.9995	1.9868	3.0653	1.6356	0.4758	5.000
5.500	1.6304	1.4260	2.3109	3.0207	3.3691	1.3077	0.6233	5.500
6.000	1.4480	1.5518	2.2829	3.5765	2.4132	1.2640	1.1821	6.000
6.500	1.3537	2.4210	2.9186	3.7595	1.5250	1.4954	2.5046	6.500
7.000	1.3223	3.6739	3.8215	3.1183	1.2892	1.5079	4.1050	7.000
7.500	1.1441	3.5591	3.2572	2.0109	1.2233	1.3425	3.7647	7.500
8.000	0.9261	2.3111	2.1901	1.5797	1.1604	1.0901	2.2053	8.000
8.500	0.9375	1.3999	1.7285	1.1349	1.0760	0.9927	1.3126	8.500
9.000	1.1677	0.9992	1.6288	0.8150	0.8269	1.0667	0.8788	9.000
9.500	1.3722	0.9028	1.2789	0.7692	0.6709	0.9613	0.6069	9.500
10.000	1.2350	0.9198	0.8761	0.7292	0.6364	0.8129	0.4234	10.000
10.500	0.9735	0.8949	0.7469	0.7218	0.6568	0.7969	0.4114	10.500
11.000	0.8335	0.7750	0.7500	0.6919	0.7287	0.7540	0.4319	11.000
11.500	0.6967	0.8491	0.7425	0.7045	0.6904	0.7470	0.4973	11.500
12.000	0.6189	0.9274	0.5694	0.7285	0.6810	0.8289	0.5893	12.000
12.500	0.6284	0.9498	0.4360	0.7244	0.6665	0.7282	0.6983	12.500
13.000	0.6134	1.0393	0.4500	0.6844	0.5541	0.6039	0.8010	13.000
13.500	0.5826	1.1234	0.4446	0.4989	0.4485	0.5412	0.8682	13.500
14.000	0.5667	1.3250	0.4069	0.4467	0.3702	0.4592	0.9572	14.000
14.500	0.7979	1.8603	0.7441	0.7897	0.3865	0.4587	1.1596	14.500
15.000	0.8830	1.7111	0.9880	1.1778	0.3605	0.4323	1.0987	15.000
15.500	0.4838	0.9883	0.5727	0.6973	0.3229	0.3604	0.7424	15.500
16.000	0.3672	0.6547	0.3046	0.3150	0.3272	0.3486	0.5339	16.000
16.500	0.3912	0.4505	0.2636	0.3043	0.2888	0.3489	0.4642	16.500
17.000	0.3558	0.3502	0.3094	0.3200	0.2331	0.3405	0.3947	17.000
17.500	0.2970	0.3968	0.3031	0.3228	0.2072	0.3108	0.3707	17.500
18.000	0.2792	0.4347	0.2667	0.3162	0.1723	0.2750	0.3351	18.000
18.500	0.2358	0.3246	0.2313	0.2898	0.1624	0.2298	0.3415	18.500
19.000	0.1936	0.3003	0.2084	0.2657	0.1595	0.2186	0.3718	19.000
19.500	0.1801	0.3516	0.1706	0.2821	0.1431	0.1986	0.3459	19.500
20.000	0.1878	0.3516	0.1957	0.2907	0.1412	0.1595	0.3495	20.000

Table 20

Power Spectral Estimates, Rabbit 21, Medial Thalamus

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	REM Sleep Under Hyp.	Frequency (Hz)
0.000	1.2398	0.1709	0.1134	0.1368	0.0687	0.3121	0.0928	0.000
0.500	2.0637	0.2626	0.2345	0.2596	0.1594	0.7746	0.1683	0.500
1.000	3.2715	0.3055	0.4199	0.3635	0.3289	1.7837	0.2639	1.000
1.500	4.2321	0.2305	0.5142	0.3917	0.4450	2.5373	0.2203	1.500
2.000	3.9410	0.2044	0.4652	0.4180	0.4664	2.3886	0.1842	2.000
2.500	2.3883	0.2505	0.4598	0.3874	0.4189	1.6355	0.1699	2.500
3.000	1.3096	0.2070	0.6304	0.2438	0.3403	1.0268	0.1417	3.000
3.500	0.9070	0.1245	1.1319	0.2164	0.2743	0.9797	0.1175	3.500
4.000	0.7492	0.1316	1.3087	0.3198	0.2782	1.0802	0.0941	4.000
4.500	0.6582	0.1768	0.9165	0.7129	0.4216	0.9230	0.0702	4.500
5.000	0.5527	0.2944	0.6166	0.9120	0.9459	0.6271	0.0820	5.000
5.500	0.4934	0.3680	0.4931	0.7883	1.1676	0.4566	0.1229	5.500
6.000	0.4212	0.3509	0.4358	0.7097	0.6452	0.4355	0.2633	6.000
6.500	0.3433	0.4811	0.4205	0.5869	0.2229	0.4033	0.4945	6.500
7.000	0.2602	0.6700	0.4467	0.3878	0.1262	0.3034	0.6386	7.000
7.500	0.2125	0.6054	0.3527	0.2194	0.0975	0.2419	0.4875	7.500
8.000	0.2255	0.3676	0.2301	0.1514	0.0753	0.2238	0.2484	8.000
8.500	0.2197	0.1897	0.1685	0.1025	0.0586	0.1931	0.1392	8.500
9.000	0.1897	0.1034	0.1648	0.0747	0.0476	0.1445	0.0907	9.000
9.500	0.1598	0.0779	0.1272	0.0642	0.0450	0.1467	0.0656	9.500
10.000	0.1567	0.0723	0.0798	0.0616	0.0516	0.1356	0.0381	10.000
10.500	0.1494	0.0644	0.0607	0.0524	0.0583	0.1225	0.0295	10.500
11.000	0.1174	0.0532	0.0525	0.0454	0.0539	0.1469	0.0291	11.000
11.500	0.1022	0.0551	0.0472	0.0451	0.0449	0.1951	0.0308	11.500
12.000	0.1171	0.0549	0.0442	0.0493	0.0360	0.1872	0.0345	12.000
12.500	0.1232	0.0497	0.0342	0.0402	0.0305	0.1279	0.0372	12.500
13.000	0.1173	0.0523	0.0344	0.0414	0.0272	0.1155	0.0399	13.000
13.500	0.1278	0.0591	0.0334	0.0355	0.0230	0.1287	0.0547	13.500
14.000	0.1675	0.0621	0.0329	0.0352	0.0211	0.1476	0.0669	14.000
14.500	0.1910	0.0715	0.0341	0.0445	0.0170	0.1726	0.0689	14.500
15.000	0.1740	0.0737	0.0328	0.0438	0.0162	0.1728	0.0574	15.000
15.500	0.1519	0.0610	0.0235	0.0342	0.0172	0.1353	0.0434	15.500
16.000	0.1474	0.0425	0.0205	0.0344	0.0159	0.1439	0.0328	16.000
16.500	0.1395	0.0290	0.0228	0.0315	0.0145	0.1473	0.0316	16.500
17.000	0.1525	0.0225	0.0240	0.0264	0.0134	0.1412	0.0294	17.000
17.500	0.1756	0.0173	0.0191	0.0248	0.0127	0.1283	0.0232	17.500
18.000	0.1500	0.0207	0.0168	0.0267	0.0111	0.0960	0.0198	18.000
18.500	0.0975	0.0211	0.0159	0.0226	0.0099	0.0633	0.0190	18.500
19.000	0.0594	0.0183	0.0161	0.0199	0.0098	0.0452	0.0184	19.000
19.500	0.0395	0.0168	0.0142	0.0201	0.0098	0.0394	0.0159	19.500
20.000	0.0377	0.0160	0.0145	0.0170	0.0095	0.0333	0.0160	20.000

Table 21

Power Spectral Estimates, Rabbit 21, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.7358	0.0179	0.0085	0.2339	0.0729	0.0663	0.0357	0.000
0.500	0.9922	0.0291	0.0183	0.4231	0.0790	0.2083	0.0516	0.500
1.000	1.3442	0.0405	0.0279	0.5412	0.0627	0.4159	0.0654	1.000
1.500	1.2431	0.0381	0.0268	0.3675	0.0525	0.3765	0.0618	1.500
2.000	0.7611	0.0339	0.0268	0.2089	0.0634	0.3545	0.0493	2.000
2.500	0.5120	0.0285	0.0232	0.1123	0.0736	0.4466	0.0341	2.500
3.000	0.5558	0.0254	0.0213	0.0897	0.0766	0.3904	0.0291	3.000
3.500	0.5995	0.0210	0.0235	0.0936	0.0525	0.3278	0.0260	3.500
4.000	0.5383	0.0158	0.0229	0.0874	0.0258	0.2814	0.0243	4.000
4.500	0.4477	0.0142	0.0170	0.0656	0.0300	0.2254	0.0224	4.500
5.000	0.3284	0.0173	0.0132	0.0741	0.0522	0.2013	0.0181	5.000
5.500	0.2946	0.0191	0.0135	0.0698	0.0538	0.1874	0.0156	5.500
6.000	0.2577	0.0163	0.0120	0.0496	0.0449	0.1565	0.0200	6.000
6.500	0.2014	0.0156	0.0119	0.0404	0.0295	0.1440	0.0242	6.500
7.000	0.1933	0.0176	0.0126	0.0382	0.0154	0.1212	0.0214	7.000
7.500	0.1699	0.0156	0.0102	0.0310	0.0187	0.0994	0.0142	7.500
8.000	0.1475	0.0121	0.0091	0.0255	0.0268	0.0912	0.0113	8.000
8.500	0.1169	0.0122	0.0093	0.0285	0.0224	0.0846	0.0108	8.500
9.000	0.0758	0.0108	0.0097	0.0274	0.0178	0.0767	0.0097	9.000
9.500	0.0803	0.0094	0.0108	0.0239	0.0162	0.0873	0.0089	9.500
10.000	0.0846	0.0100	0.0101	0.0183	0.0129	0.0698	0.0119	10.000
10.500	0.0658	0.0104	0.0088	0.0134	0.0126	0.0477	0.0122	10.500
11.000	0.0561	0.0100	0.0087	0.0142	0.0100	0.0546	0.0078	11.000
11.500	0.0554	0.0110	0.0081	0.0185	0.0083	0.0642	0.0065	11.500
12.000	0.0570	0.0089	0.0075	0.0196	0.0077	0.0577	0.0063	12.000
12.500	0.0653	0.0068	0.0076	0.0179	0.0093	0.0450	0.0069	12.500
13.000	0.0672	0.0060	0.0088	0.0168	0.0089	0.0490	0.0074	13.000
13.500	0.0653	0.0059	0.0089	0.0193	0.0077	0.0630	0.0078	13.500
14.000	0.0749	0.0083	0.0088	0.0183	0.0076	0.0832	0.0068	14.000
14.500	0.0898	0.0080	0.0088	0.0179	0.0090	0.0932	0.0065	14.500
15.000	0.0858	0.0062	0.0082	0.0164	0.0082	0.0955	0.0060	15.000
15.500	0.0846	0.0067	0.0076	0.0150	0.0070	0.0973	0.0059	15.500
16.000	0.1048	0.0070	0.0086	0.0158	0.0069	0.1219	0.0059	16.000
16.500	0.1432	0.0067	0.0081	0.0186	0.0063	0.1319	0.0053	16.500
17.000	0.1888	0.0057	0.0074	0.0172	0.0061	0.1217	0.0052	17.000
17.500	0.2446	0.0050	0.0074	0.0141	0.0069	0.1266	0.0062	17.500
18.000	0.2369	0.0050	0.0075	0.0145	0.0071	0.1044	0.0071	18.000
18.500	0.1597	0.0049	0.0076	0.0200	0.0064	0.0697	0.0067	18.500
19.000	0.0978	0.0049	0.0078	0.0227	0.0055	0.0528	0.0062	19.000
19.500	0.0717	0.0054	0.0085	0.0169	0.0056	0.0385	0.0057	19.500
20.000	0.0599	0.0056	0.0076	0.0114	0.0056	0.0310	0.0054	20.000

Table 22

Rabbit 21, MeHippocampus . Prolonged Hypnosis Power Spectral Estimates, Sleep Deprived Animal

Frequency (Hz)	Hyp Min 1	Hyp. Min 3	Hyp. Min 4	Hyp. Min 5	Hyp. Min 6	Hyp. Min 9	Hyp. Min 10 Slow S	Hyp. Min 14 REM S.	Frequency (Hz)
0.000	0.7716	0.1176	0.2194	0.2515	0.3998	0.3862	0.3090	0.0713	0.000
0.500	0.8900	0.3051	0.5443	0.6430	0.7016	0.8690	0.5953	0.1532	0.500
1.000	0.8830	0.5368	1.0606	1.1979	1.2955	1.5308	1.3280	0.2434	1.000
1.500	0.6717	0.6579	1.2240	1.2309	1.7600	1.8582	1.8397	0.1989	1.500
2.000	0.4735	0.7088	1.1805	1.1997	1.6748	1.9411	1.7792	0.1654	2.000
2.500	0.3031	0.5845	0.9811	1.1156	1.2167	1.4444	1.3244	0.1375	2.500
3.000	0.1993	0.4692	0.7218	0.8324	0.8520	0.9554	0.9349	0.1215	3.000
3.500	0.2194	0.4033	0.5096	0.7512	0.7741	0.9872	0.8312	0.1077	3.500
4.000	0.3392	0.5568	0.6484	0.8429	1.0715	0.9192	0.7496	0.0888	4.000
4.500	1.0447	0.8600	0.8709	0.9575	1.0000	0.6649	0.6643	0.0746	4.500
5.000	1.5604	0.7630	0.6727	0.8931	0.6052	0.5149	0.6004	0.0837	5.000
5.500	0.8654	0.4773	0.4875	0.5918	0.4887	0.3979	0.4904	0.1292	5.500
6.000	0.3598	0.3548	0.3752	0.3244	0.3575	0.3356	0.4245	0.2538	6.000
6.500	0.2565	0.2812	0.2973	0.2887	0.3279	0.2697	0.4273	0.5188	6.500
7.000	0.1678	0.2014	0.2500	0.2794	0.3402	0.2730	0.3737	0.7291	7.000
7.500	0.1073	0.1573	0.1843	0.2284	0.2625	0.2780	0.2894	0.5730	7.500
8.000	0.0884	0.1319	0.1384	0.1822	0.2074	0.2265	0.2498	0.3017	8.000
8.500	0.0677	0.1227	0.1477	0.2053	0.1681	0.1582	0.1946	0.1504	8.500
9.000	0.0613	0.1095	0.1509	0.2182	0.1575	0.1473	0.1472	0.0725	9.000
9.500	0.0620	0.1043	0.1382	0.1661	0.1579	0.1401	0.1438	0.0444	9.500
10.000	0.0736	0.1077	0.1251	0.1287	0.1296	0.1338	0.1615	0.0425	10.000
10.500	0.0639	0.0894	0.1100	0.1219	0.1090	0.1161	0.1505	0.0391	10.500
11.000	0.0514	0.0633	0.1014	0.1174	0.1064	0.1148	0.1310	0.0361	11.000
11.500	0.0366	0.0531	0.0871	0.1046	0.1184	0.1228	0.0999	0.0393	11.500
12.000	0.0282	0.0458	0.0915	0.0962	0.1084	0.1066	0.0915	0.0424	12.000
12.500	0.0266	0.0426	0.1245	0.0957	0.1161	0.0856	0.1016	0.0431	12.500
13.000	0.0253	0.0453	0.1347	0.1154	0.1322	0.0959	0.0979	0.0590	13.000
13.500	0.0224	0.0429	0.1160	0.1749	0.1400	0.1135	0.1161	0.0892	13.500
14.000	0.0226	0.0406	0.1197	0.2021	0.1370	0.1144	0.1365	0.1014	14.000
14.500	0.0233	0.0363	0.1289	0.1727	0.1551	0.1155	0.1468	0.0916	14.500
15.000	0.0232	0.0336	0.1125	0.1526	0.1879	0.1236	0.1765	0.0736	15.000
15.500	0.0225	0.0386	0.0959	0.1282	0.1866	0.1479	0.1941	0.0585	15.500
16.000	0.0196	0.0392	0.1068	0.1022	0.1580	0.1802	0.2081	0.0496	16.000
16.500	0.0150	0.0333	0.1383	0.0934	0.1410	0.1734	0.2042	0.0344	16.500
17.000	0.0145	0.0289	0.1240	0.0887	0.1390	0.1456	0.1738	0.0228	17.000
17.500	0.0139	0.0272	0.0856	0.0715	0.1424	0.1139	0.1325	0.0213	17.500
18.000	0.0137	0.0251	0.0611	0.0659	0.1254	0.0803	0.0938	0.0198	18.000
18.500	0.0130	0.0197	0.0396	0.0612	0.1013	0.0500	0.0736	0.0175	18.500
19.000	0.0153	0.0144	0.0287	0.0433	0.0670	0.0358	0.0615	0.0143	19.000
19.500	0.0156	0.0130	0.0250	0.0304	0.0440	0.0352	0.0408	0.0160	19.500
20.000	0.0128	0.0125	0.0190	0.0277	0.0285	0.0293	0.0261	0.0172	20.000

Table 23

Rabbit 21, Medial Thalamus. Prolonged Hypnosis Power Spectral Estimates, Sleep Deprived Animal

Frequency (Hz)	Hyp. Min 1	Hyp. Min 3	Hyp. Min 4	Hyp. Min 5	Hyp. Min 6	Hyp. Min 9	Hyp. Min 10 Slow Sleep	Hyp. Min 14 REM Sleep	Frequency (Hz)
0.000	0.6806	0.0345	0.0392	0.0626	0.0699	0.0575	0.0576	0.0323	0.000
0.500	0.8060	0.1224	0.1287	0.1763	0.2191	0.2443	0.2226	0.0783	0.500
1.000	0.8667	0.3128	0.4694	0.5334	0.6121	0.6215	0.5569	0.1502	1.000
1.500	0.7874	0.5501	0.8604	0.8329	0.9509	0.9648	0.9565	0.1909	1.500
2.000	0.6549	0.6672	1.1844	1.2340	1.1720	1.2810	1.2406	0.2158	2.000
2.500	0.5593	0.7080	1.2767	1.4920	1.2982	1.3249	1.2787	0.1973	2.500
3.000	0.5537	0.8315	1.0182	1.4009	1.1304	1.2851	1.1935	0.2328	3.000
3.500	0.7466	1.0393	0.9073	1.2760	1.0766	1.4819	1.2464	0.3153	3.500
4.000	1.1526	1.1783	1.2616	1.3848	1.4417	1.4953	1.4854	0.3162	4.000
4.500	2.4952	1.4888	1.5511	1.6479	1.6742	1.7014	1.4954	0.3164	4.500
5.000	3.3541	1.7347	1.7151	1.9133	1.4926	1.8480	1.5596	0.4260	5.000
5.500	2.7129	1.7703	1.6443	1.7580	1.3040	1.5328	1.5616	0.5329	5.500
6.000	1.9530	1.8176	1.5770	1.4016	1.1554	1.3769	1.5233	0.9972	6.000
6.500	1.6578	1.9825	1.5417	1.1641	1.5503	1.2510	1.6457	2.5601	6.500
7.000	1.5151	1.7771	1.2826	1.1067	1.6514	1.1293	1.2987	4.1758	7.000
7.500	1.1110	1.4018	1.1054	1.1240	1.1440	1.1636	1.1231	3.5938	7.500
8.000	0.8769	1.1440	1.1639	1.0226	1.0927	1.1716	1.3845	2.0891	8.000
8.500	0.8917	1.0176	1.1318	1.0666	1.0927	1.0311	1.3323	1.1700	8.500
9.000	0.8402	0.9194	0.9007	1.0740	1.0218	1.2256	1.2854	0.7398	9.000
9.500	0.6254	0.7459	0.8783	0.9099	1.1259	1.1356	1.1474	0.5455	9.500
10.000	0.6681	0.8489	0.9623	0.8465	1.0973	0.8268	0.9233	0.4521	10.000
10.500	0.7425	0.8382	0.8498	0.7792	0.9054	0.8568	0.8393	0.4212	10.500
11.000	0.7093	0.7094	0.7300	0.6849	0.8123	0.7625	0.8507	0.5248	11.000
11.500	0.5599	0.6917	0.6480	0.6506	0.8577	0.6212	0.7610	0.6275	11.500
12.000	0.4763	0.6456	0.5306	0.6343	0.7813	0.5752	0.5969	0.7906	12.000
12.500	0.4676	0.5780	0.5271	0.5628	0.6621	0.5365	0.6088	0.9410	12.500
13.000	0.4468	0.4993	0.5314	0.4532	0.5226	0.4660	0.6358	1.1333	13.000
13.500	0.3954	0.4927	0.4796	0.5030	0.4246	0.4225	0.5512	1.3779	13.500
14.000	0.4182	0.4664	0.4799	0.5252	0.4461	0.3974	0.4617	1.5923	14.000
14.500	0.4168	0.3579	0.4683	0.5155	0.5111	0.3690	0.4463	1.5641	14.500
15.000	0.3013	0.3475	0.3840	0.4736	0.4624	0.3962	0.5129	1.3274	15.000
15.500	0.2666	0.3601	0.3444	0.4082	0.3948	0.4252	0.4943	1.0640	15.500
16.000	0.2489	0.2885	0.3094	0.3544	0.3877	0.4130	0.4009	0.7345	16.000
16.500	0.2165	0.2413	0.2911	0.3187	0.4082	0.3854	0.4073	0.5485	16.500
17.000	0.1840	0.2601	0.2839	0.3032	0.4052	0.3741	0.3749	0.4076	17.000
17.500	0.1586	0.2637	0.2335	0.3317	0.3322	0.3062	0.3278	0.3291	17.500
18.000	0.1727	0.2255	0.2112	0.2904	0.2771	0.2630	0.2964	0.3453	18.000
18.500	0.1866	0.1940	0.2333	0.2204	0.2203	0.2007	0.2384	0.3356	18.500
19.000	0.1721	0.1840	0.1856	0.2046	0.1991	0.1614	0.1939	0.3003	19.000
19.500	0.1593	0.1793	0.1637	0.2123	0.1666	0.1716	0.1635	0.3059	19.500
20.000	0.1391	0.1796	0.1793	0.1880	0.1530	0.1930	0.1493	0.3642	20.000

Table 24

Rabbit 21, Sensori-Motor Cortex. Prolonged Hypnosis Power Spectral Estimates, Sleep Deprived

Frequency (Hz)	Hyp. Min 1	Hyp. Min 3	Hyp. Min 4	Hyp. Min 5	Hyp. Min 6	Hyp. Min 9	Hyp. Min 10 Slow S.	Hyp. Min 14 REM S.	Frequency (Hz)
0.000	0.6572	0.0295	0.0464	0.0553	0.0644	0.0706	0.0908	0.0340	0.000
0.500	0.7450	0.0580	0.1233	0.1250	0.1670	0.1636	0.1857	0.0487	0.500
1.000	0.6892	0.0959	0.2577	0.2823	0.3517	0.2893	0.3490	0.0558	1.000
1.500	0.4305	0.1146	0.3027	0.4592	0.4404	0.3119	0.4793	0.0537	1.500
2.000	0.2057	0.1037	0.3056	0.4965	0.4221	0.3043	0.5225	0.0441	2.000
2.500	0.0797	0.0848	0.2716	0.4017	0.3969	0.2734	0.4716	0.0323	2.500
3.000	0.0356	0.0784	0.2311	0.3363	0.3492	0.2549	0.4010	0.0306	3.000
3.500	0.0386	0.0714	0.2045	0.3404	0.3030	0.2707	0.3460	0.0273	3.500
4.000	0.0531	0.0822	0.1687	0.3072	0.2556	0.2502	0.2871	0.0236	4.000
4.500	0.0589	0.1036	0.1476	0.2497	0.2178	0.1998	0.2448	0.0202	4.500
5.000	0.0476	0.0880	0.1493	0.2052	0.1829	0.1730	0.2419	0.0158	5.000
5.500	0.0249	0.0784	0.1323	0.1810	0.1768	0.1578	0.2436	0.0138	5.500
6.000	0.0157	0.0727	0.1101	0.1736	0.1709	0.1318	0.2196	0.0158	6.000
6.500	0.0202	0.0590	0.1054	0.1441	0.1464	0.1108	0.1597	0.0161	6.500
7.000	0.0263	0.0561	0.0974	0.1317	0.1208	0.0962	0.1131	0.0165	7.000
7.500	0.0251	0.0511	0.0903	0.1143	0.0984	0.0825	0.0965	0.0158	7.500
8.000	0.0176	0.0414	0.0919	0.1050	0.0937	0.0706	0.0770	0.0123	8.000
8.500	0.0115	0.0319	0.0842	0.0968	0.0891	0.0601	0.0723	0.0095	8.500
9.000	0.0096	0.0302	0.0716	0.0739	0.0797	0.0661	0.0759	0.0089	9.000
9.500	0.0113	0.0307	0.0625	0.0638	0.0674	0.0915	0.0833	0.0083	9.500
10.000	0.0196	0.0328	0.0570	0.0610	0.0610	0.0853	0.0752	0.0096	10.000
10.500	0.0190	0.0277	0.0552	0.0514	0.0613	0.0550	0.0634	0.0094	10.500
11.000	0.0101	0.0201	0.0432	0.0533	0.0482	0.0426	0.0581	0.0079	11.000
11.500	0.0063	0.0213	0.0378	0.0604	0.0399	0.0457	0.0577	0.0069	11.500
12.000	0.0066	0.0231	0.0440	0.0596	0.0489	0.0592	0.0525	0.0063	12.000
12.500	0.0093	0.0264	0.0554	0.0609	0.0578	0.0626	0.0509	0.0059	12.500
13.000	0.0112	0.0279	0.0681	0.0603	0.0622	0.0568	0.0522	0.0061	13.000
13.500	0.0109	0.0237	0.0666	0.0590	0.0692	0.0558	0.0563	0.0057	13.500
14.000	0.0089	0.0219	0.0694	0.0670	0.0827	0.0506	0.0613	0.0056	14.000
14.500	0.0075	0.0251	0.0784	0.0728	0.0951	0.0602	0.0820	0.0066	14.500
15.000	0.0075	0.0252	0.0860	0.0713	0.1037	0.0694	0.1044	0.0068	15.000
15.500	0.0077	0.0254	0.0973	0.0812	0.1081	0.0929	0.1064	0.0063	15.500
16.000	0.0076	0.0284	0.1034	0.0891	0.1197	0.1322	0.0900	0.0062	16.000
16.500	0.0072	0.0255	0.1146	0.0801	0.1191	0.1520	0.0912	0.0058	16.500
17.000	0.0062	0.0212	0.1071	0.0787	0.1124	0.1524	0.1386	0.0059	17.000
17.500	0.0055	0.0191	0.0792	0.0814	0.1279	0.1226	0.1763	0.0066	17.500
18.000	0.0057	0.0197	0.0609	0.0921	0.1248	0.0839	0.1478	0.0066	18.000
18.500	0.0063	0.0198	0.0641	0.1017	0.0948	0.0567	0.1006	0.0060	18.500
19.000	0.0072	0.0186	0.0658	0.0777	0.0633	0.0419	0.0576	0.0053	19.000
19.500	0.0095	0.0163	0.0398	0.0416	0.0530	0.0279	0.0366	0.0060	19.500
20.000	0.0074	0.0126	0.0169	0.0249	0.0414	0.0227	0.0303	0.0055	20.000

Table 25

Power Spectral Estimates, Rabbit 23, Hippocampus (Dentate)

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	REM Sleep Under Hyp.	Frequency (Hz)
0.000	0.8277	0.1408	1.3349	0.2330	0.2292	0.7511	0.0489	0.000
0.500	1.8222	0.2661	1.8620	0.7727	0.5907	2.2311	0.1175	0.500
1.000	3.1786	0.4385	2.0544	1.4002	1.2553	4.5354	0.2231	1.000
1.500	3.7371	0.4425	1.7822	1.0913	1.5023	4.9839	0.2509	1.500
2.000	3.2327	0.3326	1.6066	0.8220	1.4710	4.5183	0.2502	2.000
2.500	2.4023	0.2716	1.3963	0.7351	1.3273	3.5886	0.2710	2.500
3.000	1.6009	0.2123	1.1435	0.5474	1.2887	2.3032	0.2463	3.000
3.500	1.1315	0.1783	0.8299	0.4431	1.2921	1.4592	0.1650	3.500
4.000	0.9938	0.1960	0.7655	0.4994	1.2973	1.2068	0.1704	4.000
4.500	0.7502	0.2042	0.7979	0.7660	1.5941	1.0542	0.1986	4.500
5.000	0.5900	0.1706	0.9075	1.1251	2.2795	0.9128	0.1645	5.000
5.500	0.5656	0.2195	1.0490	1.7084	2.8972	0.9001	0.1204	5.500
6.000	0.4881	0.4215	1.0679	2.1195	3.0635	0.8844	0.1758	6.000
6.500	0.4738	1.0190	1.0388	1.9517	2.3564	0.7209	0.6003	6.500
7.000	0.5417	1.7331	1.0981	1.7043	1.5879	0.4682	1.6972	7.000
7.500	0.4985	1.8299	0.8500	1.2374	1.0186	0.4237	2.3473	7.500
8.000	0.4179	1.3032	0.4829	0.5482	0.5488	0.4264	1.8219	8.000
8.500	0.3622	0.7118	0.2652	0.3048	0.3749	0.3831	0.9982	8.500
9.000	0.3247	0.4024	0.1896	0.2541	0.2805	0.3475	0.5572	9.000
9.500	0.3411	0.2904	0.1973	0.1927	0.2044	0.3663	0.3657	9.500
10.000	0.4155	0.2057	0.1681	0.1300	0.1779	0.3472	0.2010	10.000
10.500	0.4273	0.1471	0.1418	0.1061	0.1592	0.3317	0.1144	10.500
11.000	0.3574	0.1183	0.1463	0.1051	0.1352	0.3043	0.0997	11.000
11.500	0.3129	0.1039	0.1370	0.0965	0.1187	0.2631	0.1087	11.500
12.000	0.2574	0.1117	0.1199	0.0842	0.0939	0.2269	0.0893	12.000
12.500	0.1875	0.1203	0.1199	0.0714	0.0793	0.1814	0.0726	12.500
13.000	0.1598	0.1614	0.1200	0.0701	0.0681	0.1537	0.0839	13.000
13.500	0.1456	0.2069	0.1259	0.0747	0.0625	0.1409	0.1155	13.500
14.000	0.1370	0.2446	0.1214	0.0709	0.0568	0.1189	0.2128	14.000
14.500	0.1141	0.2772	0.1179	0.0578	0.0586	0.1050	0.3522	14.500
15.000	0.0952	0.3025	0.1176	0.0436	0.0546	0.0912	0.4201	15.000
15.500	0.1020	0.2974	0.0995	0.0441	0.0469	0.0942	0.3793	15.500
16.000	0.0948	0.2340	0.0861	0.0504	0.0411	0.1017	0.2721	16.000
16.500	0.0799	0.1907	0.0977	0.0452	0.0387	0.1080	0.1775	16.500
17.000	0.0727	0.1423	0.1026	0.0377	0.0344	0.0961	0.1362	17.000
17.500	0.0662	0.1185	0.0925	0.0292	0.0311	0.0805	0.1384	17.500
18.000	0.0620	0.0971	0.0884	0.0227	0.0288	0.0593	0.1198	18.000
18.500	0.0505	0.0841	0.0685	0.0251	0.0249	0.0478	0.0907	18.500
19.000	0.0402	0.0815	0.0627	0.0256	0.0211	0.0459	0.0584	19.000
19.500	0.0386	0.0681	0.0693	0.0218	0.0193	0.0460	0.0493	19.500
20.000	0.0366	0.0542	0.0746	0.0176	0.0177	0.0399	0.0428	20.000

Table 26

Power Spectral Estimates, Rabbit 23, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	Alert Still	Early Hyp.	Late Hyp.	Slow Under Hyp.	Frequency (Hz)
0.000	2.9442	0.8409	1.3453	1.1433	0.6014	3.1311	0.000
0.500	5.2142	1.4229	2.1891	1.4236	1.1451	6.3474	0.500
1.000	7.7563	1.8126	2.7664	1.6103	1.5842	9.7291	1.000
1.500	8.5295	1.5294	2.0674	1.5215	1.2627	9.3610	1.500
2.000	8.8761	1.0521	1.4977	1.4505	0.9707	8.6189	2.000
2.500	7.4855	0.7806	1.1232	1.4116	0.8397	6.6942	2.500
3.000	5.0443	0.6886	0.8772	1.4184	0.8754	4.4641	3.000
3.500	3.8143	0.5771	0.8218	1.2163	0.6677	3.1486	3.500
4.000	3.1028	0.6089	0.6794	0.9317	0.5230	2.5821	4.000
4.500	2.3984	0.5984	0.7007	0.8271	0.5158	2.3247	4.500
5.000	1.9501	0.4576	0.9349	0.9851	0.5162	2.0296	5.000
5.500	1.9478	0.3279	1.3264	1.2320	0.6193	2.0476	5.500
6.000	1.8467	0.2785	1.3003	1.3469	1.0533	1.9181	6.000
6.500	1.7346	0.4675	0.9831	1.0849	1.6797	1.7230	6.500
7.000	1.6468	1.0304	0.8169	0.7775	2.0566	1.3786	7.000
7.500	1.5394	1.4118	0.6448	0.5148	1.3495	1.2498	7.500
8.000	1.6039	1.1626	0.3812	0.2972	0.5779	1.1290	8.000
8.500	1.3713	0.6625	0.2888	0.2093	0.2991	0.8662	8.500
9.000	1.1656	0.3783	0.2555	0.1660	0.1909	0.9014	9.000
9.500	1.0960	0.2947	0.2204	0.1547	0.1707	1.1665	9.500
10.000	0.9935	0.1967	0.1754	0.1559	0.1471	1.0240	10.000
10.500	1.0829	0.1357	0.1418	0.1472	0.1490	1.0589	10.500
11.000	1.0063	0.1247	0.1418	0.1239	0.1642	1.1322	11.000
11.500	0.8663	0.1398	0.1300	0.1143	0.1810	1.0646	11.500
12.000	0.8231	0.1274	0.1054	0.0983	0.1692	1.0147	12.000
12.500	0.7527	0.0989	0.0912	0.0950	0.1599	1.1706	12.500
13.000	0.6498	0.1223	0.0824	0.0979	0.1689	1.1463	13.000
13.500	0.6163	0.1684	0.0888	0.0944	0.1947	0.8281	13.500
14.000	0.6368	0.2195	0.1065	0.0871	0.2092	0.6229	14.000
14.500	0.7989	0.2942	0.0969	0.0793	0.1973	0.7102	14.500
15.000	0.9688	0.2983	0.0845	0.0695	0.1770	0.7392	15.000
15.500	0.9377	0.2780	0.0941	0.0640	0.1751	0.7226	15.500
16.000	0.8553	0.2244	0.0975	0.0662	0.1735	0.8127	16.000
16.500	0.7909	0.1772	0.1178	0.0679	0.1609	0.9464	16.500
17.000	0.7171	0.1464	0.1174	0.0652	0.1360	0.9374	17.000
17.500	0.6647	0.1153	0.0813	0.0590	0.1349	0.7962	17.500
18.000	0.5528	0.1253	0.0688	0.0511	0.1169	0.5461	18.000
18.500	0.3914	0.1258	0.0709	0.0508	0.0963	0.3976	18.500
19.000	0.2539	0.1141	0.0715	0.0570	0.0989	0.3191	19.000
19.500	0.2191	0.1107	0.0653	0.0586	0.0945	0.2640	19.500
20.000	0.2413	0.0948	0.0591	0.0520	0.0880	0.2493	20.000

Table 27

Power Spectral Estimates, Rabbit 23, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Still	Early Hyp.	Late Hyp.	REM Sleep Under Hyp.	Frequency (Hz)
0.000	0.0649	0.6725	0.7884	0.6917	0.0441	0.0212	0.000
0.500	0.2270	0.7299	0.8670	0.7513	0.0606	0.0445	0.500
1.000	0.4566	0.6595	0.7600	0.6760	0.0668	0.0712	1.000
1.500	0.5053	0.4274	0.4682	0.4494	0.0535	0.0681	1.500
2.000	0.4644	0.2114	0.2275	0.2304	0.0385	0.0688	2.000
2.500	0.4633	0.0774	0.0905	0.0864	0.0321	0.0615	2.500
3.000	0.4634	0.0348	0.0401	0.0351	0.0270	0.0427	3.000
3.500	0.3541	0.0425	0.0465	0.0411	0.0206	0.0377	3.500
4.000	0.3099	0.0581	0.0700	0.0541	0.0190	0.0401	4.000
4.500	0.2844	0.0615	0.0687	0.0523	0.0189	0.0359	4.500
5.000	0.2221	0.0458	0.0466	0.0398	0.0193	0.0318	5.000
5.500	0.1892	0.0279	0.0244	0.0263	0.0177	0.0304	5.500
6.000	0.1505	0.0227	0.0160	0.0172	0.0163	0.0298	6.000
6.500	0.1425	0.0290	0.0205	0.0159	0.0175	0.0289	6.500
7.000	0.1283	0.0374	0.0257	0.0223	0.0166	0.0232	7.000
7.500	0.1085	0.0338	0.0259	0.0260	0.0133	0.0180	7.500
8.000	0.0899	0.0249	0.0213	0.0202	0.0106	0.0186	8.000
8.500	0.0817	0.0152	0.0161	0.0150	0.0097	0.0185	8.500
9.000	0.0844	0.0102	0.0142	0.0123	0.0088	0.0169	9.000
9.500	0.0766	0.0131	0.0172	0.0111	0.0085	0.0162	9.500
10.000	0.0605	0.0168	0.0203	0.0160	0.0118	0.0156	10.000
10.500	0.0517	0.0181	0.0183	0.0195	0.0111	0.0139	10.500
11.000	0.0477	0.0148	0.0131	0.0150	0.0077	0.0109	11.000
11.500	0.0530	0.0099	0.0081	0.0106	0.0078	0.0095	11.500
12.000	0.0559	0.0093	0.0074	0.0094	0.0077	0.0108	12.000
12.500	0.0495	0.0105	0.0108	0.0095	0.0070	0.0115	12.500
13.000	0.0479	0.0113	0.0138	0.0100	0.0065	0.0092	13.000
13.500	0.0564	0.0126	0.0131	0.0100	0.0057	0.0076	13.500
14.000	0.0661	0.0109	0.0120	0.0093	0.0052	0.0102	14.000
14.500	0.0764	0.0078	0.0100	0.0088	0.0057	0.0097	14.500
15.000	0.0839	0.0076	0.0085	0.0079	0.0059	0.0083	15.000
15.500	0.0978	0.0091	0.0114	0.0069	0.0064	0.0082	15.500
16.000	0.1233	0.0093	0.0118	0.0082	0.0069	0.0074	16.000
16.500	0.1518	0.0086	0.0107	0.0095	0.0067	0.0068	16.500
17.000	0.1513	0.0082	0.0100	0.0085	0.0057	0.0076	17.000
17.500	0.1219	0.0080	0.0080	0.0073	0.0051	0.0078	17.500
18.000	0.0954	0.0080	0.0085	0.0058	0.0054	0.0077	18.000
18.500	0.0685	0.0081	0.0101	0.0055	0.0053	0.0061	18.500
19.000	0.0529	0.0086	0.0096	0.0063	0.0053	0.0060	19.000
19.500	0.0421	0.0076	0.0089	0.0066	0.0054	0.0069	19.500
20.000	0.0314	0.0057	0.0075	0.0069	0.0057	0.0067	20.000

Table 28

Power Spectral Estimates, Prolonged Hypnosis, Sleep Deprived Animal, Rabbit 23, Hippocampus .

