

The melody lingers

Ray Dolby (1933-2013), who died on Friday, revolutionised the quality of audio experience, says S.Ananthanarayanan.

Ray Dolby gave his name to the **noise reduction** system which brought music hall quality to sound recorded on magnetic tape and played back in every home. The quantum jump in quality made it meaningful to build better and costlier recording and playback equipment and the great burgeoning of recorded music during the decades till the 90s is surely thanks to Dolby NR.

Recording and playback of sounds became a practical possibility with Edison's invention of the phonograph, in 1877. And, as the technology was perfected, the decades that followed ushered in the new industry, of sale of recordings, mainly music, which fast grew to be the major component of the world of entertainment. By the year 1877, great music had been written by master composers and was performed by soloists and orchestras. But, while the music was immortal by being written down, it took performers for the music to be heard. Hence the growth of sumptuous music halls in the western world. But the experience was still limited and expensive.

Recorded music changed that for ever. Now the genius of the composer and its interpretation by the orchestra could be carried in a phonograph record and played at will. Quality rapidly improved and prices fell and the greatest music, as also popular music, became truly available to common people.

The principle of the phonograph is simplicity itself. For creating the recording, vibrations of the original sound are transferred to a stylus, which marks an undulating groove on a soft, moving surface. The Groove is then transferred to a more durable medium and the medium, which could be in the form of a cylinder or a disk, with the groove in a spiral, is set moving at the same speed as the original soft surface. A stylus placed in the groove then picks up the original sound vibrations and converts them to an electric current, which can drive a loudspeaker. But, while there were great strides in improving the material of the records, the accuracy of the recording, with hi-fi and stereophonic sound, and the quality of the turntable, the pick-up and the amplifiers, a problem that could not be avoided was the appearance of scratches in the record grooves. The scratches created unwanted crackle and disturbance and stole away the advantages of quality recording and faithful amplification.

The next revolution was the magnetic tape, which recorded the vibrations not as physical markings on a hard medium, but as undulating magnetism embedded in plastic tape, to be picked up by a sensitive bit of coiled wire, the pick-up head. With the magnetic tape, there could be accurate control of speed of the medium and the quality could be kept uniform, with no hint of scratches or crackle. But although the tape recorder allowed home recording as well, it did not replace the disk record player, because Bakelite, and later plastic (vinyl) discs could be mass produced and were very simple to use. It was with the invention of the compact cassette, or music cassette, by Philips in 1963, that there was a real alternative to the phonograph disc. The introduction of portable audio cassette players made cassettes so popular that in the 1980s, their sale overtook that of the Long Play records that had dominated.

But for all their convenience and versatility, the magnetic tape, during playback, introduces a *hiss*, or a high pitched disturbance, which mars the quality of sound. Early measures, like filtering out the higher frequencies, affected the quality of the music, as tonality depends greatly on higher frequencies. One method tried was to boost the higher frequencies during recording, so that they would be louder than the unwanted tape hiss. This also distorted the music and made the bass very dim during playback if the volume of the tape hiss were to be kept low. The same problems also beset the reproduction of speech and music in films, which also had high background noise.

Dolby's solution

Dolby's solution was apparently simple – amplify the high frequencies during recording and diminish the same frequencies during playback. The original sound then stays unchanged, but the noise, which enters during playback, gets suppressed. Though simply expressed, doing this in practice is complex. What takes place is that dim sounds at high frequencies are enhanced, so that a figure called the *dynamic range*, or the ratio of the loudest to the faintest sounds, is *compressed*. During playback, this process is undone, or the range is *expanded*. The process, of compressing an expanding, is called *companding*. The device needs to first sense the loudness of the high frequency part, which is the part above 1 kHz, or pitch above the second octave above Middle C on the piano keyboard, to decide the level of compression to be applied. At the time of playback, the decompression of the dynamic range is reversed, with the highest frequencies being diminished the most. That the two processes, which would usually take place on different equipments, should be standardized, so that the music is not changed, is evident. There is also need to keep it possible for music that has been compressed to be played back on equipment that does not have decompressing capability. This places a limit on the level of enhancement that can be employed.

Ray Dolby's Dolby Labs Inc first manufactured a system for use in professional recording studios. When this system was widely accepted a simplified and cheaper system for consumer markets was developed. This system, known as Dobby B, became standard in prerecorded musicassettes which flooded the markets from the 1970s. This is the version of Dolby NR which allowed the music to be played back on cheaper players that did not have the Dolby decoding capability.

Dolby NR is relevant where the medium affects the output, which is the case in analog recording and playback. The medium does not get involved in digital recording and playback, where what is recorded is description of the sound, for creating the sound again during playback, not the sound itself. It is hence only **data** that is recorded in the medium.

Dolby's role in digital sound is in the coding of the data of frequencies and the levels o loudness, for providing more channels, to create richer sound effects. As listeners have a pair of ears and no more, there is really nothing better in sound reproduction than stereophonic sound. But in suround sound, as many as 6 channels (Dolby 5.1) are used to create enhanced effects, or to introduce or to compensate for acoustics of the listening hall.

But Dolby Noise Reduction gave enormous impetus to the effort, the world over, that led to greater quality of recorded music. The best music became affordable, it created commercial opportunities, benefited the musicians and ushered in and guided the developments in digital music. The name of Ray Dolby will sound in peoples' ears long after he is gone.
