

Investigation into the Taos Hum

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Team Forms to Study Taos Hum

A team of university and federal laboratory scientists and engineers will use a battery of sophisticated instruments to investigate a mysterious noise dubbed "The Taos Hum" by outsiders and simply "The sound" by worried Taosenos.

The low-level hum, which has been described as a rumbling or grinding sound, began in the spring of 1991. Some residents have also described a more annoying, high-frequency sound. It can be heard by some people and not others and can be masked by the wind or household noises.

Residents in the Taos area have complained about the sound and some fear it could be a health hazard. "These people are not kooks. There is something that is really bothering them -- enough to cause some to leave their homes," says team member Joe Mullins, chairman of the University of New Mexico's Mechanical Engineering department. "Several of us guess that whatever it is, it's more complicated than one source and one sound. It will be very hard to sort it out. A lot of good people have already worked on this thing and gotten nowhere."

A Los Alamos National Laboratory scientist and a sound specialist from Los Lunas consulting company in September did some early measurements using infrasound microphones. Accompanied by people who had heard the sound, they gained little information.

Although speculation abounds about its source -- the military is usually blamed -- no one yet knows what's causing the hum. Senior Department of Defence officials have repeatedly said they are unaware of any activity, classified or otherwise, that could be the source.

Nobody we have consulted knows of anything that the military is doing that could cause it," says Mullins.

Following Rep. Steve Schiff's request for assistance, a team was formed that now includes scientists and engineers from Sandia National Laboratories, UNM, the Air Force's Phillips Laboratory and Los Alamos.

Hearing experts from the UNM Medical School will also participate. Before the end of May, the team plans to begin seismic, acoustical and electromagnetic measurements.

Sandia and Los Alamos, which have developed a number of sophisticated instruments to perform treaty verification work, have staff members skilled in measuring sounds and electromagnetic signals at all frequencies, Mullins says. In addition, Phillips has geophones used to measure vibration in the ground. UNM will contribute expertise in Taos area geology and in the human perception of sound.

"We will do extensive measurements around Taos and get people who've heard the sounds to sit with us, Mullins says. "We want to interview more people who have heard the sound and try to get as much information as we can.

The hum may not be just a New Mexico phenomenon, Mullins notes. Similar low-frequency hums have occurred in other areas, often close to mountains. Sources of such sounds are both natural and human-made. For example, "microseism," the faint ground motion resulting from ocean waves pounding the California and Gulf coasts can be measured in Albuquerque, and the jet stream rushing over mountains can cause channels of sound. However, there is no obvious link between these sounds and the Taos hum, Mullins says.

A 1989 study by the City of Albuquerque, brought on by residents' complaints of a similar sound, was inconclusive. An investigator for the Environmental Health Department wrote that the sound was not water in pipes, phone, electric or gas lines; or a government experiment. He speculated that the noise was "a product of nature."

British researchers investigating similar complaints have so far identified industrial sources such as factory fans or huge, underground water pumps. However, Mullins says, in initial studies, "we haven't

found anything that comes close to explaining this."

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Scientists Continue Work on Mysterious Sound

Scientists and engineers who spent a week in Taos investigating the so-called Taos Hum" say the strange phenomenon may not be a sound, nor is it unique to Taos. I believe it's not an acoustical signal that people are sensing," said Horace Poteet, a team member from Sandia National Laboratory who can hear the sound. If it were, then one of the microphones would have sensed it. Similarly, the team so far has found nothing obvious in seismic and electromagnetic signal measurements collected during field work the last week of May. However, they will continue to analyze sound, electromagnetic and seismic data over the next few weeks in hopes of gaining new information. They expect to have a preliminary report by the end of June.

"We've done a lot of measurements and run into a few mysteries," said Joe Mullins, of the University of New Mexico. "Right now we're not close to being able to say anything. It's disappointing to all of us." The low-level tone, which has been described as a rumbling sound, began in the Taos area in the spring of 1991, although Albuquerque residents complained of a similar sound in 1989. Some residents have also described a more annoying, high-frequency sound. Few people can hear the sound, and it can be masked by the wind or household noises.

