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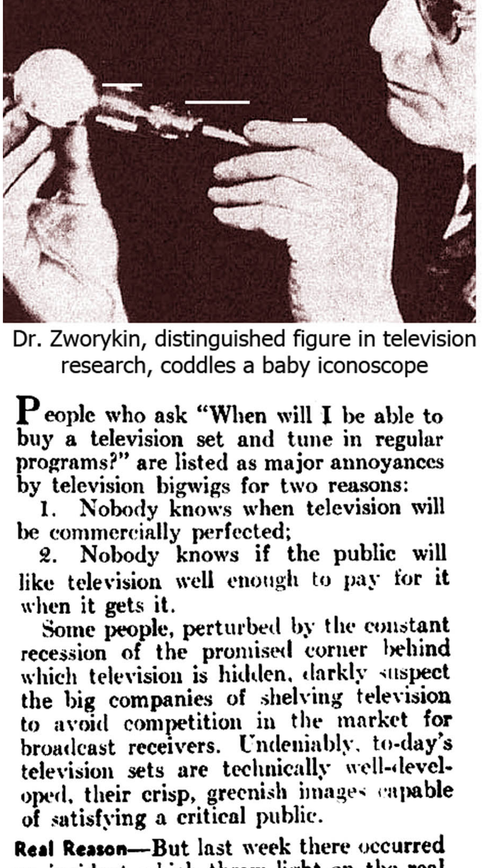
Television: Desire for perfection and Technical Difficulties Hold Up Release to Public



Dr. Zworykin, distinguished figure in television research, coddles a baby iconoscope

People who ask "When will I be able to buy a television set and tune in regular programs?" are listed as major annoyances by television bigwigs for two reasons:

1. Nobody knows when television will be commercially perfected;
2. Nobody knows if the public will like television well enough to pay for it when it gets it.

Some people, perturbed by the constant recession of the promised corner behind which television is hidden, darkly suspect the big companies of shelving television to avoid competition in the market for broadcast receivers. Undeniably, to-day's television sets are technically well-developed, their crisp, greenish images capable of satisfying a critical public.

Real Reason—But last week there occurred an incident which threw light on the real reason for television's long-delayed coming of age. The R.C.A. television studios in the Empire State Building were shut down for alterations. As recently as mid-November, the 343-line images broadcast by these studios had been regarded as perfect enough to justify an impressive public demonstration. Yet it was decided to rebuild the equipment to produce 441-line images of much finer definition.

Had 343-line television receivers been sold in quantity to a willing public, the industry would have been "frozen." The more desirable 441-line images could not have been transmitted without reconstructing every 343-line receiver in the hands of an owner. It is this unwillingness of television experimenters to freeze the industry to inferior equipment which has kept television in the laboratory, will probably keep it there much longer than the optimistic predict.

Other Problems—Television has other problems, but none regarded as insurmountable. There is difficulty in transmission. Wire networks are impracticable. Electrical interference and blind spots must be overcome. A way will have to be found to make television pay for itself. No one is likely to make money out of television for years; millions have been poured lavishly into research. It is by no means certain that advertisers will flock to the new medium. Television programs are inherently more costly than radio broadcasts. When the novelty wears off, the public may tire of television, which requires a concentrated attention not demanded by radio. Lump these and a dozen other factors together and you have the answer to the problem why a perfected medium remains a laboratory curiosity.

The big three of American television are the Radio Corporation of America,

Farnsworth Television, Inc., and Philco Radio & Television Co. All three employ the electronic scanning principle. Simply stated, an image is converted from light into electricity, the impulses transmitted by wire or radio, and the current changed back into light in a suitable receiver. A stream of electrons may be likened to a brush which paints the image, line by line, on a fluorescent screen.

Arithmetic—Simple as it sounds, the arithmetic involved in the process staggers the imagination. The scanning aperture of the narrow stream of electrons which breaks the image into millions of tiny squares is about .015 inch wide. In a 441-line image such as R.C.A. is adopting, the number of squares in the complete picture is 441 x 441, or 194,481. But this is only a single picture. The image must be painted on the receiver just as a movie film is projected on a screen; *i. e.*, a rapid series of still pictures gives the illusion of motion through the phenomenon of persistence of vision. In television the cycle is as frequent as sixty times a minute. Multiply 194,481 by sixty and the result is 11,668,860—the incredible number of impulses which electrons must carry to a fluorescent screen in order that you may look upon a televised image for a single minute!

To convert an optical image of the subject into electricity, photoelectric films are used. In the receiver, the incoming impulses are shot by an electron gun against a fluorescent screen painted inside the bulging end of an evacuated glass tube. The electrons, striking the fluorescent substance, become visible as light. Horizontal and vertical deflecting coils, actuated by electric impulses broadcast with the picture, move the electron-beam across the screen in perfect synchronism with the path followed by the beam in the transmitter. In effect, the picture is constructed by placing tiny squares of light side by side, very much as a bricklayer builds a wall. The varying intensities of light create the picture in a manner analogous to the half-tones by which photographs are printed, which upon close examination will be observed to consist of countless dots of different densities.

