Digital Stereo Photography and Phantograms

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Outline

- Background and Terminology
- Software and Techniques
- Demo
- Legal Issues (Patents)
- Community Building

Background

- Stereo Photography is almost as old as photography itself.
- Involves taking two photos, with only a small horizontal displacement (*base*) between them, and presenting them to each eye.
- Depth perception due to *parallax* shift.

Source: [Rocky Mountain Memories 3D Encyclopedia](#)

Stereo Base

- Horizontal displacement between left- and right-eye views
- 63.5mm (2.5") normal
- Rough guideline: 1/30 of distance to closest object

75"

2.5"

Source: stereoscopy.com - The Library: Stereo Photography - by Fritz G. Waack
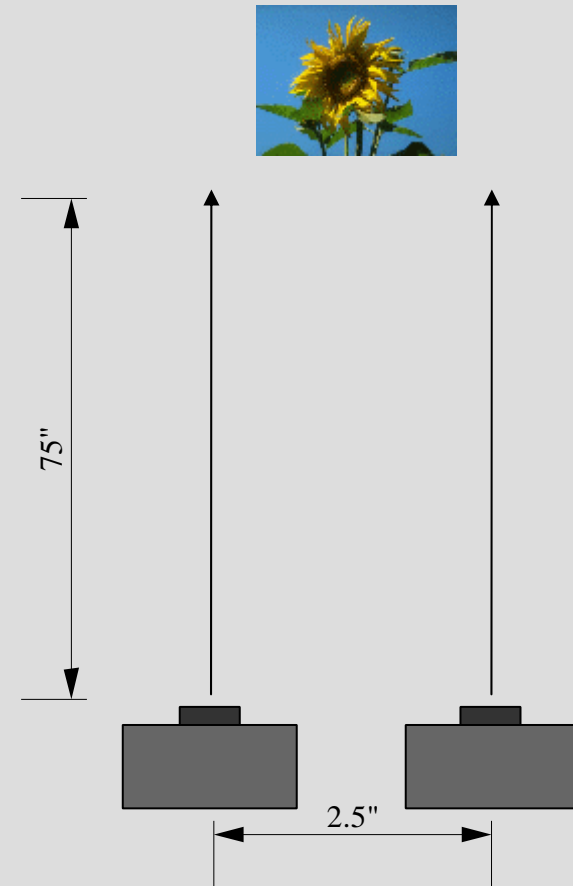
Stereoscopic Viewing

- Traditionally: using a *stereoscope*

- *Free-viewing* parallel or cross-eyed pairs

- *Anaglyph* (with coloured 3D glasses)

- Polarized, LCD shutters, lenticulars...


US Patent #00232649
1880
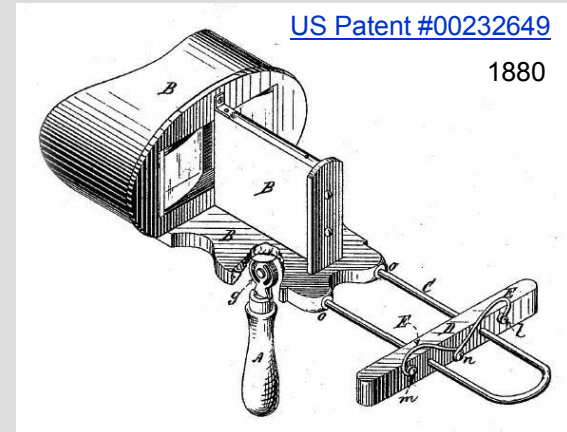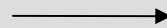
Anaglyph

- A moving or still picture consisting of two slightly different perspectives of the same subject in contrasting colors that are superimposed on each other, producing a three-dimensional effect when viewed through two correspondingly colored filters.
  (Source: Mark Newbold's Stereo 3D Stuff)

- Method of encoding a three-dimensional image in a single picture by superimposing a pair of pictures taken through colored filters or by simulating this effect through digital image processing.
  (Source: Wikipedia)

