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# 36th Annual Stereoscopic Displays and Applications Conference - Introduction

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## Abstract

*In this document we provide an overview of the 36th annual Stereoscopic Displays and Applications conference. It also serves as the introduction to the 2025 SD&A conference proceedings.*

## Introduction

The 36th annual Stereoscopic Displays and Applications conference (SD&A XXXVI) was held in February 2025 as part of the 37th annual Electronic Imaging (EI) Symposium at the Hyatt Regency San Francisco Airport Hotel in Burlingame, California.

The 2025 EI Symposium was held over the period Sunday, 2 February to Thursday, 6 February 2025. The SD&A conference was held in cooperation with the Engineering Reality of Virtual Reality (ERVR) 2025 conference to provide four days of 3D, VR and XR topics from Monday, 3 February through to Thursday, 6 February 2025.

The final program of the 2025 SD&A conference is available on the SD&A conference website:

www.stereoscopic.org/2025

The program page also identifies which papers have a supporting published conference paper or journal article. All manuscripts from the EI symposium (including SD&A and ERVR) are published open-access via the IS&T Digital Library which significantly increases the visibility of these papers:

https://library.imaging.org/ei

## First Day

The first day of this year's SD&A conference started with a technical presentation by Eleanor O'Keefe, the Monday SD&A Keynote presentation by Katie Fico from Walt Disney Animation Studios, and the annual 3D Theatre session.

Andrew Woods formally opened the SD&A conference with a rousing welcome to all attendees, an overview of the days ahead of us, also providing a status update of the various conference publication statistics. We will go into those statistics in more detail later in this introduction.

The first technical presentation of the conference was:

- "**After the 3D distortion modeling: A software package to represent image space perception in stereoscopic displays**" Eleanor O'Keefe (KBR, USA) [SDA-329] [1]

This year, we were extremely pleased to host Katie Fico, Stereoscopic Supervisor, Walt Disney Animation Studios as our Monday SD&A Keynote with her presentation "Beyond the Screen Plane: Stereo at Walt Disney Animation Studios". Katie's stereoscopic production experience has been extensive. Her stereoscopic career started with her work on the special venue 3D film "Marvin the Martian in the Third Dimension" (1996), which screened exclusively at Warner Brothers theme parks around the world including Movie World in Gold Coast, Queensland, Australia. Katie's presentation started by charting the path of the significant films in Disney's animation history. Katie Fico's own stereoscopic credits include: Wreck it Ralph (2012), Paperman (2012), Frozen (2013), Feast (2014), Frozen Fever (2015), Zootopia/Zootropolis (2016), Ralph Breaks the Internet (2018), Raya and the Last Dragon (2021), Wish (2023), and Moana 2 (2024). She is currently working on the stereoscopic visuals for Zootopia/Zootropolis 2 which is planned for release in late 2025. Katie's presentation included an in-depth discussion of the modified multi-camera rig rendering method called bent-ray rendering that is used to render Disney's 3D movies to give them more natural looking depth across entire depth range in the scene. The audience also had the opportunity to see a special 3D clip from Moana 2 to show the outcome of production methods discussed during the presentation. During the Q&A Katie received many questions from the audience representing the audience's keen interest in her presentation. One of the audience members asked about the current popularity of 3D movies and Bob Whitehill, Stereoscopic Supervisor at Pixar Animation Studios answered this by explaining that for the recently released "Inside Out 2", the 3D version accounted for a very healthy figure of around 16% of the total box office. The audience appreciated Katie's presentation and gave her a very warm applause at the end.

***Figure 1.*** *Katie Fico delivered the Monday SD&A Keynote presentation.*

## 3D Theatre

On Monday evening a selection of twenty-six 3D films (shorts or segments) were screened as part of the conference 3D Theater session. This annual event illustrates the wide range of 3D content currently produced and exhibited around the world, from major studios, to researchers, to talented individuals.

The 3D Theater session included a competition for best film in each of two categories: Animation and Live-Action. The event also featured a selection of Hollywood studio films and other special content, which was shown out-of-competition for demonstration only.

The judges at this year's session were: Katie Fico, Stereoscopic Supervisor at Walt Disney Animation Studios; Bob Whitehill, Stereoscopic Supervisor at Pixar Animation Studios; and Robert Bloomberg, independent filmmaker.

Our judges selected the films "**Alice in AI-Land**" from Martin Schub as Best Animation (Figure 2), and "**Die Buben im Pelz - Die Wudn**" (The Boys in Furs - The Wild Ones) from Christian A. Zschammer as Best Live-Action (Figure 3).

***Figure 2.*** *"Alice in AI-Land" from Martin Schub – winner of the Animation Category.*

***Figure 3.*** *"Die Buben im Pelz - Die Wüdn" from Christian A. Zschammer – winner of the Live-Action Category.*

The full list of the 3D films shown during the session is provided below:

**Competition Category**

1. "2024 Chicago Lighthouse Exhibition" from The Chicago Stereo Camera Club, cscc3d.org (USA)
2. "3D Pop-Up Party teaser" from Andrew Murchie (UK)
3. "Alice in AI-Land" from Martin Schub (USA) - **Winner in the Animation Category**
4. "Barre Pinske – Artist Bears All" from Jonathan Sabin / Variety Films (USA)
5. "Celebration" from Peter Rose (USA)
6. "Die Buben im Pelz - Die Wudn" from Christian A. Zschammer (Germany) - **Winner in the Live-Action Category**
7. "Dog Muscles (Scientific Documentary)" from Helio de Souza (Brazil)
8. "How I Survived the Pyongyang Film Festival 3D trailer" from Martin Hans Schmitt (Germany)
9. "Love Letter to Skating" from Cassandra Edwards, Kerreen Ely-Harper, Andrea Rassell, Daniel Adams, Andrew Woods; Curtin University (Australia)
10. "Miniatur Wunderland" from John Hart (USA)
11. "Museum of the History of Konigsberg 3D" from Andrey Anokhin (Russia)
12. "Renata 3D - Moonlit Floor" from Alaric Hamacher (DOP) (Republic of Korea)
13. "Shorten" from Yoshifumi Takatsume (Japan)
14. "Slow Horses" from John Hart (USA)
15. "Symphony in Circles" from Gabriel Orlando (Director), Alaric Hamacher (DOP) (Republic of Korea, Germany)
16. "The Cloud of Unknowing" from D. Carlton Bright (USA)
17. "Three Poems by Stephen Crane: An AI-Assisted Visualization" from Martin Schub (USA)
18. "Transcontinent" from Peter Rose (USA)
19. "TWENTYTИƎWT (二〇二〇)" from Max Hattler (Germany)

**Demonstration Category**

1. "Bwana Devil (1952)" from 3-D Film Archive and Kino Lorber Studio Classics (USA)
2. "Captain America: Brave New World trailer" from Marvel Studios (USA)
3. "Carnival of Souls (1962)" from EYEPOP-3D (USA)
4. "Deadpool and Wolverine trailer" from Marvel Studios (USA)
5. "Domo Arigato (1972)" from 3-D Film Archive and BayView Entertainment (USA)
6. "Moana 2" from Walt Disney Animation Studios (USA)
7. "Westermann: Memorial to the Idea of Man If He Was an Idea" from Leslie Buchbinder, Harrison Sherrod, and Brian Ashby (USA)

The producers of this year's SD&A 3D Theater session were: Eric Kurland, 3-D SPACE (host); John Stern, Intuitive Surgical, retired; and Andrew Woods, Curtin University.

