EAR, HEARING AND HEARING LOSS: WHAT PEOPLE MUST KNOW

Reg. No 8412

An independent project work submitted in part fulfilment for First year M. Sc, (Speech and Hearing) to the University of Mysore

All India Institute Of Speech and Hearing
MYSORE-570 006

TO ALL PEOPLE FOR WHOM
IT IS INTENDED

CERTIFICATE

This is to certify that the Independent Project entitled "EAR, HEARING AND HEARING LOSS: WHAT PEOPLE MUST KNOW" is the bonafide work done in part fulfilment for First Year M.Sc, (Speech & Hearing) of the student with Register No. 8412

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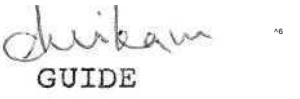
Mysore - 570 006.

CERTIFICATE

This is to certify that the Independent Project entitled "EAR, HEARING AND HEARING LOSS: WHAT PEOPLE MUST KNOW" has been prepared under my supervision and guidance.



GUIDE

ACKNOWLEDGEMENTS

I thank Dr.(Miss) Shailaja Nikam, Professor and Head, Department of Audiology, All India Institute of Speech and Hearing, Mysore for her guidance and help.

I also thank Dr.M.Nitya Seelan, Director, All India Institute of Speech and Hearing, Mysore.

My sincere thanks to Ms.Malini, Ms.Asha Ethiraj, Ms.Rangamani and Ms.Geetha Mukundan.

To my friends - Sheela, Padmaja, Shampa, Kusum, Sumathi, who spent all their free time and helped me and also Rajanikanth, Usha, Kamalini, Vanaja, Geeta and Ragini the least I can say is: TY.

To S.Prakash, and Giri - I don't need to say 'Thank You' for their immense help and most important moral support. I know they'll understand.

I extend my thanks to all the others who helped me.

I thank Ms.Rajalakshmi R Gopal and Ms. Parimala for the typing work.

C O N T E N T S

HE! HE! Come and join in a free tour-
a tour of the "E"!

There is more to the "E" than what meets the 

The journey is worthwhile, since prevention of damages and thus preserving hearing is the important destination.

So here we 

Down the ages

There is neither an external auditory canal nor a pinna in these animals. Tympanic cavity of the frong is quite close to the surface of head; and so tympanic membrane lies exposed.

These animals have a short external auditory canal.

Some birds, like owls, possess folds of skin which with tufts of feathers found in some, may perform a function similar to that of pinna of Mammals. The short, stiff, bristle-like feathers which surround the ear canal in Emu, Ostrich, and Turkey appear to be a functional hemologue of the protective hairs of the human pinna and ear canal.

These animals can shut off the external auditory canal, thus a water tight closure of canal is obtained. This prevents the canal and drumskin from becoming wet and possibly infected. Also, sudden exposure of inner parts of the ear, especially vestibular part of the labyrinth, to low temperatures is prevented. If this were not so, undesirable conditions such as vertigo and labyrinthine reflexes of the eye would result at a moment when they would be least desirable (when diving after a prey or escaping).

These animals have a more or less well developed pinna.

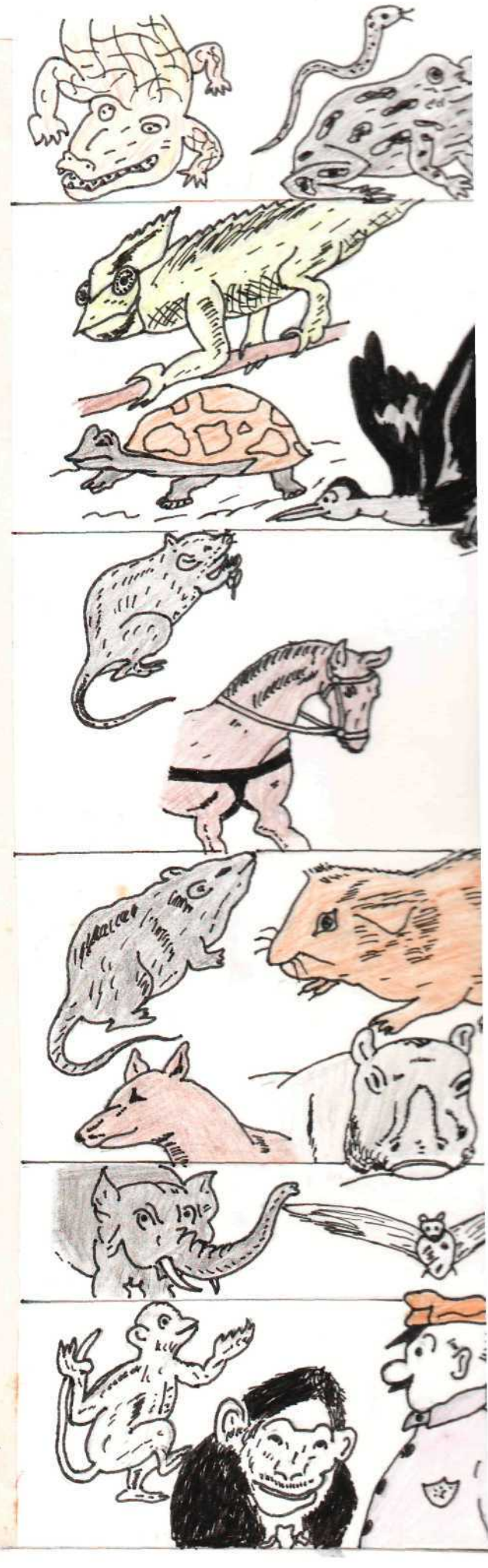
But those animals that have a burrowing habit, or spend their lives in dense vegetation have small external ear, so also acquatic mammals.

Inhabitants of open prairies, steppes and desert regions have large ears in proportion to the size of their bodies.

