Whiplash

Like disc jockeys the country over, Alan Cummings of Washington's WWDC was snowed under with requests for *Mule Train*; his listeners could not seem to hear it often enough. Early one morning last week, Cummings struck back: he began playing, one after the other, recordings of *Mule Train* as sung by Frankie Laine, Bing Crosby, Gordon MacRae, the Syncopators, Buzz Butler, Arthur Smith, Vaughn Monroe and Tennessee Ernie. Before long, the unrelieved barrage of whipcracks and clippity-clops jammed WWDC's switchboard with phone calls from desperate night owls crying "Uncle."

Cummings, with his ninth straight recording on the turntable, relented. "I never went for *Mule Train*," he explained mildly. "The only way to get my fans around to my way of thinking was to play the tune to death . . ."

Twinkle, Flash & Crawl

"Let's have color television now." This seemingly innocent proposition, proffered to the Federal Communications Commission by the Columbia Broadcasting System, has thrown the whole television industry into a frenzy of activity, alarms and bitter accusations.

Since late September the hearings before FCC in Washington's chastely paneled Department of Commerce Auditorium have been crowded with TV experts, near-experts, publicity men, lawyers, Congressmen and corporate presidents and vice presidents. Witnesses spouted reams of technical testimony. Some witnesses were branded as liars, and their motives were viewed with alarm.

So far, the harried commission has made no decision. It will probably make none for many months, and any decision it does make is sure to rouse cries of anguish. If it gives color-telecast permission to CBS, the only outfit with a color system that works well at present, it will offend the manufacturers of black & white sets and their dealers, who are prospering on the status quo, and who fear that any promise of color will make the public stop buying. It will offend many TV station owners, most of whom, now living on hope and money transfusions, dread the greater cost of color telecasting. It will also offend Radio Corporation of America, No. 1 operator in the industry, which manufactures black & white sets, is a leading telecaster in black & white, and has a still-experimental color system of its own. A decision favoring CBS, says RCA, would be disastrous.

CBS, on the other hand, has gathered behind it a head of political steam. Its color sets have toured the U.S. The brilliantly colored pictures have been seen with enthusiasm by thousands of influential citizens who say: "We've seen color television with our own eyes. It's good. Why can't we have it in our own homes?" This week, with the hearings recessed, the FCCommissioners were holding their heads and trying to make up their minds.

Fooling the Eye. Stripped of technical embroidery, the basic theory of color television is fairly simple. Even a black & white television picture is an optical illusion. All there is on the screen at any instant is a fast-moving bright spot that "scans" back & forth, covering the whole screen with 525 lines of light which the slow-reacting human eye (if not brought too close) sees as a picture. The pictures follow one another so fast (30 a second) that they are blended by the eye to give the illusion of motion—just as the eye blends the frames on a strip of movie film. Pictures or elements of pictures in the primary colors will blend too, giving a scene in reasonably natural colors.

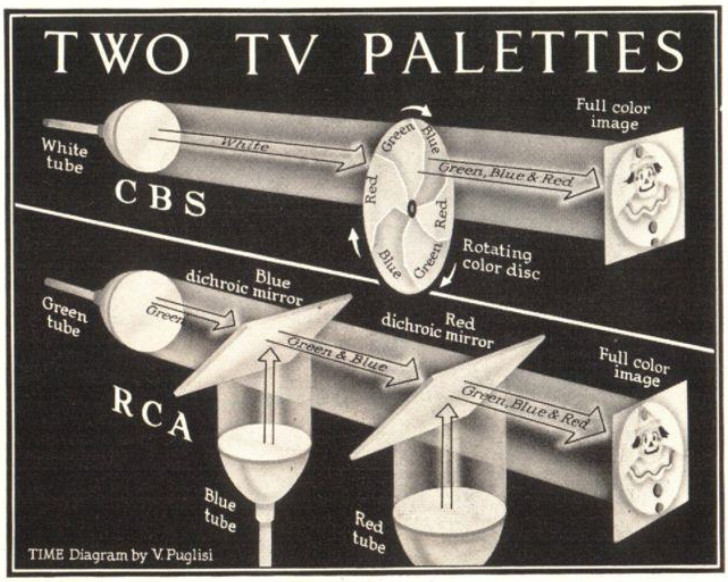
The last step, adding color, is easy in theory but exceedingly difficult in practice. The systems proposed by CBS and RCA approach the problem in fundamentally different ways.

Color with Fields. In the CBS color system (called "field sequential"), the transmitting camera, like the ordinary black & white camera, has a single Image Orthicon "seeing" tube. In front of it is a spinning disc with segments of blue, green and red transparent plastic. When a blue segment is in front of the tube, the camera sees only the blue light coming from the scene being televised. When the disc has turned a little, putting a red segment in front of the tube, the camera sees only the scene's red light. Next, it sees green through a green segment of the disc.

