

HOW LOUD IS TOO LOUD?



SOMETIMES SOUNDS CAN BE REALLY LOUD!



LAILA AND BRIAN NEED TO KNOW WHAT KIND OF SOUNDS CAN DAMAGE THEIR HEARING AND HOW TO PROTECT THEMSELVES FROM LOUD NOISE. THEY ASK MS. SALAZAR, AN **AUDIOLGIST** WHO DOES HEARING SCREENINGS AT THEIR SCHOOL.

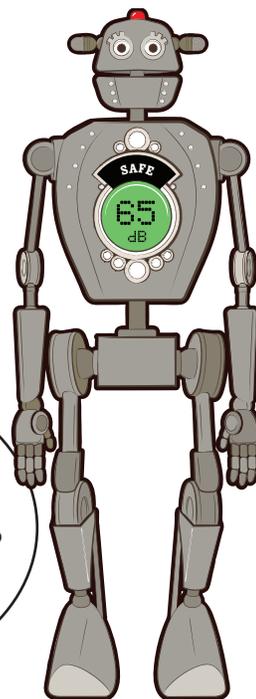
MS. SALAZAR, SOMETIMES MY EARS RING AFTER I HEAR LOUD NOISES. WHAT DOES THAT MEAN?

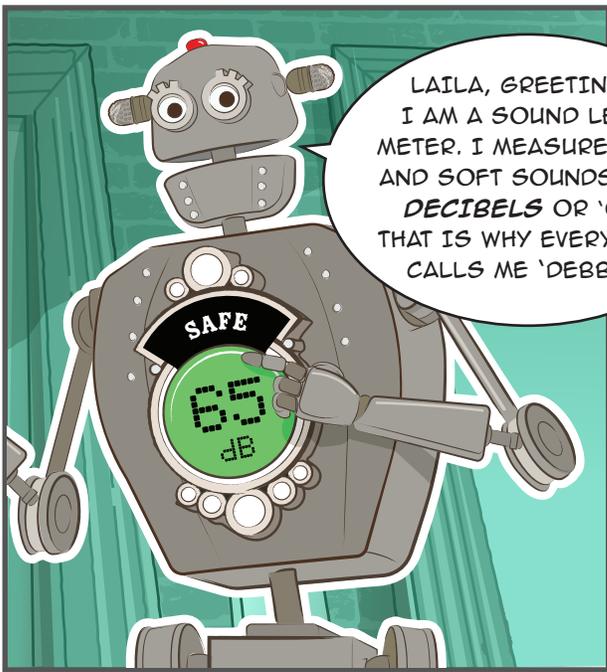
LOUD NOISES BOTHER ME TOO! SOMETIMES THEY MAKE MY EARS HURT. SO, HOW LOUD IS TOO LOUD?

THOSE ARE VERY GOOD QUESTIONS!

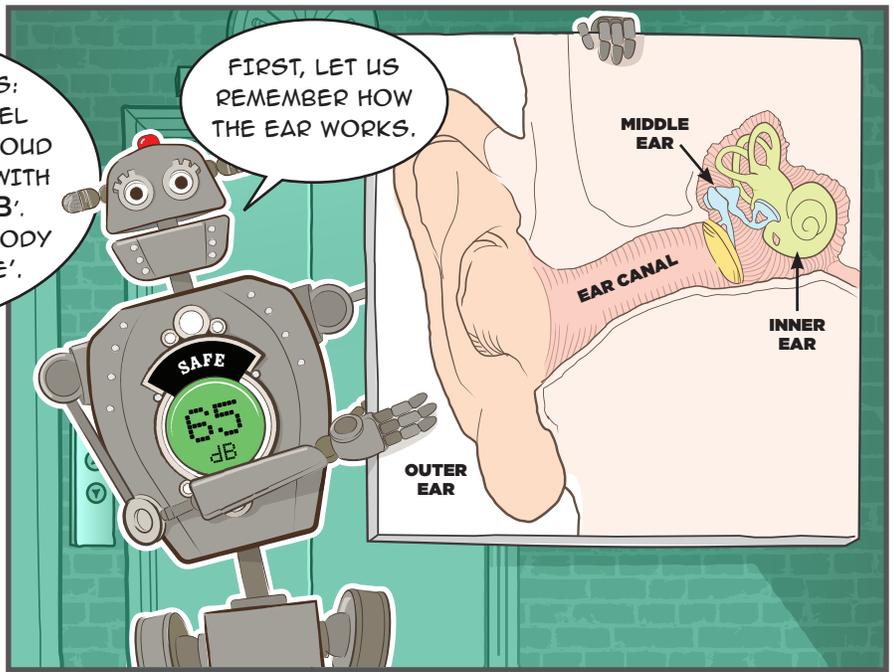
LAILA, WE'LL START WITH YOUR QUESTION, 'WHAT SOUNDS ARE TOO LOUD?'