We wish to thank all the contributors who graciously allowed their 3D content to be screened at our event. We are also grateful for the support of our 3D Theater session sponsors: 3-D SPACE, 3-D Film Archive, and DepthQ Stereoscopic.

After the 3D Theatre a large group of SD&A attendees made our way to Max's of Burlingame restaurant for the annual SD&A dinner.

## Other Monday Events at EI

Earlier in the day was the Electronic Imaging Symposium Highlights session which featured short teaser presentations from the selected papers in the various conferences across the symposium. Robin Jenkins hosted this session and he explained that he particularly liked this session because it allows attendees to see a wide range of topics across the entire EI ecosystem which they may not normally be able to see or be exposed to.

The EI Welcome Lunch was a new feature of the symposium replacing the EI evening reception. The session was held in The Grove – the large internal atrium of the symposium hotel – and brought together all EI attendees to renew old acquaintances and meet new people.

The first Electronic Imaging Symposium Plenary for 2025, "Imaging in the Age of Artificial Intelligence", was delivered by Peyman Milanfar, Distinguished Scientist at Google (Figure 4). Peyman's presentation explored how AI is revolutionizing imaging, transforming how we capture, enhance, and experience visual content. He looked at how advancements in machine learning are enabling mobile phones to have far better cameras, enabling capabilities like enhanced zoom, state-of-the-art noise reduction, blur mitigation, and post-capture capabilities such as intelligent curation and editing of your photo collections, directly on device.


***Figure 4.*** *Peyman Milanfar (Google) delivering his EI Plenary "Imaging in the Age of Artificial Intelligence". (Photo: Andrew Woods)*

## Second Day

The key elements of the second day of SD&A (Tuesday 4th February) were the three technical presentation sessions, the second SD&A keynote, the second EI Plenary, and the EI demonstration session.

The first technical session of the day was the special "Visualization Facilities" session chaired by Laurie Wilcox (York University, Canada). The Visualization Facilities session is a recurring session across multiple SD&A conference years and includes papers from visualisation facilities worldwide. This year's Visualization Facilities session had the following presentations:

- "**Case study: Love letter to skating - VR180 stereoscopic post-production workflow**" Andrew Woods, Daniel Adams, Cassandra Edwards, Kerreen Ely-Harper, Andrea Rassell, Curtin University (Australia) [SDA-332] [2]
- "**NEMO Explorer XR - The development of an ocean-based immersive co-design environment**" Alyssa Liu, Rian Stephens, Elise Hodson, Carla Amaral, Christopher Ross, Jasmine Black, Paul Anderson, Ashley Hall, Bjorn Sommer, Royal College of Art (United Kingdom) [SDA-333] [3]

The Visualization Facilities session was capped off with the second SD&A keynote presented by Daniel Sandin, Director Emeritus of the Electronic Visualization Lab (EVL) and Professor Emeritus in the School of Art and Design at the University of Illinois at Chicago (UIC) (Figure 5). Daniel's keynote was titled "Half a Century of Innovation in Interactive Electronic Displays for Art and Science at the Electronic Visualization Laboratory (EVL) at UIC and the Qualcomm Institute at UCSD." EVL is the longest-running visualization facility in the world after more than 50 years of operation – an incredibly impressive milestone.

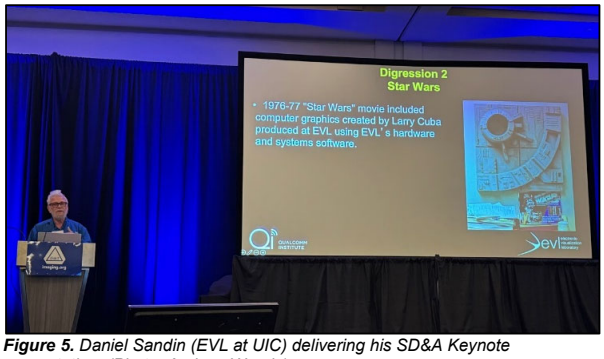


***Figure 5.*** *Daniel Sandin (EVL at UIC) delivering his SD&A Keynote presentation. (Photo: Andrew Woods)*

*The abstract for Daniel Sandin's keynote presentation was as follows:*

> *The Electronic Visualization Laboratory (EVL), established in 1973 at the University of Illinois at Chicago (UIC), specialized in interactive electronic displays even before the advent of the frame buffer. By ingeniously combining digital and analog systems, EVL enabled real-time interactive computer graphics through the Graphics Symbiosis System (GRASS). This system was instrumental for animator Larry Cuba in creating the computer graphics for the original 1977 "Star Wars" film, which was done frame by frame on 35mm film), as well as contributing to lesser-known movies like "UFO: Target Earth" for which the special effects were captured on video. SpiralPTL is a work preserved in the Museum of Modern Art's video art collection. Throughout the decades, EVL advanced the technology of computer graphics but also deeply integrated art, science, and education researchers and teaching faculty. This collaboration led to the creation of an interdisciplinary MFA program in Electronic Visualization, bridging UIC's Engineering College with its School of Art and Design. EVL's later innovations include the development of numerous interactive stereoscopic and autostereoscopic systems, most notably the Cave Automatic Virtual Environment (CAVE). This paper will describe and analyze these technological advancements, discussing both their successes and their challenges in adoption by scientists, engineers, and artists. The narrative will reflect on how these technologies have shaped interdisciplinary collaboration and the evolution of electronic art and visualization techniques over the past fifty years.*

His presentation also included the screening of a 3D short film, "A Study of 4D Julia Sets – Iterations of $Z=Z^2+K$ in the Quaternions", produced by Daniel at the EVL which had everyone's eyes popping – in a good way. He also brought a large Psychologram display for the attendees to view.

The second technical session of the day, "History & Future of Immersive Technologies", was chaired by Takashi Kawai and was a joint session with the Engineering Reality of Virtual Reality conference. The session had the following papers:

- "**Collaborative spatial streaming: real-time auto-calibrating system for multi-device dynamic 3D capture**" Tyler Bell, University of Iowa (United States) [SDA-335] [4]
- "**Active 3D flat panel displays: A new implementation of an old idea**" Michael Weissman, Peter Giokaris, independent (United States) [SDA-336] [5] (Figure 6).
- "**The rise and fall of SENSIO - Lessons for the next wave of consumer 3D**" Nicholas Routhier, CubicSpace Technologies, Inc. (Canada) [SDA-337] (Figure 7).
- "**Bringing historical stereographs to XR headsets**" Nicholas Routhier, CubicSpace Technologies, Inc. (Canada) [ERVR-159]


***Figure 6.*** *Mike Weissman (left) and Peter Giokaris delivering their presentation "Active 3D flat panel displays: A new implementation of an old idea". (Photo: Andrew Woods)*

***Figure 7.*** *Nicholas Routhier delivering his presentation "The rise and fall of SENSIO - Lessons for the next wave of consumer 3D". (Photo: Andrew Woods)*

After lunch, the second EI plenary presentation titled "Holographic Displays: Past, Present, and Future" was presented by Grace Kuo, Research Scientist, Display Systems Research, Meta (Figure 8). Despite the widespread use of the term holographic to refer to non-holographic displays, Grace's presentation was *"really-truly"* about actual *"true-to-definition"* holographic displays. Grace started by reviewing the technology and history of holograms – starting

with the invention of holography in 1947 by Denis Gabor, the invention of the coherent light laser in 1960, and the Nobel Prize award to Denis Gabor in 1971. Grace described her research in computer-generated holograms using spatial light modulators and the techniques she has been developing to improve image quality and particularly reduce speckle. She described the multi-source holography method which uses multiple laser light sources to significantly improve hologram image quality. Her talk completed by considering how holography techniques could be used in glasses-form-factor augmented reality displays and showed some of the experimental setups she is using. At the end of her talk, she showed her observational timeline of holography (Figure 9).