If the disc is properly synchronized with the scanning speed of the tube, one-color "fields" go out over the airwaves and appear one after the other on the face of the receiving "picture" tube. All of them are white, since the "phosphor" (the luminescent substance) on the tube's face glows only in white light. But in front of the receiving set's picture tube is a second spinning "color disc" (*see diagram*). This disc is synchronized so that a blue segment is between the tube and the eye of the viewer whenever a "blue" field is flashing on the tube. So the eye sees the field in blue. When a "red" field is on the tube, a red segment of the disc makes that frame look red. In the same way, "green" fields are made to look green. The three one-color fields, following one another quickly, are blended by the eye to form a full color picture.

Color with Dots. RCA's system, called "dot interlacing," is entirely electronic, needs no spinning disc. In the transmitting camera are three tubes. In front of them is a system of "dichroic mirrors" (*see below*) which allow each tube to "see" in one color only. All three tubes scan the scene continuously, but an electronic switching device, turning their signals on & off 11.4 million times a second, allows each tube to transmit over the telecasting station only one-third of the time. In this way the "video signals" from all three tubes are strung together like trains made up of red, blue and green freight cars, and sent over the air on one wave band.

The receiving set at the other end has three picture tubes. They are like black & white tubes except that each has on its face a phosphor that glows in a different basic color. Each little impulse (the colored freight cars) arriving over the beam is electronically switched to the properly colored tube. They arrive so fast that each tube-face is covered 15 times a second with a pattern of tiny dots corresponding to the blues, reds and greens in the scene being televised. The more red there is in a



part of the scene (*e.g.*, a red dress), the brighter the red dots on the corresponding part of the red tube.

Next step is to combine the three colored images in the eye of the viewer. The combining is done with two "dichroic mirrors": plates of glass with one surface covered with a thin layer of a colorless, transparent substance. Because of the special way in which this combination affects light of different wave lengths, each mirror reflects only one color. The other two colors pass right through it.

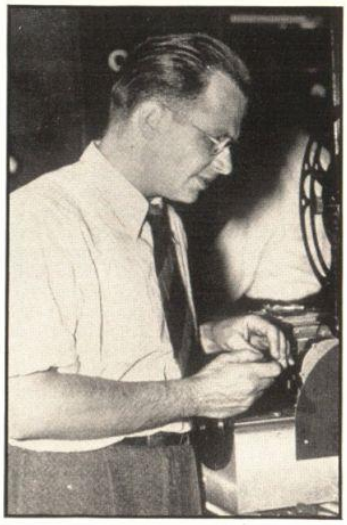
The mirrors are arranged so that red light from the red tube is reflected to the eye of the viewer from the red-reflecting mirror (*see diagram*). Blue light from the blue tube is reflected by the blue-reflecting mirror, but passes through the red-reflecting mirror to the eye. Green light from the green tube is not reflected at all. It reaches the eye direct. The viewer sees the three pictures superimposed so that they blend to form a full-color picture.

Color Now. To the FCCommissioners and other non-scientific listeners, the workings of the systems seemed far less complicated than the arguments about their comparative virtues. The solidest single fact is that the CBS system, developed to high perfection by Dr. Peter C. Goldmark, turns out pictures which are bright, crisp, and at least as faithful as most colored movies. Their own special ill is a so-called "color flash." If the viewer looks away suddenly, he sees the picture momentarily in a single color, because of the persistence in the eye of the last one-color picture seen. A color flash is seldom noticed unless it is looked for.

Proud of its color pictures, CBS has made every effort to show them to the public. A shrewd move was to make special cameras for televising surgical operations for Smith, Kline & French Laboratories, drug manufacturers. As a dignified publicity stunt, the drug house has shown surgical operations in color for the benefit of some 50,000 doctors in medical gatherings all over the country. Since black & white television gives little idea of a surgical operation, the CBS system has given many doctors their first glimpse of ultra-modern techniques. Many of the grateful doctors are loud rooters for CBS color TV.

Another fact is that RCA's system still does not work well. It has rarely been shown to the public, and does not impress laymen. Different sets show the same scene in different colors. The colors are not at all faithful; they often change suddenly and erratically. Dr. Elmer W. Engstrom, research chief of RCA, admits that the system is still in the laboratory stage. But RCA-men add that the CBS color system has reached its limit: it has no "room for growth."

RCA wants immediate public field trials to test the various systems. CBS declares that it is "perfectly willing to compete with any color TV system any place, any time." But it insists that "a system [its own] can be picked now on the basis of its known performance." Extensive trials, argues CBS, are unnecessary and would be costly and confusing.



CBS's GOLDMARK
Spinning disc.

Degradation. Both RCA and CBS are highly skilled at pointing out faults in the other company's system. First, says RCA, the CBS pictures are "degraded." This means that CBS, to increase the number of pictures per second and thereby avoid flicker, has had to reduce the number of scanned lines in each picture from 525 to 405. Thus, the "definition" is reduced and the grain of the picture is made coarser, like a newspaper cut compared to an illustration in a slick-paper magazine.