Devices—In the R.C.A. system this incredible miracle is accomplished by what is called the iconoscope and the kinescope, perfected by Dr. V. K. Zworykin, head of television research at the Camden laboratories. The iconoscope is the transmitting unit, the kinescope the receiver. The Farnsworth system achieves the same end by very similar units called the image dissector and the oscillight tube.

A complex patent situation in the television field promises to become as involved as radio's well-known patent headaches. Farnsworth owns certain basic patents; R.C.A. owns others just as basic. But R.C.A. does not dominate television as it does radio patents; any charge of monopoly is ill-founded. Certain of R.C.A.'s basic radio patents will expire within four or five years.

Inventor—Philo Taylor Farnsworth, just turned thirty, is as fascinating a personality as ever was endowed with inventive genius. Slight, blond, eager, keen-eyed, an unsuspecting observer might take him for an energetic postgraduate student pursuing an engineering degree. To his associates in his sprawling Chestnut Hill laboratories in Philadelphia he is "Phil," the boy inventor, one of themselves. One day last month he drove up in a new Packard, a gift for his wife. Every man-jack in the place dropped his work, turned out to inspect the car, expressed approval of the purchase. Whereupon they rushed back inside, called upon Phil to inspect the morning's work, which involved a new tube which sputtered mysteriously, received, in turn, his approbation.

The idea of electronic image-scanning was first conceived by Farnsworth when attending high school in his native State of Utah. He discussed his notion with his

Philo Farnsworth, one of the big three of American television, before his set

physics teacher, sketched the idea in a note-book, elaborated it. Years later, when Farnsworth had completed development work, he applied for a patent. The Patent Office informed him he was in interference. Some one else had applied for papers. If he could prove he had been the first to begin work on the idea, Farnsworth could gain his patent; otherwise, his work would go for naught.

He hadn't seen his high-school teacher for a decade, but he referred the patent examiners to him. The teacher recalled the sketches his young physics student had shown him, gave testimony which helped Farnsworth to win a basic patent.

Sets—Farnsworth believes that television sets will sell for $200 when the art is released to the public. Other authorities name $500 as the probable figure. Most present television sets produce a pale green image, which requires less light. Black-and-white images can be obtained by varying the nature of the fluorescent materials. Experimental R.C.A. and Philco sets look much like a standard radio receiver, with a top which tilts at a forty-five-degree angle. This is lined with a mirror which reflects the image from a cathode-ray tube placed vertically inside the set. Farnsworth's receiver displays the image through the front of the set. Tuning mechanisms are fairly complicated, involving from twelve to fourteen dials. Six by seven inches is about the standard size of images, although R.C.A. has a new tube twelve inches in diameter. Flicker is practically non-existent and the image is bright enough to be viewed in a lighted room.

From a practical angle, television's biggest problem is that of transmission. Microwaves, much shorter than ordinary broadcasting-waves, are employed, and they exhibit peculiar characteristics. The limit of transmission is about twenty-five miles. At distances farther than the visible horizon they skid off into space. Ordinary telephone wires will not transmit them; hence a wire set-up like that used in radio networks is impossible.

Cable—A "coaxial" cable, as it is called, is suitable for television transmission, but installation costs $5,000 a mile. Such a cable has been installed between New York and Philadelphia for experimental purposes, but a nation-wide network is prohibitively costly. The coaxial pipe is a lead cable seven-eighths of an inch in diameter, containing two copper rods the size of a lead-pencil, about which insulated copper is wound. Surrounding these are eight insulated telephone wires.

Relay stations are another possible solution to television transmission troubles, but these, too, are expensive. Two such stations already exist between New York and Philadelphia for use in R.C.A. facsimile transmission. Without human attendants, the stations are "waked up" by an electric signal which starts them in operation, boosts the microwaves on from station to station until they reach their destination. But what television really hopes for is some entirely new method of transmission, perhaps using already existing facilities, which may be developed suddenly by some unknown experimenter.

Future—First to have commercial television, it is generally agreed, will be New York City, then Philadelphia. In both of these cities transmitting-stations already

exist. Advancement to other urban centers will be slower. Chicago, for example, will have commercial television only after it has been made to pay in New York and Philadelphia. As each city's television enterprises become self-supporting, installation will be begun in a new center.

That is the way those closest to television visualize the situation to-day. But they also add a word of caution: nothing is impossible in television. Overnight, some unknown worker may announce a startling new discovery which will upset the entire picture of the industry.