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Facts about Hearing and Hearing Aids

A Consumer's Guide from the National Bureau of Standards

NBS CIS 4

Facts about Hearing and Hearing Aids

by Edith Corliss

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Editor: James E. Payne

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FROM THE NATIONAL BUREAU OF STANDARDS
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FOREWORD

Technology is changing not only the products you buy, but the marketplace as well. Unfortunately, this is not an unmixed blessing.

Products are constantly being improved, but designs are complicated, quality is variable, and good advice is hard to get. Modern stores and merchandising bring you a wide variety of products; but the large number of choices and the lack of dependable information often make shopping a confusing and frustrating experience.

A generation ago the merchant was likely to be a friend of the family. Products were out in the open where they could be seen, touched, smelled or tasted, and decisions about quality were comparatively easy to make. Today, stores are more impersonal; most of the items are pre-packaged, or made of unfamiliar materials, or so complicated only an expert can understand how they work.

If you are like most consumers you need more information—accurate, understandable, believable information which will help you make wise choices, and get more use and satisfaction from what you buy.

Your principal source of such information will continue to be manufacturers and vendors themselves. But the technical work at the National Bureau of Standards brings our experts in contact with many subjects of potential interest to the citizen, who supports our work with his taxes. The Consumer Information Series is designed to share this knowledge and experience with you.

In our research on measurement and test methods, and in our development work on standards, we produce general information in many areas which can help you to:

- clarify what you want in a particular product
- understand what you should expect from a product
- ask better questions in the marketplace
- select the type of product you want
- take better care of the product
- get more satisfaction from the product after you buy it.

At the request of the President and the Secretary of Commerce, we are pleased to make this information available.

Lewis M. Branscomb, Director

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INTRODUCTION

Facts about Hearing and Hearing Loss

The ability to hear and to interpret sounds clearly and accurately is a source of deep pleasure. The sounds of nature, the voices of friends and loved ones—these are a part of the pleasure of living.

Hearing is a principal tool for communicating with others. If your hearing is good you probably spend half of your waking time just listening!

Hearing is also essential to speech and language development. As children, we learn to speak and to acquire the symbols of language through our sense of hearing. As adults, we use our ears as a monitoring device to help us regulate the quality and volume of our voice. If we lose our hearing there is usually some decline in our ability to speak clearly.

Until recent years a hearing loss was a personal tragedy, because nothing much could be done about it. But today the situation has changed. A hearing loss is often a problem to be solved, not a tragedy to be endured, and the damage to speech can frequently be prevented or reduced.

In this booklet we will show something of how the ear functions, describe various types of hearing loss, explore the different kinds of hearing aids available, and offer practical suggestions for their selection, use, and maintenance.

We wish to acknowledge the cooperation and assistance of the agencies listed below in the preparation of the audiological and medical materials contained in the booklet:

American Academy of Opthalmology and Otolaryngology;

American Speech and Hearing Association

Army Audiology and Speech Center, Walter Reed General Hospital, Department of the Army;

National Institute of Neurological Diseases and Stroke of the National Institutes of Health, Department of Health, Education and Welfare;

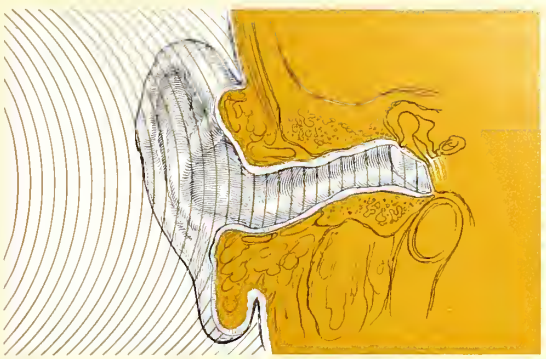
Prosthetic and Sensory Aids Service; and Auditory Research Laboratory, Veterans Administration.

National Association of Hearing and Speech Agencies

How You Hear

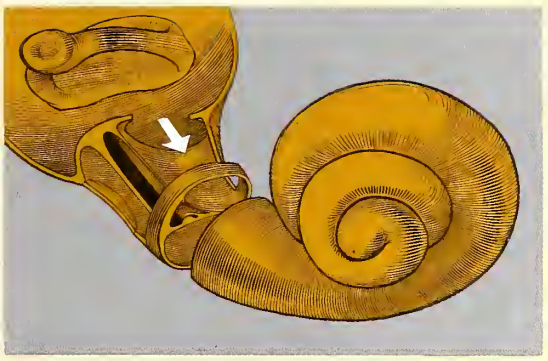
The system by which your ear converts the energy in sound waves into electrical signals for your brain is enormously complex, and some of the mechanisms are not yet clearly understood. But in general terms the system works something like this:

The outer ear channels sound waves from the air around you inward through the external **auditory canal.** The auditory canal terminates at a tightly stretched membrane, the **eardrum.**



Beyond the eardrum, in the middle ear chamber, are three tiny, linked bones called the **malleus** (hammer), **incus** (anvil), and **stapes** (stirrup). The outer bone, the malleus, is attached to the eardrum. The inner bone, the stapes, ends in a footplate which fits into the **oval window,** an opening in the wall of the bone housing the inner ear. The center bone, the incus, connects the malleus and the stapes so that when one moves they all move.

Your inner ear is filled with fluid, and the lower portion terminates in a delicate, spiral structure that is shaped something like a snail. It is called the **cochlea.**

