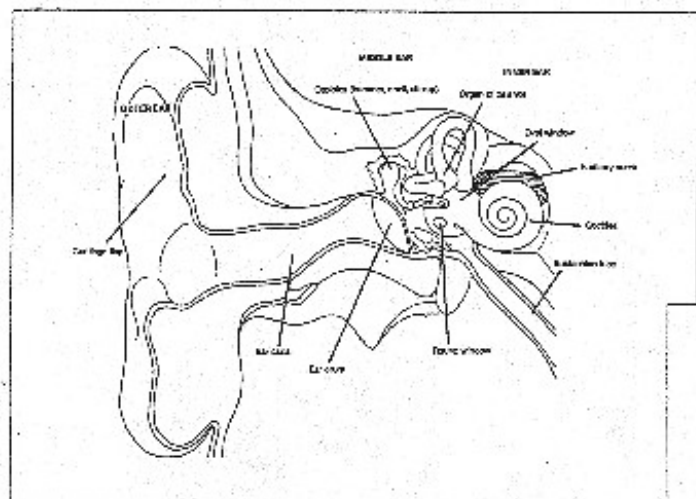
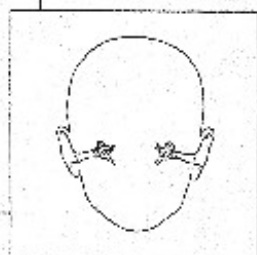


NOW HEAR THIS



by CHRISTINE COLEMAN, M.A.



No Matter How Quiet Your Bike's Engine, Motorcycling Is A Noisy Sport

I recently went to a popular annual rally. It was so popular that I was one of over 7000 people in attendance. That adds up to probably 5000 motorcycles and you know what that means—*loud*.

We were parked six deep on each side of a wide street, and when the engines turned over up the road a deep rumble reverberated through the air and ricocheted off the buildings. The noise swelled as it moved up the street toward us until we fired up our engines and became part of the roar. The sound surrounded us and we could feel it in our chests, heads and the soles of our feet. It was the kind of rumble that would have set off an avalanche if we had been in snow country.

It was exciting and it felt good. Seven thousand riders were united in a tremendous roar as if they were part of a giant dragon moving through the countryside, breathing fire.

I wore my earplugs and I could hear and feel every second of it! And I will be able to hear it again next year, and the year after. Unfortunately, I cannot say the same for many of those around me. I was surrounded by people who love to ride—tough people who make a definite

statement about life—and I was sad. Human beings may be tough but their ears are not. It's a sad fact that many of us suffer irreversible damage to our hearing before we discover how delicate our ears are.

HOW WE HEAR

Sound travels through the air and is funnelled into the ear canal by the outer ear. Air waves strike the eardrum, which transmits this energy through the three ear bones into the inner ear. The inner ear or cochlea is a fluid-filled capsule within the skull. Its shape resembles a snail shell—in fact: *cochlea* is Greek for snail. The cochlea contains nerve endings that respond to the various frequencies of sound and sensations of balance.

The nerve endings are suspended within the fluid of the cochlea. When this fluid is "disturbed" or moved, the nerve endings are set into motion, which fires off an electrical signal to the brain. The temporal lobe of the brain then translates these signals into what we know as sound.

The hearing process goes through four different modes of energy transmission: acoustic (sound waves in air); mechanical (eardrum and bones); hydraulic (fluid-

filled inner ear) and electrical (the nerve firing to the brain). A breakdown in any one of these modes will cause hearing loss. The eardrum and bones can be repaired or replaced, but once a nerve is damaged it is likely to die. There are millions of nerve endings in each human ear, and they wear out with time and stimulation.

The ear has a marvelous protective ability to "adjust" to loud sound by tightening muscles, thus preventing the bones from moving too violently or continuously—but this is only temporary. (Have you ever felt the "release" of tension inside your head when someone turns off an air conditioner? That is the muscle relaxing.)