- Easiest and cheapest format for viewing on RGB screen or in print.
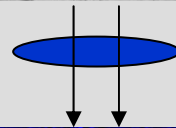
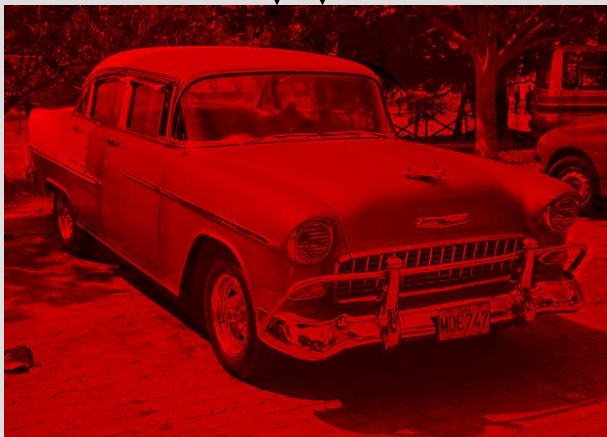- Unfortunately, colour fidelity can be a problem.

Making an Anaglyph

- Black/White photos
- Red/Blue filters
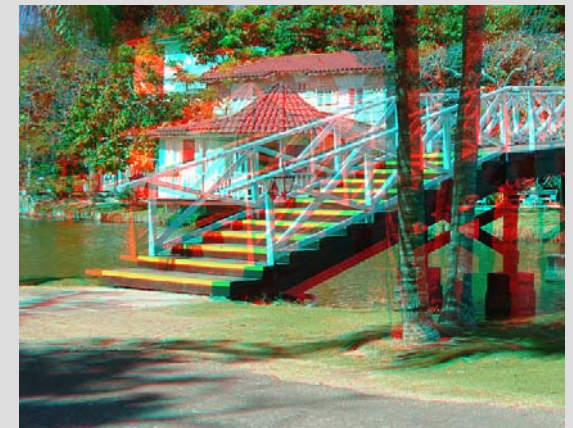- "Pure" Red/Blue Anaglyph
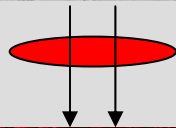
Left

Right

+

=

Making a Full-Colour Anaglyph

- Full-colour photos
- RGB decomposition
- Left R + Right GB
- Red/Cyan Anaglyph

Stereo Window

- Imaginary plane at the frame of the picture.
- Normally set at, or in front of, nearest object. (Everything else is "behind" the window.)
- If an object protrudes into space in front of this window, we call this effect "coming through the stereo window". (Technically, *negative parallax*)

(Source: http://www.gravitram.com/stereo%20window%202.htm)

Ghosting

- "Crosstalk" between images
- Due to imperfect colour separation
  - in glasses
  - in display medium (and lighting)
  - in image compression
- Worse in red/green or red/cyan than red/blue anaglyphs
- Worse when colour/intensity contrast high
- Worse against smooth backgrounds

(Source: Anaglyphs for 3 dimensional viewing)

Retinal Rivalry

- "If the pattern of vision is quite disparate between the two eyes, one sees (a conscious experience) only one pattern at a time. The image in one eye may dominate, or the experience can alternate between the two views."
  (Source: Buffalo Cognitive Psychology class notes on Perception)

- Causes:
  – Motion between two shots taken in succession
  – Differences in camera settings between shots
    (Source: Breaking the Rule about Retinal Rivalry)
  – Colour/intensity differences in anaglyphs

Anamorphosis

- A distorted or monstrous projection or representation of an image on a plane or curved surface, which, when viewed from a certain point, or as reflected from a curved mirror or through a polyhedron, appears regular and in proportion; a deformation of an image.

(Source: 1913 Webster)

Anamorphosis in Painting

Holbein, Hans
[The Ambassadors](#)
1533
Oil on wood
207 x 209.5 cm
National Gallery, London

Source: [Art of Anamorphosis](#)

Anamorphosis in Chalk Art

Source: Julian Beever's Pavement Drawings

See Also: Web Findings - Terryfic 3D

Phantogram

- Essentially, a *stereoscopic anamorphosis*.

- Usually, an *anaglyph* print.

- Meant to be laid flat on a horizontal surface.

- To be viewed at an angle and distance corresponding to camera position from target (the *sweet spot*).

