SMPTE's Fall Conference in Los Angeles Highlighted by Excellent Workshop, Papers Program, and Seminars

SMPTE's 138th Technical Conference and World Media Expo offered a full measure of educational programming, emphasizing new developments in television, film, and allied motion imaging technologies. Nearly 1,000 attendees at SMPTE's annual conference at the Los Angeles Convention Center were treated to a variety of presentations on the theme, "Film and Video Synergies: Creation to Delivery."

Editorial Vice-President Thomas J. Bentsen, NASA, and Program Chair Charles (Chuck) Dages, Warner Bros., were responsible for putting together the outstanding papers presentations.

The technical program included 75 papers on such subjects as Widescreen Issues for Film and Video, Digital Film Systems, Video Servers, Automated Video Indexing for On-Demand Retrieval, Using Intelligent Nodes and Fiber Optics to Control the Next Generation of Digital Television Transmitters, Compressed HDTV for Production, and Winning in a Global Economy. A panel discussion, entitled "Content and the Consumer: Future Pathways," was also a key attraction in the technical program.

The three seminars on Saturday, which focused on Compression, Nonlinear Editing Systems, and The Theatrical Experience: An Update, were also very well received.

Arrangements

Conference Vice-President Edward P. Hobson II, Sony Electronics Inc., was responsible for the overall operation of the four-day event. He was ably supported by General Arrangements Chairman Michael Chewey, Look Who's Talking, and his committee.

Registration Chair John Mason, Eastman Kodak Motion Imaging; Opening Films and Tapes Chair Ron Little, Consolidated Film Industries; Audio/Visual Projection Chair Paul Carey, Marketing Specialists, Inc.; Signage Chair T. Russell McMurtray, Laser Pacific Media; Hospitality and Information Chair Gerald Finn, Pasadena City College; Transportation Chair Dave Richards, Action Capture; Membership Chair Chuck Phelan, National TeleConsultants; Industry and Fellows Luncheon Chair Richard Thomas, Deluxe Laboratories; Reception and Entertainment Co-Chairs Elaine Stein, Magnasonics Corp., and Horace Scott, KCET; Student Fair Co-Chairs Donald McCroskey and Kathryn Naylor-Milton; and Partners Program Chair Judith Chewey all gave unstintingly of their time and expertise.

HDTV '96 Workshop

One of the major highlights of the four-day program was the International HDTV Workshop that preceded the official start of the conference. HDTV '96 was sponsored by the International HDTV Committee and ran for two days. The workshop featured opening remarks by Kenneth P. Davies, Canadian Broadcasting Corp. (CBC). It was followed by a keynote address by Mark S. Richer, Advanced Television Systems Committee (ATSC). The technical sessions were arranged by Program Chairman Metin Akgun, CRC, and focused on the topics of Systems and Applications, Motion Estimation, DSP Architectures, Video Processing, Video Equipment, Vector Quantization, Transmission, the North American Digital Television System, Digital Television Implementation Strategies, and 3-D Television. At the conclusion of the workshop, participants were given a tour of the HDTV facilities of Sony Studios in Culver City.

The *Proceedings of the International Workshop on HDTV '96*, containing the papers presented at the workshop, is available from Headquarters.

Opening Session

The conference was officially opened at 9:30 a.m. on Wednesday morning, October 9, with a welcoming address by SMPTE President Stanley N. Baron, NBC, Inc. Baron's talk was followed by an address by SMPTE Editorial Vice-President Thomas J. Bentsen, NASA, and general conference comments by SMPTE Conference Vice-President Edward P. Hobson II, Sony Electronics Inc. There were two keynote speakers: Christopher J. Cookson, Warner Bros., and Michael P. Harris, Canadian Broadcasting Corp. (CBC). The text of their speeches appears in this issue.

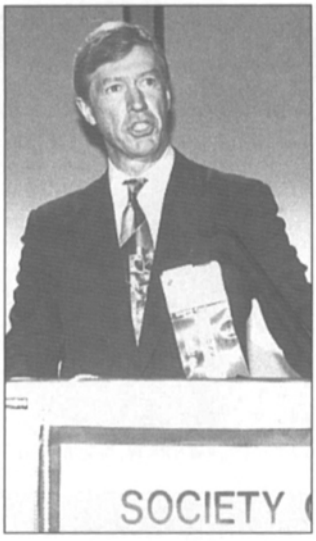
Panel Discussion

A panel discussion, moderated by Stanley Baron, was held Wednesday afternoon on "Content and the Consumer: Future Pathways." Panelists were Chris Cookson, Warner Bros.; Philip Dodds, IMA; Preston Davis, ABC Operations; and Craig Tanner, Tele-TV. Topics examined included the following: How will the all-digital media world affect the delivery of content to the consumer? How will it change the business model? Will advertising-supported services dominate or will pay-per-view? How will it affect the content creator? What impact will it have on production? Is HDTV part of the model and will it prove to be viable in the marketplace? Will there be a market for private ownership of recorded media? What is the role of interactive media? How will the consumer pay for it? A lively discussion ensued on the ways to use the new tools provided by technology.

Technical Program

The papers sessions featured a program of scientific presentations by leading international practitioners. Seminars, research papers, state-of-the-

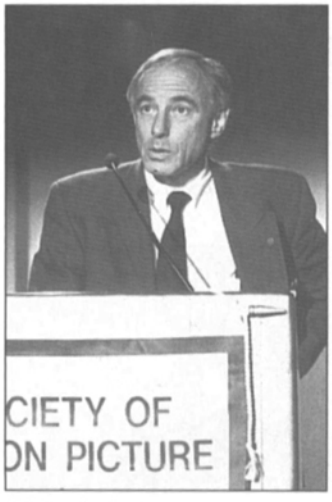
SMPTE President Stanley N. Baron delivers welcoming address at the Opening Session.



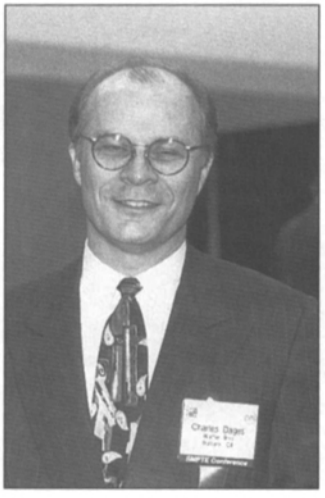
Editorial Vice-President Thomas J. Bentsen speaking at Opening Session.

Conference Vice-President Edward P. Hobson addressing Opening Session.

Christopher J. Cookson delivering his keynote speech at the Opening Session.

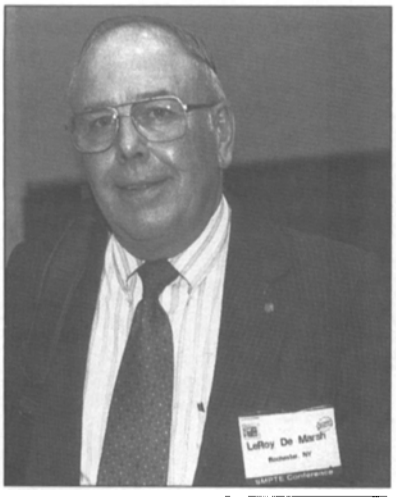


Michael Harris also delivered a keynote speech to delegates.



Program Chair Charles (Chuck) Dages.

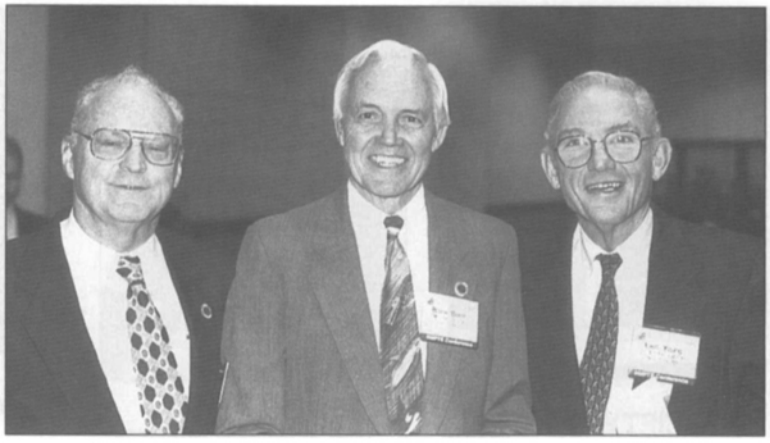
SMPTE Secretary/Treasurer Richard Thomas and Engineering Vice-President William C. Miller.



