# Conservation of Murals in a New Smithsonian Affiliate Museum: Reviving Former Cutting-Edge Fluorescent Paint and Black light Technology

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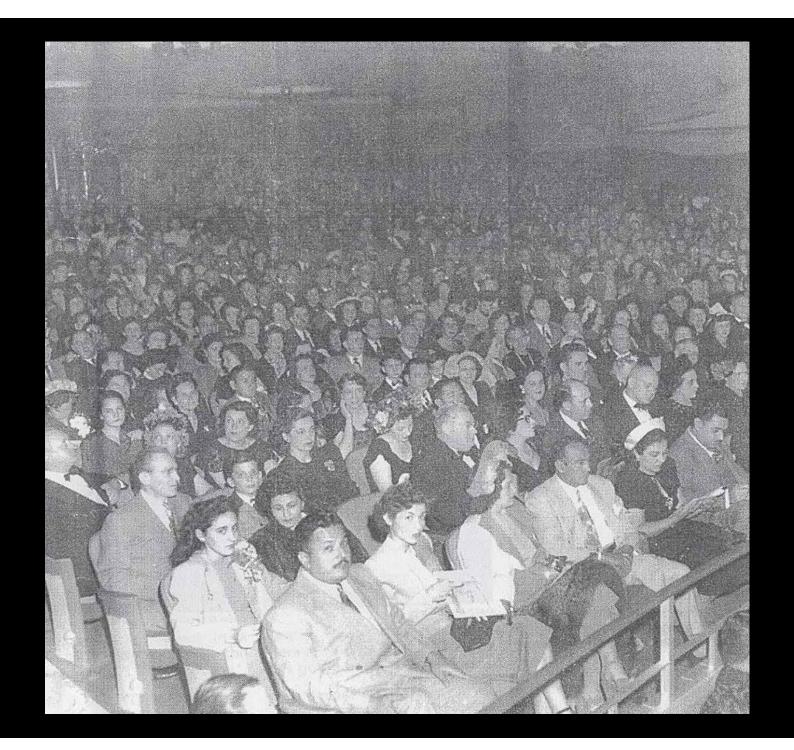