  (Source: Cascade's Stereo View, Sept. 2004)

- Objects appear above stereo window plane (*negative parallax*).

The Oldest Known Phantogram

- From "LES ANAGLYPHES GÉOMÉTRIQUES" (Librairie Vuibert, Paris, 1912) by H. Vuibert.
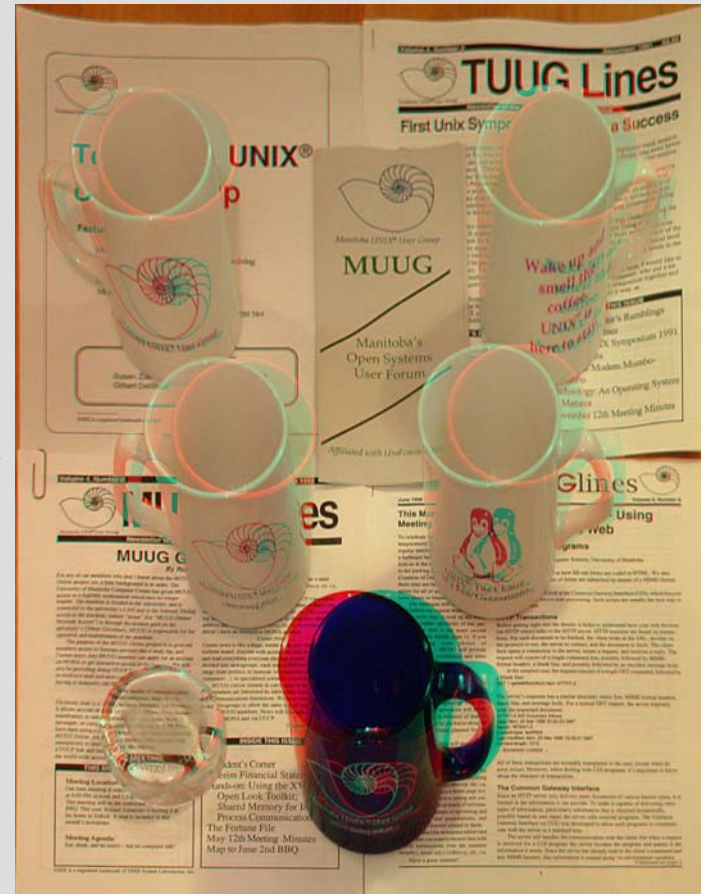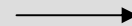- Used Red/Green glasses with Red on Right.

Source: [The 3D Company's Museum](#)
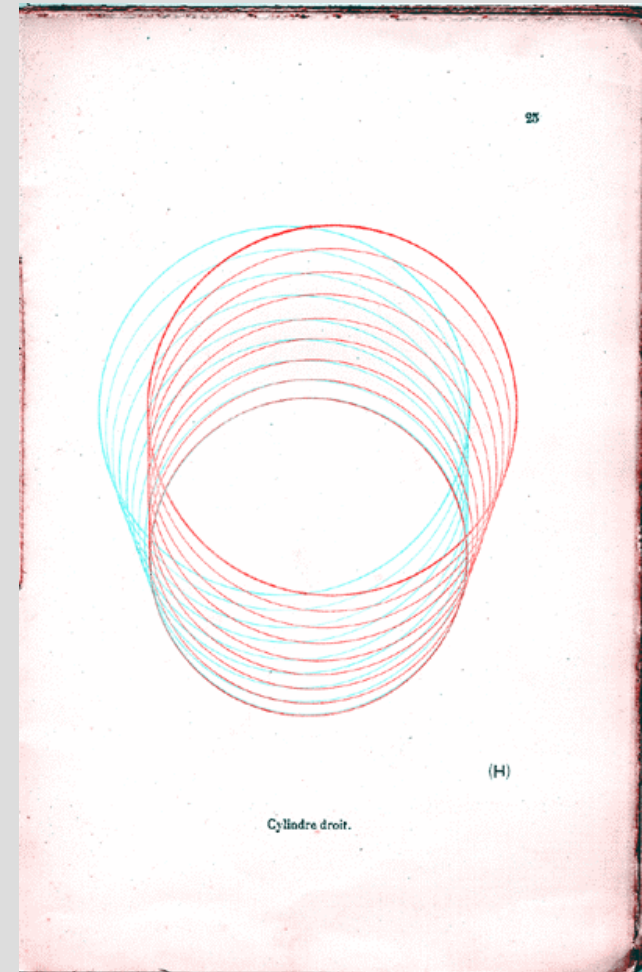
Photographic Phantogram