Following complaints from residents in the Taos area, Congressional representatives asked the national laboratories to look into it. A team was formed that now includes scientists and engineers from Sandia, Los Alamos, Phillips Laboratory and UNM.

Team members, accompanied by Taos residents who hear the sound, used highly sensitive equipment to detect, measure and record acoustic, electromagnetic, and seismic signals. An 18-inch, low-frequency microphone, which Mullins designed and team members built over one weekend in his garage, helped rule out sound. The big microphone was placed in a guest house at the home of Bob and Catanya Saltzman, where hearers say the sound is particularly strong. In addition, conventional laboratory microphones were arranged in a triangular array outside the house. Measurements from the four were recorded.

"We'd go in, listen, look at the microphone output, and there was nothing there but background noise, said Mullins, who is chair of UNM's mechanical engineering department.

From a signal generator and loudspeaker that simulated the sound, seven hearers selected low-range frequencies from 33 to 80 hertz. (Hertz is a measure of frequency. Human hearing range is between 20 and 20,000 hertz. The simulated sound was measurable. "it was a huge signal -- about 10,000 times the power of background noise," Mullins said.

Other equipment included: Geophones, which measure seismic signals created from ground movement. Geophones are normally used in seismic studies of oil fields aid in treaty verification work.

Magnetometers, which measure magnitude and direction of magnetic fields.

Electromagnetic antennae, which measure electrical and magnetic fields from power lines, cloud charges, radars, or radio transmitters. This equipment is normally used to check weapon system vulnerability to electromagnetic signals.

Readings from these instruments have so far revealed nothing dramatic. Typically, the electromagnetic levels observed are far below what research indicates people can sense. Poteet said.

"Right now, we're trying to chase down what looks like power line harmonics." said Mullins. It could cause some sounds or perceptions. we don't know if that's what people hear." Computer analysis from field recordings may bear more information, including frequencies, amplitudes,

timing, direction and correlations in data.

In the next stage of the investigation, hearing experts from the UNM Medical School will also participate. Dr. Fred Herzon, an ear, nose and throat specialist, said medical professionals will want to know why some people hear the sound and not others.

The sound is not just a Taos phenomenon, Mullins said. British researchers have been studying low level sounds and vibrations since the 1970's. With publicity surrounding this investigation, Mullins has gotten calls from people all over the country with similar complaints.

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Hum Investigation: Source Still Unknown, Questions Raised

Scientists and engineers investigating the Taos Hum did not detect the source of the mysterious and annoying sound heard by some Taos area residents, but they continue to believe the phenomenon is real. Their report, released today, raises questions about the area's electric power grid and the proliferation of electromagnetic noise,

In the next stage of the investigation, scientists will focus on how the ear perceives low frequency energy.

"It's a scientific mystery, which is evolving, says Jim Kelly, a hearing specialist at the University of New Mexico School of Medicine. We're not going to drop the ball on this investigation, if anything, it's more interesting rather than less."

The low frequency hum, which hearers liken to an idling diesel engine, began in the Taos area in the spring of 1991, although Albuquerque residents have complained of a similar sound since 1989. Publicity about the Taos hum has prompted hundreds of calls from sufferers all over the country. For some, the hum is a small annoyance: others have suffered pressure on the ears, nose bleeds, dizziness and headaches. All say the hum disturbs their sleep.

Following complaints from residents in the Taos area, Congressional representatives asked the national laboratories to look into it. A team was formed of scientists and engineers from Sandia and Los Alamos national laboratories, Phillips Laboratory and UNM.