LET ME INTRODUCE YOU TO A FRIEND OF MINE WHO KNOWS ALMOST EVERYTHING ABOUT LOUD NOISES. THIS IS MY **SOUND LEVEL METER, DEBBIE.**

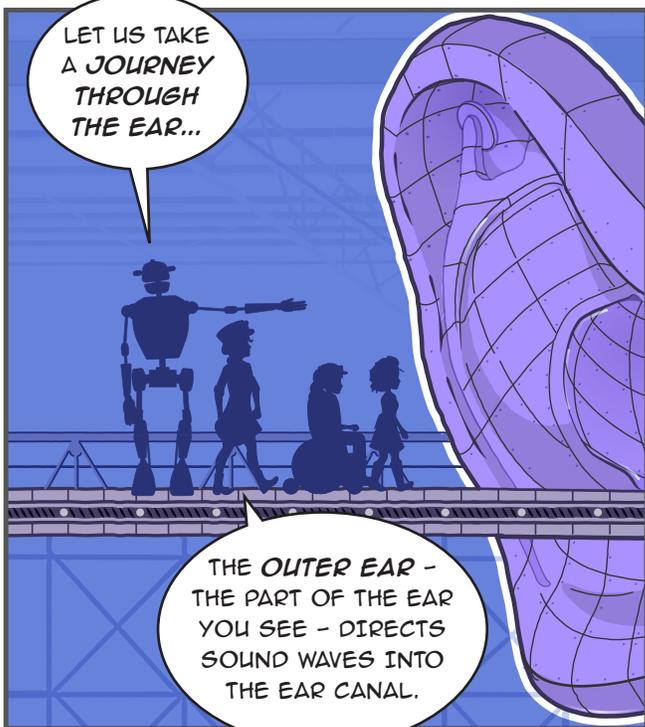




LAILA, GREETINGS: I AM A SOUND LEVEL METER. I MEASURE LOUD AND SOFT SOUNDS WITH **DECIBELS** OR 'dB'. THAT IS WHY EVERYBODY CALLS ME 'DEBBIE'.

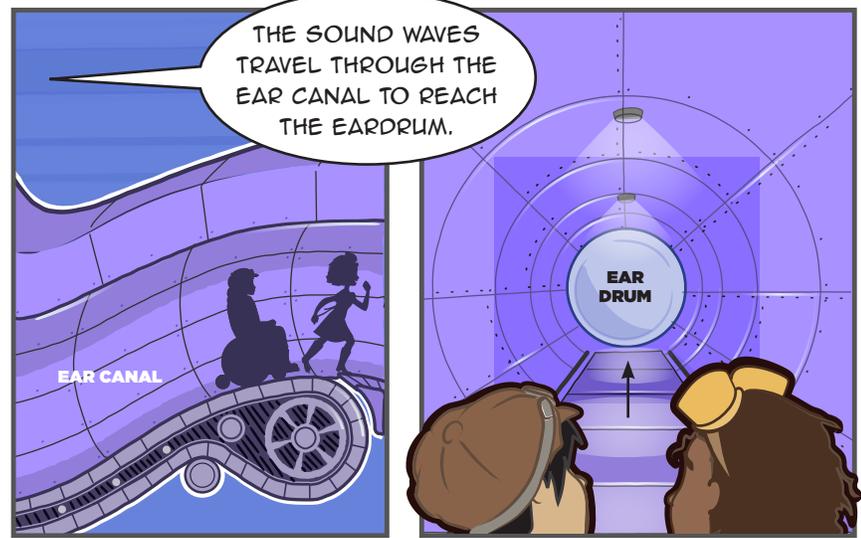


FIRST, LET US REMEMBER HOW THE EAR WORKS.



LET US TAKE A **JOURNEY** THROUGH THE EAR...

THE **OUTER EAR** - THE PART OF THE EAR YOU SEE - DIRECTS SOUND WAVES INTO THE EAR CANAL.

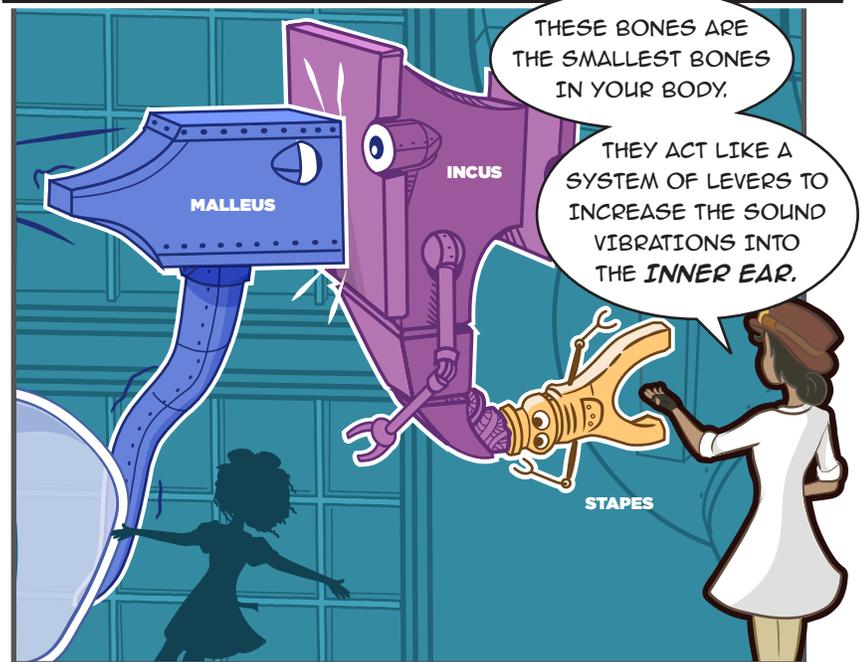


THE SOUND WAVES TRAVEL THROUGH THE EAR CANAL TO REACH THE EARDRUM.