Angled view

Perspective transformation

Software: The GIMP

- Open source, multi-platform
- Photoshop-like functionality
- Plug-ins and "Script-Fu"
  - Wideangle plug-in (to correct lens distortion)
  - Stereoscopic script (anaglyphs and pairs)
- Perspective transformation tool (for Phantograms)

Software: AnaBuilder

- Java-based, multi-platform
- Freeware (not open source)
- Excellent filters
    - Brightness/contrast adjustment
    - Red/cyan desaturation (eliminate *retinal rivalry*)
    - Reduce/eliminate *ghosting*
- Good tools for alignment/correction
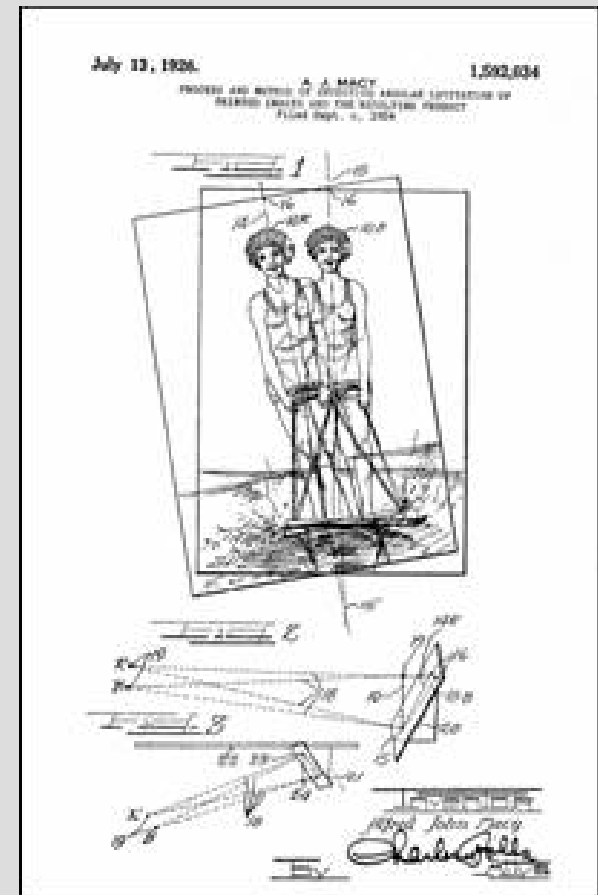- Awkward interface, lacks documentation

Demo

- Camera and target frame setup

- The GIMP

- AnaBuilder
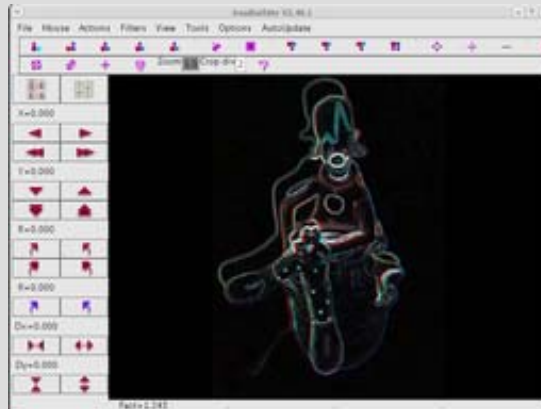
Patent: A.J. Macy

- "Process and Method of Effective Angular Levitation of Printed Images and the Resulting Product"
- Issued: July 13, 1926
- Technique described involves rotating the two stereo images about a common point.

