



ETC®
Entertainment
Technology Center



Art, Technology, Business, and Health Aspects of 3D

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www.etccenter.org

Agenda

1. How We Experience Depth
2. 3D Content Planning
3. 3D Content Creation
4. Consumer 3D Experience
5. 3D and Health (consulting, not USC ETC work)
6. 3D in the Larger Context

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How We Experience Depth in the Real World

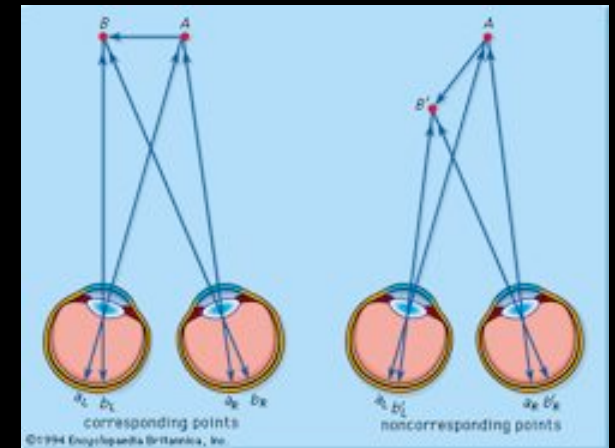
Monocular



Motion



Binocular



Balance, sound, and other sensory input

Philip Lelyveld – Phil@Reelword.com

How We Experience Depth in Stereoscopic 3D

Monocular

Motion

Binocular



“Visual-vestibular conflict”

Balance and other sensory input

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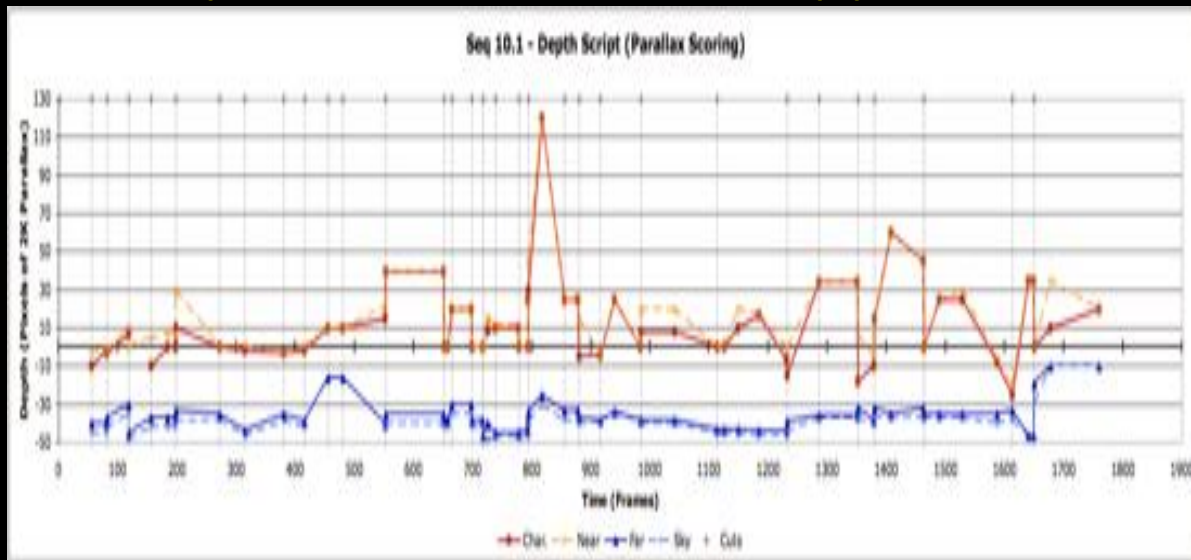
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Planning

- How will 3D affect storytelling?
- The 3D “Look”
- Production Design
- Depth Scripting

Art of S3D

Some new 3D tools and techniques will emerge
Entrepreneurial Creative Opportunities