LeRoy E. DeMarsh, Chairman of the SMPTE Board of Editors, attending the technical sessions.

The Canadian Connection: (L-R) Keynote speaker Michael Harris, SMPTE Executive Vice-President David L. George, Canadian Region Governor David F. E. Corley, Sections Vice-President Fung Fai Lam, and new Fellow Fred Benedikt.

Ed Hobson and Fred Motts working on the run.



Former SMPTE Presidents Robert M. Smith, Blaine Baker, and Irwin W. Young.

Partners Program Chair Judy Chewey and General Arrangements Chair Michael Chewey.

Transportation Chair Dave Richards and Audio/Visual Projection Chair Paul Carey.

The sections training seminar. Front row, L-R: Ed Schuller, Angelo D'Alessio, Fred Bendikt, Fung Lam, Neil Feldman, Rome Chelsi, Morten Jacobsen. Back row: Bruce Miller, Gerald Finn, Alan Hart, Tom Kraemer, Fred Motts, and Charles Hintz.

art reports, panels, and laboratory presentations were all designed to bring participants up to date on the rapid changes taking place in the industry. The program consisted of 12 sessions and was held on Thursday, October 10, and Friday, October 11.

Thursday morning's session included "Widescreen Issues for Film and Video," chaired by John Galt, Sony Pictures; "Video Servers, Nonlinear Access to Content" (co-sponsored by ITS), chaired by Stanley N. Baron, NBC. "Compressed HDTV for Production: The Challenges," chaired by Glenn Reitmeier, David Sarnoff Research Center (DSRC), was an

The panel discussion (L-R): Chris Cookson, Warner Bros.; Philip Dodds, IMA; Stan Baron, NBC; Preston Davis, ABC Operations; and Craig Tanner, Tele-TV.

Speakers at the Industry Luncheon: (L) Guest speaker Roger L. Mayer, SMPTE President Stan Baron, and Secretary/Treasurer Richard Thomas.

NIST-ATP HDTV Broadcast Technology Research collaboration.

In the afternoon, "Special Venues and Techniques" was chaired by Greg Thagard, Warner Bros.; "Winning in a Global Economy: The Power of Standards," was chaired by Chip Aycock, Warner Bros.; and "Computer-Based Assist for Broadcast" was chaired by Ira Goldstone, Tribune Broadcasting.

Friday morning's sessions focused on "The Digital Virtual Studio," chaired by David Elliott and Kenneth Michel, ABC; "Audio: The Widescreen Experience (Film and Video)," chaired by Ioan Allen, Dolby Laboratories; and "DVD Authoring: A New Technology," chaired by Mikhail Tsinberg, Toshiba.

On Friday afternoon, "Delivery Systems" was chaired by Robert Seidel, CBS; and "Applications in Production Technology" was chaired by Richard Stumpf, Universal Studios. A joint SMPTE/ACVL session on "Creating and Delivering on Film" was chaired by Frank Ricotta and Paul Bourque, Technicolor.

All full-conference attendees received copies of the conference proceedings, *Film and Video Synergies: Creation to Delivery,* containing most of the papers presented in the technical program. The book was also on sale at the SMPTE Store.

Professional Seminars

Attendees were given a choice of three seminars running concurrently on Saturday, October 12. A brief description follows.

Compression

Chaired by Ken Davies, CBC, this seminar included papers on MPEG-2 Video Compression, Systems and Applications to Production and Broadcasting, Basics of Audio Compression, Testing and Measurements in Compressed Video and Audio, and Non-MPEG Compression Systems.

Nonlinear Editing Systems

Chaired by Kim Aubry, American Zoetrope, and former SMPTE Sections Vice-President John Carlson, Monaco Labs, this seminar was divided into three parts: (1) a multimedia presentation on the history of motion picture editing; (2) existing state-of-the art systems and practical considerations of purchasing, renting, or using a nonlinear editing system, as well as a general overview of the post-production process; and (3) a panel discussion on where nonlinear editing is heading.

The New Theatrical Experience: An Update

This seminar, chaired by Edmund DiGiulio, Cinema Products Corp., was held in the Samuel Goldwyn Theater at AMPAS in Beverly Hills, on Saturday morning. It featured discussions and demonstrations of the dramatic improvements currently taking place in film technology, including new lenses, theater screens, digital sound systems, and theater configuration. Leading experts in the field presented papers to augment demonstrations of theatrical projection. Complimentary bus service was provided between the Los Angeles Convention Center and the off-site theater.

World Media Expo

The exhibits, jointly sponsored by the SMPTE, the National Association of Broadcasters (NAB) Radio Show, the Society of Broadcast Engineers (SBE), and the Radio and Television News Directors Association (RTNDA), had over 400 companies participating in an exhibit of the latest technologies in the merging worlds of motion imaging and media communications. The exhibit was open from Thursday through Saturday, and attracted a substantial attendance. Everyone registered for the full SMPTE conference received a free pass to attend one papers session at any of the other conferences.

SMPTE Store/Membership Booth

The SMPTE Store attracted a constant stream of visitors and reported brisk sales of the Society's publications and other materials. One new book, *Implementing HDTV: Television and Film Applications,* which contains selected papers from the *SMPTE Journal* that serve as a tutorial for the greater understanding of HDTV, proved especially popular, as did the conference proceedings, *Film and Video Synergies: Creation to Delivery.* Other Society publications and products also drew a great deal of attention.

Headquarters staffers were on hand to answer any questions relating to the Society. The membership booth was

also located here, and 32 visitors took advantage of its presence to join the Society.

Social Activities

In addition to attending the technical sessions and exhibits, registrants look forward to the social events that are a traditional part of Society conferences. The Industry Luncheon, Fellows Luncheon, and the Honors and Awards Reception and Evening Reception were well attended and enjoyed by all.

Industry Luncheon

At the Industry Luncheon on Wednesday, October 9, guest speaker Roger L. Mayer, Turner Entertainment Co., delivered an address on "Film Preservation and Restoration: Is It for Art, History, or Commerce?" Guests enjoyed a fine meal and a chance to mingle with other conference attendees.

Fellows Luncheon

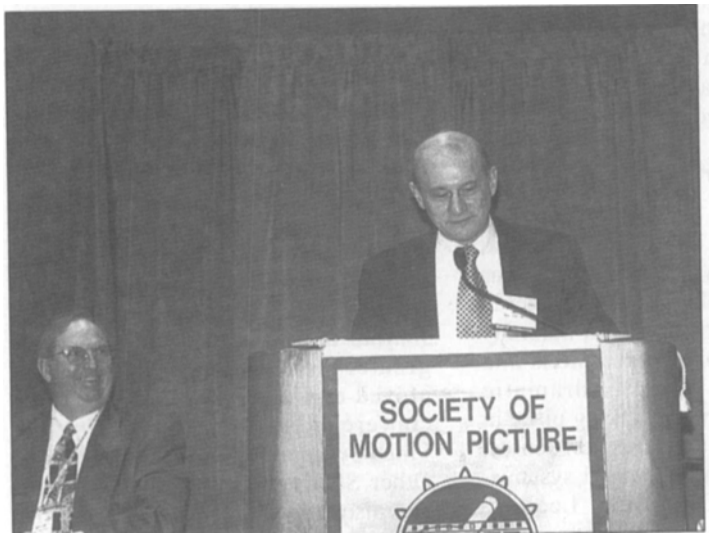
On Friday afternoon, over 100 members participated in the Fellows Luncheon. At this special event, limited to Fellows and Life Fellows, the new Fellows of the Society are recognized and introduced to their peers. Joerg D. Agin, president, Professional Motion Imaging Division, Eastman Kodak Co., was the guest speaker. His address, entitled "Making the Possible Practical: A Future in Hybrid Motion Imaging," gave those assembled a glimpse of the future as he sees it.