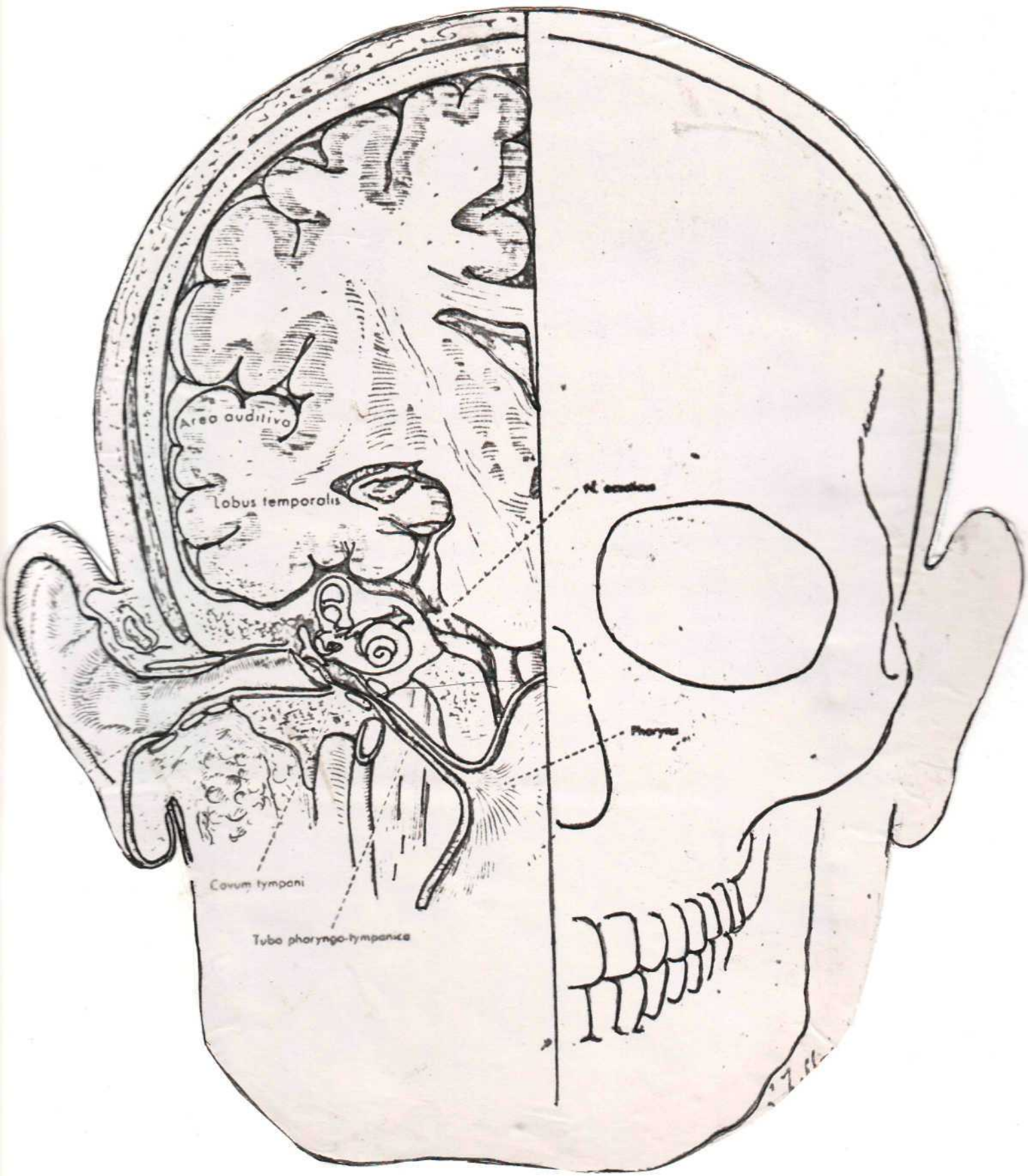
Elephants have the largest pinna of all Mammals.

But some bats have the largest pinnae of all living creatures in proportion to the size of their bodies. Hearing is the dominant sense in them, at the expense of smell and vision,

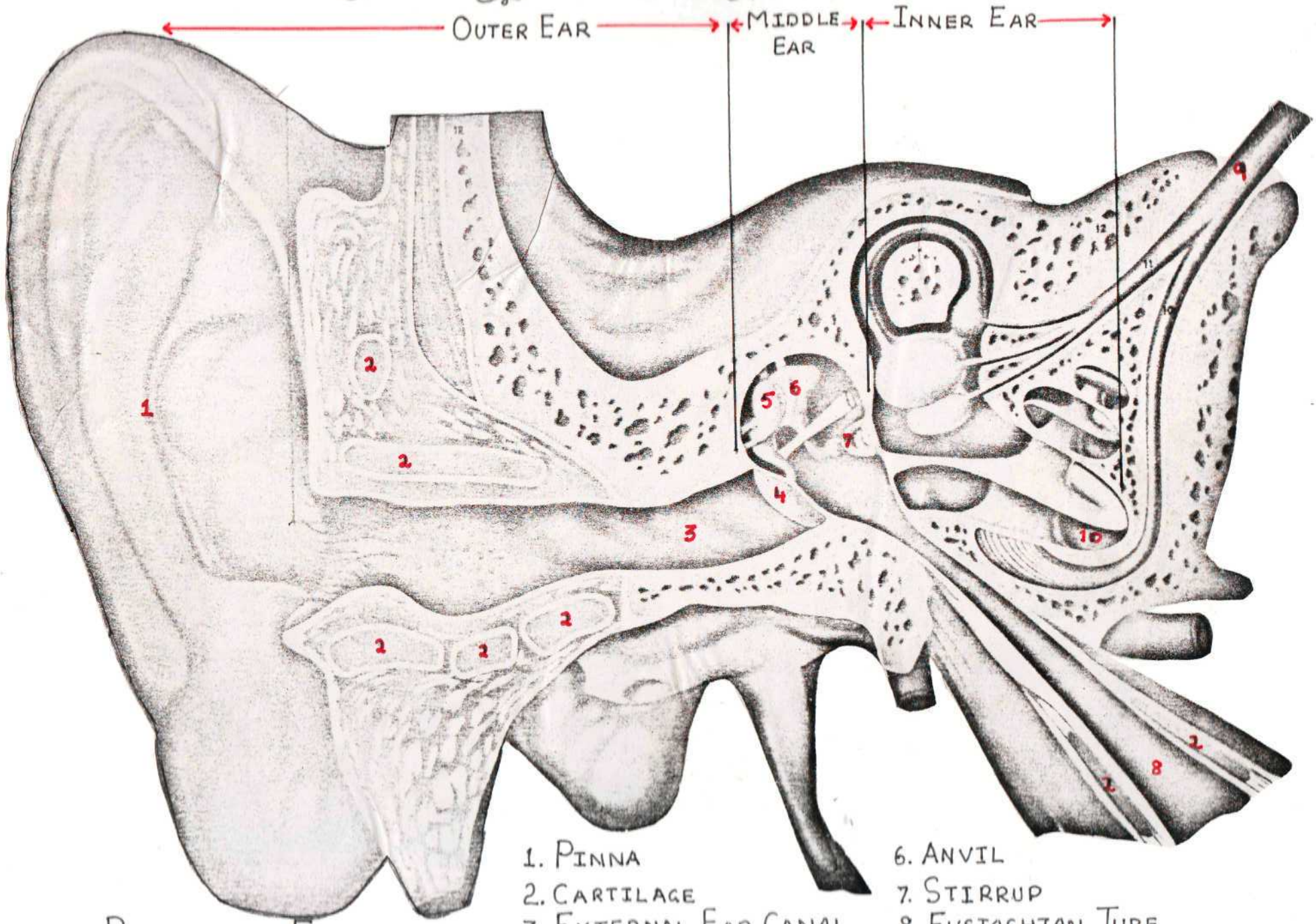
Primates and Man:- In the lowest living - ~~x~~ lemurs - the pinna resembles those of many infraprimate mammals in size and shape. In some lemurs and primitive monkeys, its size is reduced. The size of the penna is further reduced gradually in higher primates and in man ultimately. In addition, restriction of the mobility of the pinna is increased in them.