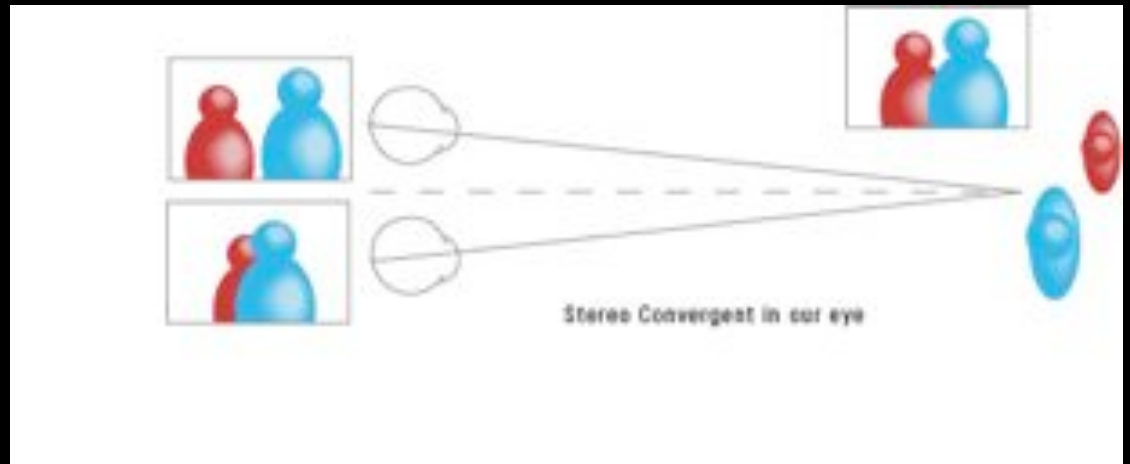
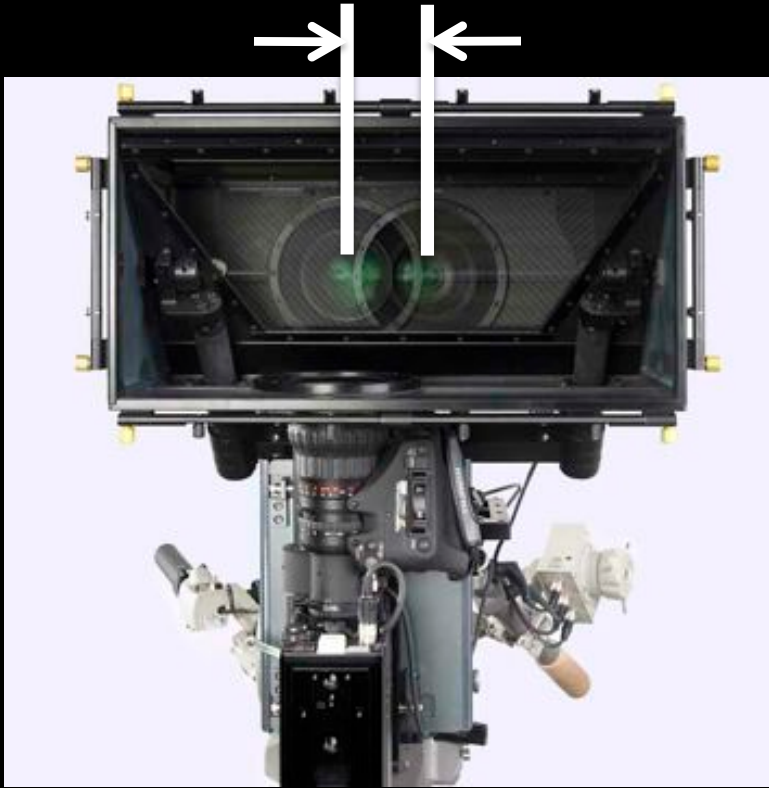


depth script



3D Previsualization

Interaxial Distance and Convergence



Two key factors that define...

- What you see
- How much you can change later

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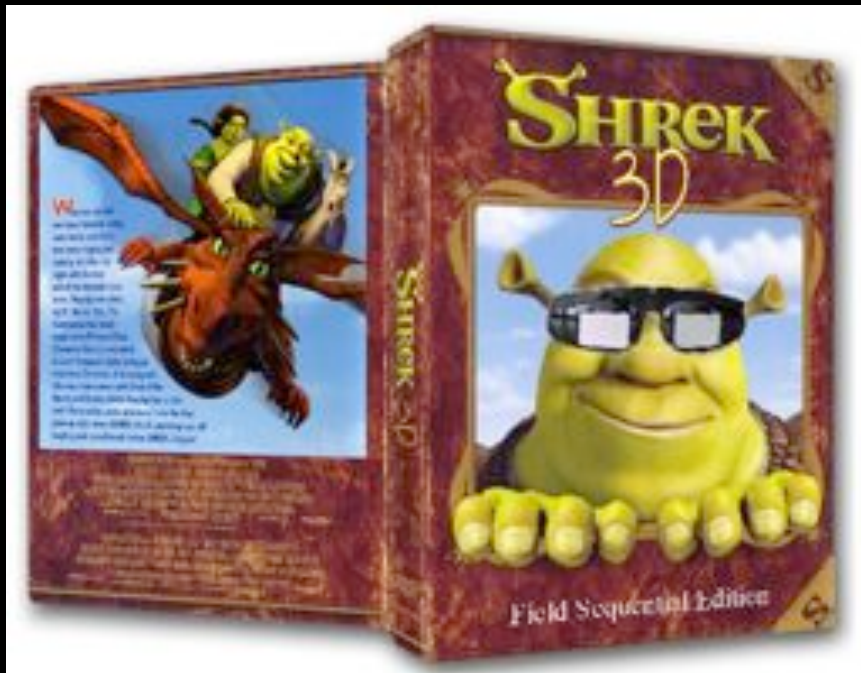
Content Creation