THE EARDRUM VIBRATES FROM THE SOUND WAVES AND SENDS THESE VIBRATIONS TO THE **OSSICULAR CHAIN**, THREE TINY BONES IN THE MIDDLE EAR.



OUR NEXT STOP IS THE **MIDDLE EAR**.

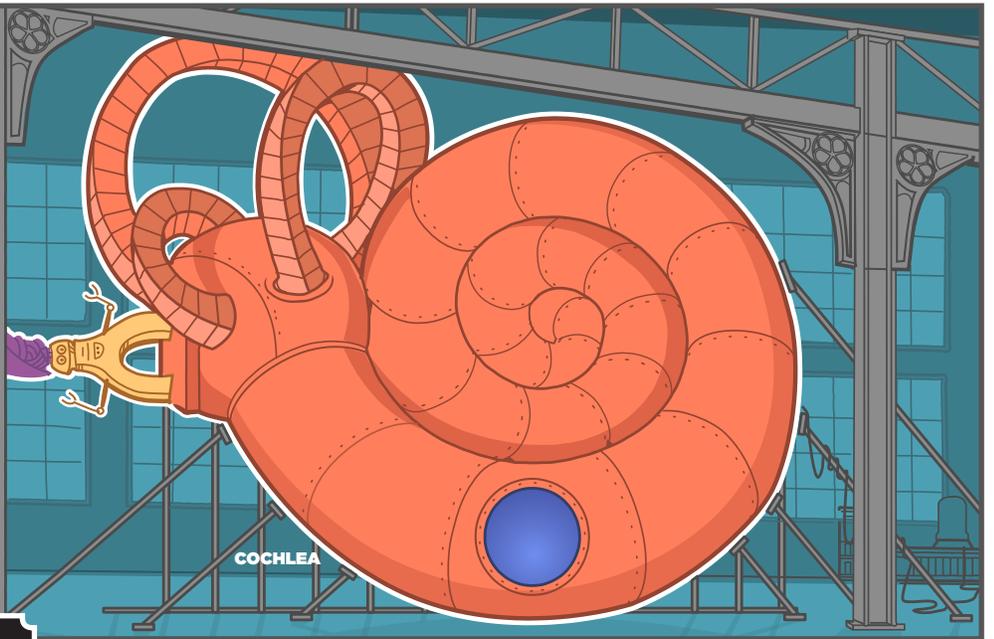


THESE BONES ARE THE **SMALLEST** BONES IN YOUR BODY.

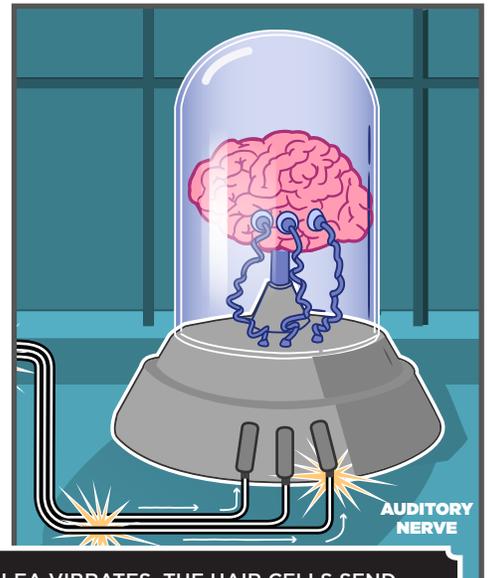
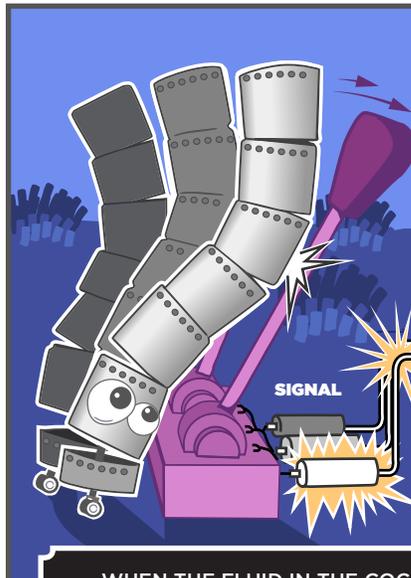
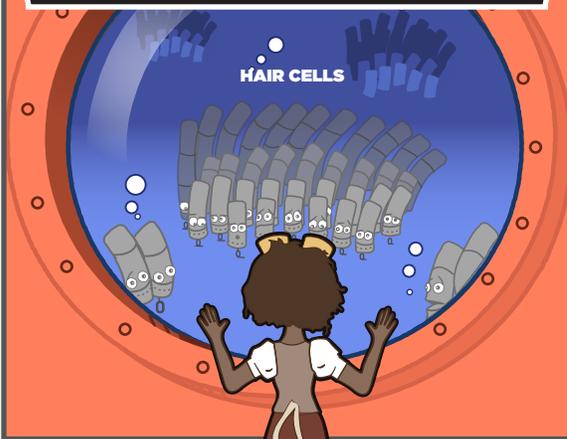
THEY ACT LIKE A SYSTEM OF LEVERS TO INCREASE THE SOUND VIBRATIONS INTO THE **INNER EAR**.