The Ear And Its Neighbours



The Human Ear

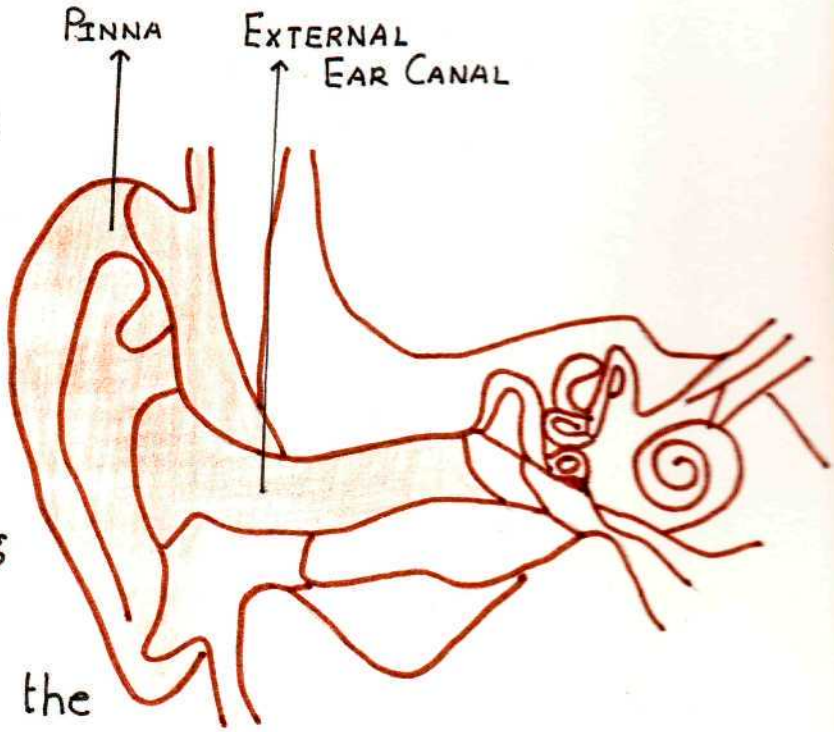


Parts of the Ear:

1. Pinna
2. Cartilage
3. External Ear Canal
4. Ear Drum
5. Hammer
6. Anvil
7. Stirrup
8. Eustachian Tube
9. Auditory Nerve
10. Cochlea

THE OUTER EAR

The outer ear has two parts: the pinna and the external ear canal. The pinn is the visible part of the ear. It helps in (i) collection of sound, (ii) directing it into the ear canl, and (iii) locating the source of the sound.

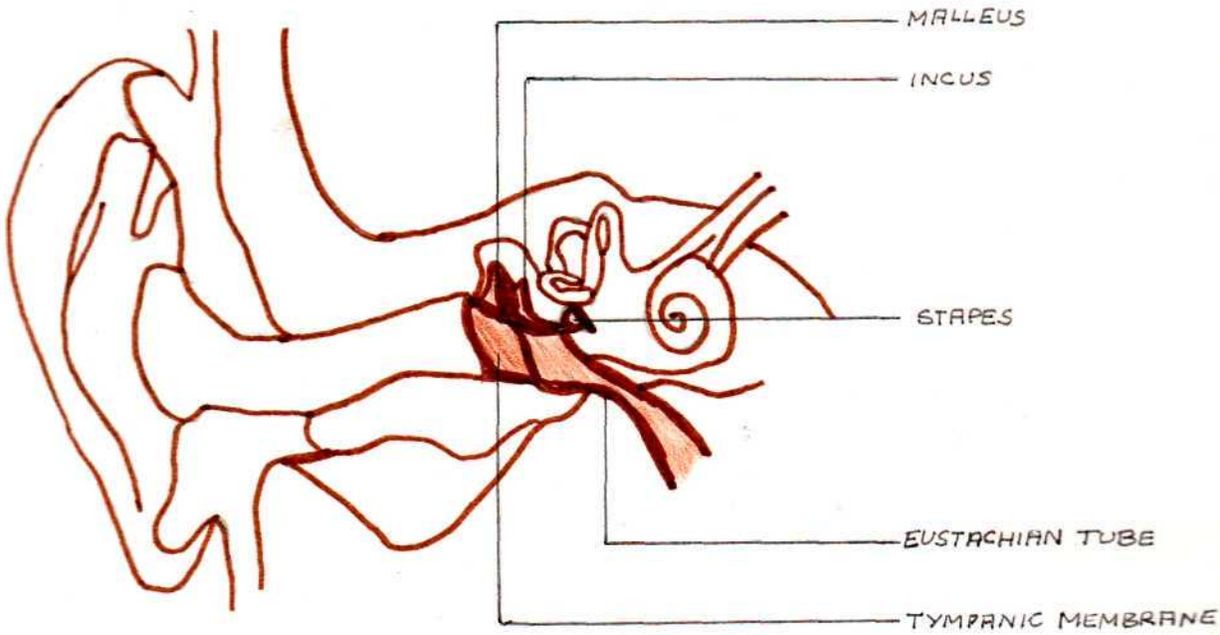


The ear canal is about an inch length. It begins at the opening at is visible in the ear, and is osed at the other end by the rdrum, thus forming a tube. These atures of the canal- the length and e shape - make it useful for boosting nds that are important for speech.

The skin of the outer portion of the r canal secretes a dark, bitter-tasting substance [wax or cerumen] which nds off insects and traps dust or other foreing particles.

Sometimes, the ear wax may harden and block the ear canal. The nal may also be blocked by insects, or, foreign bodies - beads, pieces chalk, buttons, etc. put into the ear may rupture the eardrum. These oblems may hinder the sound reaching the middle ear, resting in a aring loss.