CBS retorts that definition isn't everything. More important, it claims, is the amount of "information" the picture conveys to the eye. The faithful colors in its system, CBS insists, give so much extra

RCA's ENGSTROM
Colored tubes.

information that the viewer is glad to sacrifice a little definition.

Another weak point in the CBS system is the color disc: it is mechanical and driven by a small electric motor. Such moving parts, says RCA, have no place in television receivers. Worse, the size of the picture is limited because the diameter of the disc must be more than twice that of the picture tube. Its own all-electronic system, RCA points out, has no mechanical parts; it can use any size tube.

Incompatibility. But the worst thing about the CBS system, says RCA, is that it is not "compatible." This term, borrowed from the divorce lawyers, means that the 2,565,000 black & white sets now in use could not receive CBS color broadcasts, even in black & white, because of the different number of lines and the different number of pictures per second. Nor could an unmodified CBS color set receive conventional black & white broadcasts. RCA's own color sets are "fully compatible": when a station is telecasting black & white, they will show black & white. When the station switches to RCA color, they will show color. Existing sets will show black & white all the time.

The issue of compatibility is probably the main reason why FCC has not yet authorized the CBS color system. Existing sets can be adapted to receive CBS color telecasts as black & white, but the adapter would cost some $35 and would have to be switched on when the station changes from black & white telecasts to color. Otherwise nothing would come through but a blur. Even adapted sets, says RCA, will get a "degraded" 405-line picture.

To get CBS color telecasts at their best —in color—an existing set would need besides an adapter, a converter: a color disc and auxiliary apparatus to be slid in front of the tube during color programs. The converter would cost upwards of $50, depending on size.

Panic & Fury. The incompatibility of the CBS set has sent a wave of panic and fury through most of the television industry. Some manufacturers claim that talk of impending color television has already hurt the market for black & white sets. Telecasters fear that the confusion following an authorization of CBS color would scare off sponsors, who are timid enough already. Nearly everyone outside the CBS fold argues that color programs which cannot be received on existing sets, at least in black & white, without trouble and added expense would be a breach of faith with millions of set owners.

To all this, CBS has both general and specific replies. Color is coming, it insists. Why not make the change now, when the U.S. has comparatively few sets in use—instead of several years from now when there may be ten million? If FCC waits until then, warns CBS, black & white television will have become a vested interest with enough power to block color permanently.

Besides, claim the CBS-men, the RCA system will never bring color to the millions. Its complicated three-tube receiv-

ing sets will be so expensive that only "Cadillac buyers" can afford them. Even the most costly sets may never work well. CBS engineers contend that the RCA system is not merely half-developed, but has serious defects that may never be overcome. Its pictures, they claim, will always show an unpleasant twinkling effect. They may show "dot crawl" too, and have incurable trouble with "ghosts."

Dream Tube. Other color systems besides those of the main contestants have been proposed to FCC. The "line sequential" system of Color Television Inc. uses a single picture tube with three blocks of different colored phosphors on its face. The colored pictures are combined by projection lenses on a common screen. But C.T.I. has not shown its color pictures officially, and no one is sure how good they are or will be.

In the background is a dream-invention: a single picture tube that glows in all colors simultaneously, but which will be "compatible" with the present-day black & white system. There have been many attempts to build such a tube, but none has succeeded so far. Many experts believe that color television should be postponed until such a tube, or something equally good, has been developed. To adopt either the CBS or the RCA system in the meantime, they argue, would be to freeze color television at a low level.

FCC, most of whose commissioners are not electronic experts, will hold many more hearings, stage more demonstrations. The commission may dump the problem of color TV into the lap of some such scientific body as the National Bureau of Standards. While the decision waits, laymen can draw a few conclusions for themselves.

Televiewers can have color quickly: the CBS system. But to get such color programs (when & if they are telecast), the owners of existing sets will have to spend something like $100 each for attachments. The pictures will be good, but probably not so good as those supplied by some radical system not yet invented. The public, which ultimately controls FCC, can eat its color-cake now, thus commit itself to eating it from now on. Or it can wait for a better, as well as a less expensive, cake that may be ready five or ten years from now.

Program Preview

For the week starting Friday, Nov. 25. Times are E.S.T., subject to change.

Army-Navy Game (Sat. 1:15 p.m., Mutual).

NBC Symphony (Sat. 6:30 p.m., NBC). Toscanini conducts an all-Italian program (Giordano, Busoni, Respighi).

New York Philharmonic (Sun. 3 p.m., CBS). Soloist: Pianist Jacques Abram.

Telephone Hour (Mon. 9 p.m., NBC). Guest: Fritz Kreisler.

Carnegie Hall (Tues. 8 p.m., ABC). Guest: Helen Traubel.

Field Marshal Montgomery (Tues. 9:30 p.m., Mutual). Subject: "Western Union."