The following were named new Fellows of the Society: **Donald T. Adydan,** Post Effects; **Fred Benedikt,** CBC; **Christopher J. Cookson,** Warner Bros.; **Sven Olof Ekholm,** Sveriges Television; **Peter M. Fannon,** Citizens for HDTV Coalition; **M. Lynwood Heiges, Jr.,** King Video Associates, Inc.; **Kees A. Schouhamer Immink,** Philips Research Laboratories; **Bernard J. Lechner,** consultant; **Louis Libin,** NBC, Inc.; **Martin S. Mueller,** MSM Design, Inc.; **John F. Sawyer,** Eastman Kodak Co.; and **John David Walters, Jr.,** Florical Systems, Inc.

During the Fellows Luncheon, the British Kinematograph, Sound and Television Society (BKSTS) held a brief ceremony in which SMPTE Canadian Regional Governor Gary Teltscher, Astraltech, was named a new Fellow of the BKSTS. Ian Mackay, BKSTS President, presented the certificate to Teltscher. Also attending from the U.K. were Ronald Corke, and Ronald W. Jarvis, Technicolor.

Attendees at Industry Luncheon were addressed by guest speaker Roger Mayer.

Joerg D. Agin was the featured speaker at the Fellows Luncheon.

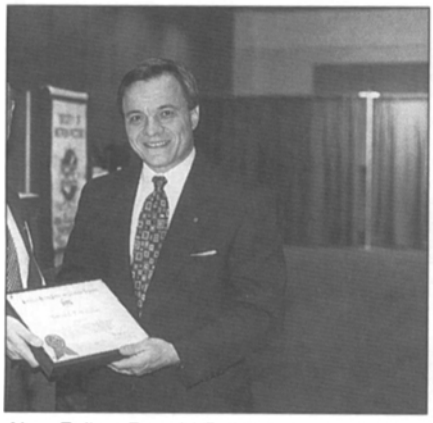


Stan Baron speaking at at Fellows Luncheon; David George is seated at the left.

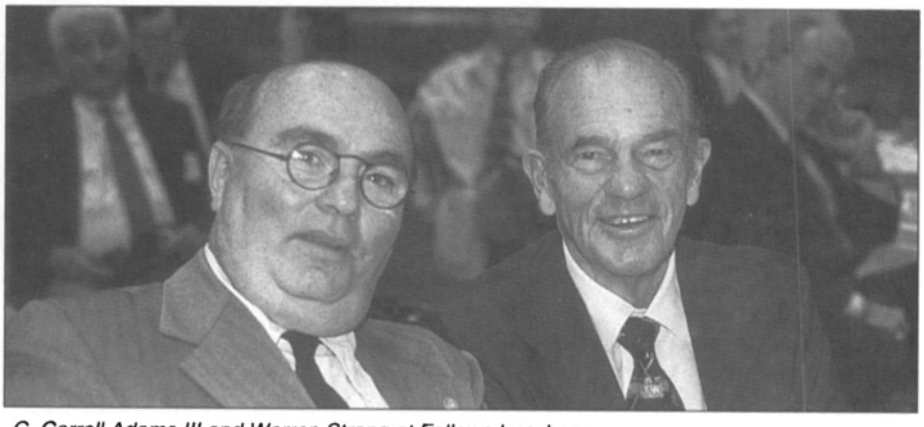
Stan Baron presented certificate to new Fellow Sven Olof Ekholm.

New Fellows of the Society: (L-R) John F. Sawyer, Bernard J. Lechner, Kees A. Schouhamer Immink, M. Lynwood Heiges, Jr.

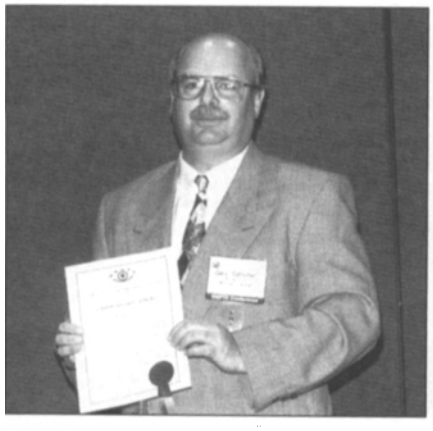
New Fellows: (L-R) Peter M. Fannon, John David Walters, Jr., Chris Cookson, Fred Benedikt



New Fellow Donald T. Adydan



C. Carroll Adams III and Warren Strang at Fellows Luncheon.



SMPTE Canadian Regional Governor Gary Teltscher holds BKSTS Fellow certificate.

Visitors from the U.K. attended the Fellows Luncheon. (L-R): Ian Mackay, BKSTS; Ronald Corke, and Ronald W. Jarvis, Technicolor.

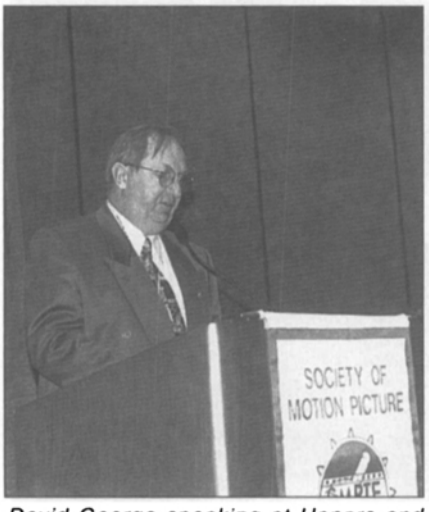
Honors and Awards Reception

At the Honors and Award Reception, held Friday evening, October 11, in the Regency Ballroom of the Hyatt, the Society presented its prestigious awards in recognition of outstanding achievements. Approximately 300 people attended the ceremony honoring this year's recipients. At the festive Evening Reception that followed, guests were treated to lively music and refreshments.

The Socety's highest award and greatest distinction, *Honorary Membership,* was conferred upon former SMPTE President **Robert M. Smith,** Du Art Film & Video, in recognition of his many contributions to innovative technology in the field of motion pictures and television.

The following were also recognized with SMPTE awards. *Citation for Outstanding Service to the Society:* **Walter J. Bebenek,** Major Technologies, Inc., **John J. Cerquone,** Sony Electronics, Inc., and **Edwin J. Kennedy,** River Cities Broadcasting; *Eastman Kodak Gold Medal Award:* **Raymond Wyman,** retired, University of Massachusetts at Amherst; *Fuji Gold Medal Award:* **Leonard Chapman,** Chapman/Leonard Studio Equipment Co., Inc.; *John Grierson International Gold Medal Award:* **Robert Drew,** Drew Associates; *SMPTE Honor Roll:* **Philo T. Farnsworth,** deceased; *Journal Award:* **Guy W. Beakley,** Optivision, Inc., **Christopher P. Cressy,** StellaCom, Inc., and **Jeffrey L. Van Pelt,** StellaCom, Inc.; *Journal Certificate Award:* **Randy Conrod, Michel Proulx,** and **David Strachan,** Leitch Technology International, Inc.; *Technicolor/Herbert T. Kalmus Gold Medal Award:* **John Sawyer,** Eastman Kodak Co.; *Presidential Proclamation:* **Jerry Lewis,** Jerry Lewis Films, Inc.; *SMPTE Progress Medal Award:* **Edwin E. Catmull,** Pixar Animation Studios; *David Sarnoff Medal Award:* **Bernard Lechner,** Consultant; *Samuel L. Warner Memorial Medal Award:* **Jim Ketcham,** Digital Theater Systems; and the *Society Citation,* **Frederick M. Remley, Jr.,** retired, University of Michigan.

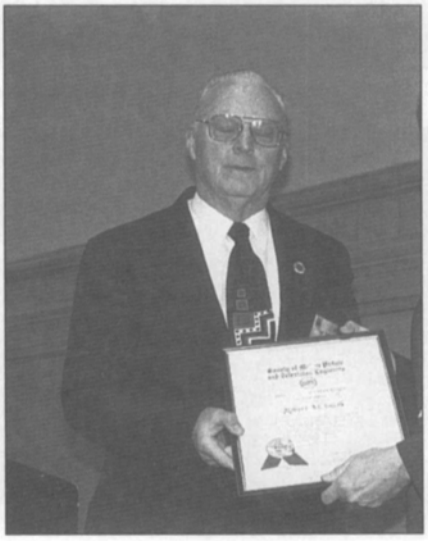
The Society extends its congratulations to all of the Honors and Awards recipients and newly elected Fellows.