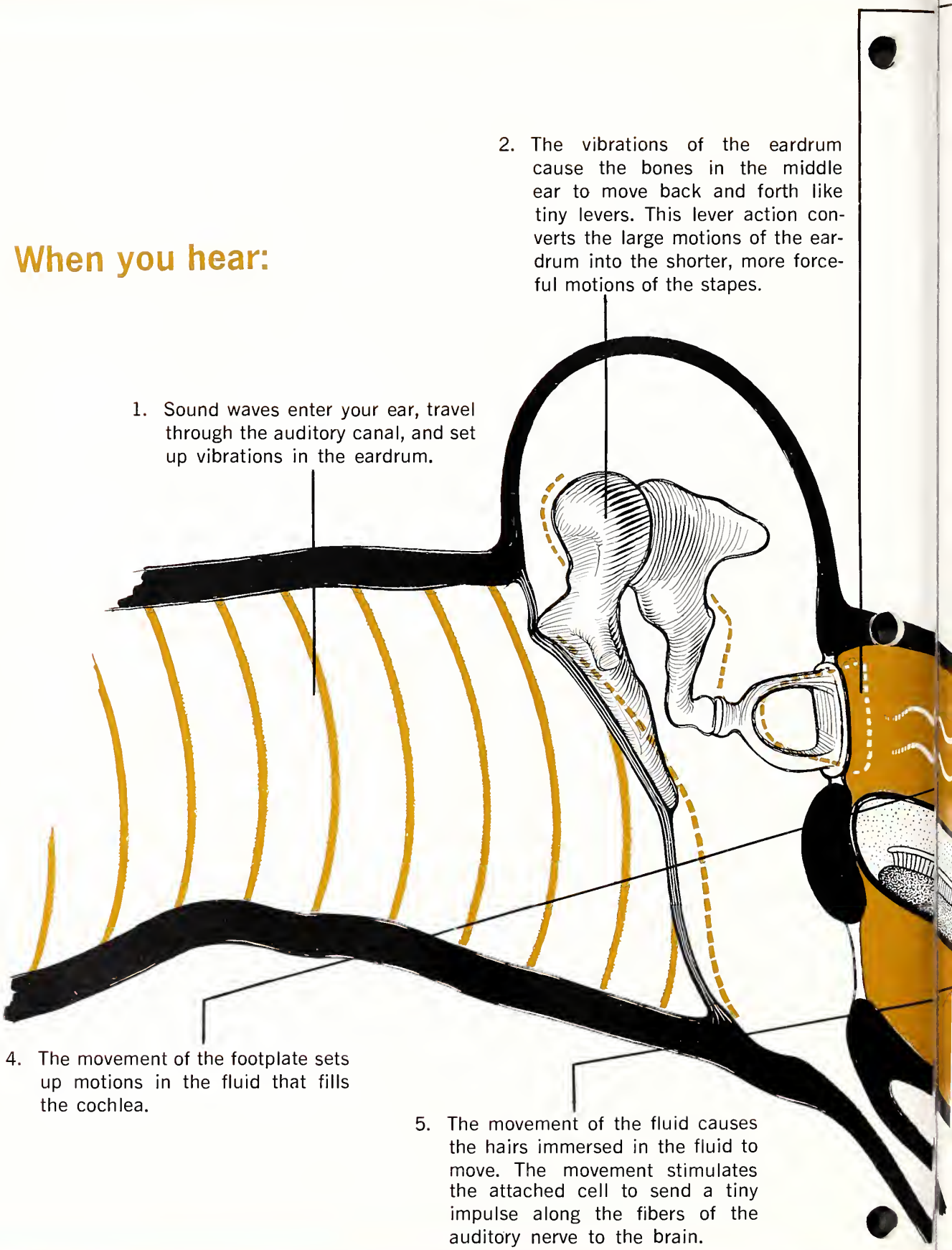


Inside the cochlea is an arrangement of thousands of tiny specialized cells, each of which is equipped with many microscopic hairs. These hairs are immersed in the fluid which fills the cochlea.

When you hear:

2. The vibrations of the eardrum cause the bones in the middle ear to move back and forth like tiny levers. This lever action converts the large motions of the eardrum into the shorter, more forceful motions of the stapes.

1. Sound waves enter your ear, travel through the auditory canal, and set up vibrations in the eardrum.

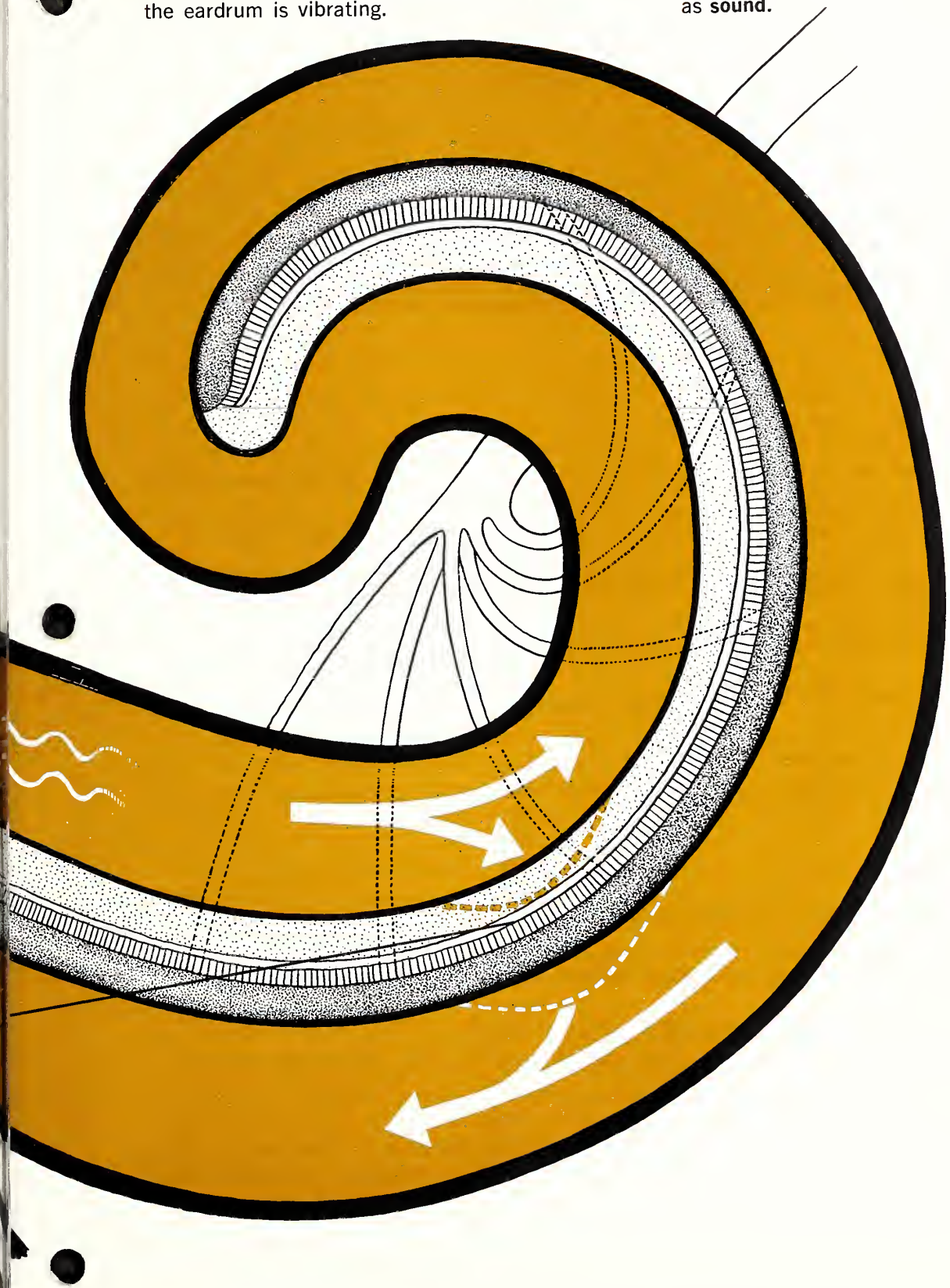


4. The movement of the footplate sets up motions in the fluid that fills the cochlea.

5. The movement of the fluid causes the hairs immersed in the fluid to move. The movement stimulates the attached cell to send a tiny impulse along the fibers of the auditory nerve to the brain.

3. The footplate at the inner end of the stapes moves in and out of the oval window at the same rate that the eardrum is vibrating.

6. In the brain the impulse is translated into the sensation you know as **sound.**



Causes and Treatment of Hearing Loss

Outer Ear

The outer part of the ear or the auditory canal may be incomplete or partially blocked.

This condition can often be treated surgically by widening the existing canal, or by opening a canal if the passageway is completely blocked.

An accumulation of wax may be blocking the external canal, preventing sound from entering.

Periodic removal of the wax by a physician will solve this problem.

An infection of the skin tissues which line the canal walls can cause itching and rawness.

This condition, called *external otitis*, may lead to more serious infection unless treated. The condition can be cleared up by a physician with the aid of the proper medication.

Middle Ear

The tissue lining of the middle ear may be infected.

In *otitis media*, pus forms and settles in the middle ear cavity, and may cause a hearing loss. If properly treated, the loss is likely to be temporary.

The mastoid bone marrow and tissue may be infected.

Treatment for *mastoiditis* may include medication and, in some cases, surgery.

The eardrum may be ruptured.

A rupture or perforation of the eardrum can have a variety of causes, including extreme air pressure changes in the external canal, pressure from accumulated middle ear fluid against the eardrum, or accidental injury. Rupture of the eardrum can produce hearing loss, and may damage the tiny middle ear bones.