As a community educator, I have three messages for you. First, earplugs will prevent hearing loss or further hearing loss—cotton does not work. Sound travels wherever air does.

Earplugs come in many varieties, ranging from the foam ones, which will reduce all sound a small degree and are found in drugstores and gun shops, to more elaborate ones, which can filter out specific frequencies. The more sophisti-

cut car plugs can be quite expensive and are designed for musicians, hunters, dentists and anybody exposed to the risk of noise damage, including motorcycle riders. An ear mold is made to fit your ear canal and will prevent invasion from any errant sounds. The sound is then filtered and you receive the result.

Just because you have a "little bit" of hearing loss doesn't mean that it can't get worse. Riding any motorcycle even at safe and legal speeds will result in guaranteed constant wear and tear on the auditory nerves. These nerves cannot be renewed or rebuilt.

Second, if you have a loss of hearing, don't assume that it is nerve damage and nothing can be done about it. In many cases, hearing problems can be cured through medical or surgical management. A simple cold or allergy can block drain and bone movement resulting in the sensation of "stuffy ears"—be sure to have an ear doctor check it out (the ear department at UCLA is called Head and Neck Surgery, but any otolaryngologist or ear, nose and throat doctor will do).

The doctor will be able to diagnose a physical problem such as a cold or allergy, which can be helped by medication. He will then send you to an audiologist who will evaluate your hearing loss, if you have any.

Lastly, remember that nerve loss can be helped by a hearing aid in many cases. An audiologist or hearing aid dealer will supply the instrument that is designed to help you hear better. Modern hearing aids have changed physically over the years from a black box that fits in your pocket to a miniature device that fits inside the ear canal.

A modern hearing aid can now be mechanically adapted to fit your specific needs with fewer problems. The newest hearing aid technology now uses a computer to "reprogram" your unit if it is unsatisfactory. This is much more convenient than sending it back to the factory and waiting several weeks for its return. Such a unit is expensive now, but hopefully time and experience will bring the costs down.

When I see a person with a hearing aid I have to respect and admire that individual's spirit—he/she wants to see and hear what goes on in the world. In my opinion, however, a rider with ear-plugs deserves the highest respect of all. That individual is taking steps to preserve his/her hearing before any damage is done.

After all, you wouldn't intentionally abuse your bike. Isn't your hearing worth the same consideration?

Motorcycle-related Hearing Loss

The article *Sound Advice* by David Marr (*Road Rider*, January 1987) mentions an interesting measurement of sound decibels (dB) measured at three speeds, with and without helmets. Marr's results were:

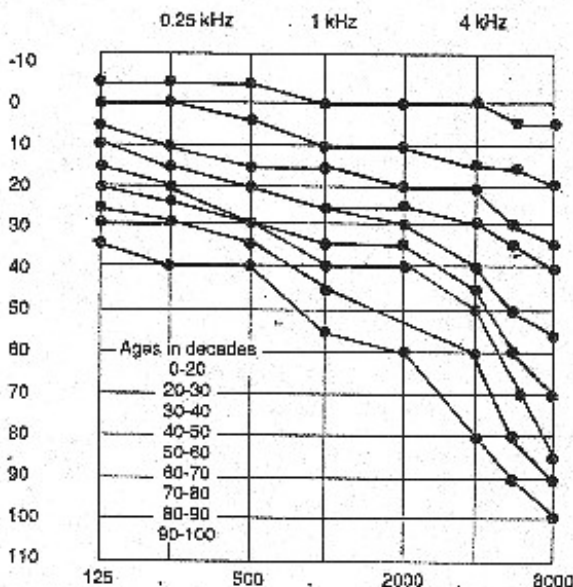
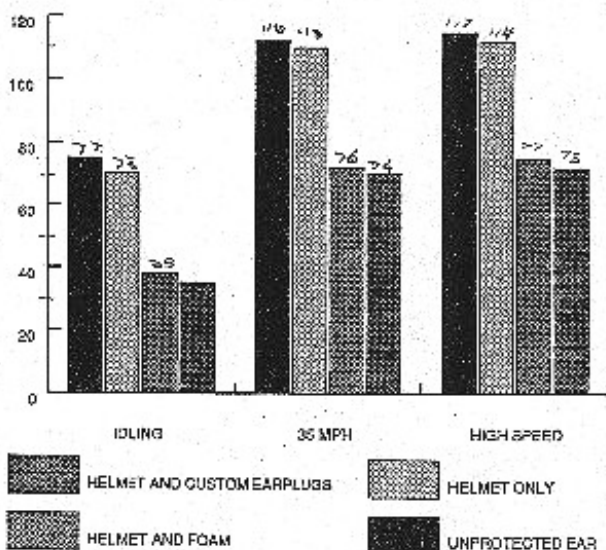
Idling—74 dB
35 mph mixed city traffic—between 110-114 dB
Highway speeds average for a 10-mile

