Letters to the Editor

The following letters were received regarding the article referenced below. The Journal is interested in publishing other Letters to the Editor that may be of interest to our readers.

Re: "Searching for the Perfect Aspect Ratio" by Mark Schubin

August 1996 *SMPTE Journal*, pp. 460-478

September 17, 1996

To Editor:

Mark Schubin's tutorial on aspect ratios in the August *SMPTE Journal* was extremely thorough. It would be impractical to respond to it in every detail. Nevertheless, it may be possible to offer some helpful clarifications. I have spent much time talking and exchanging e-mail with a few ASC members, particularly Robert Primes. Some of what follows is based on my understanding of their position.

There is an underlying assumption in the title, "Searching for the Perfect Aspect Ratio." It is that we really need to confine advanced television to just one aspect ratio by writing it into the standard. Standards ought not to contain anything which isn't absolutely necessary.

When our existing television systems were created, it was reasonable to predict that the cathode ray tube would be the dominant display device for the duration of their use. Appropriately, all existing systems transmit CRT specifics, such as sync pulses and retrace blanking intervals, as part of the standardized signal. It was, therefore, reasonable that such systems be constrained to a single aspect ratio.

Though technology is changing more rapidly than ever before, we can still make useful predictions about what is likely to remain constant throughout the next generation of television. The important things that are sure to be in all TV sets farthest into the future are memory and processing power. Ordinary TV sets will have enough memory to hold several frames, because the decompression process needs to work on several frames at a time.

In a digital data stream, and in memory, there is no reason to be constrained to just one aspect ratio. Each show can have its horizontal and vertical pixel counts given in its headers. Given mass production, inexpensive silicon doing simple arithmetic could scale any data to fit in any given display. Letterbox bars could be created automatically in the TV set, instead of being sent as if they were picture data.

In feature production, the creative community has long enjoyed the choice of aspect ratio. Any projectionist can show you the collection of mattes and lenses that makes that possible. It is incredible that anyone would seriously propose a digital high-definition video standard that cannot match the aspect ratio versatility of the century-old mechanical technology of film.

Aspect Ratio Accommodation

The ASC takes a strong position in favor of the "shrinking" or "letterbox" method over all others.

As Mark Schubin says, all accommodation techniques are problematic. Therefore, the big problem is to decide which problems to live with. There are no strong technical arguments in favor of any one of the three, though the "distortion" method is clearly the worst. Under those circumstances, it would be appropriate to let expert aesthetic judgment make the decision. That's what the ASC offers us.

Years of experience with letterbox and both the "pan and scan" and "shoot and protect" variants of truncation have led them to their conclusion — letterbox is best. The ASC would like to see that written into the standard for advanced television. Unfortunately, it's difficult to come up with a technical necessity for putting such a requirement into the standard.

By using less than the whole display area, letterbox trades away some resolution to preserve composition. It's a more affordable trade in high definition than in NTSC or PAL. Resolution has always been a variable under the cinematographers' control. They routinely use diffusion to hide fine lines on faces in close-ups, and remove it for wide shots.

Many years ago, I saw an old Rudy Vallee soundie that was made in an aspect ratio that resulted from cutting out that newfangled sound-track area. I remember being told that it was 1.18:1, though it may have been 1.15:1. I've also seen the 16:9 version of a sitcom that was made in the "shoot and protect" truncation method, with all the action confined to a 4:3 area centered within 16:9. They have a remarkable similarity. Both are very obviously impaired transitional products, the sort of things that we don't want in our archives, because they'll be tough to sell in the future.

When four or five people are composed in a group in the "shoot and protect" mode, the "fluff" area on the sides is nowhere near as harmless as the word "fluff" would imply. It's dead space, very unnatural. When it's always there, shot after shot after shot, the sitcom gets a sort of "Twilight Zone" quality. As noted, the editorial timing of entrances and exits is also thrown off, which adds to the feeling that we're seeing things that shouldn't be there. Of course, that's exactly what's happening.