A torn eardrum can heal naturally, but if it leaves a thickened scar a mild hearing loss may result. A substantial rupture may require surgery. After surgery, hearing is improved in many cases. A totally missing eardrum may cause a significant hearing loss. Reconstruction of the drum may improve hearing and prevent infection.

The tiny bones in the middle ear may be immobilized.

In *otosclerosis* deposits form between the stapes bone and the oval window, restricting or immobilizing the chain's lever action. Significant hearing loss usually follows. Surgery is helpful in many cases.

Hearing losses of this nature, caused by blockage of the passage of air, or impairment of the mechanical movement in the outer or middle ear, are called *conductive losses.*

Inner Ear

In the inner ear, the delicate nerve mechanisms which convert mechanical energy —the movement of the fluid in the cochlea—into nerve impulses can be easily and permanently damaged in a variety of ways. The result is called a *sensori-neural* or *"nerve" loss.* Some of the more common causes are:

- birth defects
- illnesses with high fever
- the impact of a very loud sound which may cause immediate and incurable loss of hearing
- exposure to damaging but less intense sounds may cause a gradual loss over a period of time. Since there is usually no associated pain, this type of loss may pass unnoticed at first.
- drugs such as quinine and some of the antibiotics
- the aging process which may lead to a hearing problem called presbycusis: a gradual decline in hearing ability, especially for high-pitched sounds
- German measles, which may affect the hearing organ of the unborn child if the disease is contracted by the mother during the first few months of pregnancy
- Meniere's disease, or Meniere's syndrome, which produces increased amounts of fluid in a portion of the inner ear, causing head noises, nausea and dizziness, and hearing loss. This syndrome may often be alleviated by medical and/or surgical treatment
- vascular problems or injuries to the head which may damage the inner ear structure
- and, occasionally, tumors which may block nerve impulses traveling along the nerve which connects the cochlea to the brain.

In many sensori-neural losses the only effective solution is a hearing aid, along with training in lipreading. In some severe losses, lipreading itself may be the most effective solution, possibly assisted by the use of a powerful hearing aid. In some cases of profound sensori-neural loss, however, a hearing aid may be of little value.

Some people with defective hearing have both conductive and sensori-neural losses.

Effects of Hearing Disorders

Conductive Loss

Your first warning of a conductive loss may be a subdued quality in the sounds you hear. Familiar sounds will not seem as loud as they once were, and less intense sounds may not attract your attention at all. The quality of sound may be about the same, but the loudness or intensity will be reduced.

Sensori-neural Loss

If the sound of words seems undiminished but you have trouble understanding what is being said, especially in a noisy environment, you may be suffering from a sensori-neural loss. You may be unable to hear high-pitched sounds such as the ticking of a watch, the dripping of a faucet, or the high notes of a violin. You may also hear a continuous "hissing" or "ringing" as a background to the real sounds in your environment. Words may have a rumbling, "fuzzy" quality, and you may think that people are mumbling or slurring their words.

In a sensori-neural loss the hair cells in the larger end of the cochlea often deteriorate first. Since they are the ones which respond to high frequency waves in the cochlear fluid, high-pitched sounds tend to be the first to fade.

Some sensori-neural losses act as though a steep barrier had been placed across the path of hearing. Sounds too weak to penetrate this barrier may be severely reduced or inaudible; sounds loud enough to penetrate it may seem abnormally loud. This effect is called "recruitment."

Recruitment becomes a serious problem when the barrier is so high that the only audible sounds are those which are disturbingly loud. In some severe cases of recruitment, hearing aids may not be tolerated. In other cases, the aid may be modified or adjusted so that loud sounds are not amplified as much as soft sounds, and the overall effect is acceptable.

Deafness in the Very Young

Effects of Hearing Loss

Some children are born with defective hearing. Others may develop a hearing loss through illness or an accident, but in either case the earlier the diagnosis can be made, the better.

Lack of hearing can interfere with learning to talk. Speech develops as a direct result of hearing, and the child whose hearing is impaired usually has difficulty learning to speak. Worse, he has difficulty learning the meaning of words and acquiring a vocabulary.

Detecting Hearing Loss in Children

Even a minor, undetected hearing problem can distort a child's whole personality. Frequently a child who has been regarded as dull or mentally retarded is found to be hard of hearing, but normally intelligent. "Slowness," "inattention," "poor attitude," "refusal to participate in group activities," "mumbles his words" . . . these harsh judgments often conceal a quite different problem: defective hearing.

It is often difficult for a parent to recognize the signs of poor hearing, but if a child does not "sound as if he is trying to talk" by the time he is a year old, an examination by a qualified ear specialist or a visit to a speech and hearing clinic would be a good investment.

If a hearing defect is discovered, the chances are good that a solution can be found. Today, very young children can receive special educational assistance, and be fitted with hearing aids—with results that are often spectacular. The child becomes more alert and cooperative, his learning ability improves; his pleasure in living increases; he becomes more interested in the world around him; he is more *alive.*

What You Can Do about a Hearing Loss

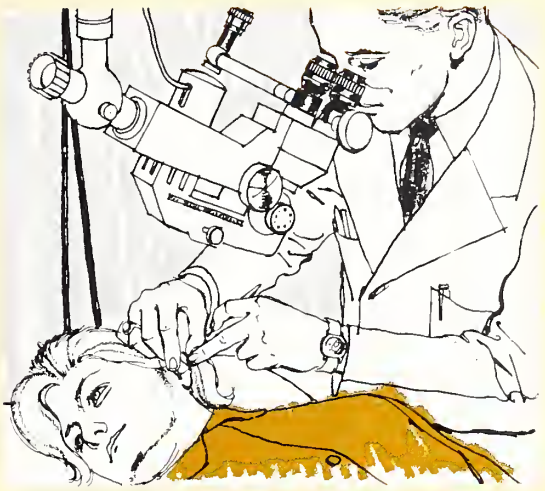
There are considerable differences of opinion as to the course you should follow when you decide to do something about your hearing loss. The *safest* course is to get all the best advice available to you in your area.

Family Doctor

If you follow this procedure, you will first consult your *family doctor.* Since hearing can be impaired by so many unexpected physical ailments, he may feel that a complete physical examination should be your first step.

Ear Specialist

If your doctor finds no physical ailment he can treat, he may refer you to a physician who specializes in problems of the ear; an *otologist* or *otolaryngologist.* This specialist will seek to determine the cause of your hearing problem, and may be able to restore some of or all of your hearing ability through medical or surgical treatment.

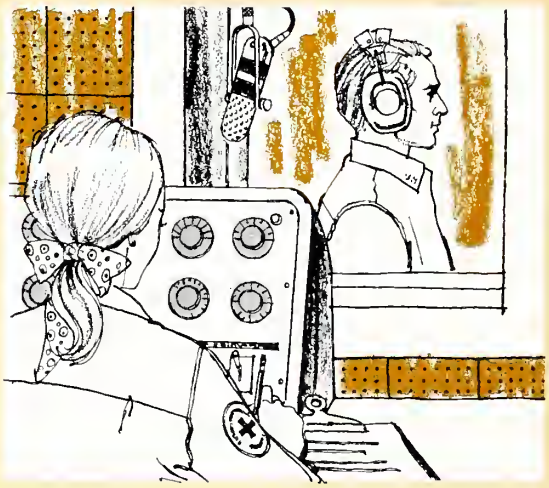


Audiologist

During the course of or following treatment, or if medical or surgical treatment is not indicated, the otologist may refer you to an *audiologist* for audiological testing, and for recommendations concerning a rehabilitation program. The audiologist is professionally trained in the testing, rehabilitation and counseling of people with hearing disorders. If the tests reveal that a hearing aid may benefit you, the audiologist will help you select the type of aid you need, and then he will refer you to a *hearing aid dealer.*

If your hearing loss is uncomplicated, and a hearing aid offers the best choice, the otologist may refer you directly to a dealer. In this case the hearing aid dealer will demonstrate the aids he sells, help you select and fit a particular aid, take the impression for your ear mold, help you learn to care for your aid, help you solve problems, maintain the aid, and make repairs afterward as they are needed. Many dealers also offer hearing tests in connection with fitting hearing aids. In over half the states, licensing now establishes the qualifications and standards of hearing aid dealers.