run—118 dB

It is interesting to note that helmets reduced the sound by only 3 dB.

Taking these figures as a base and using noise reduction rates from two different pieces of ear protection literature, a graph was constructed (see illustration).

As you can see, idling is okay but mixed city traffic and highway speeds

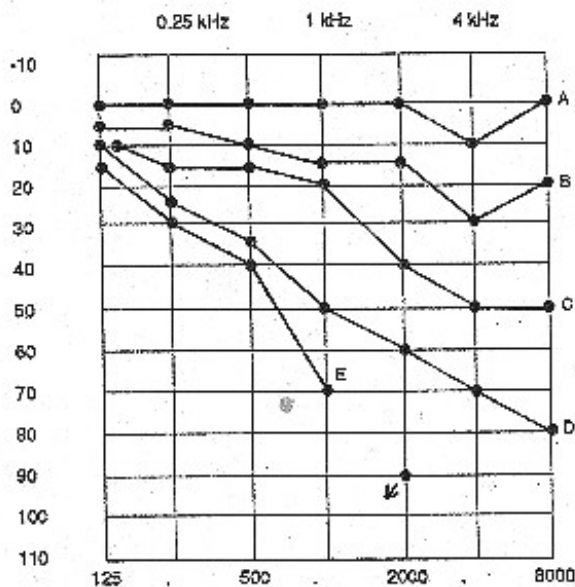


are both over the dangerous level. As loudness increases, the "safe" time exposure decreases. At 110 dB even two hours can be dangerous, and with a 5 dB increase, the "safe" time is cut in half.

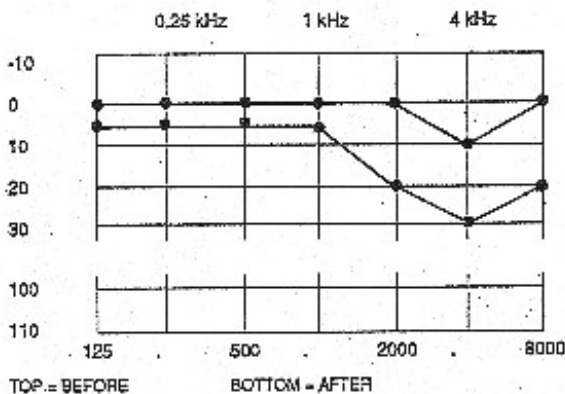
Marr had his hearing tested before and after a two-hour freeway run. He noted that "It took as much as 20 dB more volume for me to hear some of the mid-range and high frequency tones" than prior to the ride. While it is true that this was only a "temporary threshold shift," the ear can not keep adjusting forever.

You may think that since there are "millions" of nerve endings in the ears losing a few here or there won't make much difference—but it does. A long life

in this noisy world accelerates the erosive process of aging in the ear. Figure 2 illustrates a "normal" aging hearing pattern, if you consider our noisy society "normal." Figure 3 demonstrates an audiometric profile of progressive noise-induced hearing loss. A has only a slight notch at 4 kHz (speech discrimination of 96%). B has a widening and deepening of this notch (speech discrimination of 80%) while C shows major hearing loss at 5 and 6 kHz. D's hearing loss deepens over a period of years and shows the loss shifting to the left (speech discrimination score of 60%). E has a complete loss of high frequency perception (speech discrimination of 30%).



