of supernatant or microsomes to the mitochondria-rich fraction did not increase the incorporation of acetate-1-C^{14} into fatty acids. These experiments do not show whether the acetate-C^{14} incorporation represents the synthesis of new fatty acids or the elongation of preexisting fatty acids.

These results are contrary to those that have been reported for subcellular fractions of the liver, where the clear supernatant is the most active fraction for the incorporation of acetate-C^{14} into long-chain fatty acids (*8*).

Addition of DL-α-glycerophosphate to lung subcellular fractions did not alter the amount of acetate incorporated into fatty acids under our experimental conditions.

The amount of acetate-1-C^{14} incorporated into fatty acids by the mitochondria-rich fraction of lung tissue is higher than the amount usually reported for the liver mitochondria. (The possibility that the magnitude of the incorporation in our preparation is due to some minor component other than mitochondria cannot be excluded.) The high capacity of the mitochondria-rich fraction for incorporating acetate-1-C^{14} into fatty acids is consistent with the finding that, after the injection of acetate-1-C^{14} in vivo, lung tissue contained more fatty acids labeled with carbon-14 than did liver tissue (*9*).

One of the functions of lung mitochondria may be to provide the fatty acids of pulmonary surfactants. The high rate of fatty acid synthesis might be correlated with the observed morphological transformations of lung mitochondria (*3*).

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Microvibrations in Man and Dolphin

Abstract. *Microvibrations were recorded from the dorsal body surface of a bottle-nosed dolphin* (Tursiops truncatus) *while it swam in water and while it lay on a foam rubber mattress in an air environment. Unlike poikilothermic water-living animals which do not manifest microvibrations, this homeothermic mammal has 13-cycle per second microvibrations similar to those of man and other homeotherms. For comparative purposes, microvibrations of 11 cycles per second were recorded from the arm of a man while lying on the same mattress. The nature and origin of these microvibrations is discussed in relation to physiological tremors and shivering.*

Fine, tremor-like vibrations, invisible to the human eye, which occur at all times over the entire body surface of warm-blooded animals, have been studied extensively by Rohracher (*1*). These have been referred to as microvibrations (*1*) and minor-tremor (*2*). In relaxed, awake humans the amplitude of the microvibrations ranges from 1 to 5 μ. During sleep their amplitude is greatly reduced, and during muscular activity it is enhanced. Interruption of the motor innervation to a given body part results in almost complete disappearance of microvibrations in that area (*2*). Because of these characteristics there has been a tendency to associate microvibrations with processes underlying muscle tonus. The frequency of microvibrations in humans ranges from 7 to 13 cy/sec, values which are comparable to those of fine, finger tremors (*3–5*), "physiological tremors" (*6*), the grosser tremors of shivering (*7, 8*), and to the alpha rhythm of the electroencephalogram (*4, 5*). However, the lack of an exact correspondence between finger tremors and alpha waves over the motor area of the brain led Jasper and Andrews (*5*) to conclude that they were not interdependent. Also it seems unlikely that there is any close correspondence between body microvibrations and alpha waves, since the latter vary in frequency and phase over different regions of the head.

Rohracher proposed that microvibrations may vary as a function of body temperature regulation in homeothermic organisms. In humans, changing the ambient temperature from 25°C to 4.5°C caused an increase in the frequency of microvibrations, but a decrease in amplitude. Studies of wide varieties of animals showed that microvibrations occur in all warm-blooded animals, but do not occur in poikilothermic animals (*1*). It was observed recently that the snake (*Python molurus*) can increase its temperature by muscular contraction, but these contractions are of sufficiently large amplitude to be visible and are quite slow, of the order of one per 2 seconds to one per 8 seconds (*9*).

To further clarify the problem of possible relations between microvibrations and temperature constancy in warm-blooded animals, it seemed relevant to determine whether mammals adapted to living in the water show microvibrations, and if so, how these change when the animals are active and inactive in the water and how they vary from a water environment to an air environment.

Microvibrations were studied on the body surface of a female, bottle-nosed dolphin (*Tursiops truncatus*), which weighed approximately 112 kg. Measurements of microvibration were made with a special piezo-electric transducer coupled to a Grass P5C preamplifier and a Brush inkwriting recorder. The overall frequency-response characteristics of this system were good from 1.5 to 100 cy/sec at one-half amplitude, a range amply broad for the purpose. The transducer had no resonance effect in the frequency range of the microvibrations recorded.