***Figure 8.*** *Grace Kuo (Meta) delivering her EI Plenary presentation "Holographic Displays: Past, Present, and Future". (Photo: Andrew Woods)*

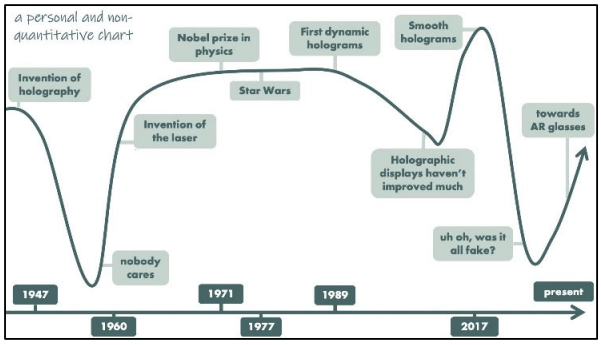


***Figure 9.*** *Grace Kuo's personal and non-quantitative chart describing the progression of holography from her EI Plenary presentation.*

The third technical session of the SD&A conference for the day, titled "Stereoscopic Vision", was chaired by Eleanor O'Keefe (KBR, United States). The session had the following presentations:

- "**Convexity biases in stereoscopically viewed ground terrain**" Brittney Hartle, Robert Allison, Laurie Wilcox, York University (Canada) [SDA-339] [6]
- "**Stereoscopic radiography: New possibilities in the digital era using low cost, existing technology**" Boris Starosta, independent (United States) [SDA-340] [7]
- "**User experience and intent to adopt VR across levels of immersion: A case study of the flight simulation game Elite Dangerous**" Aleshia Hayes, University of North Texas (United States) [SDA-341] [8]
- "**Sensory mechanisms underlying cybersickness**" Douglas Gill, FlightSafety International (United States) [SDA-342] [9] (Extended Presentation) (Figure 10)
- "**Effects of stereoscopic representations in sublime experiences induced by immersive VR**" Yoshihiro Banchi, Taisei Tsukahara, Waseda University; Tomohiro Ishizu, Kansai University; Takashi Kawai, Waseda University (Japan) [SDA-343] [10]


***Figure 10.*** *Doug Gill (Flight Safety International) delivering his presentation "Sensory mechanisms underlying cybersickness". (Photo: Andrew Woods)*

This was the final dedicated session of the SD&A conference for 2025. All subsequent SD&A sessions were joint with other conferences – either the Engineering Reality of Virtual Reality (ERVR) conference, or the Human Vision and Electronic Imaging (HVEI) conference.

## Demonstration Session

The annual Electronic Imaging Symposium-wide Demonstration Session was held on Tuesday evening. There was a wide selection of stereoscopic and VR-related demonstrations in the session including:

- Mike Weissman and Peter Giokaris [SD&A-336] "Active 3D Flat Panel Displays: A New Implementation of an Old Idea" demonstrated a new OLED 3D stereo flat-panel display that uses the time-sequential method because it uses black-frame insertion. A group of people can view the 3D presentation wearing active 3D glasses. It is high-resolution, high-contrast, and ghost-free (Figure 11). The 3D synchronizer clamps to the top-left corner of a specific active 3D compatible OLED monitor (Figure 12). The photocell in the end of the bottom arm on the synchronizer detects left and right images using a small black/white 'postage stamp' in the image which in turn transmits a synchronization signal to active 3D glasses being used to view the display.
- Kevin Gilson, WSP (USA) [SD&A-344] "Re-envisioning Paris Landmarks - VR used to Evaluate and Judge Architectural Design Competitions" had a VR model of the Eiffel Tower and Notre Dame sites in Paris which were used to present and evaluate design submissions for the redevelopment of the site on a Meta Quest 3 headset and laptop (Figure 13).
- Boris Starosta [SD&A-340] "Stereoscopic Radiography: new possibilities in the digital era using low cost, existing technology" demonstrated how to obtain 3D stereo imagery, with software that then automatically aligns and

generates viewable stereo pairs, to be viewed immediately in a digital stereoscope. Also shown were 3D radiographs on a laptop with a polarized 3D screen (kindly loaned from 3-D Space), which would be similar to the type of 3D display that could be installed in a clinician's office (Figure 14)

- Eleanor O'Keefe, KBR (USA) [SD&A-329] “3D Distortion Modeling: A software package to represent image space perception in stereoscopic displays” demonstrated the 3D Distortion Modeling Tool, which is a software package developed for stereoscopic image space calculation. It uses provides three different modes with figures for these calculations based on models from the visual perception literature. The tool itself is comprised of several GUIs (Figure 15).
- Andrew Woods, Curtin University (Australia) [SD&A-332] “Case study: Love letter to skating - VR180 stereoscopic post-production workflow” showed the VR180 3D version of the short film "Love Letter to Skating" on an Apple Vision Pro and a Meta Quest 3 (Figure 16).
- Bjorn Sommer, Royal College of Art (UK) [ERVR-160] “The XR stream - Grand challenges for ocean and cities from a London perspective” showcased a demo of the Grand Challenge 2023/24 student project “X-River” by Zak Berry and colleagues (RCA, UK). The demonstration used a Meta Quest 2 driven from a host PC where users could interactively explore a forest/river environment set in Harrow/London (Figure 17).
- Nicholas Routhier, Cubicspace Technologies (Canada) [ERVR-159] “Bringing Historical Stereographs to XR Headsets” demonstrated multiple 3D images (including historical stereographs) on multiple displays including a Meta Quest 3 headset. The demo illustrated simplified navigation, 3D zooms, simple menu integration and more (Figure 18).
- Tyler Bell, University of Iowa (USA) [ERVR-166] “bestie: An immersive, interactive, intelligent storytelling companion” allowed users to participate in an interactive VR experience in which they collaborate with a real-time AI agent on a visual storytelling experience.
- Eric Kurland from the 3-D SPACE museum showed a Looking Glass Portrait with a dataset of 71 x-rays of a sculpture that were imaged at the Getty Center, and a Looking Glass Go that was showing photos taken during the demo session with a connected XReal Beam Pro camera, using Masuji Suto's StereoLKG app for Android (Figure 19 and 20). He also showed how he had used the Looking Glass devices to proof lenticular images before going to print.