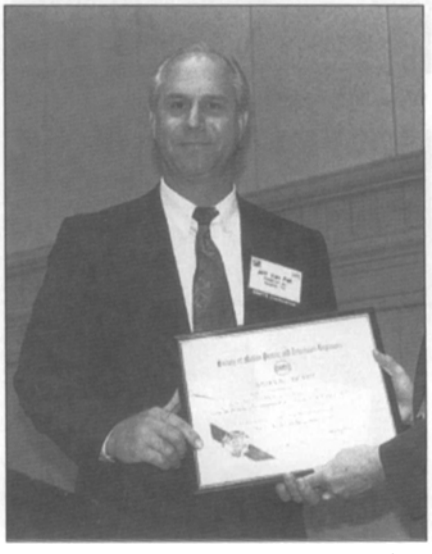
David George speaking at Honors and Award Reception.

Stan Baron addressing guests at Honors and Awards Reception; David George is at right.

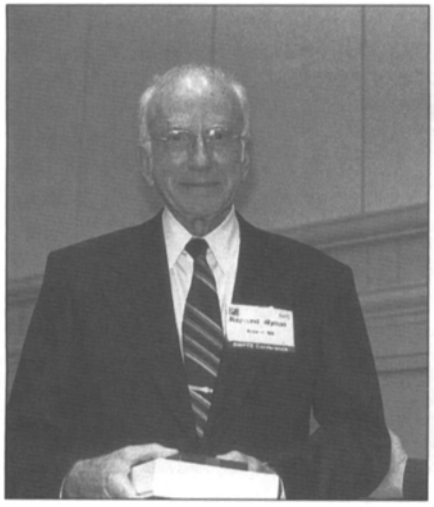
Mrs. Philo Farnsworth accepting Honor Roll Award on behalf of her late husband.



Former SMPTE President Robert M. Smith accepting Honorary Membership.



Jeffrey Van Pelt was one of the authors receiving the Journal Award.

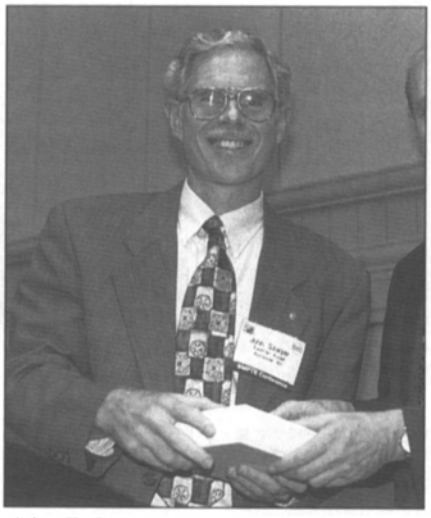


Raymond Wyman, recipient of the Eastman Kodak Gold Medal Award.

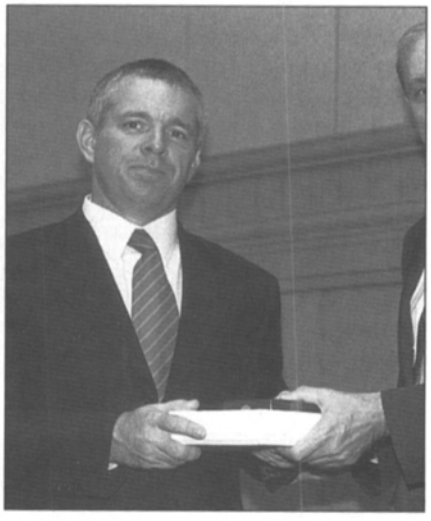
Leonard Chapman, winner of the Fuji Gold Medal Award.

Edwin E. Catmull received the Progress Medal Award.

Bernard J. Lechner was given the David Sarnoff Medal Award.



John F. Sawyer accepted the Technicolor/ Herbert T. Kalmus Gold Medal Award.

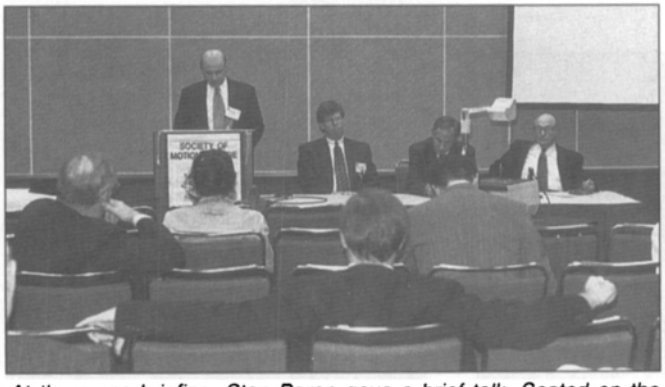


James Ketcham received the Samuel L. Warner Memorial Award.

Michel Proulx, David Strachan, and Randy Conrod accepted a Journal Certificate Award from Stan Baron.

The Honors and Awards Reception featured music and entertainment.

Guests enjoyed refreshments at the Honors and Awards Reception.



At the press briefing, Stan Baron gave a brief talk. Seated on the dais were conference guest speakers Christopher Cookson, Michael Harris, and Roger Mayer.

The registration area at the Los Angeles Convention Center.

The SMPTE Store/Membership Booth displayed many of the Society's publications and products. A number of new members joined the Society at the conference.

Conference attendees enjoyed a daily Coffee Club, courtesy of Pacific Bell. Glen Pensinger and Staff Engineer Mark Hyman are shown having an early morning cup of coffee.

Partners Program

A comprehensive Partners Program, including a trip to the famed Magic Castle Park, daily breakfast and luncheon, and a generous amount of sightseeing, was enjoyed by 40 participants. Chairwoman Judy Chewey was praised for doing a great job of organizing the popular events for companions of conference delegates.

The Society acknowledges the generous support of the following: The Academy of Motion Picture Arts and Sciences, Consolidated Film Industries (CFI), Deluxe Laboratories, Digital Theatre Systems (DTS), Eastman Kodak Co., Fuji Photo Film, Graham-Patten Systems, Hollywood Film Co., KCET-TV, Look Who's Talking, Macy's, Magnasonic Corp., Panavision, Paramount Pictures, Elaine Stein, Studio Film & Tape, Tektronix, Tele-Print, and WLR Research.

Committee Meetings

During the conference, the Society held meetings of the Executive Committee and Board of Governors, as well as other administrative, editorial, and engineering committees. Society business was transacted and the newly elected officers were introduced.

In the Authors Lounge: SMPTE Program Coordinator Marilyn Waldman (L) with Victoria Le Haie, Warner Bros.

SMPTE Marketing Director John Izzo, Finance/Membership Manager Andrew Zeyer, and Executive Director Fred Motts.

Staffing the SMPTE Membership Booth (L-R): Administrative Assistant Zoila Figueroa, Membership Chair Chuck Phelan, and Membership/Computer Services Coordinator Daureen Matera.

Headquarters personnel enjoying the Industry Luncheon included Andrew Zeyer, Zoila Figueroa, John Izzo, and Shellie Anderson, Marketing/Conference Coordinator.

Sponsored Activities

The Society wishes to express its appreciation to the following organizations for their generous support of the conference events: Dolby Laboratories, Inc., San Francisco, Calif.; Eastman Kodak Co., Hollywood, Calif.; Foto-Kem Industries, Inc., Burbank, Calif.; Fuji Photo Film U.S.A., Hollywood, Calif.; Leitch, Inc., Chesapeake, Va.; NBC, Inc., New York, N.Y.; Pacific Bell, San Ramon, Calif.; Pacific Title & Art Studio, Hollywood, Calif.; Panasonic Broadcast and TV Systems Co., Secaucus, N.J.; Quantel, Darien, Conn.; RTI/Lipsner Smith, Lincolnwood, Ill.; Technicolor, Inc., N. Hollywood, Calif.; Tele-Print, Dallas, Tex.; and Universal City Studios, Universal City, Calif.

Many thanks to all of those companies, organizations, and individuals who gave freely of their time and effort to make this conference a successful event. It couldn't have been done without them.