The Middle Ear

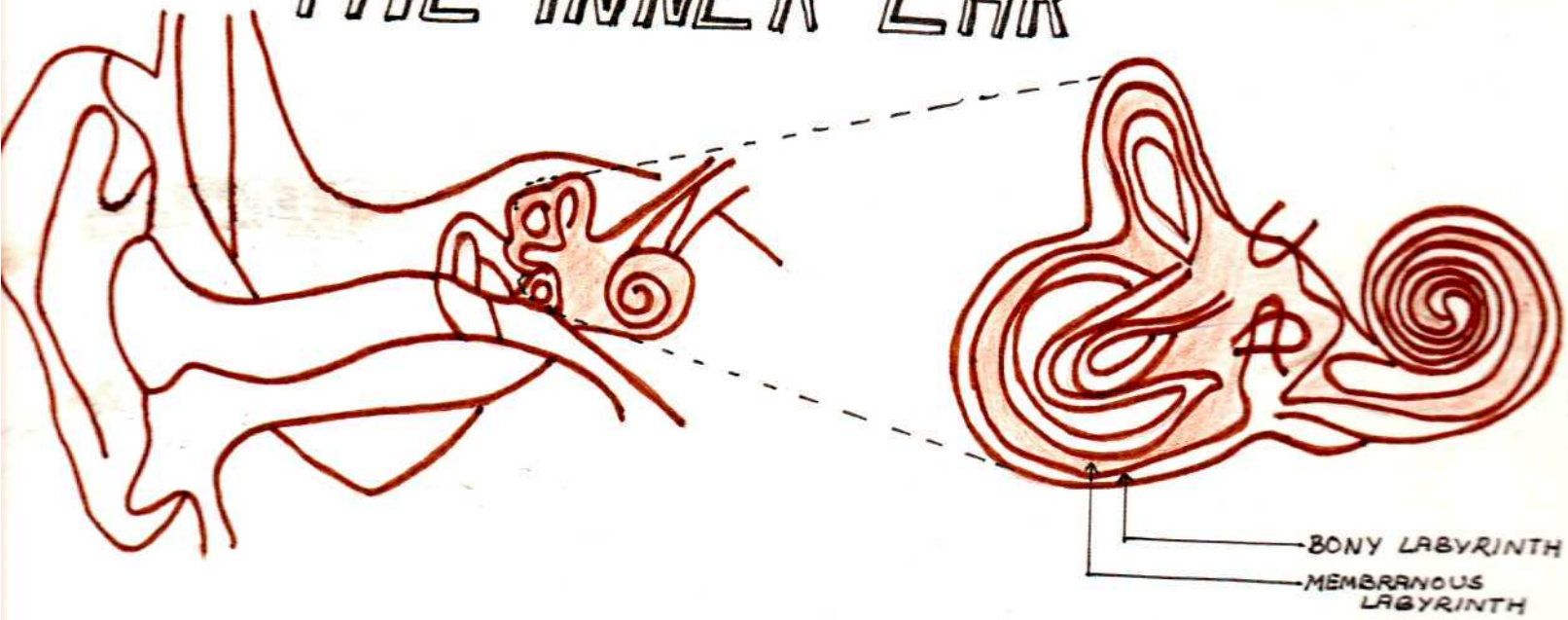


The middle ear is an air-filled cavity. The ear drum forms one of its walls. It has a chain of the three smallest bones of the body - the hammer (or malleus), the anvil (or incus) and the stirrup (or stapes). This chain called the ossicular chain; the bones are held in places by a few ligaments. They are controlled by two muscles which also protect the inner ear from loud sounds.

The eardrum and the three bones of the middle ear help in t transmission of sound to the inner ear. If this transmission is affected hearing loss can result.

The Eustachian tube connects the middle ear with the oral cavity. It helps equalize pressure of the middle ear with atmospheric pressure. It is through this tube that infections from the nose can most commonly spread to the middle ear. In children, the tube is shorter and wider, and is more horizontally placed than in adults. ther infants and young children are more prone to infections which can lead to hearing loss.

THE INNER EAR

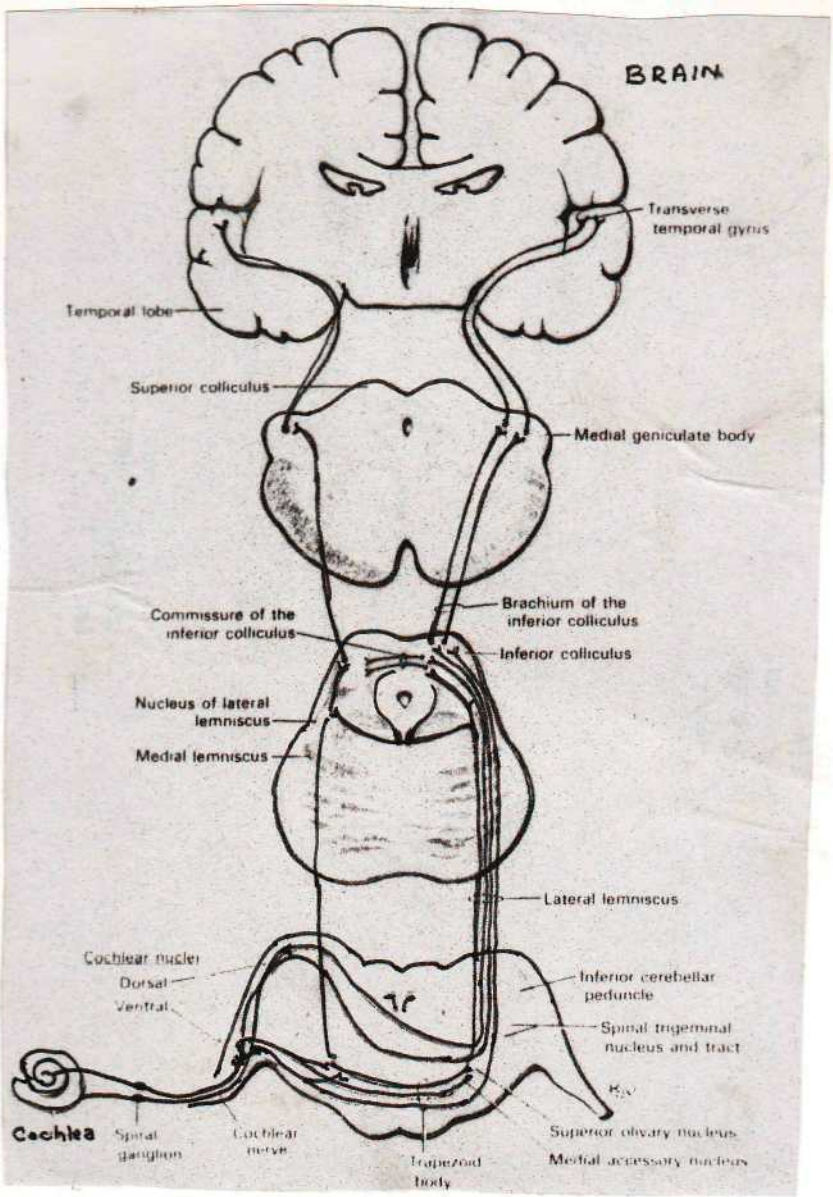


The inner ear is called the 'labyrinth' – a structure of winding passages. It has two parts. the bony and the membranous. The space between the bony and the membranous parts is filled with a fluid called perilymph. The membranous part is filled with a fluid called endolymph. The inner ear houses the organ of balance and the organ of hearing. The organ of balance is constituted by the vestibule and three semicircular canals. The organ of hearing is snail-shaped and is called the cochlea. The close positioning of these two organs explains why some people have problems of hearing as well as balance [hearing loss and giddiness or vertigo]

The organ of hearing includes the basilar membrane which is present in the membranous part. The endolymph supplies oxygen to the cochlea. The inner ear is supplied by blood vessels and nerve fibres.

The stapes rests on an opening in the vestibule called oval window. Below this is the round window. Approximately 16,000 sensory cells populate the inner ear, and are called hair cells, since they resemble hairs. Movement of the hair cells sets up electrical signals that are called to the brain by the auditory nerve, which has nearlly 1,000 nerve fibres.

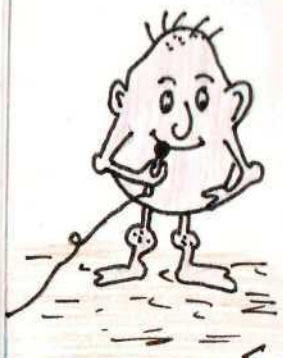
THE EAR AND THE BRAIN



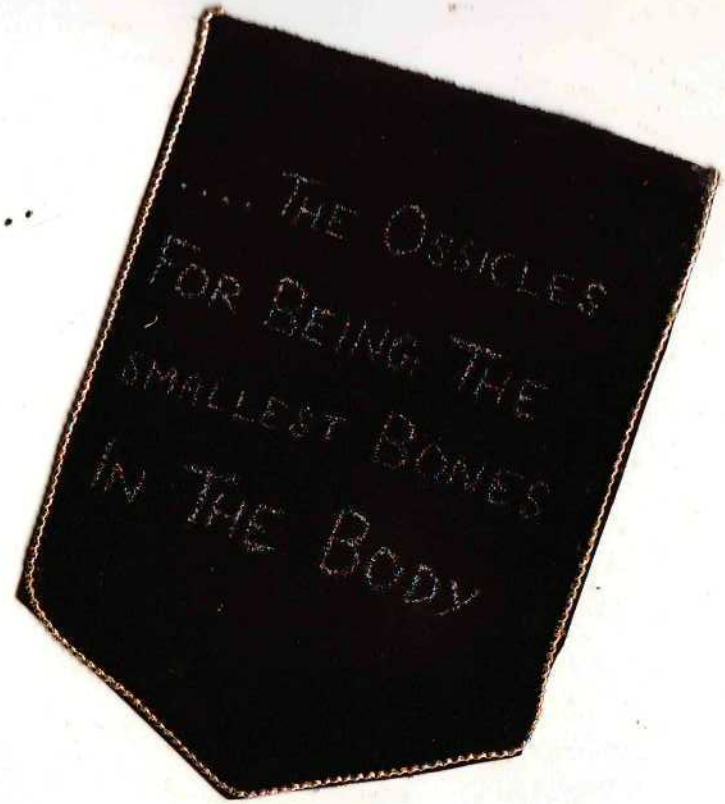
The path between the ear (cochlea) and the brain is a two-way traffic with many way stations. The fibres of the auditory nerve pass through these stations to the hearing centres of the, where the signal is analyzed and intereted as sound. The sound heard would depend to a certain extent on past experience.

