

Muscle stretch receptor

1972

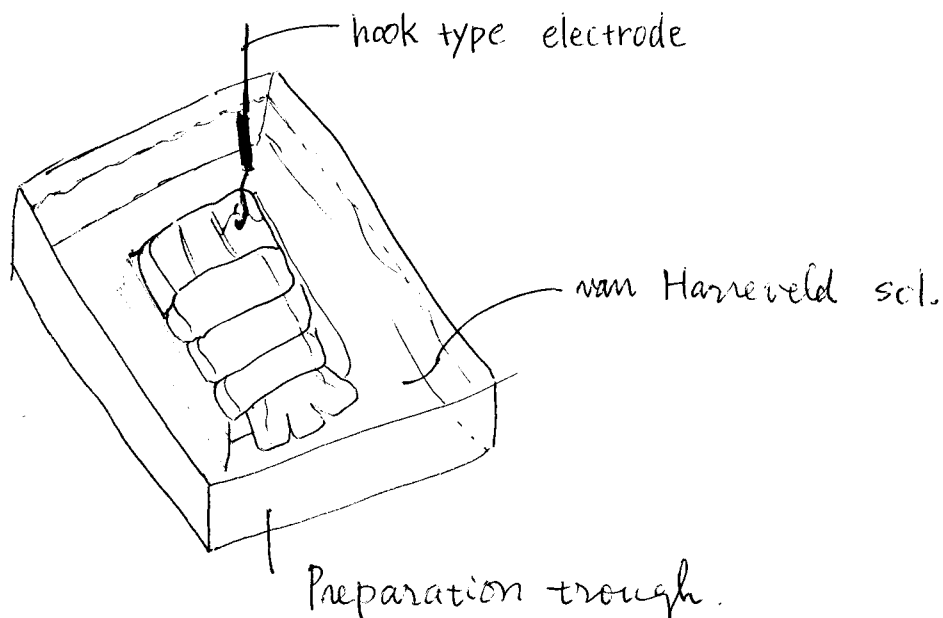
EXPERIMENT I/ PROPRIOCEPTORS (MUSCLE STRETCH RECEPTORS)

PURPOSE: It is purpose to see how the abdominal stretch receptor of the crayfish is constructed, and to demonstrate the afferent nerve impulses it generates.

APPARATUS: Cathode ray oscilloscope, Amplifier for biological potential, Electrode assembly, Preparation trough,

PROCEDURE:

1. Separate the abdominal segments from the cephalothorax by simply cutting off.
2. Opened up the tergal plate with extreme care and make a window with a pair of scissors.
3. With a light beam falling obliquely, search for the fine strands of the receptors, RM_1 and RM_2 , and their innervations.
4. Connect a hook type electrode to the input of the biological amplifier, together with the indifferent electrode.



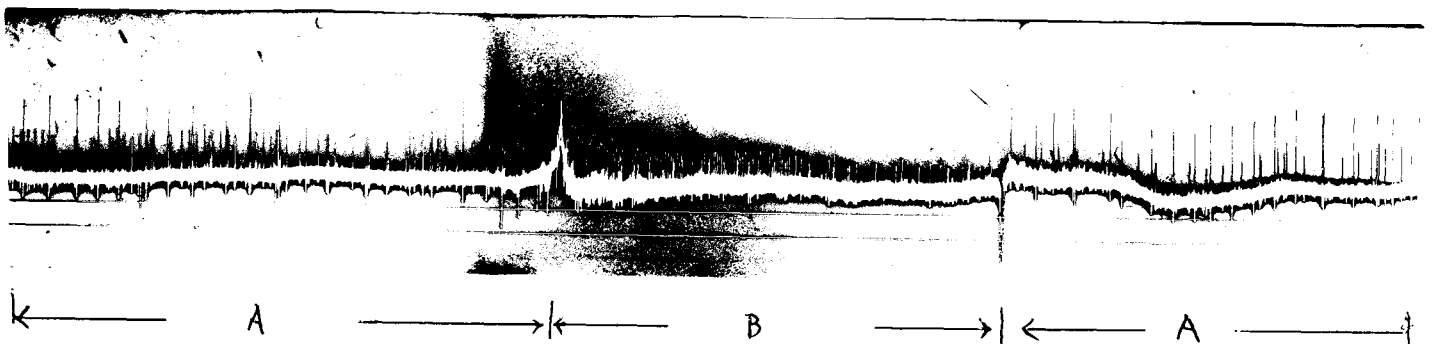
EXPERIMENT:

1. We bended and stretched the abdomen of the intact crayfish.
2. Abdominal segments is extending and fixed in the preparation trough.
Lifting up the nerve with the hook electrode into the air, we try to record the wax and wane of the afferent impulses, when abdominal segments is extending and suppressed by a glass rod.
3. A sketch of the structure of the stretch receptors.

