

Some compensation techniques border on the exotic. When Thomson's Hareng told us in Paris that newborn infants (and aboriginal peoples) resolve visual information equally in all directions, whereas maturing individuals (and civilized peoples) develop sharper resolution in the horizontal and vertical dimensions, and that an algorithm Thomson has developed for HDTV exploits these facts, it sounded to us at first like he was being ironic again. It takes only a little reflection to realize, however, that the ability to put things in accurate perspective is not innate at birth and that putting things into perspective involves favoring some types of visual information over other types.

Display technology

Both Hareng and Spitz ascended in the ranks of Thomson from laboratories responsible for research on liquid crystals. All the HDTV systems currently in advanced stages of development rely on standard cathode-ray technology, but fitting CRTs to the rectangular formats required by HDTV can be problematic, and it seems unlikely that very large cathode-ray tubes could be devised for the near-term applications anticipated in medicine, business teleconferencing and the military.

Obviously a major advance in liquid-crystal displays such that flat screens of any size and dimensions could be readily produced would revolutionize HDTV. Japan's Sharp has pioneered liquid-crystal display technology (making judicious use of American inventions), and as reported in the previous installment of this story last month, the Ministry of International Trade and Industry supports a seven-year, \$100-million Giant Electronics Project, which is devoted to display technology.

But there also is a lot of skepticism about whether LCDs can be bright enough to serve as television picture elements. Sarnoff's James Carnes seems to think that some other kind of light valve may be the answer in the long run, and Sarnoff has been participating with Texas Instruments in an effort, supported by the defense Advanced Research projects Agency, to develop TI's deformable mirror device as a light valve for high-definition displays. The deformable mirror device is a silicon memory array with a movable aluminum mirror atop each memory cell. Light is modulated through the electromechanical deflection of each mirror, which depends on the charge state of the underlying storage site.

Wayne C. Luplow, the head of

Japan's HDTV Development Strategy

Last August PHYSICS TODAY staffer Jean Kumagai paid a visit to Sony's corporate research laboratory in Tokyo and conducted an interview with Toshiro Ozawa, a young engineer in the HD display development group, and Susumu Suzuki, general manager of Consumer High Definition Business Development.

PT: How long has Sony been involved in HDTV research?

Suzuki: Since about 1978. NHK [the national broadcasting company] first began R&D on "Future TV" in 1965. In 1978 it first demonstrated HiVision [a prototype of the Japanese HDTV system]. Sony introduced a 1-inch high-definition VCR and a high-definition projector in 1981. The VCR was the first product Sony developed.

PT: How many people does Sony have doing HDTV research?

Ozawa: There are about 50 engineers in my lab who work specifically on high-definition research. There are others who are nonspecific—they do HD research part of the time.

PT: How important is the HDTV project within Sony?

Suzuki: It has been given the status of "corporate project." There are maybe less than ten corporate projects, like consumer VCRs or computers. That makes it one of the highest-priority projects at Sony.

PT: What is Sony's relationship with NHK?

Ozawa: NHK is actually leading the research effort and they set the standards. The companies—Toshiba, Matsushita, Mitsubishi, Sony, Hitachi—make contracts with NHK to use the basic technology and develop applications. NHK holds the patents on the basic technology. Each company develops its own equipment. On the more costly projects, such as LSI chip development, the companies sometimes agree to work together.

PT: How does your company work with other Japanese companies?

Ozawa: In general there is almost no exchange of information between companies. Of course we have to tell NHK what we are doing because we have a contract with them. For example, I am part of the project to develop a MUSE decoder, which does the data decompression on the receiver end. It is mostly digital signal processing, making use of large-scale integrated chips. In the first stage of the project, making the decoder with discrete [noncustom] ICs, Sony collaborated to make LSI chips. So Sony is making one part of the decoder, Panasonic is

making one part, and Hitachi is making one part, based on information provided by NHK. We are just completing the first-stage decoder, which has about 50 chips and costs about \$14 000. Obviously it is not for ordinary people!

In the second stage, which is to be completed by 1992, our objective is to reduce the number of chips in the decoder from 50 to 10, which will make the price tag look more realistic. At this stage, some companies will do everything by themselves, while others will seek partners.

PT: What are your plans for entering the US market?

Suzuki: We have no clear strategy to enter the consumer market. We're watching carefully to see which transmission system is selected by the FCC. When the trials are completed, after mid-1993, manufacturers can begin making systems [for the US market]. But the US situation is different from the one in Japan.

PT: How did NHK arrive at the 1125-line standard?

Ozawa: That is not very simple to answer. I think NHK looked at the two existing standards (525 lines and 625 lines) and decided that 1125 is the easiest to make conversions from. If the number of lines chosen is a simple proportion to existing standards, it is convenient to "down-convert" high-definition software to those standards: 1125 is $1\frac{1}{2}$ of 525 (NTSC) and $\frac{2}{3}$ of 625 (PAL or SECAM).

Besides, from experiments NHK found that when viewing at a distance of three times picture height, the smallest object that an average person can recognize can be displayed with the resolution that 1100 scanning lines gives you.

PT: What kind of products is Sony working on?

Suzuki: There are two areas in the high-definition market—consumer and nonconsumer, for applications like medicine, studios, movie theatres, production houses. We're very interested in getting into nonconsumer areas with the 1125 system, and now have a complete lineup of products. We also plan to market to industrial customers, for closed-circuit use.