Kodak and the Future

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Guest Speaker, Industry Luncheon

Thank you for providing this opportunity for us to share some ideas. I always enjoy being a part of SMPTE activities, so, I feel like I'm among friends, together at a new beginning.

As everyone is aware, we begin a new century in a little more than a month, and leave behind the most visually documented one hundred years in human history. For all of us here at the SMPTE conference, it means beginning a new era filled with opportunities and challenges that we can't even imagine.

W. Eugene Smith, was one of the world's greatest photojournalists at *Life* magazine. He was a man of fascinating passions—and so he had his detractors. Smith was once asked by a critic of his chosen medium, photography, if it had reached the end of its useful life.

He answered: "I have never found the limits of photographic potential. Every horizon, upon being reached, reveals another beckoning in the distance. Always I am on the threshold..."

The motion picture and television industries are, thankfully, full of "Eugene Smiths" who constantly feel the pull of the next horizon, who look forward to the next best thing, and who challenge us all to deliver it— *now*.

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SMPTE has a proud history of responding to those challenges. Your members have a strong sense of purpose and passion. You have fostered the dialogue and helped to set the standards to move our industry forward.

We need to continue that. We all need to leverage our talents and ideas in new ways to solve common problems...and to define uncommon opportunities.

Lots of people have lots of thoughts about that future, about the opportunities it will offer and the challenges it will provide. Today, I want to give you Kodak's perspective: the way we see the road ahead, what we're doing to get ready for it, and the role we're beginning to play. Consider us a "voice" with a great stake in the future.

As they are everywhere, things are changing at Kodak. But as we look out onto the new millennium, one thing will never change: Kodak will always be pictures. In the past, most of those pictures have been made on film. For the future, an increasing number will be made digitally or using some hybrid combination. Be assured that, someday, other technologies that we haven't imagined will be used to make pictures, too. And even then, pictures will be Kodak's domain.

They are our past, our present, and—across a wide range of technologies—our future. We believe that pictures, however they are made and manipulated, transmitted, and displayed, will be vital to communicating with, and entertaining, people in the century just ahead.

Whatever the technology, the next century will usher in mankind's most *visual* era.

- Public cinemas with very large screens and smaller "boutique" theaters with new kinds of visual entertainment and presentations...
- High-impact visual presentations in theme parks, sports arenas, convention centers, hotels, and other venues...
- High-definition and digital TVs, desktop computers connected to the Internet, and personal handheld devices, all will create a market for images that will amount to hundreds of billions of dollars in annual revenue.

It will be a market virtually without limit, a business where technologies will complement and compete with each other, and open up new opportunities for one another and for us all. There's no better example of how this is happening than in the motion picture industry, where digital motion picture technology, over time, will transform the entertainment industry. Everything—from the way movies are financed and profits are made, to the way images are handled and distributed, managed, controlled, and protected—*everything* will change.

There's no doubt about the power of digital technology and the impact it will have on cinema screens, and in venues far beyond the cinema. Kodak is focused on being part of that future, with its many, many applications. Before we get into them, let's agree on what we should call this whole range of applications we're dealing with.

For the sake of simplicity, we call it "digital cinema." We recognize that cinema screens, in terms of numbers, may be the smallest market; but in terms of quality, they'll have the highest expectations. Creating movies for cinema screens also offers the greatest challenge, and greatest opportunity, for optimizing all aspects of what we call the "imaging value chain"—that sequence of activities involved in production, post-production, distribution, restoration, and so forth.

If it looks good, and if it "works" in the cinema, it will probably "work" anywhere. So, for digital cinema, there are exciting opportunities ahead, but there are also enormous issues that need to be discussed and ultimately solved.

- At the top of the list is security. The ability to create flawless digital copies of intellectual property on digital media is the most serious concern for the entertainment industry. Standards for encryption, decryption and destruction of digital copies of motion pictures must be developed and adopted.
- New cinema technology must

expand, not restrict, filmmakers' creative options. It's important that directors, cinematographers, effects supervisors, and editors all be able to express themselves better, and with greater ease, with new room for continuous experimentation. And it's important that they be able to share their vision consistently with audiences, whether on a cinema screen, or at home, or in some other venue, no matter what the vehicle is for delivery or display.

• This leads to the critical issue of image integrity. Big cinema screens, and they are getting bigger, are unkind to images that are not of suitably high resolution or show the artifacts of digital compression. Today's digital projection systems are a great starting point, but there are concerns about scalability and rapid technological obsolescence. We shouldn't give up on developing something better.