THE LITTLE BONES INSIDE YOUR MIDDLE EAR MAKE FLUID INSIDE YOUR INNER EAR MOVE.

YOUR INNER EAR LOOKS SORT OF LIKE A SNAIL AND IS CALLED THE 'COCHLEA'.



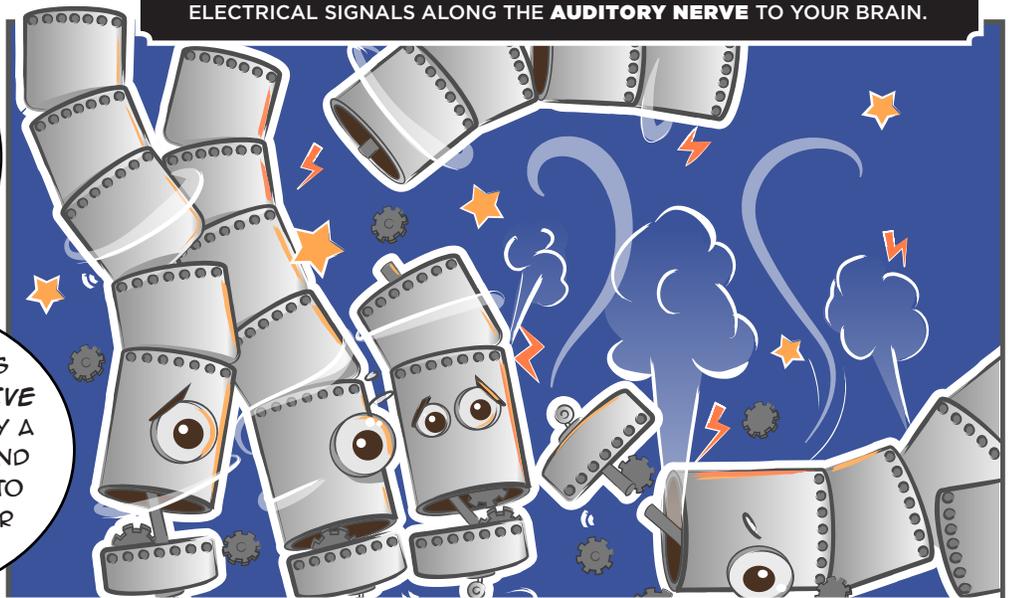
THE COCHLEA IS FILLED WITH ABOUT 18,000 HAIR CELLS CALLED "CILIA". THEY ARE SO TINY YOU CAN SEE THEM ONLY THROUGH A MICROSCOPE. ALL THESE HAIR CELLS COULD FIT ON THE HEAD OF A PIN!



WHEN THE FLUID IN THE COCHLEA VIBRATES, THE HAIR CELLS SEND ELECTRICAL SIGNALS ALONG THE **AUDITORY NERVE** TO YOUR BRAIN.

THE HEARING CENTER (TEMPORAL LOBE) IN THE BRAIN UNDERSTANDS THESE SIGNALS AS SOUNDS WE CAN RECOGNIZE AND CAN DISTINGUISH BETWEEN MUSIC, TALKING, OR A CAR HORN.

THESE HAIR CELLS ARE *VERY SENSITIVE* AND CAN BE HURT BY A SUDDEN LOUD SOUND OR BY LISTENING TO LOUD SOUNDS FOR TOO LONG.



LOUD NOISE DAMAGES HAIR CELLS. **DAMAGED HAIR CELLS DO NOT GROW BACK.** IF YOU LOSE ENOUGH OF THESE HAIR CELLS, YOU **LOSE SOME OF YOUR HEARING FOREVER.**

NOW, LET US TAKE A LOOK AT SOME SOUNDS THAT ARE **TOO LOUD**.

IN THIS QUIET ROOM, WE ARE TALKING AT A LEVEL OF **65 DECIBELS**. THAT IS NOT LOUD ENOUGH TO DAMAGE YOUR HEARING.