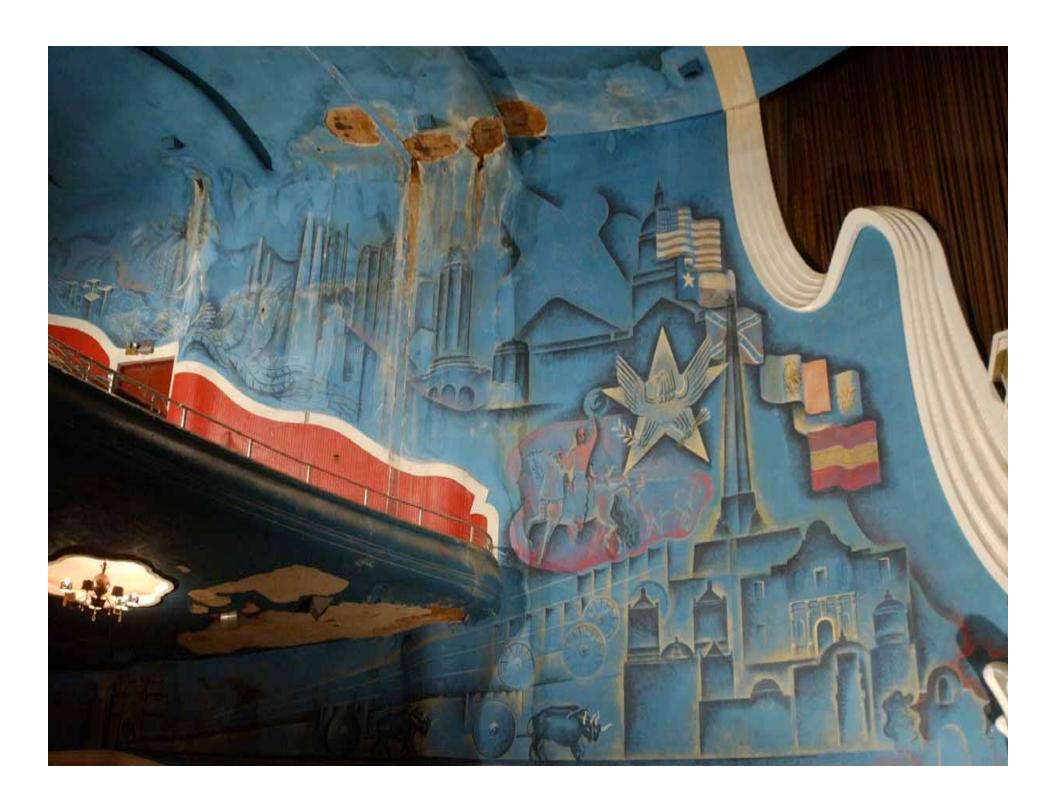
1949

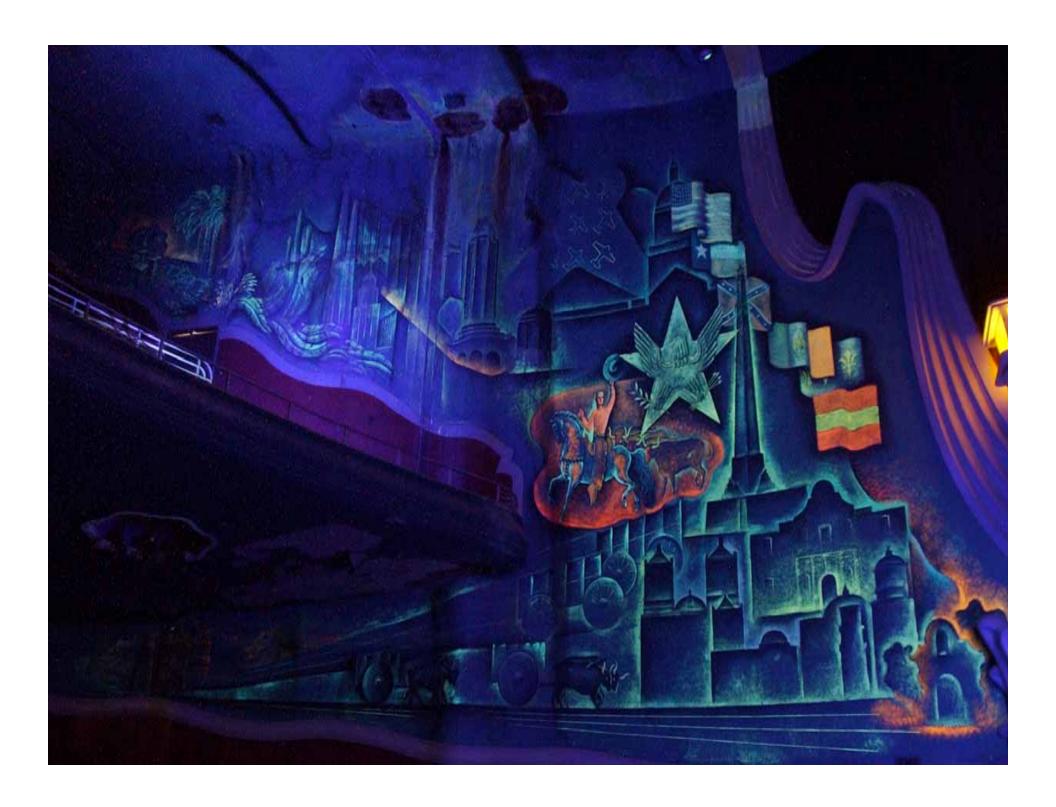


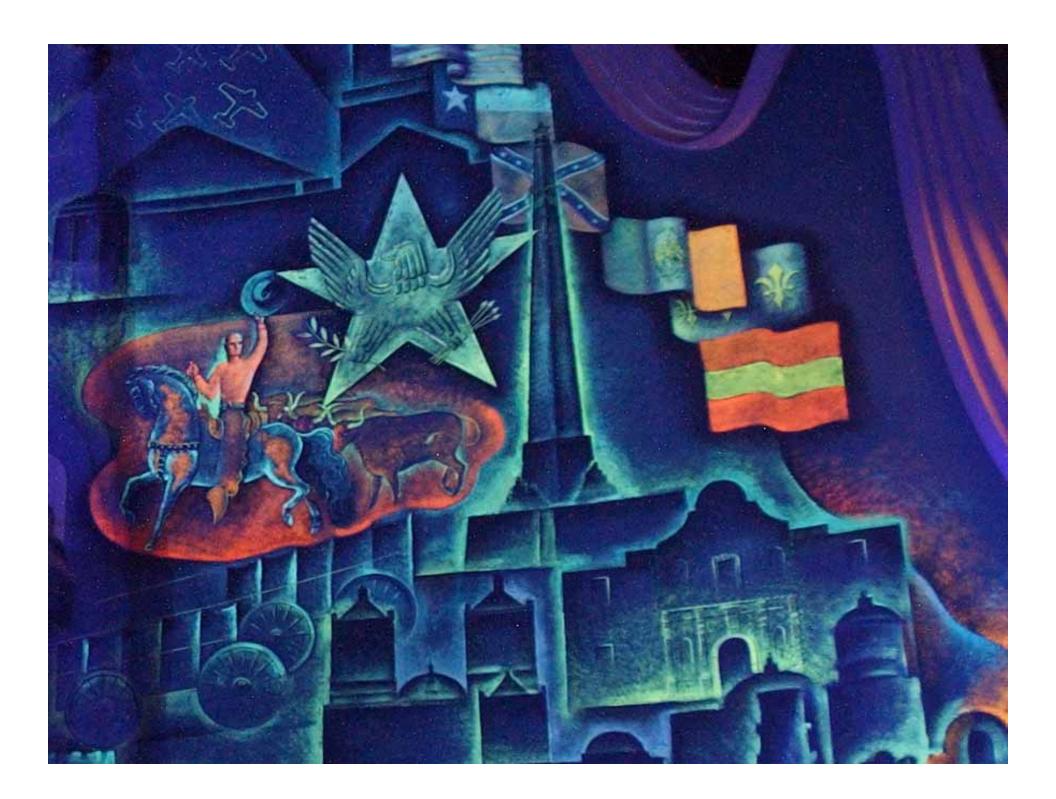
Alameda Theater
314 West Houston Street
San Antonio, Texas