DID YOU KNOW?

THE EAR AND ITS STRUCTURES HOLD THESE RECORDS TO THEIR CREDIT



FIRST PRIZE AWARDED TO...



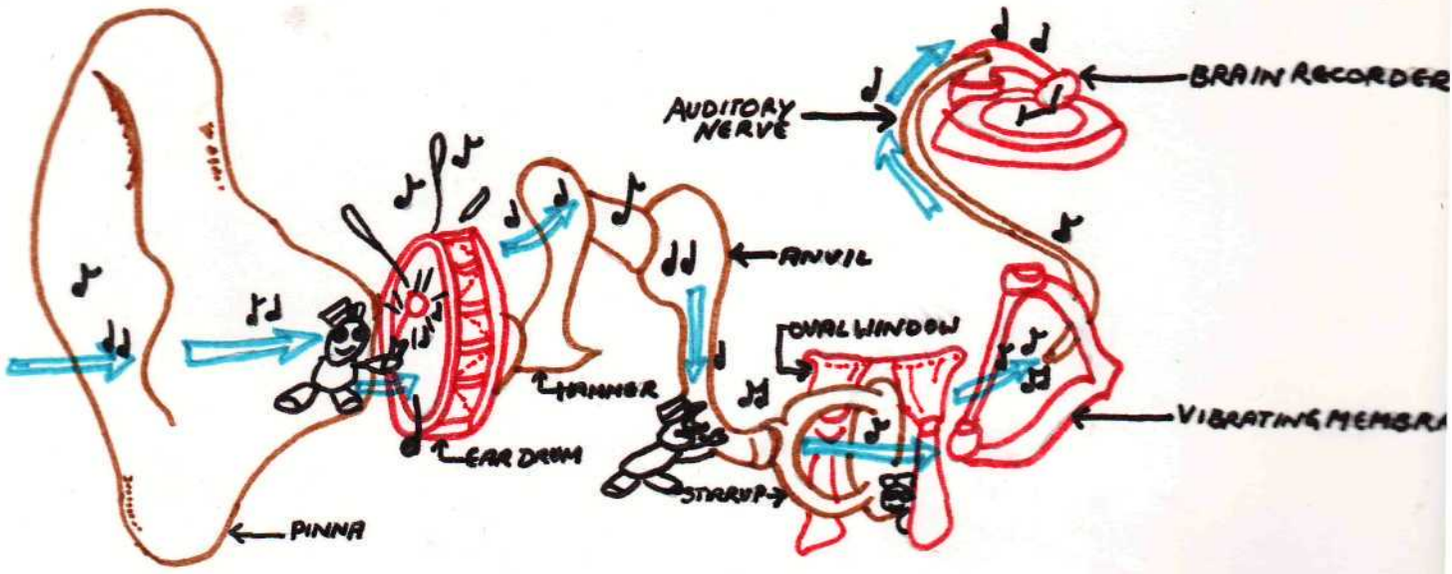
...the sta
for being the
SMALLEST of the SM
BONES in the

...the ear for being
housed in the HARDEST
BONE in the body

←STAP
MU

...the stapes for
having the tiniest
muscle attached to it

THE SYMPHONY OF HEARING



OUTER EAR MIDDLE EAR INNER EAR

Sound waves from any source are collected by the pinna and directed through the external ear canal. They strik the eardrum setting it into vibration. The middle ear transforms these sound waves (mechanical energy) into vibrations of the inner fluid. The vibrations of the eardrum are carried to the oval window by the movement of the ossicles. The stapes moves in and out of the oval window, setting up vibrations in the cochlear fluid. This then sets the basilar membrane into vibration The hair cells are activated in turn, leading to the generation o electrical signals which are carried to the hearing centres in the brain by the auditory nerve. In these centres, signals are record and interpreted as sound.

There are two routes by which we hear:

Air Conduction: This is the route by which we usually hear. Th outer and middle ears conduct sound into the inner ear, where movements of the fluids sets up electrical signals carried to the b

Bone Conduction: Intense sounds cause vibrations of the bones o the skull. This results in the direct stimulation of the inner ear

DID YOU REALIZE THAT OUR EARS CAN DO AMAZING THINGS SUCH

Locating the sound source :
- when called to; while walking along the road, or, for that matter, when any sound is heard. Normal hearing in both ears is important for this.

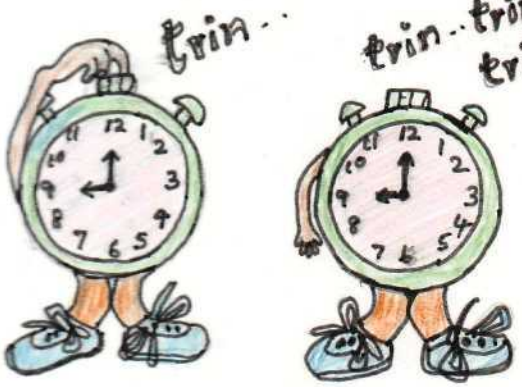
But for his ears, it would have cost this man over here his life!

Differentiating

the soft sounds from the loud sounds

the low pitched sounds from the high-pitched sounds.

the short-duration sounds from the long-duration sounds



the pleasant from the unpleasant sounds.

HEARING LOSS

... is a partial or total difficulty in hearing.

The common indicators are:

difficulty in hearing conversation.

difficulty in hearing other sounds
- such as calling bell, telephone ring

needing to turn on the radio, or T.V., at levels much higher than those considered necessary.

frequent ringing or buzzing sound in the ears.

difficulty in locating the sound source

difficulty in hearing in the presence of noise

difficulty in understanding speech

speaking in too loud or too soft a voice

Hearing is a vital learning sense, and an important mode of communication. A loss of hearing leads to problems such as delayed development of speech and language in the child; educational backwardness, emotional problems and problems in social adjustment.

TYPES OF HEARING LOSS

Not only can hearing loss be of different degrees of severity, it can also occur as different types. The three main types of hearing loss are discussed here. Remember, such problems need to be looked into immediately. Seek immediate help from an ENT doctor and a hearing specialist.

CONDUCTIVE HEARING LOSS.

Due to damage to the conducting mechanism of the ear [outer and middle ears]

Associated conditions :- ear discharge, ear ache, blocked sensation in the ear, ringing, soft voice.