THE LEVELS OF NOISE THAT A LAWNMOWER OR LEAF BLOWER MAKES CAN CAUSE YOU TO **LOSE SOME OF YOUR HEARING** IF YOU ARE AROUND IT TOO LONG OR YOU DON'T PROTECT YOUR EARS. THE DAMAGE CAN HAPPEN SLOWLY OVER TIME, SO YOU MIGHT NOT EVEN NOTICE THAT YOU'VE LOST SOME OF YOUR HEARING **UNTIL IT'S TOO LATE**.

SAFE

65
dB

THE LEVELS OF NOISE AT A SOCCER GAME, ENTERTAINMENT VENUES SUCH AS A MOVIE THEATER OR A CONCERT CAN CAUSE YOU TO LOSE SOME OF YOUR HEARING IN **LESS THAN HALF AN HOUR**.



DANGER

100
dB

WOW!
THAT'S NOT
VERY LONG!



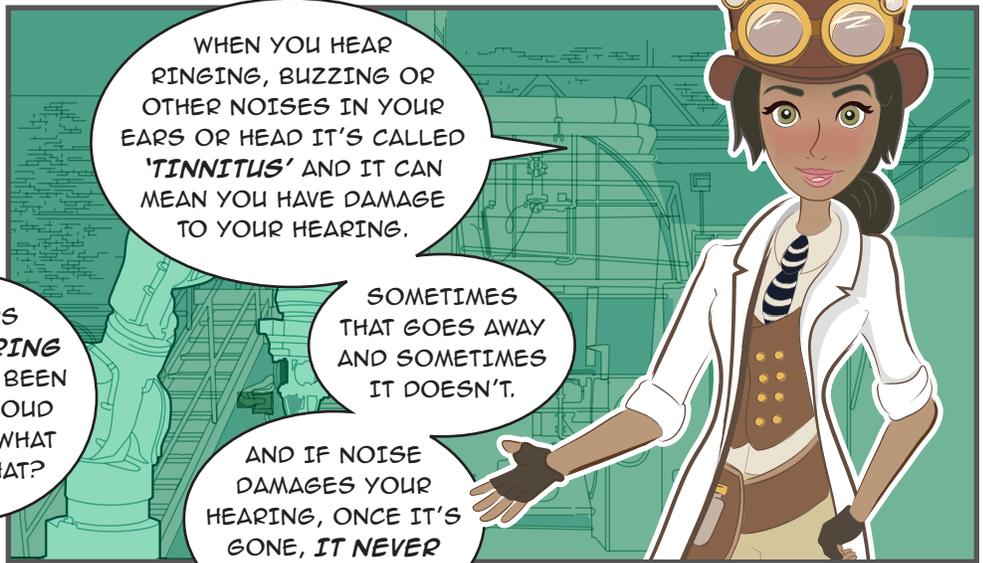
DANGER

140
dB

FIREWORKS ARE A FAVORITE, ESPECIALLY ON THE 4TH OF JULY, BUT THEY CAN SERIOUSLY HURT YOUR HEARING. IF A FIRECRACKER EXPLODES CLOSE TO YOUR EAR, YOU COULD EVEN **LOSE ALL OF YOUR HEARING FOREVER**.



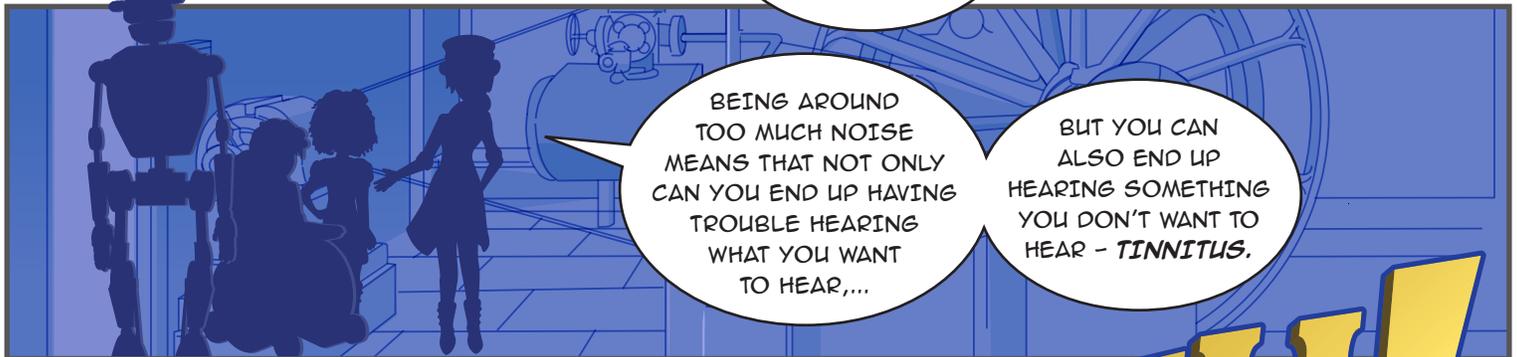
MY EARS START TO RING AFTER I'VE BEEN AROUND LOUD SOUNDS. WHAT ABOUT THAT?