# **Initial questions?**

### The murals are:

- \_ not phosphorescent
- \_ not radioactive
- \_ contains no asbestos
- \_ water soluble

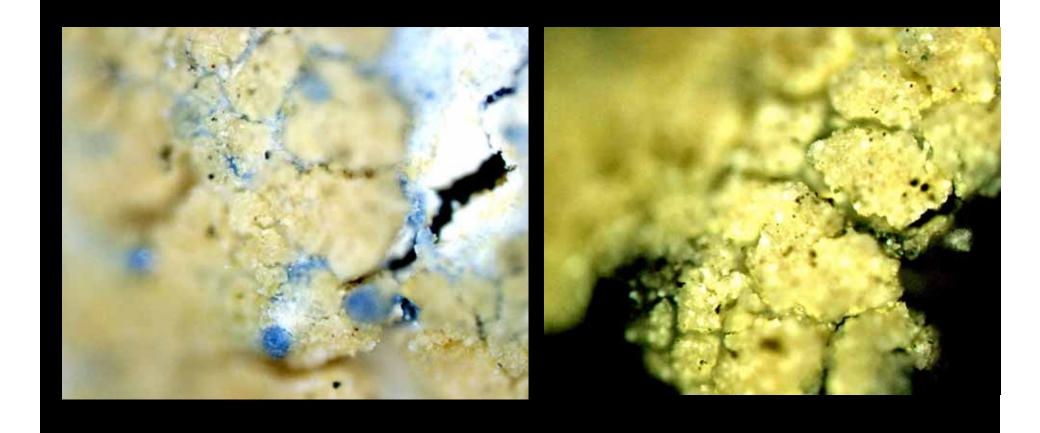


Cotton swab showing soluble paints



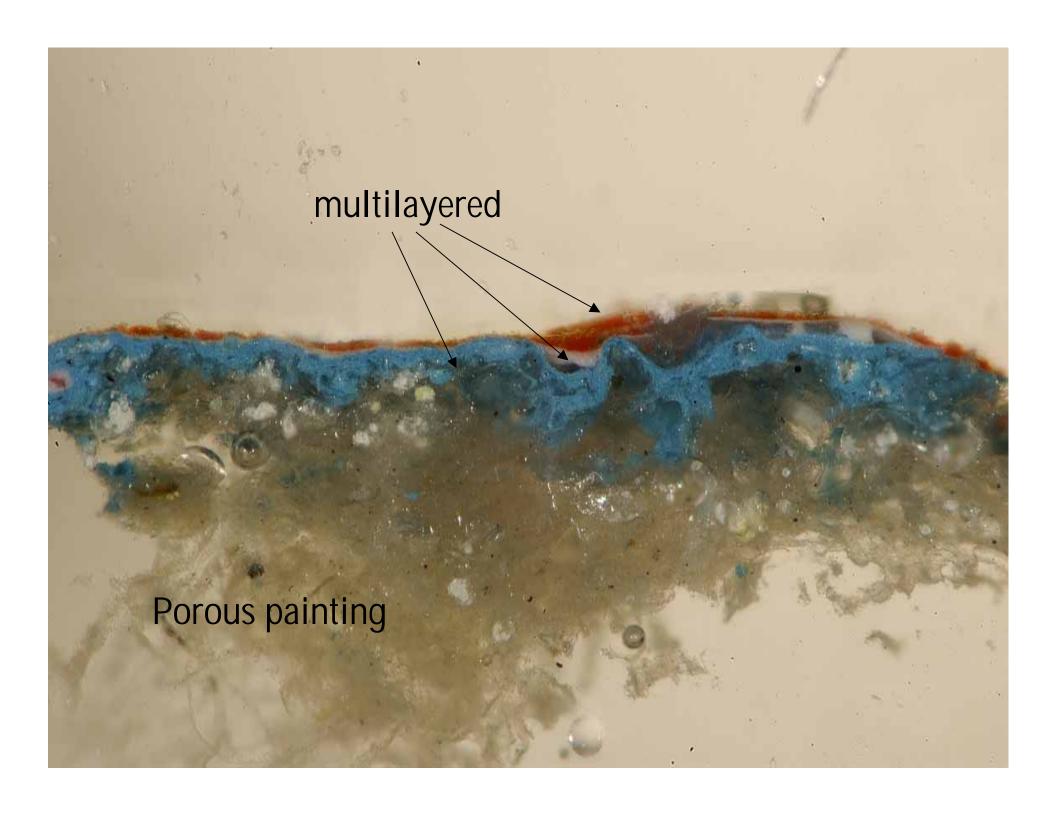
Tungsten light

ultraviolet light



Tungsten light

ultraviolet light





mezzanine wall, non-fluorescent, oil paint



# Top issues:

- \_ History of fluorescent paint
- \_ How broadly the paints were used
- \_ The chemistry and physics of these specialeffects pigments and colorants for inks, coatings, and plastics
- Black light murals trends & technology
- \_ Light fastness of the fluorescent paints in UV light