1. Computer Generated Images (CGI)
2. Live Action (2 image)
 - Prerecorded
 - Real time
3. 2D-to-3D conversion



Computer Generated Images (CGI)

- Everything is controlled
- No alignment issues



Games (the other CGI 3D)

- Adjustable S3D

- Average gamer is 34 years old
- Average gamer has been playing for 12 years
- 40% are now women (they prefer social games)

Source: Craig Allen, CEO, Spark Unlimited, 12/10 conversation

- Call of Duty: Black Ops- \$650M in first 5 days
- 50 3D games coming to PS3
- Nintendo 3DS may drive consumer adoption of 3D

Live Action

- Two cameras or camera pairs
- Alignment issues



Beam splitter



Side by side

Art of S3D

Sports and live action are driving the learning curve

Camera development

Cutting among cameras

Scores, captioning, visual tools



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2D to 3D Conversion

Quality/Cost Tradeoff

Real-Time
2D to 3D Conversion



Non-Real-Time
2D to 3D Conversion

- Painters
- Human hands



Native 3D

- Two
Cameras



Conflicting depth cues

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3D Postproduction Workflow

Technical choices of what information gets passed through the workflow will impact the design of consumer devices and 3D experiences!

Metadata
what metadata matters?

Color Depth
16 bit? 10 bit?

Frame Rate
24 fps? 48 fps? 60i

Interaxial Distance
and Convergence
information

Investment
g

es related to 3D

DVB (Europe/global)

- transmission specs
- subtitle/closed caption specs
- indicating 2D / 3D available

SMPTE (global)

- subtitles / captions / overlays
- home master metadata
- home master image

MPEG Industry Forum
3D TV vocabulary

CEA (US/global)

- eyewear signaling
- HDMI transport
- closed caption

ITU (global)

- frame compatible vs 2D+depth

Standardization can come about thru:

- Standards bodies
- **Market power and strategic alliances**
- Grassroots movements

Ex. MP3

- Convenience over quality
- Community-driven open architecture solution when industry did not offer an interoperable solution

Shooting 3D - Lessons learned



Telephoto
≠
Close-up

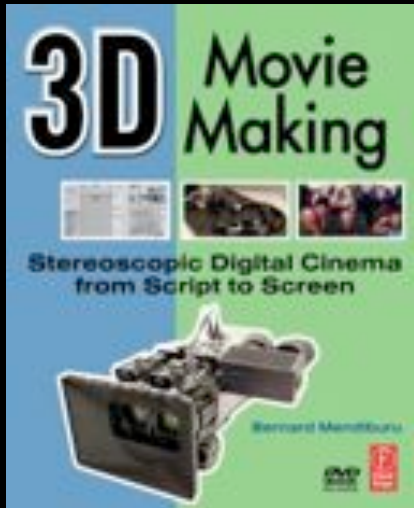


Close-up
becomes
Big-up



Sight lines

Educational Resources



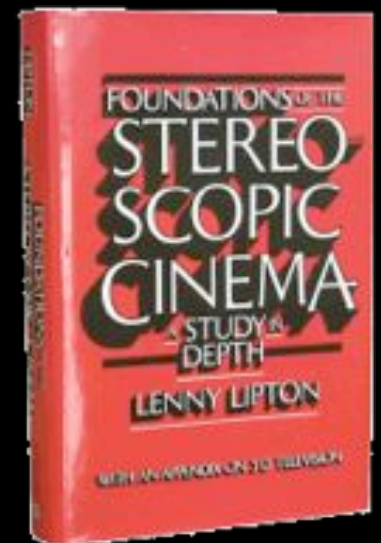
3D Movie Making
By Bernard Mendiburu

Foundations of
Stereoscopic Cinema
By Lenny Lipton



Stereo 3D filmmaking:
the Complete Interactive Course
- DVD at www.convergence3d.net

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The Emerging Language of 3D

End Game:

To transition 3D
from a special effect
to a key resource in the storyteller's tool kit