Frequency (Hz)	Alert Hypnosis	Hypnosis Minute 1	Hypnosis Minute 4	Hypnosis Minute 7 Slow Wave Sleep	Hypnosis Minute 14 REM Sleep	Frequency (Hz)
0.000	0.1617	0.3444	0.5067	0.6402	0.0763	0.000
0.500	0.5295	0.9509	1.4882	1.9688	0.2153	0.500
1.000	1.0088	1.9475	2.7314	4.3622	0.4405	1.000
1.500	1.2896	2.2174	2.2865	4.8718	0.4808	1.500
2.000	1.2842	2.1976	2.0126	3.7992	0.4055	2.000
2.500	1.0256	1.8272	1.9478	2.7559	0.3311	2.500
3.000	0.7825	1.3977	1.5186	1.9251	0.3082	3.000
3.500	0.7291	1.6223	1.2654	1.1963	0.2399	3.500
4.000	0.8132	1.5436	1.2542	0.8031	0.2074	4.000
4.500	1.1242	1.1461	1.1415	0.6724	0.2006	4.500
5.000	2.3441	1.4706	1.2619	0.7951	0.2253	5.000
5.500	4.8518	2.0424	1.8173	1.0127	0.2730	5.500
6.000	5.0195	2.1324	2.1361	1.0498	0.6234	6.000
6.500	2.9611	1.7434	1.6515	0.8513	1.5249	6.500
7.000	1.6754	1.4142	1.1298	0.6289	2.3400	7.000
7.500	0.8923	1.0014	0.7473	0.4988	1.9735	7.500
8.000	0.4448	0.5960	0.4288	0.4511	1.0876	8.000
8.500	0.2361	0.3926	0.3327	0.4021	0.6814	8.500
9.000	0.2058	0.3139	0.3431	0.3621	0.4149	9.000
9.500	0.1690	0.2673	0.3054	0.3135	0.1983	9.500
10.000	0.1297	0.2127	0.2368	0.3233	0.1175	10.000
10.500	0.1055	0.1563	0.2262	0.3699	0.1045	10.500
11.000	0.1128	0.1563	0.1856	0.3590	0.0789	11.000
11.500	0.1007	0.1611	0.1685	0.3334	0.0837	11.500
12.000	0.0972	0.1473	0.1634	0.2810	0.0850	12.000
12.500	0.0825	0.1274	0.1241	0.1942	0.0897	12.500
13.000	0.0727	0.1014	0.1020	0.1374	0.1226	13.000
13.500	0.0667	0.0835	0.0923	0.1196	0.2377	13.500
14.000	0.0672	0.0864	0.0971	0.1089	0.2924	14.000
14.500	0.0473	0.0705	0.0936	0.1093	0.2530	14.500
15.000	0.0421	0.0551	0.0689	0.1013	0.2087	15.000
15.500	0.0333	0.0500	0.0531	0.1039	0.1692	15.500
16.000	0.0326	0.0477	0.0570	0.0990	0.1214	16.000
16.500	0.0308	0.0407	0.0576	0.0757	0.1162	16.500
17.000	0.0404	0.0331	0.0534	0.0649	0.1124	17.000
17.500	0.0366	0.0279	0.0407	0.0618	0.0820	17.500
18.000	0.0311	0.0261	0.0317	0.0633	0.0713	18.000
18.500	0.0234	0.0238	0.0349	0.0587	0.0704	18.500
19.000	0.0219	0.0221	0.0346	0.0446	0.0527	19.000
19.500	0.0157	0.0197	0.0262	0.0349	0.0384	19.500
20.000	0.0166	0.0193	0.0219	0.0292	0.0390	20.000

Table 29

Power Spectral Estimates, Prolonged Hypnosis, Sleep Deprived Animal, Rabbit 23, Medial Thalamus

Frequency (Hz)	Alert Hypnosis	Hypnosis Minute 1	Hypnosis Minute 4	Hypnosis Minute 7 Slow Sleep	Hypnosis Minute 14 REM Sleep	Frequency (Hz)
0.000	0.6908	0.8934	1.3945	1.8198	1.3223	0.000
0.500	1.4391	1.6172	2.1915	4.2703	1.5882	0.500
1.000	2.1824	2.4629	3.5358	8.1628	1.5258	1.000
1.500	2.3301	2.3460	3.3451	9.8104	1.2496	1.500
2.000	2.2212	2.0113	2.3690	9.0394	1.0976	2.000
2.500	1.6316	1.4506	2.3296	7.3200	0.9123	2.500
3.000	1.0962	1.1270	2.4127	4.8692	0.7683	3.000
3.500	0.8439	1.6320	2.2682	2.9290	0.7414	3.500
4.000	0.8103	1.8995	2.2400	2.4809	0.7105	4.000
4.500	0.9334	1.2888	1.7869	2.4397	0.6252	4.500
5.000	1.4063	1.0510	1.5568	2.1945	0.5174	5.000
5.500	2.0735	1.2171	1.6838	2.1053	0.4653	5.500
6.000	2.0606	1.2015	1.7853	2.1461	0.5168	6.000
6.500	1.4800	0.9975	1.4898	1.7608	0.8383	6.500
7.000	1.0322	0.7755	1.1213	1.4519	1.1818	7.000
7.500	0.6220	0.5563	0.8379	1.2640	1.0658	7.500
8.000	0.3682	0.4135	0.6183	1.0876	0.7254	8.000
8.500	0.2635	0.3292	0.6778	0.9886	0.4791	8.500
9.000	0.2376	0.2615	0.7527	0.9297	0.3138	9.000
9.500	0.2265	0.2165	0.5868	0.7775	0.2036	9.500
10.000	0.1835	0.1882	0.4912	0.9585	0.1675	10.000
10.500	0.1536	0.1512	0.4807	1.1850	0.1589	10.500
11.000	0.1647	0.1686	0.4204	1.1164	0.1267	11.000
11.500	0.1439	0.1991	0.4458	1.0382	0.1276	11.500
12.000	0.1162	0.1787	0.4802	0.9474	0.1406	12.000
12.500	0.1650	0.1483	0.4813	0.9272	0.1260	12.500
13.000	0.2705	0.1305	0.5036	1.0079	0.1381	13.000
13.500	0.3130	0.1239	0.4699	1.0001	0.2024	13.500
14.000	0.3098	0.1185	0.5334	0.8124	0.2583	14.000
14.500	0.2163	0.1057	0.7310	0.8605	0.2430	14.500
15.000	0.1082	0.0919	0.7866	0.9716	0.2174	15.000
15.500	0.0897	0.0839	0.6681	1.0525	0.1660	15.500
16.000	0.1008	0.0880	0.5197	1.0882	0.1342	16.000
16.500	0.0863	0.0777	0.4760	0.9663	0.1575	16.500
17.000	0.0744	0.0654	0.4143	0.7158	0.1628	17.000
17.500	0.0725	0.0684	0.2778	0.4712	0.1337	17.500
18.000	0.0704	0.0747	0.1895	0.4283	0.1375	18.000
18.500	0.0683	0.0825	0.2116	0.4238	0.1262	18.500
19.000	0.0653	0.0753	0.2232	0.3088	0.1019	19.000
19.500	0.0634	0.0660	0.1640	0.2329	0.0834	19.500
20.000	0.0581	0.0660	0.1173	0.2574	0.0918	20.000

Table 30

Power Spectral Estimates, Rabbit 26, Hippocampus (Dentate)

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.5018	0.1016	0.1157	0.1362	0.1236	0.1834	0.000
0.500	1.1431	0.2192	0.3414	0.4367	0.3115	0.4758	0.500
1.000	1.7046	0.3196	0.6987	0.8808	0.8120	0.9556	1.000
1.500	1.7429	0.3331	0.9290	0.7961	1.1122	1.0366	1.500
2.000	1.8009	0.2812	0.8864	0.5191	0.9456	0.9308	2.000
2.500	1.7273	0.2282	0.7850	0.3680	0.8452	0.8129	2.500
3.000	1.2590	0.2281	0.6670	0.3962	0.7205	0.6960	3.000
3.500	0.9041	0.2013	0.4833	0.4836	0.4997	0.5907	3.500
4.000	0.8346	0.1910	0.4664	0.3869	0.3960	0.4576	4.000
4.500	0.6966	0.1914	0.5043	0.2721	0.4082	0.4297	4.500
5.000	0.4905	0.2136	0.4723	0.2166	0.4310	0.3850	5.000
5.500	0.4051	0.1839	0.3658	0.2148	0.4431	0.3819	5.500
6.000	0.4637	0.1504	0.3608	0.2527	0.4579	0.3921	6.000
6.500	0.5133	0.1910	0.3373	0.3663	0.4242	0.3712	6.500
7.000	0.4536	0.2235	0.3253	0.3979	0.3944	0.3434	7.000
7.500	0.4033	0.2302	0.3723	0.3631	0.3825	0.3138	7.500
8.000	0.3032	0.2107	0.3799	0.3027	0.3096	0.2562	8.000
8.500	0.2471	0.1621	0.2961	0.1954	0.2104	0.1920	8.500
9.000	0.2973	0.1416	0.1879	0.1124	0.1685	0.1828	9.000
9.500	0.2947	0.1123	0.1437	0.0748	0.1373	0.1503	9.500
10.000	0.2505	0.0733	0.1176	0.0587	0.1225	0.1015	10.000
10.500	0.2057	0.0529	0.1027	0.0490	0.1028	0.1030	10.500
11.000	0.1850	0.0449	0.1042	0.0509	0.0888	0.0920	11.000
11.500	0.1799	0.0395	0.0974	0.0478	0.0799	0.0683	11.500
12.000	0.1813	0.0410	0.0742	0.0458	0.0668	0.0557	12.000
12.500	0.1587	0.0399	0.0605	0.0426	0.0580	0.0563	12.500
13.000	0.1212	0.0321	0.0534	0.0344	0.0462	0.0561	13.000
13.500	0.1199	0.0306	0.0406	0.0331	0.0365	0.0491	13.500
14.000	0.1377	0.0322	0.0354	0.0320	0.0354	0.0401	14.000
14.500	0.1432	0.0370	0.0335	0.0270	0.0325	0.0336	14.500
15.000	0.1527	0.0396	0.0299	0.0228	0.0285	0.0273	15.000
15.500	0.1476	0.0392	0.0266	0.0204	0.0256	0.0232	15.500
16.000	0.1370	0.0332	0.0235	0.0193	0.0257	0.0231	16.000
16.500	0.1433	0.0276	0.0205	0.0188	0.0257	0.0217	16.500
17.000	0.1394	0.0255	0.0206	0.0180	0.0237	0.0199	17.000
17.500	0.1147	0.0255	0.0195	0.0157	0.0221	0.0217	17.500
18.000	0.0749	0.0228	0.0171	0.0164	0.0180	0.0224	18.000
18.500	0.0618	0.0181	0.0173	0.0145	0.0145	0.0170	18.500
19.000	0.0606	0.0165	0.0141	0.0137	0.0143	0.0166	19.000
19.500	0.0419	0.0175	0.0138	0.0128	0.0154	0.0160	19.500
20.000	0.0259	0.0164	0.0130	0.0116	0.0141	0.0118	20.000

Table 31

Power Spectral Estimates Rabbit 26, Medial Thalamus

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Frequency (Hz)
0.000	0.2739	0.2026	0.1116	0.0688	0.0882	0.1565	0.000
0.500	0.4335	0.3342	0.1534	0.1295	0.1782	0.2091	0.500
1.000	0.5811	0.3631	0.2013	0.1904	0.3090	0.2381	1.000
1.500	0.5178	0.2629	0.2007	0.1559	0.2872	0.2031	1.500
2.000	0.4300	0.1853	0.1660	0.0931	0.1682	0.1588	2.000
2.500	0.3983	0.1204	0.1206	0.0643	0.1147	0.1360	2.500
3.000	0.3258	0.1018	0.0975	0.0620	0.1035	0.1223	3.000
3.500	0.2307	0.0811	0.0845	0.0691	0.0957	0.0964	3.500
4.000	0.1969	0.0678	0.0775	0.0648	0.0869	0.0739	4.000
4.500	0.1765	0.0627	0.0748	0.0538	0.0776	0.0685	4.500
5.000	0.1500	0.0559	0.0645	0.0426	0.0645	0.0656	5.000
5.500	0.1427	0.0502	0.0536	0.0378	0.0593	0.0655	5.500
6.000	0.1421	0.0417	0.0581	0.0460	0.0627	0.0610	6.000
6.500	0.1245	0.0490	0.0597	0.0628	0.0663	0.0523	6.500
7.000	0.0978	0.0595	0.0596	0.0616	0.0623	0.0402	7.000
7.500	0.0877	0.0643	0.0610	0.0606	0.0614	0.0345	7.500
8.000	0.0781	0.0550	0.0507	0.0580	0.0530	0.0321	8.000
8.500	0.0709	0.0397	0.0383	0.0396	0.0406	0.0321	8.500
9.000	0.0735	0.0357	0.0310	0.0248	0.0367	0.0296	9.000
9.500	0.0757	0.0263	0.0248	0.0179	0.0299	0.0226	9.500
10.000	0.0739	0.0200	0.0200	0.0143	0.0209	0.0189	10.000
10.500	0.0612	0.0170	0.0190	0.0132	0.0153	0.0169	10.500
11.000	0.0594	0.0137	0.0175	0.0125	0.0161	0.0131	11.000
11.500	0.0757	0.0119	0.0160	0.0104	0.0159	0.0104	11.500
12.000	0.0861	0.0121	0.0128	0.0097	0.0124	0.0101	12.000
12.500	0.0726	0.0118	0.0113	0.0090	0.0093	0.0108	12.500
13.000	0.0567	0.0103	0.0095	0.0084	0.0077	0.0108	13.000
13.500	0.0580	0.0092	0.0090	0.0087	0.0073	0.0090	13.500
14.000	0.0661	0.0102	0.0090	0.0081	0.0082	0.0076	14.000
14.500	0.0758	0.0104	0.0080	0.0077	0.0076	0.0078	14.500
15.000	0.0853	0.0105	0.0058	0.0080	0.0059	0.0066	15.000
15.500	0.0937	0.0093	0.0054	0.0073	0.0058	0.0065	15.500
16.000	0.0991	0.0076	0.0053	0.0068	0.0063	0.0071	16.000
16.500	0.1004	0.0073	0.0050	0.0061	0.0066	0.0066	16.500
17.000	0.0982	0.0078	0.0054	0.0053	0.0061	0.0064	17.000
17.500	0.0782	0.0072	0.0058	0.0045	0.0055	0.0072	17.500
18.000	0.0527	0.0060	0.0048	0.0048	0.0052	0.0080	18.000
18.500	0.0446	0.0054	0.0044	0.0054	0.0044	0.0065	18.500
19.000	0.0366	0.0050	0.0037	0.0052	0.0040	0.0054	19.000
19.500	0.0231	0.0058	0.0036	0.0043	0.0040	0.0042	19.500
20.000	0.0138	0.0071	0.0033	0.0041	0.0036	0.0033	20.000

Table 32

Power Spectral Estimates, Rabbit 26, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	Awake Moving	Awake Still	Early Hypnosis	Late Hypnosis	Frequency (Hz)
0.000	0.1768	0.1852	0.2142	0.1471	0.1209	0.000
0.500	0.4756	0.4785	0.6362	0.3372	0.4449	0.500
1.000	0.8591	0.8297	1.4480	0.6350	0.9071	1.000
1.500	0.9300	0.7891	1.8012	0.8130	0.9487	1.500
2.000	0.9076	0.6419	1.6598	1.0112	0.9855	2.000
2.500	0.8897	0.5578	1.3198	1.1912	0.9819	2.500
3.000	0.9094	0.5190	1.0110	0.8998	0.7840	3.000
3.500	0.8315	0.4536	0.8888	0.5141	0.5300	3.500
4.000	0.6586	0.4383	0.7538	0.3898	0.3734	4.000
4.500	0.5059	0.3910	0.6124	0.3779	0.3605	4.500
5.000	0.4441	0.2859	0.5408	0.3688	0.3468	5.000
5.500	0.5088	0.3330	0.5559	0.4321	0.3823	5.500
6.000	0.6709	0.5614	0.7417	0.6638	0.6480	6.000
6.500	0.8631	0.8730	0.9514	0.8729	1.0592	6.500
7.000	0.8648	0.9265	0.7773	0.7379	1.0439	7.000
7.500	0.5949	0.6388	0.4948	0.4604	0.6312	7.500
8.000	0.3623	0.3734	0.3483	0.3156	0.3585	8.000
8.500	0.2574	0.2373	0.2522	0.2517	0.2387	8.500
9.000	0.2088	0.1756	0.2283	0.2072	0.2360	9.000
9.500	0.1767	0.1439	0.2022	0.1934	0.2259	9.500
10.000	0.1371	0.1234	0.1648	0.1489	0.1988	10.000
10.500	0.1195	0.1009	0.1367	0.1145	0.1488	10.500
11.000	0.1105	0.0854	0.1034	0.0986	0.1206	11.000
11.500	0.0950	0.0628	0.0801	0.0885	0.0920	11.500
12.000	0.0798	0.0594	0.0916	0.0839	0.0764	12.000
12.500	0.0698	0.0561	0.0933	0.0713	0.0655	12.500
13.000	0.0603	0.0443	0.0714	0.0597	0.0597	13.000
13.500	0.0616	0.0393	0.0651	0.0557	0.0567	13.500
14.000	0.0606	0.0415	0.0719	0.0524	0.0557	14.000
14.500	0.0548	0.0355	0.0672	0.0452	0.0563	14.500
15.000	0.0488	0.0297	0.0571	0.0456	0.0556	15.000
15.500	0.0413	0.0300	0.0482	0.0552	0.0475	15.500
16.000	0.0381	0.0293	0.0483	0.0522	0.0443	16.000
16.500	0.0340	0.0293	0.0557	0.0415	0.0381	16.500
17.000	0.0280	0.0259	0.0552	0.0416	0.0350	17.000
17.500	0.0266	0.0194	0.0544	0.0400	0.0382	17.500
18.000	0.0234	0.0187	0.0546	0.0381	0.0368	18.000
18.500	0.0222	0.0195	0.0440	0.0397	0.0294	18.500
19.000	0.0227	0.0222	0.0395	0.0335	0.0262	19.000
19.500	0.0197	0.0196	0.0362	0.0296	0.0226	19.500
20.000	0.0181	0.0195	0.0272	0.0273	0.0245	20.000

Table 33

Power Spectral Estimates, Rabbit 56, Hippocampus

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.0863	0.0281	0.0531	0.0146	0.0118	0.0264	0.0270	0.0218	0.0000258	0.000
0.500	0.3380	0.0771	0.1441	0.1007	0.0927	0.1619	0.0766	0.1218	0.0000261	0.500
1.000	1.1513	0.1471	0.3082	0.3031	0.2956	0.4997	0.2985	0.4320	0.0000263	1.000
1.500	1.7891	0.1705	0.4803	0.5966	0.6076	0.7437	0.5756	0.9527	0.0000263	1.500
2.000	2.1227	0.1866	0.6472	0.7756	0.9068	0.9463	0.7392	1.1678	0.0000263	2.000
2.500	2.2968	0.2403	0.6643	0.8723	1.0238	1.2345	0.7265	1.0734	0.0000263	2.500
3.000	2.3197	0.2916	0.6530	0.8152	0.9304	1.3266	0.8382	1.0177	0.0000263	3.000
3.500	2.2517	0.3007	0.7086	0.7710	0.8971	0.9951	0.9347	0.7569	0.0000263	3.500
4.000	1.9906	0.3188	0.6561	0.7711	0.8833	0.7412	0.9315	0.6660	0.0000263	4.000
4.500	1.8747	0.2666	0.5220	0.9506	1.0611	0.8648	0.9616	0.8680	0.0000263	4.500
5.000	1.8098	0.2189	0.4872	1.3009	1.3922	1.1083	1.2445	1.0592	0.0000263	5.000
5.500	1.9019	0.2258	0.4750	2.1152	2.5936	1.4139	2.0276	1.6143	0.0000263	5.500
6.000	2.1146	0.2582	0.6207	3.6028	3.7991	2.4203	3.8118	2.5237	0.0000263	6.000
6.500	2.0140	0.3790	1.2433	5.4095	3.3961	3.1663	4.9525	2.8955	0.0000263	6.500
7.000	1.4501	1.1232	3.6540	5.7268	2.6857	2.5627	4.9963	2.3240	0.0000263	7.000
7.500	1.0985	2.8345	8.1177	3.6686	1.7218	1.7627	3.7978	1.6241	0.0000263	7.500
8.000	1.1407	4.0827	10.1839	1.8603	0.8895	1.1172	2.1644	1.2404	0.0000263	8.000
8.500	0.9987	3.1099	6.6932	1.1138	0.5347	0.7082	1.2376	0.7574	0.0000263	8.500
9.000	0.7732	1.3163	2.5339	0.8723	0.4825	0.4787	0.7997	0.4276	0.0000263	9.000
9.500	0.9352	0.4131	0.9862	0.6701	0.3947	0.3609	0.5819	0.3913	0.0000263	9.500
10.000	1.0335	0.1955	0.5240	0.4495	0.3650	0.3442	0.5032	0.4082	0.0000263	10.000
10.500	0.7845	0.1771	0.3237	0.3401	0.3618	0.3467	0.4120	0.3331	0.0000263	10.500
11.000	0.5624	0.1570	0.2386	0.3313	0.3962	0.3037	0.3661	0.2947	0.0000263	11.000
11.500	0.5731	0.1493	0.1885	0.3100	0.4169	0.2893	0.3425	0.3136	0.0000263	11.500
12.000	0.5610	0.1419	0.1536	0.2730	0.3832	0.3112	0.2803	0.3628	0.0000263	12.000
12.500	0.4721	0.1371	0.1781	0.2450	0.3752	0.3387	0.2953	0.3195	0.0000263	12.500
13.000	0.3796	0.1526	0.1944	0.2035	0.3423	0.3230	0.2748	0.2546	0.0000263	13.000
13.500	0.3085	0.2275	0.1852	0.1656	0.2599	0.2660	0.2724	0.2309	0.0000263	13.500
14.000	0.3125	0.3541	0.1729	0.1469	0.2272	0.2162	0.2368	0.2133	0.0000263	14.000
14.500	0.3210	0.5717	0.2011	0.1275	0.2530	0.1786	0.2284	0.1570	0.0000263	14.500
15.000	0.3369	0.9173	0.2378	0.1289	0.2340	0.1494	0.2163	0.1243	0.0000263	15.000
15.500	0.3082	1.2290	0.2484	0.1238	0.1451	0.1199	0.2089	0.1411	0.0000263	15.500
16.000	0.2250	1.5179	0.2299	0.1135	0.1154	0.0933	0.1580	0.1308	0.0000263	16.000
16.500	0.1837	1.3750	0.1721	0.0895	0.0977	0.0829	0.1450	0.0918	0.0000263	16.500
17.000	0.1654	0.8868	0.1217	0.0745	0.1063	0.0688	0.1361	0.0794	0.0000263	17.000
17.500	0.1412	0.5445	0.0998	0.0667	0.0944	0.0574	0.1145	0.0801	0.0000263	17.500
18.000	0.1321	0.3256	0.0771	0.0699	0.0769	0.0661	0.1033	0.0791	0.0000263	18.000
18.500	0.1293	0.2137	0.0694	0.0630	0.0652	0.0757	0.0960	0.0931	0.0000263	18.500
19.000	0.1120	0.1653	0.0588	0.0659	0.0621	0.0696	0.0887	0.0923	0.0000263	19.000
19.500	0.0903	0.1446	0.0589	0.0707	0.0596	0.0559	0.0811	0.0757	0.0000263	19.500
20.000	0.0712	0.1484	0.0659	0.0687	0.0586	0.0567	0.0642	0.0560	0.0000263	20.000

Table 34

Power Spectral Estimates, Rabbit 56, Medial Thalamus

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.1434	0.0454	0.0776	0.0195	0.0139	0.0231	0.0214	0.0183	0.000
0.500	0.5144	0.0902	0.2337	0.0904	0.0608	0.1241	0.0561	0.1000	0.500
1.000	1.3686	0.1600	0.5241	0.2155	0.1899	0.3652	0.1529	0.2945	1.000
1.500	2.0302	0.2064	0.7166	0.3740	0.3124	0.5026	0.2340	0.4493	1.500
2.000	1.9866	0.2405	0.9719	0.4285	0.3828	0.5108	0.2883	0.4423	2.000
2.500	1.7639	0.2838	1.1929	0.3707	0.4105	0.6298	0.3033	0.3430	2.500
3.000	1.7947	0.2903	1.0496	0.3422	0.3949	0.6796	0.3639	0.3188	3.000
3.500	1.6973	0.2862	1.0285	0.4051	0.3895	0.4878	0.4010	0.3349	3.500
4.000	1.3119	0.2728	0.9951	0.3914	0.3663	0.3923	0.4023	0.3099	4.000
4.500	1.0802	0.2050	0.7366	0.4853	0.4789	0.4500	0.4008	0.3744	4.500
5.000	0.9065	0.1676	0.5474	0.6508	0.6867	0.5259	0.4642	0.4752	5.000
5.500	0.7686	0.1451	0.4368	1.0736	1.2914	0.7363	0.6865	0.6632	5.500
6.000	0.8374	0.1382	0.4652	1.7626	1.8913	1.2644	1.3493	1.1167	6.000
6.500	0.9140	0.1723	0.6627	2.3184	1.7639	1.5465	1.8741	1.4198	6.500
7.000	0.6331	0.5017	1.4655	2.2175	1.4969	1.3650	1.9355	1.3437	7.000
7.500	0.4405	1.1191	2.9151	1.3342	0.9884	1.3601	1.5276	1.2993	7.500
8.000	0.4505	1.3840	3.5311	0.6704	0.4214	0.9159	0.8808	1.0798	8.000
8.500	0.4048	0.9892	2.3310	0.3925	0.1940	0.3400	0.4492	0.5607	8.500
9.000	0.3085	0.4445	0.8976	0.3103	0.1764	0.1636	0.2513	0.2411	9.000
9.500	0.3094	0.1732	0.3700	0.2405	0.1519	0.1197	0.1819	0.1526	9.500
10.000	0.3434	0.0943	0.2003	0.1798	0.1340	0.1159	0.1451	0.1332	10.000
10.500	0.2902	0.0772	0.1271	0.1529	0.1176	0.1187	0.1184	0.1313	10.500
11.000	0.2215	0.0660	0.1043	0.1371	0.1283	0.0989	0.1063	0.1092	11.000
11.500	0.2290	0.0588	0.0891	0.1085	0.1260	0.0814	0.0956	0.0969	11.500
12.000	0.2223	0.0564	0.0762	0.0991	0.1017	0.0854	0.0863	0.0753	12.000
12.500	0.1944	0.0528	0.0801	0.0870	0.1024	0.0847	0.0952	0.0644	12.500
13.000	0.1729	0.0614	0.0778	0.0721	0.1040	0.0772	0.0913	0.0619	13.000
13.500	0.1817	0.0747	0.0712	0.0513	0.0861	0.0632	0.0938	0.0689	13.500
14.000	0.1915	0.0933	0.0664	0.0481	0.0740	0.0620	0.0820	0.0709	14.000
14.500	0.1992	0.1534	0.0646	0.0450	0.0702	0.0526	0.0741	0.0614	14.500
15.000	0.2049	0.2507	0.0623	0.0456	0.0638	0.0484	0.0615	0.0483	15.000
15.500	0.1907	0.3351	0.0654	0.0435	0.0414	0.0442	0.0554	0.0372	15.500
16.000	0.1410	0.4208	0.0618	0.0380	0.0314	0.0379	0.0441	0.0387	16.000
16.500	0.1097	0.4035	0.0468	0.0302	0.0264	0.0267	0.0365	0.0352	16.500
17.000	0.1025	0.2713	0.0318	0.0300	0.0280	0.0201	0.0310	0.0242	17.000
17.500	0.0843	0.1612	0.0295	0.0234	0.0281	0.0165	0.0301	0.0223	17.500
18.000	0.0666	0.0904	0.0286	0.0237	0.0262	0.0164	0.0273	0.0245	18.000
18.500	0.0702	0.0620	0.0242	0.0193	0.0204	0.0171	0.0220	0.0201	18.500
19.000	0.0563	0.0478	0.0167	0.0201	0.0168	0.0193	0.0194	0.0162	19.000
19.500	0.0385	0.0348	0.0168	0.0189	0.0145	0.0161	0.0199	0.0155	19.500
20.000	0.0297	0.0313	0.0187	0.0195	0.0172	0.0144	0.0165	0.0170	20.000

Table 35

Power Spectral Estimates, Rabbit 56, Caudate

Frequency (Hz)	Slow wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp	Frequency (Hz)
0.000	0.3866	0.1103	0.4129	0.0636	0.0327	0.0522	0.0330	0.0430	0.000
0.500	1.1166	0.2812	0.8040	0.1514	0.1099	0.1619	0.0852	0.1246	0.500
1.000	2.8827	0.5530	1.2612	0.3085	0.3121	0.3780	0.2210	0.2563	1.000
1.500	4.6128	0.5921	1.7414	0.3965	0.4273	0.5527	0.4036	0.3813	1.500
2.000	5.2636	0.6039	2.3072	0.4239	0.4846	0.6054	0.4681	0.4934	2.000
2.500	5.2401	0.7145	2.3736	0.4632	0.4365	0.6186	0.3840	0.6369	2.500
3.000	4.5090	0.8076	2.1681	0.4598	0.4061	0.6545	0.3696	0.6321	3.000
3.500	3.8380	0.8373	1.8917	0.4922	0.3705	0.6451	0.3889	0.5439	3.500
4.000	3.9339	0.8392	1.8497	0.5691	0.4192	0.5642	0.4446	0.5916	4.000
4.500	3.6249	0.6036	1.4750	0.5080	0.4531	0.6043	0.4367	0.6372	4.500
5.000	2.7212	0.4201	1.0952	0.5423	0.5422	0.7007	0.4659	0.7115	5.000
5.500	2.3838	0.3979	0.9185	0.8264	0.8604	0.9379	0.7503	0.8802	5.500
6.000	2.4007	0.4517	0.7742	1.1670	1.4930	1.3616	1.3756	1.0519	6.000
6.500	2.3966	0.4965	0.9337	1.5657	1.8467	1.5224	2.0700	1.1096	6.500
7.000	1.8608	0.9396	1.4709	1.7626	2.1753	1.5160	2.7229	1.1584	7.000
7.500	1.2476	2.2547	2.4000	1.3028	2.0629	1.6425	2.3412	1.3717	7.500
8.000	1.0683	3.2179	2.7147	0.7319	0.9396	1.5030	1.3657	1.4574	8.000
8.500	1.1273	2.3079	1.5482	0.5039	0.4864	0.9455	0.8372	0.8636	8.500
9.000	0.9804	0.9389	0.5429	0.4174	0.3884	0.4419	0.6100	0.4053	9.000
9.500	0.8833	0.3417	0.2345	0.3202	0.2584	0.2671	0.4367	0.2390	9.500
10.000	0.9542	0.1741	0.1678	0.2369	0.1641	0.2008	0.3084	0.1843	10.000
10.500	0.9324	0.1451	0.1580	0.1889	0.1339	0.1491	0.2551	0.1680	10.500
11.000	0.7830	0.1193	0.1266	0.1698	0.0980	0.1573	0.2085	0.1470	11.000
11.500	0.5819	0.0981	0.1083	0.1741	0.0927	0.1387	0.1700	0.1145	11.500
12.000	0.5115	0.0936	0.1141	0.1836	0.0960	0.1113	0.1371	0.1111	12.000
12.500	0.5828	0.0888	0.1117	0.1583	0.0948	0.1073	0.1294	0.0953	12.500
13.000	0.5822	0.0789	0.0872	0.1302	0.0864	0.1080	0.1160	0.0959	13.000
13.500	0.5598	0.0816	0.0680	0.0991	0.0861	0.0976	0.1069	0.1011	13.500
14.000	0.5799	0.0961	0.0729	0.0951	0.0802	0.0936	0.1055	0.0835	14.000
14.500	0.6218	0.1160	0.0770	0.0976	0.0969	0.0894	0.1039	0.0810	14.500
15.000	0.6878	0.1368	0.0708	0.0854	0.0837	0.0798	0.0910	0.1009	15.000
15.500	0.6905	0.2001	0.0734	0.0661	0.0733	0.0745	0.0807	0.0908	15.500
16.000	0.6348	0.2615	0.0735	0.0631	0.0714	0.0858	0.0710	0.0769	16.000
16.500	0.5094	0.2446	0.0748	0.0702	0.0741	0.0838	0.0615	0.0658	16.500
17.000	0.3673	0.1788	0.0674	0.0651	0.0651	0.0736	0.0611	0.0619	17.000
17.500	0.2825	0.1234	0.0495	0.0646	0.0564	0.0675	0.0660	0.0498	17.500
18.000	0.2501	0.0934	0.0398	0.0647	0.0563	0.0635	0.0690	0.0452	18.000
18.500	0.2322	0.0777	0.0432	0.0575	0.0576	0.0573	0.0686	0.0431	18.500
19.000	0.2022	0.0633	0.0519	0.0538	0.0483	0.0460	0.0525	0.0329	19.000
19.500	0.1516	0.0671	0.0482	0.0494	0.0435	0.0422	0.0441	0.0274	19.500
20.000	0.1102	0.0609	0.0358	0.0414	0.0434	0.0370	0.0361	0.0321	20.000

Table 36

Power Spectral Estimates, Rabbit 56, Reticular Formation

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.4092	0.1137	0.4736	0.0871	0.0873	0.0864	0.0968	0.1046	0.000
0.500	1.6181	0.2913	1.1595	0.3616	0.2845	0.4375	0.2253	0.4071	0.500
1.000	4.3945	0.5849	2.0534	0.8182	0.8014	1.2644	0.6819	1.1136	1.000
1.500	6.5393	0.8015	2.6072	1.3954	1.2472	1.9953	1.0978	1.4306	1.500
2.000	6.2620	0.9513	3.4148	1.6216	1.4061	2.0129	1.2543	1.2032	2.000
2.500	5.0148	1.0105	3.7111	1.3672	1.3710	1.7758	1.2632	1.2008	2.500
3.000	4.9286	1.0146	3.5028	1.2857	1.2345	1.5019	1.4056	1.3393	3.000
3.500	4.3484	0.9325	3.0141	1.6423	1.1850	1.3448	1.3683	1.3446	3.500
4.000	2.9135	0.7964	2.4784	1.6034	1.2110	1.4567	1.4582	1.4007	4.000
4.500	2.4670	0.5963	2.3153	1.7541	1.8668	1.7307	1.5695	1.8763	4.500
5.000	2.3847	0.4792	2.1931	2.2271	3.2063	2.2637	2.0165	2.5070	5.000
5.500	2.4435	0.4849	1.7063	3.6758	5.9180	3.6986	2.7389	3.6547	5.500
6.000	2.8032	0.4482	1.5237	6.2939	8.2683	5.6511	4.8596	4.9673	6.000
6.500	2.8616	0.7435	2.5157	8.5092	7.5991	5.9598	6.9723	5.9591	6.500
7.000	2.1935	2.8141	4.8027	7.7045	6.0336	4.7070	6.7932	5.9499	7.000
7.500	1.3819	6.4867	8.0035	4.2865	3.7765	3.6847	4.8768	4.7900	7.500
8.000	1.2769	7.7054	8.5627	2.1281	1.5463	3.5317	2.8513	3.5523	8.000
8.500	1.3333	5.0194	4.5266	1.2093	0.6675	2.1641	1.5045	1.9505	8.500
9.000	1.0219	1.8492	1.7763	0.9071	0.6130	0.7662	0.7738	0.9567	9.000
9.500	0.8684	0.5355	0.9564	0.6769	0.5018	0.4435	0.6227	0.6575	9.500
10.000	0.9198	0.2569	0.6443	0.5565	0.4115	0.4052	0.5170	0.5321	10.000
10.500	0.7944	0.2581	0.4828	0.4888	0.3562	0.3515	0.4397	0.4055	10.500
11.000	0.6043	0.2389	0.3610	0.4024	0.3670	0.2662	0.3750	0.4057	11.000
11.500	0.5916	0.1812	0.2518	0.3067	0.3357	0.2519	0.3344	0.3544	11.500
12.000	0.5350	0.1506	0.2253	0.3295	0.2624	0.2818	0.2697	0.2917	12.000
12.500	0.4260	0.1293	0.2081	0.3172	0.2882	0.2490	0.2774	0.2399	12.500
13.000	0.3971	0.1263	0.1927	0.2585	0.3034	0.2024	0.2910	0.2455	13.000
13.500	0.4387	0.1593	0.1496	0.1877	0.2644	0.2065	0.3208	0.2716	13.500
14.000	0.4495	0.1961	0.1439	0.1767	0.2355	0.2163	0.2958	0.2656	14.000
14.500	0.4546	0.2888	0.1377	0.1610	0.2051	0.1590	0.2463	0.2217	14.500
15.000	0.4549	0.4640	0.1475	0.1601	0.1953	0.1106	0.1921	0.1914	15.000
15.500	0.4015	0.6590	0.1507	0.1513	0.1352	0.1134	0.1679	0.1822	15.500
16.000	0.2795	0.8365	0.1538	0.1312	0.0980	0.1062	0.1483	0.1545	16.000
16.500	0.2054	0.7952	0.1400	0.0946	0.0764	0.0750	0.1204	0.1057	16.500
17.000	0.1764	0.5545	0.1149	0.0899	0.0751	0.0652	0.0924	0.0770	17.000
17.500	0.1365	0.3722	0.0817	0.0681	0.0683	0.0657	0.0868	0.0674	17.500
18.000	0.1210	0.2348	0.0790	0.0737	0.0616	0.0765	0.0779	0.0739	18.000
18.500	0.1268	0.1517	0.0624	0.0637	0.0489	0.0716	0.0629	0.0733	18.500
19.000	0.1036	0.1206	0.0548	0.0637	0.0467	0.0540	0.0451	0.0715	19.000
19.500	0.0767	0.0842	0.0493	0.0546	0.0459	0.0440	0.0526	0.0592	19.500
20.000	0.0673	0.0721	0.0507	0.0578	0.0504	0.0372	0.0483	0.0427	20.000

