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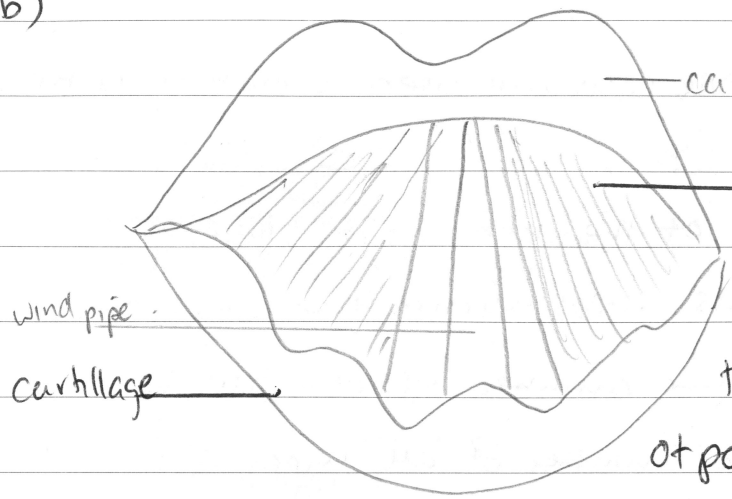
Structures used in organisms to detect vibrations

a)

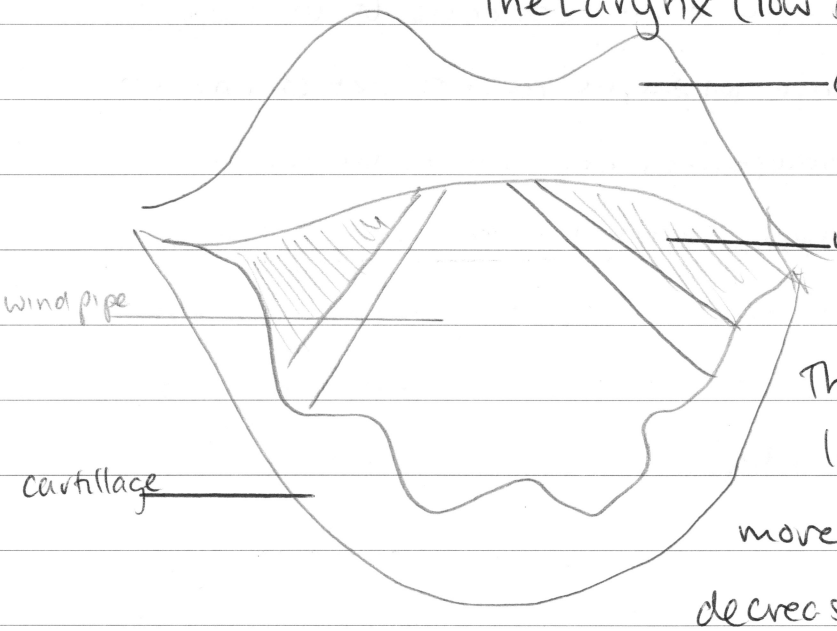
Structure name	How it detects vibration	Organism using it
Tympanum (they also use: Jonathan's organ)	A small membrane placed on the leg of the insect is pulled tight and responds to vibrations in the surrounding air. This then sends an electrochemical message to the brain where the vibrations are interpreted as sound	Insects (grasshopper)
Otolith (also use swim bladders and lateral lines)	A hard, dense piece of bone in the fish which, unlike the rest of the fish does not move in response to vibrations and pressure changes in the surrounding water. The difference in movement is interpreted as sound	Fish
Ears (cochlea, ossicles, tympanic membrane)	Amplify sound and convert it into kinetic energy which is converted into electrochemical energy in the cochlea and sent as a message to the brain and interpreted as sound.	Mammals

b) The Larynx. (High Pitch)



(High Pitched note)
Membrane is pulled tight to minimise/restrict movement of passing air, this increases frequency and pitch. There are little to no folds, creating a taught membrane and a higher pitched note

The Larynx (low pitched)



The membrane is more loose and can move more, causing larger fibrations decreasing frequency and pitch of the note. The membrane is less rigid and has more folds allowing greater movement and thus creating a lower pitched note. (The membrane is relaxed).

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ci) Cone cells.

ii) Three different types of cone cells are used to detect light (Red, blue and green). Therefore, for the detection of colour, different areas of the retina have different structures of cone cells. Areas needing to detect more red light have a higher number of cone cells, whilst the fovea has a large number of all types of cone cells for visual acuity.

iii) Rhodopsin is the pigment in rod cells. It is used to detect the presence of light and to detect intensity of light. When rhodopsin is exposed to light, the pigment is bleached, causing a message to be sent to the brain. In this way, the bleaching of the pigment on exposure to light is how the rod cells detect light intensity.

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di) There could be a lack of action potentials in ~~area~~ region X due to a severe injury to the back of the head which could lead to haemoraging and cell death, this would then involve the death of ~~the~~ neurones in that area of the brain, causing a lack of action potentials. There could also be an injury to the optic nerve or auditory which sends messages to that area of the brain, this would mean that no action potentials would be sent to region X of the brain and subsequently no action potentials would occur ~~s~~ in region X.

ii) This condition could involve the loss of sight in the mammal which would cause the animal to not be able to respond to its environment. This could lead to irratic behaviour and a reduction in movement due to loss of senses (a more cautious behaviour) This would in turn lead to acute other senses or possibly death, depending to what degree the mammal relied upon their sense of sight. In mammals, loss of sight can also lead to aggression.

e) The understanding of depth perception has led to the ability to produce 3D movies. This is due to the understanding of how the two eyes detect different images and how the brain judges the difference between the two images to gauge depth. It also uses the knowledge that the brain combines the two separate images to form a single 3 dimensional image in order to create 3D films. This is why 3D glasses are worn, so each eye is sent a different image which the brain then processes as 3 dimensional.

Surround sound systems use the concept of sound shadows and how our ears percieve sound to place the audience in the centre of the auditory film. This is due to the fact that our pinna and our head channel sound into our ears, allowing the ear to detect the direction from which the sound originated. It is also detected through the movement of the head which further allows the detection of direction of sound through the changing of the sound shadow. The sound shadow is mainly created through the pinna which funnels sound into our ear, the relative volume (amplitude) of sounds entering the ear canal acts to determine to which degree the sound was channeled and thus from whence it came.

The understanding of how sights and sounds are received and transmitted also plays a large role in the development of audio and visual technologies. This is due to the effect of the structure of the eye and ear on

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light and sound. The basic structure of the eyes and ears play a role in the primitive development of lights and sounds. This is due to the responses of rods and cones in the eye and how different pitches are translated and percieved in the cochlea. Most importantly and with the biggest impact is the understanding of how we interpret the lights and sounds that we are exposed to. The importance of the brain; in depth perception and in determining the direction of sound, the interpretation of the signal sent to our eyes and ears is the main understanding that led to the development of 3D movies and surround sound.

You may ask for an extra Writing Booklet if you need more space.