

## ACOUSTICS

# Our World Grows Noisier

Jet engines being tested, huge trucks rolling through city streets, steel works, street cars all add up to a noisy world that makes millions uncomfortable.

See Front Cover

By WADSWORTH LIKELY

► JET ENGINES, factory machinery, the roar of city traffic—the noise goes upward in a cacophonous crescendo — the theme song of our civilization.

It hurts our ears. It can deafen thousands.

It has reached the point where thousands of dollars are being spent each year on anti-hearing aids—on ways to make our civilization pipe down a little, at least to a bearable level.

The noisiest noise in our factories is the sound of a jet engine with afterburner being tested. The noisiest noise in the open air is that of traffic on a city street.

Some noises there is no escaping. This is true of the jet engines. One of the surest ways of testing these engines is to listen to them. Many defects first show up in the changes in sound and the motor can be stopped before it is damaged.

The intensity of the sound of a jet engine, 50 feet away from its tail assembly, has been measured at 134 decibels, the loudest industrial noise today. Inspectors and other workmen have to go closer to the engine than 50 feet.

The plane manufacturer has two problems. First, he has to protect the men who must work close to the jet engines from bodily damage. Second he must protect the other workmen in his factory and the people who live or work near his plant from the roar of the jet engines.

He has two channels of attack. First, he can try to reduce the sound at its source. For instance, mufflers are built into the test cells and the tails of the jet engines fit into the mufflers.

Then he can try to keep as much of the original sound as possible from getting far away from its source. He builds thick walls, which confine it, and he covers the inside of those walls with material which will absorb the noise.

The massive concrete structures shown on the cover of this week's SCIENCE NEWS LETTER are test cell intakes for jet engines on test. Their design helps to reduce sound levels of engines being tested.

The jets are only the most recent and most fearsome examples of industrial noise. Factories which work with metals or electrical power transformers send out noises which cut down the efficiency of the men who have to work with them and annoy the neighbors.

The noise in our factories has been going steadily up as our civilization becomes more complex, and now the Korean crisis has sent it to a new high. Not too much is yet known about the physical effects of sound on the human body, but some sounds can cause permanent deafness in some people, if they are subjected to it long enough.

The noise of the water dripping out of the faucet, or a feather falling to earth, or a jet engine tuning up is basically the same thing. It is a pressure variation set up in air by a vibrating object. The air carries these pressure vibrations to the ear drum. The drum moves back and forth, very rapidly, in response to these pressure variations. We have learned to recognize the different speeds and intensities which various sounds set up and to interpret them in our brain.

We can best hear and understand the sound of the human voice when the intensity of the sound is between 40 and 90 decibels. When sound goes up to 120 decibels, we experience discomfort and an-

noyance. Above 140 the sensation becomes definitely painful.

Evidence about mechanical damage to the ear is scanty, but in two cases the ear was ruptured at about 160 decibels.

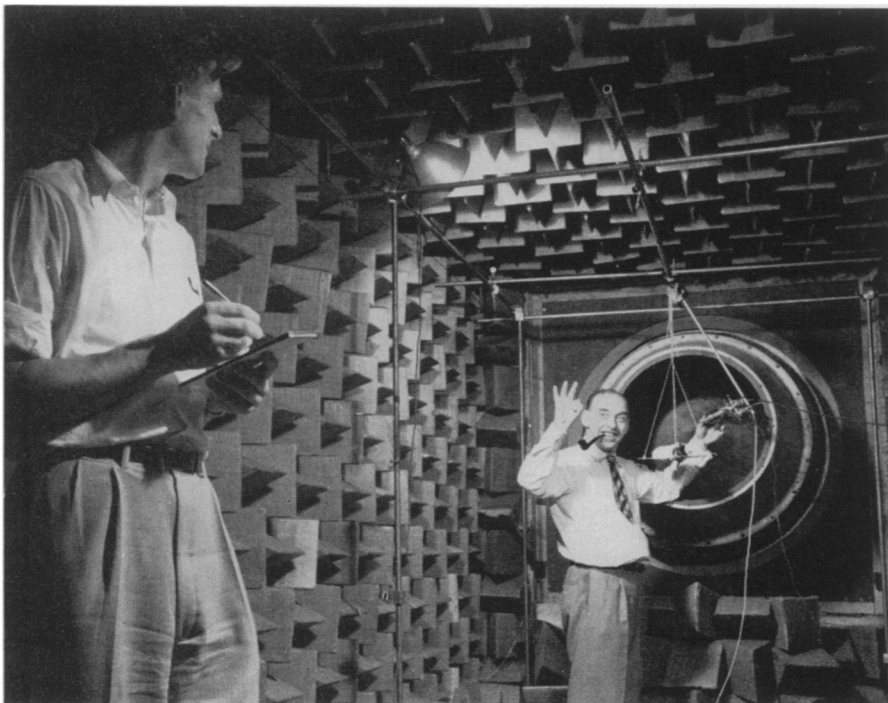
Sound can make you deaf without rupturing the ear. Here again the data are incomplete, but there is clinical evidence that permanent deafness does result when men are exposed daily to noise over a long period of time. Under those conditions, it is generally agreed, the maximum safe noise intensity is about 85 decibels—quite a bit under the intensity of a jet engine.