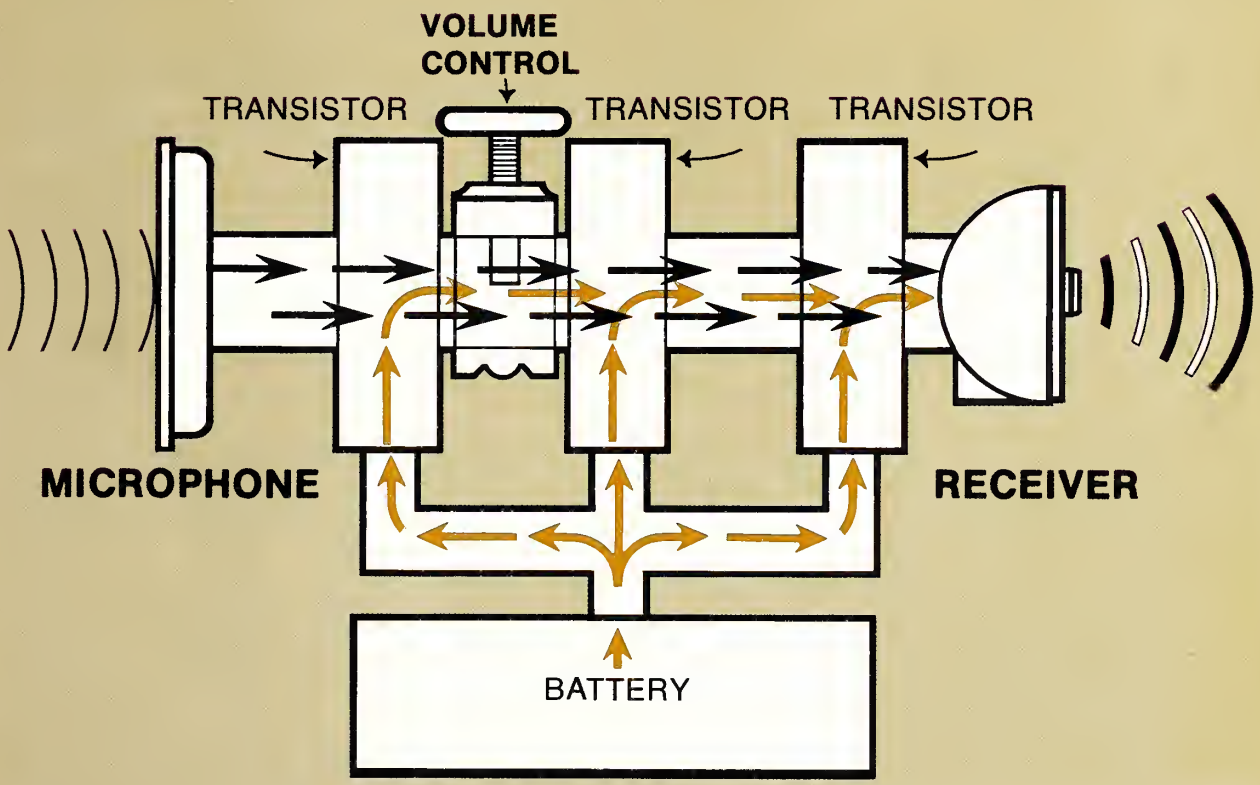
In a growing number of areas the problem of diagnosis and selection of a hearing aid is greatly simplified by the presence of a *speech and hearing center* associated with a hospital or university; a *community health clinic;* or a private *speech and hearing clinic.* Here you will find a wide range of services which may include an examination by an otologist; various types of hearing tests and a hearing aid evaluation by an audiologist; and auxiliary services such as lipreading, counseling and vocational guidance if your hearing problem interferes with your work. (See page 30 for information on hearing centers and clinics.)



There is general agreement that a medical diagnosis of your hearing problem should precede the fittting of a hearing aid.

The Hearing Aid

To understand how a hearing aid works it is helpful to think of it as a group of tiny components working together as a system to do one specific job: amplify sound. In this sense it is like your hi-fi set, but miniaturized and specially designed to be lightweight, inconspicuous, and highly efficient in bringing sound directly into your ear.



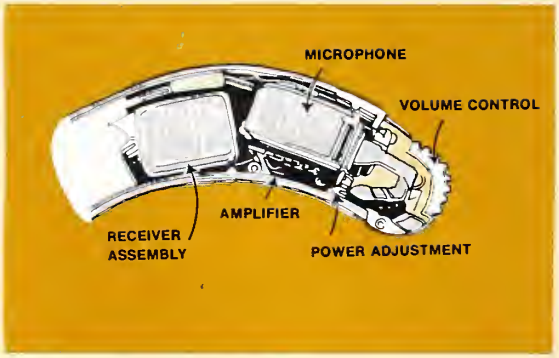
The system consists of a tiny *microphone* which picks up sound waves from the air and converts them into electrical signals, an *amplifier* which increases the strength of the electrical signals, a *battery* which provides electrical energy to operate the hearing aid, and a tiny loudspeaker called a *"receiver"* which converts the amplified signals back into sound waves and directs them into your ear through a specially fitted *ear mold.*

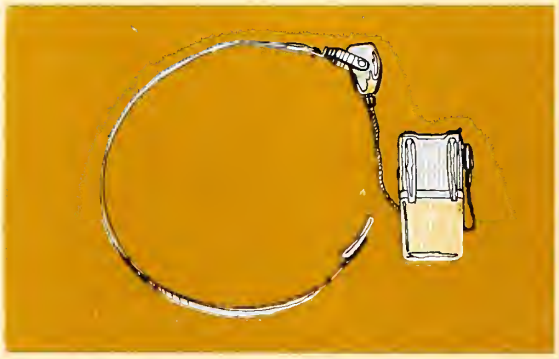
By increasing the intensity of the sound as it enters your ear, a hearing aid helps to offset your hearing loss. In some aids the amplified signal is fed into a bone conduction receiver, a device which sets up vibrations in the bone behind the ear. This type of aid is not widely used, but if the outer ear was never fully formed, or if there is a severe ear infection with drainage problems, it may be the most practical solution.

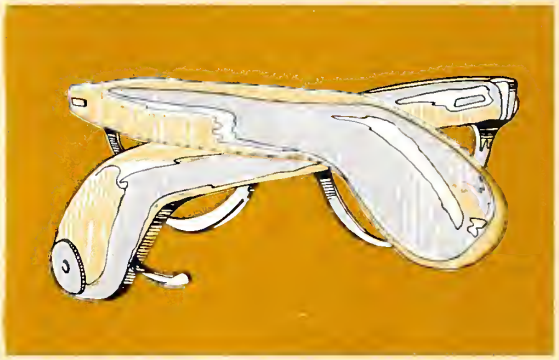
A few years ago, hearing aids were cumbersome units with large components and heavy batteries. Today, tiny "solid state" electronic devices such as transistors have reduced the instrument and its power source to a fraction of their former size and weight.