In the earliest sound movies, people talked to potted plants that were used to conceal the microphone. In single camera "shoot and protect," though the 4:3 composition may be reasonable, the 16:9 version is sometimes filled out with unnecessary potted plants. We should avoid making shows in a way that will soon look very silly.

2:1 versus 16:9

The transmission standard ought not to specify an aspect ratio. TV sets, however, are solid objects with fixed dimensions, so each set will have a fixed ratio for the largest picture it can display. Today's TV sets don't all have the same dimensions, and in the future, they shouldn't all have to have the same largest image aspect ratio.

It is clear that a manufacturing capacity exists for 16:9 CRTs, and that they will be the dominant display in the very earliest years of this new generation of television. However, we must think of the whole life cycle of any new television system. The investment in monochrome NTSC in 1952 was proportionally far greater than the present investment in 16:9. There are no commercial 16:9 stations on the air, and no such receivers in American homes. It would be an unnecessary shame to create an impediment to the manufacture of sets in other aspect ratios by writing a ratio into the standard. Manufacturers should be free to move to other ratios as soon as technology and the market allow. The ASC's suggestion to them is 2:1.

The ASC is aware that the 2:1 aspect ratio would create an area and resolution bias in favor of wider aspect ratios and against narrower ones, while 16:9 yields a more even distribution of impairment. There are two very good aesthetic reasons to want such a bias.

Some shows are shot to be seen small, some large. The majority of the 1.33:1 material that exists was made for NTSC television. It's intended to be seen on a small screen. All existing wide material was intended to be seen on large theater screens. Cinematographers, directors, and editors make different decisions for screens of different sizes. I've seen close-ups that are powerful on TV, but laughable on a big theater screen.

Wider formats, 70mm and anamorphic 35mm, are inherently of higher resolution than the narrower ones, especially video. Imax is unlikely ever to be widely chosen as an originating medium for television. Aesthetic decisions made in shooting were, and are, made in light of the resolution of the originating medium. Therefore, a truer preservation of original intent can be had by biasing in favor of wider ratios.

In conclusion, this whole controversy is the result of a failure on our part to distinguish between aesthetic decisions and technical ones. Aspect ratio properly belongs to the artists. When we forget that, we step on the toes of the creative community. We should thank them for not being shy about letting us know it.

Respectfully,
John L. Sprung

Author's Response:

September 22, 1996

To Editor:

Though I didn't consider it at the time the title was suggested to me by SMPTE's editorial reviewers, I agree that the article "the" implies a single aspect ratio. Like Mr. Sprung, I also agree that digital image transmission can easily accommodate almost any aspect ratio. As Mr. Sprung, himself, points out, however, TV sets must "have a fixed aspect ratio." What should "the" perfect aspect ratio for those TV sets be?

I might add that it is not only TV sets that have had aspect ratios imposed by physical constraints. A solid-state imaging chip must be built in a particular shape. A 35mm motion picture film camera must have a maximum aperture of a particular shape. The imposition of a particular aspect ratio for designers of the physical equipment to be used for advanced television is neither more nor less necessary than the imposition of, say, a fixed number of sprocket holes per frame for the designers of 35mm motion picture film cameras. Both define the limits of the images that may be captured. Neither precludes the use of image shrinking, truncation, or anamorphic optics to change the physically fixed aspect ratio.

There's no question that feature films have been shot in a wide range of aspect ratios over the years. It is clear, however, that they have not always been displayed — even in theaters — in the aspect ratios at which they were intended to be seen. My paper pointed out Stanley Kubrick's problems with *Dr. Strangelove* being projected in a wider aspect ratio than he intended and George Stevens' similar problems with *Shane*. Drive-in movie theaters have had fixed screen shapes onto which movies have been haphazardly projected. Even today, few motion-picture theaters project all movies in the aspect ratios at which they were intended to be seen. Grant Lobban's "Guide to 35 mm Release Print Formats" (Ref. 17 in my paper) discusses the problems of inappropriate aspect ratio in theatrical projection in more detail.