***Figure 11.*** *Mike Weissman (left) and Peter Giokaris demonstrated low-crosstalk active 3D on an OLED monitor. (Photos: Justus Ilgner)*

***Figure 12.*** *The 3D synchronizer for active 3D compatible OLED monitors developed by Peter Giokaris and discussed in his presentation. (Photo: Andrew Woods)*


***Figure 13.*** *Kevin Gilson demonstrates Paris landmarks in VR using a Meta Quest 3 headset. (Photo: Justus Ilgner)*

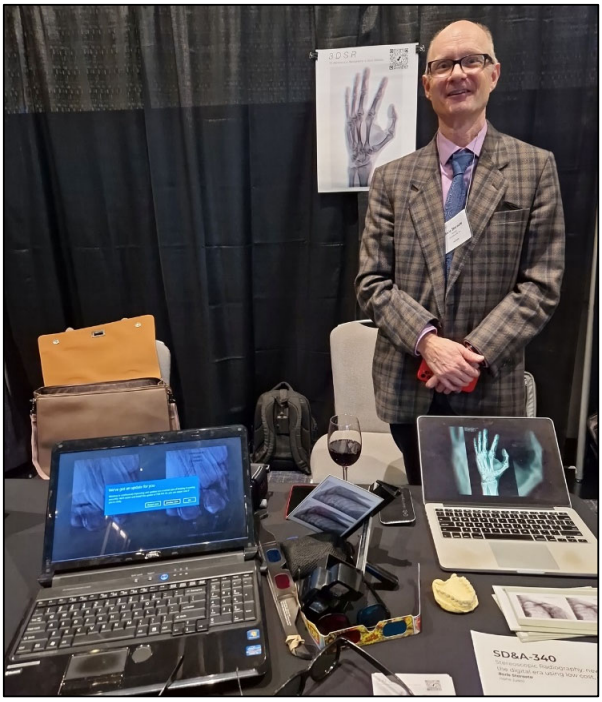


***Figure 14.*** *Boris Starosta demonstrated low-cost (and low-radiation dose) methods of capturing 3D X-Ray images. (Photo: Justus Ilgner)*

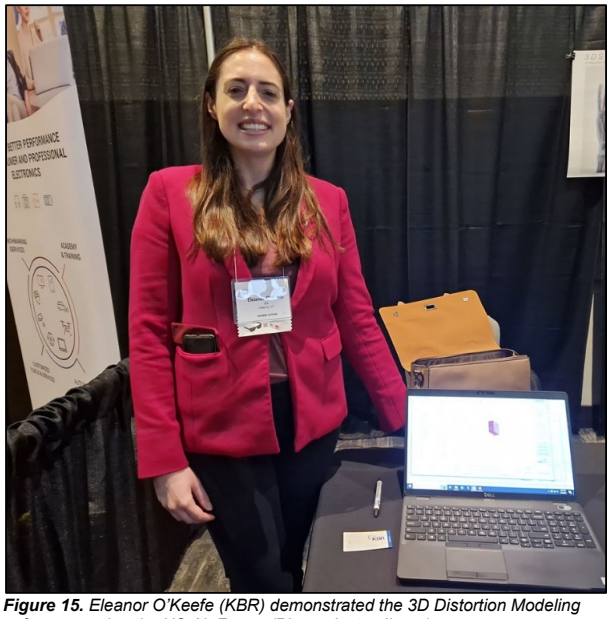

***Figure 15.*** *Eleanor O'Keefe (KBR) demonstrated the 3D Distortion Modeling software used at the US Air Force. (Photo: Justus Ilgner)*

***Figure 16.*** *Andrew Woods (Curtin University) demonstrates the VR180 3D short film "Love Letter to Skating" to our keynote speaker Daniel Sandin on a Meta Quest 3. Some attendees also got to see it on an Apple Vision Pro. (Photo: Justus Ilgner)*

***Figure 17.*** *Bjorn Sommer's (Royal College of Art) demonstration of the XR Stream project "X-River" from Zak Berry and colleagues, explored on a Meta Quest 2 headset worn here by Daniel Sandin. (Photo: Bjorn Sommer)*

***Figure 18.*** *Nicholas Routhier demonstrated CubicSpace's software for viewing historical stereographs on a Meta Quest 3 headset. (Photo: Justus Ilgner)*

***Figure 19.*** *Eric Kurland (3-D Space) is shown demonstrating a Looking Glass Go with a 3D image of Andrew Woods captured during the demonstration session. (Photo: Andrew Woods of photo captured by Eric Kurland)*

***Figure 20.*** *A stereoscopic version of Figure 19 for free-viewing. Wall-eye on the top, and cross-eye on the bottom. Shot with an iPhone 15 Pro in Spatial 3D mode. (Photo: Andrew Woods)*

## Special Recognition Award

At the beginning of today's plenary session, a moment was taken to acknowledge the contributions made to the Electronic Imaging Symposium and IS&T by Suzanne Grinnan who has been Executive Director of IS&T since 2005. Suzanne has recently announced her departure from IS&T and hence this meeting was the perfect time to acknowledge her 20 years of service to IS&T and thank her for the guidance and leadership she has demonstrated at the 21 Electronic Imaging Symposiums that she has personally attended. Suzanne was presented with an IS&T Special Recognition Award and a selection of gifts (Figures 21 and 22). We all wish her the very best for her next adventure.


***Figure 21.*** *Joyce Farrell, Jonathan Phillips, Bernice Rogowitz and Susan Farnard presented Suzanne Grinnan with the IS&T Special Recognition Award. (Photo: Eric Kurland)*


***Figure 22.*** *Suzanne Grinnan at the Electronic Imaging Symposium. (Photo: Andrew Woods)*

## Third Day

On the third day there were three sessions of the Engineering Reality of Virtual Reality (ERVR) conference, one of which was specifically joint with the SD&A conference.

This year the ERVR conference was co-chaired by Sharad Sharma (University of North Texas) and Bjorn Sommer (Royal College of Art) and they jointly opened the conference (Figure 23 and 24).


***Figure 23.*** *Sharad Sharma (University of North Texas) jointly opened the 2025 ERVR conference. (Photo: Andrew Woods)*


***Figure 24.*** *Bjorn Sommer (Royal College of Art, UK) jointly opened the 2025 ERVR conference. (Photo: Andrew Woods)*

The first session of the ERVR conference was "XR for Urban Design & Social Applications" chaired by ERVR co-chair Sharad Sharma (University of North Texas). This session was hosted jointly with the SD&A conference. The following presentations were delivered:

- "**The XR stream - Grand challenges for ocean and cities from a London perspective**" Bjorn Sommer, Rian Stephens, Rashi Agarwala, Ayushi Saxena, Zak Berry, Elise Hodson, Carla Amaral, Christopher Ross, Alyssa Liu, Jasmine Black, Paul Anderson, Ashley Hall, Royal College of Art (United Kingdom) [ERVR-160] [11]
- "**Re-envisioning Paris landmarks - VR used to evaluate and judge architectural design competitions**" Kevin Gilson, WSP (United States) [SDA-344]
- "**Look around you! Situating extended reality within the urban fabric**" Carolina Ramirez-Figueroa, Royal College of Art (United Kingdom); Campbell Orme, Meta Reality Labs (United States) [ERVR-161] [12]

The second session of the day for ERVR was titled "VR for Education & Learning" and chaired by ERVR co-chair Bjorn Sommer. The following presentations were delivered:

- "**Enhancing teacher training with AI-guided simulations in smart virtual reality**" Lee Flores, Seth King, Vedansh Airen, Tyler Bell, University of Iowa (United States) [ERVR-163] [13]
- "**Virtual reality as a value engineering method in machine shop learning**" Myles Cupp, Marie Vans, Colorado State University (United States) [ERVR-164] [14]
- "**Evaluating the impact of interaction level on content learning in the Eureka VR Environment for Mining Engineering Education**" Rojin Manouchehri, Levi Scully, Araam Zaremehrjardi, Umut Kar, Pengbo Chu, Frederick Harris Jr., Sergiu Dascalu, University of Nevada Reno (United States) [ERVR-165] [15]
- "**bestie: An immersive, interactive, intelligent storytelling companion**" Tyler Bell, University of Iowa (United States) [ERVR-166] [16]

This year the EI Symposium Poster Session was held during the Wednesday lunch break and a nice meal was also provided by the symposium. The poster authors were kept busy and hopefully they also had time to grab some lunch (Figure 25).