Table 37

Power Spectral Estimates, Rabbit 56, Sensori-Motor Cortex

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.1051	0.0274	0.0839	0.0099	0.0172	0.0134	0.0193	0.0167	0.000
0.500	0.4009	0.0944	0.1837	0.0317	0.0395	0.0404	0.0525	0.0383	0.500
1.000	1.0836	0.1917	0.3723	0.0660	0.0890	0.1010	0.1360	0.1026	1.000
1.500	1.6783	0.2699	0.5367	0.1089	0.1300	0.2067	0.1889	0.1803	1.500
2.000	2.2078	0.3694	0.7612	0.1782	0.1592	0.3103	0.2082	0.2069	2.000
2.500	2.6468	0.3876	0.8021	0.2504	0.1920	0.3318	0.1980	0.2423	2.500
3.000	2.4711	0.3881	0.8043	0.2573	0.1849	0.2698	0.1775	0.2228	3.000
3.500	2.2953	0.3989	0.9529	0.2437	0.2016	0.2457	0.1863	0.1907	3.500
4.000	2.1664	0.3755	0.9759	0.2651	0.2031	0.2280	0.1938	0.2029	4.000
4.500	1.9035	0.2831	0.8048	0.2449	0.1718	0.2289	0.1788	0.2030	4.500
5.000	1.4947	0.2319	0.5072	0.2383	0.1784	0.2695	0.1767	0.2216	5.000
5.500	1.2580	0.2368	0.3812	0.4737	0.2584	0.3534	0.2526	0.2571	5.500
6.000	1.2547	0.2250	0.3327	0.7541	0.4306	0.3900	0.4319	0.3271	6.000
6.500	1.2842	0.1970	0.3123	0.6744	0.5443	0.3853	0.6562	0.3468	6.500
7.000	1.4137	0.3303	0.3727	0.5439	0.5138	0.3825	0.8613	0.3090	7.000
7.500	1.3879	0.6117	0.4879	0.3768	0.3582	0.3643	0.6833	0.2944	7.500
8.000	1.0669	0.7703	0.5044	0.2227	0.1819	0.2898	0.3302	0.2853	8.000
8.500	0.8861	0.5542	0.3476	0.1523	0.1268	0.1563	0.1853	0.2005	8.500
9.000	0.8791	0.2467	0.1800	0.1381	0.1102	0.1020	0.1361	0.1169	9.000
9.500	0.8510	0.1141	0.1011	0.1297	0.1057	0.0966	0.1029	0.0924	9.500
10.000	0.8442	0.0755	0.0843	0.1131	0.1067	0.0849	0.1024	0.0754	10.000
10.500	0.8170	0.0780	0.0740	0.0990	0.1018	0.0660	0.1012	0.0599	10.500
11.000	0.7783	0.0667	0.0680	0.0843	0.0773	0.0714	0.0824	0.0609	11.000
11.500	0.7868	0.0586	0.0682	0.0837	0.0658	0.0729	0.0803	0.0657	11.500
12.000	0.9427	0.0519	0.0646	0.0772	0.0695	0.0679	0.0916	0.0705	12.000
12.500	1.0358	0.0473	0.0682	0.0629	0.0637	0.0655	0.0874	0.0730	12.500
13.000	0.9468	0.0541	0.0696	0.0657	0.0590	0.0598	0.0716	0.0755	13.000
13.500	0.8834	0.0577	0.0681	0.0658	0.0628	0.0630	0.0754	0.0718	13.500
14.000	0.8261	0.0667	0.0675	0.0560	0.0579	0.0675	0.0761	0.0587	14.000
14.500	0.8343	0.0761	0.0576	0.0477	0.0623	0.0517	0.0711	0.0589	14.500
15.000	0.9693	0.0785	0.0509	0.0482	0.0614	0.0448	0.0674	0.0621	15.000
15.500	0.8617	0.0760	0.0530	0.0518	0.0491	0.0571	0.0584	0.0586	15.500
16.000	0.4892	0.0887	0.0600	0.0516	0.0453	0.0662	0.0491	0.0557	16.000
16.500	0.3131	0.0921	0.0588	0.0475	0.0464	0.0572	0.0472	0.0526	16.500
17.000	0.2749	0.0740	0.0556	0.0419	0.0399	0.0501	0.0441	0.0443	17.000
17.500	0.2583	0.0657	0.0475	0.0395	0.0375	0.0496	0.0435	0.0395	17.500
18.000	0.2600	0.0680	0.0423	0.0396	0.0377	0.0472	0.0458	0.0413	18.000
18.500	0.2130	0.0593	0.0421	0.0456	0.0400	0.0424	0.0442	0.0389	18.500
19.000	0.1657	0.0534	0.0421	0.0455	0.0442	0.0422	0.0403	0.0437	19.000
19.500	0.1275	0.0560	0.0463	0.0373	0.0420	0.0418	0.0357	0.0410	19.500
20.000	0.0957	0.0582	0.0447	0.0363	0.0394	0.0388	0.0378	0.0346	20.000

Table 38

Power Spectral Estimates, Rabbit 57, Dorsal Hippocampus

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	D.C. Potential	Frequency (Hz)
0.000	0.0959	0.0390	0.0397	0.0207	0.0193	0.0311	0.0173	0.0336	0.0000007	0.000
0.500	0.3155	0.1231	0.0902	0.0783	0.0731	0.1141	0.0723	0.0942	0.0000007	0.500
1.000	0.6928	0.1826	0.1622	0.2209	0.1942	0.2529	0.1855	0.2438	0.0000007	1.000
1.500	0.9044	0.2013	0.2081	0.3891	0.2846	0.3782	0.2898	0.3001	0.0000007	1.500
2.000	0.9622	0.1827	0.3457	0.4877	0.3378	0.4776	0.3549	0.4021	0.0000007	2.000
2.500	1.1572	0.2565	0.3856	0.4562	0.3987	0.6129	0.5290	0.5319	0.0000007	2.500
3.000	1.2421	0.2396	0.2999	0.4304	0.4789	0.6139	0.5834	0.6043	0.0000007	3.000
3.500	1.1249	0.2219	0.3066	0.4531	0.5405	0.6563	0.5255	0.6557	0.0000007	3.500
4.000	0.9545	0.2335	0.3241	0.4981	0.5721	0.8602	0.6117	0.6771	0.0000007	4.000
4.500	0.9900	0.3459	0.3177	0.6799	0.7768	1.1840	0.9467	0.7612	0.0000007	4.500
5.000	0.9705	0.3046	0.3328	1.2355	1.3878	1.7364	1.3275	1.2785	0.0000007	5.000
5.500	0.8740	0.3831	0.4413	2.5370	2.2378	2.1325	1.8176	1.8500	0.0000007	5.500
6.000	1.0781	0.8080	0.7641	3.5929	2.6236	1.8536	2.2791	2.1655	0.0000007	6.000
6.500	1.3362	1.4819	1.2388	2.5148	2.0387	1.3816	1.8875	1.8935	0.0000007	6.500
7.000	1.3764	2.5024	2.3595	1.3189	1.1567	0.9807	1.0894	1.0736	0.0000007	7.000
7.500	1.0542	5.7720	3.9602	0.8432	0.6340	0.6390	0.6967	0.6122	0.0000007	7.500
8.000	0.7472	7.5632	4.7266	0.5184	0.3832	0.4422	0.4893	0.3783	0.0000007	8.000
8.500	0.5348	3.7641	4.4064	0.3750	0.2455	0.3157	0.3056	0.2566	0.0000007	8.500
9.000	0.3555	0.9406	2.4242	0.2616	0.1567	0.2186	0.2654	0.1871	0.0000007	9.000
9.500	0.3503	0.4061	0.7625	0.1830	0.1315	0.1461	0.2569	0.1676	0.0000007	9.500
10.000	0.3195	0.2645	0.3002	0.1662	0.1333	0.1417	0.2090	0.1510	0.0000007	10.000
10.500	0.2538	0.1561	0.2037	0.1532	0.1342	0.1703	0.1475	0.1319	0.0000007	10.500
11.000	0.2297	0.1597	0.1836	0.1179	0.1190	0.1898	0.1210	0.0982	0.0000007	11.000
11.500	0.2453	0.1144	0.1666	0.1038	0.1030	0.1519	0.1088	0.0942	0.0000007	11.500
12.000	0.2476	0.1176	0.1248	0.1116	0.0935	0.1093	0.0981	0.0817	0.0000007	12.000
12.500	0.2515	0.1043	0.0940	0.1049	0.1008	0.0971	0.0824	0.0849	0.0000007	12.500
13.000	0.2652	0.0993	0.0967	0.0794	0.0949	0.0830	0.0734	0.0754	0.0000007	13.000
13.500	0.2197	0.0849	0.0932	0.0659	0.0684	0.0617	0.0693	0.0591	0.0000007	13.500
14.000	0.2016	0.0838	0.0811	0.0568	0.0513	0.0613	0.0614	0.0500	0.0000007	14.000
14.500	0.1787	0.0803	0.0676	0.0453	0.0418	0.0589	0.0512	0.0453	0.0000007	14.500
15.000	0.1257	0.0957	0.0657	0.0384	0.0378	0.0447	0.0497	0.0418	0.0000007	15.000
15.500	0.1048	0.0981	0.0618	0.0390	0.0327	0.0447	0.0455	0.0385	0.0000007	15.500
16.000	0.0993	0.0996	0.0596	0.0316	0.0325	0.0448	0.0392	0.0339	0.0000007	16.000
16.500	0.0996	0.0882	0.0530	0.0278	0.0371	0.0366	0.0398	0.0369	0.0000007	16.500
17.000	0.0944	0.0852	0.0571	0.0249	0.0335	0.0365	0.0366	0.0301	0.0000007	17.000
17.500	0.0845	0.0516	0.0547	0.0251	0.0310	0.0452	0.0325	0.0232	0.0000007	17.500
18.000	0.0776	0.0451	0.0431	0.0278	0.0308	0.0405	0.0363	0.0207	0.0000007	18.000
18.500	0.0712	0.0373	0.0442	0.0295	0.0297	0.0298	0.0340	0.0238	0.0000007	18.500
19.000	0.0589	0.0444	0.0423	0.0255	0.0270	0.0253	0.0283	0.0222	0.0000007	19.000
19.500	0.0508	0.0382	0.0389	0.0217	0.0248	0.0223	0.0224	0.0217	0.0000007	19.500
20.000	0.0439	0.0350	0.0355	0.0194	0.0218	0.0179	0.0192	0.0158	0.0000007	20.000

Table 39

Rabbit 57, Medial Thalamus

Frequency (Hz)	Slow Sleep	Para Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	D.C. Potent.	Frequency (Hz)
0.000	0.2090	0.1055	0.1705	0.1162	0.1315	0.1313	0.1095	0.1113	0.0000000	0.000
0.500	0.4907	0.1494	0.2672	0.1881	0.2084	0.2417	0.1708	0.1769	0.0000000	0.500
1.000	0.8795	0.1760	0.3822	0.2994	0.2410	0.2756	0.2101	0.2365	0.0000000	1.000
1.500	1.1273	0.1852	0.5031	0.3761	0.2201	0.2872	0.2091	0.2648	0.0000000	1.500
2.000	1.0677	0.1723	0.6465	0.3568	0.2588	0.3829	0.2052	0.3080	0.0000000	2.000
2.500	0.9975	0.1766	0.6744	0.2858	0.3444	0.5215	0.2267	0.3312	0.0000000	2.500
3.000	1.3405	0.1505	0.4756	0.2713	0.3786	0.4773	0.2552	0.3581	0.0000000	3.000
3.500	1.2294	0.1535	0.3814	0.2586	0.3248	0.3798	0.2788	0.3286	0.0000000	3.500
4.000	0.8047	0.1694	0.3567	0.2853	0.3035	0.4284	0.3495	0.3139	0.0000000	4.000
4.500	0.7854	0.2027	0.2775	0.4069	0.3765	0.5951	0.5221	0.3560	0.0000000	4.500
5.000	0.8807	0.2227	0.2722	0.7679	0.6238	0.8413	0.7618	0.6175	0.0000000	5.000
5.500	0.7799	0.3014	0.3131	1.6555	1.1070	1.0958	1.0386	0.9851	0.0000000	5.500
6.000	0.7536	0.3035	0.4548	2.5057	1.4568	1.0134	1.2297	1.2693	0.0000000	6.000
6.500	1.0266	0.5656	0.7637	1.8156	1.2823	0.7832	1.0065	1.1858	0.0000000	6.500
7.000	1.1208	1.5674	1.5029	0.9795	0.7370	0.6174	0.5913	0.7466	0.0000000	7.000
7.500	0.8241	2.9805	2.5244	0.5938	0.3482	0.4256	0.3624	0.4482	0.0000000	7.500
8.000	0.5724	2.5031	3.0711	0.3280	0.2394	0.2982	0.2551	0.2550	0.0000000	8.000
8.500	0.4763	0.9082	2.9416	0.2802	0.1959	0.2046	0.1856	0.1616	0.0000000	8.500
9.000	0.3934	0.3568	1.6719	0.2341	0.1410	0.1418	0.1903	0.1185	0.0000000	9.000
9.500	0.3483	0.1628	0.5829	0.1615	0.1154	0.1157	0.1862	0.1025	0.0000000	9.500
10.000	0.3183	0.0892	0.2715	0.1231	0.0957	0.1198	0.1466	0.0929	0.0000000	10.000
10.500	0.2625	0.0679	0.1738	0.1262	0.0815	0.1062	0.1146	0.0853	0.0000000	10.500
11.000	0.2084	0.0828	0.1424	0.1023	0.0873	0.1085	0.0906	0.0735	0.0000000	11.000
11.500	0.2472	0.0638	0.1198	0.0956	0.0848	0.0995	0.0826	0.0777	0.0000000	11.500
12.000	0.2578	0.0558	0.0976	0.0997	0.0646	0.0811	0.0839	0.0676	0.0000000	12.000
12.500	0.2335	0.0542	0.0800	0.0911	0.0576	0.0654	0.0678	0.0626	0.0000000	12.500
13.000	0.2226	0.0676	0.0777	0.0658	0.0575	0.0594	0.0518	0.0524	0.0000000	13.000
13.500	0.2119	0.0697	0.0710	0.0562	0.0478	0.0526	0.0463	0.0523	0.0000000	13.500
14.000	0.2075	0.0931	0.0604	0.0456	0.0376	0.0517	0.0469	0.0459	0.0000000	14.000
14.500	0.1754	0.1123	0.0497	0.0409	0.0288	0.0388	0.0435	0.0371	0.0000000	14.500
15.000	0.1452	0.1497	0.0472	0.0364	0.0241	0.0275	0.0365	0.0335	0.0000000	15.000
15.500	0.1555	0.1994	0.0483	0.0330	0.0214	0.0254	0.0291	0.0297	0.0000000	15.500
16.000	0.1686	0.1655	0.0538	0.0269	0.0200	0.0282	0.0244	0.0242	0.0000000	16.000
16.500	0.1626	0.0962	0.0436	0.0228	0.0216	0.0253	0.0242	0.0212	0.0000000	16.500
17.000	0.1475	0.0684	0.0402	0.0198	0.0194	0.0222	0.0202	0.0192	0.0000000	17.000
17.500	0.1107	0.0525	0.0438	0.0205	0.0173	0.0212	0.0185	0.0162	0.0000000	17.500
18.000	0.0828	0.0438	0.0366	0.0200	0.0162	0.0240	0.0202	0.0127	0.0000000	18.000
18.500	0.0815	0.0361	0.0321	0.0218	0.0147	0.0249	0.0186	0.0117	0.0000000	18.500
19.000	0.0863	0.0327	0.0297	0.0172	0.0140	0.0230	0.0161	0.0112	0.0000000	19.000
19.500	0.0709	0.0237	0.0271	0.0140	0.0134	0.0156	0.0150	0.0120	0.0000000	19.500
20.000	0.0476	0.0228	0.0257	0.0144	0.0125	0.0121	0.0132	0.0131	0.0000000	20.000

Table 40

Rabbit 57, Caudate. Power Spectral Estimates

Frequency (Hz)	Slow Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.1831	0.0411	0.0835	0.0400	0.0388	0.0301	0.0229	0.0223	0.000
0.500	0.5731	0.1254	0.2366	0.0904	0.0778	0.1044	0.0484	0.0695	0.500
1.000	1.3821	0.2748	0.6110	0.1845	0.1437	0.3510	0.1031	0.1729	1.000
1.500	1.8613	0.4108	0.8769	0.2464	0.2070	0.7843	0.1841	0.2530	1.500
2.000	2.3074	0.4429	0.9134	0.2798	0.2685	0.9888	0.2157	0.2988	2.000
2.500	2.6457	0.4771	0.8972	0.2962	0.2982	0.9584	0.2034	0.3805	2.500
3.000	3.0771	0.4444	0.9531	0.2964	0.3288	0.9017	0.2110	0.3562	3.000
3.500	2.9748	0.4215	0.8795	0.2615	0.3504	0.8477	0.2531	0.3278	3.500
4.000	2.8111	0.4209	0.6744	0.2543	0.3441	0.9355	0.3218	0.3588	4.000
4.500	2.8313	0.5845	0.5494	0.2879	0.4622	1.0120	0.3831	0.4356	4.500
5.000	2.3722	0.5765	0.5290	0.3968	0.9327	0.9426	0.4928	0.5442	5.000
5.500	1.8989	0.4135	0.4941	0.6653	1.1913	0.8684	0.6996	0.6723	5.500
6.000	1.4966	0.3671	0.4873	1.0426	0.9497	0.7637	1.0385	0.7716	6.000
6.500	1.5948	0.4370	0.6098	0.9623	0.6297	0.6179	1.0075	0.9750	6.500
7.000	1.5702	1.0153	0.9885	0.6031	0.4784	0.4976	0.6754	0.8341	7.000
7.500	1.2785	2.0497	1.5230	0.5342	0.4335	0.3728	0.4211	0.4490	7.500
8.000	0.9712	1.9448	1.8694	0.4672	0.2801	0.2947	0.3056	0.2618	8.000
8.500	0.7749	0.8184	1.2361	0.3300	0.1977	0.2472	0.2414	0.1910	8.500
9.000	0.6354	0.3351	0.4344	0.1874	0.1540	0.2134	0.1736	0.1864	9.000
9.500	0.5909	0.2066	0.2097	0.1347	0.1619	0.2044	0.1258	0.1590	9.500
10.000	0.6548	0.1793	0.1513	0.1326	0.1804	0.1601	0.1056	0.1227	10.000
10.500	0.6609	0.1365	0.1155	0.1129	0.1747	0.1345	0.1012	0.1042	10.500
11.000	0.5391	0.1002	0.0986	0.0930	0.1410	0.1393	0.1043	0.1033	11.000
11.500	0.4914	0.0962	0.0852	0.0853	0.1034	0.1412	0.0958	0.0875	11.500
12.000	0.5351	0.1053	0.0760	0.0883	0.0897	0.1189	0.0830	0.0765	12.000
12.500	0.5424	0.0849	0.1040	0.0840	0.0791	0.1010	0.0793	0.0702	12.500
13.000	0.4967	0.0649	0.0968	0.0726	0.0755	0.0889	0.0630	0.0665	13.000
13.500	0.4996	0.0670	0.0771	0.0764	0.0793	0.0946	0.0493	0.0675	13.500
14.000	0.6200	0.0934	0.0616	0.0718	0.0723	0.0915	0.0538	0.0672	14.000
14.500	0.6810	0.1097	0.0589	0.0602	0.0631	0.0774	0.0555	0.0600	14.500
15.000	0.5166	0.0992	0.0535	0.0450	0.0605	0.0698	0.0462	0.0566	15.000
15.500	0.4336	0.1013	0.0468	0.0416	0.0573	0.0676	0.0381	0.0573	15.500
16.000	0.4367	0.0873	0.0410	0.0462	0.0595	0.0656	0.0303	0.0513	16.000
16.500	0.4197	0.0631	0.0400	0.0468	0.0542	0.0525	0.0333	0.0464	16.500
17.000	0.3577	0.0638	0.0428	0.0420	0.0482	0.0468	0.0450	0.0372	17.000
17.500	0.3043	0.0559	0.0474	0.0464	0.0467	0.0570	0.0447	0.0349	17.500
18.000	0.2850	0.0449	0.0455	0.0382	0.0421	0.0538	0.0390	0.0428	18.000
18.500	0.2740	0.0436	0.0449	0.0305	0.0388	0.0464	0.0334	0.0469	18.500
19.000	0.2212	0.0576	0.0370	0.0352	0.0371	0.0531	0.0323	0.0486	19.000
19.500	0.1593	0.0559	0.0310	0.0403	0.0344	0.0555	0.0330	0.0431	19.500
20.000	0.1340	0.0456	0.0342	0.0339	0.0324	0.0497	0.0295	0.0330	20.000

Table 41

Power Spectral Estimates, Rabbit 57, Septum

Frequency (Hz)	Slow Wave Sleep	Para Sleep	Awake Moving	Awake Alert Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.1551	0.0405	0.1369	0.0190	0.0102	0.0201	0.0198	0.0095	0.000
0.500	0.3929	0.1134	0.2741	0.0441	0.0295	0.0463	0.0438	0.0337	0.500
1.000	0.8218	0.2177	0.5338	0.1371	0.0740	0.1356	0.0928	0.0764	1.000
1.500	1.0293	0.2385	0.8473	0.2241	0.1086	0.2075	0.1334	0.0956	1.500
2.000	1.2129	0.2683	1.2622	0.2118	0.1211	0.2038	0.1232	0.1075	2.000
2.500	1.3905	0.2869	1.2061	0.1679	0.1430	0.2067	0.1185	0.1251	2.500
3.000	1.9584	0.2732	0.7004	0.1407	0.1433	0.2479	0.1524	0.1385	3.000
3.500	2.1740	0.2185	0.4743	0.1302	0.1291	0.2961	0.1652	0.1277	3.500
4.000	1.7619	0.2604	0.4317	0.1444	0.1403	0.5076	0.2141	0.1262	4.000
4.500	1.4448	0.3621	0.3319	0.1480	0.1461	0.7052	0.3078	0.1415	4.500
5.000	1.1472	0.3577	0.2490	0.1545	0.1574	0.6240	0.3879	0.1506	5.000
5.500	0.8850	0.3126	0.2099	0.3625	0.1674	0.3908	0.3941	0.1634	5.500
6.000	0.7215	0.2168	0.1814	0.6502	0.1942	0.1813	0.2546	0.1968	6.000
6.500	0.6669	0.1477	0.1729	0.4409	0.3057	0.1041	0.1351	0.2502	6.500
7.000	0.5290	0.1653	0.2284	0.1679	0.3904	0.1007	0.0852	0.2223	7.000
7.500	0.4827	0.1690	0.3120	0.1314	0.2422	0.0950	0.0707	0.1351	7.500
8.000	0.4547	0.1333	0.3827	0.1119	0.1150	0.0837	0.0725	0.0885	8.000
8.500	0.4293	0.1058	0.3745	0.0819	0.0802	0.0879	0.0638	0.0767	8.500
9.000	0.3521	0.1013	0.2275	0.0608	0.0575	0.0822	0.0595	0.0641	9.000
9.500	0.3030	0.0812	0.1172	0.0501	0.0458	0.0698	0.0536	0.0572	9.500
10.000	0.2692	0.0638	0.0880	0.0396	0.0440	0.0665	0.0501	0.0512	10.000
10.500	0.2488	0.0592	0.0743	0.0405	0.0440	0.0640	0.0483	0.0389	10.500
11.000	0.2441	0.0523	0.0656	0.0390	0.0414	0.0561	0.0393	0.0336	11.000
11.500	0.2931	0.0420	0.0550	0.0354	0.0376	0.0462	0.0363	0.0320	11.500
12.000	0.3372	0.0413	0.0431	0.0360	0.0310	0.0363	0.0352	0.0353	12.000
12.500	0.2881	0.0372	0.0409	0.0377	0.0235	0.0298	0.0278	0.0357	12.500
13.000	0.1954	0.0305	0.0375	0.0318	0.0256	0.0309	0.0230	0.0310	13.000
13.500	0.2014	0.0313	0.0308	0.0263	0.0311	0.0331	0.0240	0.0313	13.500
14.000	0.2559	0.0339	0.0361	0.0238	0.0275	0.0329	0.0258	0.0323	14.000
14.500	0.2633	0.0375	0.0388	0.0252	0.0238	0.0281	0.0257	0.0259	14.500
15.000	0.2284	0.0336	0.0302	0.0237	0.0243	0.0274	0.0232	0.0206	15.000
15.500	0.2443	0.0298	0.0250	0.0233	0.0236	0.0272	0.0237	0.0240	15.500
16.000	0.2439	0.0269	0.0247	0.0225	0.0204	0.0235	0.0224	0.0237	16.000
16.500	0.2141	0.0242	0.0246	0.0178	0.0192	0.0228	0.0192	0.0177	16.500
17.000	0.1976	0.0228	0.0248	0.0162	0.0175	0.0195	0.0179	0.0164	17.000
17.500	0.1586	0.0290	0.0257	0.0165	0.0171	0.0184	0.0178	0.0166	17.500
18.000	0.1256	0.0302	0.0234	0.0172	0.0157	0.0207	0.0159	0.0155	18.000
18.500	0.1336	0.0240	0.0240	0.0180	0.0148	0.0210	0.0156	0.0145	18.500
19.000	0.1308	0.0204	0.0244	0.0149	0.0149	0.0201	0.0154	0.0159	19.000
19.500	0.0982	0.0198	0.0209	0.0137	0.0139	0.0198	0.0145	0.0140	19.500
20.000	0.0713	0.0211	0.0174	0.0127	0.0121	0.0155	0.0128	0.0130	20.000

Table 42

Power Spectral Estimates Rabbit 57, Reticular Formation

Frequency (Hz)	Slow Wave Sleep	REM Sleep	Awake Moving	Awake Still	Early Hyp.	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp.	Frequency (Hz)
0.000	0.1522	0.0640	0.2511	0.0594	0.0482	0.0847	0.0562	0.0454	0.000
0.500	0.4721	0.1792	0.5802	0.2011	0.1362	0.2260	0.1659	0.1599	0.500
1.000	1.0984	0.3626	1.0725	0.4871	0.3693	0.7042	0.3380	0.4228	1.000
1.500	1.5390	0.5823	1.2813	0.8464	0.6618	1.0240	0.5388	0.6783	1.500
2.000	1.6988	0.5623	1.2984	1.1210	0.7919	1.0234	0.6983	0.8067	2.000
2.500	1.8090	0.5325	1.3765	1.1979	0.8409	1.2339	0.7611	0.8873	2.500
3.000	1.9468	0.5021	1.6149	1.1625	0.8051	1.2558	0.7339	0.9259	3.000
3.500	1.5833	0.4980	1.8093	1.0186	0.7682	0.8387	0.7556	0.9320	3.500
4.000	1.0246	0.4775	1.7061	0.8651	0.7997	0.8051	0.7689	0.8792	4.000
4.500	1.1124	0.5535	1.3511	1.2025	1.5556	1.3592	1.0135	1.0629	4.500
5.000	1.4350	0.5661	0.9899	2.3672	3.2161	2.1172	1.8366	1.6437	5.000
5.500	1.5444	0.5441	0.8255	4.7030	3.8298	2.6769	3.7824	2.6092	5.500
6.000	1.7068	0.4811	0.9931	5.7288	2.9579	2.6239	4.7169	3.7153	6.000
6.500	2.1333	1.1422	1.6262	3.9170	1.9099	2.1056	3.8376	3.8628	6.500
7.000	2.1039	3.8771	3.2563	2.2102	1.4138	1.7920	2.4070	2.5623	7.000
7.500	1.5666	7.7249	4.8965	1.4741	1.1847	1.2454	1.1415	1.2021	7.500
8.000	1.1659	6.4062	5.9594	0.9210	0.7306	0.6409	0.6084	0.5911	8.000
8.500	0.9193	2.1524	3.7747	0.5386	0.4392	0.5727	0.4153	0.3801	8.500
9.000	0.7848	0.7936	1.1875	0.4049	0.3576	0.5579	0.3477	0.2907	9.000
9.500	0.7008	0.3807	0.5518	0.2939	0.3129	0.4114	0.3152	0.2586	9.500
10.000	0.6320	0.2116	0.3566	0.2484	0.2221	0.2924	0.2995	0.2527	10.000
10.500	0.5072	0.1504	0.2999	0.2336	0.1826	0.2474	0.2318	0.2352	10.500
11.000	0.4246	0.1744	0.2902	0.2210	0.1931	0.2317	0.2100	0.2002	11.000
11.500	0.4798	0.1514	0.3065	0.2111	0.1761	0.2022	0.1864	0.1790	11.500
12.000	0.4843	0.1368	0.2400	0.2177	0.1383	0.1733	0.1745	0.2252	12.000
12.500	0.4765	0.1089	0.2048	0.1975	0.1186	0.1604	0.1428	0.1922	12.500
13.000	0.4243	0.1278	0.2062	0.1746	0.1023	0.1356	0.1441	0.1539	13.000
13.500	0.3409	0.1245	0.1863	0.1497	0.1028	0.1085	0.1573	0.1706	13.500
14.000	0.3306	0.1788	0.1508	0.1136	0.1108	0.0880	0.1372	0.1469	14.000
14.500	0.2893	0.2201	0.1585	0.0907	0.0912	0.0870	0.0830	0.1060	14.500
15.000	0.2591	0.2969	0.1491	0.0957	0.0675	0.0913	0.0746	0.0777	15.000
15.500	0.2512	0.3602	0.1383	0.0863	0.0577	0.0933	0.0701	0.0756	15.500
16.000	0.2141	0.2870	0.1156	0.0924	0.0507	0.0872	0.0674	0.0683	16.000
16.500	0.1981	0.1783	0.1143	0.0790	0.0550	0.0789	0.0661	0.0595	16.500
17.000	0.2086	0.1300	0.1024	0.0637	0.0499	0.0611	0.0640	0.0607	17.000
17.500	0.1732	0.0936	0.0855	0.0505	0.0478	0.0536	0.0448	0.0570	17.500
18.000	0.1276	0.0805	0.0647	0.0482	0.0522	0.0468	0.0422	0.0570	18.000
18.500	0.1086	0.0824	0.0707	0.0438	0.0477	0.0461	0.0361	0.0527	18.500
19.000	0.1039	0.0763	0.0705	0.0383	0.0386	0.0459	0.0354	0.0465	19.000
19.500	0.0857	0.0434	0.0775	0.0292	0.0333	0.0398	0.0350	0.0374	19.500
20.000	0.0640	0.0410	0.0656	0.0300	0.0287	0.0377	0.0425	0.0340	20.000

Table 43

Rabbit 57, Sensori-Motor Cortex

Frequency (Hz)	Slow Wave Sleep	Para Sleep	Awake Moving	Awake Alert Still	Early Hyp	Late Hyp.	Early Unrest. Hyp.	Late Unrest. Hyp	Frequency (Hz)
0.000	0.0297	0.0222	0.0384	0.0097	0.0107	0.0197	0.0164	0.0116	0.000
0.500	0.0881	0.0426	0.0755	0.0236	0.0243	0.0415	0.0333	0.0285	0.500
1.000	0.2459	0.0736	0.1438	0.0494	0.0503	0.0852	0.0695	0.0564	1.000
1.500	0.3803	0.0961	~~0.2120~~	0.0567	0.0684	0.1351	0.0930	~~0.0793~~	1.500
2.000	0.5432	0.1350	0.2430	0.0739	0.0770	0.1568	0.0849	0.0932	2.000
2.500	0.7044	0.1434	0.2188	0.0837	0.0739	0.1826	0.0758	0.0962	2.500
3.000	0.7993	0.1182	0.2136	0.0817	0.0669	0.1975	0.0727	0.0743	3.000
3.500	0.7613	0.1170	0.1808	0.0845	0.0701	0.2031	0.0716	0.0855	3.500
4.000	0.7630	0.1275	0.1353	0.0766	0.0750	0.1936	0.0595	0.1117	4.000
4.500	0.8131	0.1235	0.1361	0.0844	0.0796	0.1649	0.0626	0.1173	4.500
5.000	0.7657	0.0968	0.1436	0.1040	0.1157	0.1806	0.0821	0.1217	5.000
5.500	0.6579	0.0904	~~0.1366~~	0.1183	0.1409	0.2330	0.1036	~~0.1213~~	5.500
6.000	0.6101	0.0963	0.1269	0.1454	0.1312	0.2189	0.1323	0.1457	6:000
6.500	0.6642	0.0957	0.1375	0.1606	0.1084	0.1661	0.1417	0.1461	6.500
7.000	0.7066	0.1241	0.1860	0.1139	0.0935	0.1408	0.1137	0.1210	7.000
7.500	0.6169	0.1933	0.2325	0.0869	0.0911	0.1124	0.0856	0.0828	7.500
8.000	0.4868	0.1979	0.2368	0.0737	0.0743	0.1092	0.0660	0.0649	8.000
8.500	0.4456	0.1242	0.1758	0.0583	0.0620	0.1106	0.0514	0.0590	8.500
9.000	0.5096	0.0736	0.1007	0.0512	0.0597	0.1000	0.0494	0.0615	9.000
9.500	0.5112	0.0501	~~0.0839~~	0.0488	0.0579	0.0904	0.0447	~~0.0619~~	9.500
10.000	0.4673	0.0524	0.0785	0.0567	0.0571	0.0715	0.0453	0.0657	10.000
10.500	0.4128	0.0496	0.0718	0.0634	0.0602	0.0633	0.0461	0.0691	10.500
11.000	0.3742	0.0457	0.0622	0.0596	0.0573	0.0749	0.0468	0.0560	11.000
11.500	0.3721	0.0529	0.0536	0.0605	0.0489	0.0858	0.0483	0.0594	11.500
12.000	0.3396	0.0492	0.0568	0.0577	0.0436	0.0906	0.0529	0.0676	12.000
12.500	0.3632	0.0383	0.0628	0.0497	0.0444	0.0749	0.0610	0.0601	12.500
13.000	0.4243	0.0398	0.0536	0.0534	0.0457	0.0515	0.0521	0.0612	13.000
13.500	0.4439	0.0454	~~0.0532~~	0.0562	0.0440	0.0504	0.0389	~~0.0606~~	13.500
14.000	0.4902	0.0515	0.0563	0.0541	0.0415	0.0603	0.0433	0.0503	14.000
14.500	0.5044	0.0412	0.0525	0.0543	0.0444	0.0620	0.0489	0.0446	14.500
15.000	0.4170	0.0379	0.0441	0.0489	0.0413	0.0637	0.0497	0.0447	15.000
15.500	0.3415	0.0487	0.0415	0.0429	0.0393	0.0568	0.0497	0.0491	15.500
16.000	0.3706	0.0456	0.0400	0.0398	0.0389	0.0456	0.0440	0.0495	16.000
16.500	0.3603	0.0425	0.0387	0.0423	0.0386	0.0440	0.0432	0.0453	16.500
17.000	0.3015	0.0491	0.0394	0.0407	0.0461	0.0450	0.0447	0.0512	17.000
17.500	0.2964	0.0441	~~0.0399~~	0.0401	0.0567	0.0406	0.0477	~~0.0518~~	17.500
18.000	0.2852	0.0361	0.0413	0.0372	0.0549	0.0412	0.0457	0.0479	18.000
18.500	0.2528	0.0301	0.0420	0.0405	0.0464	0.0414	0.0446	0.0485	18.500
19.000	0.1861	0.0338	0.0397	0.0460	0.0414	0.0484	0.0385	0.0415	19.000
19.500	0.1739	0.0493	0.0367	0.0419	0.0422	0.0478	0.0377	0.0397	19.500
20.000	0.1584	0.0542	0.0360	0.0400	0.0415	0.0402	0.0405	0.0423	20.000

Table 44

Electrode Placements for Single Cell Study

Rabbit	Electrode	Placement
25	9	Dorsal Hippocampus
27	7	Dorsal Hippocampus
31	4	Nucleus Centralis Medialis
31	7	Nucleus Centralis Medialis
31	20	Limbic Cortex
31	21	Dorsal Hippocampus
32	5	Nucleus Reuiens
34	18	Limbic Cortex
35	1	Posterior Lateral Septum
35	2	Posterior Lateral Septum
35	4	Posterior Lateral Septum
35	7	Posterior Lateral Septum
36	3	Dorsal Hippocampus
40	2	Sensori-motor Cortex
40	5	Sensori-motor Cortex
40	7	Sensori-motor Cortex
43	2	Nucleus Ventralis Anterior (Bordering Nucleus Antereomedialis)
43	5	Nucleus Ventralis Anterior (Bordering Nucleus Antereomedialis)
43	12	Nucleus Ventralis Anterior (Bordering Nucleus Antereomedialis)
43	7	Nucleus Ventralis Anterior (Bordering Nucleus Antereomedialis)

Table 44(Continued)

Rabbit	Electrode	Placement
44	2	Nucleus Paracentralis
44	4	Nucleus Paracentralis
45	7	Central Grey
46	2	Sensori-motor Cortex
46	5	Sensori-motor Cortex
47	10	Nucleus Antereo-Ventralis
48	2	Nucleus Reticularis Tegmenti
48	4	Nucleus Reticularis Tegmenti
49	5	Nucleus Reticularis Tegmenti
49	7	Nucleus Reticularis Tegmenti
50	2	Nucleus Medio-Dorsalis Thalami
50	4	Nucleus Medio-Dorsalis Thalami
50	5	Nucleus Reticularis Pontis
50	18	Nucleus Reticularis Pontis
51	4	Corpus Callosum Bordering Hippocampus
51	7	Corpus Callosum Bordering Hippocampus
51	16	Corpus Callosum Bordering Hippocampus
52	2	Nucleus Reticularis Tegmenti
52	4	Dorsal Hippocampus (near Alveus)
53	3	Dorsal Hippocampus

Table 44(Continued)

Rabbit	Electrode	Placement
53	5	Dorsal Hippocampus
53	20	Nucleus Reticularis Pontis
53	7	Dorsal Hippocampus
55	3	Hippocampus (Dentate)
55	6	Hippocampus (Dentate)
58	2	Nucleus Reticularis Tegmenti

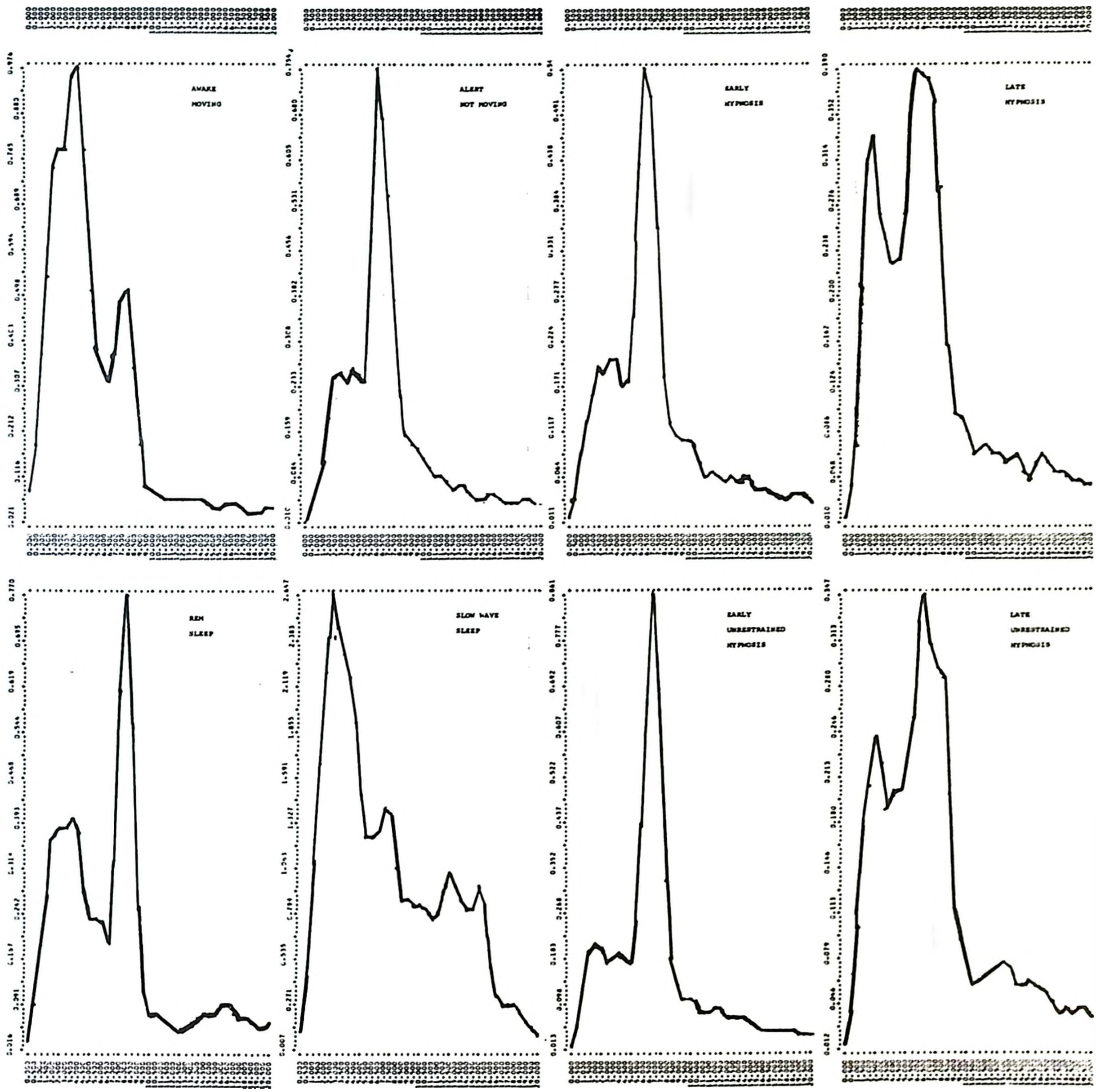

Figure 1. Power spectral estimates, Rabbit 56, SM Cortex.