WHEN YOU HEAR RINGING, BUZZING OR OTHER NOISES IN YOUR EARS OR HEAD IT'S CALLED 'TINNITUS' AND IT CAN MEAN YOU HAVE DAMAGE TO YOUR HEARING.

SOMETIMES THAT GOES AWAY AND SOMETIMES IT DOESN'T.

AND IF NOISE DAMAGES YOUR HEARING, ONCE IT'S GONE, IT NEVER COMES BACK!



BEING AROUND TOO MUCH NOISE MEANS THAT NOT ONLY CAN YOU END UP HAVING TROUBLE HEARING WHAT YOU WANT TO HEAR,...

BUT YOU CAN ALSO END UP HEARING SOMETHING YOU DON'T WANT TO HEAR - TINNITUS.



TINNITUS SOUNDS LIKE YOUR HAIR CELLS ARE SCREAMING AT YOU EVERY TIME NOISE HURTS YOUR HEARING.

OH NO! WE WANT TO HAVE GOOD HEARING FOR THE REST OF OUR LIVES!

HOW CAN WE PROTECT OUR HEARING?





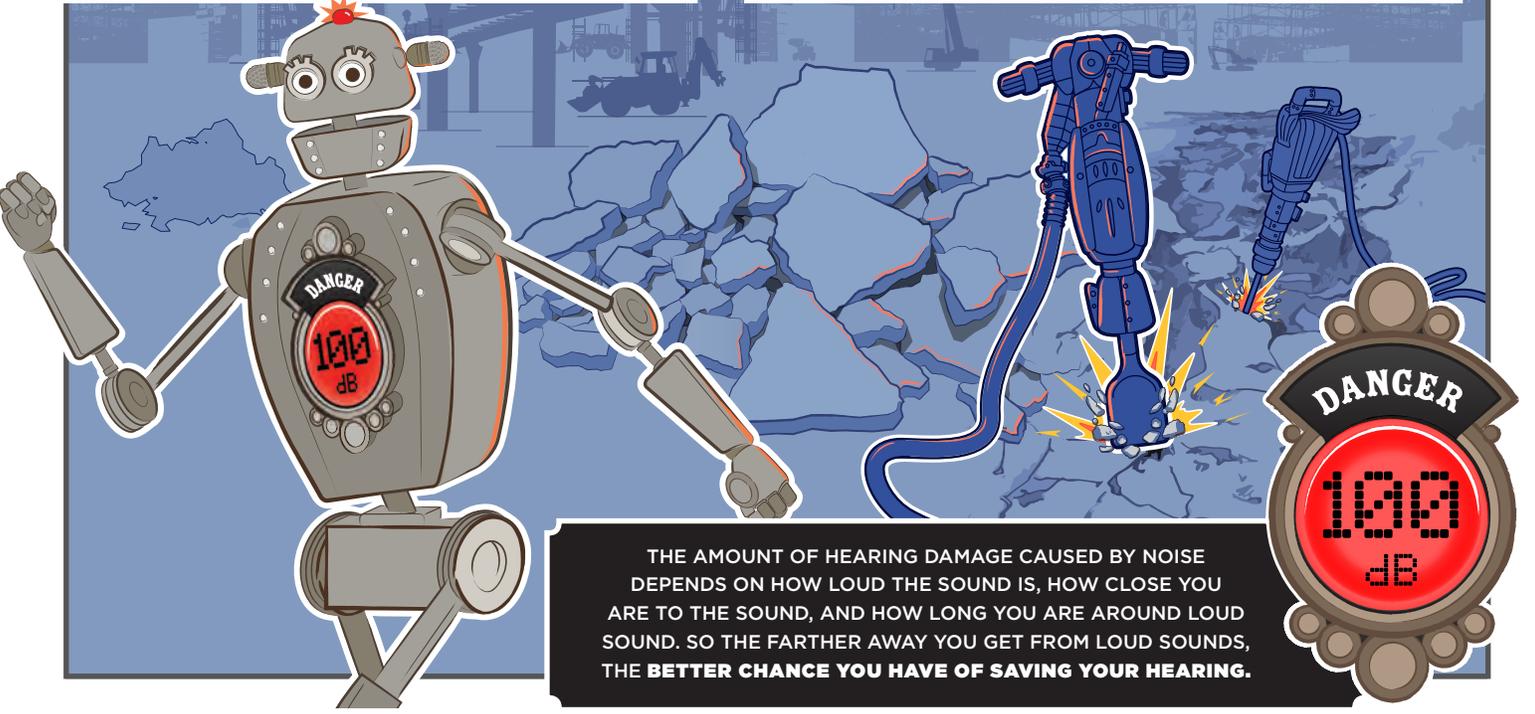
YOU CAN PREVENT DAMAGE THAT COMES FROM BEING AROUND LOUD NOISE FOR TOO LONG.

THERE ARE **THREE EASY** WAYS TO MAKE SURE YOUR HEARING HAIR CELLS (CILIA) DON'T DIE.