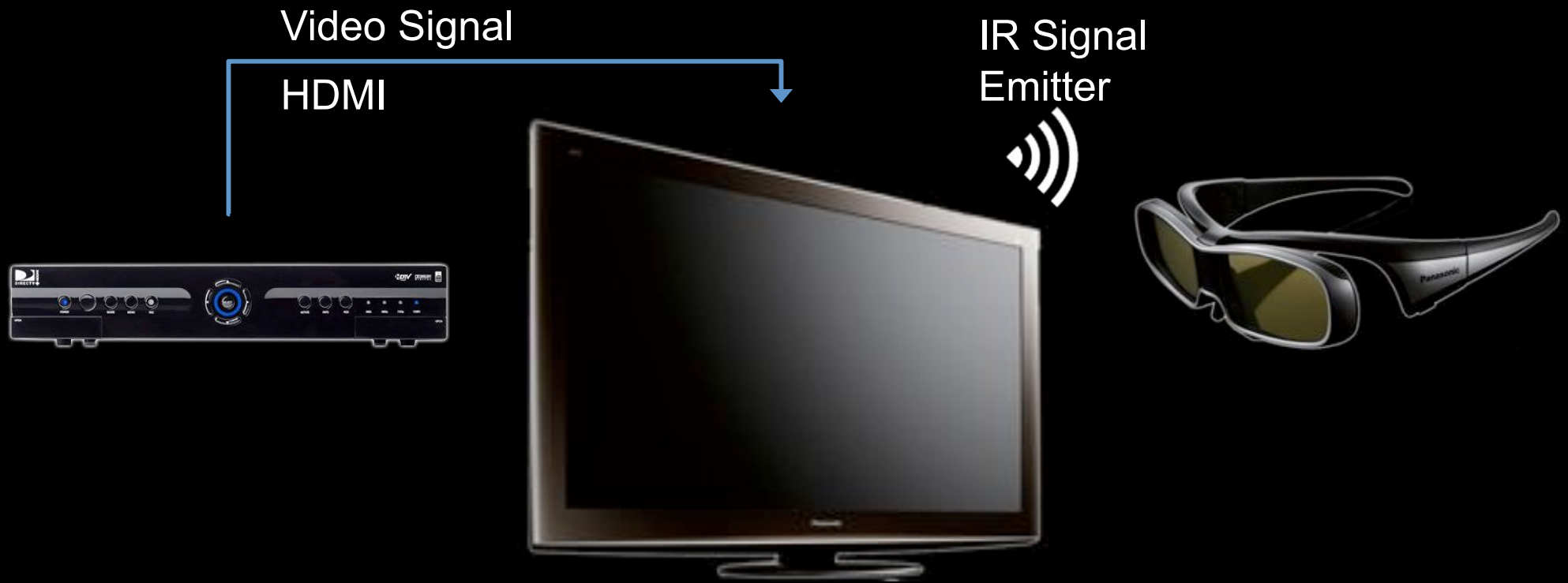


As the audience learns the conventions,
the language of 3D will evolve

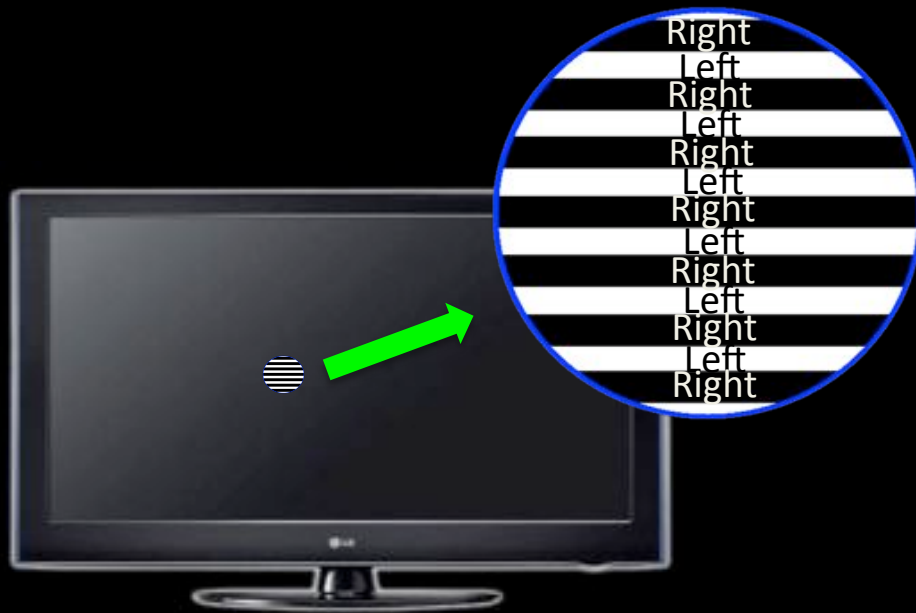
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Active Shutter



Polarized



Low-cost glasses

3 Legs of the Stool

Movies



Sports/
Live Events

Games

Active
glasses



Consumer 3D Choice

Glasses-free



Passive
glasses



Head Mounted
Display



Glasses-free

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Consumer 3D

TVs, laptops, phones,
handheld games



Pleasant **buying** experience comes before
a pleasant **viewing** experience

Selling 3D at Retail



Key concerns

- Consumer & Salesforce education
 - Consistency of messaging
 - Simplify
- Compelling demo (movies, sports, games)
- Interoperability / standardization (glasses)

