Watching the "Death Whisper" Kill

Physics—Biology

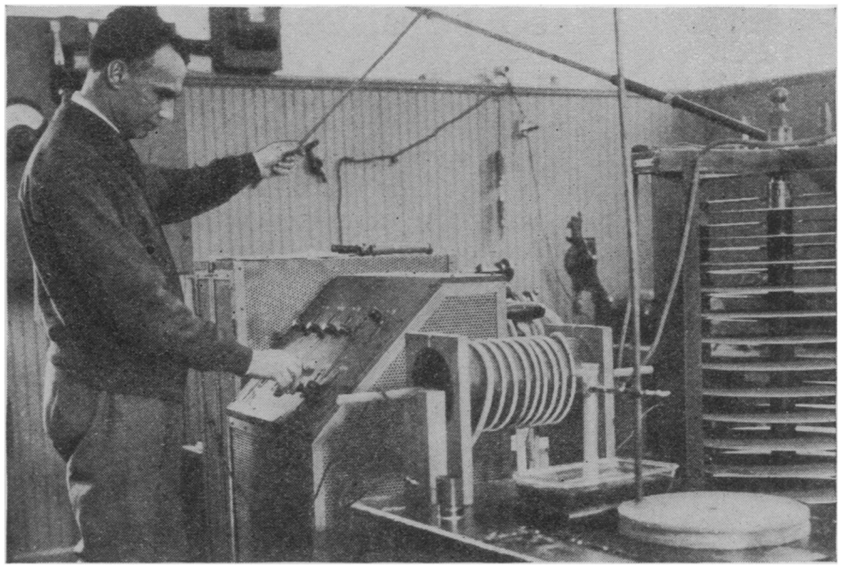
By Frank Thone

A sound too shrill to be heard by any ear, rending to death living things too small to be seen with the unaided eye, is the newest thriller in the field of science. "The Death Whisper" it has been nicknamed. Deadly it certainly is, for the instant its "ray" of waves enters a living cell the protoplasmic content is violently disturbed and finally disrupted and destroyed. But to call it a whisper is an exaggeration, for even a whisper is a sound, and this terrific force works in utter silence. Though it is composed of sound waves, one has to watch it rather than listen to it.

Watching it is impressive enough, even dramatic. Under the microscope the cells of a plant, far too small to see with the naked eye, appear to be an inch or two in length, and all the details of their structure are plainly visible. One can see the slow, steady streaming of the protoplasm, that strange gelatinous substance that is the physical basis of life. One can see as tiny, separate, neatly arranged particles the green stuff that gives most plants their color. The undisturbed cell is a placid, peaceful, unworried thing.

Then an electric circuit is closed, and the whole picture instantly changes. The water in which the cells are floating becomes violently perturbed, trembling as though it were being subjected to a kind of continuous explosion. The bit of plant tissue shivers and shifts about as though it were being torn at by a thousand tiny, violent hands. Particles of debris are whirled into little eddies. Within the cell the first touch of the soundless waves stops the quiet streaming of the protoplasm as though it were paralyzed. Then the motion begins again, but it is not the same as before. It is faster, unnatural, forced, dizzy. The substance of life is dancing a dance of death. Faster and faster it whirls, sweeping the green particles with it. Fragments become detached and spin as separate globules in the interior sap cavity of the cell. At last everything is broken down; anarchy has succeeded order, life has been swallowed up in death.

So delicately can the process be controlled, however, that it can be stopped short at any point desired, before the death point is reached, just as it is possible to administer strychnine or arsenate in such small quantities that they will act as medicines instead of poisons. This makes it possible to use this strange force as a scientific tool for the study of life, and this is one of the reasons why physicians and biologists are so much interested in it at present. And after understanding comes control; so that eventually the "Death Whisper" may become an important weapon in man's campaign for the subjugation and dominion of the earth, which was commanded to our grandfather Adam.



ALFRED L. LOOMIS operating the powerful supersonic apparatus in his laboratory at Tuxedo Park, N. Y.

Like all new things under the sun, these supersonic waves tie back to an origin in something old. It is nearly a half-century now since Pierre Curie, later famous as the co-discoverer with his wife of the element radium, working with his brother in Paris, found that certain crystals would produce electricity if they were squeezed hard enough. They learned also that the converse was true, that if electricity were fed into the crystals they would expand. Rapidly oscillating currents, they found, would produce rapid alternations of expansion and contraction in the crystals, and this vibration gave rise to sound waves. This phenomenon was named "piezo-electricity"; it might have been kept out of Greek by calling it simply "squeezo-electricity".

These "talking" piezo-electric crystals remained for many years simply interesting laboratory toys. Then, during the World War, a French physicist, named Langevin, saw a possible use for them as a means for detecting submarines. Prof. Langevin was experimenting with his crystals in a large tank at the great French arsenal at Toulon, when it was noticed that small fishes that happened to be in the way of the supersonic waves were killed.

There was at the arsenal at that time an American scientist, Prof. R. W. Wood of the Johns Hopkins University. Prof. Wood combines two things that make for success in a scientist: the ability to notice quickly apparently trivial occurrences, and an intense curiosity for getting at their causes. He noticed the dead fish, and asked why they died. Nobody could guess. So he put his hand into the water—and promptly jerked it out again. He had not got an electric shock, but simply an instantaneous sensation of most intolerable pain. Later he tried it again, with a much milder current, and this time felt only a gentle sensation of warmth penetrating his whole hand.