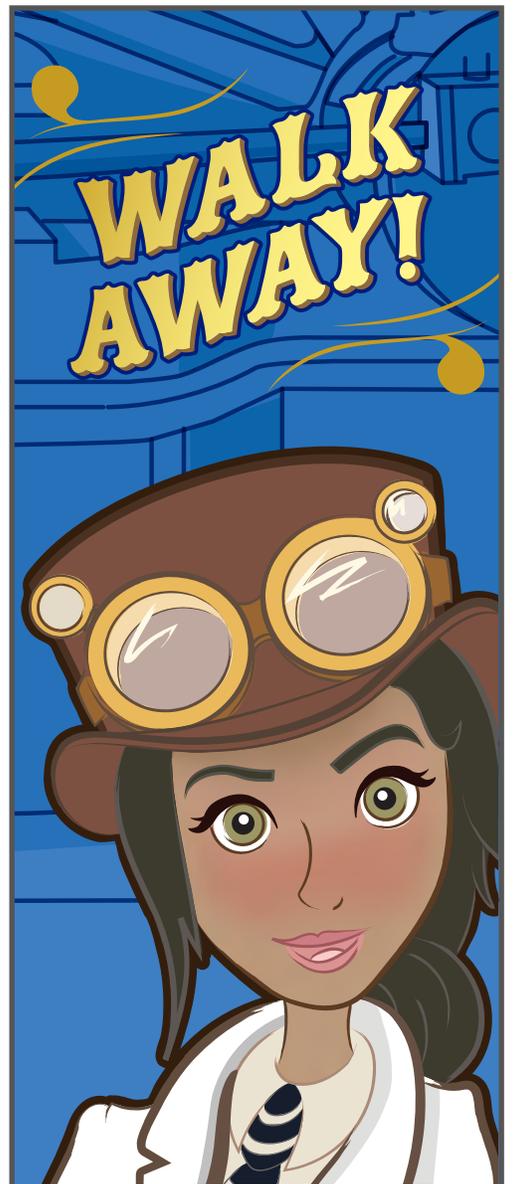
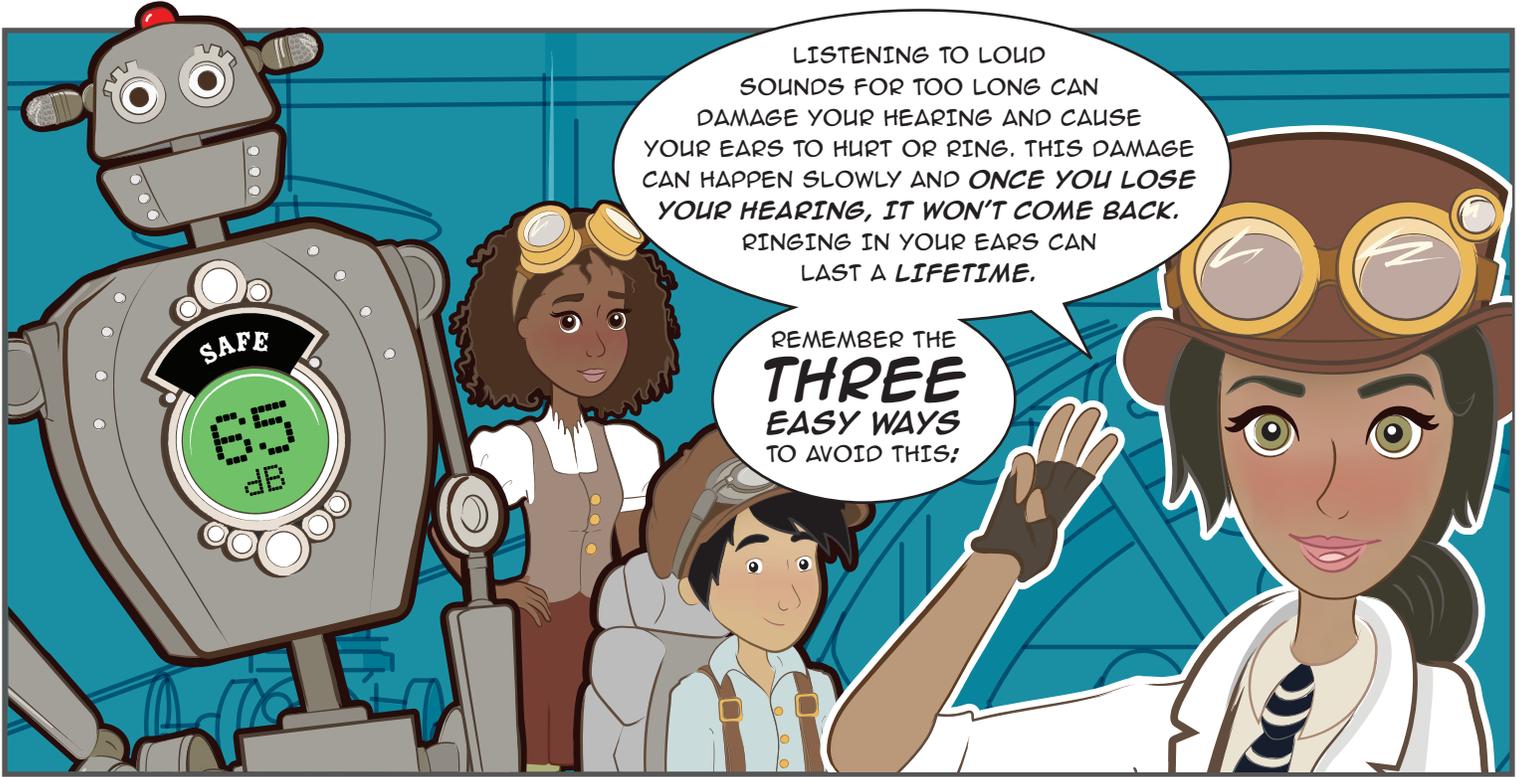


