Neurogenic heart

- **As mentioned earlier the neurogenic heart are normally present in invertebrates with open circulatory system.**
- **The hearts are either sac like or tubular with lateral ostia.**
- **This heart when relaxed produce vaccum due to which the haemolymphy is sucked in and then pumped. Hence these hearts are known as suction pump.**
- **Ex. Heart of Daphnia .**

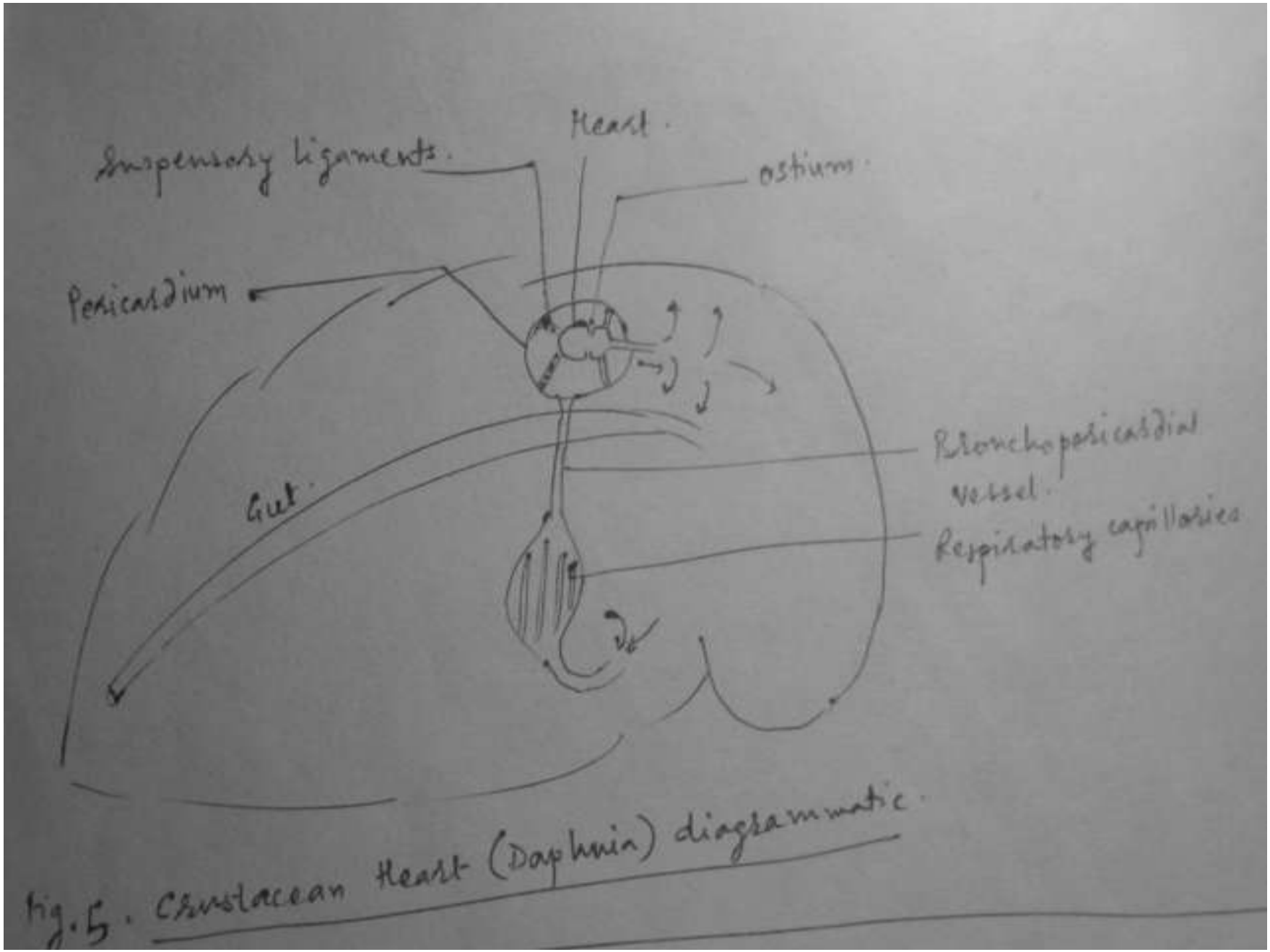


Fig. 5. Crustacean Heart (Daphnia) diagrammatic.