My paper makes no recommendation of a particular aspect ratio accommodation technique to be used when the source's aspect ratio differs from the display's, but it does note the disadvantages of each as well as the impossibility of perfect framing when "shoot and protect" is used. I cannot agree with Mr. Sprung that the distortion method is "clearly the worst," however. As my paper points out, the difference between a 1.85:1 aspect ratio and a 16:9 aspect ratio is less than four percent, an amount probably less than the existing nonlinearity of many TV sets. I would personally prefer that to image truncation.

It is interesting to me that Mr. Sprung finds the word "fluff" to imply harmlessness. I felt the opposite when I first read it in the cited paper (Ref. 15): How can one simultaneously compose a frame for intense drama as well as for fluff? Regardless of our reactions to the word, however, we are in complete agreement about the problems of "shoot and protect."

Mr. Sprung may not be aware of some of the latest developments in 16:9 aspect ratio television. While few TV sets matching that aspect ratio have been sold in the United States, millions have already been sold in Europe and Japan, and commercial entities have, indeed, been broadcasting programming in that aspect ratio.

Regardless of what is transmitted, there is nothing in an aspect ratio standard that says that a manufacturer must abide by it. NTSC has a 4:3 aspect ratio, but, as my paper noted, TV sets have already been sold in the U.S. in both 16:9 and 3:2 aspect ratios as well as 4:3. Similarly, the 4:3 35mm film frame has yielded other aspect ratios over the years.

Mr. Sprung says there are "two very good aesthetic reasons to want" advanced television display aspect ratios biased towards the wider. I must confess that I do not understand either of them.

To me, the first seems to be that wider aspect ratio material was meant to be seen on theatrical screens rather than in homes. Advanced television will be seen primarily in homes, however, so this argument makes no sense to me. There has also been a wealth of theatrical programming shot for aspect ratios narrower than 2:1 (e.g., *E.T., Gone With The Wind, Jurassic Park, The Lion King, The Wizard of Oz,* etc.) — more than has been shot for ratios wider than 2:1, not to mention more than half a century of television programming.

The second argument seems to me to be that higher resolution is associated with wider aspect ratios. Again, that makes no sense to me. As my paper pointed out, Imax, the highest-resolution film format, has one of the narrowest aspect ratios; Mr. Sprung is clearly unaware that Imax films are already being distributed in video form, but that seems irrelevant to his argument. Current electronic film systems from such sources as Kodak, Management Graphics, Oxberry, Quantel,

and Rank operate at resolutions greater on a 4:3 35mm film frame than any proposed for advanced television in the U.S. Why should higher resolutions favor wider aspect ratios?

Since I clearly do not understand Mr. Sprung's arguments in this area, let me assume for the moment that they are correct, and there should be an aesthetic bias towards the widest current film aspect ratios of 2.2:1 and 2.4:1. If so, I must ask, as I have asked ASC members and their representative in the past, why 2:1? Both a linear and an equal-area compromise between 2.2:1 and 2.4:1 is 2.3:1. If there's a desire to avoid letterbox or other aspect ratio accommodation techniques for the widest current aspect ratios, why not 2.4:1, an aspect ratio that could allow theatrical-style masking (as JVC demonstrated in the TV set referred to in my paper)? If a 2:1 aspect ratio is somehow particularly aesthetically pleasing to directors and cinematographers, why is no one shooting in that aspect ratio today?

Although I agree with Mr. Sprung that a choice of programming "aspect ratio belongs to the artists," I cannot agree with him that the aspect ratio "controversy is the result of a failure on our part to distinguish between aesthetic decisions and technical ones." It is precisely because artists have used and continue to use a wide range of aspect ratios that a controversy over how they should all be accommodated arose. I have not the slightest doubt that if all directors and moving-image photographers adopted a single aspect ratio it would certainly be the one chosen for advanced television.