- (A) Slight notch at 4 kHz (speech discrimination 96%)
- (B) Widening and deepening of this notch (speech discrimination 80%)
- (C) Major hearing loss at 5 & 6 kHz
- (D) Deepens loss over period of years and shifting to left (speech discrimination 60%)
- (E) Complete loss of high frequency (speech perception of 30%)



Tinnitus

There are three warning signs that may indicate you're something wrong with your ears: hearing loss, ringing, buzzing, and tinnitus.

Tinnitus is a ringing, buzzing, whistling, or hissing noise. It is frequently described as a high-pitched, keening sound that's intermittent, a nuisance, or one that's gradually getting worse. It can result from a simple cold and slowly goes away, or it can be a sign of high blood pressure, abnormal cholesterol, or other causes. If left untreated, you may hear it all night in a quiet room, or you may be unable to sleep without putting your hands or a pillow over your ears to shut it out. It is a terrible nuisance, but as your eardrums grow thinner and the inner sound grows louder.

Tinnitus can and does drive some people crazy. Peter Low, a friend of the author, wears earplugs and practices "inside soundproofing" because he can't listen to music without his tinnitus worse. It will reduce his ability to hear even further.

When an audiologist gives you a hearing test, he usually plots frequencies on the left side being low frequencies and the right side being high frequencies. The notation "L" is beside your hearing level and "R" is beside the hearing level. Normal hearing is considered to be within a range of 0 to 20 dB. An additional decibel at 4,000 Hz, for example, would suggest old hearing loss at that frequency. This is a simplified explanation.

For more information about tinnitus, contact the author at Hope for Hearing Foundation (HFF). The foundation does not perform hearing tests, but does provide education and counseling through private sessions of group work and/or.

This article is based on a presentation by the author at the 1991 National Hearing Loss Conference, held in San Francisco, California, at the Sheraton Hotel.

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Now Hear This

Even though Gold Wings are some of the quietest motorcycles on the road today, many of us will suffer some form of hearing impairment after an extended ride on the freeway. What causes this temporary hearing loss, how can we prevent it and what are the benefits to be gained by prevention are questions I hope to answer in this article.

To understanding how hearing works, we must first look at the operation of the ear. There are four different modes of energy transmission involved when we hear a sound. Acoustical waves enter the ear canal and strike the eardrum. This action moves the bones in the ear (hammer, anvil and stirrup) mechanically. These bones are connected to the cochlea and inner ear, which is filled with fluid generating hydraulic pressure. This pressure is picked up by the nerve endings and sent to the brain as electrical impulses. These impulses are usually followed with the spoken phrase "We are not lost, we're exploring!" Riding a motorcycle, especially at freeway speeds, results in constant wear and tear on the auditory nerves. Once the nerves are damaged, hearing loss can become permanent.

Where's the problem? British researchers have found that engine and exhaust noise are not the real culprits. At about 40 mph machinery noise disappears and is replaced by ever increasing wind noise. Based on standards established by OSHA, hearing damage can begin to occur in as little as two hours at 65 mph. At 80 mph the safety limit is one hour. Unfortunately, just wearing a helmet isn't enough.

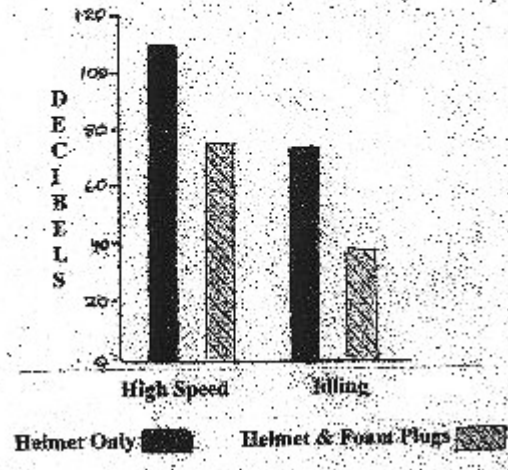
The type of helmet has little effect on the noise that reaches the ear. Full face helmets provide only slightly better protection than 3/4 helmets. The biggest factor creating the most noticeable difference in wind noise is the fairing/windshield. Sitting behind a tall windshield can make a difference in noise equal to a 10 mph drop in speed. Just how noisy is a motorcycle at high speed? Compare results below.