If your hearing loss is mild, you may get satisfactory performance from a device so small that it fits directly in your ear. If you have a severe impairment, you will need a larger, more powerful system; but even in the largest models, size and weight are not a serious problem.

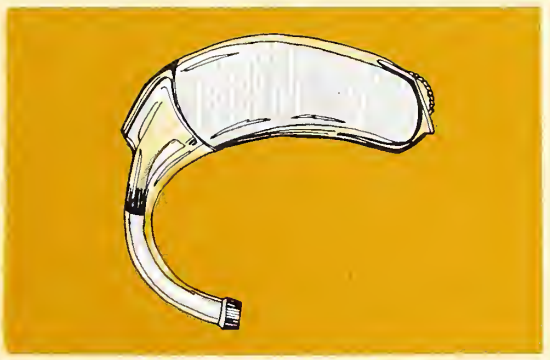
"In-the-ear" aids fit directly in the ear canal, supported by the ear shell, itself. These models have no external wires or tubes, and are very light in weight. They have a volume control, but may have no tone control. Generally speaking, they are useful only if the hearing loss is mild.







"Behind-the-ear" models are housed in a small curved case which fits neatly behind the ear. They can cope with losses ranging from mild to severe. The microphone, amplifier, and receiver are all housed in the hearing aid case, connected to the ear mold by a short plastic tube. Some models have a tone control as well as a volume control, and some come equipped with a telephone pick-up device.



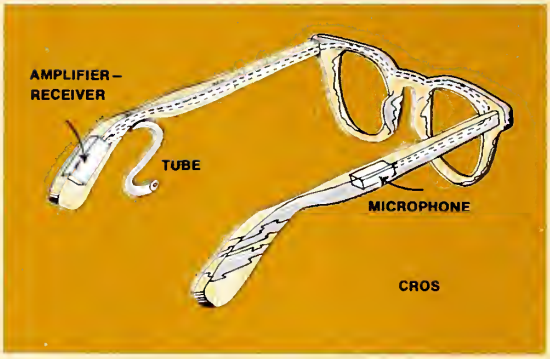
"Eye-glass" models are similar to behind-the-ear models, except that the device is built into an eyeglass frame. Bone conduction hearing aids are also available in the "eyeglass" style.

"On-the-body" models have a larger microphone, amplifier, and power supply enclosed in a case which can be carried in a pocket or attached to the clothing. They are more powerful, and the controls may be easier to adjust. The external receiver attaches directly to the ear mold, and is powered through a flexible wire from the amplifier. In some models a variable tone control enables you to strengthen or diminish, selectively and at will, sounds from different parts of the spectrum.

Monaural hearing aid systems are those of any type which provide amplified sound for one ear only.

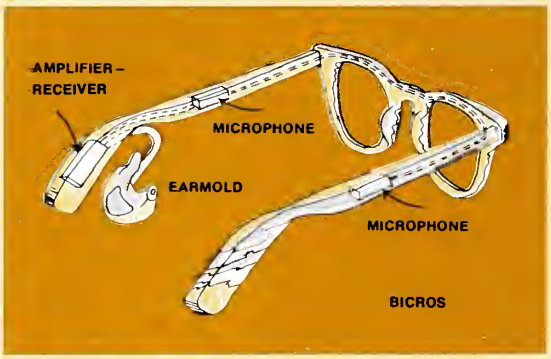
A *binaural* hearing aid system consists of two complete hearing aids—microphone, amplifier, and receiver—one for each ear. For some people, the binaural system increases the directional sense, helps to separate wanted sounds from unwanted background noise, and may increase the pleasure of hearing. Others find that the system is not worth the additional cost.

The *CROS* (Contralateral *R*outing *O*f *S*ignal) or "cross-over" system places the microphone beside the poor ear, and feeds the amplified signal to the better ear. This system may improve hearing by eliminating "head shadow"; that is, it prevents the head, itself, from blocking off sounds from the better ear. In some designs, the sound is carried to the ear canal by a plastic tube alone, eliminating the ear mold. This leaves the good ear partially open, and permits some sound to reach it directly.

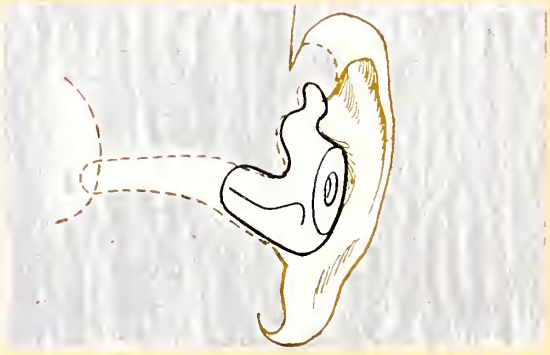


Recent experiments have shown that the CROS system may help make speech more understandable to people who have a high frequency loss in both ears.

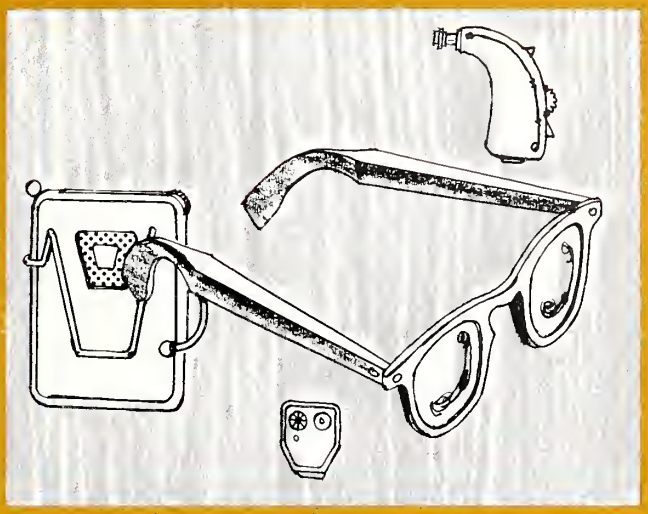
Excellent results have also been obtained in some cases by the use of a *BICROS* system. It consists of two microphones—one above each ear—which send signals to a single amplifier. The output from the amplifier goes to a single receiver which delivers sound to the better ear through a conventional ear mold.



The *ear mold* itself is an essential feature of the hearing aid system. It provides support for the aid, and directs the amplified sound into the ear canal with high efficiency—if it fits properly. If it does not fit properly it may cause whistles and squeals, or produce local irritation and soreness. Ready-made ear molds are available, but in order to achieve a good fit it is worth the trouble and expense to have a mold custom-made to the exact shape of your ear.



Selecting a Hearing Aid



When you go to buy a hearing aid you should not be overly influenced by price, except for the practical limitations of your pocket book. You may need an expensive aid, but on the other hand you may find maximum satisfaction with an aid which sells for half the price.

In selecting a particular aid, you have to take a major part of the responsibility. Hearing tests and expert judgment can determine the type of aid you need, but your own personal feeling about the quality of sound which the aid offers should be a major factor in making the final choice. Furthermore, only you can judge its comfort and convenience.

Bear in mind, however, that you may need a month or more to adjust to wearing the aid. A good approach is to rent a hearing aid from the dealer for a period of one or two months, and try it out in your home environment, and at work. By the end of that time you should know whether or not you are satisfied with its performance. Even though you will have to pay the rent and the cost of the ear mold, this step will probably be worth the effort.

Remember, too, that you are buying not only an aid, but also a set of services, including mechanical and electronic adjustments, counseling in the use of the aid, maintenance through the guarantee period, and repairs when they are needed. So it is wise to consider quality of service as well as quality of the merchandise.

