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## W. Dixon Ward, 1924–1996

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W. Dixon (Dix) Ward, a distinguished scholar in the area of music perception, died of heart failure at his home in St. Paul, Minnesota, on December 19, 1996. Born and raised in South Dakota, he attended the South Dakota School of Mines and Technology, from which he received a B.S. in physics in 1944. After service in the Navy, he started graduate work in physics at the University of Minnesota in 1946, but decided that his real interest was in perception and transferred the next year to Harvard for graduate study in the psychology department. There he became a member of the Psychoacoustics Laboratory, which at the time was the center of the known psychophysical universe. While at the laboratory, Dix performed a number of studies in basic auditory psychophysics: his classic work on short-term auditory fatigue, in collaboration with Ira Hirsh, was the precursor for his later work on the effects of noise on hearing, work that would make him one of the acknowledged world's experts in that area.

Dix was also an accomplished pianist and singer, and had played professionally while in college in South Dakota. This set the stage for one of the first professional instances of the iconoclasm for which Dix would later become justly famous. The Psychoacoustics Laboratory was headed by S. S. Stevens, who was also Dix's advisor. Stevens was best known as the developer of subjective scales for the percepts associated with essentially all known unidimensional physical continua, the most famous being the "sone" loudness scale for auditory intensity. Among the scales Stevens had developed was a subjective frequency (i.e., "pitch") scale, called the mel scale. When developing the scale, Stevens specifically exempted musicians as subjects because they were, in his words, guilty of "a deliberate commission of the stimulus error" in that they based their judgments on a learned physical scale, the logarithmic music scale, rather than on how they "really" heard the sounds. Stevens stated that the mel scale results "contradict the widespread notion that equal ratios of frequency give rise to equal intervals of pitch." Although Dix respected and admired Stevens, Stevens' stance on this issue vexed him as both a musician and a scientist. As Dix wrote in a 1970 review chapter on music perception: "Such statements alienate musicians from psychophysics. Any competent musician knows that equal ratios of frequency do indeed give rise to equal intervals of pitch—

as *he* defines intervals, at any rate,” and “the use of the word ‘really’ provides insight into Steven’s metaphysics, but is of little other relevance.”

To his credit, Stevens supported Dix’s dissertation research, “The Subjective Octave, and the Pitch of Pure Tones,” which would result in the seminal 1954 article in the *Journal of the Acoustical Society of America*, “Subjective Musical Pitch,” wherein Dix demonstrated that musicians were an order of magnitude more consistent in judgments of musical pitch than were subjects in judgments in other psychophysical scaling tasks and that the subjective musical scale deviated in a small but highly significant way from the physical musical scale (the octave stretch). Dix likened the use of the mel scale instead of the musical scale to measuring a room for carpet by pacing it off, even though a steel measuring tape was handy.

While at Harvard, Dix also carried out a study on the information transfer for identification of pure-tone frequencies by an expert possessor of absolute pitch. This study showed that the performance of absolute pitch possessors in this task was a clear exception (and as it turns out, perhaps the only exception) to George Miller’s famous “magic number 7 plus or minus two” limitation on information transfer in identification tasks along unidimensional physical continua. This experiment was included in Dix’s classic 1963 review of research on absolute pitch, published in *Sound*.

After receiving his doctorate in 1953, Dix continued his research in music perception as a research engineer at the Baldwin Piano Co. At this time, however, Dix also came to the realization, all too common in our area, that although music perception was his first love, it would be hard to make a living concentrating exclusively on it. He therefore took a job as a research associate at the Central Institute for the Deaf, working on the effects of high-intensity noise. He subsequently moved to Los Angeles to join the Research Center of the Subcommittee on Noise, where he collaborated with Aram Gloger on a series of classic experiments on temporary threshold shift.

In 1962, Dix accepted a faculty position at the University of Minnesota, where he remained for the rest of his career. Although the preponderance of his almost 200 publications were on the effects of noise on hearing, he continued to do research and publish in both basic psychoacoustics and music perception, and he mentored graduate students in all of these areas. The breadth of his accomplishments is illustrated by his appointments at the University of Minnesota in the Departments of Otolaryngology, Psychology, Communication Disorders, and Environmental Health, and by the fact that his nomination for the silver medal of the Acoustical Society of America, awarded in 1991, was cosponsored by three technical committees: Musical Acoustics, Psychological and Physiological Acoustics, and Noise. Dix served as president of the Acoustical Society and of several other hearing-related societies. He served as associate editor on a number

of journals, including *Music Perception*, and on many national and international committees. Of particular importance was his chairing of the Committee on Hearing and Bioacoustics at the time when its noise-exposure damage-risk contours were developed.

As alluded to earlier, one of Dix's more memorable roles was that of constructive critic, iconoclast, and occasionally, curmudgeon. As pointed out by one of the participants at the memorial session for Dix at the spring 1997 meeting of the Acoustical Society: "Dix's critiques shared one characteristic: they were almost always correct." In addition to his many scientific critiques, Dix was locally famous in the twin cities for his copious letters to the university and local papers, primarily on the following topics: (1) the use and misuse of the English language, (2) politics (particularly from the Libertarian viewpoint), (3) religion or why we should not have it, and (4) the purpose of the university. He would occasionally address less lofty topics also. One of my personal favorites was a sequence of letters between Dix and a colleague in St. Louis, published simultaneously in both Minneapolis and St. Louis papers, on the effects of the crowd noise at the Minneapolis Metrodome on the performance of the St. Louis Cardinals in the 1987 World Series.

Dix had many outside interests, prominent among which were fishing and hunting (the source of the ubiquitous moose jerky that always accompanied Dix to meetings), bridge, and, of course, music: he could often be found at professional meetings either playing the piano in the hotel lobby or performing in a barbershop quartet composed of himself and three other prominent psycho/musical-acousticians.

Finally, Dix was a dedicated and loving husband and family man. He is survived by his wife, Edith Marion (Bunny), his four daughters, Marnie, Laurie, Chris, and Holly, and several grandchildren. Dix's daughters, incidentally, were the subjects in his longest-running experiment. When they were infants, he trained the oldest and youngest to identify (blindly) individual notes on the piano, but the middle two were not so trained. When the youngest daughter reached 21, he tested them all for absolute pitch. The results supported Dix's earlier conclusion that absolute pitch is probably learned in early childhood.

Dix was liked by almost all he came in contact with, and beloved by his ex-students. He will be greatly missed, both on a personal and a professional level, particularly for the absence of his insightful criticisms.

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