And relatively short exposures to intense sound can produce temporary deafness in a number of cases.

The problem of industrial noise has become serious enough so that scientists are working on methods of combating it. Physicians, psychologists, architects and physicists are all working on the problem, each from his own angle.

Reducing the transmission of sound is mainly obtained by providing sound barriers. With a non-porous wall, the weight of the wall is the determining factor and it has to be rather heavy and thick to provide adequate sound insulation.

However, the weight factor can be reduced by building the wall in several layers



**SOUND-PROOF ROOM**—Fiber-glass acoustical insulation is used in this room for testing the effects of noise on hearing. Siren produces sounds whose levels and intensities can be accurately measured.

that are attached to each other in as few places as possible. The fewer the attachments for supporting the inner layers, the less sound transmission there will be. With no connections, you can lose 45 decibels through the use of a one-half inch plaster-board double wall.

What about the noise inside these barriers? Sound absorption must be relied on. Already in almost every room the materials used for furnishing and the people themselves absorb some of the sound. Adding a sound-absorbing material to the ceiling may not reduce the number of decibels of sound much more.

However, a small reduction in decibels may seem like a much larger reduction in loudness to the ears of the people who have to work with the sound.

Acoustic materials can also be used for controlling the reverberations of sound in a room. This can be overdone, so that the room is said to sound "dead."

The National Bureau of Standards has been experimenting with what they call space-absorbers. These are geometrical forms such as spheres, cubes, cylinders and pyramids. They are hung from the ceiling at various points in space in the room.

It has been found that these are much more efficient than the same amount of material applied to a flat wall because that side of the material facing the wall is useless. They are useful where not enough sound absorption can be achieved on the wall surfaces.

A special adaptation of this principle is in jet engine test stands. Honeycomb structures made of sound absorbent walls or streamlined baffles placed in the exhaust stacks cut down the noise considerably.

Architects are now considering noise levels when they begin drawing their plans and deciding construction methods.

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**Whales**

► WHEN WE get to talking about the biggest animals that ever lived, we are apt to forget that they are still living.

Dinosaurs are what our minds jump to or mammoths and mastodons; but the mammoths were pygmies compared with the dinosaurs that roamed the earth long before their time, and the dinosaurs would have to yield first place for size to the modern whales.

The humpback whale is credited with a length of 60 feet, the right whale with

70, a chalong with 80, while the blue whale has been known to reach a length of 85 feet.

Such size, of course, would be impossible to a land-dwelling animal. Whales can make it because they are supported on all sides by water, which is somewhat more dense than their bodies, and therefore takes up much of the burden that would have to be borne by bone and muscle and skin in land animals.

Whales are excellent examples of what adaptation to an environment can do to animals. They are mammals, warm-blooded animals that presumably once lived on land. But having taken to the water and lived there for many generations they have developed streamlined, fish-shaped bodies so perfectly that earlier generations naively classified them as fish.

Thus it came to pass that popular imagination saw the "sea monster" or "great fish" of the story of Jonah in a whale, and has been wrangling about the size of the whale's gullet ever since. And even the great Milton attributed to the whale a "scaly rind" as though it were a fish.

Whaling today is such a science that many of the heretofore unknown intimate details of the life histories of whales are being uncovered. But for the ordinary person who may not often get a chance to see a whale, even one stuffed in a museum, many restaurants throughout the country are now serving whale steak.

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