# Types of ultraviolet light

spectrum	range nm	effects	suitability for black light effects
UVA	315-400		
short	315-345	sun tanning	<b>not</b> suitable
long	345-400	eye "tanning"	suitable
UVB	280-320	sun burning skin cancer	<b>not</b> suitable
UVC	<280	germ killing	<b>not</b> suitable

# Health and Safety of UVA

# Eye Hazards

Heavy UVA exposure can lead to "nuclear cataracts". This is a permanent "tanning" of the lens of the eye. "Nuclear" refers to the occurrence in the center of the lens of the eye.

This usually occurs mainly among people who work outdoors. Those who are around blacklights may want UV blocking eyewear.

#### **UVA LAMPS**

# \_ Incandescent blacklights

Bulb made with dyed filter

Filters out visible light, emits UVA through glass

# \_Fluorescent blacklights

Tube coated with phosphor

Phosphor absorbs UVC, emits UVA

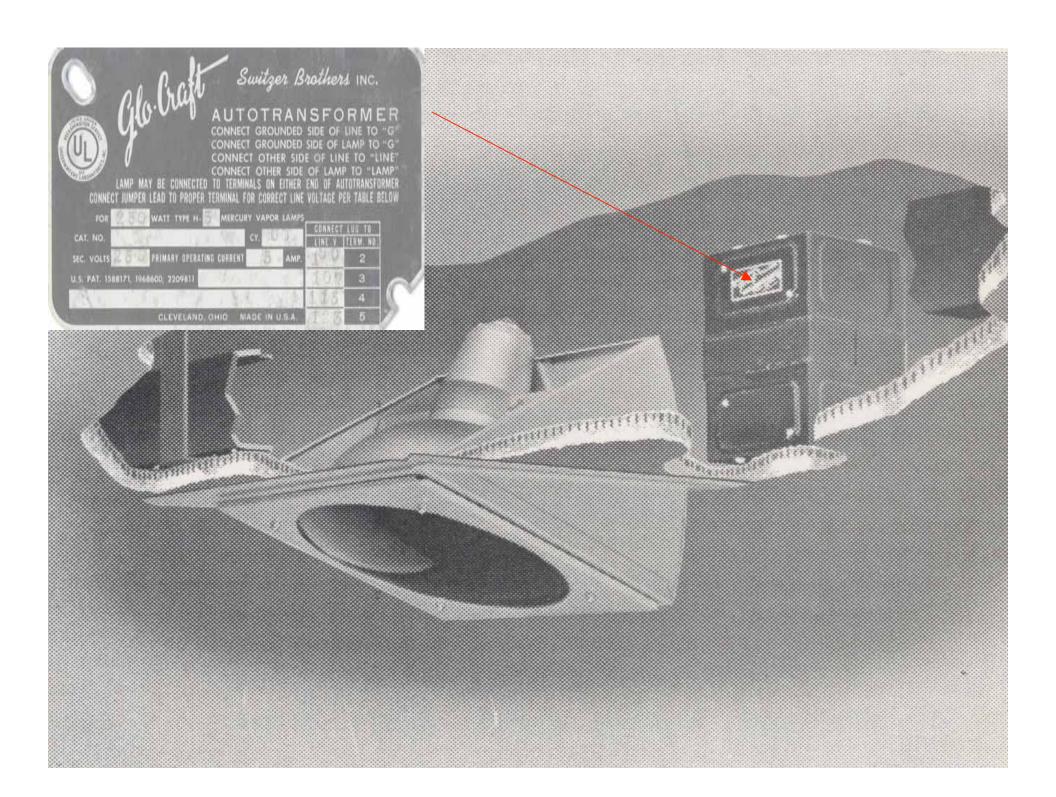
# Mercury Vapor blacklights

Mainstream UV lamps

Visible and three primary UV spectra 254, 312, and 365 nm

Flood or spot; distance and heat generated

Wattage (lumens/watt, color temperature, color rendering)