***Figure 25.*** *Doug Gill discusses his poster with Nicholas Routhier. (Photo: Andrew Woods)*

The third and final Plenary Presentation for this EI Symposium was delivered by Gérard Medioni, vice president and distinguished scientist, Amazon Prime Video & Studios.

His plenary presentation was titled “Prime Video: a Differentiated Viewing Experience” and described the wide range of advanced image processing methods that Amazon Prime Video uses to deliver compelling experiences to its customers (Figure 26). Unfortunately, Amazon Prime Vision doesn’t currently deliver any 3D content to consumers via their platform, but wouldn’t it be wonderful if they followed the lead of Apple TV+ (Apple TV Plus) and Disney+ (Disney Plus) who both offer 3D content steaming to the Apple Vision Pro headset.

***Figure 26.*** *Gérard Medioni delivering his EI 2025 plenary presentation. (Photo: Andrew Woods)*

The last session of the day for the ERVR conference was titled “VR/AR for Research, Training & Emergencies” and was chaired by Tyler Bell. The following presentations were delivered:

- “**The Trojan horses of virtual reality**” Bjorn Sommer, Royal College of Art (United Kingdom) [ERVR-167] [17]
- “**ScryVR: A systematic framework for accelerating experimental research in VR**” Levi Scully, Jose Toro-Cerna, Pengbo Chu, Frederick Harris Jr., Sergiu Dascalu, University of Nevada Reno (United States) [ERVR-168] [18] (Figure 27)
- “**A collaborative virtual reality environment module for active shooter response training and decision making”** Pranav Moses, University of North Texas (United States) [ERVR-169] [19]
- “**A mobile augmented reality application for indoor emergency evacuation and navigation”** Keerthana Srinivasan, University of North Texas (United States) [ERVR-170] [20]
- “**VR/AR-NRP: Improving training for the neonatal resuscitation program using virtual and augmented reality**” Mustafa Yalin Aydin, Vernon Curran, Peter Attia, Memorial University of Newfoundland; Susan White, Eastern Health, Newfoudland and Labrador; Lourdes Pena-Castillo, Oscar Meruvia-Pastor, Memorial University of Newfoundland (Canada) [ERVR-171] [21]


***Figure 27.*** *Levi Scully delivering his presentation “ScryVR: A systematic framework for accelerating experimental research in VR” citing Ivan Sutherland and the “Sword of Damocles” VR headset. (Photo: Andrew Woods)*

Manuscripts from this day’s ERVR conference sessions will be published as part of the ERVR conference proceedings [22] in the IS&T Digital Library.

## Fourth Day

On the fourth day there were two sessions led by the Human Vision and Electronic Imaging (HVEI) conference held jointly with both SD&A and ERVR.

The first session was titled “Perception in Augmented/Virtual/360° Environments” and chaired by Alex Chapiro from Meta (Figure 28) and had the following papers:

- **HVEI Keynote**: “**Transparency and Scission in Augmented Reality**” Michael Murdoch, Rochester Institute of Technology (United States) [HVEI-193]
- “**Investigation of whether perspective guide vergence when gazing at moving object in 360-degree images**” Hisaki Nate, Tamaki Takamura, Tokyo Polytechnic University (Japan) [HVEI-194] [23]
- “**The impact of realistic avatars on self-other perception in virtual environments**” Hiroyuki Morikawa, Tokyo University of Technology; Shota Maruyama, Yoshihiro Banchi, Takashi Kawai, Waseda University (Japan) [ERVR-158] [24]
- “**From Polaroid to augmented reality: The enduring advantages of whiteborders**” Michael Murdoch, Rochester Institute of Technology (United States) [HVEI-195] [25]

***Figure 28.*** *Alex Chapiro (Meta) introduces HVEI Keynote presenter Michael Murdoch (Rochester Institute of Technology) for his presentation "Transparency and Scission in Augmented Reality". (Photo: Andrew Woods)*

The second session of the ERVR conference was titled "Fundamental and Extended Visual Perception" and was chaired by Bjorn Sommer. The papers in this session were:

- "**Computational trichromacy reconstruction: empowering the color-vision deficient to recognize colors using augmented reality**" Yuhao Zhu, Ethan Chen, Colin Hascup, Yukang Yan, Gaurav Sharma, University of Rochester (United States) [HVEI-196] [26]
- "**Effectiveness of visual, auditory, and haptic guidance cues for visual targets in virtual environments**", Hila Sabouni, Iowa State University (United States) [HVEI-197] [27]
- "**Experimental investigation of depth cues for small-field light sources in darkness**" Yuko Harada, Midori Tanaka, Takahiko Horiuchi, Chiba University (Japan) [HVEI-198] [28]
- "**Impact of camera height and field-of-view on distance judgement and gap selection in digital rear-view mirrors in vehicles**" Felix Thulinsson, Niclas Söderlund, Shirin Rafiei, Bo Schenkman, Anders Djupsjöbackaa, Börje Andrén, Kjell Brunnström, RISE Research Institutes of Sweden AB (Sweden) [HVEI-199] [29]
- "**Influence of display sub-pixel arrays on roughness appearance**" Kosei Aketagawa, Midori Tanaka, Takahiko Horiuchi, Chiba University (Japan) [HVEI-200] [30]
- "**Cross-modal brain plasticity in haptic perception, kinesthetics & spatial navigation: Profound interhemispheric asymmetry**" Lora Likova, Kristyo Mineff, Zhangziyi Zhang, Michael Liang, Christopher Tyler, Smith-Kettlewell Eye Research Institute (United States) [HVEI-201] [31]

Manuscripts from these two HVEI sessions will be included in the conference proceedings of the HVEI conference [32] the ERVR conference, or in the case of three presentations, the Journal of Perceptual Imaging [33], both available in the IS&T Digital Library.

Christopher Tyler was a co-author of the last paper presented at this year's SD&A conference. Coincidentally, Christopher presented a paper at the very first SD&A conference in 1990. The paper Christopher presented at that conference was titled "Autostereogram" and was the first technical paper to describe the autostereogram – the single image random dot stereogram that Christopher developed the in 1971. The autostereogram was the inspiration for the massively popular Magic Eye series of posters and books which has confounded people all around the world for decades. Of course, this was a perfect opportunity for Andrew Woods to capture a photo with Christopher whilst wearing his autostereogram necktie (Figure 29). Can you see what hidden image in the autostereogram necktie?

***Figure 29.*** *Christopher Tyler (Smith-Kettlewell Eye Research Institute) (left), developer of the autostereogram, and Andrew Woods (Curtin University) wearing his autostereogram necktie (enlargement at right).*

## SD&A Publication Statistics

With the SD&A conference now hosting its 36th annual meeting, it also means that there are now 35 years of publishing history under our belt, which is a good point to look back at our conference publication statistics.