Unless you are immobilized, or live in a very remote area, avoid itinerant salesmen, and "bargain offers" through the mail when you purchase a hearing aid. You need expert assistance in selecting an aid; you may need to make several visits for adjustments of the aid or the ear mold; and you need continuing assistance for several months as you learn to wear the aid with maximum efficiency and comfort. This kind of attention can rarely be provided by an itinerant salesman; it cannot be provided at all through the mail.

How to Listen

If your loss is a mild one, you may be delighted with your hearing aid from the very beginning. Suddenly, listening is easy again, and your fear of gradually being shut off from the world is relieved. The adjustment period may last only a few hours.

But if your hearing loss is more severe, particularly if it developed gradually over a long period of time, the *absence of sound* may have become a familiar part of your everyday world, and the use of a hearing aid may be in the beginning an unpleasant or even shocking experience. There is a great confusion of sound, and many of the individual sounds at first may seem meaningless.

Hearing aids are designed to favor sounds in the frequency range of speech. Some of the sounds that lie outside this range may be altered by the hearing aid, and seem unfamiliar. It takes practice to select what you want to hear from all these strange sounds.

Some unwanted sounds may seem excessively loud. People with normal hearing learn to block out or adjust to loud, unpleasant noises. Without quite knowing how they do it, they "turn off" traffic sounds on a noisy street so that they can hear a conversation; or filter out the confusing echoes in a church, and listen to a sermon with perfect understanding. When you begin wearing a hearing aid, you may have to learn how to do this all over again.

If you find that sounds continue to be unpleasant after a reasonable trial period, you should have the dealer or audiologist check the aid. It may have some design fault which exaggerates the noises around you to an unbearable degree; you may be using more amplification than you need; the mold may not fit properly, possibly because you are not inserting it the right way.

Your audiologist or dealer should have the patience and skill to help you through the adjustment period as you become accustomed to wearing your aid, but here are some suggestions which may make this period easier for you.

Begin with a comfortable volume level

In the beginning keep the volume at a level which feels comfortable for your ears even if you miss a few words. As you adjust to using the aid you can gradually increase the volume.

Begin with easier hearing challenges

Treat yourself to easy listening during the first few days or weeks. Don't be dismayed if at first you cannot understand low voices or hear a conversation perfectly in a noisy room. Stand close and face the person with whom you are talking, and don't be afraid to ask people to speak more distinctly.

Don't overtire yourself

If the aid begins to make you feel nervous or tired, turn it off or remove it. In a few weeks you probably will be able to wear it from morning till night without fatigue or nervousness.

Re-learn the trick of concentration

Because of your hearing loss, you may have forgotten how to concentrate on the "sound environment." Make a conscious effort to pay close attention to conversations, to music, to the quality of the sounds within your new hearing range. You will soon find that you are coming closer to nature, and to the people around you.

Don't be afraid to ask for help

Your friends and loved ones have a stake in helping you adjust to the hearing aid. You might ask them to touch your arm or make a gesture to attract your attention before they speak to you during the first few days. Ask them to speak slowly, clearly, and distinctly in a normal conversational tone. Shouting only makes it more difficult for you to hear.

Hearing in noisy places

You may be discouraged when you first try to follow a conversation where there is a high level of background noise. But be patient. You probably can learn to separate speech from background noise, or one voice from a number of voices around you. If your loss is severe, however, even the best of hearing aids may not help you much in a noisy room.

Hearing at church

In a church or auditorium, sit near the front and turn up the volume on your hearing aid as much as you can without making the background noises uncomfortably loud. You may miss some of the words the first time around, but be patient. Listening with a hearing aid is often a skill which must be acquired.

Listening to hi-fi or television

Recorded or broadcast speech and music may present something of a problem. The double distortion—in your TV or Hi-Fi and in your hearing aid—may make music and voices sound "canned" or artificial. But again, give it time. If your aid has a tone control, try different settings. Sit eight or ten feet away from the speaker; listen to the rhythm and pace of the sound. Soon you will be able to follow the action and the meaning with greater ease.

Listening over the telephone

If your hearing aid has a telephone pick-up switch, move the switch to "T" before using the telephone. The important thing to remember is that the *telephone receiver* should be close to the hearing aid microphone, rather than to your ear. You may also have to turn up the volume when you use the telephone switch.

If your hearing loss in the unaided ear is not too great, you may find it more practical to have the telephone company install an amplified phone. They are quite efficient, and you can control the loudness to suit your need.

Listen with your eyes

Your eyes can contribute much to understanding speech. Watch the lips, facial expressions and gestures of the person you are listening to. Even if you have only a moderate hearing loss, a course in lipreading may be well worth the time, effort, and cost.

Consider the environment

Hard walls, ceilings, and bare floors reflect sound. Draperies, carpets, upholstered furniture, and open windows and doors absorb sound. The out-of-doors soaks up sound like a sponge. Adjust the volume control of your hearing aid, and your hearing habits, to the environment. Eventually you will find a volume setting which will be comfortable for you under most conditions.

Be patient

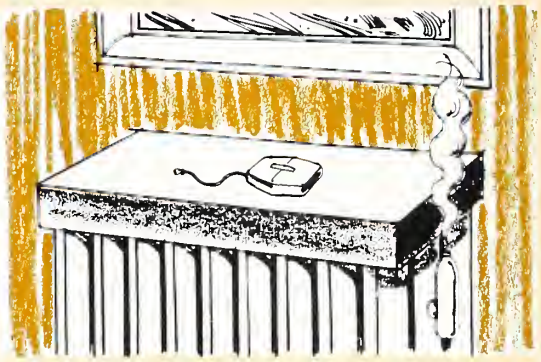
Patience is the watchword in learning to use a hearing aid. As your mind adjusts, noise and meaning will slowly sort themselves out, and within a month or two you will be using your hearing aid with maximum effectiveness.

Maintenance and Care

A hearing aid is a delicate mechanism. Gentle handling, a few simple precautions, and occasional maintenance will pay dividends of good service. If you make a *habit* of the practices listed below, you will avoid many of the problems which hearing aid users experience.

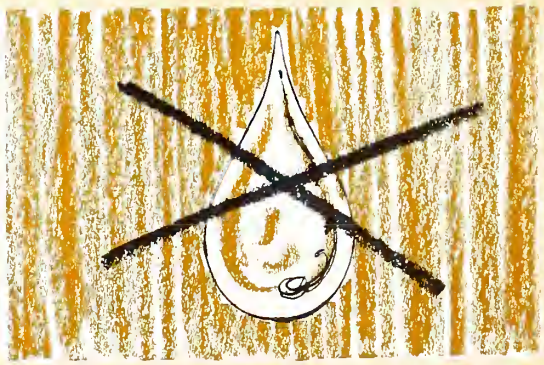
Temperature

Avoid high temperatures. High heat in the glove compartment of a car on a hot day; exposure to the blast from a hair dryer, or to direct summer sun; or too close proximity to a radiator can damage a hearing aid amplifier, and cause batteries to deteriorate.



Moisture

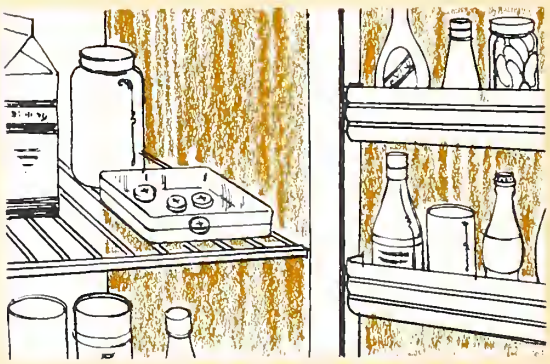
Keep your hearing aid dry. Even perspiration can cause damage. If you have trouble with excessive perspiration, you can purchase silica gel from your hearing aid dealer. Place the aid and a fresh package of silica gel in a plastic bag overnight, and the aid will be dry by morning.