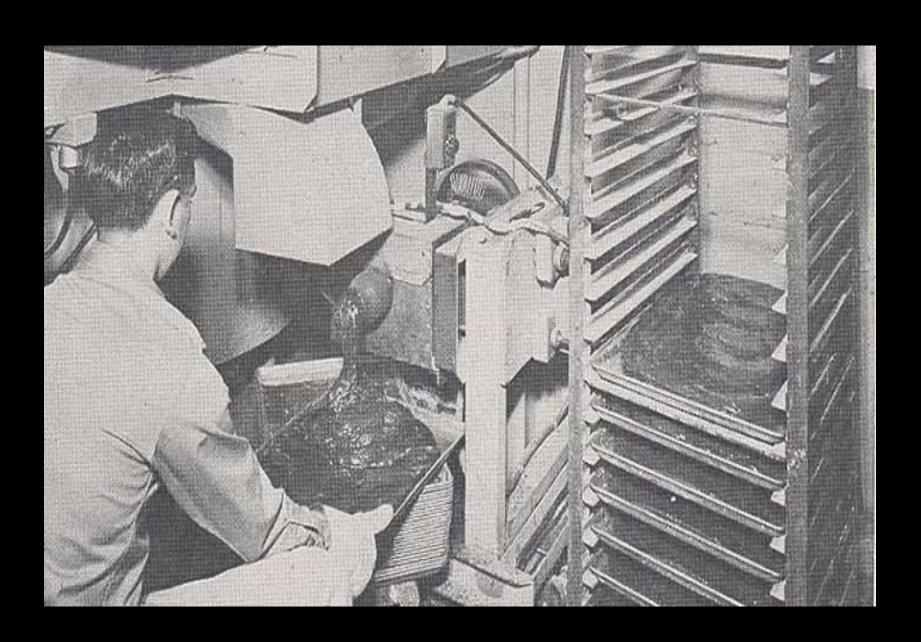


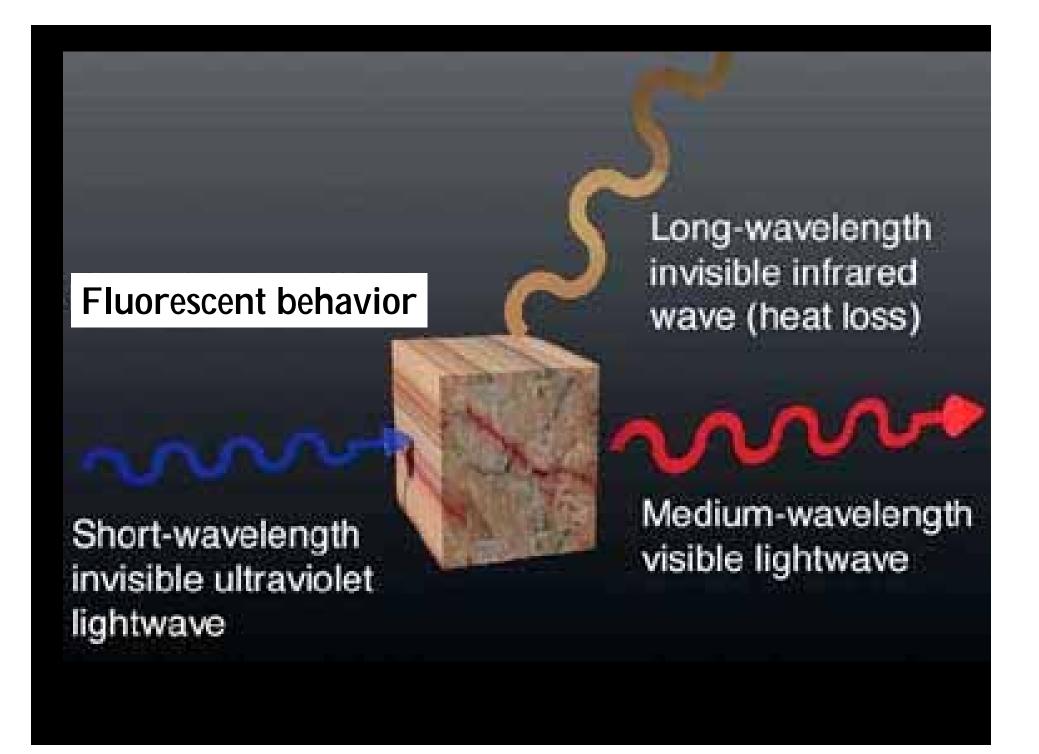
# American Inventors of Fluorescent Paints

# Bob Switzer and Joe Switzer, 1934

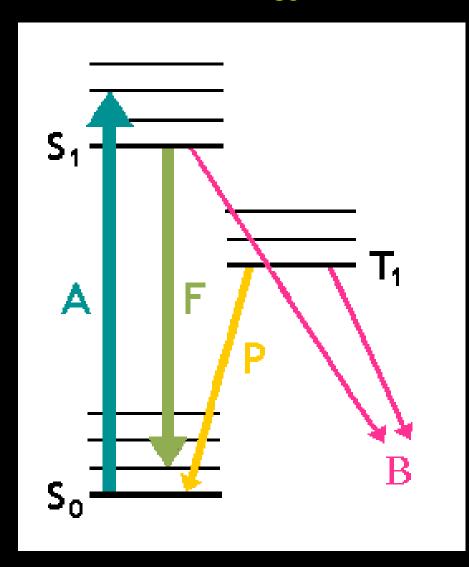


HARDENED MATERIAL is broken up from the trays and started through the micro pulverizer, where it is turned from brittle chunks into a flour-like material. At left is Joseph L. Switzer, vice-president of research for Switzer Brothers.