• Of course, there's lots of interest in standards, and we salute the work that Ioan Allen and his team will do. We live in a world of standards. One—35mm film—is universal. You can play a 35mm film print in any cinema in the world. We would all like to see digital cinema adopt a similar standard to help power its growth and cut through some of the technological clutter.

• Archiving, film restoration, digital storage, and digital asset management are also huge issues. They're increasingly important because of the recognized value of entertainment and media assets.

And, of course, as we get serious about new technical alternatives, and/or complements, to film, we need to think about finances. New technology will require new investments, and the scope of the financial considerations of digital cinema is not yet completely understood.

One thing we do know is that the most successful technologies are ones that are "future proofed" by being *scalable* and *extensible*. Scalability and extensibility help ensure continuous generations of cost-effective improvement in quality and economy, with a high-degree of both forward and backward compatibility.

So our challenge is to develop business solutions, expand creative alternatives, and accelerate technological innovation— all at the same time.

The question that many are asking us, right now, is: What will be Kodak's role in this future; can our company repeat its historic role in the development of motion pictures? I believe the answer is a simple yes. That's why, under George Fisher's leadership, and now Dan Carp's, we've been dedicating a major corporate effort to the digital image. Consistent with that, we have been developing and creating a Kodak imaging complex in Hollywood, to provide leadership, coordination, prototype testing, and development activities for our work in digital cinema and beyond.

Through those efforts, we will set our objectives and define our strategies for participation in digital imaging. Together with the company's research and development community, and the work we're doing with others including partners, we will form a sort of "virtual" team for the advancement of motion pictures—across a range of technologies. In the near future, you can expect to hear more and more about our work in digital cinema and other motion imaging applications. But let me emphasize: This is an important initiative for us. For some time now, we've been moving into it in several ways. We've begun by expanding our role beyond the visual effects work we do at Cinesite. We are increasingly involved with digital mastering, as well as archiving, restoration, and media asset management.

All of that has given us the opportunity to offer new "creative options" to the filmmaking community—directors, cinematographers, editors, effects supervisors and others—who share our enthusiasm for the capabilities we've been developing. Working with them, we continue to push both our film and digital technologies.

One of the results that's really catching their attention and sparking their imagination is what we call the "digital intermediate." In simplest terms, it involves scanning the film original and putting the images into "digital space," with new flexibility. Now, color or any other visual aspect of the image, can be manipulated on a shot by shot, or even frame by frame, basis. Our customers tell us they can't do that as effectively or as creatively, with high standards of quality, any other way.

It is our intention to make it possible to completely post a theatrical motion picture using the digital intermediate. It will eventually be the dailies, the work print, the conformed negative, the color-timed printing master and the digital cinema and video master. In fact, the digital intermediate really has the potential to change the way production is done, to give filmmakers the same creative freedom and control that TV and commercial directors and post houses have enjoyed.

Actually, the digital master can reproduce the movie in *any* form for digital television, high-definition, or DVD, or even back to film. And, as digital cinema begins to find acceptance, we believe digital masters will be a critical "bridge." They are our "entry point" to providing images of superior quality, in a standardized form, without creative compromise, and regardless of projection media.

In the future, we may find other uses for them—for distribution of movies over the Internet, or for any media that demands high-quality images in motion. Broadband connections seem to be accelerating peoples' appetite for that, and there's an exploding number and variety of location-based entertainment venues.

Digital mastering connects the quality of film capture, with the flexibility of digital manipulation and the expanding channels of distribution in any medium, without creative compromise. At the same time, our extensive work in special effects also helps us better understand how the filmmakers want to manipulate images. What we learn about correcting defects, physical and artistic, in their *new* productions, we are applying to restoring classic movies, television programming, games, and other Internet-distributed content.

A number of "content providers," those who have access to old television programs and other content, are now talking to us about restoration and helping them to manage their assets, for new channels of distribution. And with broadband opening up possibilities to someday bring a wealth of content into homes through the Internet, the opportunities are multiplying, exponentially. We are also working on creating a new high-capacity, high-security medium that anticipates the demands of digital cinema storage and conveyance, and could have a number of applications beyond that.

This is exciting stuff. This is real. This is digital cinema. And this is from Kodak. The question is: Where do we go from here? The answer is: in several directions, all of them linked to each other and to the entertainment industry.

In the process of reviewing what we've done in digital cinema so far, we've been finding that everything is interconnected, skills are transferable for other applications, and the whole can be much greater than the sum of its parts. And so, moving forward, we'll play several roles.