- **In neurogenic heart there are nerve fibres innervating in heart.**
- **They fire electrical impulses causing rhythmic beating of heart.**
- **The nerve cells innervating the heart come together to form a ganglion near the heart known as cardiac or heart ganglion.**
- **The ganglion may be one or more.**
- **1st ganglion studied was by Thomson 1904 in Limulus which has series of ganglia on dorsal side of heart.**

- **Carlson proved that**
- **If heart ganglia are damaged heart beat stop**
- **If temperature of ganglia is changed it alters the rate of heart beat**
- **If the nerves from CNS to ganglia are stimulated by chemcial, electrical or temperature impulses.**
- **Thus it proves that the cardiac ganglia is under control of CNS**

The CNS sends excitatory and inhibitory neurons to cardiac ganglion. The system is represented below diagrammatically.

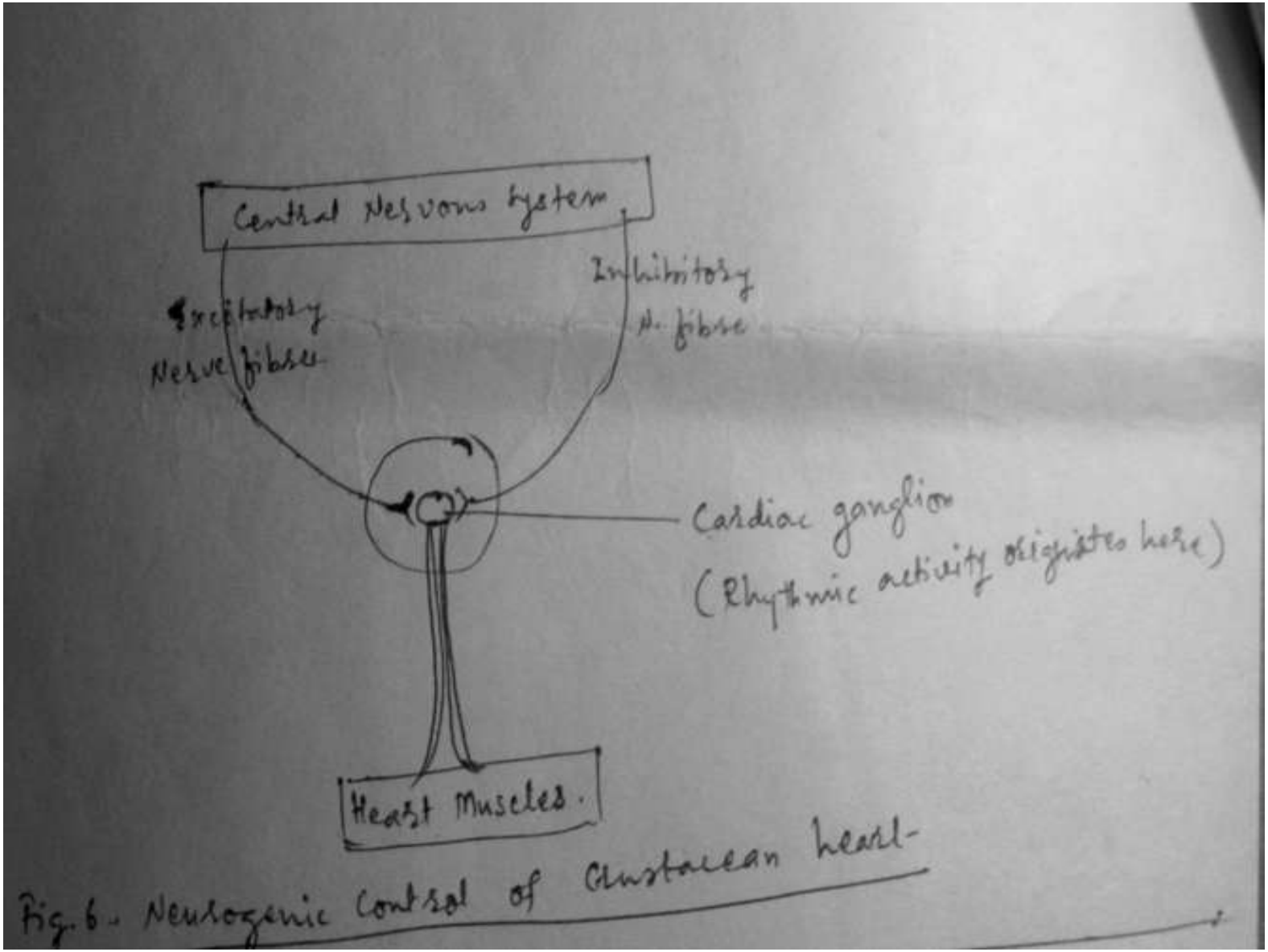
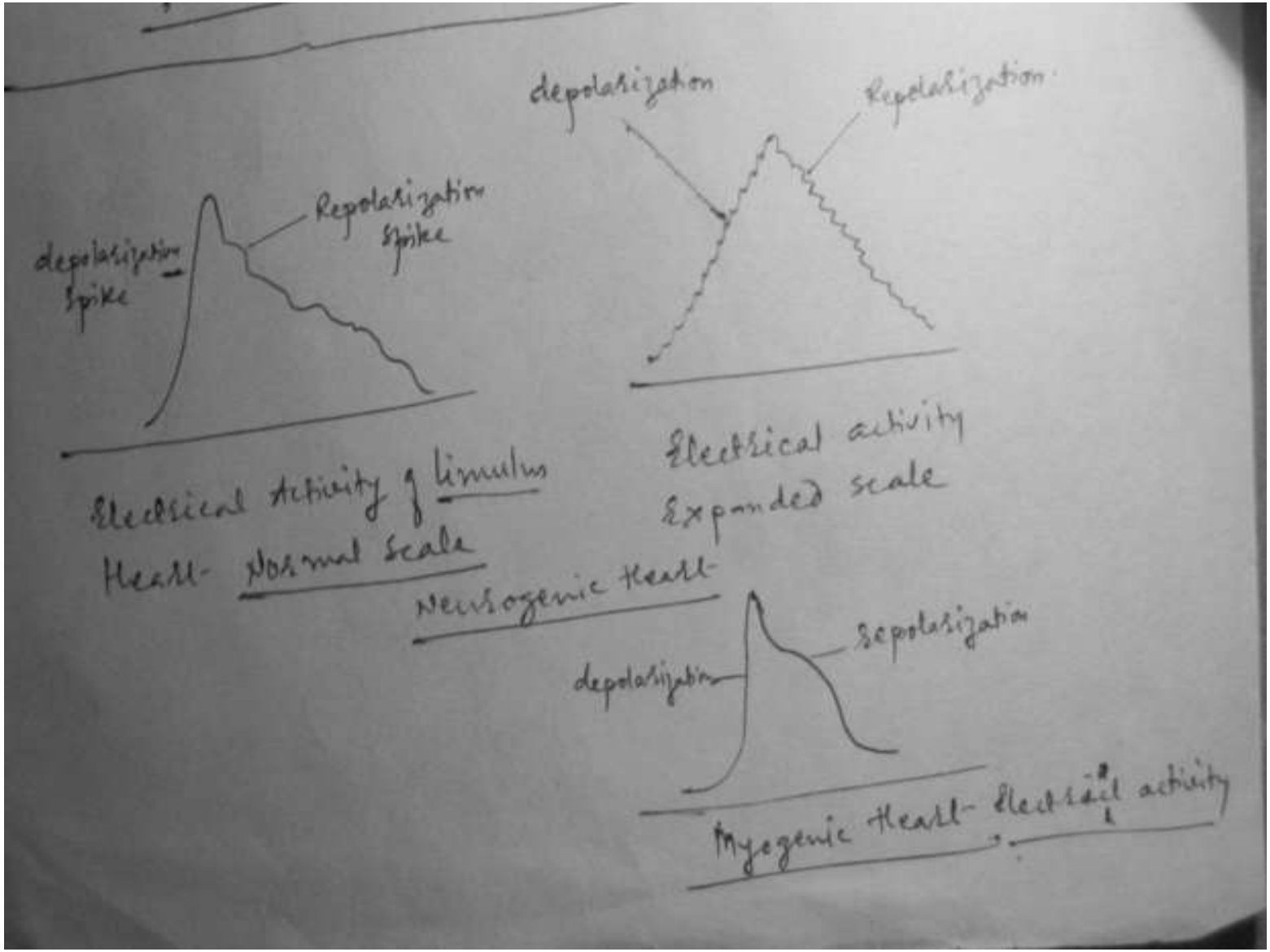


Fig. 6. Neurogenic control of Crustacean heart.

- **Lobster cardiac ganglion has 9 cells.**
- **Squilla cardiac ganglion has 16 cells.**
- **In some organisms heart muscles are innervated by neurons from own segment ganglion**
- **In others there is additional innervation from the distant segment ganglion. Such organisms have more than one cardiac ganglion.**

- **The transmitter substances in neuron vary greatly. It has been found that glutamate stimulates GABA inhibits.**
- **Acetylcholine excites crustacean heart but very high concentration is required.**
- **In neurogenic heart also the contraction and relaxation is by change in electrical potential.**
- **Depolarisation causes contraction and repolarisation causes relaxation.**

The ECG recording shows the graph as below



- **As shown the depolarisation spike looks smooth in short time scale.**
- **Whereas when it is observed in expanded time scale it looks as if made up of many small depolarisation spikes.**
- **This is because depolarisation is casued by many small depolarisation impulses sent by pacemaker neurons.**