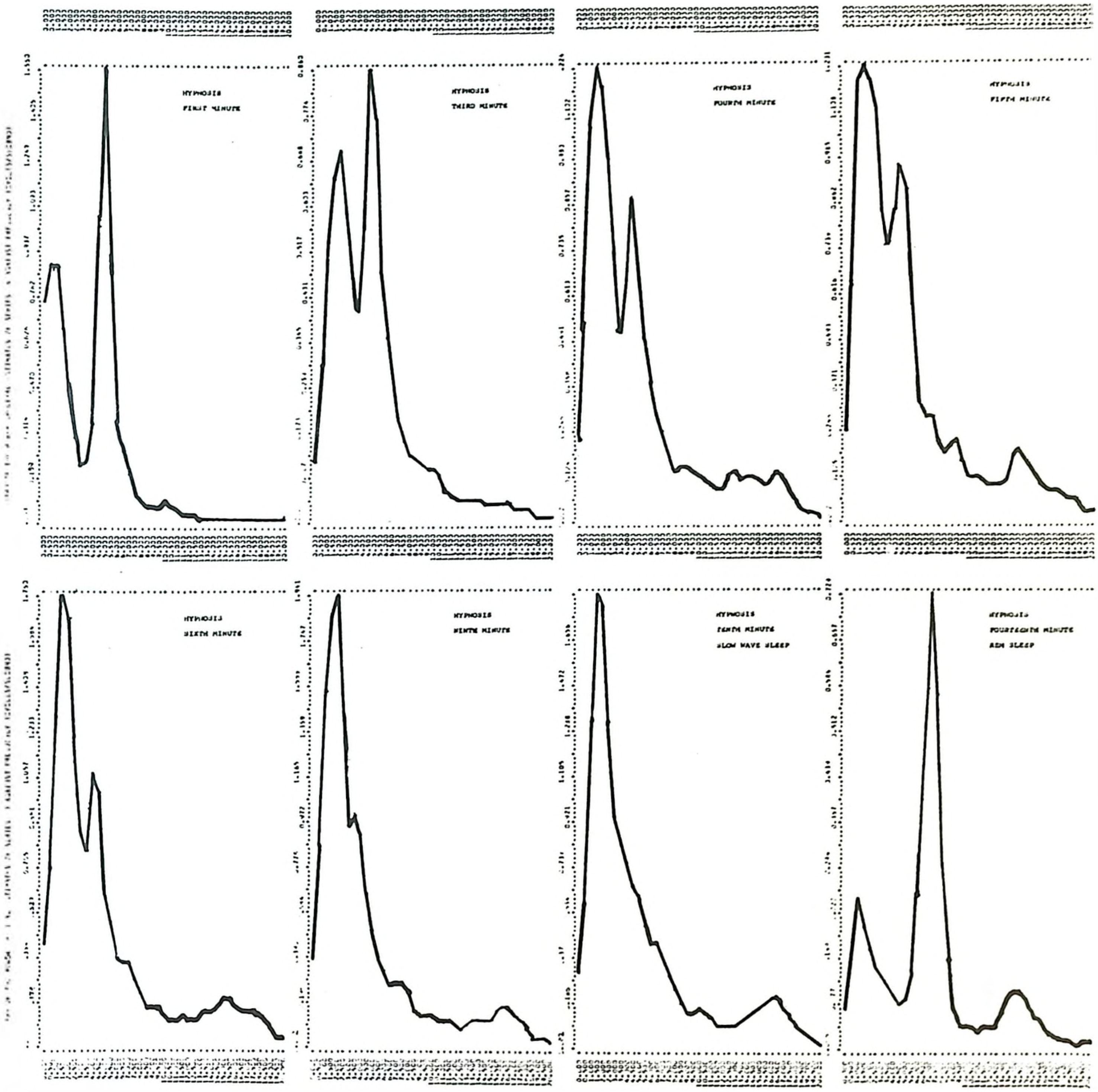

Figure 2 . Power spectral estimates, Rabbit 21 dorsal hippocampus. Prolonged hypnosis session.

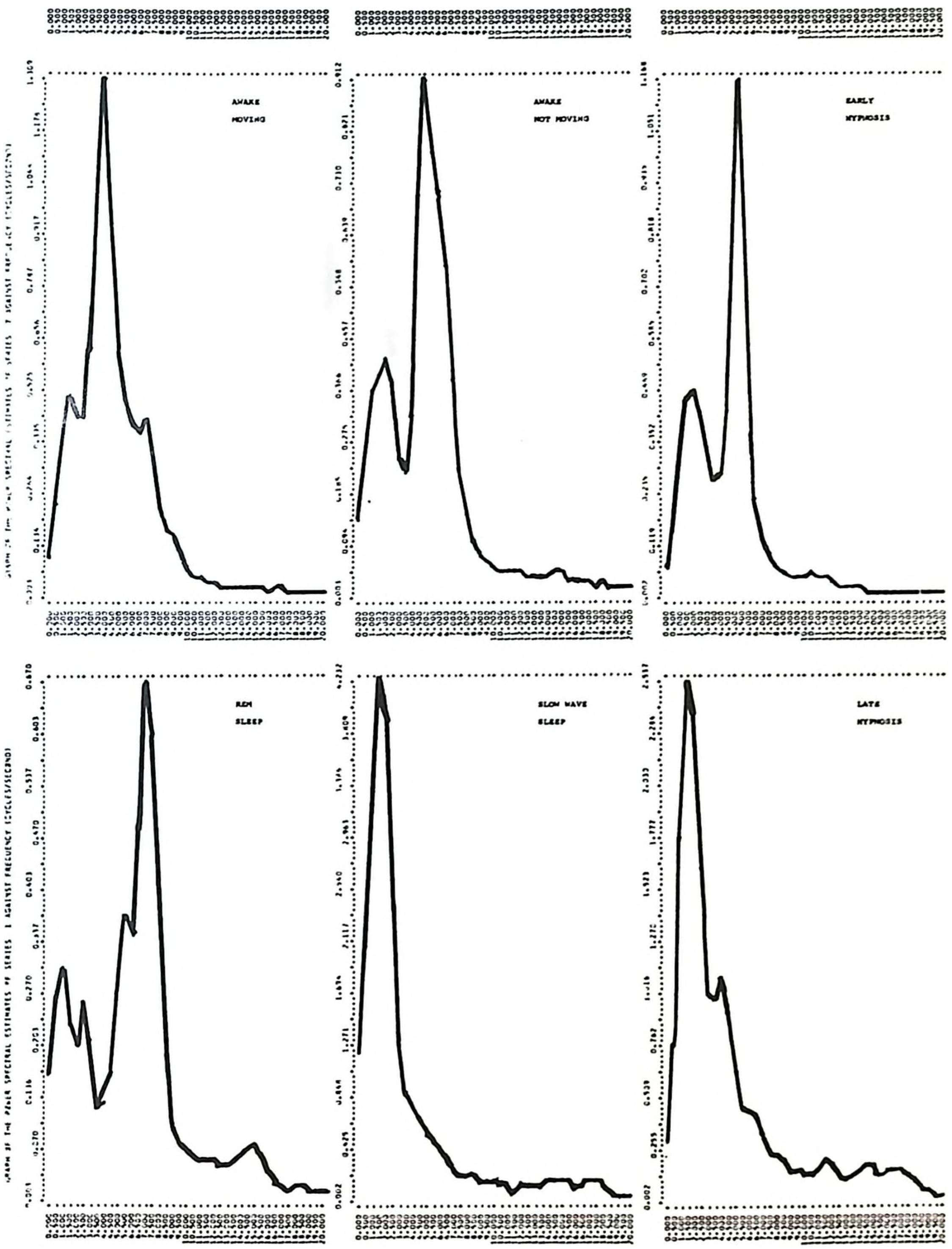

Figure 3. Power spectral estimates, Rabbit 21, Medial thalamus.

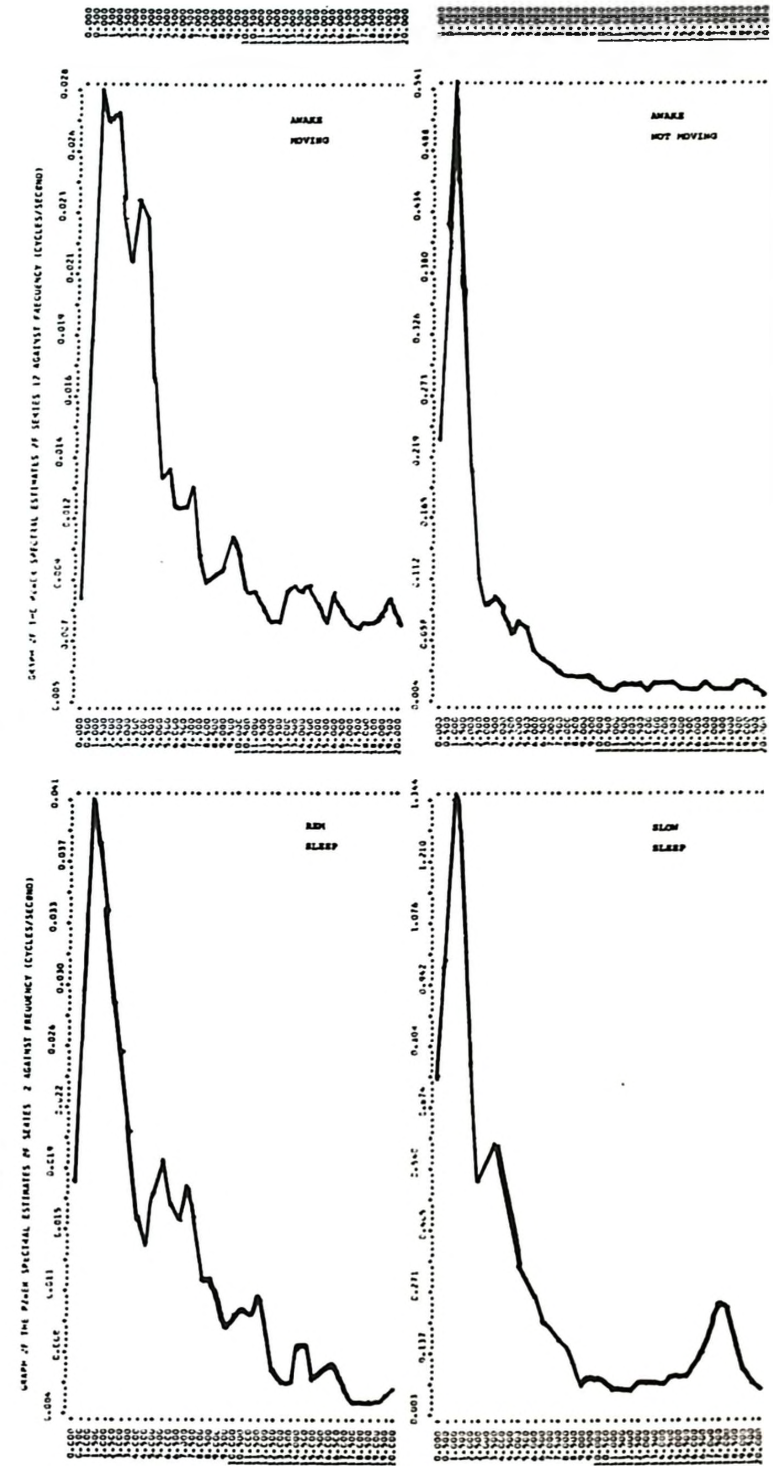

Figure 4. Power spectral estimates, S-M cortex, Rabbit 21.

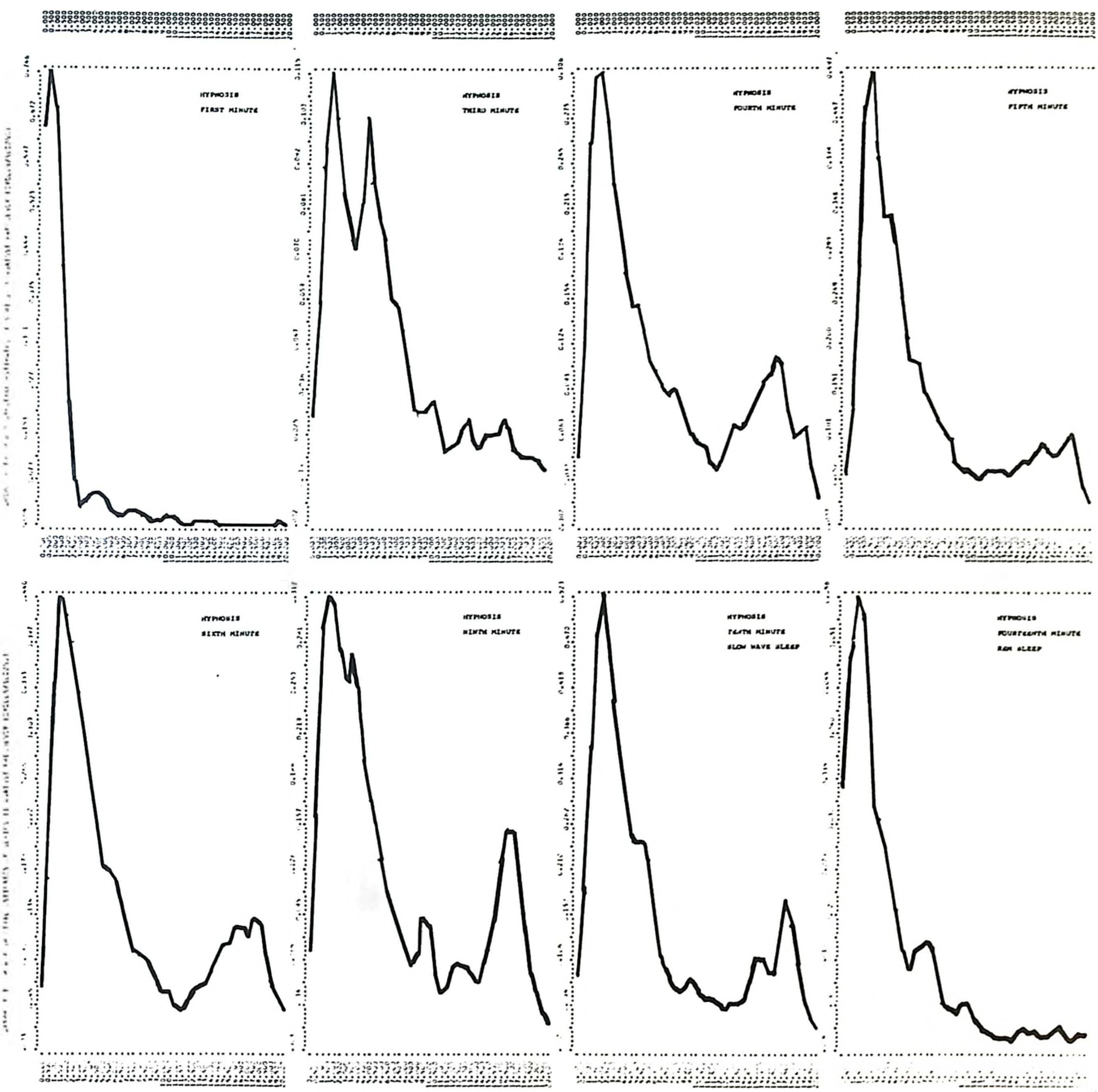

Figure 5. Power spectral estimates, S-M cortex, Rabbit 21. Prolonged hypnosis session

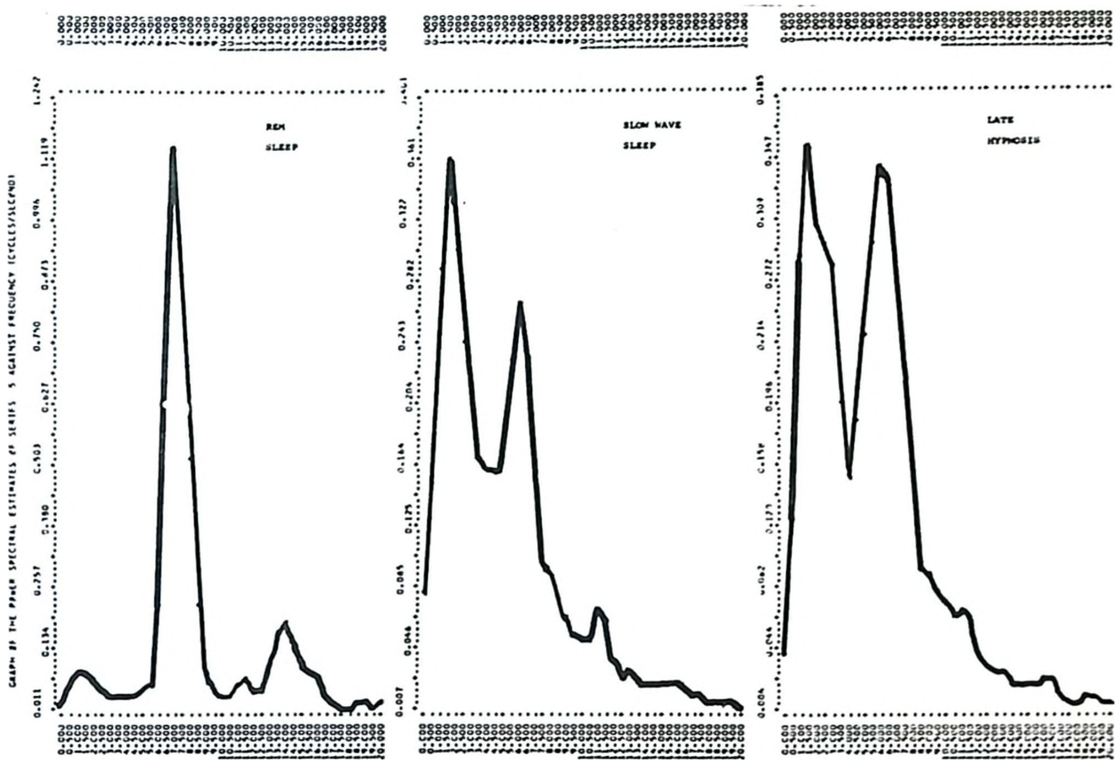

Figure 6. Power spectral estimates, Rabbit 19, dorsal hippocampus.

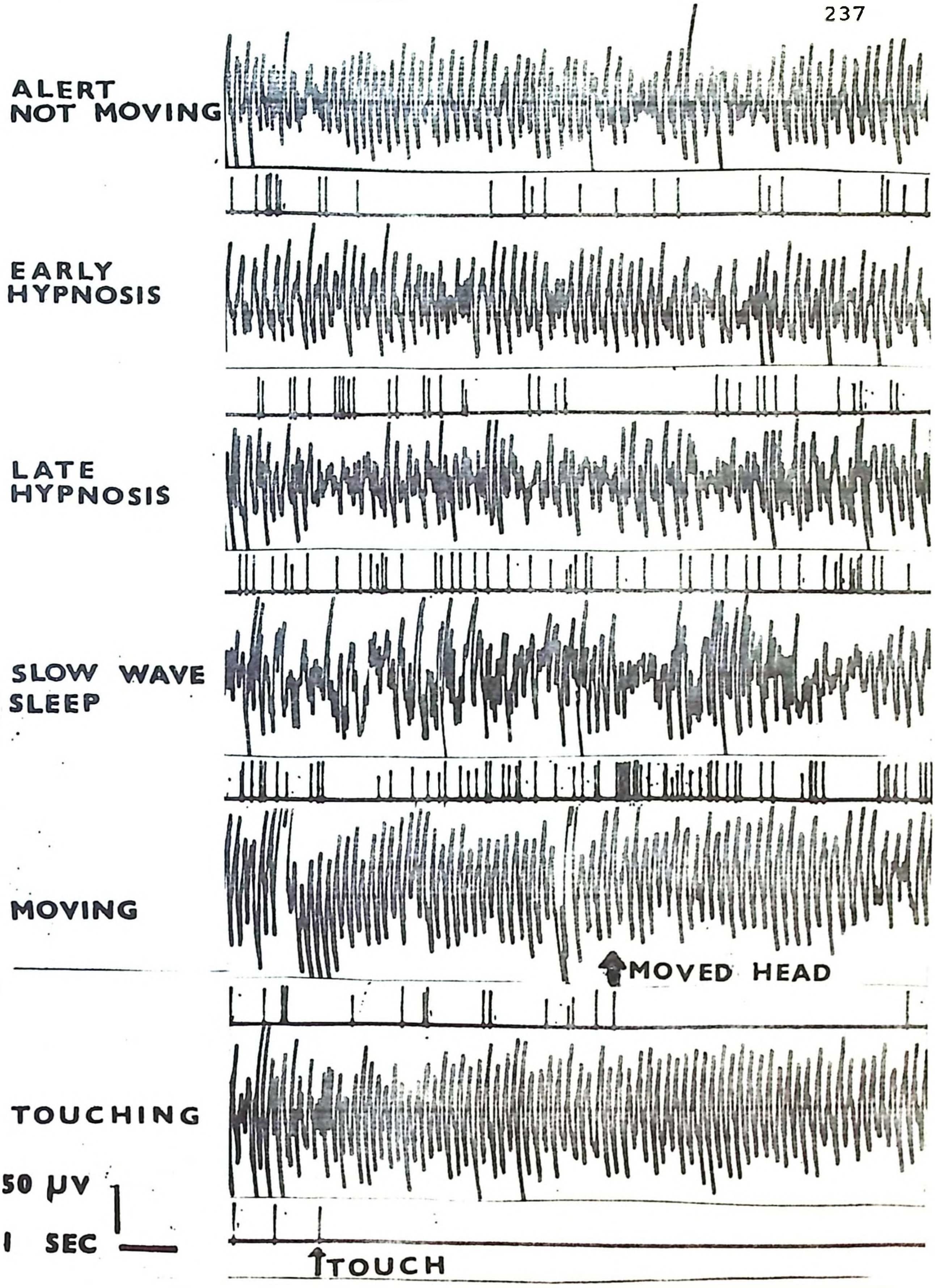

Figure 7. Rabbit 25, Channel 9, Dorsal Hippocampus

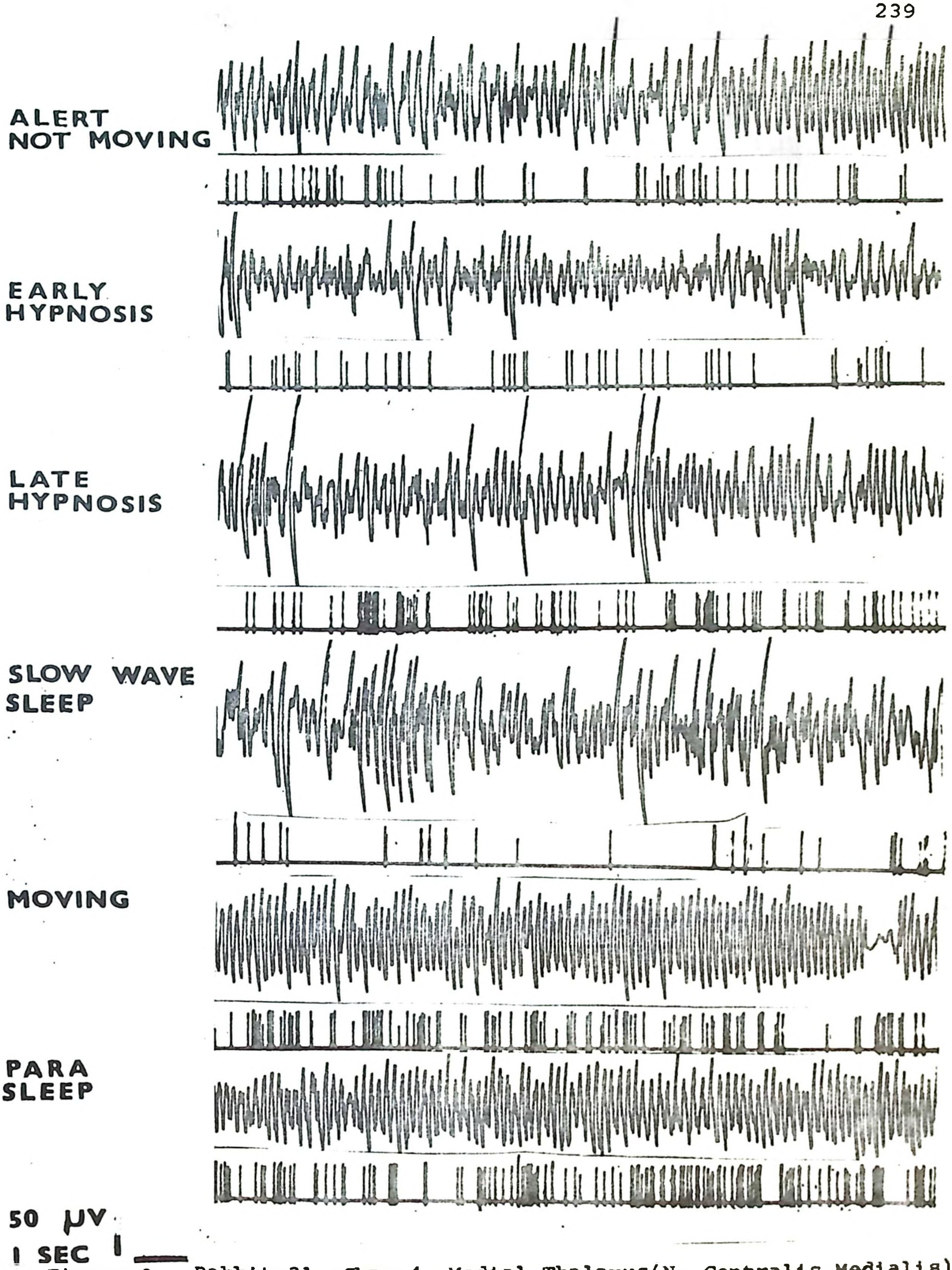

Figure 9. Rabbit 31, Chan 4, Medial Thalamus(N. Centralis Medialis)

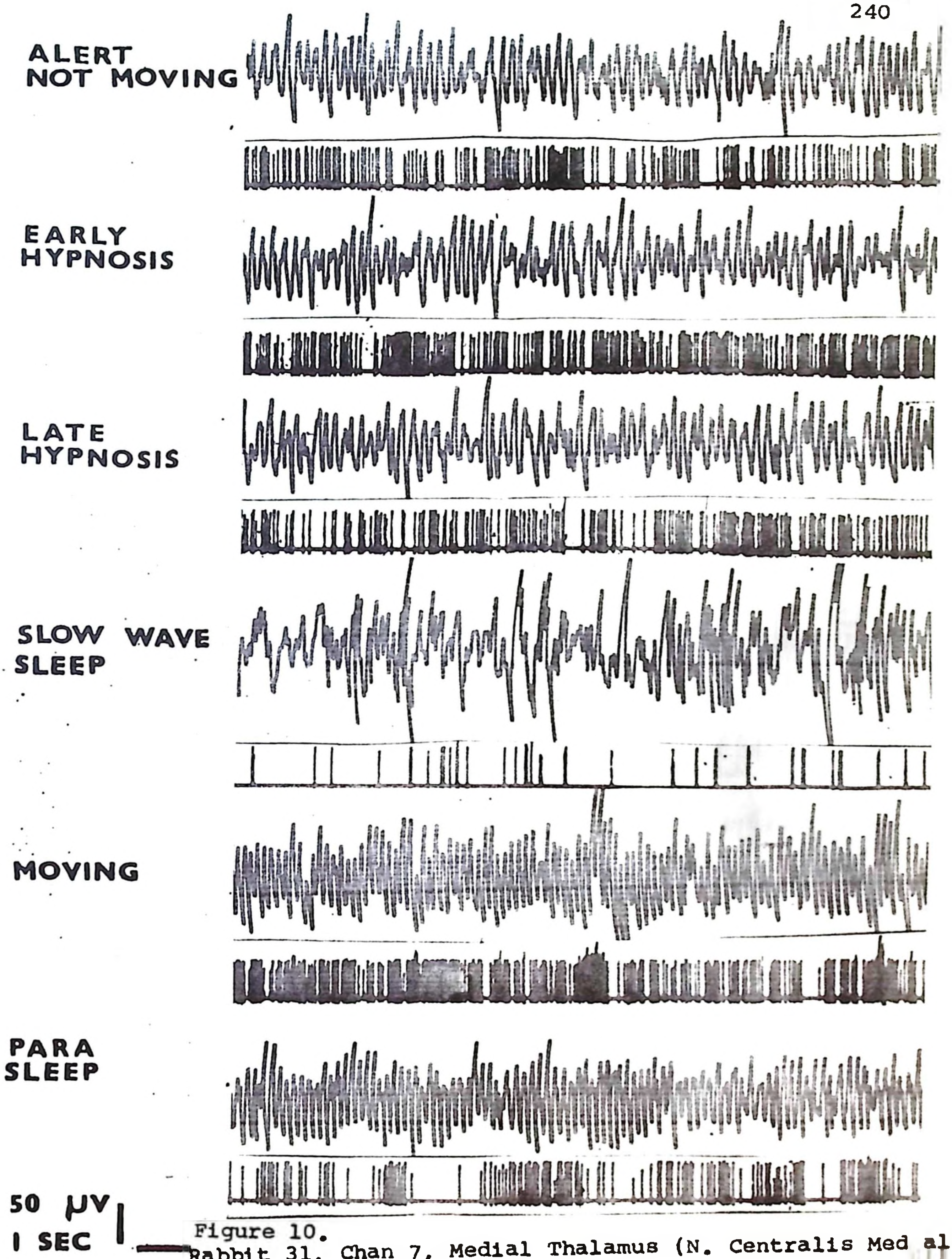

Figure 10.
Rabbit 31, Chan 7, Medial Thalamus (N. Centralis Medialis

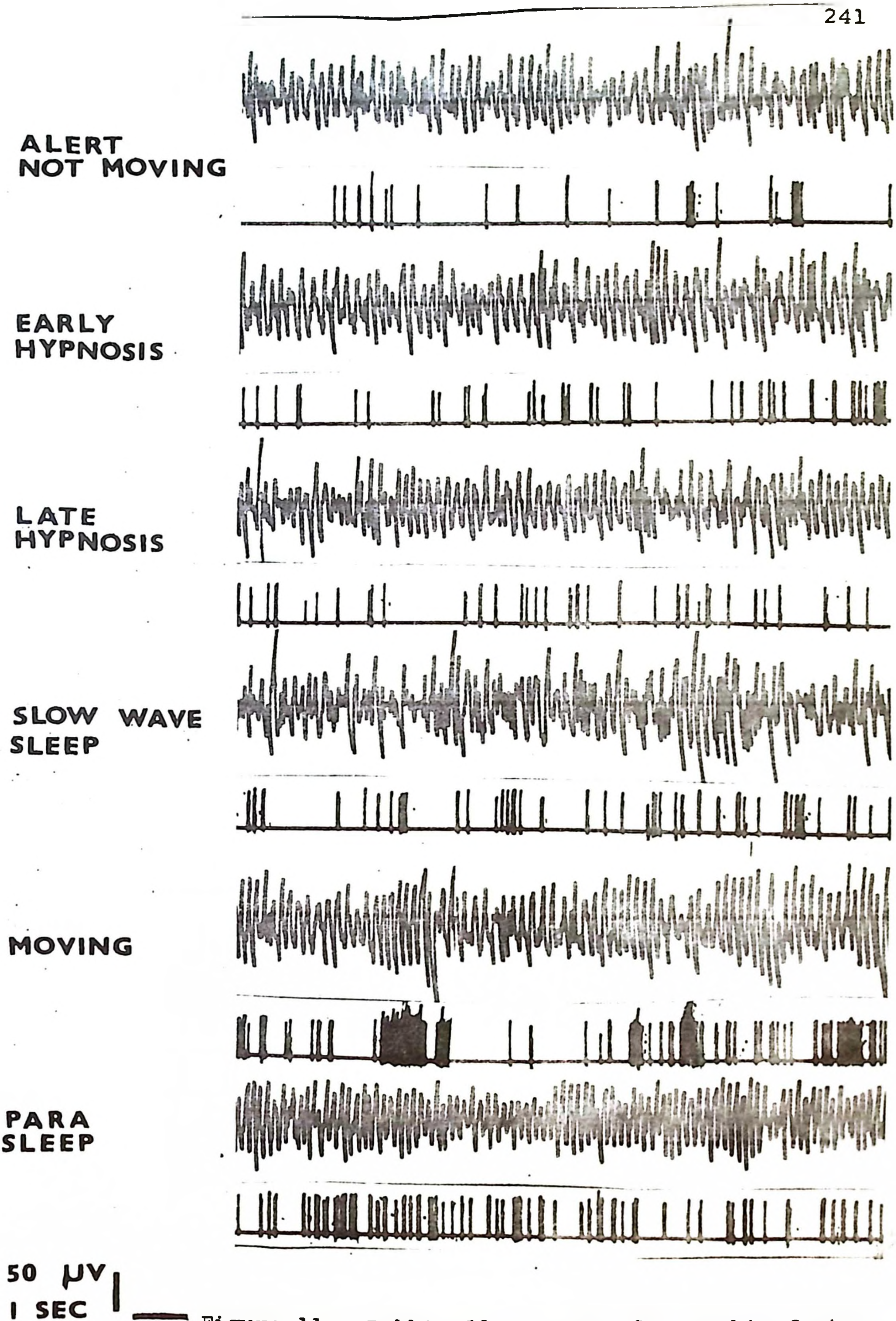

Figure 11. Rabbit 31, Channel 20, Limbic Cortex.