Gun Shot.....	140 Decibels
Live Rock Music.....	90-130 Decibels
Motorcycle 70 mph.....	115 Decibels
Lawn Mower.....	100 Decibels
Conversation.....	60 Decibels

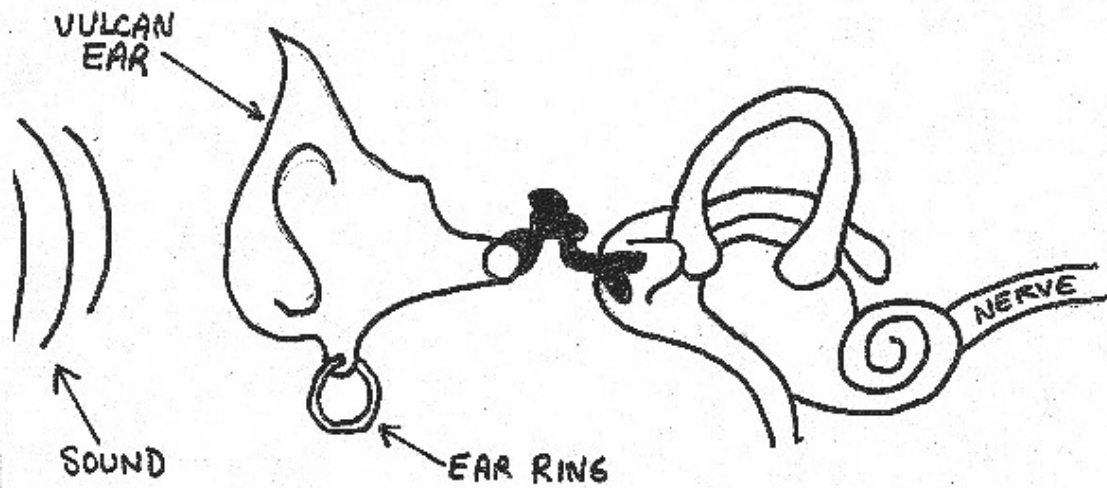
Wind noise is mostly low frequency and helmets are nearly transparent to low frequency sound waves. (This explains why there is only a 3-5 decibel reduction when wearing a helmet verses not wearing a helmet.) In order to reduce the possibility of hearing damage when traveling at high speeds for long periods of time, ear plugs should be worn.




Ear plugs are a cheap and simple solution to the problem. They vary in price from a few dollars for the disposable foam plugs to over \$100 for custom fit "musician earplugs". The difference being that foam plugs tend to filter out high frequency noises better (like music and conversation) than low frequency noises (which is produced by the wind). Custom fit plugs tend to work equally well across the entire frequency band. Why bother with ear plugs?

Hearing impairment tends to cumulative. Once damaged, the nerves do not repair themselves. Personal experience has shown that after a long day's ride at freeway speeds my ears will ring for several hours after I leave the bike. Loud noise for an extended period of time can cause fatigue and stress. To illustrate: have you ever been in a room with a window air conditioner running and then it is suddenly turned off? Notice how the tension inside your head seems to vanish? That's because the muscles in your ear have relaxed. Around town on short trips ear plugs are not really needed, but if you plan to travel long distances at freeway speeds, seriously consider adding ear plugs to your list of proper riding attire. Ride Safe



NOW HEAR THIS



-  UNPROTECTED EAR
-  HELMET ONLY
-  HELMET + EAR PLUGS