During the last week in May, team members, accompanied by Taos residents who sense the hum, used highly sensitive equipment to detect, measure and record acoustic, electromagnetic, and seismic signals, all the known energy sources of sounds or vibrations. They took measurements in four locations where hearers sense the hum strongly -- the home of Bob and Catanya Saltzman south of Ranchos de Taos, the Taos golf course, three sites in the Tres Piedras area west of Taos, and, at a later date, sites near Lumberton and El Rito.

Measurements revealed nothing dramatic or obvious in Taos, although team members were able to rule out external sound.

"There was nothing unusual," says Joe Mullins, a UNM mechanical engineering professor. "There were no large signals we, don't see other places, nothing out of the ordinary."

The team, looked for electromagnetic signals that might indicate radar, ELF (extremely low frequency) radio transmissions, or other Department of Defence activities and found none.

"We're all very disappointed," says Horace Poteet, of Sandia National Laboratories, who can also sense the hum. We hoped we could help these people.

Team members say some people could be unusually sensitive to radio frequency or microwave radiation from the growing volume of electromagnetic noise as society relies more and more on electric gadgets, microwave communications and cordless devices. It's a fact that we're slowly building up the background of electromagnetic noise," says Mullins. "We're going to more and more cordless things, all electromagnetic transmitters. Whether that's the cause of the hum, we don't know, but we can't write it off!

One curious aspect of readings taken in the field north of the Saltzman house was the high levels of 60-hertz signals and their harmonics (signals at 120 hertz, 180 hertz and other multiples). (Hertz is a measure of frequency.) Measurements showed that these signals were present on the Taos area electric power arid.

"It was apparent that stray fields along the ground were quite strong, even well away from any power lines," according to the team's report. "However, there were no firm indications that the presence of these strong overtones were somehow responsible for the hum."

The hum, a bona fide scientific mystery, deserves additional inquiry, the report says. Because external, physical possibilities have been examined, UNM, scientists now want to look at the human side of the puzzle -- hearers themselves -- as the best remaining approach to identify the source.

Possibilities include unusual hearing sensitivities, effects on ears from some interaction with the environment, or disorders of low-frequency hearing. They may even find that the ears have a new way of perceiving energy.

The goal of this research is to identify the source of the hum, internal or external to the ear, and to suggest ways to reduce its impact on sufferers.

Kelly dismisses hearing impairments like tinnitus, which causes a high-frequency ringing in the ears, as the likely source of the hum, but he is interested in otoacoustic emissions, or sounds actually produced by the ear. Most studies of this phenomenon ignore frequencies below 250 hertz, and little is known about the region of the inner ear that receives low-frequency sounds.

The receptor cells of the cochlea, in the inner ear, are the subjects of increasing interest. In the last ten years, scientists have learned that they don't just receive sound but vibrate actively and can be provoked or tuned to resonate at particular frequencies. Something in the environment may be causing people's ears to emit sounds they can then hear, according to the report.

Another factor is that humans can focus on particular sounds; this is known to increase perception of a sound, especially an annoying one. The brain may do this, scientists have learned, by changing physical properties of the inner ear's receptor cells.

"It's not surprising that people can select for the hum. If they're disturbed by a sound, they may selectively attend to it," says Jim Kelly.

"Otoacoustic emissions are also extremely important.

They're a carefully studied phenomenon in hearing science. That's why we're focusing on them. They're the best candidate for this." "We'd like to help people who are suffering, and obviously there is something to be learned here," says Mullins.

March 16 1994

Second Phase of Research on Taos Hum Begins

University of New Mexico researchers will begin the second phase of study on the "Taos Hum" this month with work that has broader applications in medicine.

Jim Kelly, an ear specialist with the UNM School of Medicine, is surveying residents of Taos and the surrounding area to learn who perceives the mysterious sound, which has troubled some residents of the area since 1989. Surveys, in Spanish and English are in the mail.

Meanwhile, UNM physicist and engineer Joe Mullins has developed a new instrument to test the low frequency hearing of those who perceive the hum. Horace Poteet, distinguished member of Sandia National Laboratories' technical staff and member of the original hum study team, will continue his research with a letter of academic title as a UNM research professor.