Source: Phantograms, Patents, S. Hughes

Patent: Owen C. Western

- "Anaglyph and Method"
- Issued: May 14, 2002
- Patent specific to anaglyph Phantograms.
- Seems to claim all Phantograms including hand-drawn ones.
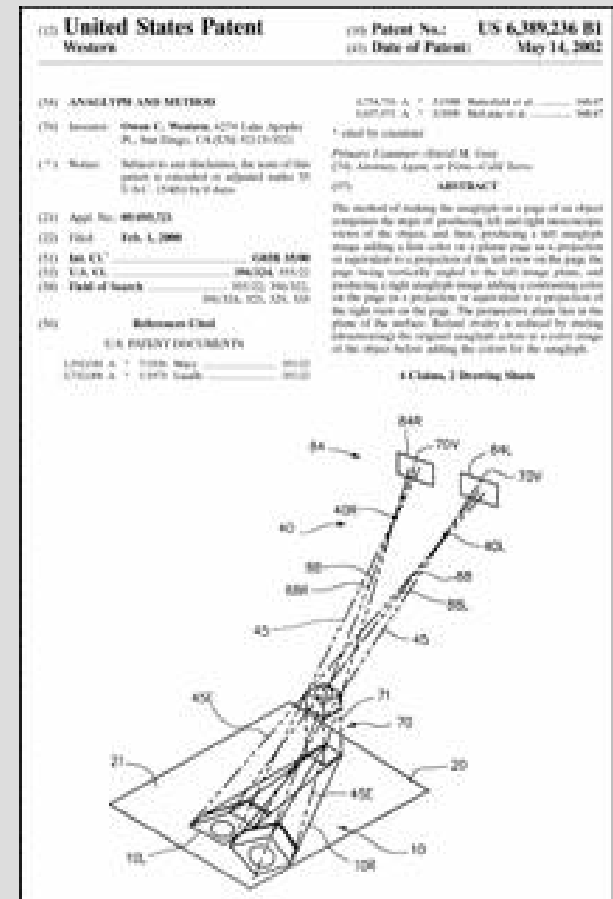
Source: Phantograms, Patents, S. Hughes

Patent: Steve Aubrey

- "Process for Making Stereoscopic Images Which Are Congruent With Viewer Space"
- Issued: Sep 2,2003
- Covers virtually all forms of stereo image presentation (not just anaglyphs).
- Refers to images created by digital manipulation (not optical processes).
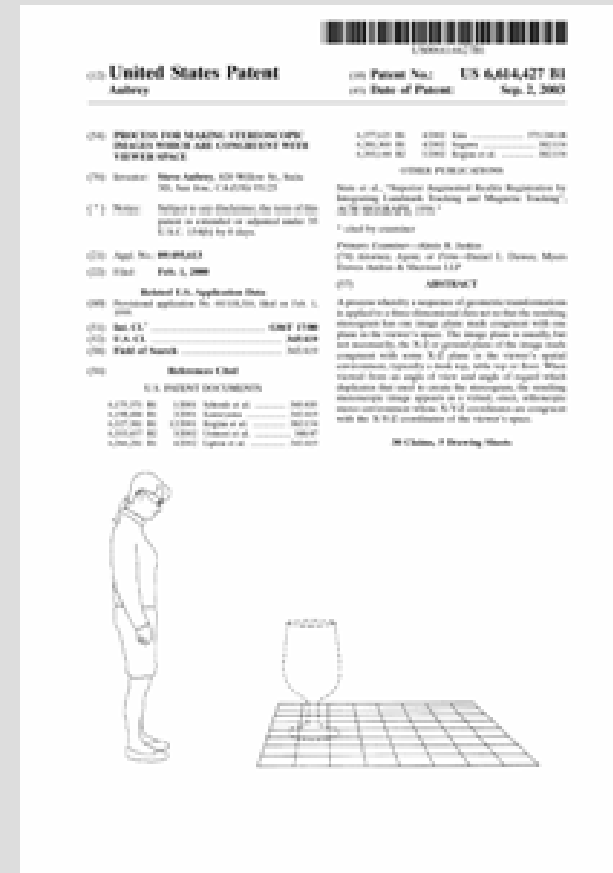
Source: Phantograms, Patents, S. Hughes

Associations and Communities

- [Cascade Stereo Club](), Portland, OR
- [National Stereoscopic Association](), USA
- [International Stereoscopic Union]()
- [Phantogram]() Yahoo Group

Questions

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