As my paper pointed out, however, as recently as 1995 the cinematographer Walter Lassally wrote, "The adoption of, say, 1.75:1 as a universal new standard... would in my opinion greatly benefit the industry as a whole." Steven Spielberg has shot some older popular movies in a 2.4:1 aspect ratio and more recent ones at 1.85:1. I have been privileged to work for such award-winning film directors as Robert Altman and the late Emile Ardolino on work they chose to display to the public in a 4:3 aspect ratio. I have also been privileged to work with many award-winning television directors on both 4:3 and 16:9 programming, much of which, it is hoped, will be desirable to future viewers.

Jean-Jacques Annaud's *Wings of Courage* was shot in a large film format for a 4:3 aspect ratio. One of Doug Trumbull's recent projects was shot in a large film format for a 0.5:1 aspect ratio (yes, a vertical orientation).

It appears to me that there is no unanimity in the creative community about aspect ratio, but, since unanimity may well stifle creativity, that's probably a good thing.

Sincerely,
Mark Schubin

August 16, 1996

To Editor:

In the *SMPTE Journal* of August 1996 is an article entitled "Searching for the Perfect Aspect Ratio." In the middle of page 463 is a paragraph which begins: "At the same time, the Motion Picture Association . . . " That paragraph describes a newly developed anamorphic film format in which the input "squeeze ratio" was 1.5:1 rather than the standard 2:1. The topic referred to is the 1984 "IscoVision® development," demonstrated at the Academy Theatre with the encouragement of the Motion Picture Association of America via Mr. Alan Cooper. The paragraph (Reference #16) was from a 1985 SMPTE HDTV report by R. J. Stumpf.

In the cited paragraph, it seemed to appear as though the development had a main aim to achieve a 1.77 aspect ratio, which in actuality was a secondary goal. However, the primary goal was development to achieve a new, higher level of film projection quality as a replacement for the usual masked-off 1.85 ratio, commonly sent to cinemas.

The IscoVision development would, in fact, increase the screen illumination of the 1.85 format by over 50%, without any adjustment of the projection equipment (other than the lens change), and also would reduce picture jump. Further, it would both increase the depth of focus and improve resolution transfer to the movie screen, from the same original image information. No change in the screen masking was required.

The 1.85 ratio was based on 0.839 x 1.5 for image width, divided by 0.680-in. image height on the screen (0.839 x 1.5/0.680 = 1.850). It used the standard release print format of 0.868 in. x 0.735 in. with the 1.5 "squeeze." Of course, the article, by using the 2.35 x 1.5/2 = 1.7625, suggests that it was designed for HDTV with the 16:9 aspect ratio, which certainly is an alternate usage, when actually, the end goal was for an easy-to-install cinema screen image performance improvement! It would permit larger (by a 50% area increase) screen images, with similar light and image quality.

At the demonstration, it was further discussed that, by using the standard film format of 0.690 in. x 0.839 in. with a 1.65 squeeze, the screen image format becomes 2.00 to 1 (0.839 x 1.65/0.690 = 2.00). At the time, 2.0/1 was preferred by the major cinema exhibitors and also by several cinematographers. Later in the same article (p. 465), it cites a current ASC preference for a 2:1 aspect ratio, which on film can certainly be done using the IscoVision development with improved screen image quality, over both existing 2.35 systems and existing 1.85 systems, still maintaining the option for higher quality 1.77.

With this clarification, perhaps, IscoVision is an idea whose time has come!

Glenn Berggren,
Co-developer of IscoVision®

Glenn Berggren is a cinema design consultant, Sigma Design Group, Claremont, CA 91711. He served for several years as Chairman of the SMPTE Technology Committee on Projection and is a Fellow of the Society.

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