"We are poised now to launch a thorough scientific investigation of this phenomenon," says Kelly. We want to know why some people hear it and some don't.

The renewed investigation will use the hum as a springboard to look at how the ear processes low-frequency sounds. "This is the first detailed study of low-frequency hearing, Kelly says, and the results will be useful to medical professionals. "The technology we have developed to look at low-frequency hearing can also be used for the hum."

This phase of work is funded with \$37,000 in seed money from the medical school, which covered the cost of the survey, development of the new equipment and support staff salaries. The Department of Mechanical Engineering is contributing the time of Mullins and engineering senior Carlos Melendez Jr. who has fabricated some of the new equipment and written computer software to conduct hearing tests. With preliminary results, the research team can seek federal and foundation funds for long-term research.

The hum, which hearers liken to an idling diesel engine, began in the Taos area in the spring of 1991, although Albuquerque residents have complained of a similar sound since 1989. Some hearers have also suffered pressure on the ears, nose bleeds, dizziness and headaches. All say the hum disturbs their sleep.

After Congressional representatives asked the national laboratories to look into it a team of scientists and engineers from Sandia and Los Alamos national laboratories, Phillips Laboratory and UNM last spring spent a week in Taos. They used highly sensitive equipment to detect acoustic, electromagnetic, and seismic signals but found nothing dramatic or obvious. We've looked at the environment," says Kelly, "Now we have to look at the individuals."

Possibilities include heightened sensitivities to sound, changes in hearing from some interaction with the environment, disorders of low-frequency hearing, or as yet undetected electromagnetic signals in the area. Kelly dismisses hearing impairments like tinnitus, which causes a high frequency ringing in the ears, as the likely source of the hum, but he is interested in otoacoustic emissions, or sounds actually produced by the ear. Previous studies of this phenomenon have ignored frequencies below 250 hertz, and analysis of these emission may provide information about disturbances in the region of the inner ear that receives low-frequency sounds.

The survey, months in preparation to assure it was scientifically valid, will help identify individuals who are willing to participate in hearing studies using the new equipment. In April, the team will go to Taos to study the ears of hearers and gather more information from them.

Hearing test equipment consists of a powerful IBM microcomputer, a state-of-the-art digital signal processor (Ariel Corp.'s Sysid Test and Measurement System), and an ear insert developed by Mullins and Melendez. The equipment can generate a variety of low frequency sounds and perform sophisticated analysis on human responses.

"We're trying to measure sound that's 10 to 100 times below the faintest sound that can be heard, Kelly says. It must be that sensitive to study the properties of their ears."

The team can generate any combination of low-frequency signals and analyze their effects on the inner ear, Kelly says. In addition, they can measure otoacoustic emissions. "Nobody's measured otoacoustic sounds at these frequencies, Mullins adds. "We believe they exist and can be measured."

In a related study, Kelly, Mullins and Poteet will join Arthur Diehard, assistant professor of surgery and staff surgeon at the veterans Medical Center, in a study of otoacoustic emissions from Meniere's Disease patients, who suffer from low-frequency hearing loss and periodic dizziness. Specialists in Meniere's Disease are very interested in this work,* says Mullins. "They're not interested in the hum but they want information about problems in low-frequency hearing.

Another application is workplace sounds that may annoy workers to the point of causing physical distress and slowing production.

Nobody to date has looked at low-frequency hearing in these people because the technology has not been available," Kelly says. "What we are really studying is hearing and its disproportionate influence on human behavior. We still want to know the origin of the hum and how to stop it, but we also want to learn why people react to it as they do."

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Taos Survey Complete: Hearers Step Forward

University of New Mexico researchers have completed a survey of people living in and around Taos and identified 161 people, or 11 percent of respondents who hear the Taos Hum.

Statistically that's a large percentage, says Jim Kelly an ear specialist with the UNM School of Medicine.