Worldwide 3D TV Forecast



TV Makers get bad reception for 3D

Source: Wall Street Journal

December 19, 2010

Tagged to move | Prices of 3-D TVs are falling to spur demand

	SHARP	Panasonic	SAMSUNG	LG	SONY	TOSHIBA
Model:	60-inch Aquos Quattron 3-D TV	65-inch Viera plasma 3-D TV	65-inch 8000-series 3-D LED TV	55-inch Infinia 3-D LED TV	60-inch Bravia NX900 3-D TV	55-inch 3-D LED TV
Suggested retail price:	\$5,299	\$4,299	\$5,999	\$5,400	\$4,699	\$3,299
Lowest price on Bing.com:	\$3,095	\$3,619	\$3,390	\$2,291	\$3,395	\$1,579
Difference in price:	42%	16%	43%	58%	28%	52%

Note: These models were released in 2010. Source: WSJ.com/Bing

Polarized 3D TVs coming to consumer market

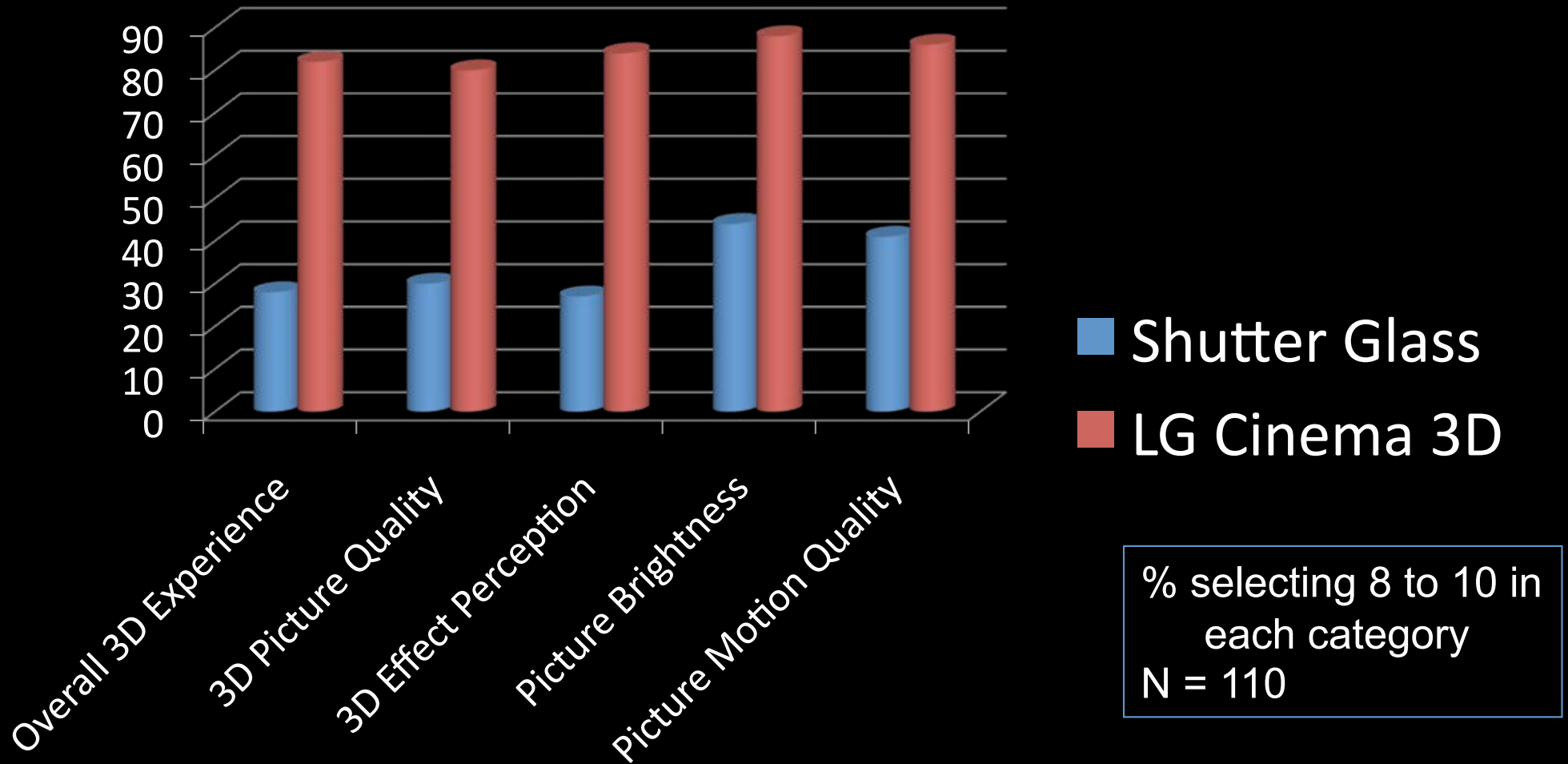
- Re-energize the market? -

LG
Vizio
others



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LG market research



Source: 1/5/11 LG press briefing at CES Philip Lelyveld – Phil@Reelword.com

LG market research



Consumer Choice – NOT format war

Overall 3D

3D Picture

3D Effect

Picture

Picture Motion

each category
N = 110

Australia
Germany
Belgium
Brazil
Estonia
Turkey
Korea
Japan
UK
US
...

3D Content

3D Channels

			Q1'10	Q2	Q3	Q4	Q1'11
Japan	Cable	JCOM					
	Satellite	BS11					
		SkyPerfect JSAT					
	IPTV	Hikari					
Korea	Cable	CJ					
	Satellite	Skylife					