Joyce R. Hurwitz
Photographs by Jeffrey Friedman

CONFERENCE COMMITTEE

Conference Vice-President
Edward P. Hobson II, Sony Electronics

Editorial Vice-President
Thomas J. Bentsen, NASA

Program Chair
Charles Dages, Warner Bros.

General Arrangements
Michael Chewey, Look Who's Talking

Hospitality and Information
Gerald Finn, Pasadena City College

Registration
John Mason, Eastman Kodak Motion Imaging

Opening Films & Tapes
Ron Little, Consolidated Film Industries

Audio/Visual Projection
Paul Carey, Marketing Specialists, Inc.

Signage
T. Russell McMurtray, Laser Pacific Media

Transportation
Dave Richards, Action Capture

Membership
Chuck Phelan, National TeleConsultants

Industry & Fellows Luncheons
Richard Thomas, Deluxe Laboratories

Reception & Entertainment
Elaine Stein, Magnasonics Corp.
Horace Scott, KCET

Student Fair
Donald McCroskey, ret.

Partners Program
Judith Chewey

Resolution Independence . . . A Studio's Perspective

By Christopher J. Cookson

Thank you, Mr. President, for the welcome and introduction to this year's SMPTE Conference. It is an honor and pleasure to be here this morning.

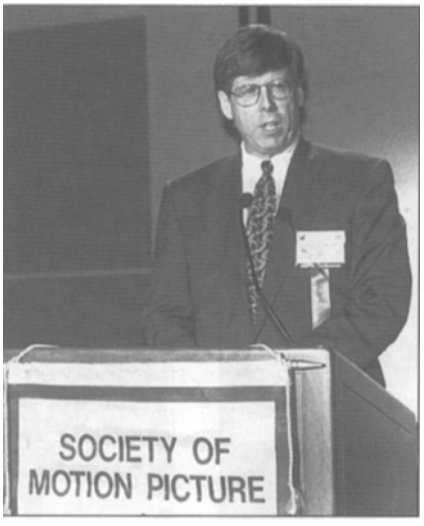
We are all familiar by now with the directive to "rethink the business we are in." The railroads, we are told, failed to do this in a timely fashion and paid the price of discovering too late that they were in the transportation business and not the railroad business. For this, they have been typecast as the village idiots of the Industrial Age. But there is another way to look at this story. If railroaders had not had the good sense to recognize their own limitations, Amtrak might be responsible for running the airline system today!

The point is this: not everyone recognizes the application potential of new technology to change the basics of the business that they are in. Corollaries of this are that not every invention works and not every institution benefits by every innovation. But, those institutions and individuals who carefully assess the application of technology will not only survive but prosper.

The rewards for choosing the right changes are substantial. Today, the railroads in the United States are in a state of unprecedented financial success due to a technological innovation called "mixed modal": the integration of rail, water, and highway transportation using containerized cargo techniques.

As the noted Stanford University sociologist, Edward Spicer, put it, "Changing people's customs is an even more delicate responsibility than surgery." And the more deeply rooted the custom, the more dangerous the surgery.

Text of keynote address given at the SMPTE 138th Technical Conference in Los Angeles, Calif., on October 9, 1996. Christopher J. Cookson is senior vice-president, technical operations, Warner Bros., Burbank, CA 91505.



Christopher J. Cookson

Film as the Medium of Preference

As we, the technical leaders in the entertainment side of the television and motion picture industry, continually rethought our business, we discovered that we are in the narrative storytelling business . . . the creation of copyrighted materials. Historically, the chosen medium of preference for the creation of these stories is film — a visual medium that is demonstrably more stable than any of the various magnetic media available to us today. Our challenge is to use this tool and others now emerging so that our creative products can be seen more widely and become readily accessible to the billions of people who will be entertained and informed by them for generations to come.

At Warner, most of our theatrical and television products are originated on film. To some degree this is a technical decision, but it is more fundamentally a structural reality. The fact is, moving pictures — film, cinema — were the first major change in narrative structure since storytelling began. The printing press, doubtless an important invention, nevertheless failed to alter the narrative form. Stories, before and after its invention, were still told pretty much the same old way. But motion pictures did, at last, change the narrative structure: lighting, sets, props, costumes, action, the juxtaposition of visual images, words, no words, and pacing. All these elements came together in a new structure to tell stories in an entirely new way.

In the hundred plus years that civilization has been making moving pictures, we have developed a highly refined and sophisticated narrative structure in film. It is a collaborative form. Everybody contributes something. (Hard as it is to believe, a goodly number of the people and organizations listed in the credits actually contribute something that is visible up there on the screen.)

The medium of film is fundamental to this process. The people who make narrative movies and television shows are used to working in it and writing on it. You cannot substitute something else for it and still get the same product.

Therefore, as we went through the process of rethinking, reengineering, and becoming digital at Warner Bros., we reached the startling conclusion that the medium that best suits our long-term origination and storage requirements is motion picture film.

Advent of Television

Television has been to motion pictures what the printing press was to writing — a new delivery system that radically altered access to the content but didn't fundamentally alter the linear, narrative structure. The social impact of the distribution medium of television has been chronicled by many. Evolutionary distribution formats of television, such as cable TV, videocassettes, and, most recently, direct broadcast satellites, have opened up still more avenues of distribution by which consumers gain access to the products produced here in Hollywood.

The concession that Hollywood has made to the advent of television and the ever-increasing array of viewing systems is called "shoot and protect," the practice of framing and staging scenes generously enough to allow for the alternative aspect ratios of the principal display systems, the theatrical movie screen, and the television screen.

In the long run, this seems to be the right concession to make. In recent years, we have been blessed with scores of new tools that have allowed us to further expand and develop our narrative arts. The computers and software that have made it possible to create believable scenes that could never have been constructed in the physical world have helped to invigorate film and television storytelling. Just as many new tools have been developed that have improved the efficiency of the process so that lighting setups are more precise and can be set up more quickly, or allow us to record or rerecord sound with ever greater fidelity, nonlinear edit systems have given directors, editors, and producers greater control of the editing process. But in the end, the goal is always greater control and mastery of the narrative process and not a fundamental change in the way stories are told.

Convergence of Technologies

To what then, should we devote our inventiveness? I believe that a fundamental change is occurring. There is an ongoing convergence of the creative palette and tools for film and television, but this convergence is occurring, and should continue to occur, independent of the final display medium. I call this "resolution independence."

We can no longer presume what the consumer will use as the final display — a motion picture screen, a television, a computer screen. Or will it be some other yet-to-be-invented device? Now that we have decided that we are not interested in reinventing the narrative structure and that we are interested in expanding the manner and frequency of access to our product inventory for consumers, what technologies should we bet on?

New Display Products

Every consumer electronics show introduces a staggering new array of display products. The technical press is filled with stories of new network technologies, and the business press routinely features reports of new alliances and businesses lining up to exploit these new technologies.

An amazing array of electronic devices has come into the market over the past 30 years designed to let people watch movies and television wherever and whenever they want. Recently, declining prices and digital technology have helped to accelerate the introduction and adoption of new consumer video and home entertainment products. According to the 1995 consumer electronics survey, color television has now penetrated better than 98% of households; VCRs, 96%; and color stereo TVs are in more than 50% of households.

Personal computers are now in better than 40% of households, but barely 15% of households have modems. (However, within the past couple of years, an increasing percentage of the devices entering the market are ready for multimedia.)

While these are notable successes, it has not been an unbroken chain. Videodisk players, of various design and price points over the past 25 years, still show disappointing penetration levels. DAT and DCC have not been successful in the marketplace despite heavy promotion; and even the most notable consumer electronic successes continue to evolve and show changing patterns of use. Blank videocassette sales to consumers have dropped off precipitously over the past decade, dropping from $1.05 billion in 1985 to just $708 million in 1995; a much steeper drop than can be attributed simply to price decreases.

Resolution

Another notable aspect of the successful and unsuccessful consumer television products of the past 20 years is that the vast majority of the successes have provided the viewer with lower resolution, rather than higher. Does this suggest a preference for less resolution? Hardly! It simply underscores the realization that — to consumers — some things are more important than resolution.

