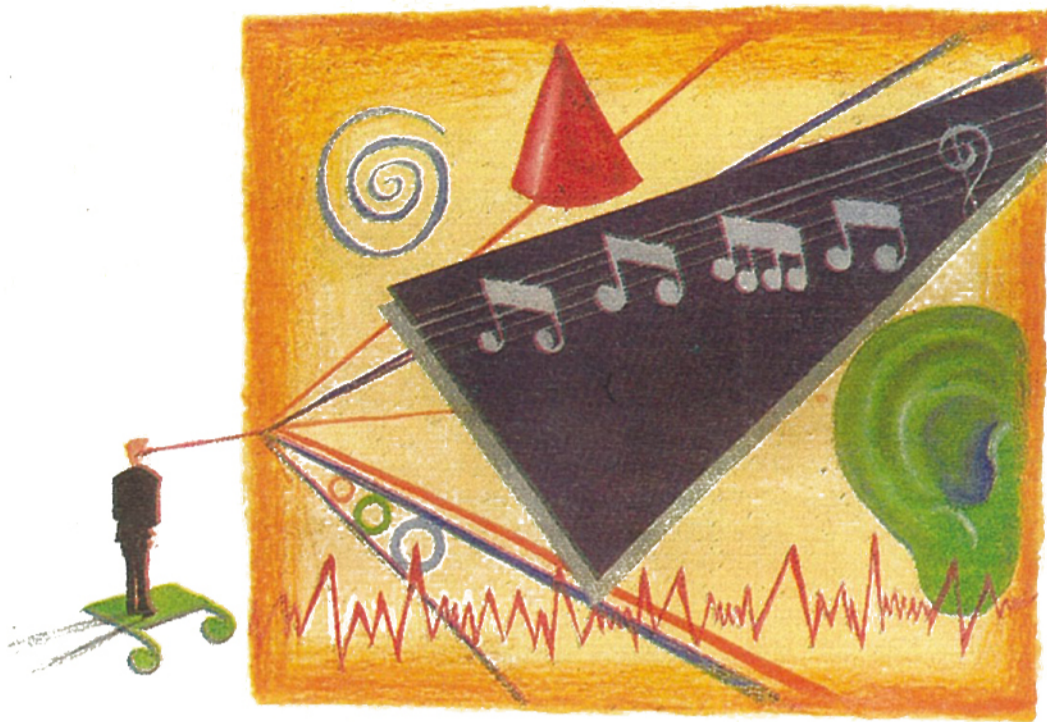


SANJAY GHOSH



How to fool the brain

... and other psycho-acoustic tricks
by SANJIV MALVI

The eternal debate between spiritualists and scientists has been about the absolute reality. To the spiritualist the world is ordinarily perceived as an illusion. It is not the absolute reality. Whereas to the scientist, what is perceived is real and what is not perceived doesn't exist. The human being has five senses of perception: sight, hearing, smell, taste and touch. These are our antennae. Using these sense perceptions we can be in touch with a part of the total reality around us. Imagine if one of these sense perceptions were missing — our reality and view of the world around us would be very different. Over the years scientists have been realising the limitations of our own senses of perception. It is commonly known that our senses can be easily fooled into believing what is not. Mirages in a desert are an age-old natural illusion. The famed cube turning inside out is another example of a visual illusion. A lot of work has been done on the illusive characteristics of sight and sound. The study of the perception of sound by the brain is called "Psycho-acoustics". The reason I choose to elaborate on psycho-acoustics is because it is the foundation on which electronically reproduced sound will be based. As our knowledge of the perception of sound by the brain grows; electronics tunes in to take advantage of this, in helping to create amazing sound effects, even at home.

Many special sound effects rely on the human brain's idiosyncratic behaviour when

interpreting sounds. Basically the brain does not always perceive sounds as they truly are, but simply interprets them, so that they conform to a preconceived pattern; thus it can easily be fooled into misinterpreting the nature of sound.

It has been found that if the brain receives two sounds which are identical in all respects one after another, then depending on the time interval between the two sounds, the brain interprets them differently. If the time interval between the two sounds is less

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than 10 milliseconds, then the brain will interpret the two sounds as a singular sound. If the time interval is greater than 10 milliseconds, and less than 50 milliseconds, the brain will perceive the two sounds as independent sounds but will integrate the information of both these sounds into a single pattern. The result of this will be heard as a warmer fuller more subliminal sound than the singular sound. If the time interval is greater than 50 milliseconds, the brain will interpret the sounds as two distinct sounds. This being the basis for echoes.

Apart from interpreting the nature of sound, the brain, also uses

preconceived patterns to identify, 'location' of sounds and also 'distances' between sounds. If the brain receives two sounds which are identical in all respects, except that one sound is louder than the other and these sounds reach the brain more than 10 milliseconds apart — the brain will perceive the first sound to be the primary sound source and the second as the secondary sound. Also depending on the time interval between the two sounds the brain will perceive the distance between the primary and secondary sounds. Thus if electronically we can vary the time interval between sounds, we can change our perception of the sound field.

We can fool the brain into falsely locating sounds in space and also creating false perceptions of distances between sound sources. This further helps to alter the perception of the size of the environment in which the sounds are being produced. This is the basis of surround sound technology today. Thus in modern day amplifiers we can alter the sound field in our living room to simulate a sound field heard in a stadium.

Having understood the basics about psycho-acoustics, we can use electronics to play around with the kind of sound and sound field we would like to perceive. It is important to note that today it is not only the quality of sound which is important in terms of frequency response, but the sound field as a whole which is considered. The greater the fluidity and mobility in it, the richer it becomes. Today's trend for a magically moving sound field is highlighted by the trend towards Dolby cinema sound and surround sound at home. Electronics not only helps in creating this magnificent sound field but is widely used in all recording studios and in live musical programmes to enrich recorded sound. The voices of even the most well-known singers of the day are electronically treated to sound rich and resonant. If beauty lies in the eye of the beholder, great sound is in the mind of the listener.