# Schematic Energy-Level Diagram for a Dye Molecule



F =fluorescence

P= phosphorescence

B= internal conversion (including heat loss)

A=absorption to excited states

## Fluorescent colors: Day-Glo colors

daylight fluorescent colors

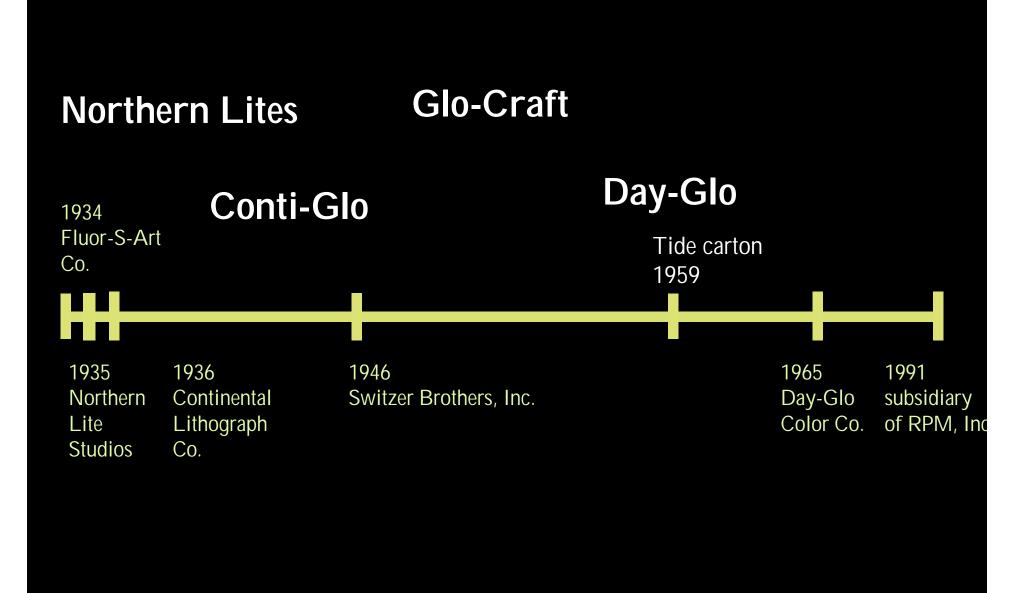
Neon color

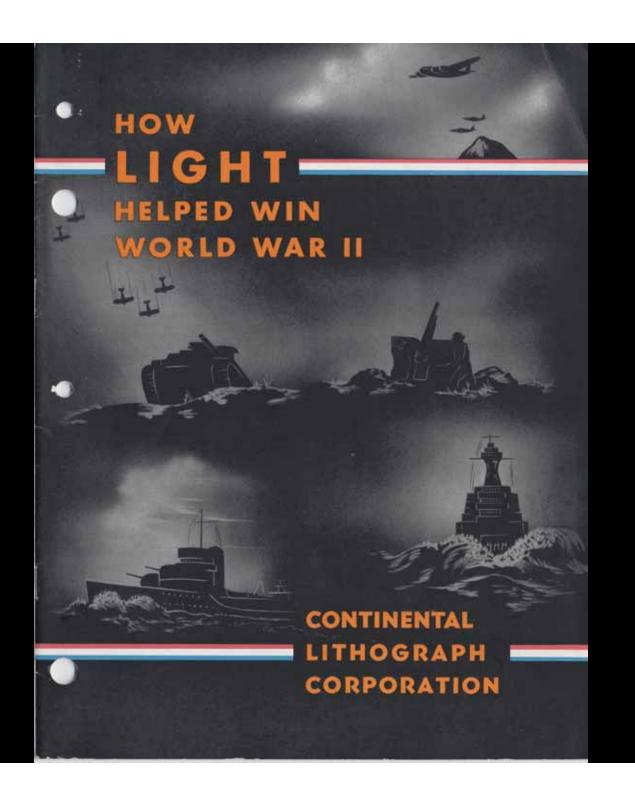
- \_ brighter than conventional colors
- \_ brighter indoors, low light outdoors, limited visibility areas
- \_ attention grabbing
- \_ glow under ultraviolet light
- \_ contains dyes and resin (thermoplastic or thermoset )
- \_ reflectance values great than 100% in a specific part of the spectrum

#### 20 Patents Issued

- 1. Apr. 4, 1939 2,152,856
- Fluorescent Lithographing Ink
- 2. Mar. 24,1942 2,277,169 Press Process of Making Reproduction Impresses and Product Thereof
- 3. Nov. 17,1942 2,302,645 Printing Process and Product Thereof

- 19. Nov. 19, 1968 3,412,035 Method for Producing Fine Pigment Particles in a liquid vehicle
- 20. Nov. 19, 1968 3,412,104 Prinking Ink Production