Recently, someone said to me in the midst of a discussion about HDTV, "If you stop the average person on the street and ask them what they want to see more of on television today, no one will say, 'more resolution.' " Instead, most viewers will say they want more drama, more comedies, more children's shows, more movies. Certainly, the evidence in the marketplace supports this observation.

While total broadcast television viewing may be growing only slightly or even declining in some categories, the home screen has never been busier. According to the MPAA, 43% of feature film and TV programming revenue is currently generated by home video sales and rentals. And while the cassette rental markets seem to have peaked in Europe in the mid to late 1980s, it has been more than offset by an increase in cassette sales.

DVD

Now we are looking at the impending mass marketing of DVD. Industry analysts, consumer product manufacturers, and many of the studios have a very positive feeling about the prospects for DVD in the consumer market. It is expected to be attractively priced, widely available, have a better picture quality than laserdisk, and provide a portable multimedia platform for the PC.

As with earlier technologies, we expect the availability of motion pictures in the DVD format to play a major role in the rapid acceptance of this new technology. So far, consumer electronics experts have rated DVD's chance for success as very high. Indeed, one writer in *The Economist* noted that DVD seems "to meet the 10X rule" — the industry truism which asserts that an innovation must be at least 10 times better than the idea it supersedes in order to be successful. But what if there's been a miscalculation, and DVD is only 9.8 times better?

At Warner Bros., of course, we are delighted that the prospects for DVD are so bright. In fact, we are supremely confident. But, what if. . .

Effect on Motion Pictures

Over the years we have noted that there is a positive correlation between the success of a new consumer video format and the sale and rental of motion pictures. As an owner of copyrighted material, we greet each new consumer video format with a cheer, "The more the merrier."

Indeed, what has marked the technical advances of the past 30 years and will mark the technical advances of

the next 30 years is the apparently unlimited number of ways in which large numbers of people like to view motion pictures. Perhaps to the consternation of those who endlessly argue the aesthetics of the wide screen, or the small screen, or high resolution, or low resolution, or 16:9 or 4:3, audiences for motion pictures are insatiable.

Ultimately, the greatest impact of the digital age on our business is the impact it is having on the number of ways and variety of environments in which our products are seen. The technological challenge, therefore, is to come up with a method that will permit us to perpetually repackage our narrative products for optimal display wherever and whenever people may wish to view them.

Once we have recorded a narrative production on theatrical motion picture film, we already have it at the highest resolution level for which there is a demonstrated demand. We can, and do, easily accommodate every alternate line density we are asked for. The fact is, for now, every single delivery system we are asked to produce copies for has a lower resolution requirement than the 35mm color film we originate on. And should some higher resolution ever come into common use, we are reasonably certain that digital techniques would permit us to enhance the resolution.

Resolution Independence

So, when we looked at the new media technologies introduced over the past 30 years, we decided to proclaim our "resolution independence." Resolution independence is the proposition that not all distribution media are created equal. As technologists, we are not called on to modify the storytelling. Instead, we are charged with the responsibility to make the stories available to all present and future audiences. Therefore, it is crucial that all investment in content be preserved at quality levels sufficiently high to exploit the maximum feasible image fidelity of any distribution medium generally available now or in the foreseeable future.

To become resolution independent, Warner Bros. is engaged in the development of new digital telecine technology that will, we expect, permit us to create digital masters from film originals optimized in every way for a plethora of current and future digital distribution formats. By the same token, our filmed originals of feature films and television programs will continue to be carefully preserved.

Like the Declaration of Independence, resolution independence is a simple statement of principles; the value of which, we believe, will endure for generations regardless of the vicissitudes of fashion and fortune. We thought about digitizing our content for archive purposes, but as we examined that proposition, we found digital technology lacking on several counts. There is no single, all-encompassing digital format. Magnetic storage media are expensive, most deteriorate more quickly than film, and the read/write technology continues to evolve rapidly — which would put us in the machine preservation business.

Our colleagues over at CBS Studios practically created the market for used 2-in. quad machines and parts over the past couple of years as they began the process of transferring old videotaped shows to new digital media. This is a process that video and digital media will go through multiple times in the years ahead.

Conclusion

At this juncture in the evolution of technology, our gut tells us that resolution independence is the way to go. It seems the best possible hedge for the future. And, as the Roman Persius said, "The stomach is the teacher of the arts and the dispenser of invention."

When and if DVD becomes a major new consumer format, we will be able to supply those consumers with top-quality copies of their favorite Warner Bros. films and programs. When and if the World Wide Web becomes a major new distribution channel, we will be able to supply it with access to movies and programs stored in the appropriate format. Whether the display screen covers one entire wall of someone's living room or is embedded in a chip on the back of the viewer's eyelid, we will be able to deliver the best of Warner Bros. productions to that venue.

The challenge to us as technologists is to understand what our tools will be used for in the business enterprise of our companies and how our creative colleagues will use them. Film is a rich legacy. Storytelling is an even richer legacy. Legacy systems ought not interfere with your vision of the future; rather, they should be a point of departure and a source of inspiration.

If resolution independence seems less than revolutionary to the digital partisans out there, we don't apologize. . . so be it! After all, take a look at the revolutions that confront us. The proposed "Grand Alliance" specification for Advanced Digital Television seemed like a sure thing until a few weeks ago. Major broadcasters and television equipment manufacturers hammered out their specification over eight years. The computer industry, in the form of the Computer Industry Coalition on Advanced Television, countered with its own proposal criticizing the Grand Alliance specification as "too limiting; too restrictive of innovation." The principal computer industry interests soon linked up with formidable Hollywood interests, in the form of the Americans for Better Digital TV, to press their case in Washington.

And, of course, broadcasters are themselves far from united. The Association for Maximum Service Television, representing mostly smaller market group broadcasters, has tallied up the costs it sees associated with the transition to the proposed digital television system and declared it financially ruinous.

Machiavelli understood the thankless task of innovation well. "There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new order of things," he wrote. "Whenever his enemies have occasion to attack the innovator they do so with the passion of partisans, while the others defend him sluggishly, so that the innovator and his party alike are vulnerable."

While we describe our decision to develop a new digital telecine technology as "resolution independence," we could just as easily describe it as "revolution independence."

As creators of content who wish to see it perpetually distributed in every manner and form for which there is demonstrable demand, we are apt to follow the advice of the poet, Alexander Pope:

"Be not the first by whom the new are tried,
Nor the last to lay the old aside."

Thank you, and have a great conference.

Keynote Address — 138th SMPTE Technical Conference and World Media Expo

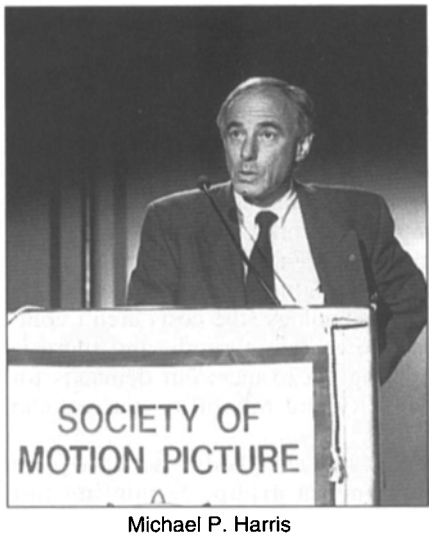
By Michael P. Harris

I'm going to talk about the new environment facing us, particularly in regard to digital technology — what it makes possible, and what it makes easy. I don't want to humiliate myself in front of this eminent audience by guessing what applications are going to prevail, or which players are going to win, or where the money will go — Microsoft, IBM, John Malone, Ted Turner, Ted Rogers, AT&T, Bell Canada, and all the television network planning departments in North America, Europe, and Asia are trying to figure that out. They are all smarter than I am, and also they have enough wealth and resources to turn the developments in ways that will favor their interests. I've got none of that. What I will try to do this morning is outline the kinds of ideas facing the network television management community in Canada as it considers what's going on.

My thesis is a simple one, that there will be room in five years for a much broader range of television production, a range that still has the same top end — maybe a little higher — a lower bottom end, and a fuller selection of programming and production values in the middle. But it's a long way to there from here.