Reversible ; can be medically or surgically treated.

SENSORY NEURAL HEARING LOSS

Due to damage to the inner ear and/or the auditory nerve.

Associated conditions :- Frequent head aches, giddiness, vomitting sensation, ringing or buzzing sound in the ear, loud voice.

Irreversible ; generally can not be medically or surgically treated.

But, a hearing aid can be used if possible. Or, patient can be taught other modes of communicati-on such as lip reading [understandi-ng what is spoken by watching lip movements of the speaker], or sign language.

MIXED HEARING LOSS.

Is a combination of the other two types.

WHAT CAUSES HEARING LOSS?

Here are some of the direct and indirect causes of hearing loss. Consult a specialist if you notice any of these in you or in your child.

Jaundice; infections like chicken pox, typhoid fever, measles, mumps, meningitis, encephalitis, tuberculosis.

A Difficulty in hearing ?

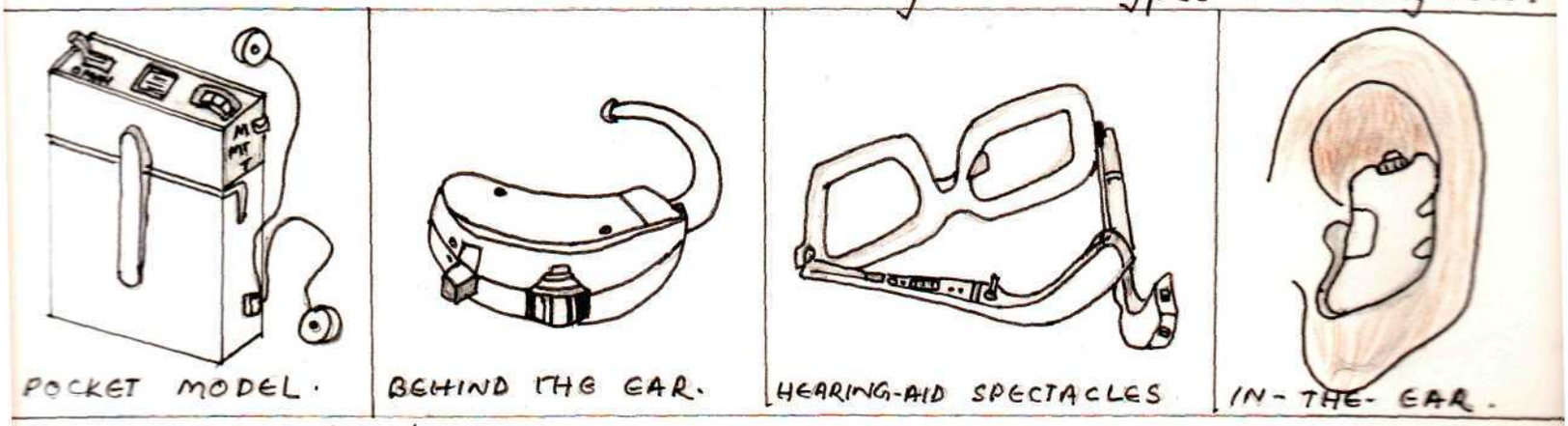
Get your ears tested immediately!

- An audiologist is the person you have to contact.

HEARING AIDS

Let's see what a hearing aid is. It is an electrical device which amplifies sounds so that they can be heard by the user. It does not restore hearing, but, with it, the user can hear better. Users of hearing aids are: children born with a hearing loss, or who later in life acquired hearing loss that cannot be medically or surgically treated; or, adults who developed hearing loss.

There are several types of hearing aids, as shown here. They ha different characteristics to suit different degrees and types of hearing loss.



POCKET MODEL. | BEHIND THE EAR. | HEARING-AID SPECTACLES | IN-THE-EAR.

n audiologist is the best person to find an aid that best suits you. earing aids should not be bought or used without advice.

Hearing aid users should have regular ear-check-ups, and hould get their hearing tested periodically. Reasons for this are:

] A hearing aid should not be worn when there is discharge, wax, etc. in he ear. If worn, the problem will worsen. Also, the hearing aid may be amaged.

] In the case of children especially, the ear mould [the piece that holds e reciever of the aid in place] used will not fit correctly as they grow. o, new ones have to be made from time to time. Also, the same aid may ot be useful always.

] Another reason for seeking professional help is: if a hearing aid is not working properly, it has to be repaired only by a trained person.

Prevention of Hearing Loss

Here are a few tips that will help you in this.
Don't forget – it's important that you follow them.

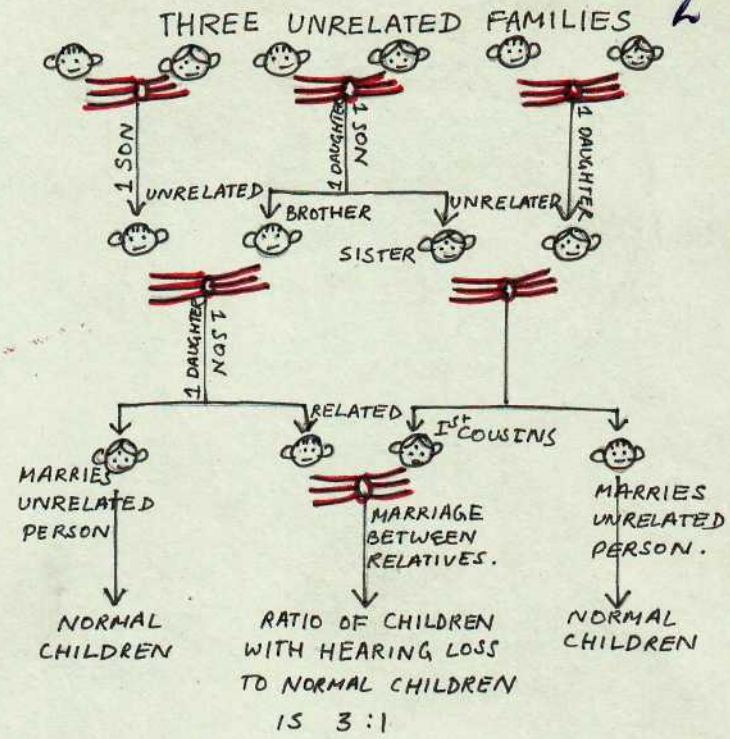
7 Useful Tips

1

Keep your ears dry:
Moisture can cause infection. So, when you swim, use ear plugs. Take care not to let water into your ears. when taking a bath.

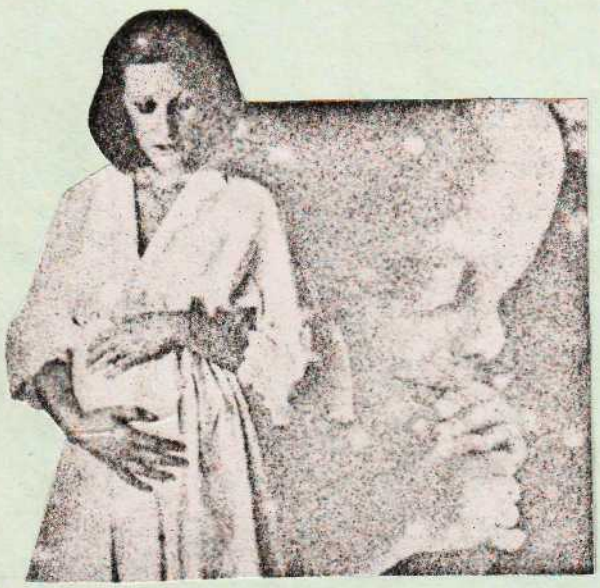
2

Don't get married to close relatives. Let's see what may happen if you do.