In a preliminary experiment the dolphin was removed from the water and placed on a stretcher. The vibration transducer was fixed with vaseline on different parts of the body surface. At all points tested, microvibrations appeared with a frequency of about 13 cy/sec and with considerably greater amplitude than that of the resting human under similar circumstances.

A few weeks later a more detailed study was attempted. The transducer was mounted in a water-proof container held in place by a suction cup. With this unit on the back of the dolphin, halfway between the blowhole and the dorsal fin, records were obtained with the dolphin moving slowly in water about 38 cm in depth. The dolphin was then removed briefly to an air environment, and records were obtained while it was lying moistened on thick layers of rubber foam. Subsequently, recordings were made from the right forearm of a human subject while lying on the rubber foam mattress.

Figure 1 shows sample records of

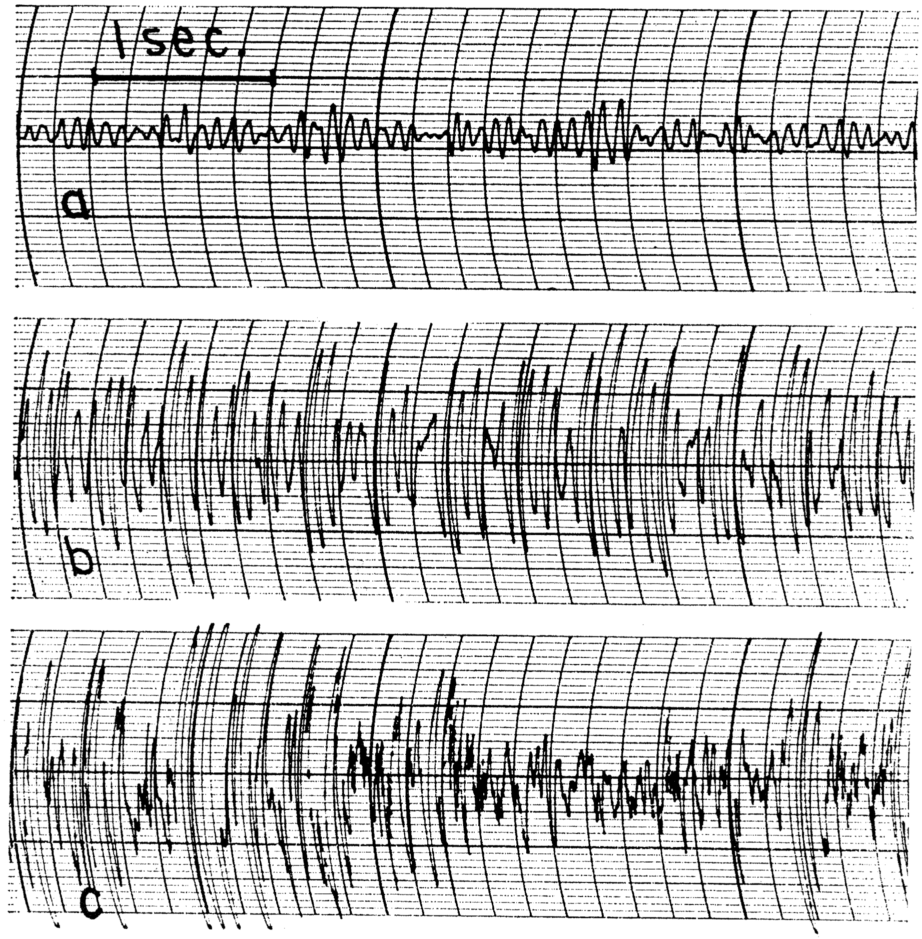

Fig. 1. Sample records of microvibrations recorded from forearm of human subject (*a*), and from a dolphin out of water (*b*) and swimming in water (*c*).