CBC as an Example

Let me start with the CBC, where I work, as a moderately typical case. The Canadian Broadcasting Corp. is the largest broadcaster in Canada. We have nine networks, main television networks in English and French, all-news cable specialty channels in English and French, four radio services, English and French FM and AM, and Radio Canada International, our international arm. The English television network originates from the Broadcasting Centre in Toronto — the first and, we think, still the largest — totally digital, serial component facility in North America. That's how big we are.



Michael P. Harris

Financial Problems

Here's the trouble we're in. The CBC, like public and private broadcasters everywhere, is facing severe financial problems, through an over 30% cut in our financing (advertising and government grants) over the past three years. We have plans to take 416 million dollars out of a total budget of about 1.3 billion. In planning the cuts on the English television and English radio side, senior management, as you'd expect, has tried to keep every dollar possible for programming. We're getting rid of bricks and mortar, of support services; we're cutting back on capital expenditures, easing maintenance schedules, and lowering standards (we can't even afford to send people here); and we're trying to increase the efficiency of the remaining employees.

Digital Applications

We have looked at applications of digital technology in all spheres of our operations as one of the most important tools to help enable us to come as close as possible to maintaining the quality of our product despite the budget cutbacks. We've looked at those applications, but they aren't helping us yet, and we're not sure when they'll start to help.

We continue to look at digital distribution and compression. Our network, on the English TV side, has 14 originating stations, 20 affiliates, more than 600 rebroadcasters, 6 distribution channels, and 3 gathering channels. All this serves five different time zones. It comprises one of the most sophisticated and complicated distribution and gathering structures in the world, and that's not counting the specialty services or radio. We know the whole distribution and gathering side is going to change — we're not sure what to — and we're also not sure how much money, if any, will be saved at the end of the day when we do make the change.

Our experience is that this industry isn't great at predicting the future — which standards or which technologies will prevail — and we make no apology for waiting to follow whatever compression standard and digital distribution trend emerges, whether it's satellite, wireless cable, cable, or telephone fiber, or continued operation of the transmitter networks. It won't be easy — whichever way we go, we'll be disenfranchising some taxpayers who are supporting our services. In the meantime, we keep sustaining our old system, just like I keep paying for repairs to my '85 car. And we get caught in the middle — told that if we choose the wrong standard, our signal, come the millennium, will end up in analog form in the consumer household, without any of the digital bells and whistles we're staking our future on.

Multiskilling and Cross-Skilling

We have looked at our union agreements — agreements that originated in an environment where our technical unions owned the equipment. If someone was going to touch a tape machine, that person would be NABET

Text of keynote address delivered at the 138th SMPTE Technical Conference in Los Angeles on October 9, 1996. Michael P. Harris is executive director, media operations, English television networks, Canadian Broadcasting Corp. (CBC), Toronto, Canada.

(National Alliance of Broadcast Employees and Technicians).

Earlier this year, we successfully renegotiated to respond to the changing nature of the work; i.e., that almost anything can now be done on a computer terminal — the journalist's script, the research, the graphic design, the whole electronic newsroom, the editing, the Chyron and still-storer function, the autocue — it is all data now, and it all can be done by the same person, if he/she has the skills, from a single workstation with a single piece of equipment. Multiskilling and cross-skilling became a key for us to save millions of dollars by allowing, for example, camera operators to be editors, journalists to be Chyron operators, etc.

In our labor negotiations, we actually had a target of 16 million dollars based on cross-skilling alone. But our experience to date is that nonlinear editing tends to simply increase the number of options someone can look at in an editing session. It improves quality, but without management discipline, there is no impact on costs. And the people who make nonlinear editing systems aren't yet the people who make cameras that are compatible, or the newsroom systems. So again we see the savings, but they'll only follow an enormous capital expenditure, converting all our newsrooms. And the equipment we want may show up next year in Las Vegas, or it may not.

Instead of closing some foreign and domestic news bureaus, we examined the possibility of reducing the staff to one or two people. That depends on the kind of easier, lighter camera operation made possible by digital technology. And if the output was to remain as productive, it required planning for a work environment where the journalist, returning to the feed point, could make a rough edit and compose his script and have it approved by satellite telephone en route. We recognized the cost in quality — our studies show that everyone going down the multicross-skilling road in the field has faced a quality deterioration in the product — there's less think time, less research time, and less craft. We also know the training demands are large — and we know the appropriate equipment is not all there yet.

One result, from another broadcaster's experience — we'll be testing ourselves soon — an experience that seems counter-intuitive to me, but perhaps not to this group. It is technicians, not journalists nor producers, who are most suited for multiskilling. They pick up the others' skills more quickly. The attitude in many journalistic environments had been, if you're capable of screwing in a light bulb, then obviously you can't read or write. Apparently that's not true, and it's finally being shown.

Future Areas

Also at the CBC we're sitting on a small pile of capital money, waiting for server technology that we can use in our Network Control Centre. That's another area where manufacturers keep changing the storage standards and technology, the costs aren't coming down fast enough, and there is nothing yet to meet our demands for capacity and reliability that we can afford.

We, like everybody else, have got a new media group, expanding our Internet and CD presence, generating business plans, carrying the same message those groups carry in most companies . . . either you're in, or you're not, and if you want to be in, you're going to have to invest a lot more in developing and maintaining your sites than you're spending now. And the revenue? Down the road.

That's our example. Savings, simplicity, better quality on the horizon maybe — but the savings won't be immense, and it will require strong management, good timing, some luck, and careful guiding of the union agreements to achieve what may be possible.

But the savings will not be enough to offset either the increased competition for the same commercial pie, or the decline in government funding and protection. It is just a Band-Aid. The more important impact of digital technology addresses the bigger questions: "Is the whole system going to be there?" "What will a broadcaster be in five years?"

Fragmentation

The overwhelming change that we're all dealing with — and will continue to deal with — is fragmentation, all kinds of it. We usually mean channel fragmentation. You all know about that . . . the multitude of channels, made possible partly by coaxial cable, by digital technology and its impact on distribution systems; partly by the new economics of the television industry, where the bulk of revenue comes from direct payments from subscribers and purchasers as opposed to through advertisers buying time. It is important to note that the consumer price elasticity for services is very great — they'll pay a lot more than they are currently paying for television service. But, on the other side, the advertising pie isn't expanding much, it's just being spread thinner.

Another force that's increasing fragmentation is deregulation . . . the most recent incarnation of which was the granting of 23 new Canadian specialty service licenses just last month. The fragmentation has always been more apparent in Canada than in the U.S., where our television industry has always had to compete alongside the immensely popular, expensive, and well-promoted product from south of the border.

The three American networks are joined by the PBS stations and Fox, and in Toronto by approximately 7 independent stations and some 20 or 30 specialty channels, about half Canadian and half American; some French-language, some multilingual and multicultural channels; and an array of pay and pay-per view channels on top of that. If you start at Channel 2, you finally run out of channels up around the 70 mark. Canadian educational, Canadian private network, multicultural, channel guide, public broadcaster, local, private Canadian network, news alphanumeric, community, local private, French public, French educational, ABC, NBC, CBS, PBS, federal parliament, provincial parliament, real estate, home shopping, remote private, barker channel, weather, religion, kids, news, women's, music, sports, A&E, Nashville, CNN, TLC, TVCinq, New Country, Showcase, Discovery, Bravo, Life, Headline; superchannels from New York, Chicago, Atlanta, Boston; Movie Network, Family Channel, MoviePIX, CNBC, and now 23 more Canadian and probably a matching 23 new foreign services, business, talk, comedy, sports, preschool, science fiction, history, and on and on.

Of course, what's always said after a list like that is, "100 channels, and nothing's on." Or another version,

"Whoever is going to succeed in that environment is going to succeed with programming." Or "People watch programs, not channels." Well, yes and no.

Network Programming

One major thing that has happened recently is that a lot of less expensive network programming is being produced. I was involved in the launch of Canada's first all-news channel, Newsworld, a spin-off from the News and Current Affairs arm of the CBC. Whereas the CBC was producing (by American standards) relatively cheap news and current affairs program, of an order of magnitude of $50,000 to $100,000 per hour, Newsworld produced a schedule at about a tenth of the cost. The same was true of CNN at its launch — a whole network at a tenth of the cost of the news departments of the major broadcasters. Ditto for other Canadian and American cable channels. Budgets of tens of millions, not hundreds of millions of dollars.