First, we will fund the development of digital solutions to bring new levels of creativity to filmmakers and, in some cases, "compete" directly with our own continuing innovations in film. We see special promise in leveraging and combining our knowledge of digital intermediates and mastering, with image asset management, visual effects and restoration activities. We are also actively involved with the development of very high capacity storage media, one of the biggest pieces of the digital cinema puzzle.

Next, we want to participate in discussions that will define systems, specifications and standards for digital cinema and beyond. We want to use our technical capability and accumulated business experience to ensure the longevity of these solutions and the integrity and color quality of images from screen to screen and venue to venue.

And, third, we will continue to prototype, demonstrate, develop, and offer to our customers real digital products and services that set quality standards for digital cinema and other motion imaging applications.

Although we are proud of our extensive expertise in color and image management, encryption, and other areas, you can expect some of the initiatives we'll announce in the coming months will involve key partnerships. I want to be very clear about this: At Kodak, we are committing to a serious and long-term effort in digital motion picture technology that matches our traditional commitment to film. That effort will be led by the Kodak imaging complex in Hollywood. As part of our effort, we're challenging everyone involved, including our own R&D staff, to drive the image quality of digital movies to a level where it exceeds the quality demanded by the most creative filmmakers.

Let's enable filmmakers everywhere to work without creative compromise. Let's use technology the way it should be used, as an *enabling force* for digital cinema to deliver superior entertainment to the most critical audiences; audiences that have become much more sophisticated. Today, theaters and television, home video, video games, and now, streaming media via the Internet, deliver image-rich content to audiences, and in the process, enable more people to share information, express their personal visions, and redefine what we used to call "the movies." As a result of all that, everyone's expectations are rising.

For the future, audiences will expect images to transcend technologies without compromise. They'll expect to see pictures on PC and cinema screens with consistent color and without loss of image integrity from the original. And they'll expect to be able to watch a movie in the cinema, go home and view the sequel, and take the interactive version with them on their PC or pocket computer.

How will we meet those expectations? Standards.

They're the key to moving the industry into the new technology. This is what we believe about standards:

- To gain acceptance, any digital cinema system must be an *open system* that will allow multiple suppliers of products and services to provide competitive solutions. Proprietary technology that is not interoperable with other components would be irresponsible. Outside gatekeepers will not be welcomed.
- Secure copy protection, control of playback, collection of rents, feedback of customer demographics, and "destruction" of local digital copies of movies at end of a theatrical run—all are the key features of the theater management system. A standard system for digital distribution must address them all.
- Standards must be scalable across different markets and display platforms. We've all talked about this, but one approach might be designed to include a hierarchy of resolutions linked to screen size, broader color gamuts, different frame rates, or mechanisms for encoding the "texture" of a "film look."
- And standards should be extensible to allow upgrades without rendering everything obsolete. 35mm film has been an extensible standard for a long time. All of the improvements we'll continue to make tomorrow will still run through cameras and projectors made long ago. We need to drive digital in the same direction. We believe digital technology can meet these challenges.

Today, digital projection looks better than ever. But technical and artistic advancement should not be limited by today's technology. Because, in the end, every advance in technology leads to new creative visions, new ideas and imagination, new ways to expand image performance and extend the power of pictures. There are millions and millions, perhaps billions, of feet of pictures, largely on film, in archives and repositories all over the globe. Crews shooting for feature movies, for commercials and TV programs, for games, Internet content, and other purposes, are exposing more film even as we speak here today.

And so, while we make our contributions to digital cinema, we'll also be driving the visual performance of film to new levels of excellence, because we believe there is much, much more power and potential in the silver halide crystal. Film will not disappear anytime soon. Digital and photochemical imaging will chase each other...challenge each other's superiority...and complement each other's capability...in terms of performance, economics, and other factors.

Picture, if you will, a day when there are fewer choices in color negative films and fewer choices in color print films, but many, many more choices in the look of the image on the screen, due to the "digital intermediate" being used as an integral part of the production chain. This pursuit of image excellence and creative choice, involving film or digital, alone or in combination, is good for all of us, and good for the art, science, and commerce of motion pictures on home screens, cinema screens, and everything in between.

In fact, one of the lessons of this century is that no new technology has ever actually completely replaced another. Each technology has moved us forward. Each has made possible new ways of telling stories, of entertaining audiences, of growing our business and brightening our future.

We believe that will continue—and accelerate. In a world that is changing beyond recognition, people will still communicate in pictures. We are fortunate to be in a business where, to paraphrase Eugene Smith, "we never reach the limits of *imaging's* potential...we are always on the threshold..."

Thank you.