NAB 2016

unleash anytime anywhere

connected technologies • immersive experiences • redefined revenue

Mark Schubin, SchubinCafe.com
(who has visited every booth at every NAB show since 1973)

these slides at bit.ly/bbtb-nab16
2005

ARRI D-20
Alexa precursor

Sony HDC-1500
1080p internal

P2 and XDCAM for HD

Belden
video over IP

Immersive Media

Sony 4K projector

on the other hand...

Vision Imaging III
digital parallax scanner

Kinetta "concurrent photon amplification"

holographic disk storage
Non-Camera Acquisition

- “Hello Stage”
  - Auto lip-sync
  - Up to 23 characters
  - Up to 54 actions
- Show special:
  - 4 characters
  - 14 actions
  - $20 (yes, twenty)
Multi-aspect-ratio universe

- 4:3 HDTVs:
  - Magnavox
  - Panasonic
  - RCA
  - Samsung
  - Toshiba
  - etc.

Mark Schubin, SMPTE-BBTB, 2016 May 11
"I’d like to see what we can do about fixing your aspect ratio."

Joe Dator
*The New Yorker*
2015 Sep 8
(licensed)
shown at SMPTE DCS NAB 2008

GV Xensium CMOS sensor 10,000,000:1 contrast ratio >23 stops
2009: NICT Live Hologram (lightfield camera)
NAB 2010:
Fun out of the Sun in Las Vegas
(and the elephant in the room)
Best 3D Quotes at NAB 2010

- Buzz Hays, Sony 3D Technology Center:
  “Making 3D Is Easy; Making Good 3D Is Hard.”

- Jay Ankeney, *TV Technology* magazine:
  “…3D at the NAB Show Seemed to Be a Profit Motive in Search of a Market.”
High Dynamic Range Imaging

Live Technologies
LiveLens

ARRI Alexa

courtesy of Adam Wilt, provideocoiation.com
2011: How Good Is Good Enough?

- Digital Cinema Summit
  - 4K, high frame rate, high dynamic range, wider color gamut

- Show Floor
  - those
  - plus “good enough”
  - and a total reversal

Douglas Trumbull
photo by Adam Wilt, ProVideoCoalition.com
A Tale of Two NABs

- NAB 2010: We Are 3D
  - Lousy 3D
  - Everyone 3D

- NAB 2011: We Have Useful 3D
  - Better 3D
  - Some 3D
Fun Out of the Sun in Las Vegas 2012

photo by Craig Cuttner
NAB Is All Work!

Central Hall

North Hall
Presentation V: Canon?
2013: Three Lightfield Techniques

Lytro fly’s eye (commercially available, stills only)

Fraunhofer 6-camera array at NAB

MIT coded aperture at SMPTE TSC 2013
2013’s Elephant: Ultra-HD (4K)

- Cameras
  - BMD $3995

- Storage
  - Redray $1750, Sony FMP-X1 $699

- Processing
  - BMD production switcher $1995

- Distribution
  - Fraunhofer HEVC in 5 Mbps

- Display
  - Sony XBR-55X900A <$5K*
  - several 30” professional
  - and...

* but HD version <$2800
2014: Does Sex Attract Buyers?
Expect the expected.

outdoor exhibits
Monday morning

South Hall Upper
Tuesday morning

North Hall
Wednesday morning

Blackmagic booth
Monday afternoon
2015: Fraunhofer Lightfield

- Previously shown:
  - Re-focus in post
  - Re-frame in post
  - Re-iris in post/HDR

- NAB 2015:
  - Re-light in post

unleash
connected technologies • fresh content • immersive experiences
Lytro Cinema
Lytro Cinema
- **Imager**
  - 755 RAW Mpels
  - 300 fps
  - 16 stops DR

- **Post**
  - refocus, DOF
  - reframe, relight
  - depth keying
  - tracking
Fraunhofer’s Tracking

Fraunhofer’s Tracking

Ncam ReLight

lighting sensor for intensity, color, and directions
attendance 103,012, down 107
space 1,063,380 ft², up 49,826
Lands

- Advanced Advertising Pavilion
- Aerial Robotics and Drone Pavilion
- ATSC 3.0 Consumer Experience
- Connected Media|IP
- Futures Park
- Post|Production Campus
- SPROCKIT
- StartUp Loft
- StudioXperience
- Virtual and Augmented Reality Pavilion

LED Walls Land – not an official land
(from 0.8 mm pixel pitch and 8K to...)

Mark Schubin, SMPTE-BBTB, 2016 May 11
ATSC 3.0 Land

artist’s rendering
The ATSC 3.0 Conundrum

- No second channel
- No ATSC 3.0 TV sets
- No government-paid converters
The ATSC 3.0 Conundrum

- No second channel
- No ATSC 3.0 TV sets
- No government-paid converters

ATSC 3.0 to WiFi converter
Intentionally Funniest Thing at NAB

Comedy Rugby
- mixed audios
  - dialog
    - multi-language
  - commentary
    - multi-level
    - comedy
- M&E
- etc.
- **not the technology**
  - A/52 1995
Sennheiser MKE 440
SoftPanels Autocolor

3 x 4 ft (90x120 cm)
2 x 3 ft (60x90 cm)
1 x 2 ft (60x90 cm)
Visionsmith LED ReLamp

Insert the LED
Drone Land
Aerotain: Non-Droning Drone
Anti-Droning

sound camera
AJA RovoCam

- “4K”
- integrated 12x zoom
- HDBaseT
- $2995
Looks Like IP But Isn’t
Some IP

- AES 67
- RFC 4175
- SMPTE ST 2022-6
- VSF TR-03
- NewTek NDI
- Evertz ASPEN
- GV AIMS
- Sony IP LIVE
Some IP