But in 1917 there was no time for following up so promising a lead, and Prof. Wood simply put the idea away in the back of his head until the war was over. Some time after peace had returned, he took it up again, with a New York (*Turn to page* 159)

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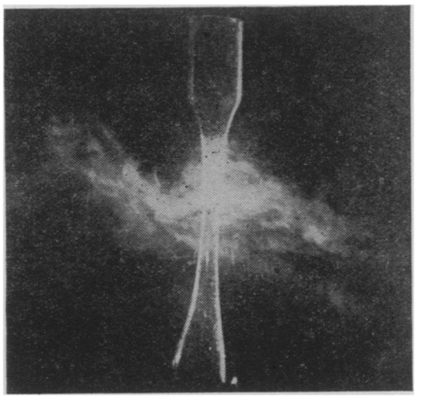
friend, Alfred L. Loomis. Mr. Loomis is a man of considerable means and a banker by profession, but he has made science, particularly physics, his avocation to such an extent that it would be a grave understatement to call it his hobby. He has the passion for apparatus of precision, the delight in its accurate manipulation, that is the mark of the born experimental physicist. He already had to his credit several successful inventions in the field of heavy ordnance, one of which, now known as the Aberdeen chronograph, is still an indispensable instrument for the testing of artillery at the Army proving grounds.

With Prof. Wood's cooperation, Mr. Loomis established a private laboratory near his home at Tuxedo Park, where the two men and a small group of other scientists have spent their spare time working on some of the newer forces in physics and their applications to living animals and plants. For the production of supersonics they assembled a most formidable apparatus. An oscillator such as is used in the larger radio stations, with two kilowatts' capacity, and tunable to frequencies of from 100,000 to 500,000 per second, was the heart of it. Through this machine voltages as high as 50,000 were impressed on the piezo-electric crystals.

It was found immediately that at such power and so high a vibration rate the crystals could not stand up to their task in air. They had to be kept immersed in oil to keep them from shattering themselves under the strain. When the current is turned into one of these oil-drowned crystals through a thin sheet of metal laid on either side, the resulting "ray" of inaudible sound immediately piles itself up into a steep-sided little liquid sound like a miniature volcano.

The first experiments on living things were performed before the apparatus was adapted for use under the eye of the microscope. Fish, tadpoles, little frogs were subjected to its lethal influence. A few convulsive struggles, and they floated to the surface, dead. Single-celled animals, such as swarm in stagnant water, were paralyzed and finally disintegrated and vanished. Plants proved more resistant, and for a time it was thought that they were immune to the action of the waves. But finally it was found that the fine, silky stuff, known as Spirogyra, common in stagnant and slowly flowing water, could be killed



A GLASS TUBE covered with oil and set to vibrating with supersonic waves, hurls the oil off in a smoke-like spray

and its cells broken up in a vessel of water held above the vibrating crystal. Bacteria could not be harmed at all. Blood corpuscles were destroyed in a very short time, when exposed in a test tube; and a mouse was given a severe case of artificial anemia by "raying" it as it swam in a beaker of water. Strangely enough, the mouse seemed to experience no discomfort during the "raying", in contrast to the convulsive struggles of the fish and other lower animals, and it subsequently recovered very rapidly from its anemia.

These anomalies in the behavior of different organisms exposed to the supersonic waves led Mr. Loomis to construct the special apparatus which permits the crystal to be placed directly under the microscope, permitting the action of the waves on the cells to be watched while they are at work. The power used in this new set is much less than it is in the first apparatus, so that the crystal does not need to be immersed in oil. It is laid on the stage of the microscope. The first work with this new weapon of research—"microsupersonic" apparatus would seem an appropriate name —was done at the Loomis Laboratory at Tuxedo, for this was the only place in the world where there were facilities for supersonic wave production at very high frequencies. But Mr. Loomis has now constructed for his friend, Prof. R. B. Harvey, a duplicate of the first microsupersonic set, which has been installed in the biological laboratory at Princeton University, and here the fascinating researches on the biological effects of these soundless sounds is now going forward.

At the University of California a group of investigators, Dr. F. O. Schmitt, Prof. A. R. Olson and Dr. C. H. Johnson, have been conducting some supersonic researches of their own. They also have subjected living things to the disruptive power of inaudible waves up to rates of 750,000 a second. Large protozoa have had their fringes of waving appendages torn off, and in the end have been violently burst asunder. Their protoplasm has been coagulated as though by heat or extreme pressure.

The California researchers have tried out the supersonic waves from a new angle. They have conducted them along microscopically fine-drawn threads of glass, and have touched various living creatures with these vibrating needles. Whatever one of these glass points touches it sears as though it were hot; laid across the body of a flatworm a supersonic needle cuts through it like a knife. At Berkeley as at Tuxedo Park, research is being continued on the physical and chemical effects of the waves.

Among the strangest of the phenomena observed in the supersonic experiments have been the effects of the waves upon liquids which do not usually mix with water. Oil and water were easily driven into a practically permanent emulsion by the waves, and even mercury was sprayed upward into water, forming an inky fluid that stood for several days before separating into its component liquids again. Light liquids, like benzol, were sprayed into a fine mist, almost like smoke, the instant the waves reached them.

On these and a number of more abstruce problems the scientific groups at Tuxedo and Berkeley are still at work, and the programs they have mapped out for themselves will probably keep them busy for many years. The possibilities of supersonic waves have only begun to be suspected; it would require a bold imagination, even in a scientist, to guess what may lie around the corner, to say nothing of what may be brought by the more distant future.

Science News-Letter, September 15, 1928

The new German Zeppelin airship LZ-127 is 772 feet long and is the largest Zeppelin that has been built.

The solar system to which the earth belongs contains seven planets, 25 satellites, and over 1,000 planetoids.