microvibrations from man and dolphin with equal amplification. Tracing *a* is from the human subject and shows microvibrations of about 11 cy/sec. Tracing *b* is from the dolphin while at rest in the air on the rubber foam mattress. The frequency of the microvibrations is relatively constant at 13 cy/sec. The amplitude of the dolphin microvibrations is 3 to 4 times greater than that of the microvibrations from the human forearm. There is also an underlying slow periodicity of about 2.5 per second which was correlated with the heart beat, simultaneously recorded electrocardiographically. Tracing *c* shows microvibrations obtained when the dolphin was moving slowly in shallow water. During underwater swimming the record is more variable in amplitude and less rhythmic than when the dolphin is lying out of water, but the same fundamental frequency of about 13 cy/sec seems to persist. The variations in frequency and amplitude may be due to muscular activity of swimming. The underlying slow periodicity, associated with the heartbeat in tracing *b*, is not readily apparent in *c*.

Mammals living in a heat-absorbing water environment need very effective mechanisms to maintain their temperature constancy. The blubber and the vascular system supplying the fins in whales and dolphins are specially adapted for heat conservation (*10*). However, when a dolphin was kept restrained in water at 11°C, it has been observed to shiver noticeably (*11*). Besides gross muscular contractions during movements, and smaller ones during shivering, microvibrations might reflect a very small continuously present muscular activity participating in thermoregulation. The fact that dolphin microvibrations both in and out of water are higher in amplitude and frequency than those of man might point to a special effectiveness of this mechanism, helping to adapt these warm-blooded animals to their water environment.

Shivering is believed to be a natural amplification of the continuously present physiological tremor (*12*). But fine adjustments of thermoregulation are believed to be controlled through frequency changes in microvibration (*1*). The neural regulation of, and the relationship between, microvibrations, physiological tremor, and shivering have been extensively discussed (*8*).

Finger tremors, though coarser than microvibrations, have essentially the same frequency range (*3, 4, 12*). It has been reported that a motor response tends to occur at a particular phase of the finger tremor (*4*). This might suggest that rhythmic excitability cycles are also operating at the level of the spinal motor neuron pool. Bioelectric recordings in long-term cultures of human spinal cord tissues from 6-week embryos have revealed spontaneous waves at 5 per second, indicating that such tissues have rhythmic properties (*13*). It might be suggested that an intrinsic spinal mechanism also plays a role in the regulation of microvibrations. It has been proposed that single motor-unit contractions cause microvibrations (*1*). Such units begin to respond in the weakest muscular contractions at rates of 5 to 10 per second and have been observed to fire in relation to fine finger tremors (*14*). Possibly there exists a tendency for individual units to fire in certain phases of the proposed excitability cycle. The few units active would presumably be the ones with the lowest thresholds, which are normally found in deeper locations (*15*). As more units become involved, a gradation of movement could account for the coarser finger tremor and finally vigorous shivering.

Supraspinal, pyramidal, and extrapyramidal mechanisms of tonic discharge and postural control, must be considered along with local spinal stretch-reflex loops, as potential causes of microvibrations and physiological tremors, through their modulating influences upon spinal motor outflow. Descending influences from brain regions which play a part in the temperature control of the organism may impinge upon the intrinsic spinal mechanisms and cause changes in the frequency as well as the amplitude of the microvibrations participating in the process of fine homeothermic regulation. During the emergency state of shivering a gross visible tremor may result in enhancement of the activity of the spinal mechanism responsible for the fine tremors and microvibrations.

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Visiting in Perodicticus

Abstract. *Three* Perodicticus potto *have been observed in captivity for about 1 year. The social custom of visiting was established when one isolated himself from the others by living in a hollow tree trunk. The existence of such very marked social ceremonial in the Lorisoidea is of considerable evolutionary interest.*

Certain behavior patterns have been observed among three *Perodicticus potto*, kept in captivity for a period of roughly 4 years, that are so consistent they give the impression of being characteristic; hence it would be interesting if similar patterns were noticed under field conditions. These observations were made during the past year.

The pottos are maintained in a walk-in wire cage, 3.5 by 1.2 meters, 2 meters high. The floor of the cage is covered with cedar chips and sawdust. There are wooden (pine) shelves around the middle portions of the walls, and rafters for climbing are affixed to the ceiling. The cage also contains a large hollow red maple trunk, roughly 45 cm in diameter, open at both ends with a shelf and a small window built in the middle. Above the shelf, a 4-cm dowel transects the area. The bottom of the trunk, beneath the shelf, is covered with cedar chips and sawdust.

