

## HUMAN VOICE

**John Chowning** – (*music*)... Fundamental... Other harmonics... But not a voice... Until the addition of micro-modulation... (*music*)... With the addition of micro-modulation, vibrato, synchronous to all harmonics, the listener perceives the tone as that of a singer rather than an electronic tone. So, in Nature, whether it's the visual world in which we live or the auditory world, there is no perfection. We have these small differences in the great cathedrals of the Middle Ages, for example Notre-Dame de Paris, which show the small differences in distances of the portals, the width of the portals, that the master builders must have understood, in some intuitive way, were important to the liveliness of the image at the level of the visual system... And so in sound, pure tones we perceive in a way that sounds are dead... But if we introduce a small amount of variation, especially frequency, or pitch, because our ears are so sensitive to small changes in pitch, we can make sounds come alive and the ear pays attention.

The fact that the visual world and the auditory world are complementary is not surprising, considering that before modern times half of our time was spent in darkness, at which time the visual system is not effective, so the auditory system is a 360° scanner that pays attention to the small details, the small imperfections within background noise, for example of a low growl of a lion, which may be soft and close, and the auditory system knows that that is much more dangerous than the growl of a lion in the background noise, that's loud and far... So our auditory and visual systems have these complementary scanning properties, and to the extent that we make use of them in music, we enliven the music which we produce with machines... And that was the open door, for me personally, the fact that if I knew that if I could learn to program a computer, I could produce the numbers that would produce the sounds that I imagined in my creative musical self...

Jean-Claude Risset's analysis of brass tones had a very direct bearing upon my development of FM synthesis. So we were complementary in the sense that we shared the same goal, using Nature as a model, but extending Nature into that which cannot be done by Nature. The human voice is the instrument of instruments. It's certainly the first musical instrument... When I began working with computers, I was told that this was the dehumanization of music. So when I was able to combine a live performance of the singing voice in the composition of voices, with synthesized sounds using the synthesized voice where the two were indistinguishable, I felt that somehow I had accomplished something which had been my original goal, which was to make sounds that were lively to the ear, had attributes of naturalness as is the singing voice, but also were extensible into sounds that we could not produce by natural means.

*(music)*... So they are quite good! Those voices are thought by many people to be recording of real voices, but they are all done with this means of synthesis...

**04min 48sec**