Batteries

Keep several spare batteries handy, but buy only a few at a time. They tend to lose their strength as they age.

Store batteries in a cool, dry place. If you keep them in the refrigerator, let them warm up to room temperature and wipe them with a dry cloth before you insert them in the aid.



If you carry spare batteries in your pocket or handbag, wrap them in plastic to avoid accidental contact with metal objects.

Remove batteries from your aid at night. They will last longer. Occasionally a defective cell may leak, and removing the cell daily permits you to examine it and take it out of service before it damages the aid.

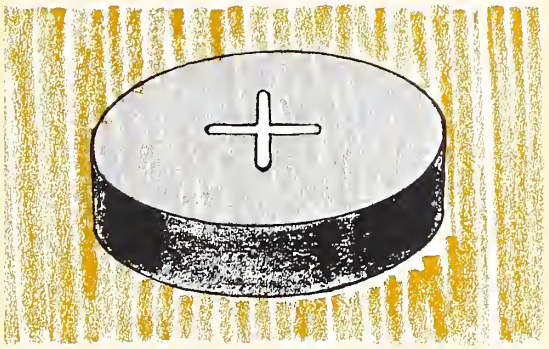
Keep battery contacts bright and clean. Poor contacts mean loss of power, and may cause a "frying" noise in your aid. If the contacts in the aid itself become corroded, ask your dealer to clean them.

If you notice a sudden decrease in battery life, ask your dealer to check your aid. Excessive drain on the battery usually means a defective aid.

Remove dead batteries from your aid immediately; otherwise they may leak and cause damage.

When you replace a battery, be sure the contacts of the battery match the markings on your aid.

Avoid the use of re-chargers unless you use batteries which the manufacturer labels as being re-chargeable.



Ear Molds

Keep the ear mold clean. If the opening becomes clogged with wax, clean it gently with a toothpick or pipe cleaner.

At frequent intervals the mold should be detached and washed with soap and water, or with a prepared cleaning fluid recommended by the dealer. Be sure the mold is dry before it is reconnected. One drop of liquid can block the passage of sound, and might also damage the aid. Do not use alcohol as a cleaning agent, since it may dry out the material and cause it to crack. *Never* use carbon tetrachloride, or cleaning solutions containing this chemical, to clean your ear mold.

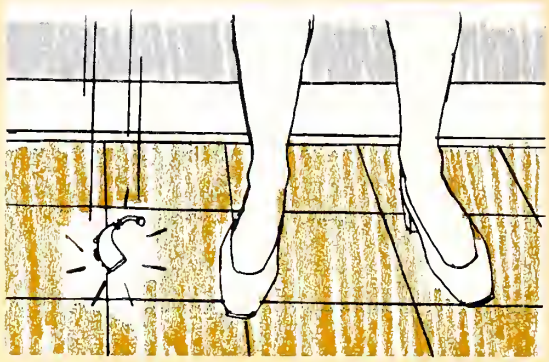
Tubing and Cords

If you have a behind-the-ear or eyeglass type of aid, the tubing will have to be replaced at intervals.

If you have a body-worn aid, the cord will eventually wear out or develop a short and have to be replaced. Avoid twisting the cord, or bending the tubing.

Protect the aid from hard knocks

A hearing aid is a delicate mechanism. Avoid dropping it, or bumping it against hard objects.

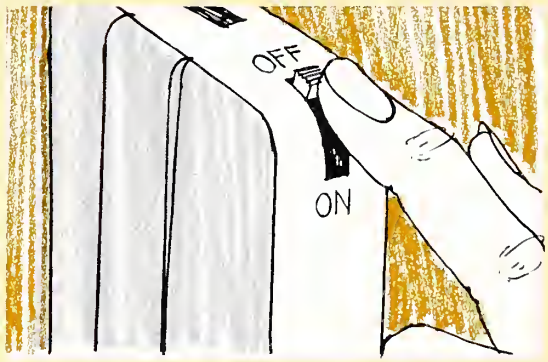


Hair spray

Do not use hair spray while wearing the aid. The spray may cause expensive damage to the microphone.

Removing the aid

Develop the habit of turning the switch to the "OFF" position before you remove the aid. When the switch is in the "ON" position the battery is discharging whether you are wearing the aid or not.



Repairs

Do not attempt to repair the hearing aid yourself. Only an expert can service it. In this regard your hearing aid is like your watch or radio. If it is not functioning properly, ask your audiologist's or dealer's assistance.

Emergency First Aid

There are a few "home remedies" you can safely try which may save you a trip to the dealer:

- If the hearing aid does not work at all:
  1. Try a fresh battery.
  2. Check the battery to see if by mistake you have connected the "+" contact of the battery with the "—" contact in the aid.
  3. Check the tubing. If the tube is bent too sharply it may be blocking the sound.
  4. If your aid has a telephone pick-up, check the switch. You may have it set in the "T" position.
  5. If you have a body-worn aid, try a spare cord. The old one may be broken or shorted.
  6. Check the ear mold. It may be plugged with wax.
- If the sound from the aid is weaker than usual:
  1. Try a fresh battery.
  2. Check the tubing to see if it is bent, and the ear mold to see if it is clogged.
  3. If the aid has been exposed to extremely cold weather, it may not work properly until it is restored to room temperature.
  4. Try re-fitting the ear mold. (See below.) The aid may be whistling at a frequency you cannot hear.
  5. Ask your doctor to see if you have excessive wax in your external ear canal.
- If the aid "goes on and off," or makes scratchy sounds:
  1. Work the switch back and forth. Sometimes dust or lint will interfere with electrical contacts.
  2. On body-worn aids, try removing and inserting the plugs connecting the receiver to the aid. If the problem persists, try changing cords.
- If the aid makes a whistling sound:
  1. Remove the aid. If this increases the whistling sound, put your finger over the opening in the ear mold. If the whistling stops, the problem may be improper insertion of the ear mold, or a poor fit. Re-insert the ear mold carefully, and try the aid again. If the whistling persists, consult your dealer.

Common Questions New Hearing Aid Users Ask

"What can I do about wind noise?"

You will gradually learn to protect the microphone from the direct blast of the wind, but it will always be troublesome. A wind screen may help. Ask your dealer if he has one for your particular type of aid.

"Why does the ear mold hurt my ear?"

You may not be inserting it properly, or it may need to be re-fitted. Talk over the problem with the dealer who fitted the mold. *Do not accept an ear mold that hurts.*

"How can I learn to insert my ear mold properly?"

Ask your dealer to help you learn the proper way to insert the mold; then practice until it becomes easy to do.

"Should I wear my aid full time?"

You don't have to, particularly if you have a very mild hearing loss. But if you want to get the most benefit from the aid you will wear it as much as you can within the limits of comfort and convenience.

"Why does my hearing aid make background noises louder?"

A hearing aid amplifies every sound within range of the microphone, including background noise. You will probably be able to train your mind to block out the noise and concentrate on speech and the meaningful sounds you want to hear. If noise continues to bother you, discuss the problem with your dealer. When your aid is adjusted properly, you have the best chance of separating speech you want to hear from unwanted background noise. It is also possible—though not likely—that your hearing loss is of a type which makes it impossible for you to adjust to amplified sound.