The pottos are fed nightly a diet of bananas, a protein meal (consisting of high protein pablum, methiscol, and meritene mixed with water) and water. The diet is frequently varied by the occasional additions of a variety of insects, baby mice, peanuts, persimmons, papaya juice and solids, oranges, apples, apricots, and grapes. An attempt is made to keep the environment emotionally peaceful.

The shelves of the cage are scrubbed daily with soap and water and the sawdust and chips on the floor are replaced monthly and cleaned daily. The animals appear to be in excellent condition and, with the exception of respiratory infections apparent on arrival, no disease has been prevalent.

Initially there were four animals, two males and two females. One female died as a result of pregnancy initiated elsewhere. As a consequence of her death, her male, the "beta" of the two males, decided to seclude himself on the dowel in the trunk of the tree. He came out of his "jail" (he is called M. Genet) only in the late hours of the night to eat. Initially, this determined isolation of his choice made him rather thin and as a result a shelf was placed in the trunk so that he could be fed without his having to leave his house. Once fed, he was not inclined to leave his "jail." When this pattern of behavior had been established the other male initiated a stable relationship by visiting him in his house. The pottos get an "apéritif" around five in the afternoon consisting of a half a banana each. The "alpha" male eats his banana, takes a walk, and visits the *P. potto* in the trunk, situating himself in such a way on the dowel that the two animals are face to face (Fig. 1). Sometimes the lone female also consents to visit and places herself on the shelf below. This situation persists for about 2 hours at which point the two visitors leave the trunk to eat, play, and sleep again—M. Genet remaining alone in the trunk. It occurs now practically every day.

It is interesting that the alpha male initiates the visiting. When the four animals first arrived, they were shipped in boxes, two in a box with a partition separating them and doors on either end. The screws were removed and the four doors were opened simultaneously. The alpha male potto immediately came out of his box and examined the entire cage. The other three animals remained in their sections and did not leave until after the alpha potto had visited each one when he had finished investigating.

The occurrence of such clearly marked social behavior in the Lorisoidea may be of some evolutionary significance. It would be interesting to know whether comparable behavior in these arboreal and nocturnal animals occurs

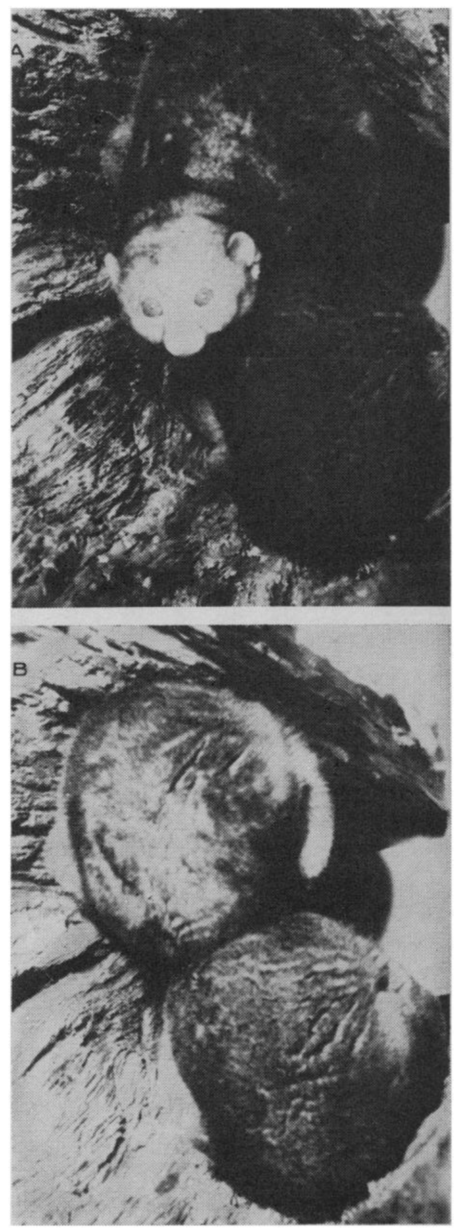

Fig. 1. (*A* and *B*) Male pottos in the tree trunk.