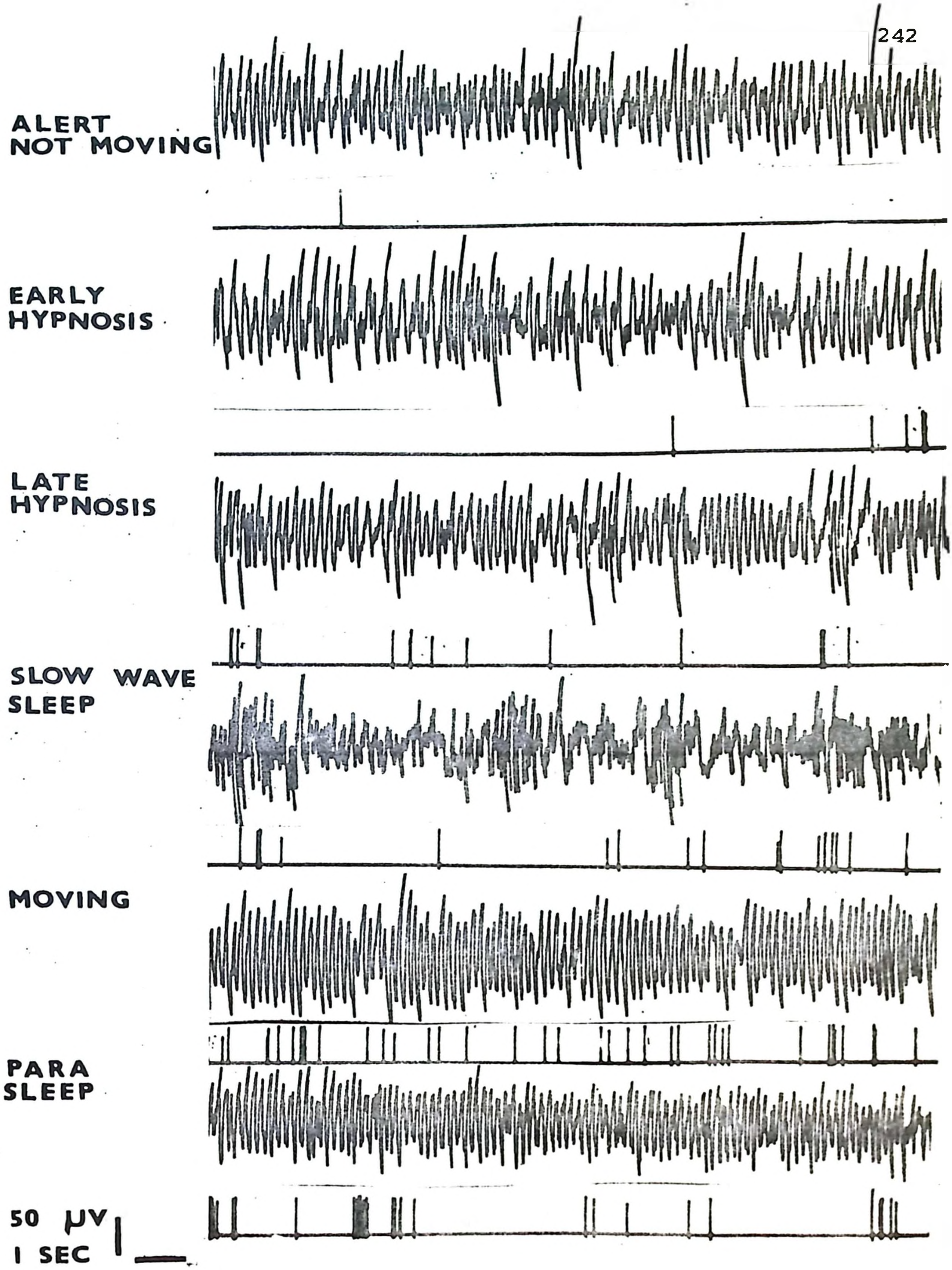

Figure 12. Rabbit 31, Channel 21, Dorsal Hippocampus

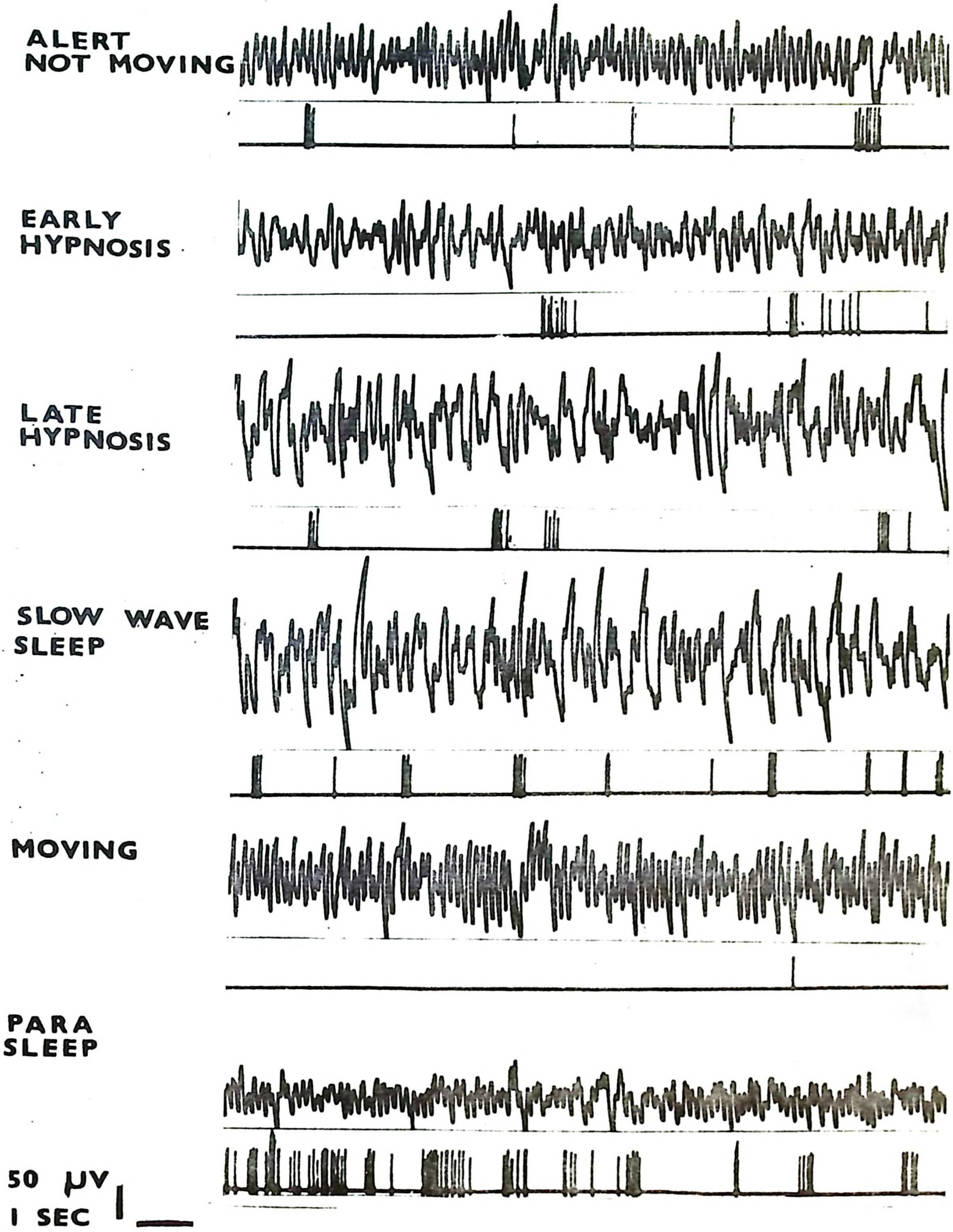

Figure 13. Rabbit 32, Channel 5, Medial Thalamus (Nucleus Reuiens)

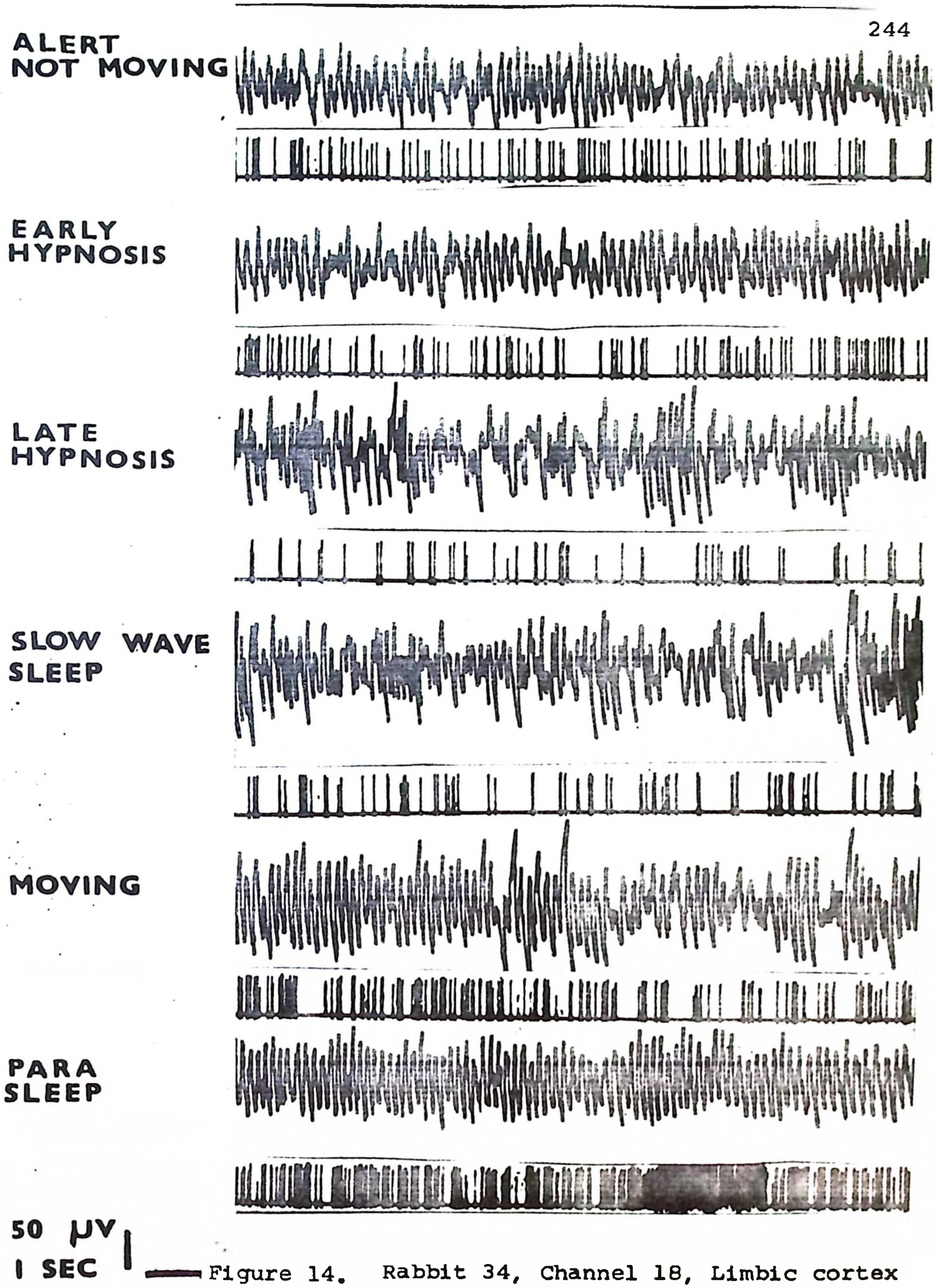

Figure 14. Rabbit 34, Channel 18, Limbic cortex

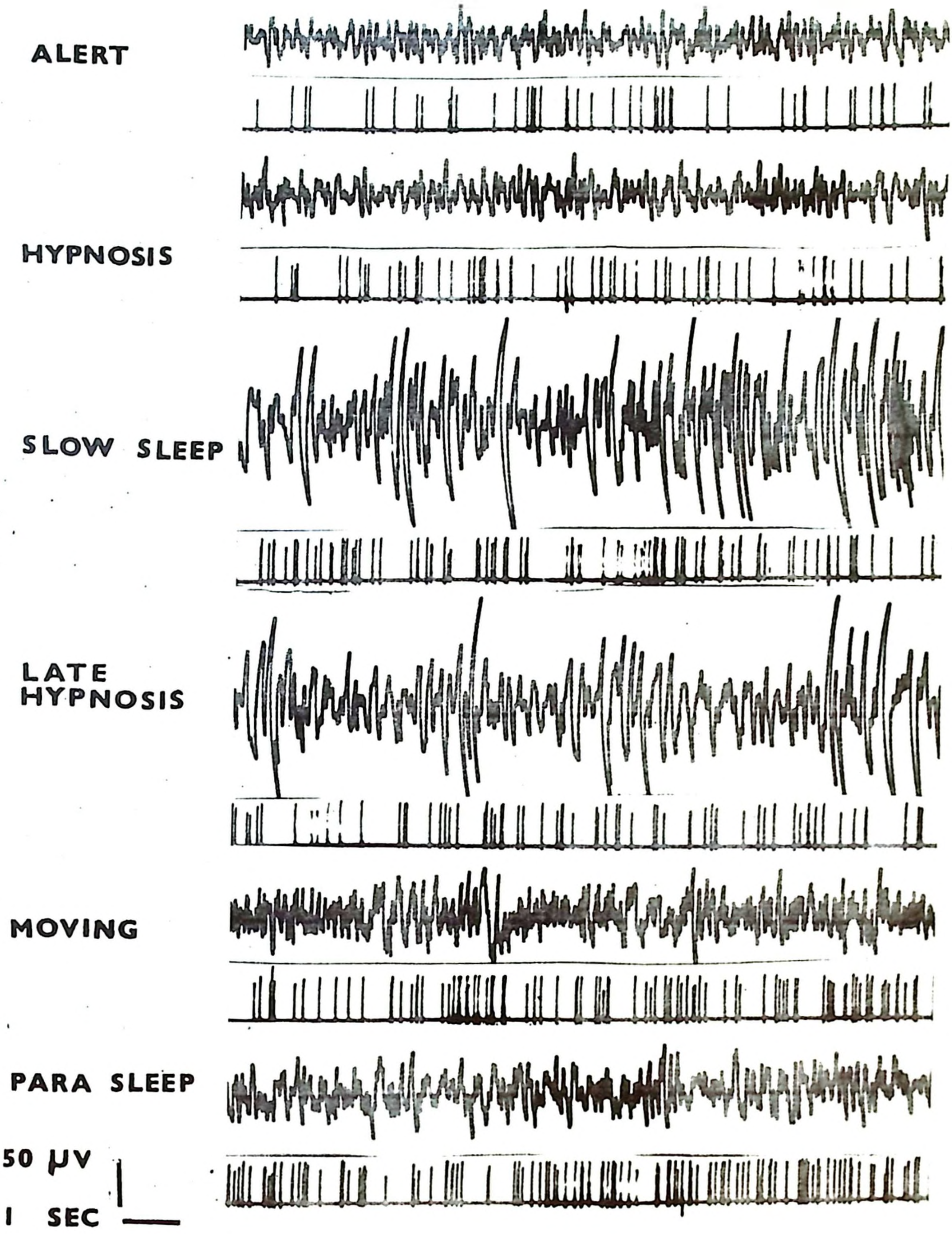

Figure 15. Rabbit 35, Chan 1, Posterior lateral Septum

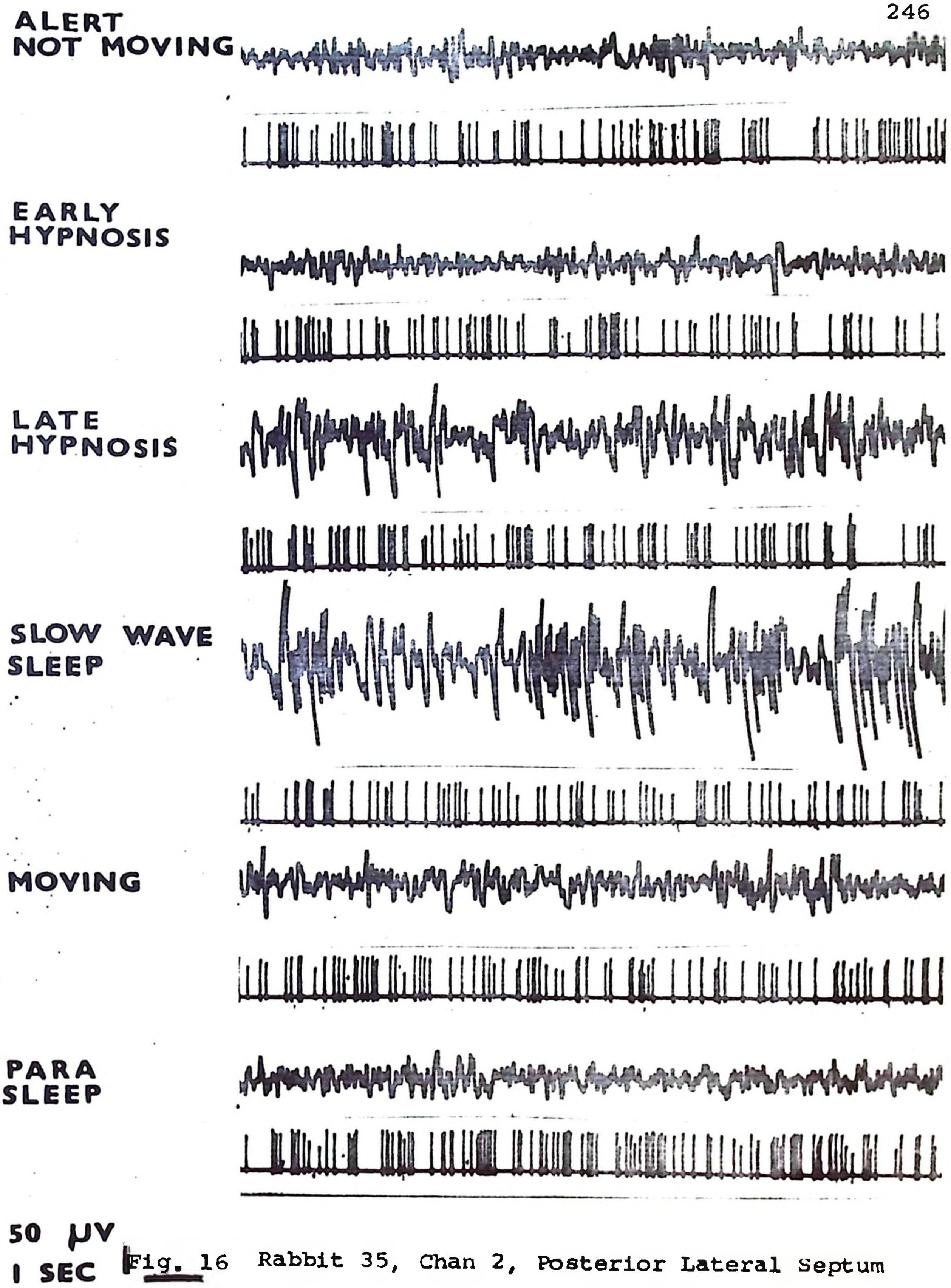

Fig. 16 Rabbit 35, Chan 2, Posterior Lateral Septum

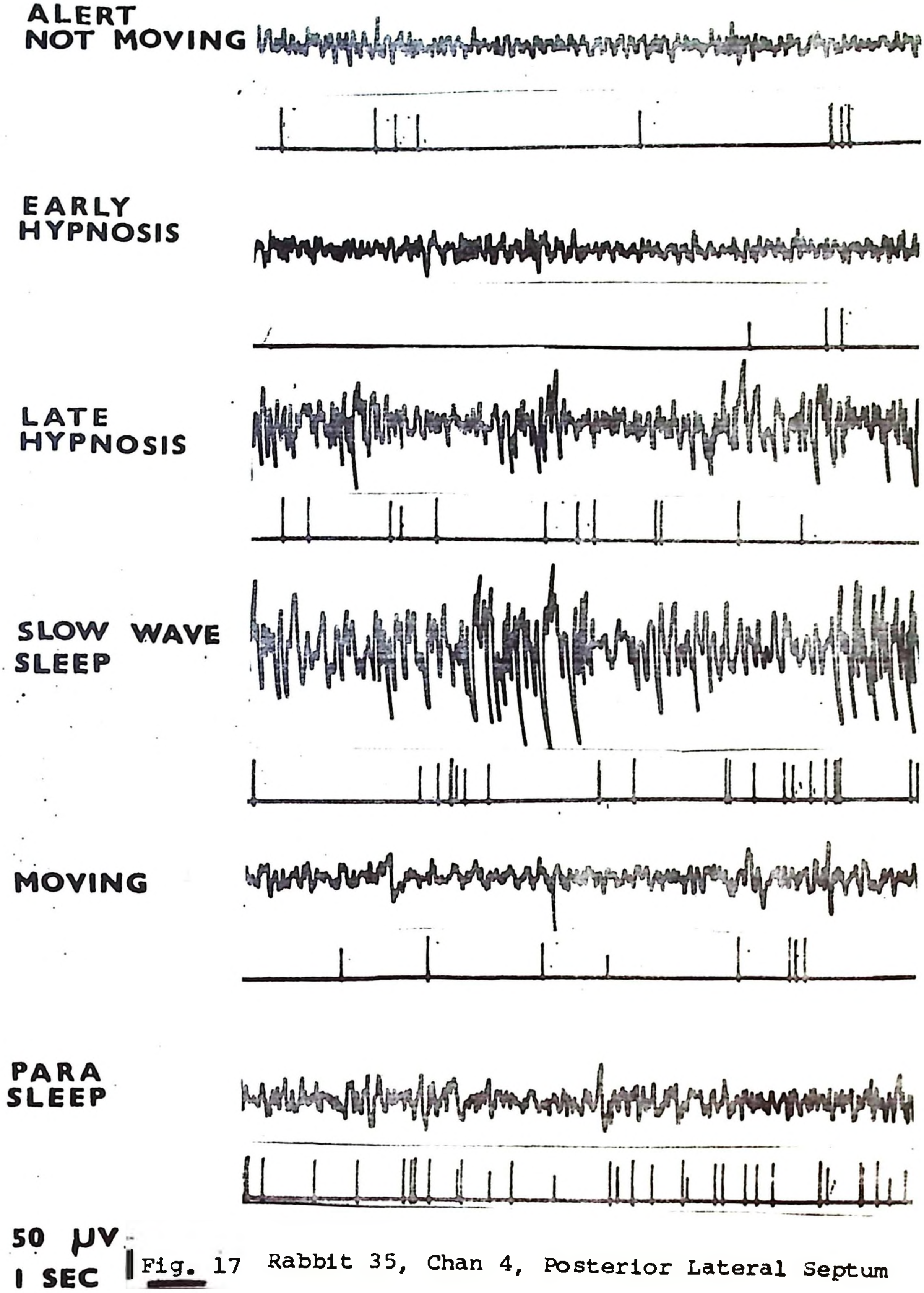

Fig. 17 Rabbit 35, Chan 4, Posterior Lateral Septum

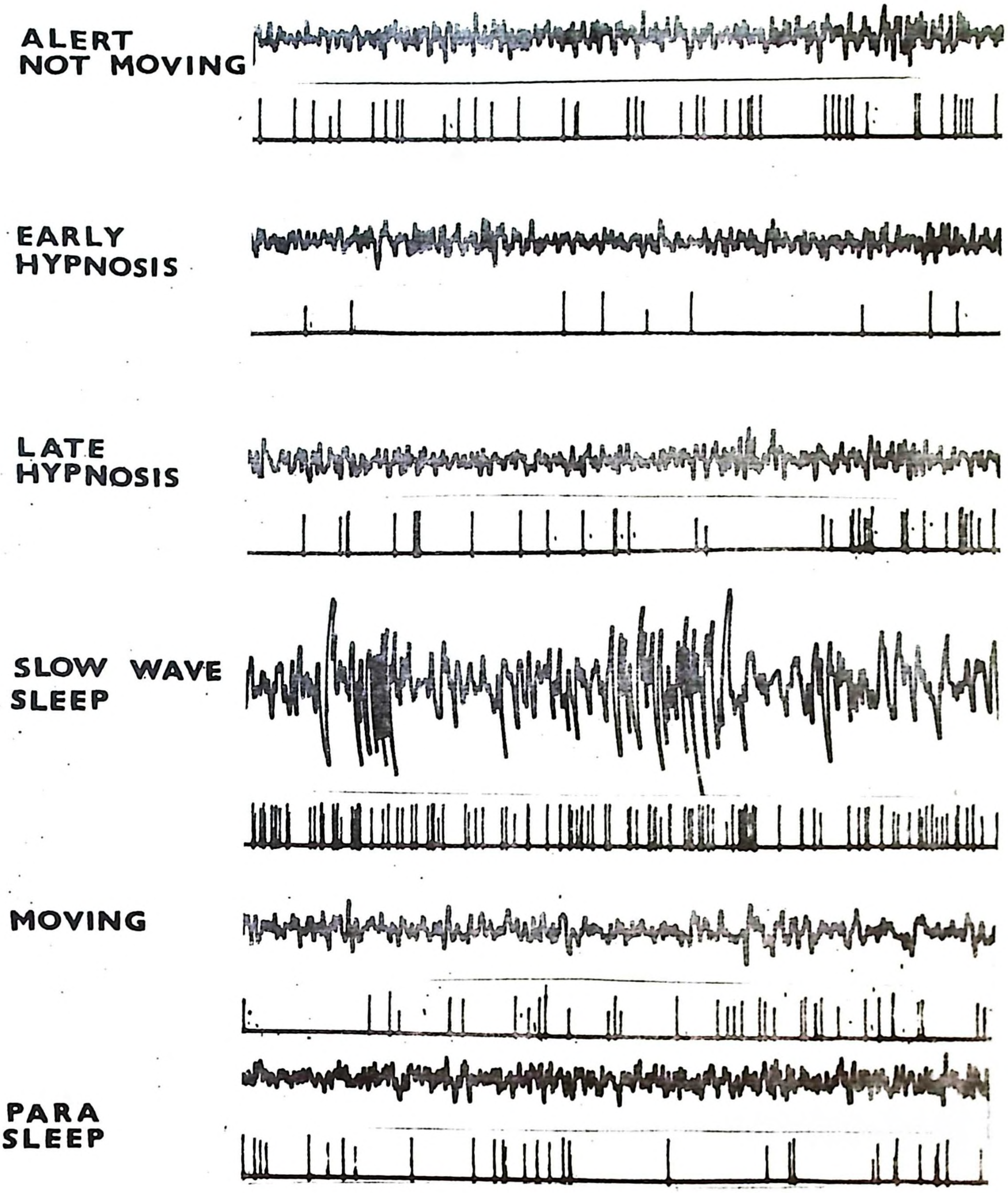

Figure 18. Rabbit 35, Chan 7, Posterior lateral Septum

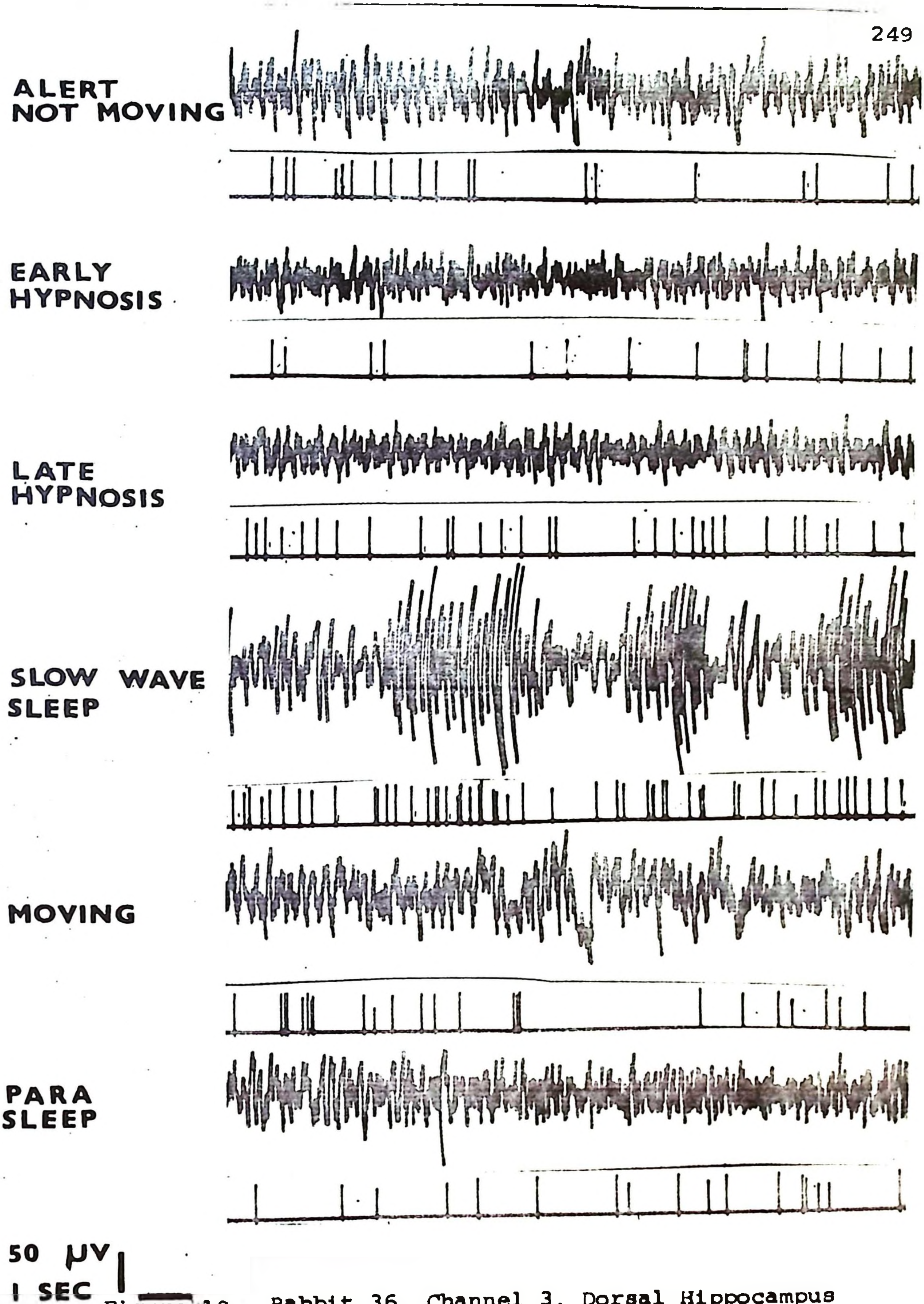

Figure 19. Rabbit 36, Channel 3, Dorsal Hippocampus

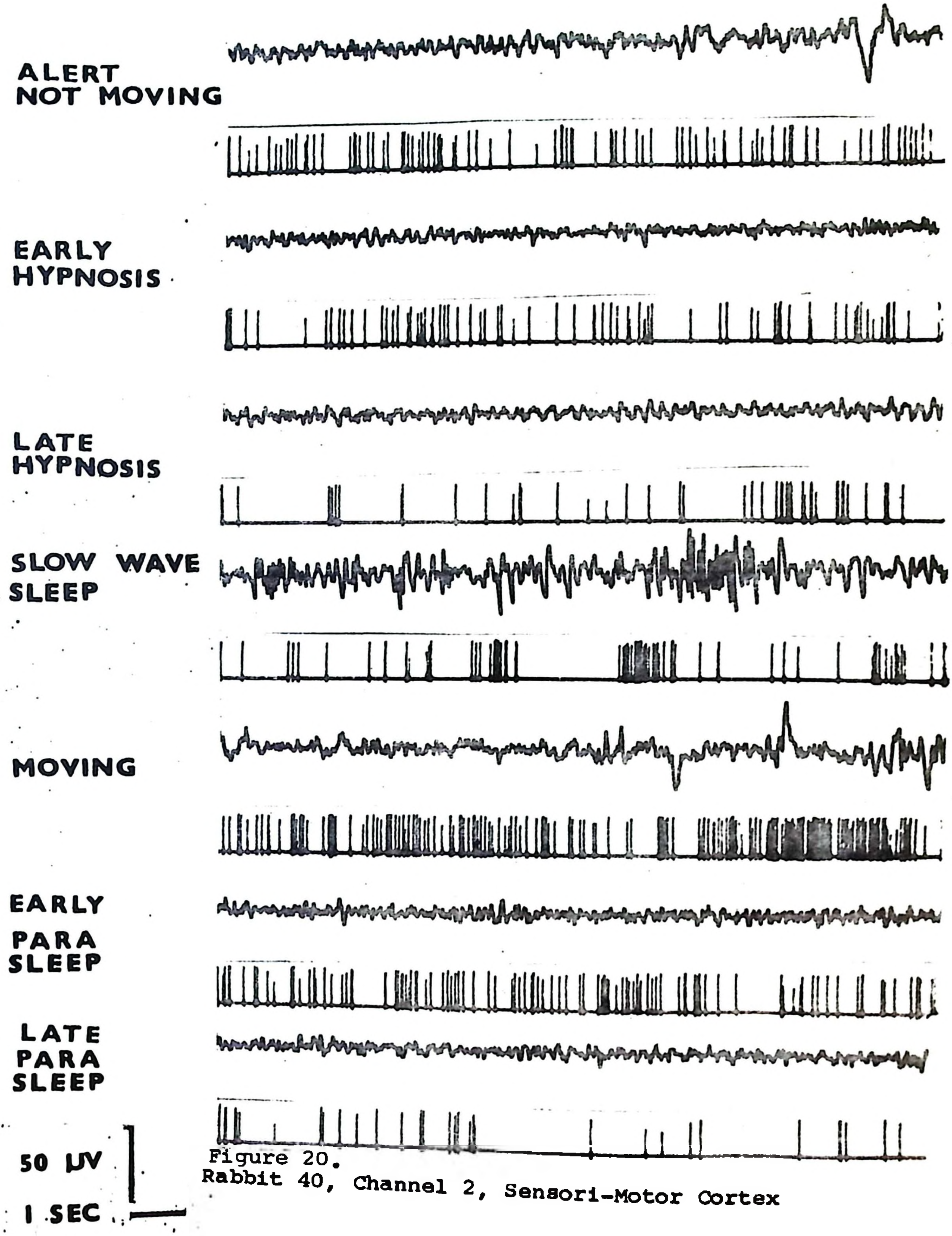

Figure 20.
Rabbit 40, Channel 2, Sensori-Motor Cortex

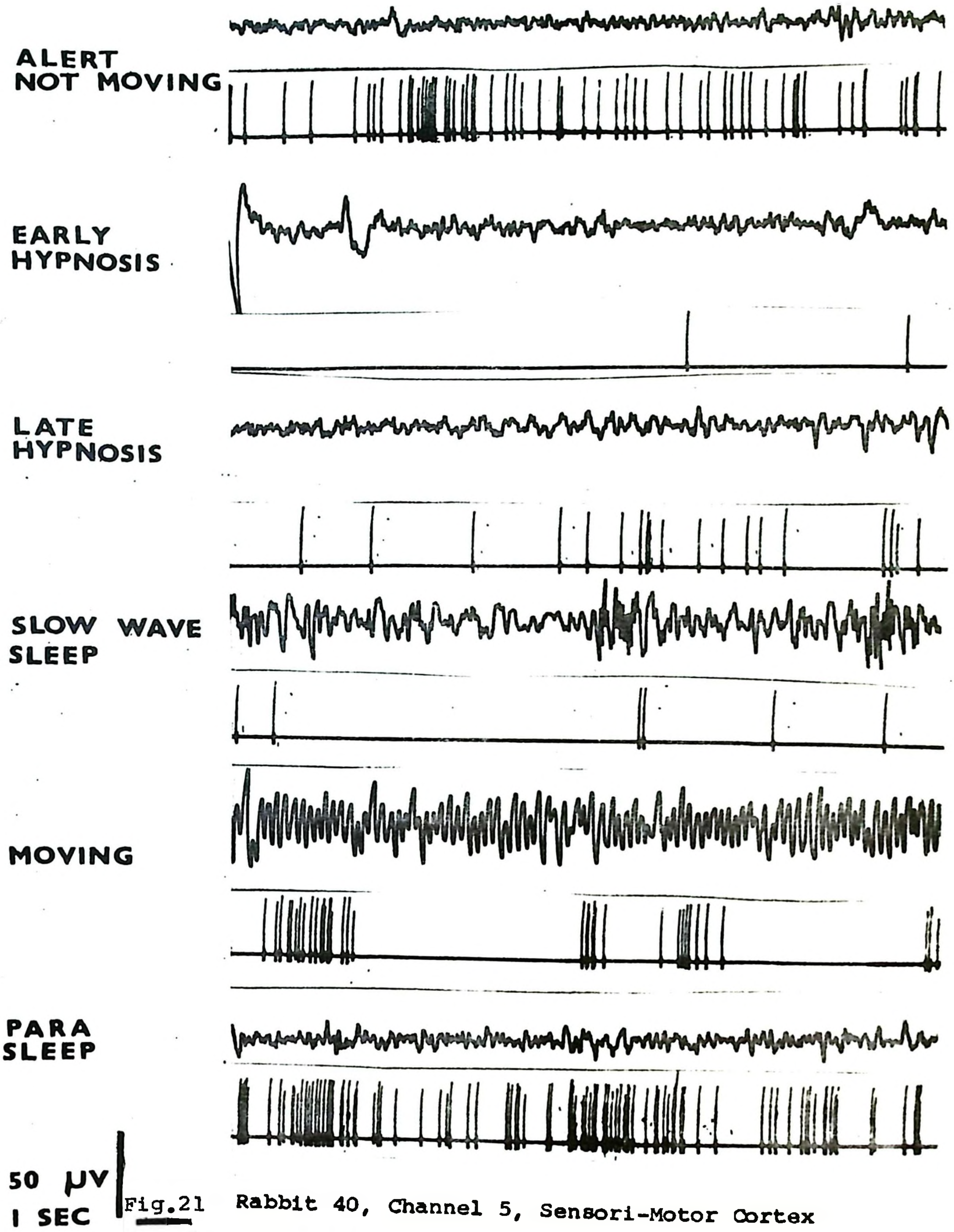

Fig.21 Rabbit 40, Channel 5, Sensori-Motor Cortex

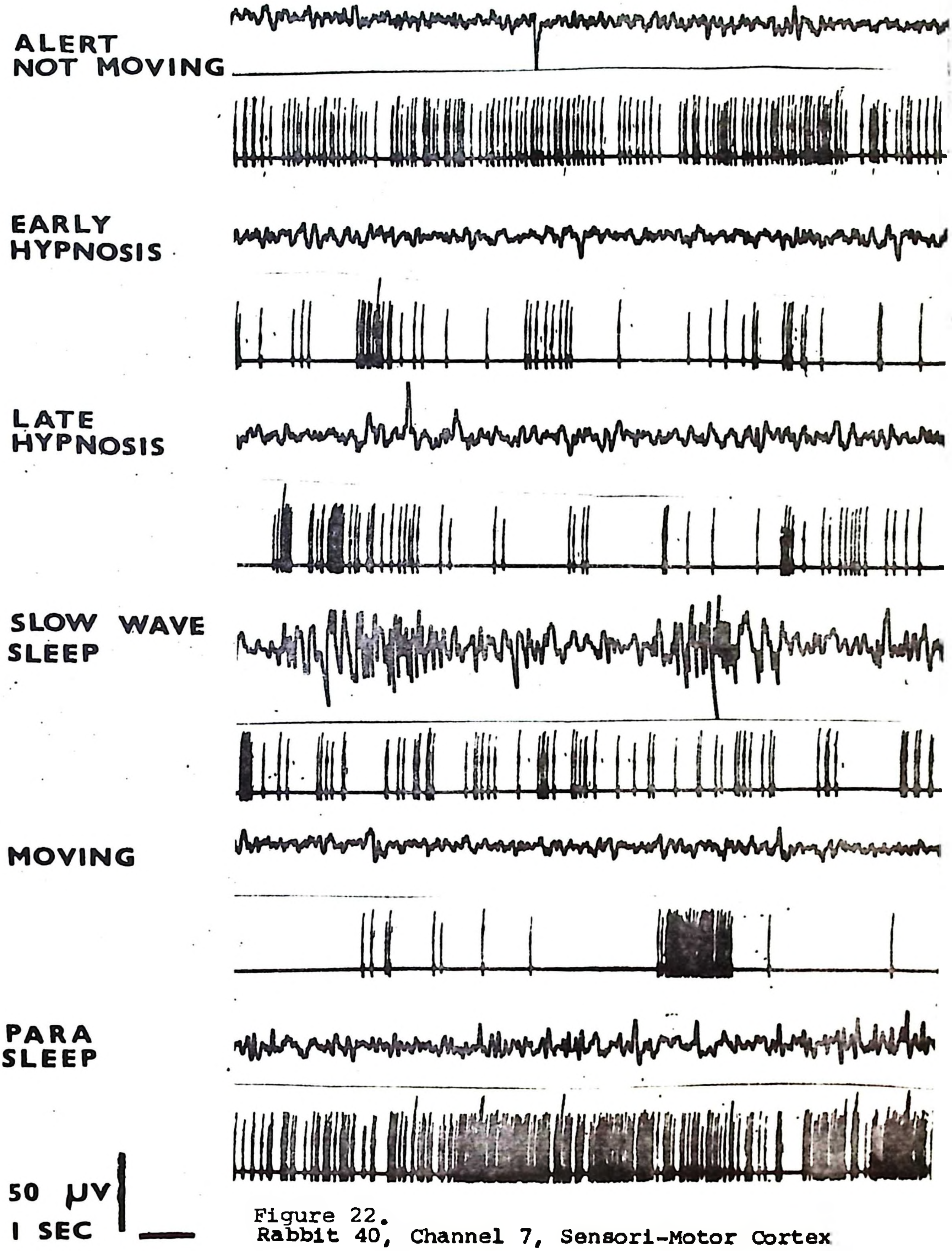

Figure 22.
Rabbit 40, Channel 7, Sensori-Motor Cortex

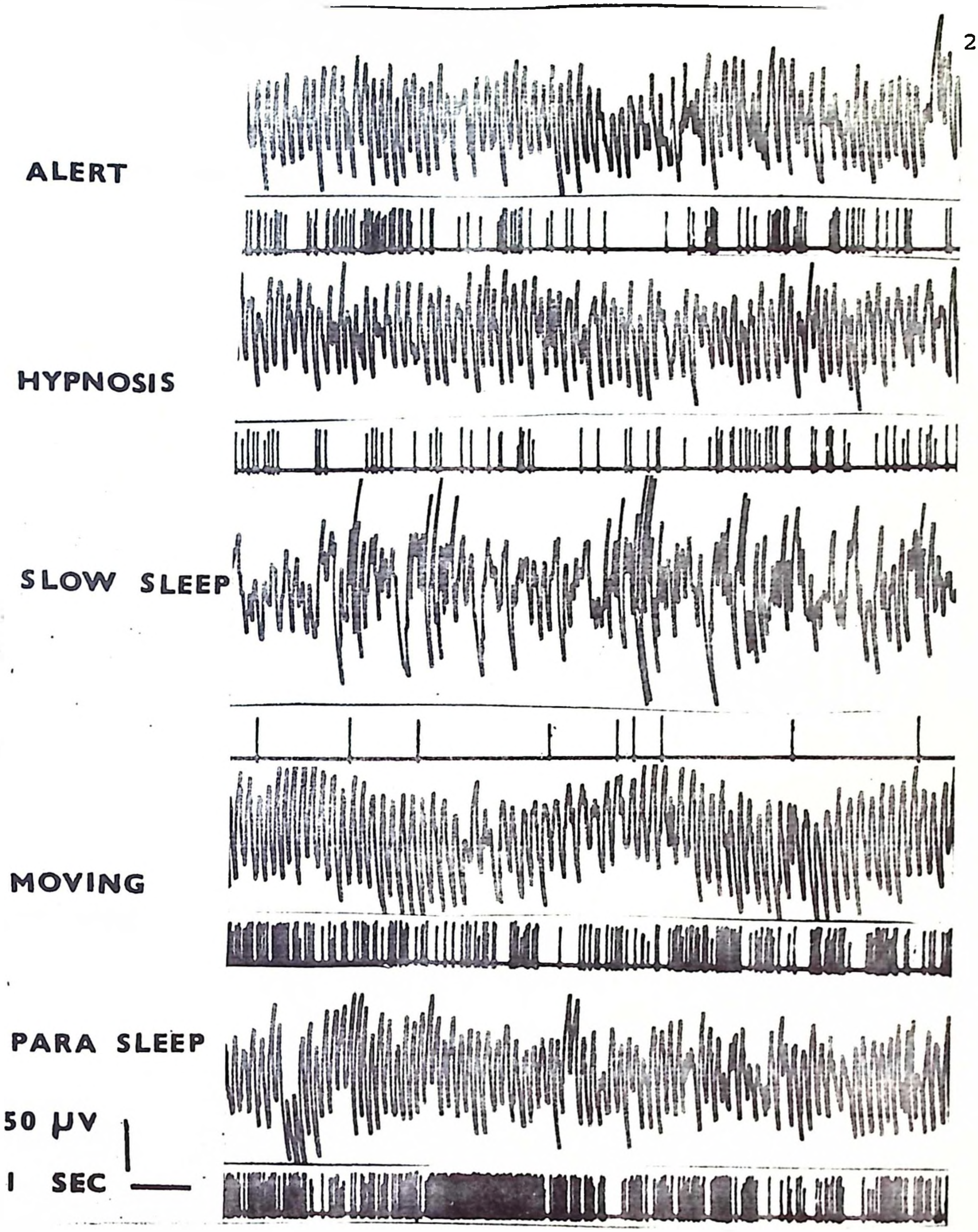

Fig 23 Rabbit 43, Chan 2, Anterior Thalamus, (N. Ventralis Anterior bordering N. Antereomedialis)