RESULTS:

1. When the abdomen of the intact crayfish is forced to bend or stretch, it will tend to regain the original position as soon as the force is removed.

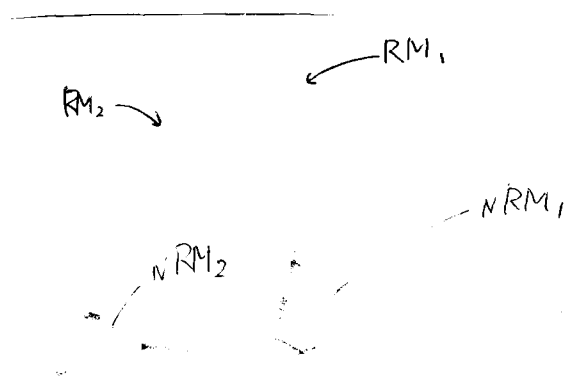
2.



A: When abdominal segments is extending.

B: When abdominal segments is suppressed by a glass rod.

3.



COMMENTS:

Results 1 is called resistance reflex, and is known to be actuated by the mediation of the slow adapting one of these two stretch receptors, namely RM_1 . When the abdomen is bent, the RM_1 will produce a burst of impulses and in turn, activate the unshared motor neurone existing neurone in the abdominal ganglion. The efferent impulses of this neurone will then activate the superficial slow extensors muscles of the same segment, and bring back the segment in the original position unless the new setting point is commanded from the higher center. The setting of the abdominal position is mediated by the shared motor neurone which activates the slow superficial extensors as well as the muscle fiber of the RM itself.

The resistance reflex is probably one of the rather well known example of the feedback control system of the animal posture.

Results 2; It means that stretch receptors are activated during A by extending the abdominal segments, and the activity of RMs are suppressed during B by the inhibitory impulses.

The inhibitory nerves supplying RMs works when the whole segments are rather violently brought into the flipping by activation of the giant fiber system.

EXPERIMENT II

PROPIOCEPTORS
(MUSCLE SPINDLE, FROG)

PURPOSE: It tries to see how the muscle spindle receptor of the frog is constructed, and to demonstrate the afferent nerve impulses it generates

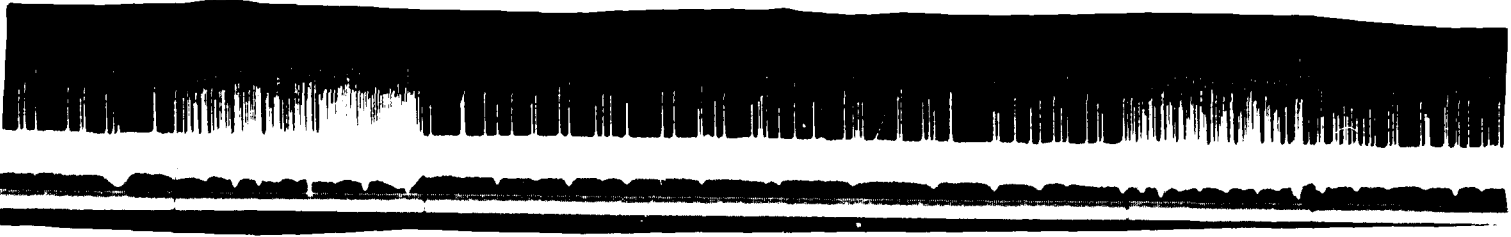
APPARATUS: Cathode ray oscilloscope, Amplifier for biological potential, electrode assembly, Frog Ringer's solution, Preparation trough (a glass plate), A glass rod of blunt end.

PROCEDURE:

1. Pith the frog, and skin the hind legs.
2. Proceed then to free the sartorius muscle together with the main sciatic nerve.
At least a centimeter of nerve is needed.
3. Observe the muscle spindle under the microscope.
4. Lifting up the nerve with the hook electrode into the air, lightly press the muscle with a blunt end of a glass rod.

RESULTS:

the recording of the impulses;



: the muscle is pressed with a blunt end of the glass rod.

COMMENTS: When the frog leg is stretched by an external force, the spindle discharges with more frequentcy than rest. The spindle discharges impulses when it is rest. It is called spontaneous activity.

In this figure, the record of impulses are different length. This is why a few of muscle spindle is existing.

When the frog leg is constracted by an external force, the spindles will discharge with less frequency than rest.

IN animal, two kinds of nerve is existing. One of ~~thess~~ is motor nerve the other is sensory nerve.

Sensory organs are exteroceptor and proprioceptor. It is important in animal to control the posture as well as to feel an external stimulus.

The structure of proprioceptor is different in the various animals. Proprioceptor of the frog is a muscle spindle, and proprioceptor of the crayfish is chordotonal receptor.