	IPTV	SK Telecom					
Australia	Satellite	Foxtel					
USA	Cable	Comcast					
		Cablevision					
	Satellite	DirectTV					
		Dish				tentative	
	IPTV	AT&T U-Verse					
		Verizon FIOS					
France	Cable	Numericable					
	Satellite	Canal+					
	IPTV	Orange					
Germany	Satellite	Sky.de					
	IPTV	Telekom					
Italy	Satellite	RAI					
Netherlands	Cable	UPC					
Spain	Satellite	Canal+					
	IPTV	Telefonica					
UK	Cable	Virgin Media					
	Satellite	Sky					
Czech Republic	Satellite	IKO TV					
Poland	Satellite	Cyfrowy+					
Russia	Cable	Akado					
	Satellite	NTV plus					
Slovakia	Satellite	IKO TV					
United Arab Emirates	Satellite	Du					

3D
Games

No Activity
Trial
Limited Service / Special Events
Full Service

3D Blu-ray

What to Watch in 3D

- 77% of consumers think 3DTV viewing will be geared to special events, as opposed to regular programming

- Top Genres:



nielsen

Nov. 9, 2010

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Nintendo 3DS

Consumer's first personal 3D experience?



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Parameters that impact the 3D viewing experience

Technology

Art

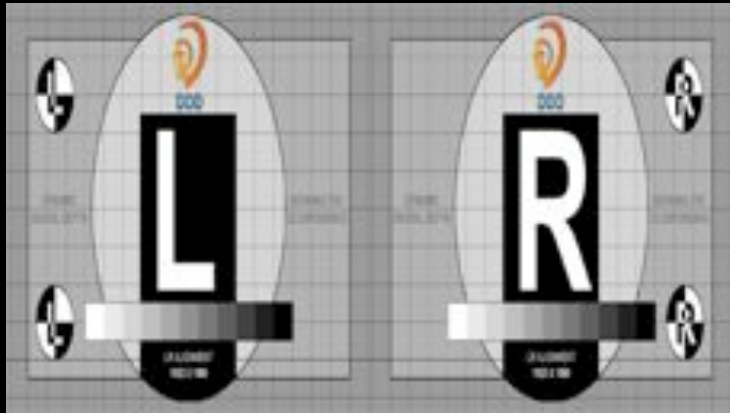
Source

Human visual system

Receiver

Viewing environment and behavior

Art Technology



Crosstalk

- a form of binocular mismatch
- quantifiable test!