The SD&A conference has a Google Scholar account to help us keep track of the conference citation statistics. The Google Scholar account has been setup to list all the conference manuscripts from 1991 to now and is available here:

https://scholar.google.com/citations?user=lYYx0xsAAAAJ

Ironically, searching Google for "Google Scholar Stereoscopic Displays and Applications" doesn't find the SD&A Google Scholar page, however doing a Bing search for that same term does find the right page. Just remember that tip when you want to check the conference's citation statistics, or just come back to this conference proceedings introduction for the link.

Figure 30 compares the citation statistics for the SD&A conference for the years 2023 and 2025.

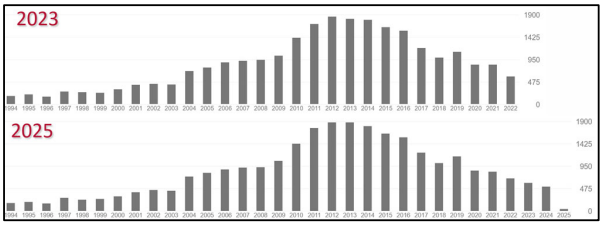


***Figure 30.*** *Comparison of SD&A citation statistics for 2023 and 2025 from the SD&A Google Scholar account as at 2 February 2025.*

Although there is seemingly only a small visual difference between the two graphs, there was an increase of 1667 total citations during this two-year period. This increase in citation count illustrates that SD&A proceeding papers remain relevant and are continuing to be cited. As can be seen in the graphs, 2012 and 2013 were the biggest years for the SD&A conference in terms of citation counts and these roughly align with the massive build-up of 3D activity in the consumer market following the rollout of 3D digital cinema (commenced in 2005), the release of 3D TVs into the home (commenced in 2008), and the availability of the first Blu-ray 3D discs (2009).

A summary of various SD&A citations statistics from Google Scholar is provided in Table 1. The h-index figure is a commonly used statistic to indicate the scale of citations – it represents the largest number 'h' such that 'h' publications have at lease 'h' citations. As the h-index becomes larger, it progressively becomes harder and harder to climb up another step since it is a non-linear measure. The h-index of 69 for the SD&A conference is very large.

***Table 1****. SD&A citation statistics for 2023 and 2025 (as at 2 February 2025).*

| | 2023 | 2025 | Change |
|---|---|---|---|
| Citations | 26102 | 27769 | +1667 |
| h-index (lifetime) | 67 | 69 | +2 |
| i-10 index | 545 | 578 | +33 |

The SD&A Google Scholar page also reveals the citation count per manuscript and also provides a leader-board of the highest cited papers (Table 2). The highest cited paper remains "Depth Image Based Rendering (DIBR)" by Christoph Fehn from the 2004 SD&A conference.

Another statistic worth examining is the download statistics of the SD&A proceedings papers. From 1991 to 2015 the SD&A conference was co-hosted by the two technical societies SPIE and IS&T, and SD&A papers from those years remain available exclusively from the SPIE Digital Library [34]. SPIE has kindly provided the download statistics for SD&A papers. The lifetime downloads for SD&A papers (1991-2015) currently sits at 155,715 downloads, and in the past six years this, number has increased by 35,926 downloads, which is roughly 6000 downloads per year. Papers published from 2016 onwards are published via the IS&T Digital Library [35] and are available for free download.

***Table 2****. Highest cited papers of the SD&A conference as collated by Google Scholar (as at 24 February 2025).*

| Title | Cited by | Year |
|---|---|---|
| Depth-image-based rendering (DIBR), compression, and transmission for a new approach on 3D-TV<br>C Fehn<br>Stereoscopic Displays and Virtual Reality Systems XI 5291, 93-105 [36] | 1979 | 2004 |
| Image distortions in stereoscopic video systems<br>AJ Woods, T Docherty, R Koch<br>Stereoscopic displays and applications IV 1915, 36-48 [37] | 709 | 1993 |
| Variation and extrema of human interpupillary distance<br>NA Dodgson<br>Stereoscopic Displays and Virtual Reality Systems XI 5291, 36-47 [38] | 685 | 2004 |
| Perceptual issues in augmented reality<br>D Drascic, P Milgram<br>Stereoscopic displays and virtual reality systems III 2653, 123-134 [39] | 623 | 1996 |
| Visual discomfort in stereoscopic displays: a review<br>MTM Lambooij, WA IJsselsteijn, I Heynderickx<br>Stereoscopic Displays and Virtual Reality Systems XIV 6490, 183-195 [40] | 342 | 2007 |
| Controlling perceived depth in stereoscopic images<br>GR Jones, D Lee, NS Holliman, D Ezra<br>Stereoscopic Displays and Virtual Reality Systems VIII 4297, 42-53 [41] | 321 | 2001 |
| Micropolarizer-based multiple-viewer autostereoscopic display<br>SA Benton, TE Slowe, AB Kropp, SL Smith<br>Stereoscopic Displays and Virtual Reality Systems VI 3639, 76-84 [42] | 318 | 1999 |
| Computational model for the stereoscopic optics of a head-mounted display<br>W Robinett, JP Rolland<br>Stereoscopic Displays and Applications II 1457, 140-161 [43] | 316 | 1991 |
| Characterization and optimization of 3D-LCD module design<br>C Van Berkel, JA Clarke<br>Stereoscopic Displays and Virtual Reality Systems IV 3012, 179-186 [44] | 244 | 1997 |
| Effect of disparity and motion on visual comfort of stereoscopic images<br>F Speranza, WJ Tam, R Renaud, N Hur<br>Stereoscopic displays and virtual reality systems XIII 6055, 60550B [45] | 240 | 2006 |

The Electronic Imaging Symposium first set up its own YouTube channel in early 2014. The very first video uploaded to the channel was the 2014 SD&A Keynote presentation "Preservation and exhibition of historical 3D movies" by Jeff Joseph, Producer, World 3D Film Expo (United States). The access statistics of the SD&A conference presentations on the Electronic Imaging YouTube channel are also a useful measure of the impact of the conference (see Table 3).

***Table 3****. Electronic Imaging YouTube Channel usage statistics (5 May 2014 to 25 February 2025).*

| | |
|---|---|
| *Videos* | *245* |
| *Lifetime Views* | *137,100* |
| *Lifetime Watch Time* | *12,100 hours* |
| *Average View Duration* | *5 mins 17 seconds* |

The standout figure from Table 3 is the average view duration of 5 minutes 17 seconds. Most of the videos on the channel are only 15 minutes in length so 5+ minutes average view duration is impressively high.

The leaderboard of videos on the EI channel is shown in Table 4. The highest viewed video is the EI2020 Plenary

presentation “Quality Screen Time: Leveraging Computational Displays for Spatial Computing” by Douglas Lanman, Director of Display Systems Research, Facebook Reality Labs (USA), with 23,260 views and 4,000 hours of total watch time.