This is an example of a marriage between first cousins. It shows that the chances of this couple having deaf children are more. Children of such blood-related couples can have other problems too.

3



For the mother-to-be:

Your unborn child's hearing can be affected if you get any infection [like measles] or disease; consume drugs; or if you have a fall or any physical injury.

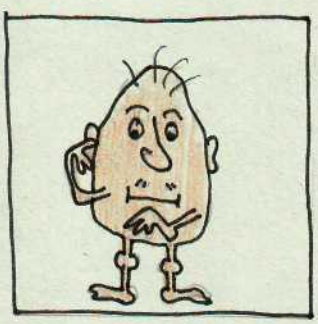
So, take good care of your health. Meet your doctor periodically for advice on diet, general health, vaccines, and protection of the unborn child from all health hazards.

Seek help:

If you have pain in the ear or discomfort, ringing in the ears, hearing loss, dizziness, or frequent headaches, consult your doctor. Everytime you undergo a physical examination, have your ears checked.

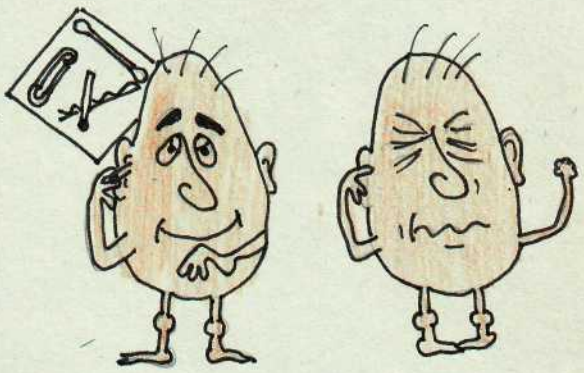
Don't scratch:

If there is any feeling of itching or irritation in your ear, get it checked. Scratching can damage the delicate skin of the ear canal.

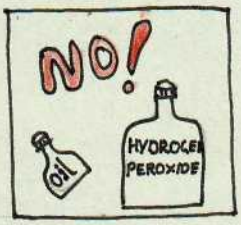


Here's an apt saying :

"Put nothing in your ears that is smaller than your elbow".



Use of sharp objects such as pins and sticks to clean the ear can tear the eardrum. Use of ear buds may sometimes push the wax further into the ear canal, blocking it. If wax collects and affects hearing, seek help. However if you can use ear buds to clean the ear without pushing it too deep inside.



Also, do not use chemicals such as hydrogen peroxide ; or oil to clean your ears.

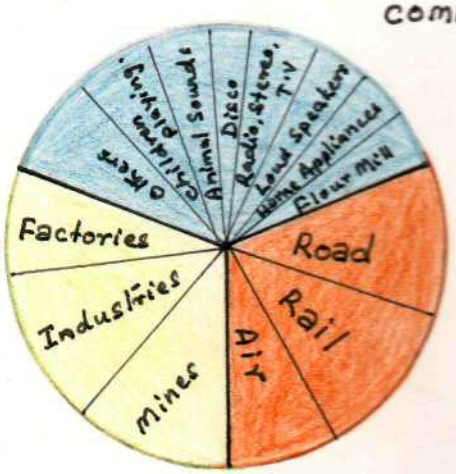
When you are feeding your baby, remember to hold him/her in a oblique position. If he/she is held in a horizontal position, milk can enter the middle ear through the Eustachian tube. This can cause ear infections.

After birth and during childhood or later life, various illnesses and physical injuries can cause hearing loss. Take good care of your child. If you notice any problems in him/her take him/her to a doctor immediately.

NOISE

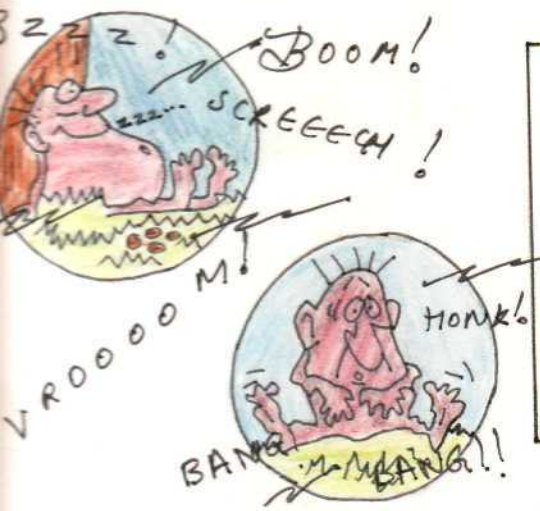
Noise is any unwanted sound. Sources of noise are many. Loud and long duration noises can affect not only hearing, but can also have other effects on man. Lets see what the sources, and the effects of noise are.

The Sources of Noise →



The Effects of Noise :

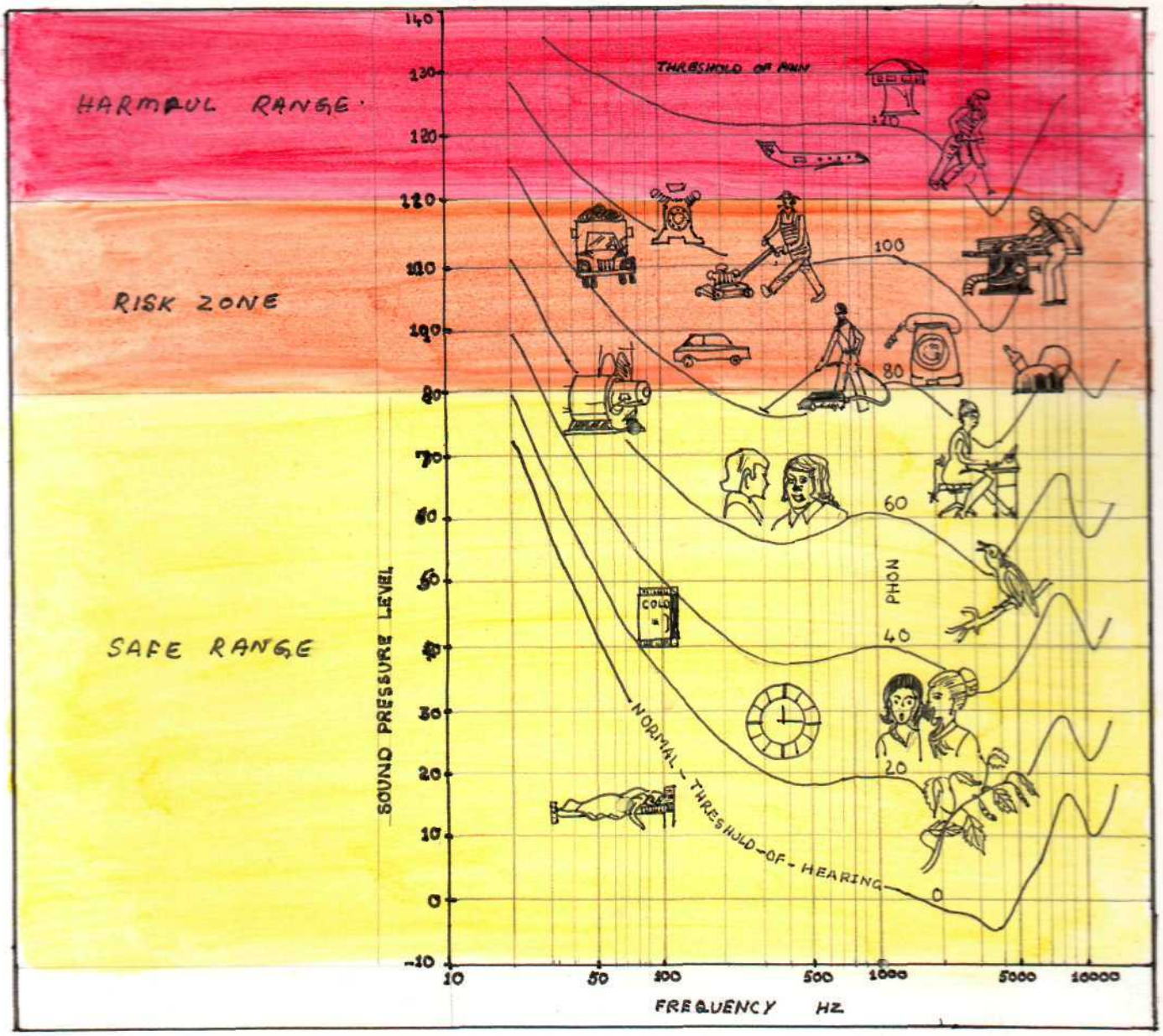
AUDITORY:
Hearing loss- can be temporary or permanent; result of: perforation of ear drum, break in the ossicular chain; hair cell damage in the inner ear, changes in blood supply to the cochlea.