Of the 70-odd channels in the Toronto environment, only three or four — the American Nets — are showing original million-dollar half-hours, 2-million-dollar hours. For non-Americans, the sad truth is that the vastness of the American audience and the economies of scale available in this country mean that only the U.S. (maybe Britain) can finance top-end productions at the cost that they are currently being produced — in excess of 3 million dollars for an episode of "E.R." Those highly distributed and highly promoted programs make it very difficult for other English-speaking countries to compete profitably for the mass audience without government help, or without culturally protective policies. Enough whining.

Most of the channels in a 100-channel universe have extremely inexpensive original programming. Their success depends on the identification of their audience, and tracking and meeting its needs. The programmers are trading off the already selected interest in the subject matter against increased production values. At Newsworld we always knew that as long as we stayed exactly on the issue of the moment, surfing along the public agenda, it almost didn't matter, beyond a base minimum, what production values we brought. Programming as simple and inexpensive as an extended interview with the minister responsible for a new

"Our experience is that this industry isn't great at predicting the future — which standards or which technologies will prevail — and we make no apology for waiting to follow whatever compression standard and digital distribution trend emerges, whether it's satellite, wireless cable, cable, or telephone fiber, or continued operation of the transmitter networks."

government policy, or live coverage of an endless trial, would serve our mandate and our audience well.

That's a lot easier programming job than staring at a blank piece of paper or the noise of an empty TV screen, trying to create something brand new; and to create it with enough intelligence, production values and insight, promotion, and stars to bring a significant audience to your product, an audience that hasn't already been preselected. It is in that most competitive environment that the creators of network American programming have been raised. On the American networks, out of 1,600 pitches, 1,200 scripts are finished. From those, 120 pilots are produced. Forty of those go into a schedule, and three survive at the end of a year. A 0.1% success rate. On the other 60 channels, and on all the networks in almost every other country in the world, pretty much everything that is piloted goes. That means that what succeeds in the U.S. is vastly more likely to please a mass audience than what's produced elsewhere.

It also brings to mind what I heard Kurt Vonnegut say in an interview a couple of years ago, when he was asked who his favorite writer was. He said he liked "Cheers," and that the writers usually had something to say with almost every line.

Until recently, there has been Hollywood and there has been local station TV, and really nothing in between. You are going now to have modes of production with production values across the spectrum. We are looking at ways to do interesting things, without them costing what they traditionally have and without them requiring the same bandwidth they traditionally have.

On the content side, in the big American media, you can create the agenda. What Bart Simpson does sets a tone for children across the world. The way that Jerry Seinfeld's eyebrows deal with the trials and humiliations of everyday life functions as a kind of psychosocial barometer to tell us what limits of behavior can be tolerated, and what is beyond the permissible. If you're not plugged in, you'll have a little trouble getting by.

Mass Media

Which brings us to another central variable . . . the mass of the medium and how important it is to have a mass audience to the experience of television. It was a big moment for all of Canada when Donovan Bailey and the relay team won their races in Atlanta. It's popular mythology among producers that the way to a successful program is to have the people talking about it around the water cooler tomorrow . . . and commercials.

Let's not forget commercials. Neil Postman, a critic of American television, points out in his most recent book that between the ages of 3 and 18 the average American youngster will see about 500,000 television commercials. This means, says Postman, that the television commercial is the single most substantial source of values to which the young are exposed . . . and the basic message, as understood by Postman, is that life is made worthwhile by buying things.

But to get caught up in the content, even that cynical content, I think, is to miss most of what's happening.

One of the first people to focus a critical eye on television was Marshall McLuhan. He argued that societies were always shaped more by the nature of the dominant media through which people communicate than by

what they communicate. He saw television as presenting very little information but demanding a great deal of fill from the viewer, and that the filling-in activity led to unprecedented involvement. The array of pixels, the low-resolution quality of the picture, left the viewers a great deal of work in terms of filling in the image. Subsequent research confirms that the eye pattern of people watching television is extremely active — research I confirm daily as I watch my 8 and 10-year-old children in the classic television facial set, taking in their 23 hours a week.

In McLuhan's conception, the content is the steak, the ice cream, the laugh every 12 seconds, that diverts the mind while the medium, the succession of dots and lines, does its actual work. McLuhan argues that those who say TV presents experiences for passive viewers are wrong. He says, "TV is above all a medium that demands a creatively participant response."

Interaction

The arrival of Nintendo, Sega, CD games, chat groups, and new realities and societies on the Internet raises participation to a level even McLuhan couldn't have contemplated. And the arrival of these different media is not the end of fragmentation.

Even in the way we watch television in the home, there is fragmentation. In fact, ever since the popularization of the zapper, the relationship between the audience and the tube has become more and more a one-on-one experience. It has been a long time since television functioned as the family fireplace — it's more likely that everybody is in his or her own space, watching a personal program. To a large extent there is no culture anymore, no event like the old Ed Sullivan show where a cross-section of generations would sit down and see what their parents or children found entertaining or funny or outrageous. Now a boy might be watching the Simpsons while Dad's watching football, Sis is on the computer, and Mom's watching "E.R." One person may never understand another, or even know what the others are doing. Now we are looking, with the Internet, with interactive games, at a present where all those players might be intensively involved, in four different rooms, with whole different worlds, much more real, involving, and interactive, than the family around them.

Digital Technology in the Home

I think the arrival of digital technology in the home should be understood as going in two directions. First, the high-definition television direction, using the possibility of digitization to increase the information available in current-style television programs, to make them better than movie quality, to change the nature of the TV experience, and to turn the home screen into a more passive medium. There is an enormous market for that. When I started thinking about this presentation, my thesis was going to be that the passivity of the end user, kicking off her shoes and collapsing on the couch, to be drowned in a sea of "Roseanne," commercials, and over-the-top production values, was going to win the day — a "nobody-ever-went-broke underestimating-the-passivity-of-the-North-American-viewer" kind of thing. People wouldn't take the time and effort to interact.

As I've read and talked to people, I see more clearly a vibrant second direction, towards lower quality, toward something like the Internet, with its low resolution and total involvement, with the possibility of meeting computer programs masquerading as people in multiuser domains on the Internet — the whole notion of Sherry Turkel's that our interactions with the digital world are causing us to think in a new way, with a tight deadline, about what it is to be human. One-on-one connections and marketing, where constant interactions allow self-definition through the comfort that the medium knows what I want.

I think everybody agrees that there will be a digital box on the side of our homes in ten years. My guess is that it'll be attached to a couple of things in just about every room inside, to the telephone, the fax, the radio, the computer, the TV — that all those machines will soon start resembling each other — another generation of fragmentation. I think as well that the people who developed each medium will have a head start in keeping their percentage of the audience's time. For example, radio producers know about companionship, intimacy, economy, being in the background, and dealing with subjects in depth — all qualities that are anathema to TV producers. A tastefully done video wall with radio traits, plus a little data, and some personalized updated information may be more competition for screen time than many TV services could stand.

I believe there will be a lot of use of the highly interactive, personal, one-on-one, cheap, low-resolution applications . . . how you'll get your news, weather, how you'll talk and get messages, how you'll program your day. And I think there will be space reserved for the high-end mass megabucks productions that create and reflect who we think we are. And in the middle will be myriad individuals and corporations trying to grow their business from their little or giant home page or specialty channels into the creation of mass consciousness. I think, on the bandwidth side, we should be treating it as elastic, not as a constant.

Conclusion

In summary, one way to think about what may be happening in television would be to remember what happened with the arrival of the Japanese in the North American auto market. I think there will be a lot of pressure on the big producers from low-cost competition more in touch with what the audience wants. In cars it was quality and value; in new digital media, responsiveness and relevance. In the end, in both worlds, a fuller array of products to satisfy a more demanding and multifaceted audience.

McLuhan thought television was ushering in a global village. But the latest twist, the forces of fragmentation are creating the possibility of a new individualism and a demand for elasticity in the production and delivery processes. Higher end for HDTV . . . not much better than noise at the totally personal level. This group here will have to be extremely spry to meet the coming range of product demand.