- AES 67
- RFC 4175
- SMPTE ST 2022-6
- VSF TR-03
- NewTek NDI
- Evertz ASPEN
- GV AIMS (not NewTek)
- Sony IP LIVE

AJA Kona IP
GV LDK86N

- N for “native”
- 3 4K sensors
- with DPM

real IP interface

Native 3840x2160 pixels in 4K

Native 1920x1080 pixels in 3G/HD
Money Matters

Sony HDC-4800
4K@480 fps

“a game changer”
- Jason Dachman
Sports Video Group
Money Matters

Sony HDC-4800
4K@480 fps

For-A FT-ONE
NAB 2012
4K@900 fps
2013 Super Bowl
Sony PKW-Z450

single-sensor 2/3-inch 4K
Graphics in the Camera

JVC GY-HM200SP
In VR Land: Nokia Ozo Camera
And Other Gear

Assimilate Scratch VR
Even a Truck!
Center of Human-centered Interaction for Coexistence

- Spatial Touch
- Coexistent Reality Software Framework
LiveLike: Just Like Being There

with friends wearing goggles
Mevo

4K sensor, 720-line out (but 9 images)
Auto-Cutting by Automatic.TV
Ross Makes Cameras?

low noise, “UltraChrome” output
Next-Generation Television

remarkable consensus
(except on clothing)
“It's pretty clear after this NAB that the industry needs to find a Moses and fast”
Ken Kerschbaumer, Sports Video Group
(26 consecutive NAB Shows)
-4300 camera with a new generation of 2/3-inch sensors, featuring execute cut-outs and zooms during replay while maintaining any of your current B4 lenses, camera control units and paint boxes.

Beyond Definition
Sony ad in NAB Daily

Beyond Definition

-4300 camera with a new generation of 2/3-inch sensors, featuring execute cut-outs and zooms during replay while maintaining any of your current B4 lenses, camera control units and paint boxes.
EMC, Pixspan, Aspera, and NVIDIA demoed uncompressed 4K workflows within an IT infrastructure at the show in an effort to advance digital media workflows with full resolution content over standard 10GbE networks.

- **mezzanine compression** (~4K to ≤ bit-rate of HD):
  - BBC Dirac
  - Evertz J2K
  - Fraunhofer Lici
  - intoPIX TICO
  - NewTek NDI
  - Sony LLVC
  - V-Nova Perseus

- production, distribution, perceptual interactions
8K, Too

at Canon
Neither 1\textsuperscript{st} Battle Nor 1\textsuperscript{st} Elephant
Some HDR

Atomos
1500 nit

Panasonic Demo
1000 nit

1000-0.05 nits
or
540-0.0005 nits

600 nits

Mark Schubin, SMPTE-BBTB, 2016 May 11
Correlation between experiments

<table>
<thead>
<tr>
<th></th>
<th>EPFL Pref. scale</th>
<th>EPFL Full PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBU Pref. scale</td>
<td>95%</td>
<td>86%</td>
</tr>
<tr>
<td>EPFL Pref. scale</td>
<td>100%</td>
<td>92%</td>
</tr>
</tbody>
</table>

 HDR video quality assessment by full paired comparison

Prof. Touradj Ebrahimi

EPFL

NAB 2014
Correlation between experiments

<table>
<thead>
<tr>
<th></th>
<th>EPFL Pref. scale</th>
<th>EPFL Full PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBU Pref. scale</td>
<td>95%</td>
<td>86%</td>
</tr>
<tr>
<td>EPFL Pref. scale</td>
<td>100%</td>
<td>92%</td>
</tr>
</tbody>
</table>

Quality Score Value

HDR video quality assessment by full paired comparison

Prof. Touradj Ebrahimi

EPFL

NAB 2014
light from the screen

light reflected back to the screen
RealD scientists found greatest reflection in a movie-theater auditorium is from audience
IBC 2015

- RealD scientists found greatest reflection in a movie-theater auditorium is from audience
  - .: best HDR results when empty

Pete Ludé
SVP, RealD
RealD scientists found greatest reflection in a movie-theater auditorium is from audience

- best HDR results when empty

Issue only when screen is bright
IBC 2015

- RealD scientists found greatest reflection in a movie-theater auditorium is from audience
  - .: best HDR results when empty
- Issue only when screen is bright
  - .: best HDR results when black

Pete Ludé
SVP, RealD
Viewer Attire for 0.0005 Nits?
ULTRA HD WITH HDR
Powered by the Harmonic PURE Compression Engine

HDR

SDR

SDR Up-Conversion

LG OLED TV 4K
HDR-to-SDR

DOLBY

isoVideo

technicolor
HDR-to-SDR

fully automatic conversion with local contrast preserved
Creating cinematic wide gamut HDR-video for the evaluation of tone mapping operators and HDR-displays

Authors: Jan Fröhlich, Stefan Grandinetti, Bernd Eberhardt, Simon Walter, Andreas Schilling, Harald Brendel

https://hdr-2014.hdm-stuttgart.de/ Hochschule der Medien, Stuttgart

Jan Fröhlich in front of Christie 3P projected content at 2015 HPA Tech Retreat

photo courtesy of Charles Sappington, Morningstar Productions
Tons of Data

10,300 TB
YEAR 4
Blackmagic Duplicator 4K

as shown: 125 copies;
in same case: 250

built-in H.265 encoder
Everything You Own is Obsolete — Before You Even Buy It!

Zelin Nation rejoices at the return of the legendary Bob Zelin’s legendary NAB wrap-up, featuring his unmatched insights into the industry’s most important stories in shared storage, IO, converters, studio cameras, Thunderbolt 3, and more.
Questions?

these slides at
bit.ly/bbtb-nab16