"Why do people raise their voices when they see my hearing aid?"

It is natural for people to try to help you. If you ask them to speak in a normal, conversational tone they will quickly forget that you are wearing an aid.

"Can I do anything to reduce clothing noises in my body-worn aid?"

Try wearing soft, unstarched garments in contact with the aid. A hearing aid carrier garment may reduce the noise considerably. If the noise is too troublesome, consult your dealer.

"My aid feels bulky behind my ear."

A behind-the-ear aid may feel bulky at first, because you are not used to it. But it is quite light, and has been contoured to fit your ear, so you will probably get used to it in a few days.

"I feel a fullness in my ear when I wear my aid."

You may be feeling the air trapped between the tip of the ear mold and your eardrum, or you may have wax in the external ear canal. If the sensation continues to bother you, the dealer can probably alter the mold and relieve the problem.

"How can I overcome my embarrassment when I wear my aid?"

After a little while you will probably regard your aid as one of your most valued possessions, as essential as eyeglasses to those who have problems with vision. Once you discover the advantages of your aid, you'll forget it is there—except when you stop to appreciate the listening benefits it provides you.

Hearing Aid Costs

Hearing aids come in many types, designs and styles. Some are simple instruments which do a straightforward job of amplification; others provide a variety of special features such as a telephone pickup and adjustable tone and volume controls. They range in output from tiny in-the-ear models, suitable for people with mild losses, to powerful body-worn aids for people with severe losses.

Hearing aid prices vary widely, depending largely on the type of aid, the number of special features incorporated in the design, and the services provided by the dealer. The price may include the cost of fitting the ear mold, rent of the unit during the trial period, service during the guarantee period, and, generally, continuing advice throughout the life of the aid.

Retail prices of nationally advertised hearing aids range from below $100 for a simple design to over $700 for the pair of aids in some dual-system binaural designs. This great diversity of prices and designs emphasizes the need for the best advice available in your area. First, be sure that a hearing aid is what you need. Then, before you spend your money, make sure that you are getting the most for your hearing aid dollars.

Battery Costs

Battery costs depend in part on the type of aid, and in part on the way the aid is used. The cost of a single hearing aid battery is not large, but if you use your aid constantly during waking hours—and you probably should—the cost of replacement batteries can become a substantial item in the course of a year. Ask your dealer to give you an estimate of battery cost and expected battery life, under normal use, for the various aids you are considering.

To protect your batteries and get maximum service from them, follow the suggestions for battery care on page 22.

Guarantee

Before you complete your purchase, reach a definite agreement with your dealer about the details of the transaction. Is the cost of fitting the ear mold included in the price of the aid? Will the dealer help you adjust to wearing the aid during those critical first few weeks? How long will he provide free service? Will he help you with problems if they develop as you wear the aid under varying conditions? Will he give you a written warranty?

Your warranty is your basic agreement with the manufacturer, and it should be backed by your dealer.

If a disagreement should arise which cannot be solved by direct negotiations with your dealer, you can write to the president of the hearing aid dealers association in the state in which the hearing aid was purchased. Nearly any dealer will provide you with the name and address of the President of the State Association. The Association will refer your complaint either to the Ethics Committee Chairman, or the Grievance Committee Chairman. You should receive a prompt acknowledgement of your letter, and your complaint should be handled in a reasonable length of time. If there is no state association, you can write directly to the National Hearing Aid Society. You may write directly to Society headquarters. For the address, see page 30.

In half of the states, dealers are now licensed. In those states, complaints can be directed to the State Hearing Aid Licensing Board, in care of the State Capitol.

Professional Services

Fees charged for medical examinations, hearing tests, and hearing aid evaluations vary widely, depending on such factors as where you live and the type of problem you have. For your protection, have a clear understanding with your otologist and/or audiologist about fees before your tests begin.

Financial Assistance

Financial assistance is sometimes available for those on limited budgets who need hearing aids. Your audiologist, dealer, or a local hearing center or clinic may be able to tell you if assistance is available locally. If not, you can call:

- your local Community Chest or other social service organization;
- your State Vocational Rehabilitation or Public Health Department;
- or write to:

  Office of Deafness and Communicative Disorders
  Rehabilitation Services Administration
  Department of Health, Education and Welfare
  Washington, D.C. 20201

In some states the Medicaid program offers assistance to those who qualify.

The Veterans Administration furnishes hearing aids to veterans who have met the necessary requirements for eligibility and entitlement to such care. For further information as to their individual status, veterans having a hearing disability should contact their nearest VA office or hospital.

Regional Information

For information about speech and hearing clinics and centers write to:

American Speech and Hearing Association
9030 Old Georgetown Road
Washington, D.C. 20014

National Association of Hearing and Speech Agencies
919 18th Street NW.
Washington, D.C. 20006

For information about qualified hearing aid dealers in your area, write to:

National Hearing Aid Society
24261 Grand River
Detroit, Michigan 48219

VA Hearing Aid Performance Evaluation Program

Each year the Veterans Administration invites hearing aid manufacturers to submit a limited number of models for performance evaluation and possible selection for contract. The maximum number of manufacturers electing to participate has been 22, and the total number of hearing aid models has never exceeded a high of 93 different models. The number of different models submitted by all the manufacturers who elect to participate in the VA program usually represents about twenty percent or one-fifth of all the models produced and offered for sale in the United States. While information regarding the models considered and those selected on contract is available from the Veterans Administration, it must be remembered that the agency's program is geared to caring for veterans who have incurred hearing disabilities related to their service in the Armed Forces of the United States. To meet its obligation to deafened veterans, the Veterans Administration has established a program which will permit selection of a group of high quality hearing aids deemed satisfactory for issue to eligible and entitled deafened veterans.

In relation to its Hearing Aid Performance Measurement Program, the Veterans Administration emphasizes the following points:

"(1) There is no 'best' hearing aid for all individuals. Aids that test well for one person may not test well for someone else. The VA, for instance, examines each eligible veteran before issuing a hearing instrument. VA's general advice to a person with a hearing disability is to seek professional guidance in obtaining the aid best suited to his particular problem.

"(2) VA does not test all hearing aids—only those submitted by manufacturer-bidders who want to participate in the VA program. Some manufacturers do not participate at all in VA's program, and others submit only one or two of their models for VA consideration. Therefore, VA lists should not be used as an absolute buying guide, and persons not finding the aid they now wear listed among those VA buys should not automatically conclude the device they have is inferior."

For information about brands tested, write:

Director of Information Services
Veterans Administration
810 Vermont Avenue NW.
Washington, D.C. 20420

SUPPLEMENTAL READING

Hearing Loss—Hope Through Research
Public Health Service Publication Number 207

Dizziness Including Meniere's Disease—Hope Through Research
Public Health Service Publication Number 1651

For free copies, please send a postal card request to:

Neurology
Building 31
Room 8 A 22
Bethesda, Maryland 20014

How to Choose the Right Hearing Aid for You
Write to:

National Hearing Aid Society
24261 Grand River
Detroit, Michigan 48219

For a bibliography of additional pamphlets on Deafness, Speech and Hearing, write to:

The Volta Bureau
3417 Volta Place, NW.
Washington, D.C. 20007

For a more detailed technical paper on hearing and hearing aids, consult:
Hearing Aids

NBS Monograph 117
Order from Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Price 35 cents

U. S. GOVERNMENT PRINTING OFFICE : 1971 O - 447-527

For further information contact:

National Bureau of Standards
Washington, D.C. 20234
(301) 921-3434

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