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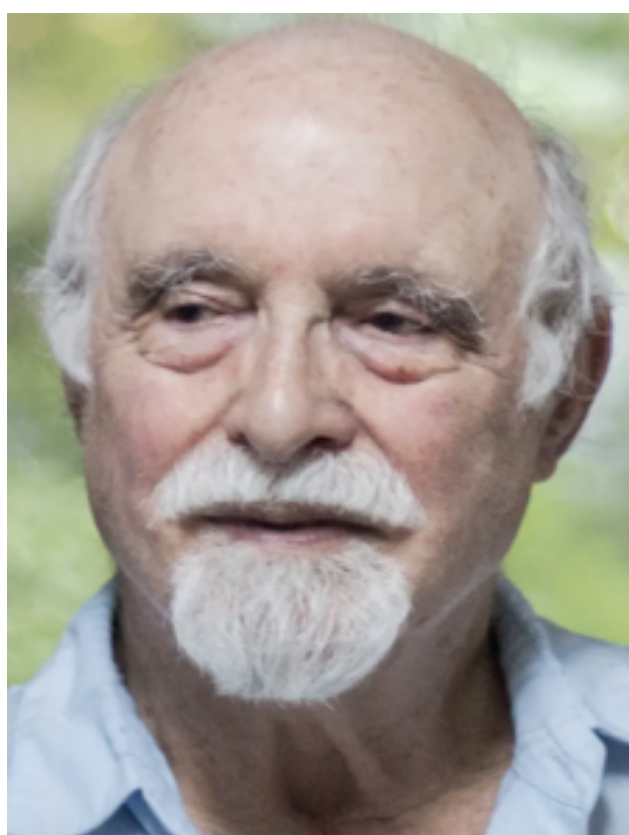
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THE WORK OF ALLAN H. FREY



In 1960, biologist Allan Frey, then 25, was working at General Electric’s Advanced Electronics Center at Cornell University when he was contacted by a technician whose job was to measure the signals emitted by radar stations. The technician claimed that he could “hear” radar.

Frey traveled to the facility where the man worked and stood at the edge of the radar beam. “And sure enough, I could hear it, too,” he said. “I could hear the radar going ‘zip, zip,

zip’.” Frey went on to establish that the effect was real—microwave radiation from radar (and other source) could somehow be heard by human beings. The “hearing,” however, didn’t happen via normal sound waves perceived through the ear. It apparently occurred somewhere in the brain itself, as microwaves interacted with the brain’s cells, which generate tiny electrical fields. Frey proved also that many deaf people and animals could hear microwave radiation. This phenomenon came to be known as the Frey effect, or simply “microwave hearing.”

At that time the U.S. military, which was interested in greatly expanding its use of radar around populated areas, had substantial funding available to investigate the effects of such radiation on health. For the next two decades Frey, funded by the Office of Naval Research and the U.S. Army, was the most active researcher on the bioeffects of microwave radiation in the country. Frey caused rats to become docile by exposing them to radiation at an average power level of only 50 microwatts per square centimeter. He altered specific behaviors of rats at 8 microwatts per square centimeter. He altered the heart rate of live frogs at 3 microwatts per square centimeter. At only 0.6 microwatts per square centimeter, he caused isolated frogs’ hearts to stop beating by timing the microwave pulses at a precise point during the heart’s rhythm. 0.6 microwatts per square centimeter is about 10,000 times less than the amount of radiation an active cell phone would expose a man’s heart to if he carried it in his shirt pocket.

In a study published in 1975 in the Annals of the New York Academy of Sciences, Frey reported that microwaves could induce “leakage” in the barrier between the circulatory system and the brain. Breaching the blood-brain barrier is a serious matter. It means that bacteria, viruses and toxins from the blood can enter the brain. It means the brain’s environment, which needs to be extremely stable for nerve cells to function properly, can be perturbed in other dangerous ways. Frey’s method was rather simple: He injected a fluorescent dye into the circulatory system of white rats, then swept the ~microwave frequencies across their bodies. In a matter of minutes, the dye had leached into the confines of the rats’ brains. Dr. Leif Salford, whose work is also highlighted here, is currently the most active researcher continuing Frey’s pioneering work on the blood-brain barrier.

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