***Table 4.*** *Top 8 viewed videos on the Electronic Imaging YouTube Channel (as at 24 Feb 2025).*

| Video | Date | Views |
|---|---|---|
| EI 2020 Plenary: Quality Screen Time: Leveraging ... This Plenary presentation was delivered at the 33d annual Electronic Imaging Symposium (26-30 Januar... | Jul 16, 2020 Published | 23,260 |
| SD&A 2016: LEIA 3D: holographic reality This presentation was delivered at the 27th annual Stereoscopic Displays and Applications conference... | May 16, 2016 Published | 18,640 |
| SD&A 2016: 3D autostereoscopic display image ge... This presentation was delivered at the 27th annual Stereoscopic Displays and Applications conference... | May 1, 2016 Published | 6,030 |
| SD&A 2016: 3D will be back but not as we know it This presentation was delivered at the 27th annual Stereoscopic Displays and Applications conference... | May 1, 2016 Published | 3,981 |
| SD&A 2014: Interpolating vertical parallax for an a... This presentation was delivered at the 25th annual Stereoscopic Displays and Applications conference (... | Aug 8, 2014 Published | 3,207 |
| SD&A 2016: Capturing and rendering light-field vid... This presentation was delivered at the 27th annual Stereoscopic Displays and Applications conference... | May 15, 2016 Published | 2,842 |
| SD&A 2015: Interactive stereo games to improve vi... This presentation was delivered at the 26th annual Stereoscopic Displays and Applications conference (... | Dec 16, 2015 Published | 2,713 |
| SD&A 2014: Fully automatic 2D to 3D conversion ... This presentation was delivered at the 25th annual Stereoscopic Displays and Applications conference (... | Aug 8, 2014 Published | 2,296 |

You will find these videos and much more on the Electronic Imaging YouTube channel which is available here:

https://www.youtube.com/@ElectronicImaging

## An Informal Post-Conference Site-Visit

Many conference attendees take the opportunity to visit colleagues at local companies in Silicon Valley whilst they are in town for the conference. In previous years we have also organized a site visit to NVIDIA, Intuitive Surgical and Stanford University. This year after the conference a small group took the opportunity to visit the Computer History Museum [46] in Mountain View (Figure 31). As well as seeing many computers from our collective past (including the PDP11 mentioned in Daniel Sandin’s presentation), we also were surprised and elated to see the “Sword of Damocles” head-mounted display made famous by Ivan Sutherland. There it was, just sitting on the shelf of one of the display cabinets in the museum (Figure 32). Coincidentally three presenters at the conference (Daniel Sandin’s keynote, Bjorn Sommer’s Trojan Horses, and Levi Scully’s ERVR presentation) mentioned this headset during their talks. One aspect of curiosity that you might notice from the photos is the presence of what looks like half-silvered mirrors at the view-pieces (Figure 33) – confirming that this was actually an optical passthrough augmented reality display, although ithe graphics driving the display would have been rudimimentary due to the limitations of computer graphics power during the period this system was developed (1968). On the front of the head-mount is what appears to be a hinged panel which can presumably be lowered to block the view of the real-world (Figure 33) turning it into a virtual reality display.

If there is enough interest, we could organize a special post-SD&A conference tour to the Computer History Museum to see the “Sword of Damocles” head-mounted display at the end of next year’s conference. If you’re interested, let us know!

***Figure 31.*** *Andrew Woods, Daniel Sandin, Eric Kurland and Bjorn Sommer at the Computer History Museum with the “Sword of Damocles” head-mounted display in the background. Those with a keen eye will also notice another item of 3D history (two items to the right) - the active 3D glasses from the Sega Master System. (Photo: Andrew Woods)*

***Figure 32.*** *The “Sword of Damocles” head-mounted display developed by Ivan Sutherland at the Computer History Museum. The placard reads “Ivan Sutherland’s experimental 3-D display, Harvard University, US, 1968. This ungainly device was probably the first head-mounted stereoscopic display. It was called the Sword of Damocles, because it was suspended from the ceiling to reduce the weight pressing on the wearer’s head. Gift of Evans and Sutherland, X1044.90.” (Photo: Andrew Woods)*

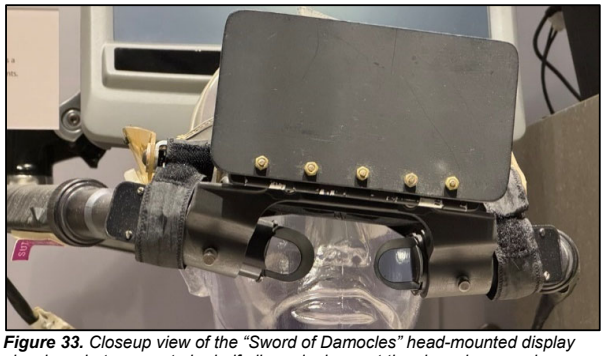

***Figure 33.*** *Closeup view of the "Sword of Damocles" head-mounted display showing what appear to be half-silvered mirrors at the view-pieces and a hinged panel which can presumably be lowered to block the view of the real-world. (Photo: Andrew Woods)*

Of course, these days it's much easier to achieve high quality stereoscopic head-mounted displays using micro-displays and micro-electronics. For example, on one of the conference nights at a local restaurant Eric Kurland pulled out a small stereoscopic head-mounted display – the GOOVIS Art – out of his bag and demonstrated some high-quality 3D content to the people around the table (Figure 34). It's interesting to compare and contrast this display with the "Sword of Damocles" head-mounted display from over 50 years ago.

***Figure 34.*** *Eric Kurland with the GOOVIS Art stereoscopic head-mounted display. (Photo: Andrew Woods)*

## Discussion

Organizing the Stereoscopic Displays and Applications conference and the Electronic Imaging Symposium involves a huge amount of effort across many people each year. We wish to thank all of the individuals and groups that contributed to the success of this meeting:

- conference authors and attendees.
- demonstration session presenters.
- the SD&A conference committee: Justus Ilgner, Eric Kurland, Eleanor O'Keefe, Nicholas Routhier, John Stern, Chris Ward and Laurie Wilcox.
- the staff at the Society for Imaging Science and Technology (IS&T / Imaging.org): Suzanne Grinnan, Marion Zoretich, and Donna Smith; and Palisades Convention Management: Jenny Donelan, Mari Ramirez, and Bill Klein. (Figure 35)
- the AV staff at the venue managed by Adrian Romero from Spectrum Audio Visual (Figure 36).
- DepthQ Stereoscopic and 3-D Film Archive for their support of the 3D Theater Session. DepthQ kindly loaned a DepthQ stereoscopic polarization modulator for use during the 3D Theater Session and conference.
- Eric Kurland from the 3-D Space museum for supporting the presenters' technical requirements and looking after the 3D projection system at the conference (Figure 37).
- Videos from last year's conference were edited, uploaded and curated by Andrew Woods, Jasmine Woods, and John Stern. We often neglect to acknowledge those who process each year's conference videos because it usually happens after the proceedings introduction is completed, so we've also got some catching up to do and hence we need to thank Dan Lawrence, Stephan R. Keith, Eric Kurland and Jade Woods for processing previous year's videos.