Conflicting depth cues

- binocular and monocular mismatch
- obvious in 2D-3D autoconversion

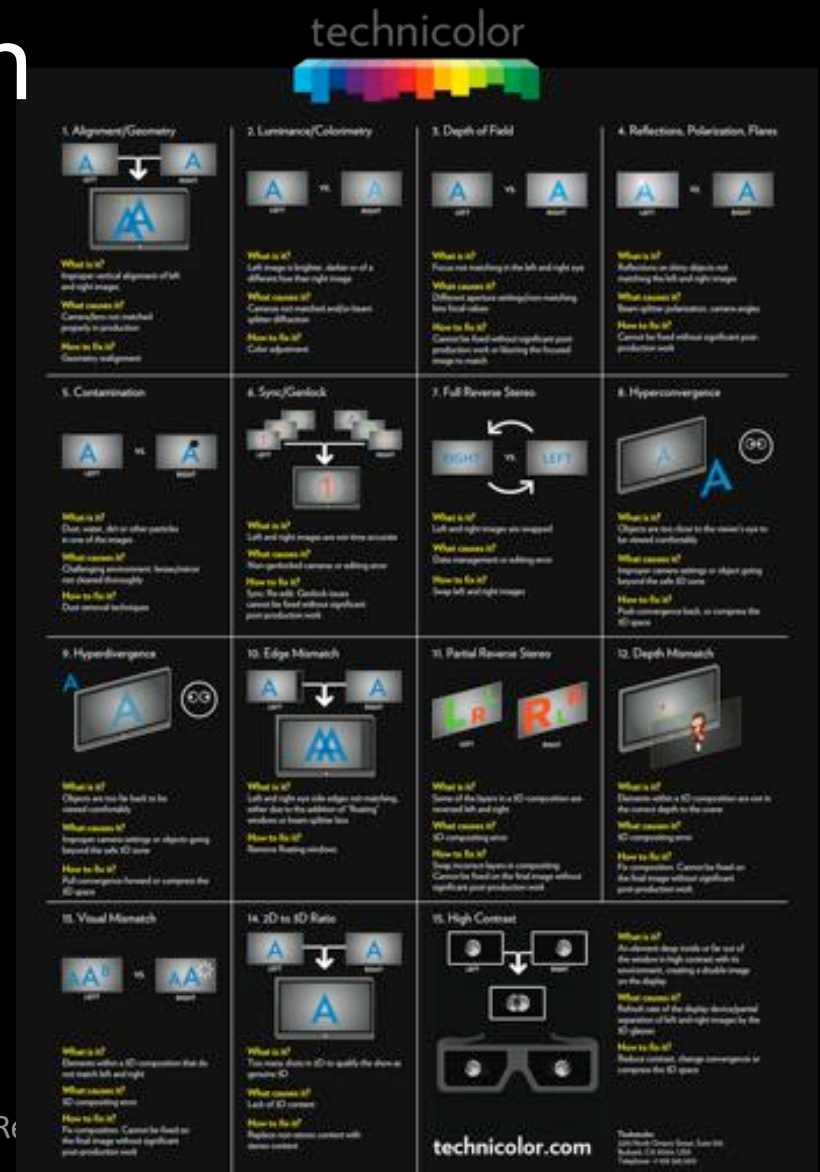
Vergence Shock

- quick cuts or jumps in 3D depth

Technicolor Certification

1. Alignment / Geometry
2. Luminance / Colorimetry
3. Depth of Field
4. Reflection / Polarization / Flares
5. Contamination
6. Sync / Gen Lock
7. Full Reverse Stereo
8. Hyperconvergence
9. Hyperdivergence
10. Edge Mismatch
11. Partial Reverse Stereo
12. Depth Mismatch
13. Visual Mismatch
14. 2D to 3D Ratio
15. High Contrast

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Parameters that impact the 3D viewing experience