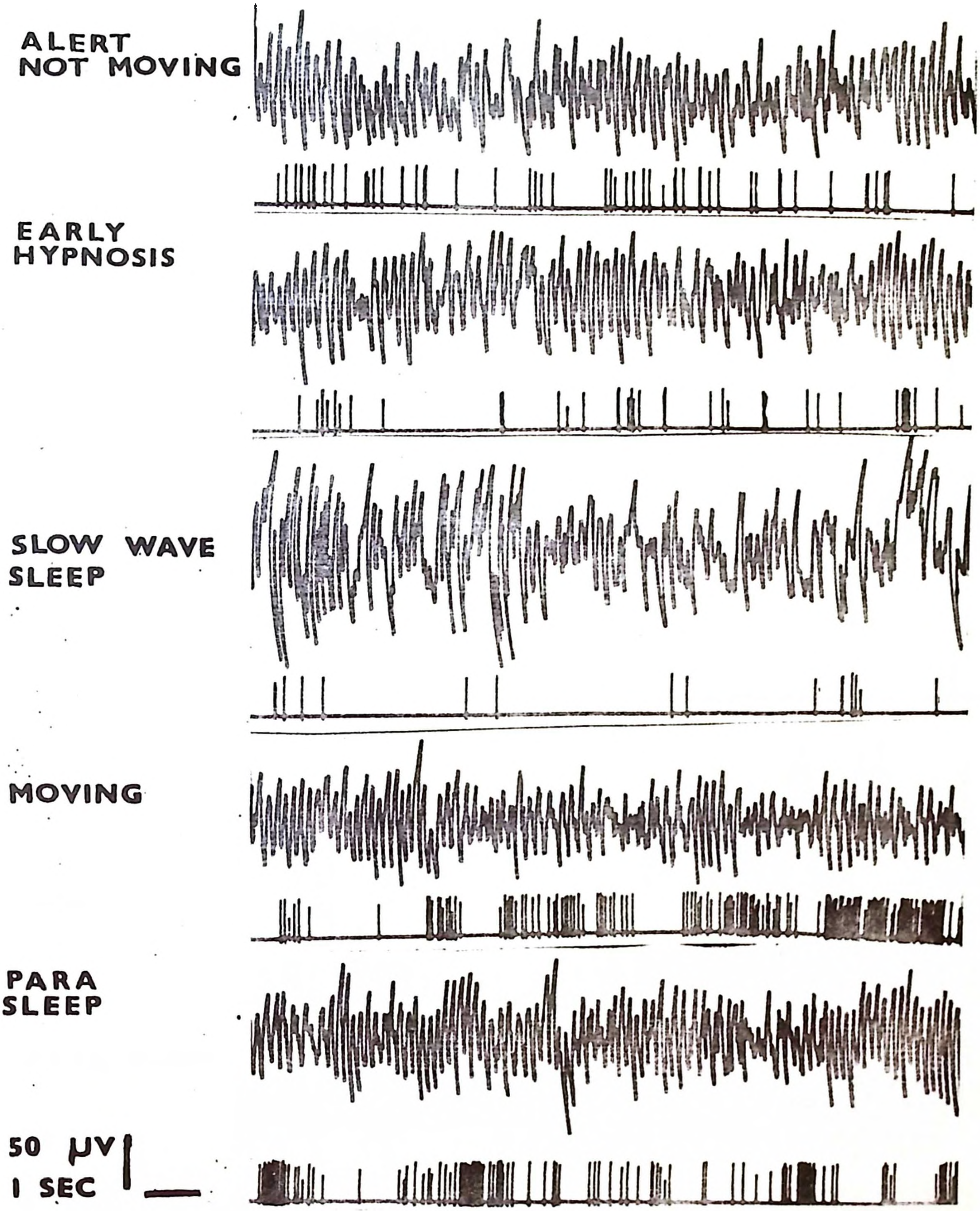

Fig 24. Rabbit 43, Chan 5, Anterior Thalamus (N. Ventralis Anterior bordering N. Antereomedialis).

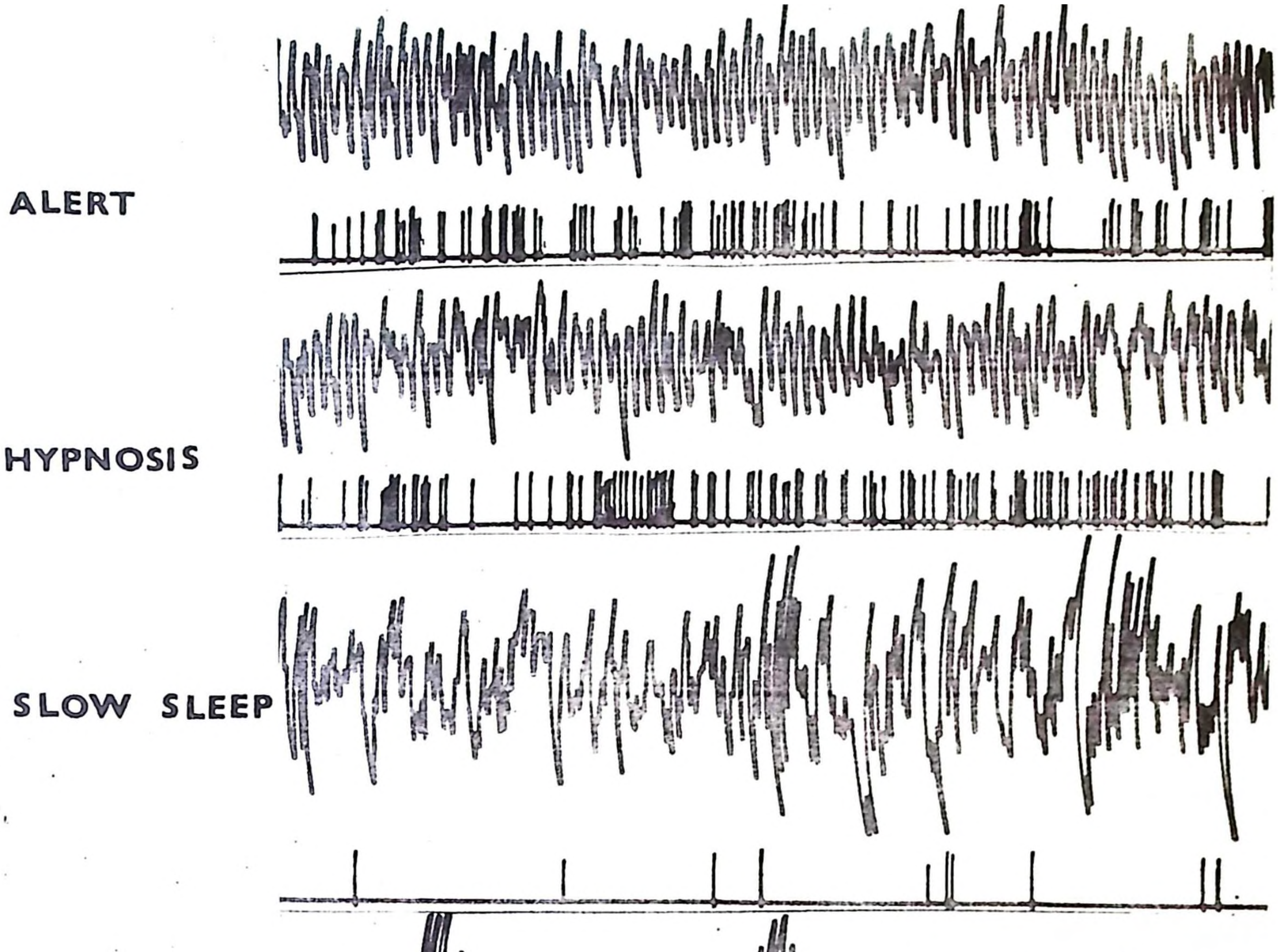

Fig 25 Rabbit 43, Chan 7, Anterior Thalamus,(N. Ventralis Anterior bordering N. Antereomedialis)

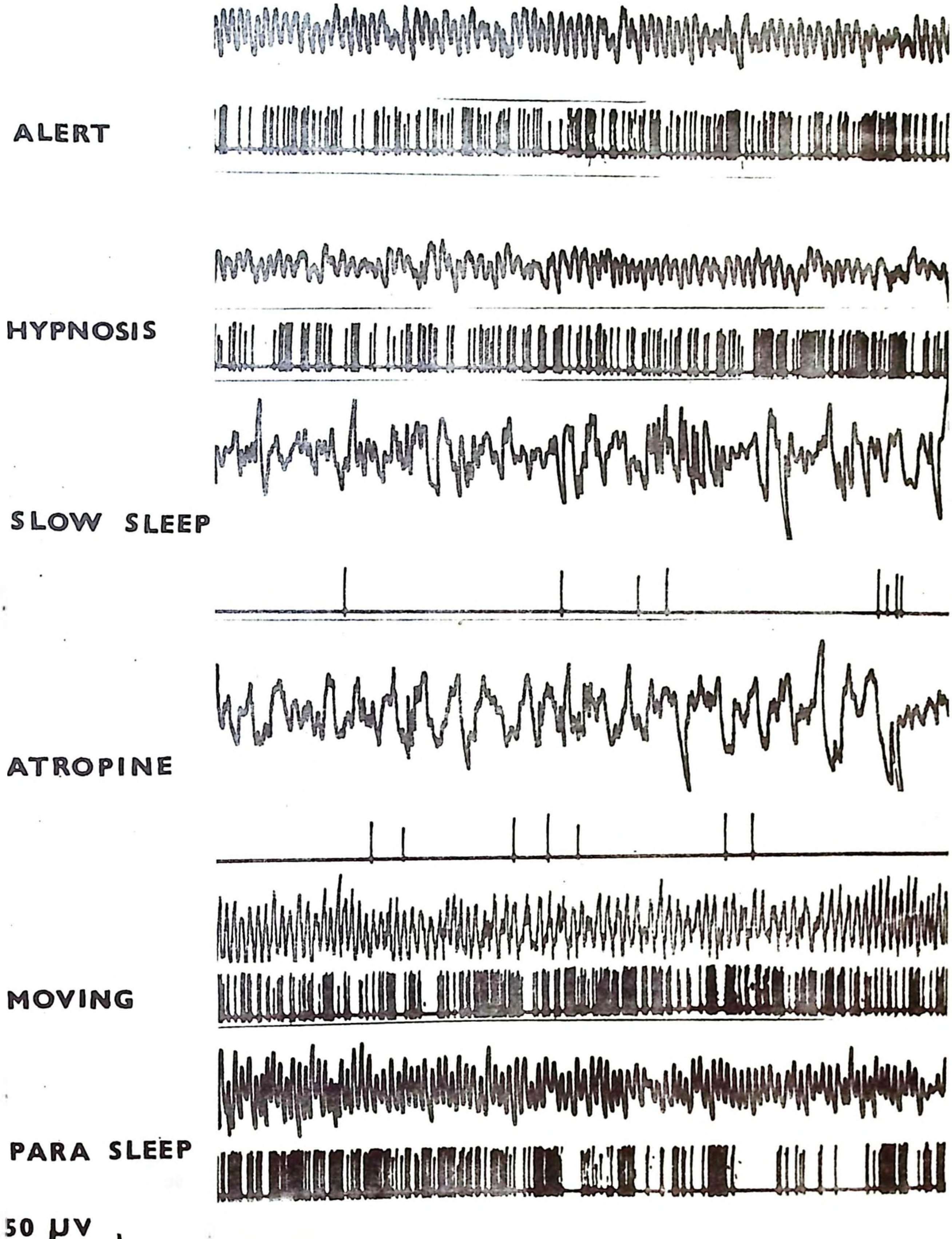

Figure 26.
Rabbit 43, Channel 12, Anterior Thalamus (N. Ventralis Anterior bordering N. Antereomedialis)

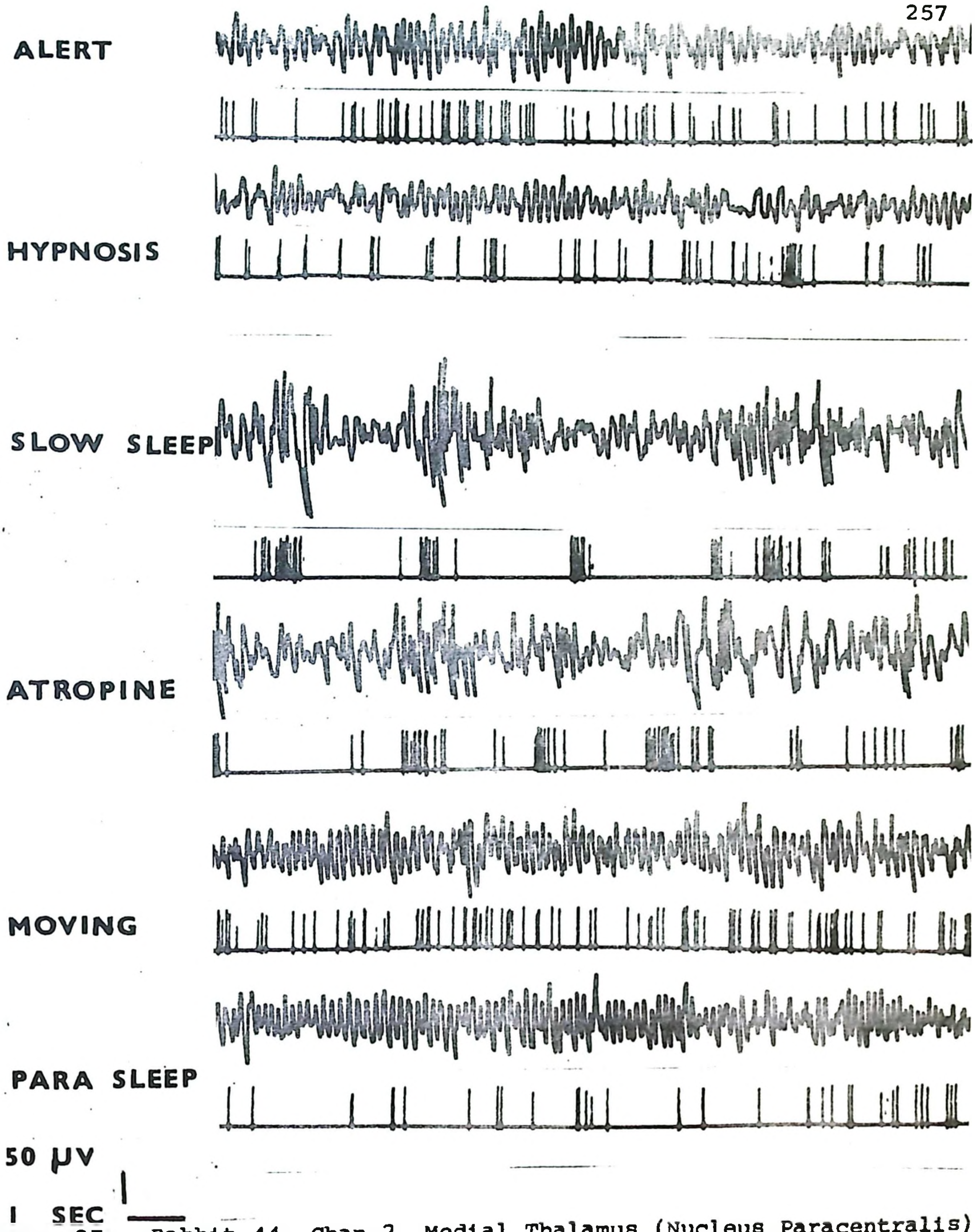

Figure 27. Rabbit 44, Chan 2, Medial Thalamus (Nucleus Paracentralis)

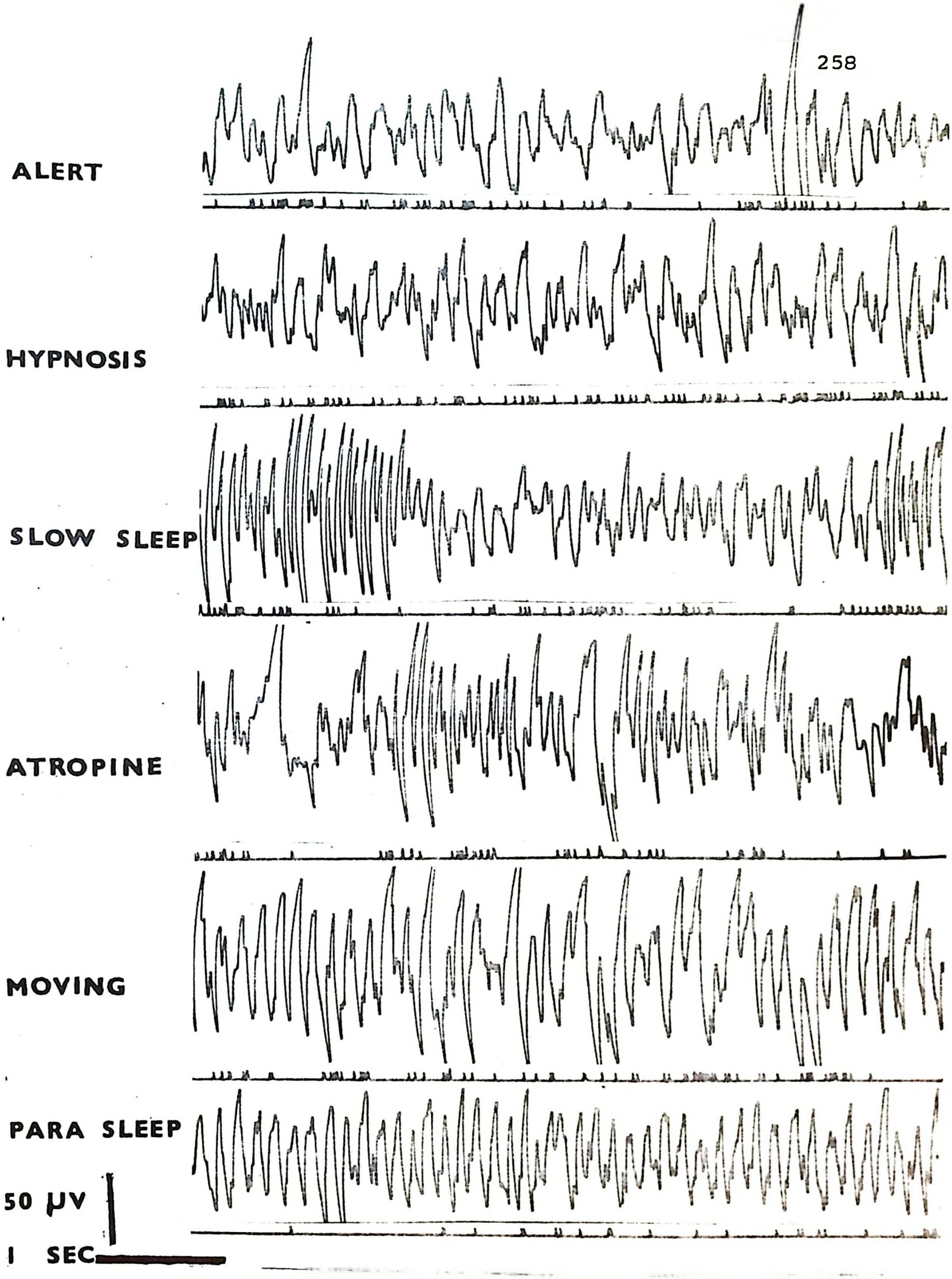

Figure 28. Rabbit 44, Chan 4, Medial Thalamus (Nucleus Paracentralis)

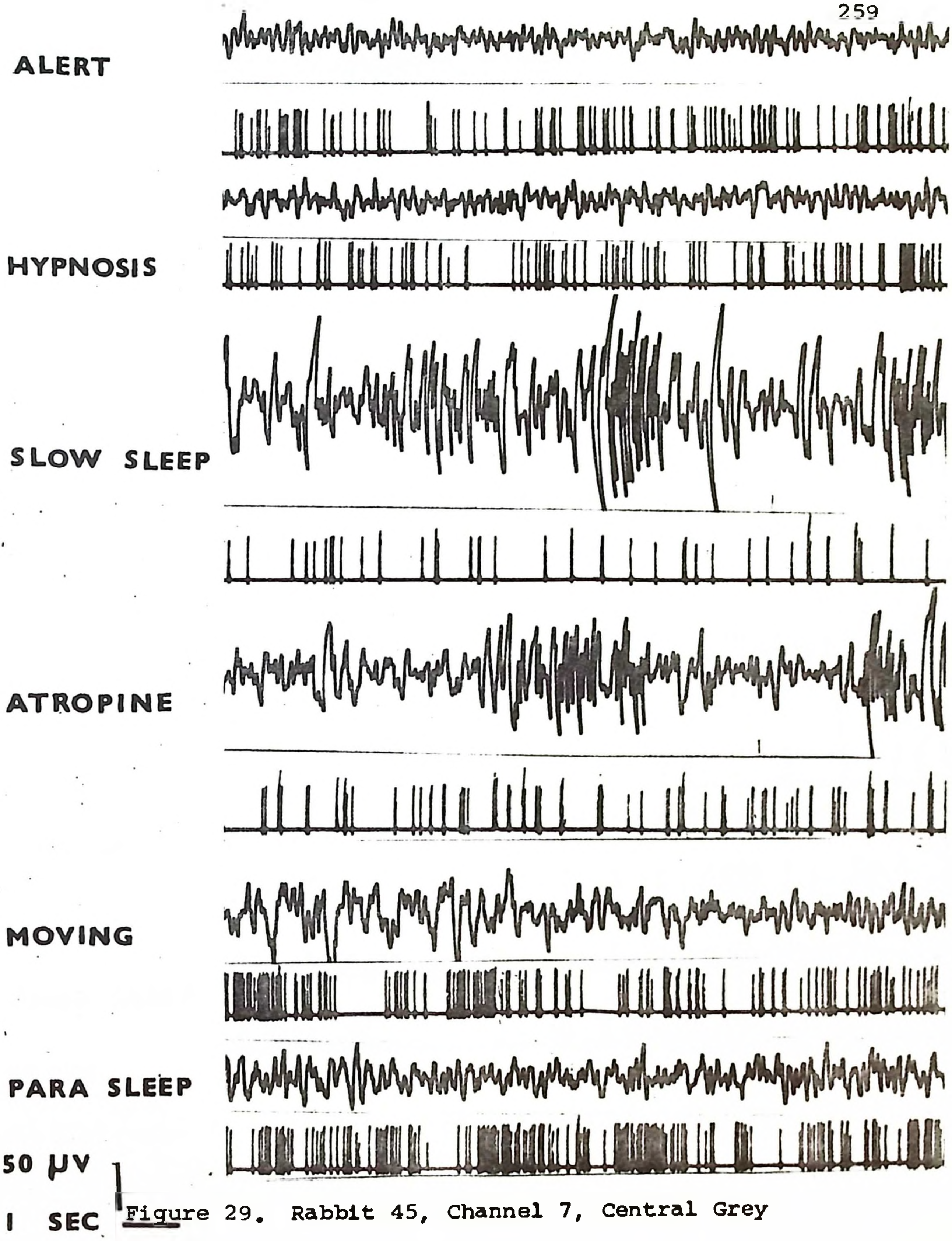

Figure 29. Rabbit 45, Channel 7, Central Grey

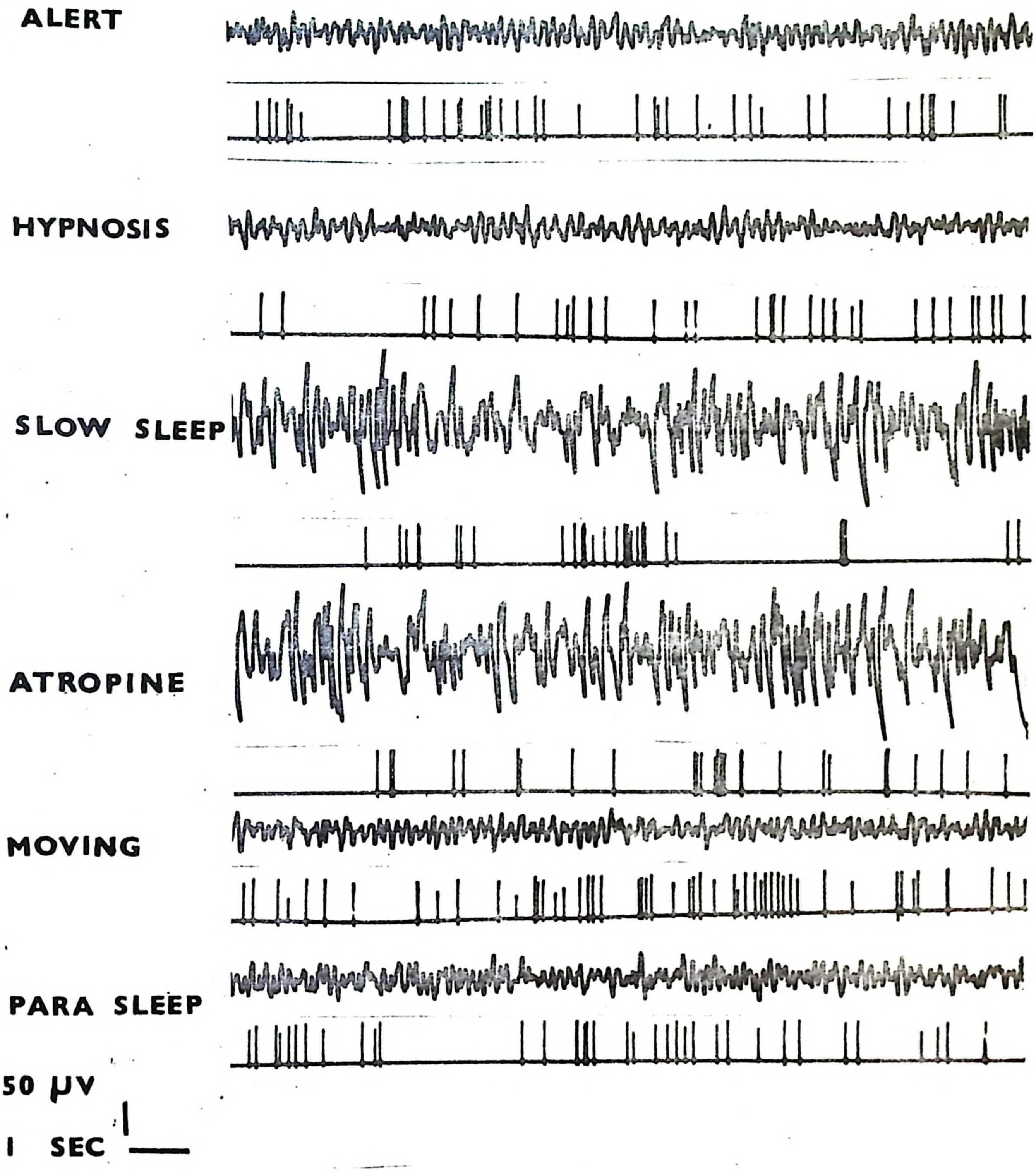

Figure 30. Rabbit 46, Channel 2, Sensori-Motor cortex.

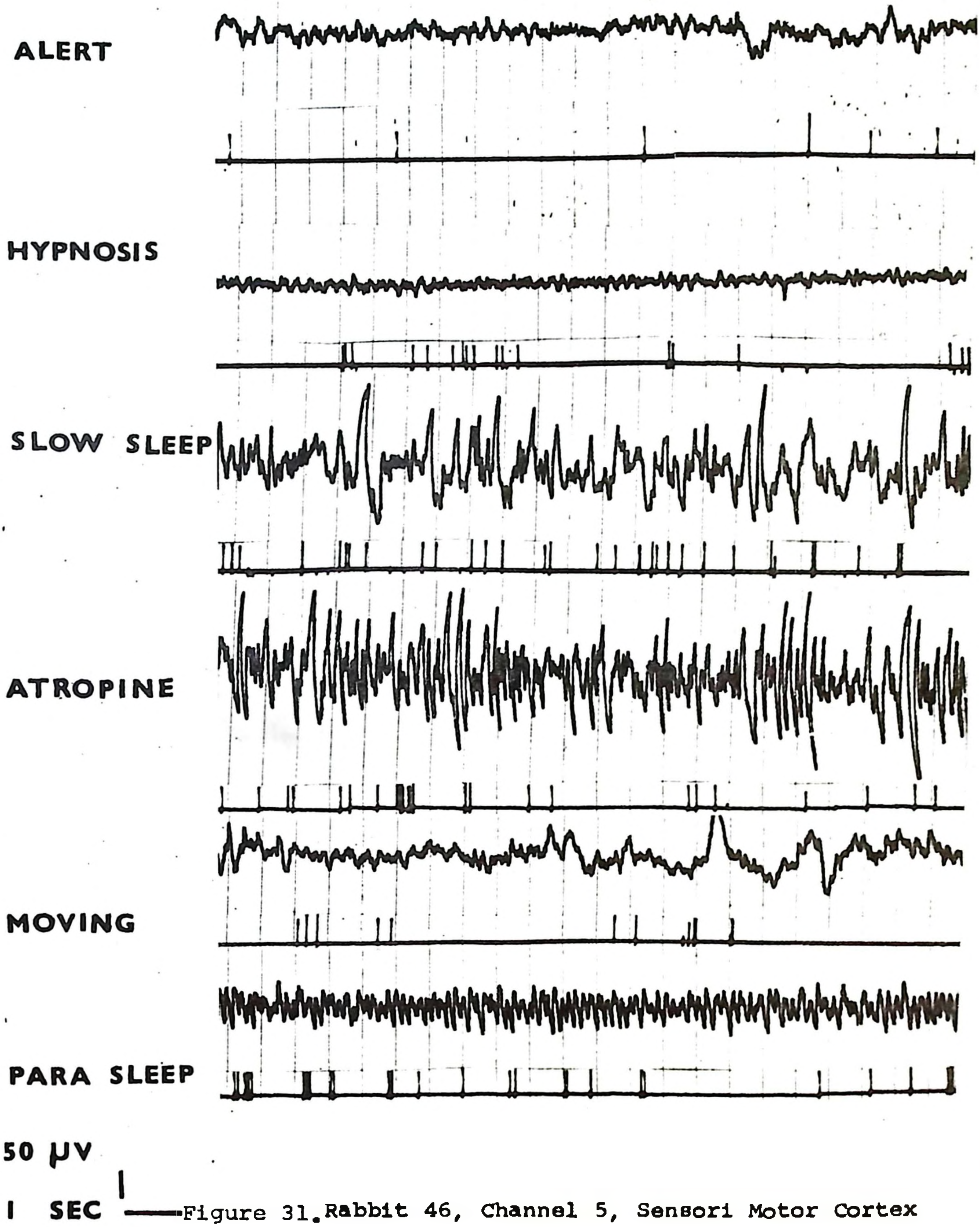

Figure 31. Rabbit 46, Channel 5, Sensori Motor Cortex

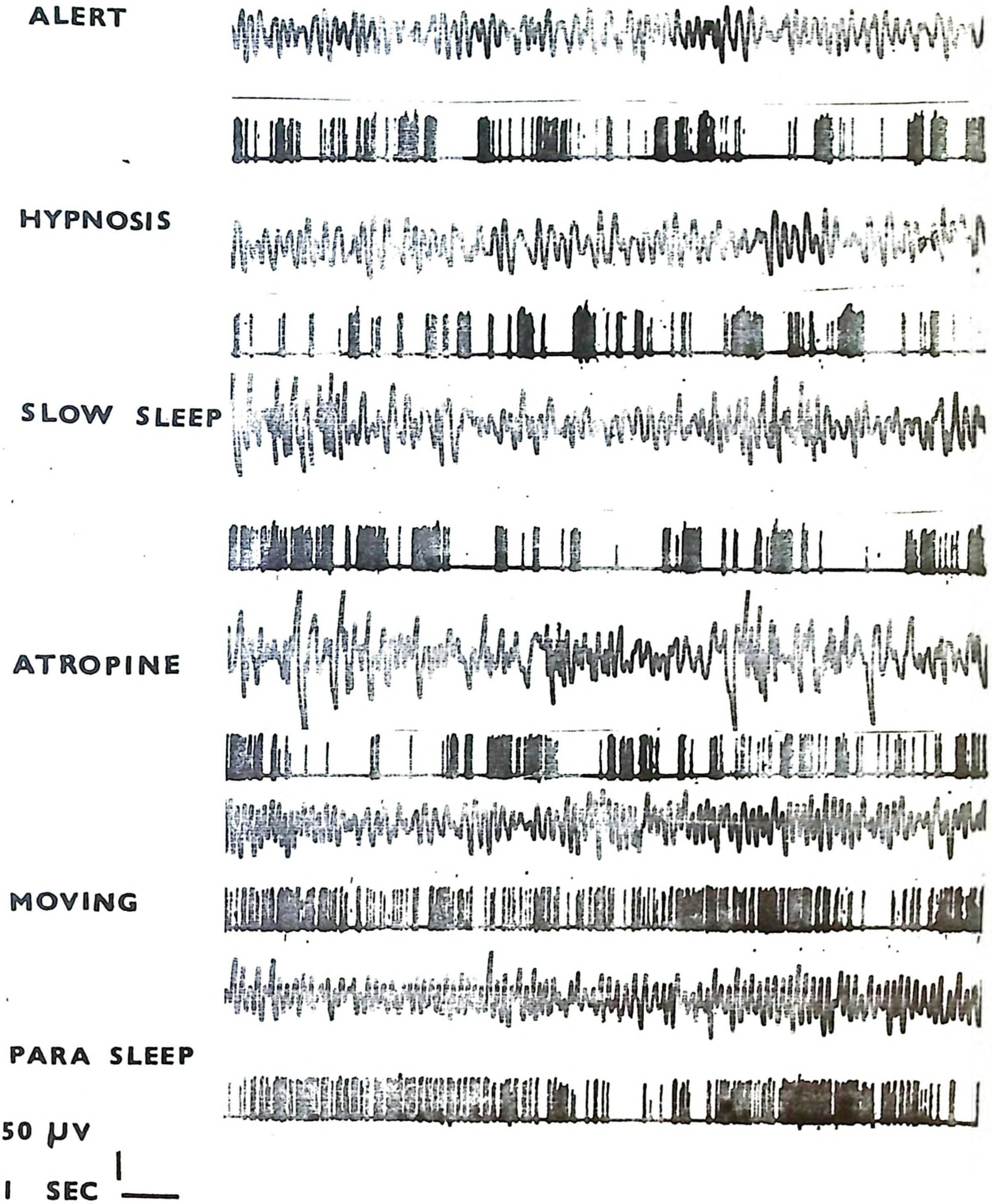

Figure 32 Rabbit 47, channel 10, medial thalamus.