Kelly teamed up with university psychologists to survey residents of Taos, Questa, Eagle Nest, Penasco, Ranches de Taos and Tres Piedras. Their goal was to gauge how much of the area's population is affected by the mysterious sound and learn about the common experiences of hearers.

The hum, which hearers liken to an idling diesel engine, began in the Taos area in the spring of 1991, although Albuquerque residents have complained of a similar sound since 1989. Some hearers have also suffered pressure on the ears, nose bleeds, dizziness and headaches. All say the hum disturbs their sleep.

Surveys, carefully worded to avoid biasing readers, were designed by associate professor Steve Gangestad and evaluated by graduate student Eric Augustson, both of the UNM psychology department.

They were mailed last spring to 8,000 area residents. Response was substantial, Kelly reports, at 18 percent, or 1,440. Typical response for a survey like this is less than 10 percent. Of those responding, 11 percent, or 161, "perceive what we classify as the hum," Kelly says.

They are primarily baby boomers, are evenly divided between men and women, and mostly live in Taos or Ranchos de Taos

Here are the results of respondents

73 percent were between 30 and 59. While most adult hearing ailments trouble elderly people, hearers, Kelly notes, "are in the prime of life."

About half (52 percent) of hearers are female, and half (47 percent) male. (One percent didn't identify their gender.)

That says something too, Kelly says. Male hearing is most likely to be affected by environmental or work-related noise, factory racket or gunfire and explosions.

Just over half of hearers first perceived the sound in either Taos or Ranchos de Taos, while another 37 percent heard it elsewhere, usually in the mountains around Taos.

Sixty-seven percent have heard the hum for one or more years.

It's not a transient phenomenon," Kelly says. "The vast majority have heard it for at least six months, many for more than two years. When it starts it doesn't go away. This will make it difficult to tie to a single event," such as a microwave tower installation.

Seventy-five percent hear the hum daily, every few days or once a week.

"That's frequent, Kelly says. It means that a signal, either internal or external, is probably always present but only rises above background noise at night when it's quiet. A few people, 5 percent, hear the hum continuously.

One interesting result is that 17 percent reported hearing the hum at one time but not currently. This suggests there may be a way to lose your sensitivity to it or suppress that sensitivity, Kelly says.

Sixty-two percent hear the hum late at night or in the early morning. Those numbers again raise the issue of the sound being masked by daytime noise.

Some hearers, 23 percent, hear the hum outside the Taos area. Kelly notes that the survey numbers could be somewhat skewed. Hearers may have been more likely than non-hearers to respond to the survey. On the other hand, actual numbers may be even higher because some hearers didn't care to publicly identify themselves. Media attention, he said, has been a mixed blessing. Publicity about the hum probably fuelled the high response rate, he says, but may also have prejudiced some responses. A segment of the population clearly resents the inquiry, Kelly says. A number of respondents complained the survey was a waste of time and blamed newcomers, New Agers or "pot-smoking hippies" for what they perceived as an invention. However, hearers outnumbered the sceptics three to one, Kelly says. Those who take a dim view of the work "don't understand that we've gotten letters from reasonable people living all over the country, he says. He adds that the hum presents scientists with an opportunity to learn about the mechanics of low-frequency hearing and shed new light on low frequency hearing disorders. "We're trying to probe a very poorly understood region of the inner ear, the region where low-frequency sounds are processed. There is only one known disorder of low-frequency hearing, Meniere's disease, which is also a subject of the current study. "If this is a disorder of low-frequency hearing, we want to know about that," Kelly says. This survey was a necessary first step in research. "The first thing to do is determine an incidence rate and then the characteristics of the affected individuals," he says, "That's standard clinical procedure." The next step will involve testing the low-frequency hearing of those who perceive the hum. UNM engineer and physicist Joe Mullins and his research associate Carl Melendez are designing and building hardware and software to make objective measurements of hearers' sensitivity to low frequency sounds.