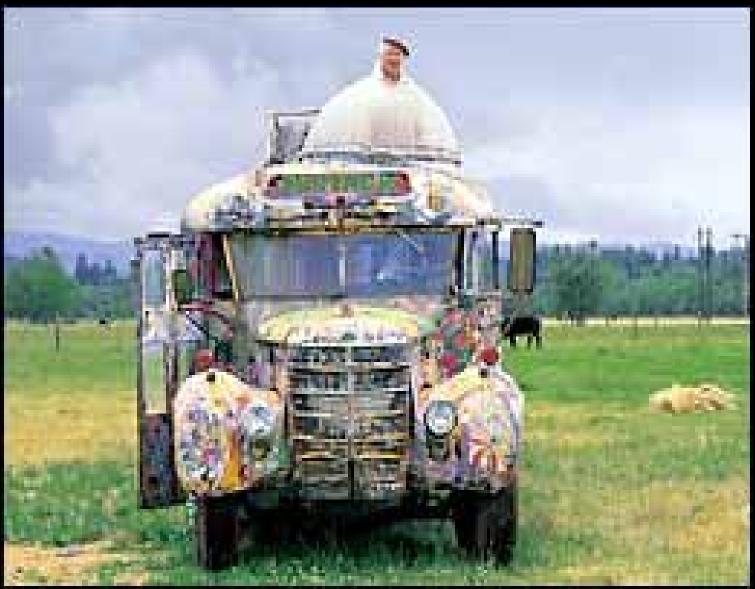






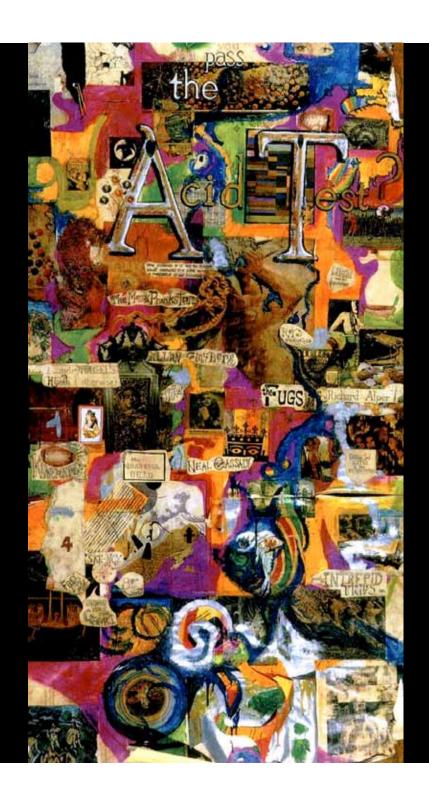
Garber Facility, National Air and Space Museum (NASM), Smithsonian Institution

#### Ken Kesey & the Merry Pranksters



"You are either on the bus, or you are off the bus"