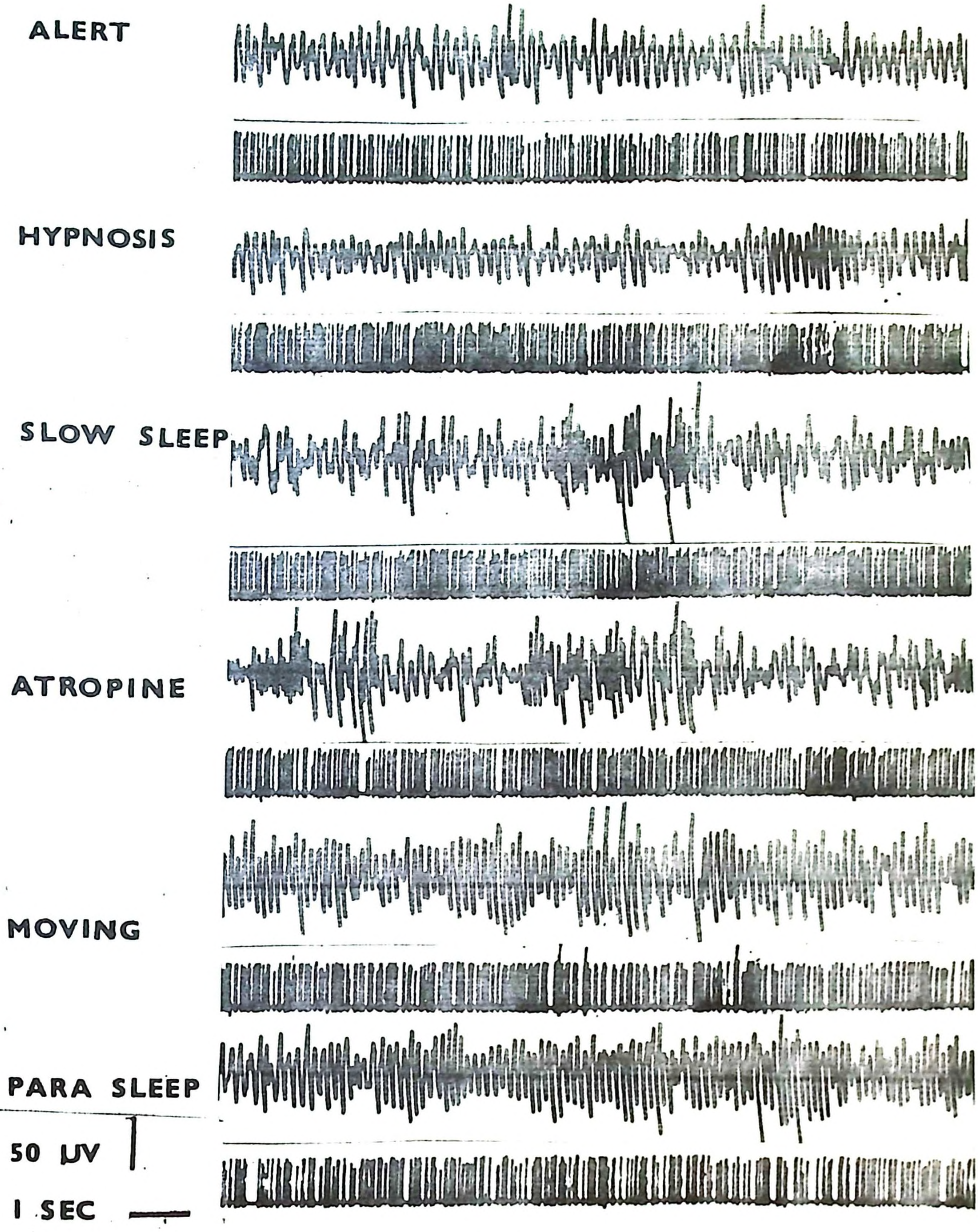

Figure 33. Rabbit 48, Channel 2, Nucleus Reticularis Tegmenti

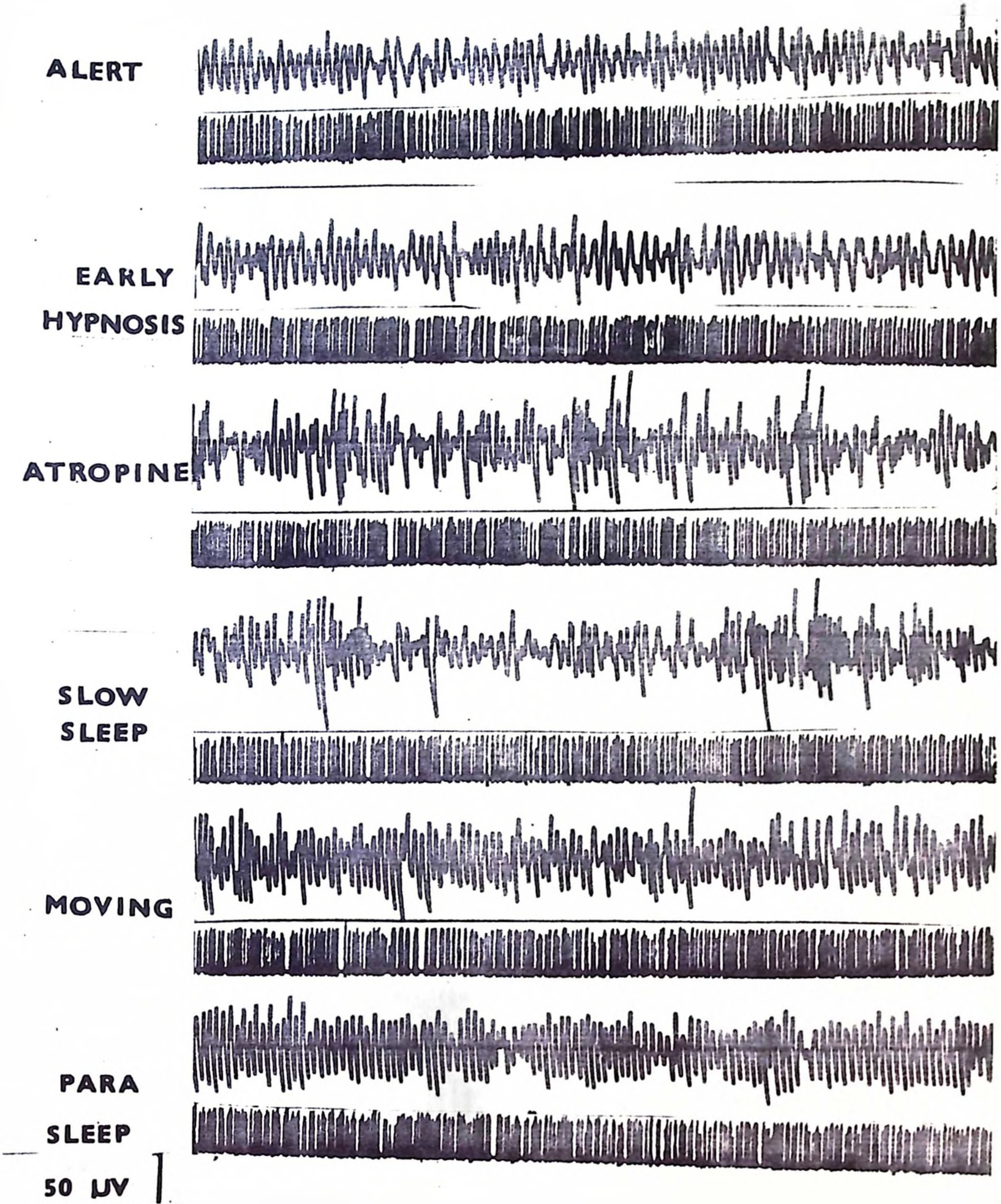

Figure 34. Rabbit 48, Channel 4, Nucleus Reticularis Tegmenti

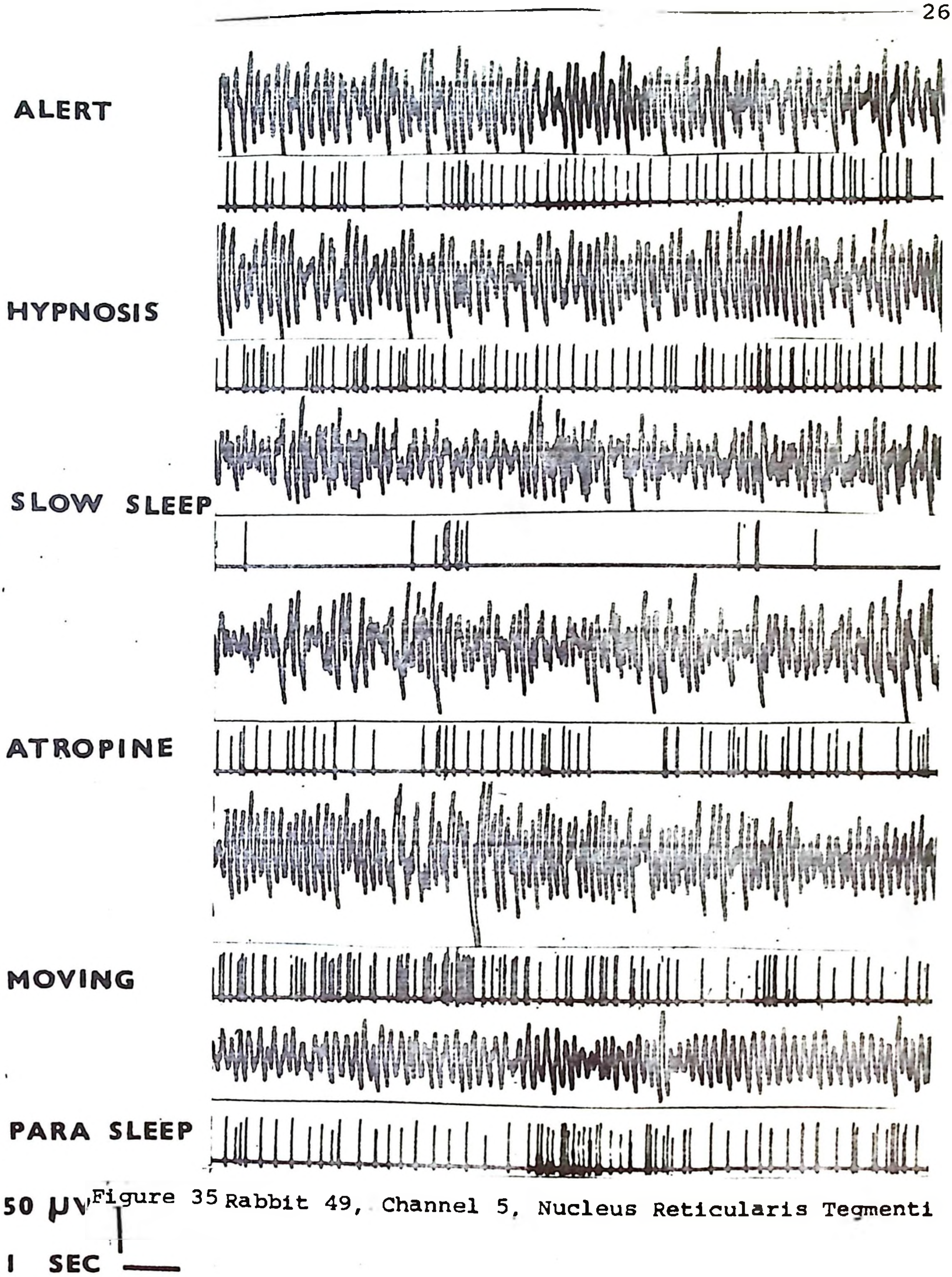

Figure 35 Rabbit 49, Channel 5, Nucleus Reticularis Tegmenti

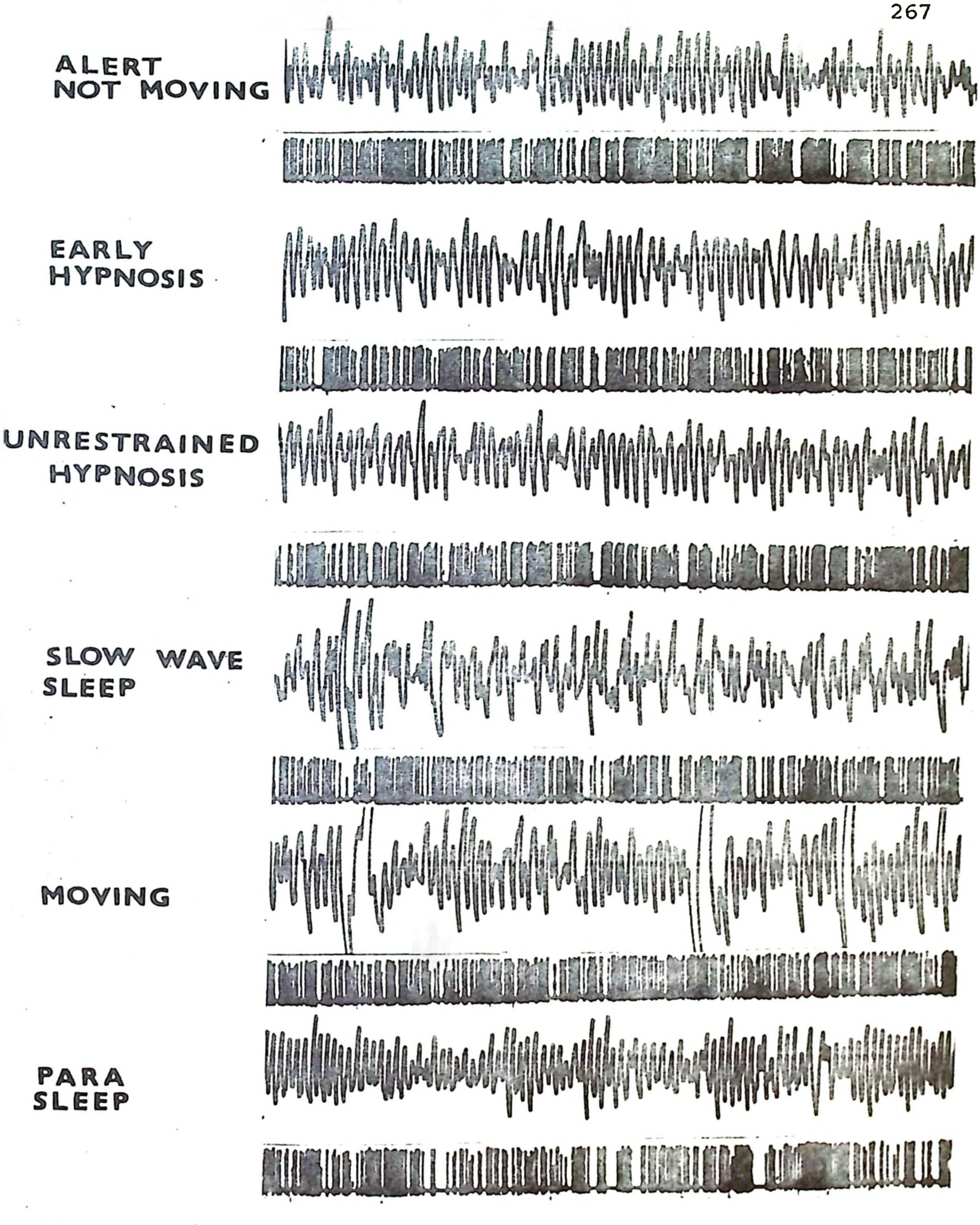

Figure 37.
Rabbit 50, Channel 2, Nucleus Medio-dorsalis Thalami

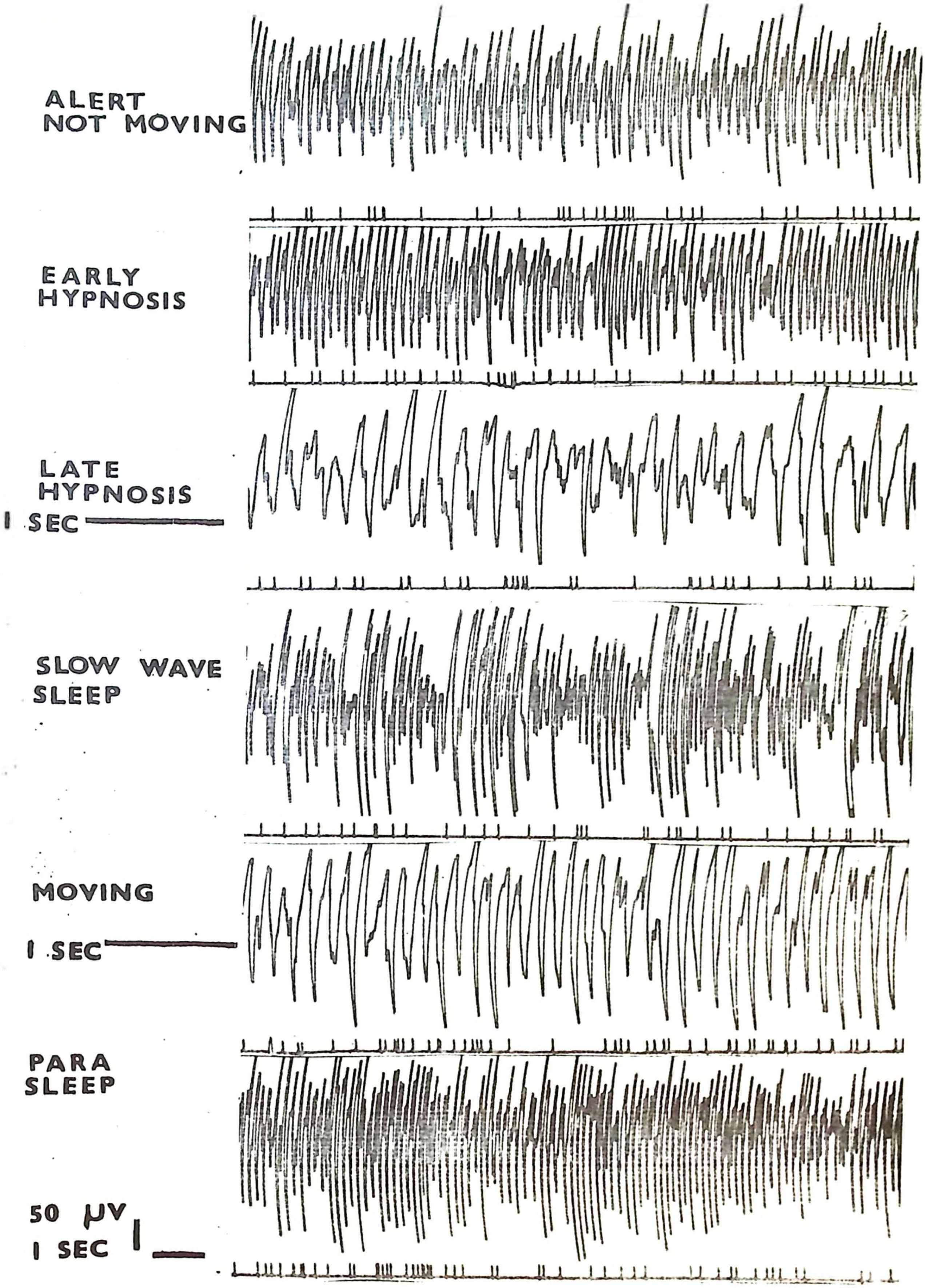

Figure 38. Rabbit 50. Channel 4. Nucleus Medio-dorsalis Thalami

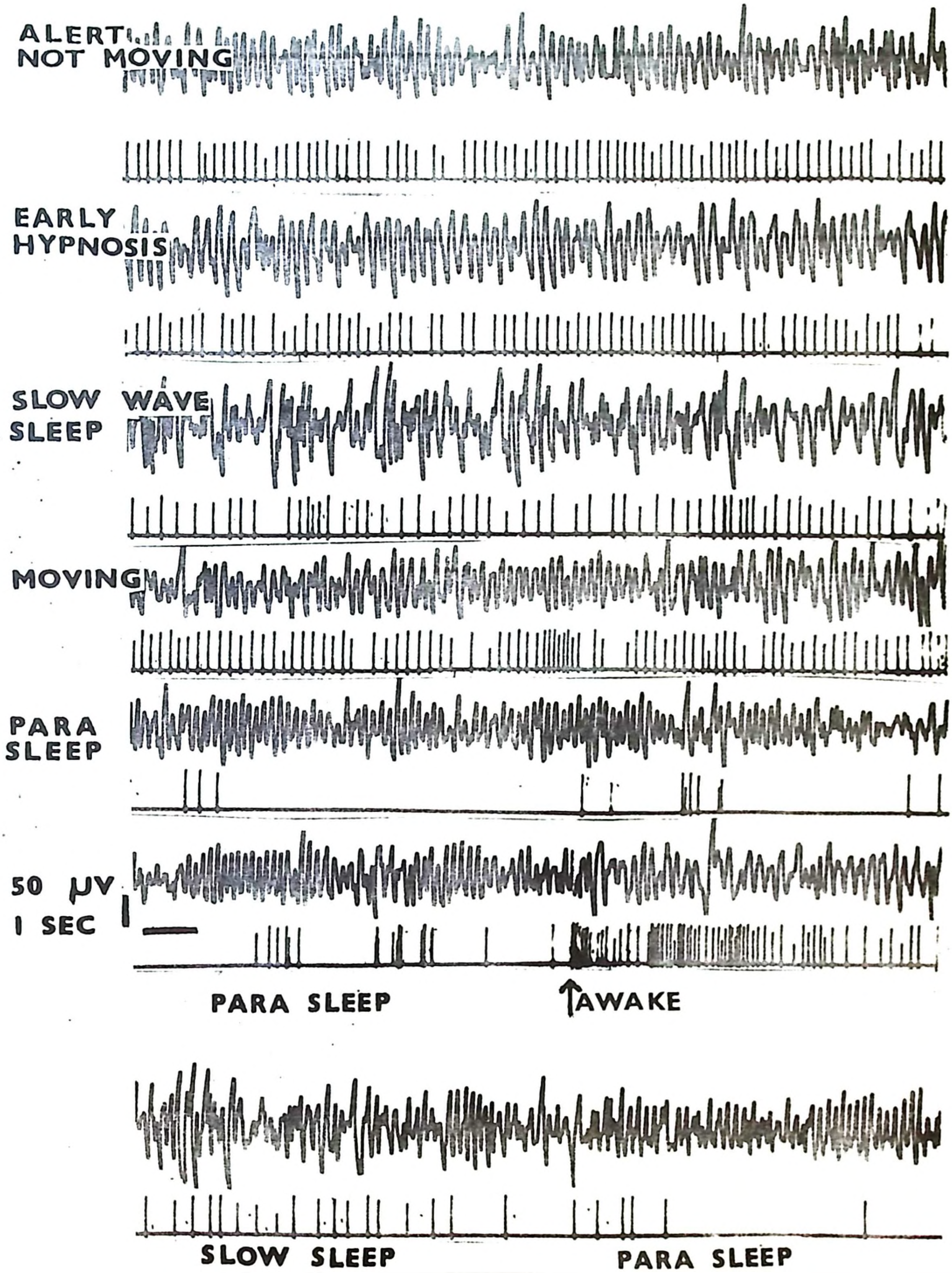

Figure 39. Rabbit 50, Channel 5, Nucleus Reticularis Pontis

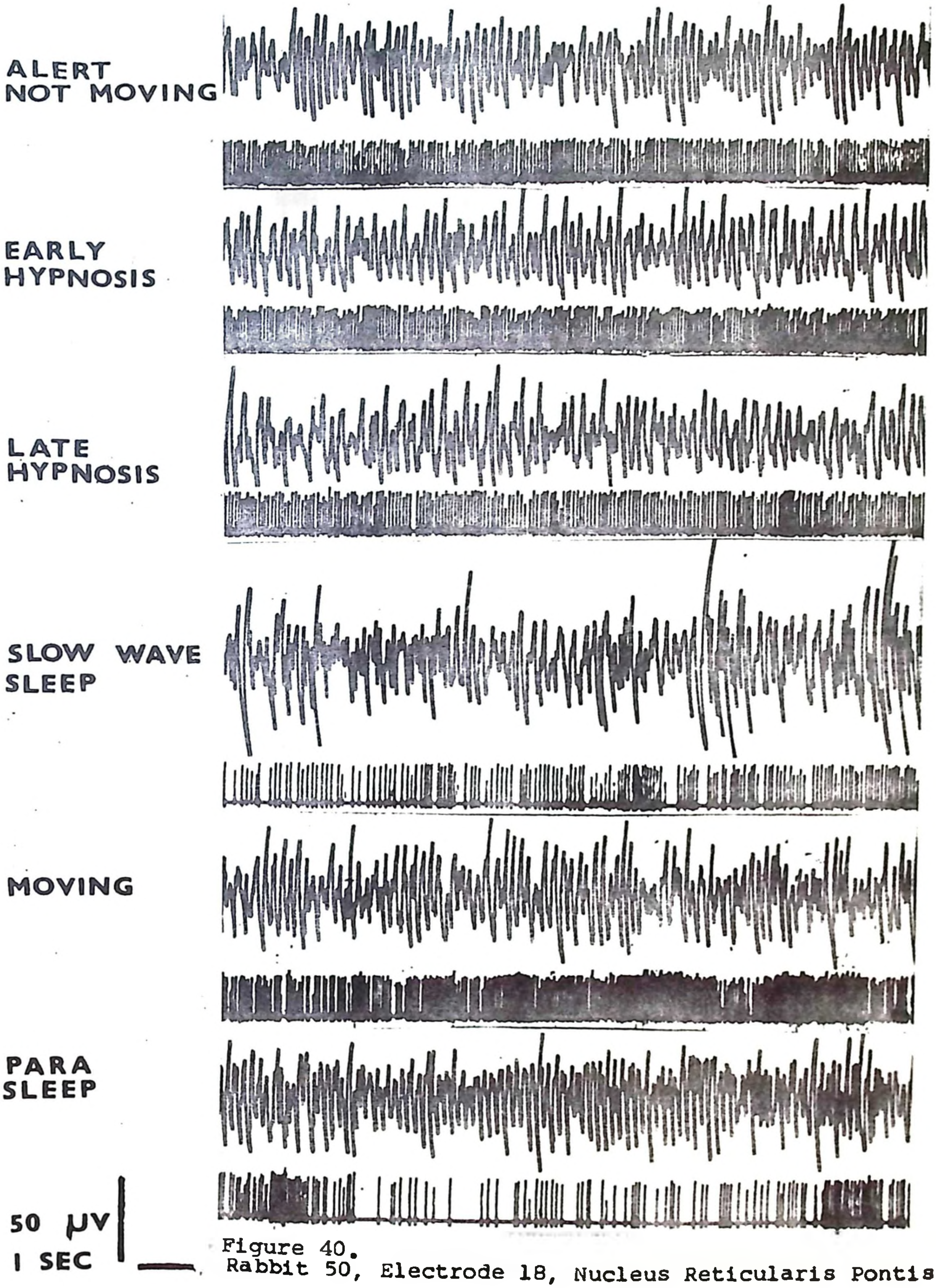

Figure 40.
Rabbit 50, Electrode 18, Nucleus Reticularis Pontis

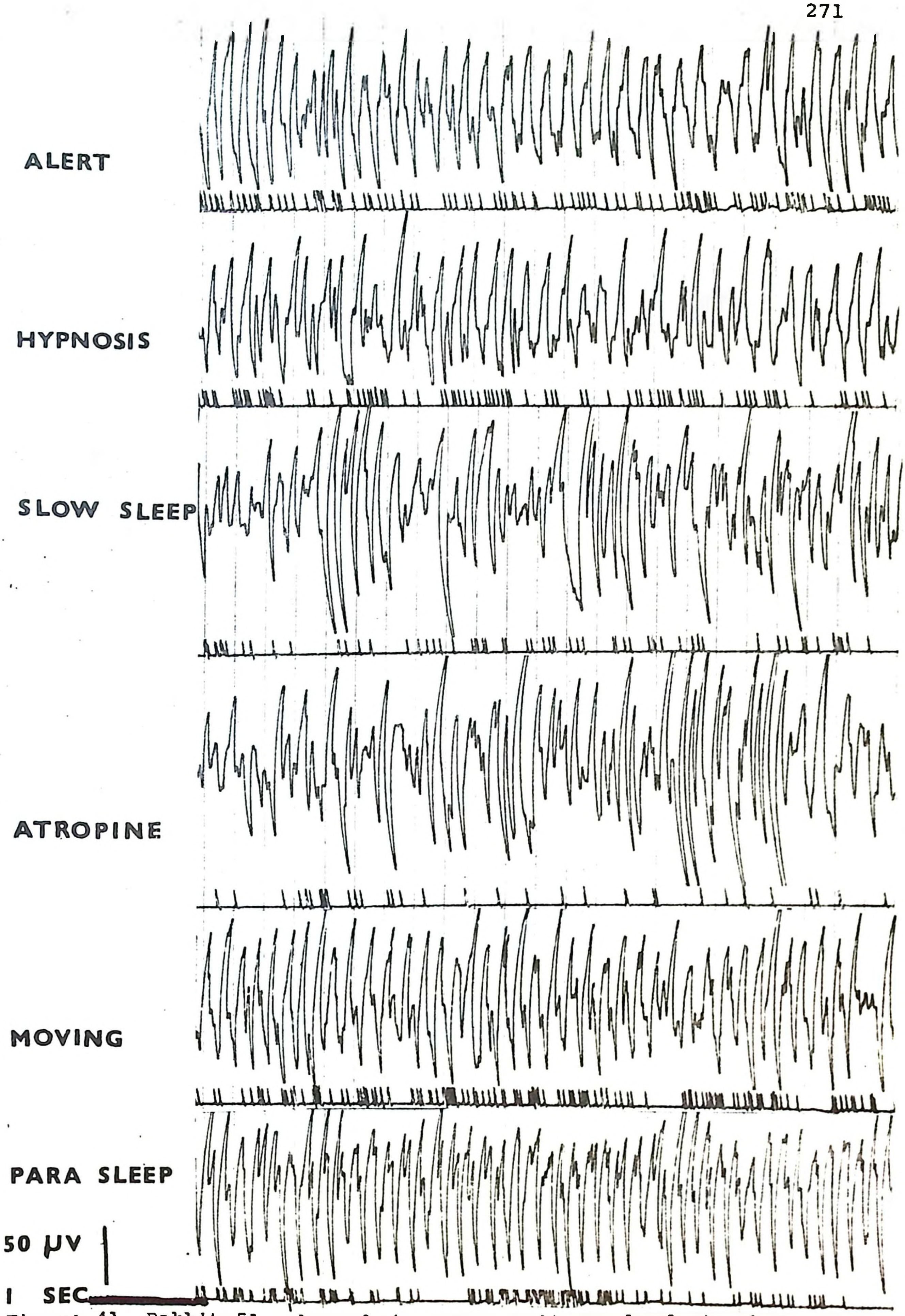

Figure 41. Rabbit 51, channel 4. Corpus callosum bordering hippocampus.

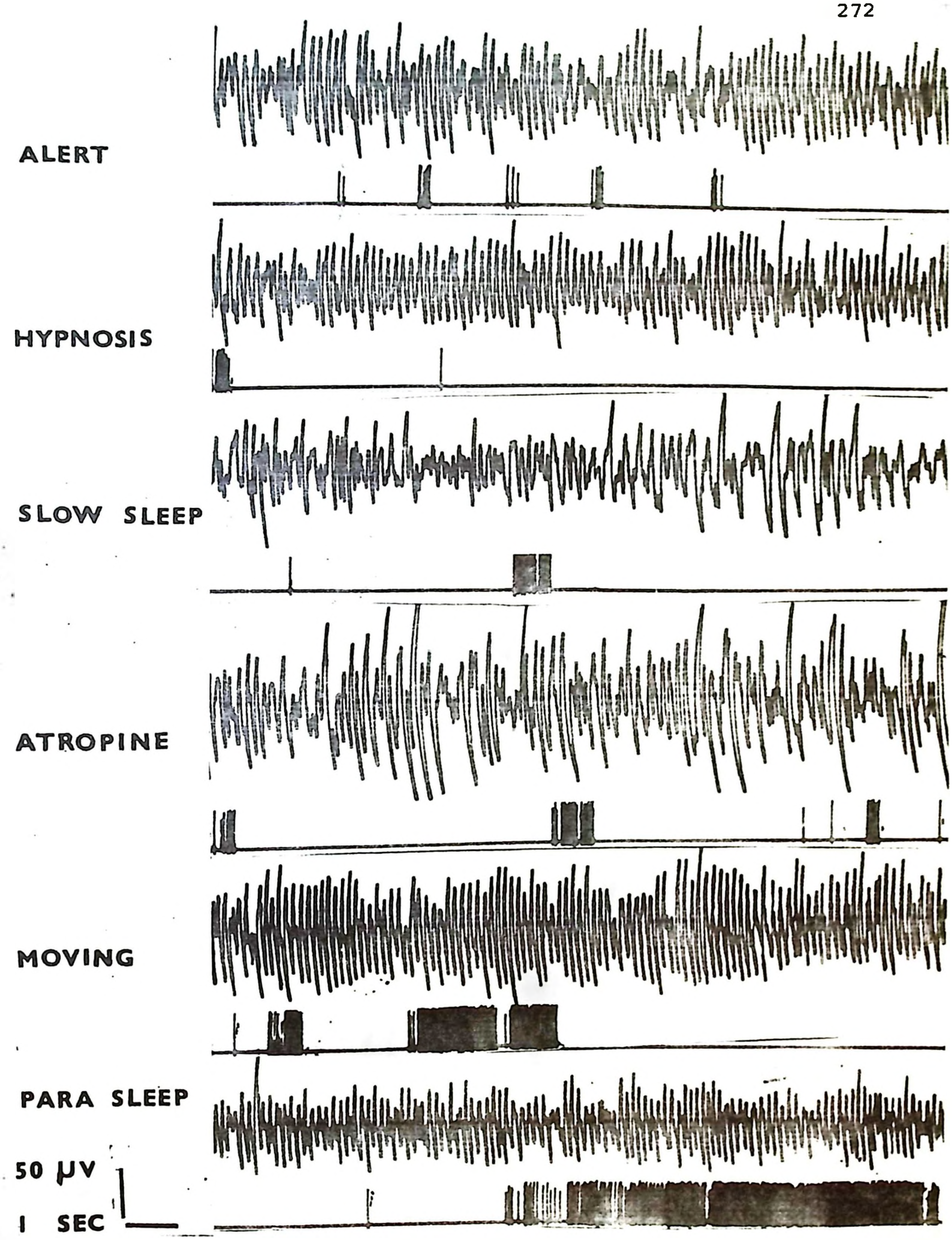

Fig 42 Rabbit 51, Channel 7, Corpus Callosum bordering Hippocampus

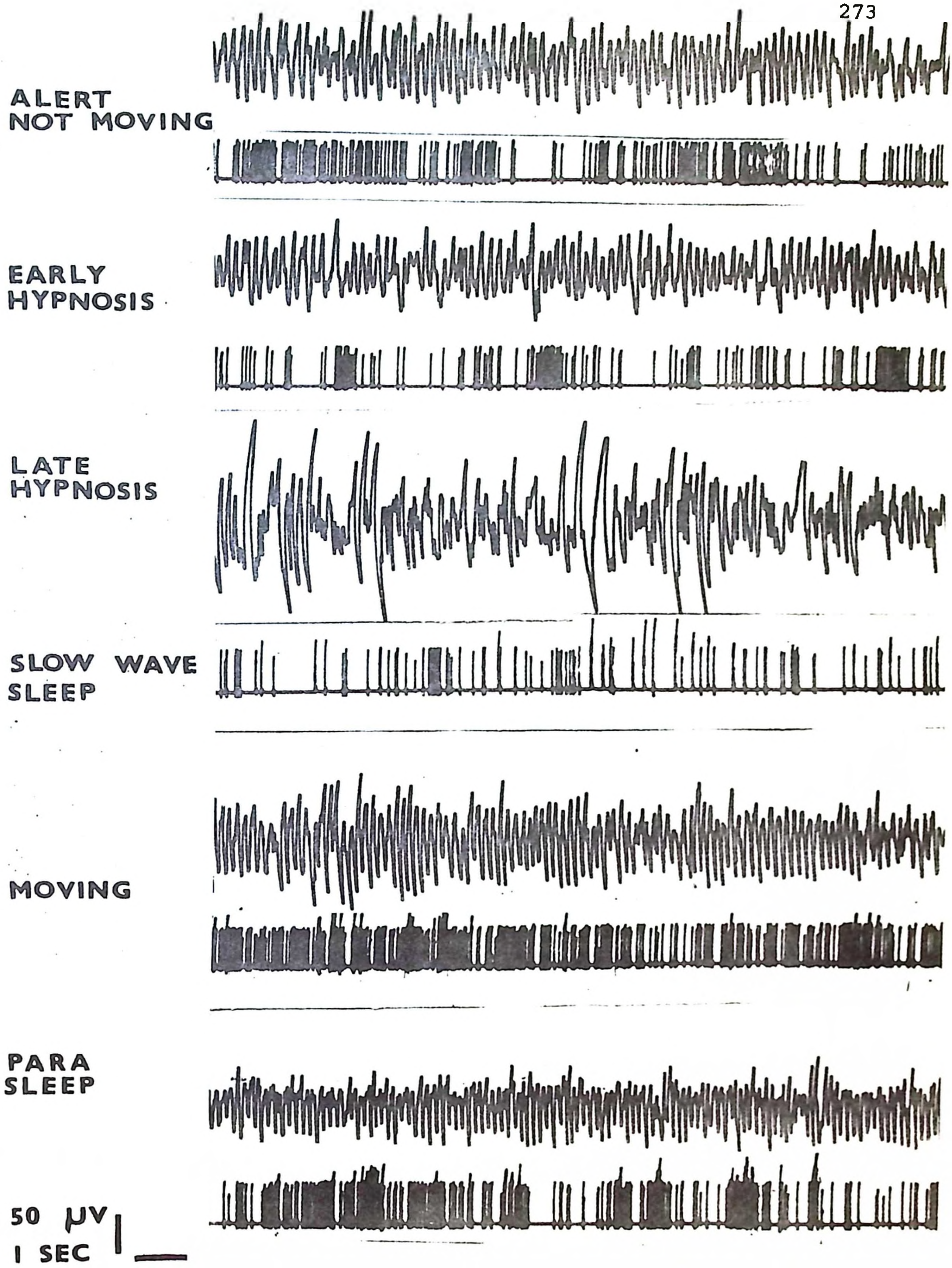

Figure 43. Rabbit 51, Channel 16, Corpus Callosum bordering Hippocampus

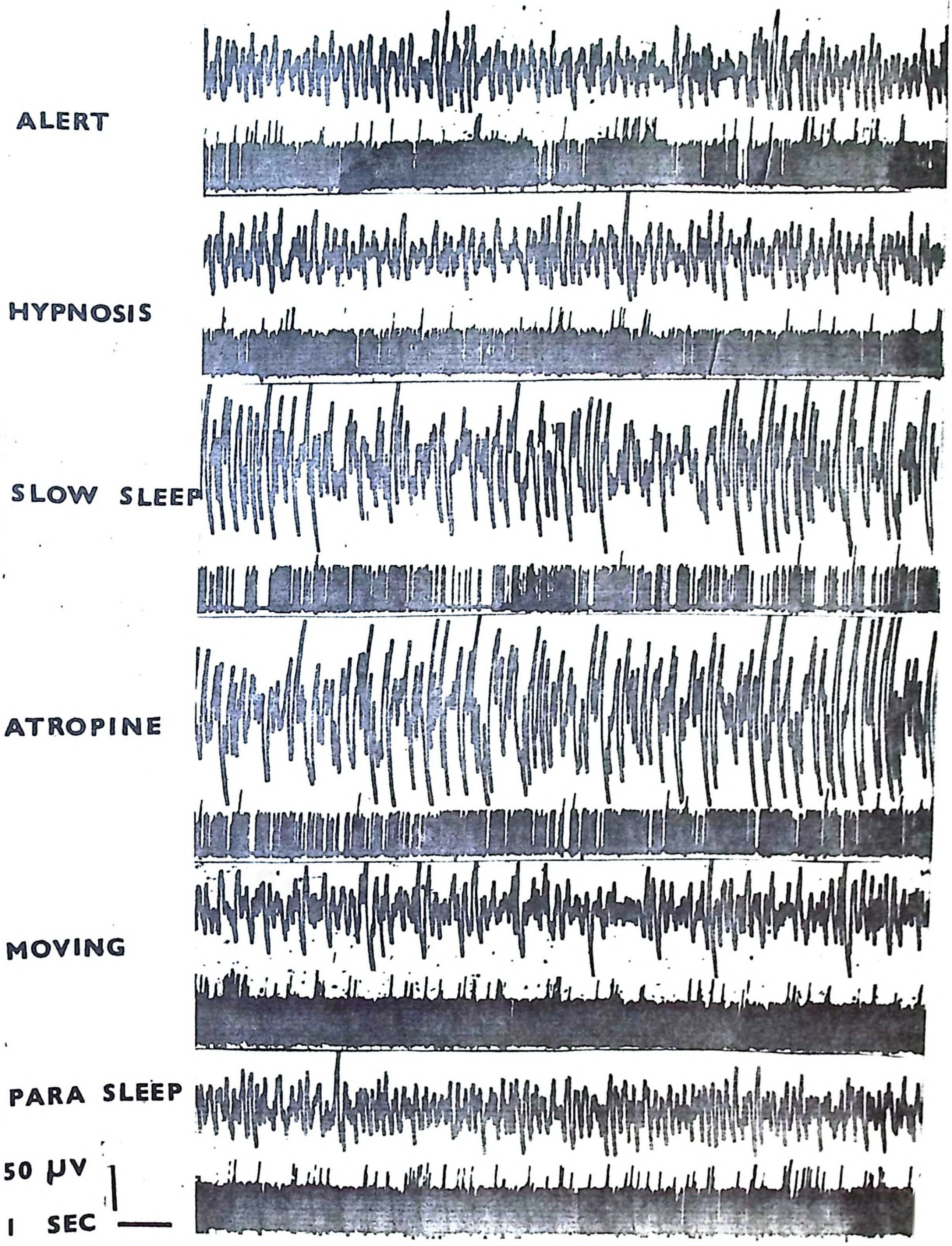

Figure 44. Rabbit 52, Channel 2, Nucleus Reticularis Tegementi

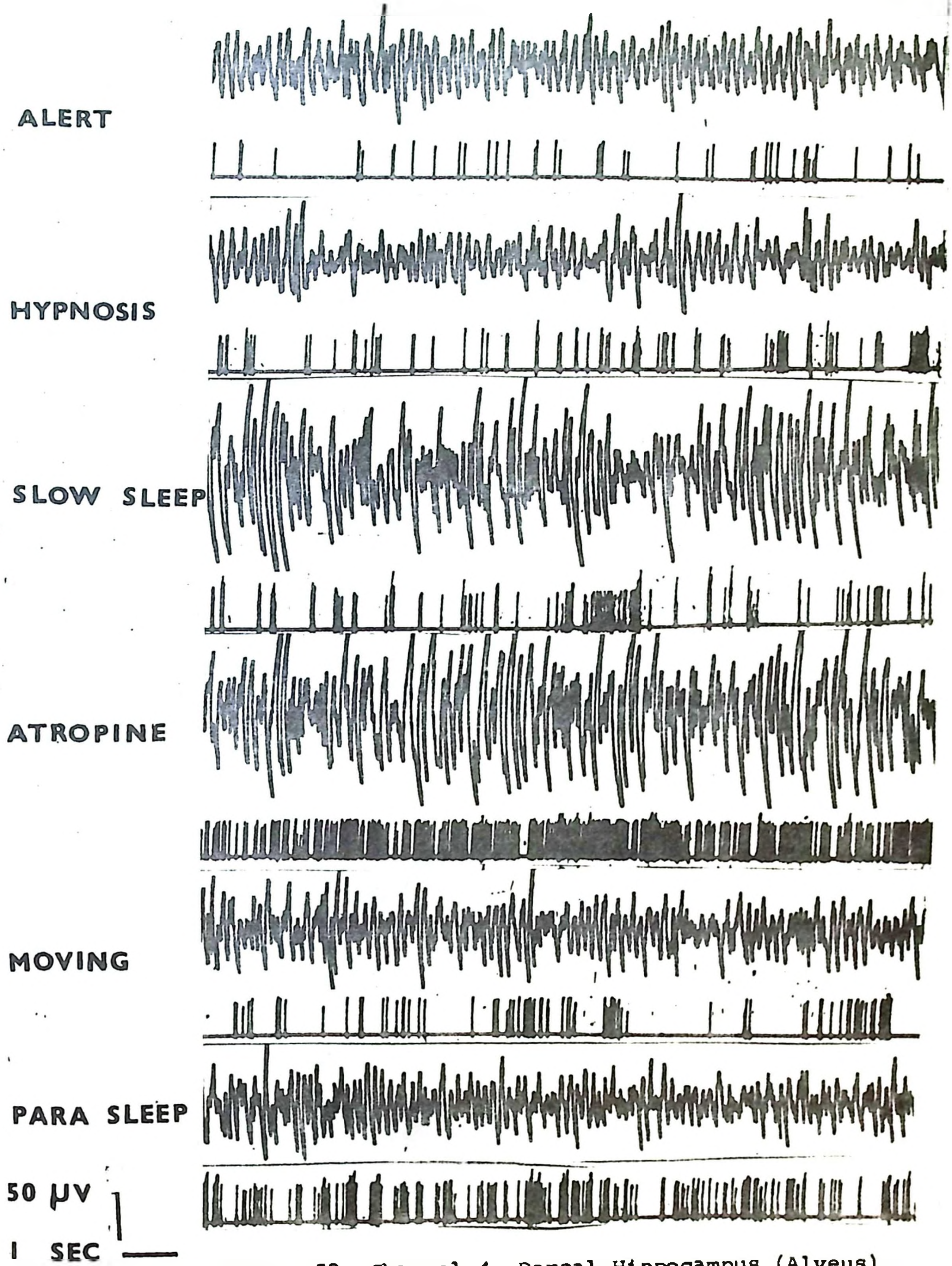

Figure 45. Rabbit 52, Channel 4, Dorsal Hippocampus (Alveus)

