# Visual Steganography Update

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## Visual Steganography

- Based on a mixture of steganography and visual cryptography
  - Existence of messages is hidden, but no software is necessary to extract them
- Uses ultraviolet light to project messages, images, etc onto cover media
- While invisible to the naked eye, messages may be seen through special eyewear

## Issues

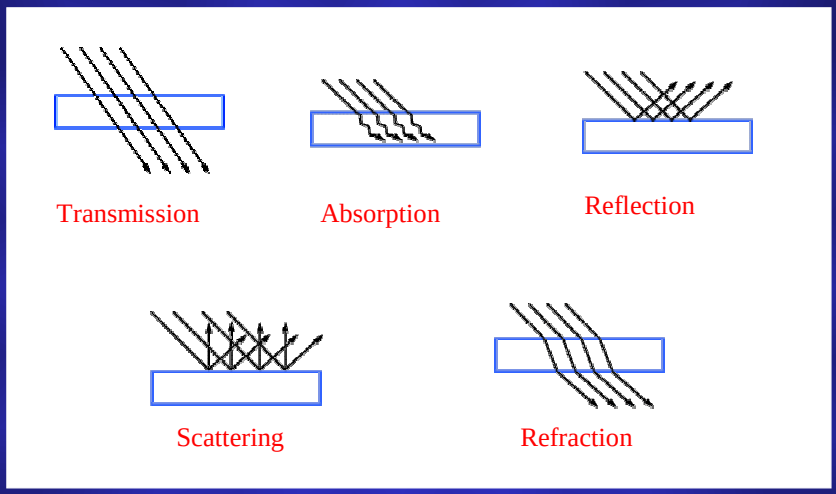
- Actual projection
- Dealing with media (post-projection)
  - New Idea: projection through other media
- Making UV visible
- Seeing UV and Visible simultaneously
- Secret Keys



## Background on Light

- Four different things happen when light hits an object:
  - It is reflected/scattered
    - Electrons send light back out at same wavelength
  - It is absorbed
    - Electrons of material absorb light waves
  - It is refracted
    - Light waves are bent, electrons send light back out
  - It is transmitted
    - Wave passes through the material unchanged

# Background on Light (2)

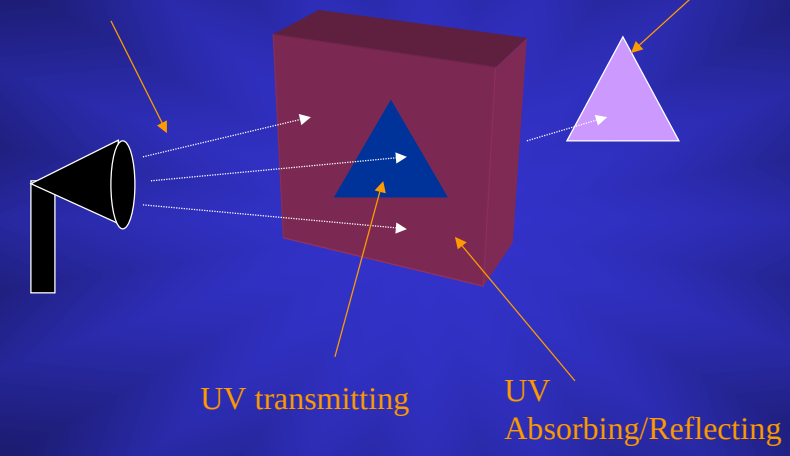





# Actual Projection

- Visible light slide projection
  - light is projected through material that transmits or reflects/absorbs visible light
    - Colors transmit only color wavelength, black absorbs all waves
- UV light projection
  - UV light is projected through material that transmits or reflects/absorbs UV rays
    - In accordance with picture, words, etc. to be projected

# Projection




# Dealing with media (post-projection)

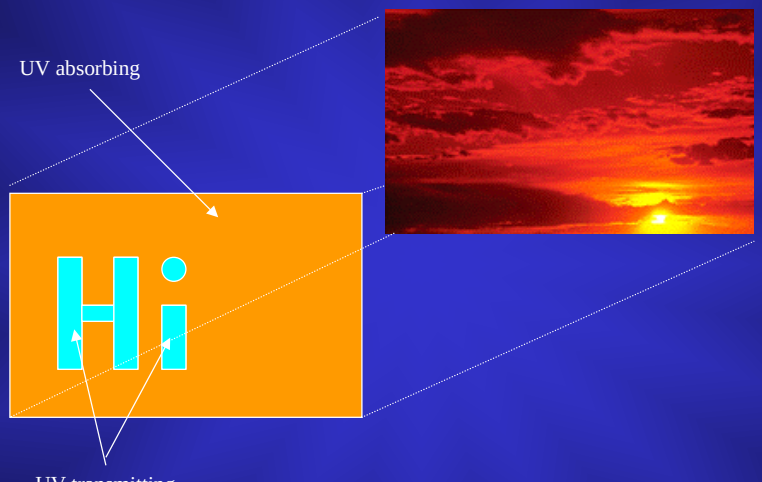
- Discard Media
  - After projection, “slides” are discarded
- Projection through other media
  - Take printed media
  - Reprint media onto material with message embedded

# Projection through other media

- Take a simple photograph
- Reprint photograph onto material with message embedded
  - Message embedded using non-UV-reflecting material
- Shine UV light through picture
- See the message using UV viewing glasses/material

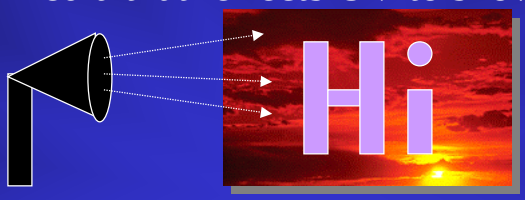


# Projection through other media (2)



## Review- 2 ideas

- Cover media that reflects UV to show message




- Cover media that transmits UV to show message

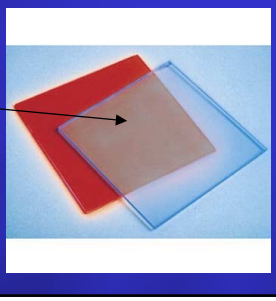

## Projection through other media (4)

- Example:
  - Movies are projected shining bright light through transparent film
  - Film could contain two types of material
    - One blocks UV, one does not (with message embedded)
  - Hidden messages could be projected by shining UV light through film

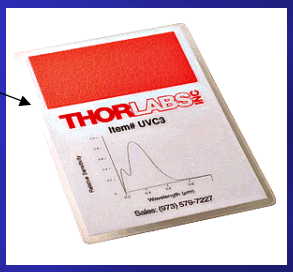
# Making UV Visible

- Possible through the use of fluorescence
  - Moves the UV rays down the light spectrum into visible light wavelengths
- Products on market:

Ultra-Glo Blue UV to Visible light converter



UV Viewing Card




# Seeing UV + Visible

- Has not yet been implemented in filters
- May be difficult because of method of converting UV to visible
  - Using fluorescence (phosphors)
- Balance may be struck using fewer phosphors and letting more visible light through
  - Image would be darker, converted UV would be lighter

## Secret Key

- Key cannot be wavelength of UV rays
  - Most UV viewers can see convert large range to visible
- Is a key necessary?
  - With Visual Cryptography, there is no key
  - Key may be ignorance of message?



## Questions?