WHEN YOU'RE LISTENING TO MUSIC, DOES THE PERSON NEXT TO YOU NEED TO YELL FOR YOU TO UNDERSTAND WHAT THEY'RE SAYING? IF YES, **TURN DOWN THE VOLUME!** ALSO, GIVE YOUR EARS A REST AND TAKE REGULAR BREAKS FROM YOUR HEADPHONES OR EARBUDS.

USE HEARING PROTECTION. WEAR EARPLUGS OR HEARING PROTECTION EARMUFFS WHEN YOU GO TO A LOUD EVENT (LIKE A SOCCER GAME, CONCERT, MOVIE THEATER, FIREWORKS SHOW), WHEN NEAR LOUD TOOLS (LAWNMOWER OR LEAF BLOWER), OR WHEN YOU'RE AROUND NOISY VEHICLES.



THE AMOUNT OF HEARING DAMAGE CAUSED BY NOISE DEPENDS ON HOW LOUD THE SOUND IS, HOW CLOSE YOU ARE TO THE SOUND, AND HOW LONG YOU ARE AROUND LOUD SOUND. SO THE FARTHER AWAY YOU GET FROM LOUD SOUNDS, THE **BETTER CHANCE YOU HAVE OF SAVING YOUR HEARING.**



GLOSSARY

WORD

DEFINITION

AUDIOLOGIST	A health care professional who is trained to evaluate and rehabilitate individuals with hearing loss and related disorders.
SOUND LEVEL METER (SLM)	Instrument used to measure noise or sound levels in decibel units.
DECIBELS (DB)	Unit measure of sound intensity used to describe how soft or loud sounds are in our environment.
OUTER EAR	The part of the ear you see. It funnels sound waves into the ear canal to reach the eardrum.
MIDDLE EAR	The eardrum vibrates from sound waves and sends these vibrations to three tiny bones in the middle ear. These bones amplify, or increase, the sound vibrations and send them to the inner ear.
OSSICULAR CHAIN	Three bones in the middle ear consisting of the malleus, the incus, and the stapes, referred to as the ossicular chain.
INNER EAR	Contains a fluid filled snail-shaped structure called the cochlea. Sound vibrations create waves in the cochlear fluids causing tiny hair cells to bend and converting the vibrations into electrical signals.
COCHLEA	Spiraled (snail-shaped) part of the inner ear that contains the organ of hearing.
HAIR CELLS (CILIA)	Microscopic cells called cilia which are moved back and forth by the wave in the fluid of the cochlea and cause electrical nerve signals in your auditory nerve.
AUDITORY NERVE	Carries the electrical signals from the inner ear to the brain, which interprets the signals as sound that you recognize and understand.
TINNITUS	Ringling, hissing, buzzing, or other sounds in the ear caused by damage to the ear. The most common cause of tinnitus is exposure to loud sound.
HEARING PROTECTION; HEARING PROTECTION DEVICE (HPD)	Reduces the level of noise entering the ear to protect against loud sounds. HPDs include earplugs, noise-cancelling headphones, and electronic hearing protection devices.

WRITTEN BY John Eichwald and Lauren Benet

EDITED BY Karla Mayorga Whitney (CTR) and Dr. Victoria Jeisy-Scott

ILLUSTRATED & DESIGNED BY Dan Higgins, Meredith Newlove, & Stephanie Rossow (CTR)

This project was a collaboration between the National Center for Environmental Health, Noise-Induced Hearing Loss Program, the Office of Laboratory Science and Safety, and the National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, School Health Branch.

HELPFUL RESOURCES

Centers for Disease Control and Prevention: www.cdc.gov/hearingloss

Noisy Planet: www.noisyplanet.nidcd.nih.gov

Dangerous Decibels: <http://dangerousdecibels.org>

“Too Loud, Too Long” Lesson Plan:

https://www.cdc.gov/healthyschools/bam/teachers/documents/too_loud_too_long.pdf

CDC Healthy Schools: <https://www.cdc.gov/healthyschools/>

BAM! Body and Mind Classroom Resources for Teachers:

<https://www.cdc.gov/healthyschools/bam/teachers.htm>