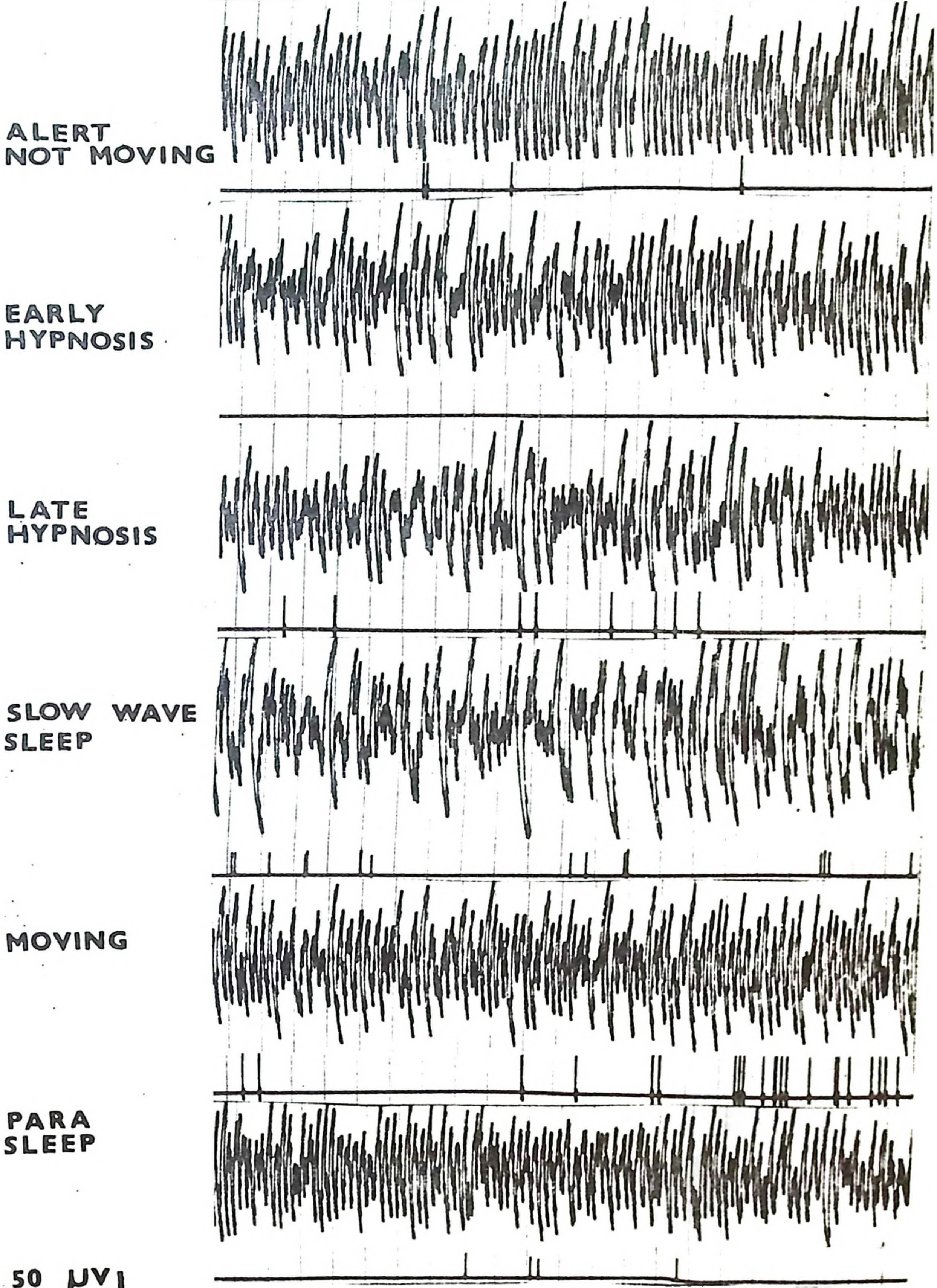

Figure 46.
Rabbit 53, Channel 3, Dorsal Hippocampus

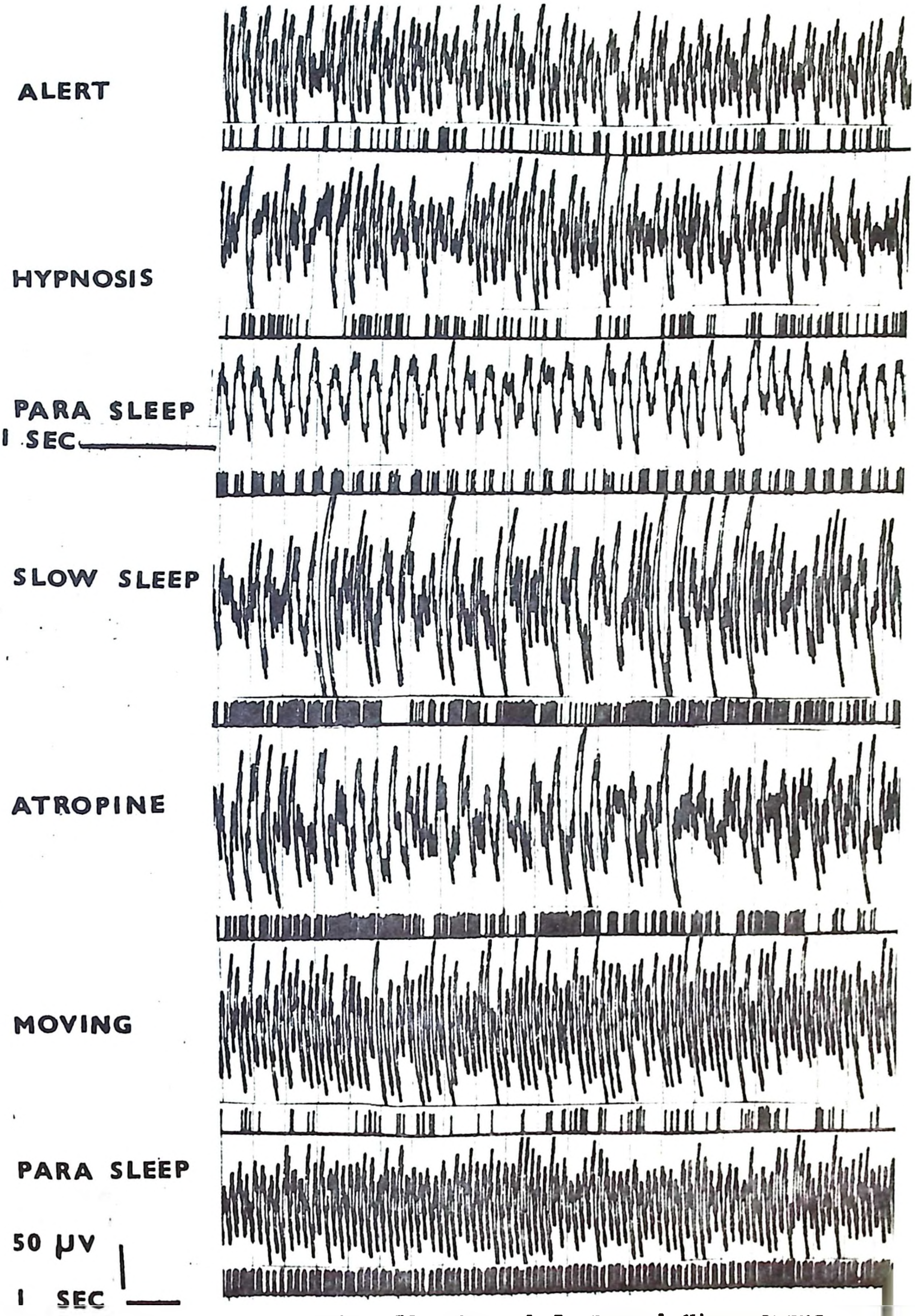

Figure 47. Rabbit 53, Channel 5, Dorsal Hippocampus

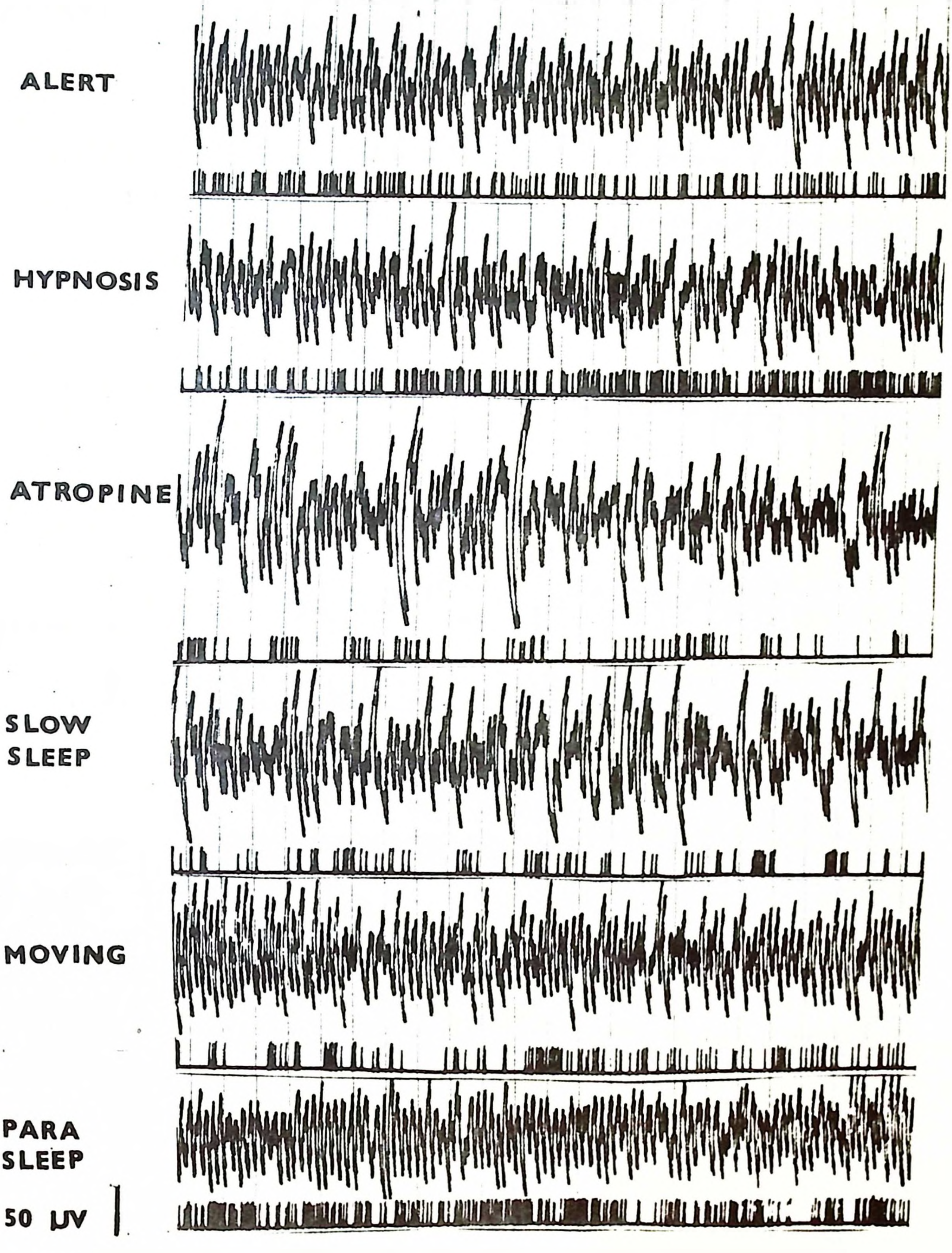

Figure 48. Rabbit 53, Channel 7, Dorsal Hippocampus

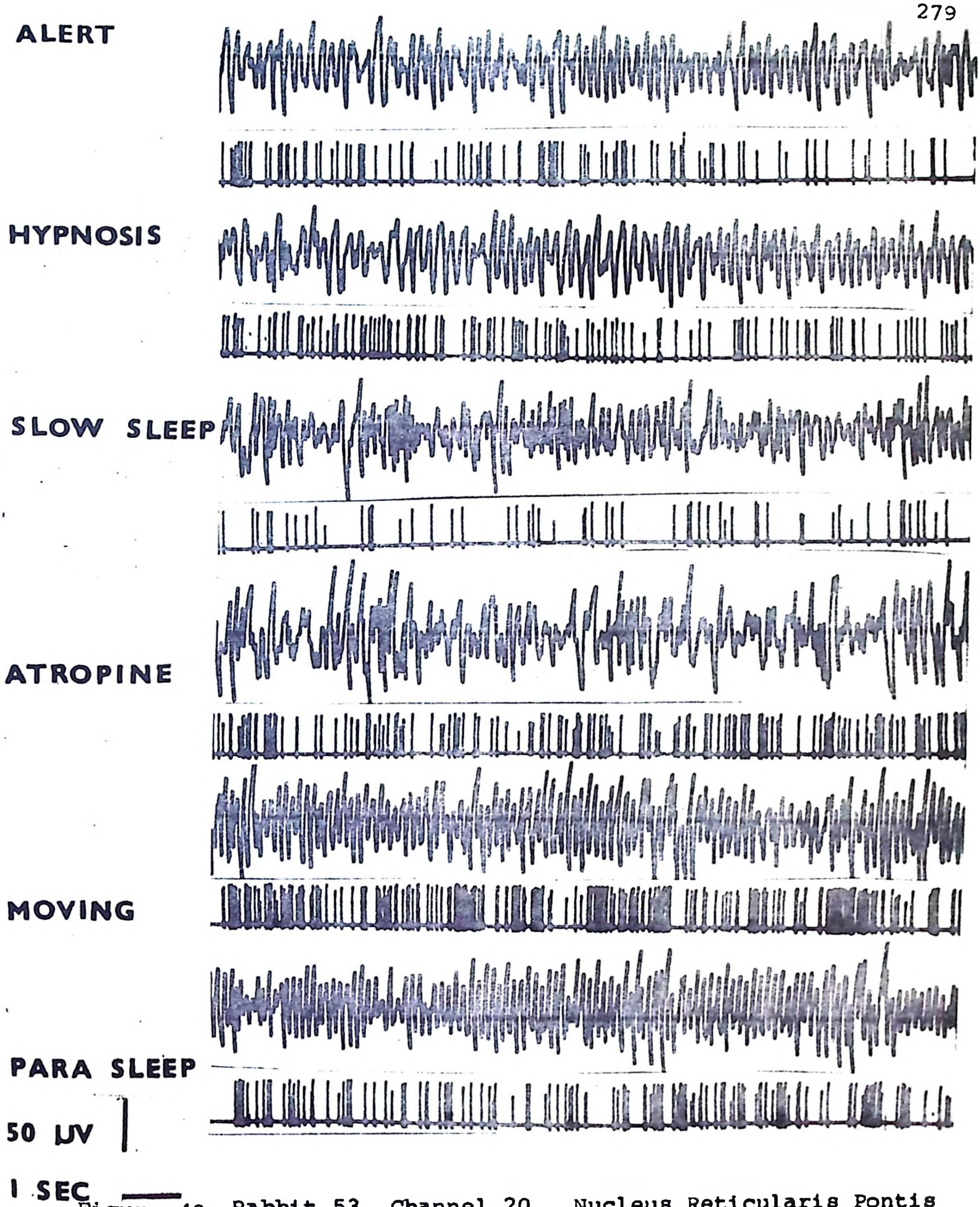

Figure 49 Rabbit 53, Channel 20, Nucleus Reticularis Pontis

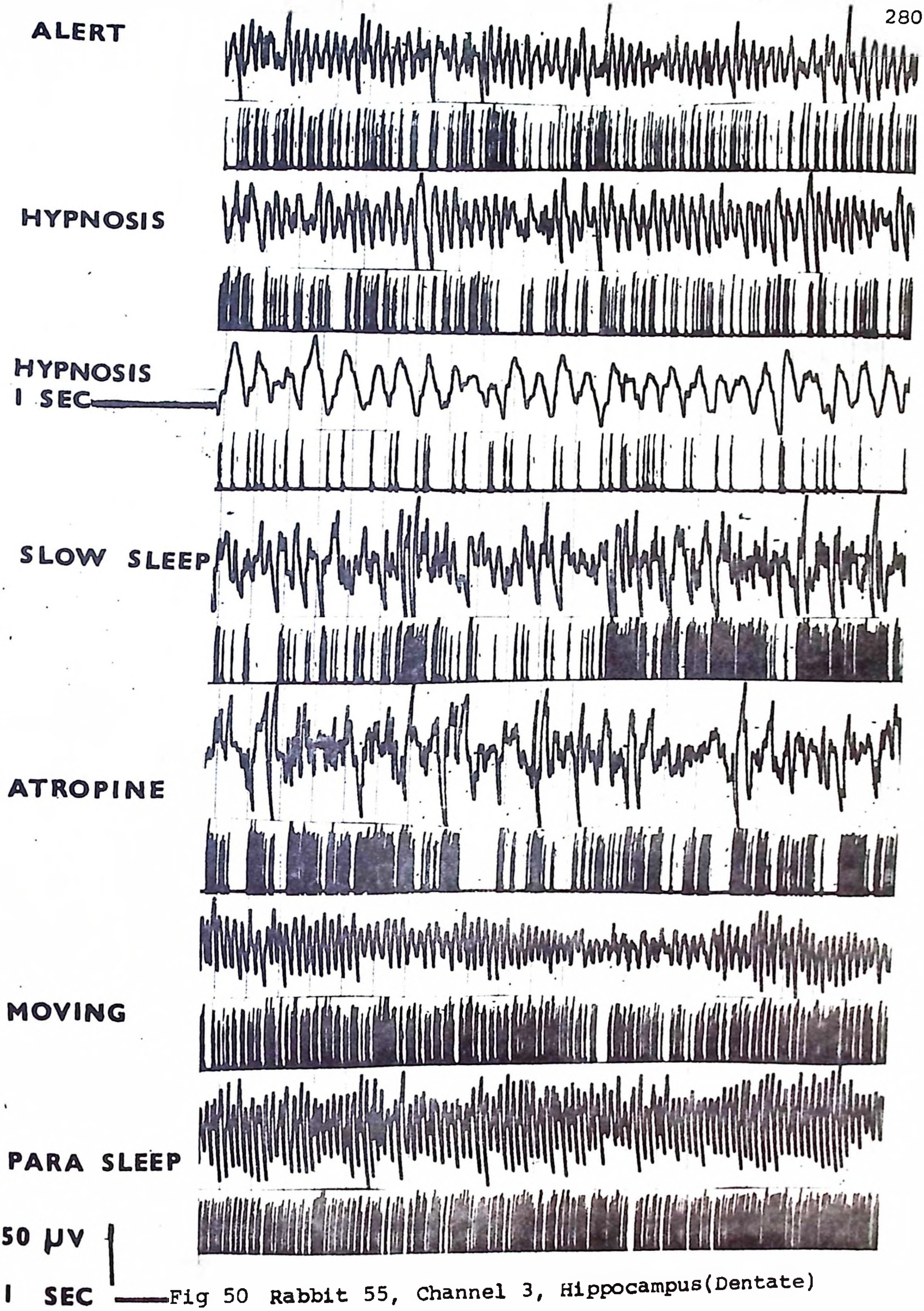

Fig 50 Rabbit 55, Channel 3, Hippocampus(Dentate)

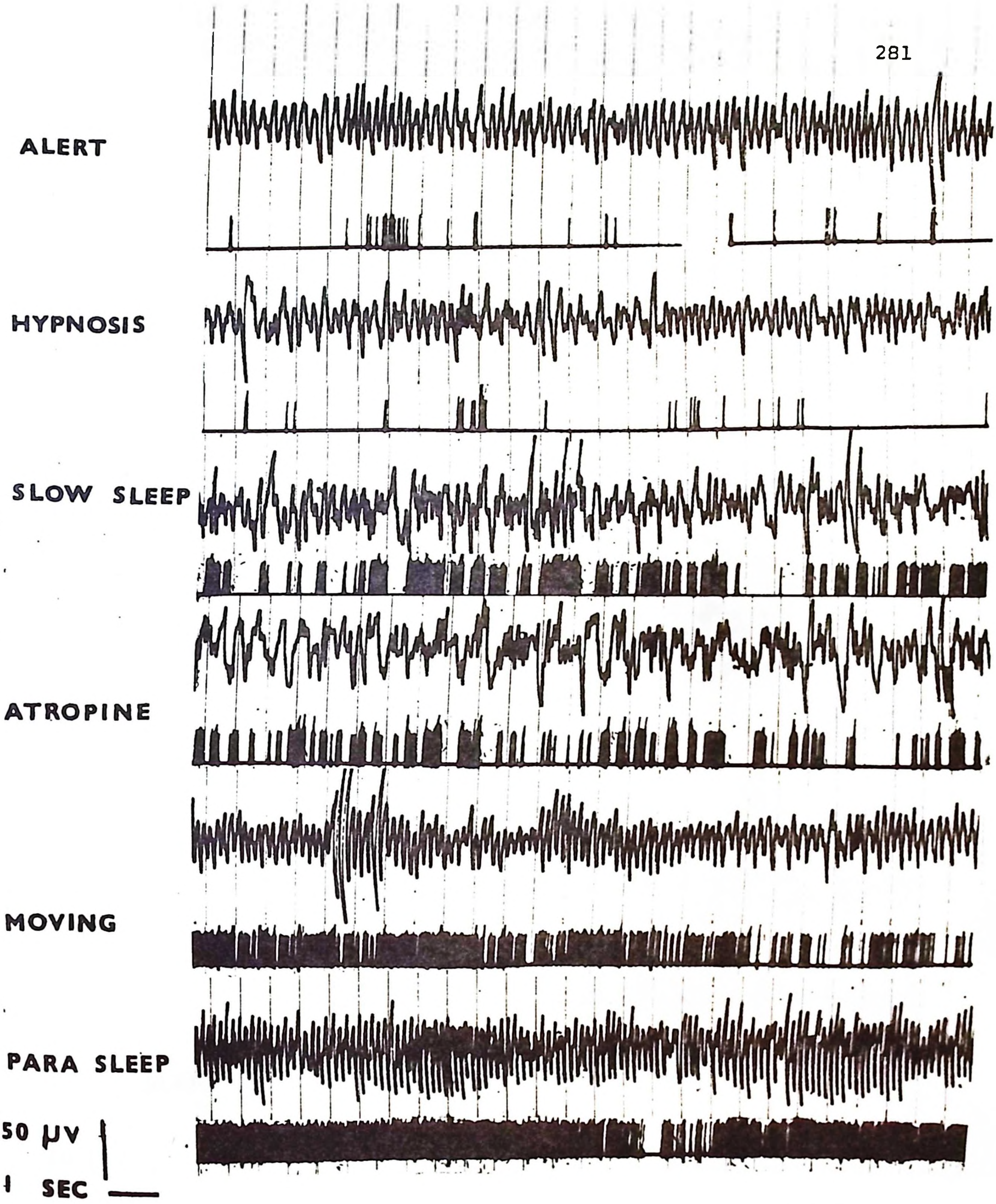

Figure 51. Rabbit 55, Channel 6, Hippocampus (Dentate)

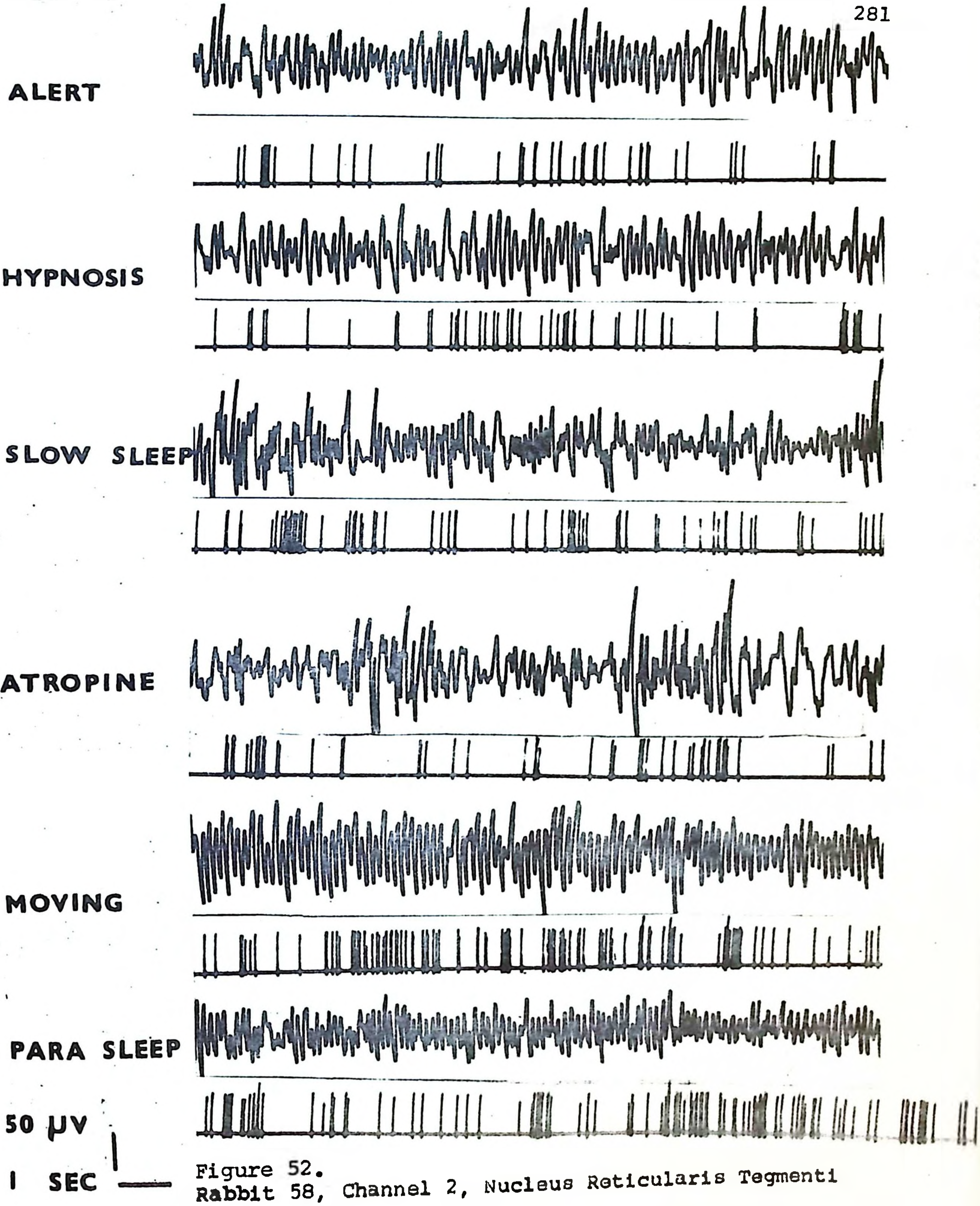

Figure 52.
Rabbit 58, Channel 2, Nucleus Reticularis Tegmenti

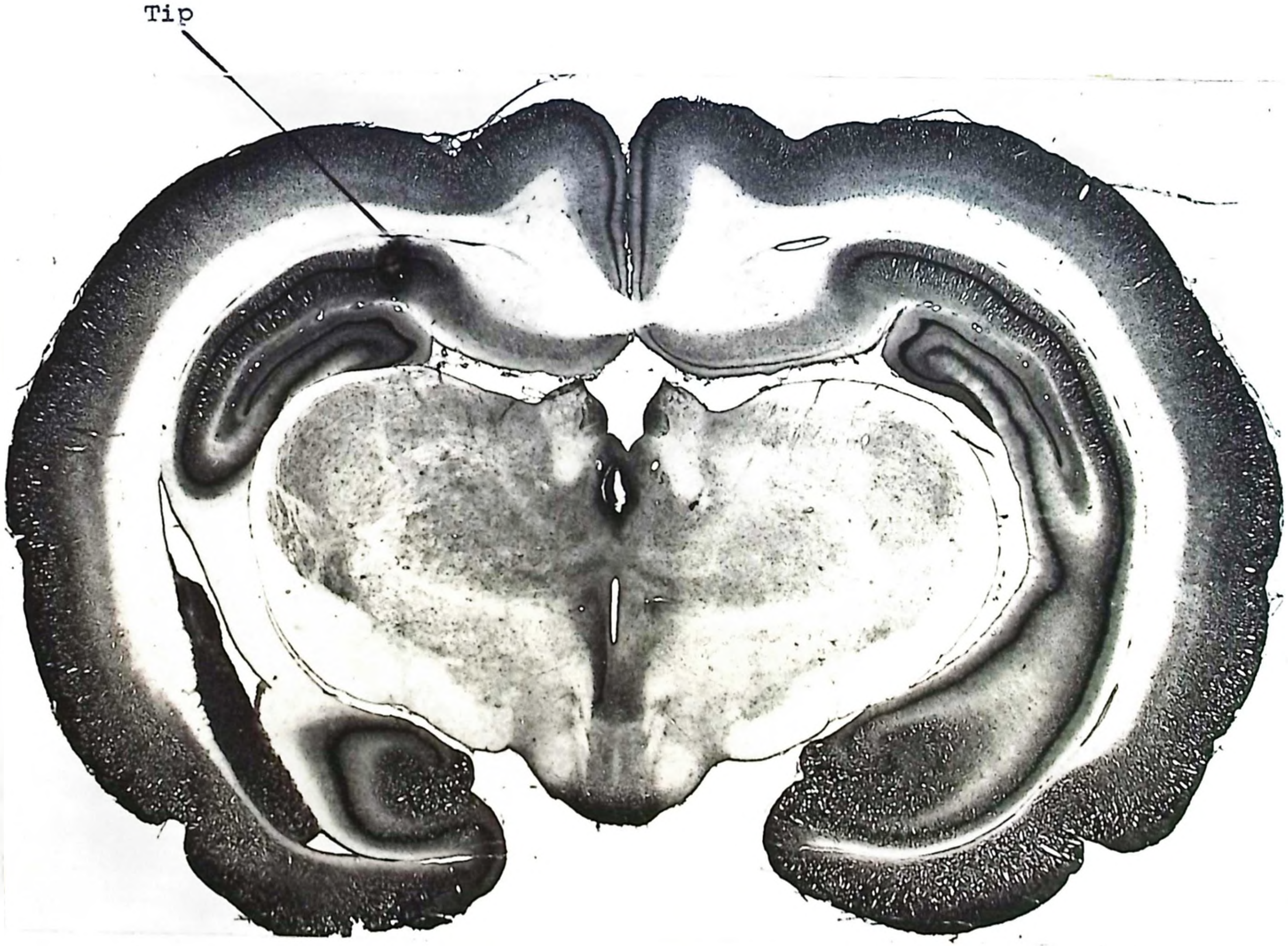

Figure 53. Coronal section with microelectrode tip. Rabbit 31, cell 21.

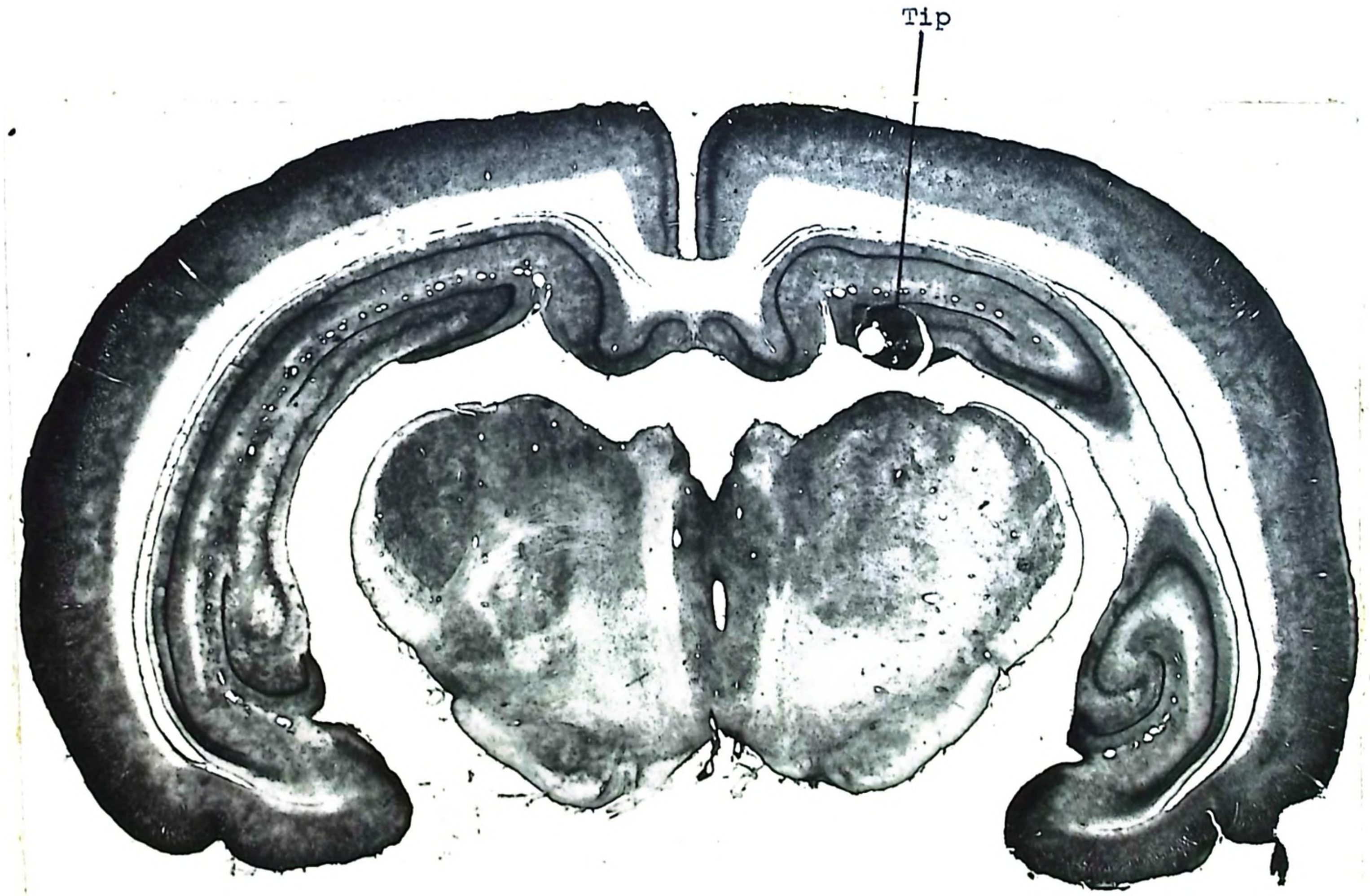

Figure 54. Coronal section with microelectrode tip. Rabbit 55, cell 6.