***Figure 35.*** *Jenny Donelan, Mari Ramirez, and Bill Klein at the Electronic Imaging 2025 registration desk. (Photo: Andrew Woods)*

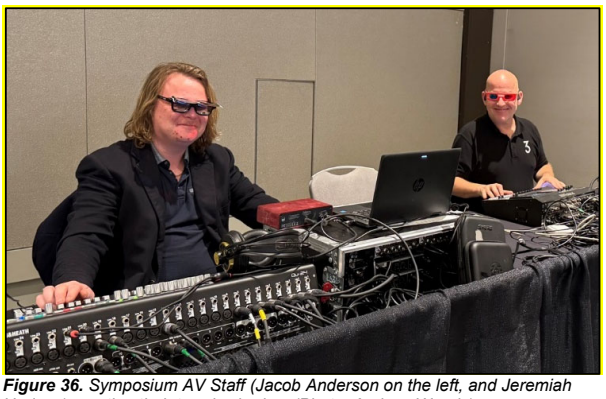

***Figure 36.*** *Symposium AV Staff (Jacob Anderson on the left, and Jeremiah Hudson) sporting their trendy shades. (Photo: Andrew Woods)*

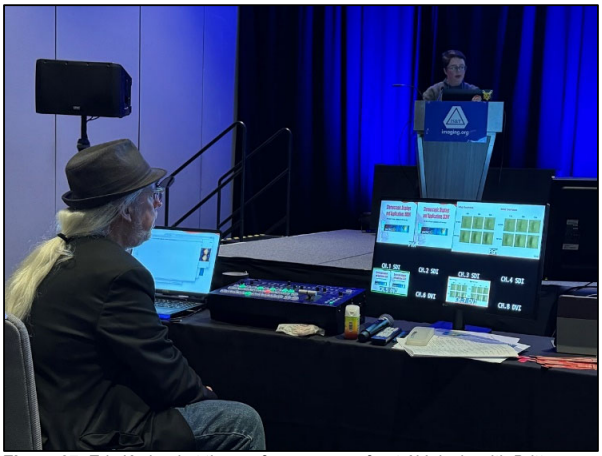

***Figure 37.*** *Eric Kurland at the conference room front AV desk, with Brittney Hartle (York University, Canada) presenting on stage. (Photo: Andrew Woods)*

The conference committee play an important role in supporting and shaping the conference each year. One of our longest serving committee members is Chris Ward, from Lightspeed Design Group and the DepthQ Stereoscopic brand. Chris has been on the committee since 2009. Chris is now rotating off the committee and we thank him for his amazing support of the conference over a 17-year period.

There was one more prize to announce at this year's SD&A conference and that was the **Winner of the Best Use of 3D During the SD&A Technical Presentations**. That was awarded to Daniel Sandin for this keynote presentation "Half a Century of Innovation in Interactive Electronic Displays for Art and Science at the Electronic Visualization Laboratory (EVL) at UIC and the Qualcomm Institute at UCSD" which included a screening of the 3D short film "A Study of 4D Julia Sets – Iterations of $Z=Z^2+K$ in the Quaternions" produced by Daniel at the EVL in 2005.

As every regular SD&A attendee anticipates, there was also a good supply of various Tim Tam flavours. This made the many coffee breaks much more enjoyable. A few "Tim Tam slams" were also undertaken for experimental purposes only.

The SD&A conference has an online presence via our website and also on Linkedin.

Visitors can refer to the SD&A website to learn about the extensive history of the conference, see a full listing of all conference papers and presentations across all 36 years of the conference, and refer to a selection of historical 3D books in PDF format. The SD&A conference website is at:

www.stereoscopic.org

The SD&A conference has had a Linkedin discussion group for some time where people can discuss a range of conference-related topics:

www.linkedin.com/groups?gid=1945944

Additionally, this year we have set up a new Linkedin profile for the SD&A conference.

https://www.linkedin.com/company/105913226/

You can follow this new Linkedin account from your own Linkedin account to have SD&A news come up in your Linkedin feed. This SD&A profile will operate differently to the SD&A Linkedin discussion group which as the name suggests operates more like a traditional discussion group.

The conference also has an announce-only mailing list which you can sign up for. Messages are infrequent and consist of only SD&A conference updates. If you're not already a member, you can subscribe here:

https://lists.curtin.edu.au/mailman/listinfo/sdalist

Most presentations at the 2025 SD&A conference and the ERVR conference were recorded. They will progressively be made available on the Electronic Imaging YouTube channel:

https://www.youtube.com/@ElectronicImaging

Manuscripts presented at the conference (as well as conference presentation recordings) will also be indexed on the SD&A conference website:

http://www.stereoscopic.org/2025

## Conclusion

Next year's SD&A conference will be held in March 2026 as part of the 38th annual IS&T Electronic Imaging Symposium at the Hyatt Regency San Francisco Airport Hotel in Burlingame during the period 1-5 March 2026. The later timing than usual is because the Superbowl will be hosted in Santa Clara in mid-February 2026 which is a huge event that leads to hotel bookings maxing out up and down Silicon Valley.

Join us in February 2026 for an immersive, in-depth. in-person 3D experience. To attend, present, or demonstrate at the 2026 SD&A conference, please visit the Electronic Imaging website www.ElectronicImaging.org or the SD&A conference website www.stereoscopic.org for details and deadlines. We look forward to seeing you there – in 3D!

Finally, if you're still wondering what the hidden image is in Figure 29, it's a dolphin (several actually).

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## Author Biographies

*Andrew Woods is an Associate Professor at Curtin University where he manages the HIVE visualisation facility (Hub for Immersive Visualisation and eResearch) and is a Research Engineer at the Centre for Marine Science & Technology. He specialises in visualisation, stereoscopic 3D imaging, 3D reconstruction, 3D cameras and displays, video electronics, underwater vehicles (ROVs), and engineering software development, with applications in offshore oil and gas, and maritime archaeology. He has BEng and MEng degrees in electronic engineering and his PhD was on the topic of crosstalk in stereoscopic displays. He is a senior member of IS&T. He was the technology lead on the Sydney-Kormoran Project which surveyed the wrecks of HMAS Sydney (II) and HSK Kormoran in 2015, and imaging lead for the survey of the wreck of HMAS AE1 in 2018. In 2017 he was recognized as one of Australia's Most Innovative Engineers by Engineers Australia. He has been co-chair of the Stereoscopic Displays and Applications conference since 2000.*

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*Nick Holliman is a freelance researcher based in Brisbane, Australia. Until late 2024, he was a Professor of Computer Science at King's College London, researching the science and engineering of data visualization and visual analytics. His research has included working with psychologists to understand how the human visual system processes information, developing novel computational algorithms to control image quality and demonstrating how these algorithms work in practice in cloud-based visualization tools and award-winning stereoscopic 3D scientific visualizations. He has worked in both industrial and academic environments and is experienced in delivering commercial impact from research outputs*

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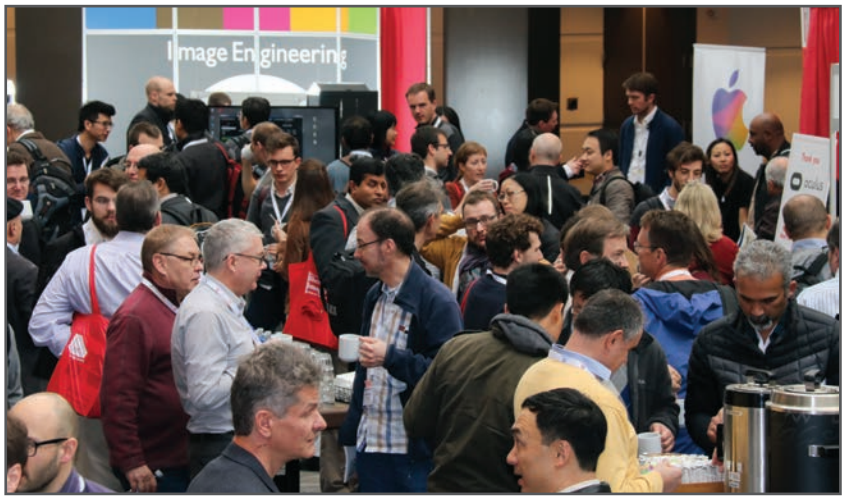



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