PHYSIOLOGICAL:
Constriction of blood vessels, reduced blood flow, high blood pressure, quickened pulse rate; slow deep breathing; diarrhoea, peptic ulcer; impaired colour vision; changes in muscle tension; sleep interference; change in voice.

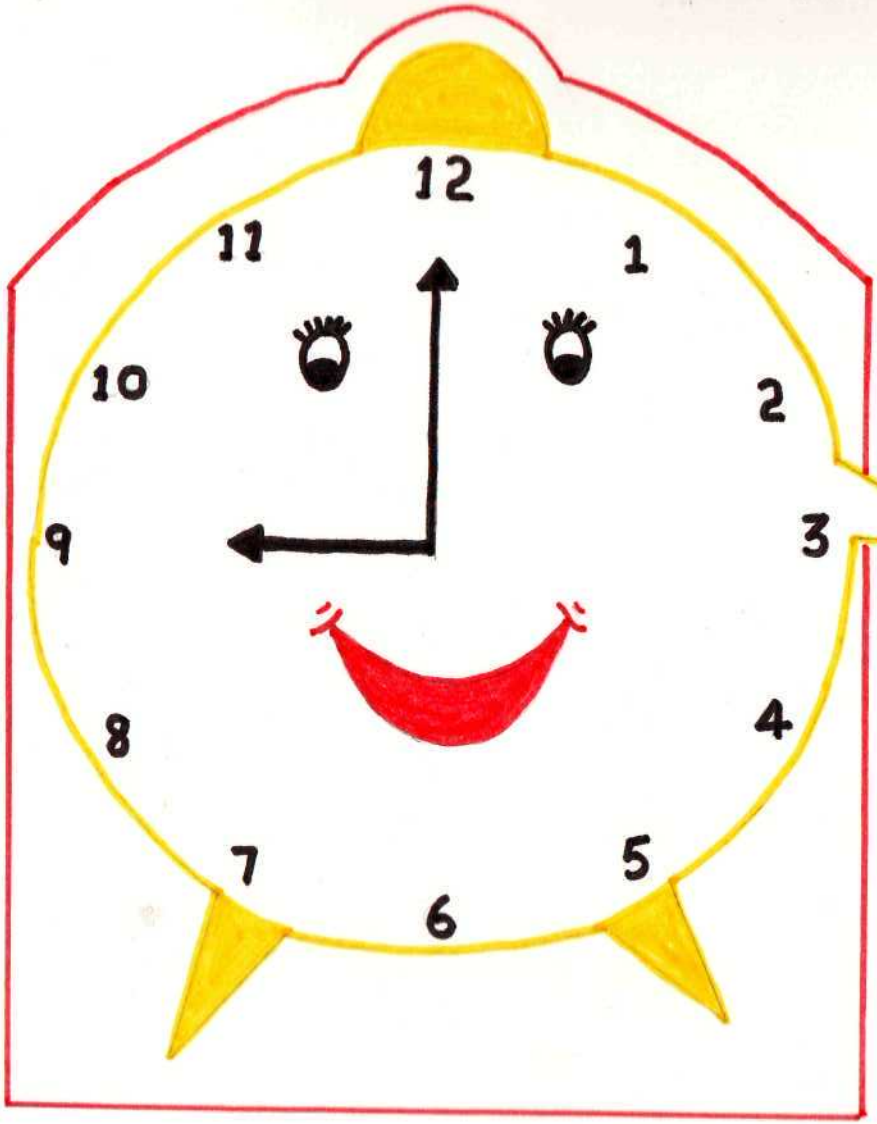
PSYCHOLOGICAL:
Anxiety and depression, which may lead to nervous breakdown; reduced attention and concentration; poor learning in the classroom; reduced job performance.

COMMON NOISE SOUREESAND HOW LOUD THEY ARE



FOR THE INDUSTRIAL MANAGEMENT/WORKER

how much noise is too much noise



- Sound level of 90dB(A) for 8 hrs/day
- Sound level of 92dB(A) for 6hrs/day
- Sound level of 95dB(A) for 4hrs/day
- Sound level of 97dB(A) for 3hrs/day
- Sound level of 100dB(A) for 2 hrs/day
- Sound level of 102dB(A) for 1½ hrs/day
- Sound level of 105dB(A) for 1hr/day
- Sound level of 110dB(A) for ½ hr/day
- Sound level of 115dB(A) for ¼ hr/day

The above are permissible levels of noise exposure (given by the Occupational Health and Safety Act, U.S.A. 1969). If you are exposed to noise exceeding these levels, consult a hearing specialist immediately

NOISE CONTROL.

Since the effects of noise are wide and varied, it is important to safeguard against them. Prevention of noise exposure is the best solution. However, this is not always possible. The next best solution is noise control, for which a few suggestions, that can be followed at home and in industries, are given here.

OPEN →

EPILOGUE

Dear Readers,

Hope you have enjoyed the tour. This has just been a 'highlighting' tour, providing some information about the ear, hearing aad hearing loss. There is some information about noise and noise control too.

There is a lot more to know about the above aspects. Hope your curiosity and interest have been aroused enough to make you feel like going on a more extensive, 'special' tour. 'Special' tours will provide information ia detail for people from various walks of life - school children, school teachers, housewives on a buying (of home appliances) spree, family members of a person with hearing loss, social workers, people from allied professions, industrial workers and employers, atc. For further details about such tours, please contact:

AlLL INDIA INSTITUTE OF SPEECH AND HEARING

MYSORE-570006

Thank you,

Year Guide,

Register No.8412 -

P.S: Any comments/Suggestions are welcome.

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