The bus was painted with Day-Glo Colors

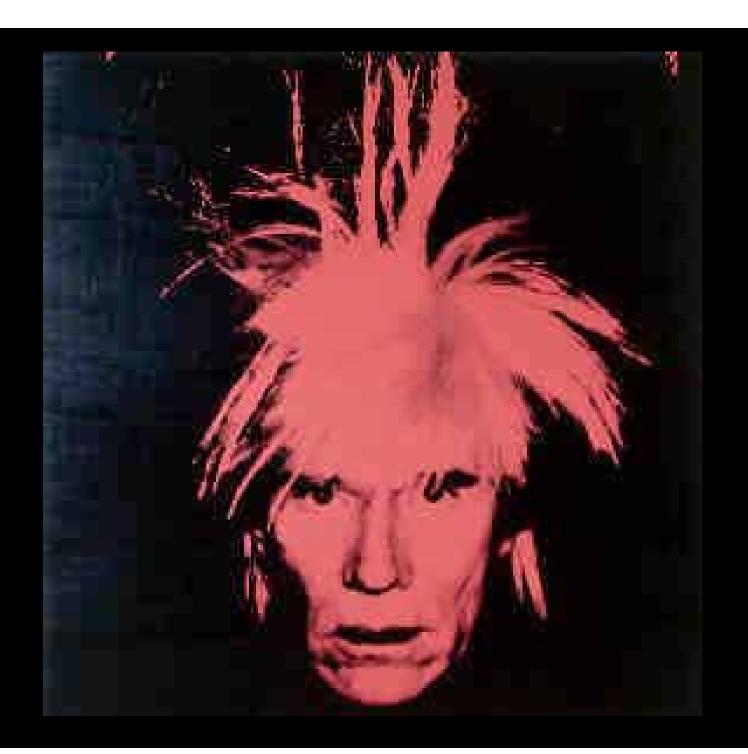


## Merry Pranksters' signboard

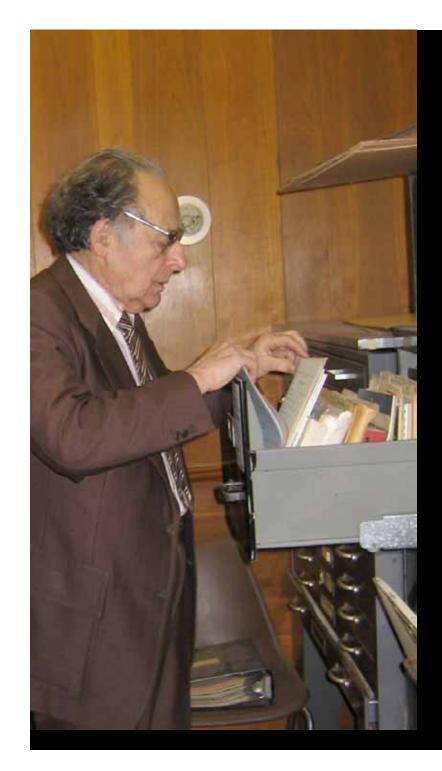
New acquisition

National Museum of American History (NMAH)

**Smithsonian Institution** 







Critical Link to Archival Research
Tom Gray

The only surviving employee from the early days of Switzer Brothers

He is a lawyer and helped the Switzers Brothers with their patents

(Photo taken from our oral history interview in April 2004 at Day-Glo Cleveland Ohio)

# Conservation Strategy:

- 1) Establish a technical team: building engineer, building foreman, lighting engineer, lighting designer, health and safety officer, paint chemist
- 2) Establish chains of communication with management, legal counselors, FEO and public affairs
- 3) Establish time line, progression of actions, and price tag for each action
- 4) Recruit the best plasterer and artists/inpainters

## **Unusual Problems in Conservation**

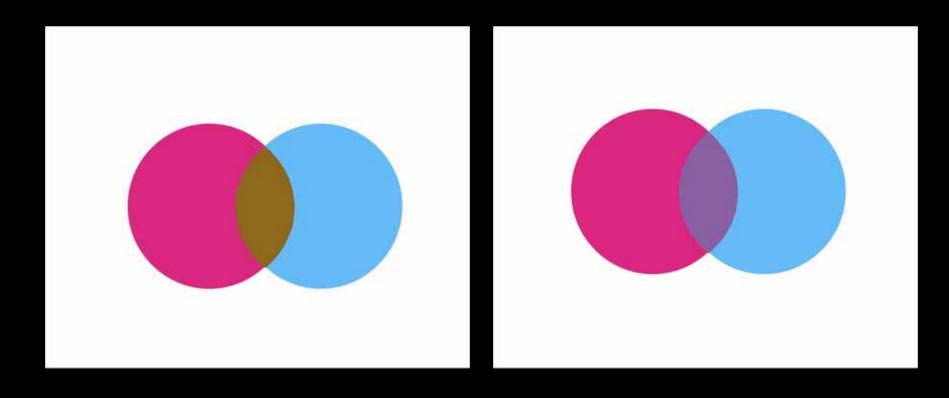
- 1) Color matching (inpainting) in UV
- 2) Photo documentation of the conservation process as prints or digital files with fair representation of colors and intensity
- 3) Permanence of new fluorescent materials vs. old fluorescent materials

# visible light



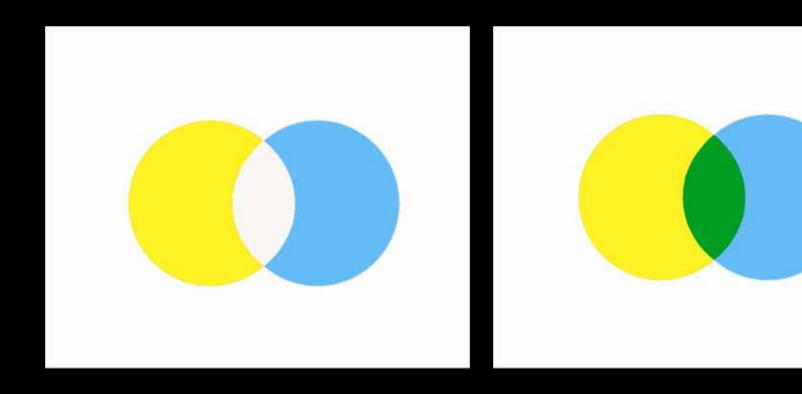






Fluorescent color under ultraviolet light

Traditional color visible light



Fluorescent color under ultraviolet light

Traditional color under visible light

# Inpainting materials and methods:

- 1) Prepare a small test area using water-based materials
- 2) Repair the interior background blue paint first
- 3) Inpaint with daylight fluorescent paints under visible light, check behavior under UV light, correct if necessary
- 4) Use Pantone Color Specifier or equivalent as guide in colors and UV intensity matching

#### The murals in the Alameda Theater are robust

- 1) the drama of the lighting is achieved through good design not through the intensity of the light
- 2) the intensity and duration of the mercury vapor lamps was reasonable
- 3) the UV sensitive paints are indoors
- 4) the theater was in the dark for limited use
- 5) the damage is from liquid water not from aging

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