Technology

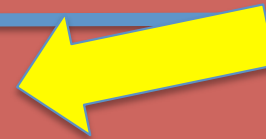
Art

Human visual system

Viewing environment and behavior

Source

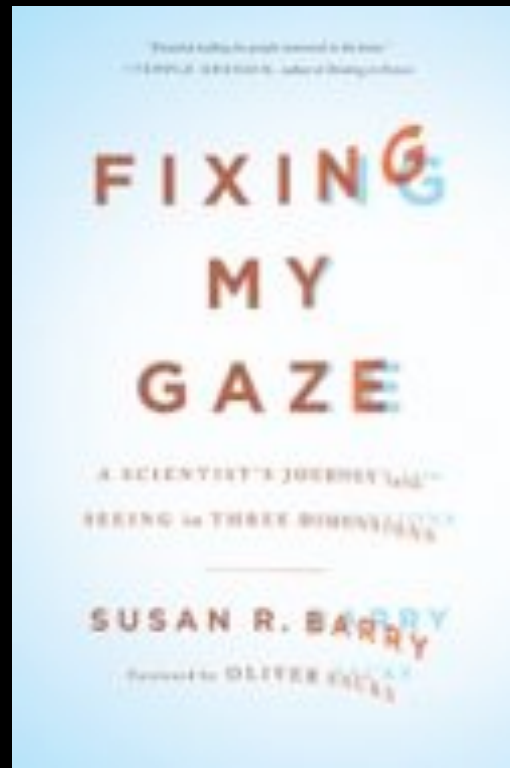
Receiver



Human Visual System

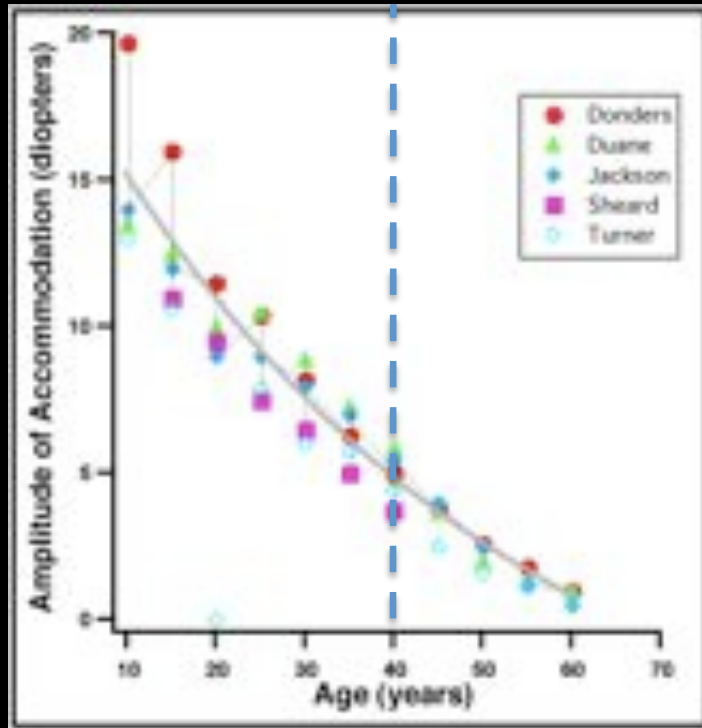
4% stereo blind

Fixing My Gaze
By Dr. Sue Barry



Human Visual System

Academic Research
and Vision Dynamics



Eye Exams and
Binocular Vision Issues



Human Visual System

Eye Exams and Binocular Vision Issues

3D 영상 안전성에 관한 임상적 권고안

(Practical Recommendation for 3D image Safety)

Ver. 1.0

For Children

Binocular Vision Disorders

Misdiagnosed as ADHD

(Attention Deficit Hyperactivity
Disorder)



Viewing Environment and Behavior



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3D is global



3D Porn
Hong Kong



Argentina
Animation



WildEarth TV 3D
launches 24/7 channel
South Africa

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Turkey
Live Action



Japan
Games

The Larger Ecosystem



2010 worldwide sales projection

- 3.0M will be **3D-capable** → 42.9M by 2014
- 228M **displays** (2D and 3D)
- 100M will be “**connected TVs**”

DisplaySearch 8/10/10

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50


DYI ("Do It Yourself")
S3D community

YouTube

Search Browse Upload

3D Waltz of the Flowers (YouTube 3D HD Test)

inouek3D 58 videos ☐ Subscribe



0:50 / 6:25

3D

inouek3D July 21, 2009
Direct link to YouTube 3D 1080p

553,846 views

3D file format menu



Quantel
Pablo Neo
3D Mastering



iPhone App:
Cine3D
Stereographer



CRC Depth
Estimation from
3D video



\$70 3D
Shot Cam



Oakley 3D



3dtpubfinder.com/



3D mapping
laser backpack

Apps / devices specific to 3D content

Professional

Consumer

Laser Light Engines Raises \$13 Million;
Pacts With IMAX

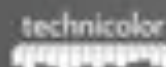
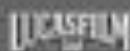
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Academy Award



About the ETC

ETC Activities

Projects

Facilities/Labs

Sponsors

Job Board

Enter keywords...



3D News



Francis
Risk, M
Collabo

10 JAN, 2011

Excerpt "He re

Now and Sunrise," based on an alcohol-induced dream he had in Turkey. The film even features the latest 3-D technology – but as a brief dramatic segment that serves the story, rather than the typical two-hour, multiplex gimmick." Read the full interview here: <http://the99percent.com/articles/6973/Francis-Ford-Coppola-On-Risk>

3D Categories

3D

www.etccenter.org

↳ Projects

↳ Consumer 3D Project

↳ 3D News and Events

Other S3D Markets

Simulations

Augmented reality

Telepresence



Surgery



Military

Opportunities!



Events / Marketing

Wonderbra 3D Billboard

Source: Daily Mail, UK 9/14/10



Education and S3D

- Discipline not an issue!*
- **29-35% after-lesson retention***
 - 10% in control group
- **Greater understanding of spatial relationships⁺**
 - sketch lesson in 3D vs 2D by control group

* Rock Island, Illinois and Boulder Valley School District, Colorado
+ Abbey School, Redding, England



7/28/10 XpanD / TI / Eon rollout to five school districts in Tx, Fl, Ca, and Co
11/18/10 Pilot program in 7 European countries

Consumers don't buy technology,
they buy the **experiences** that
technology delivers



Conclusions

3D will be in TVs, PCs, game consoles, etc.,
as well as movie theatres

Conclusions

We will see how consumers use it
as markets emerge

Conclusions

Entrepreneurial opportunities in the
professional and consumer markets for...

Hardware
Software
Services
Support
Training/Ed.
Tools
Marketing
PR
...



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Thank You

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