Contents

Sections are separately numbered and indicated with footers. Italics indicates nonpictorial pages. The right column references other sections or video locations. Items in the right column without page numbers refer to entire sections. Video entrees show the approximate time from the beginning of the video.

Preface

Introduction

1 Introduction
6 Diagrammatic conventions

The Overhead Projector

1 The Overhead Projector
4 Inside an overhead projector
5 The mirror
6 Image orientation
7 Handedness or parity
8 Illumination
9 Illumination system typical layout
10 An illumination detail
11 Lamp reimaged
12 Misadjusted illumination
13 The screen

Imaging, pp. 9,10
Radiometry, p.4
Imaging, p.10
Polychromatic Rays, p.10
Polarization, p.49
Scattering

Using the Overhead Projector

1 Safety for People and Apparatus
2 Lamp power warning
3 Absorbing materials
4 Improving Demonstration Quality
6 Field limiter
7 Stray light from the base
8 Stray light baffle at the projection lens
Monochromatic Ray Optics

1 Monochromatic Ray Optics
2 Plane Parallel Plate
3 Plane parallel plate
4 Axial image shift
5 Axial image shift
6 Lateral image shift by a tilted plate
7 Double-thickness plate
8 Rotating transmission scanner
9 Prism
10 Prism monochromatic properties
11 Variation of deviation angle with orientation
12 Prism deviation and vertex angle
13 Prism deviation and material
14 Range of incidence angles
15 Image revolution without rotation
16 Variable angle prism
17 Miscellaneous
18 Wave patterns
19 Total internal reflection
20 TIR demonstrations
21 Retroreflectors
22 Sharp shadows

Polychromatic Ray Optics

Video: 11:40

(Callled Geometric Optics in the video)
**Polychromatic Ray Optics**

1. *Polychromatic Ray Optics*
2. Dispersion
3. Prism deviation and dispersion
4. Prism dispersion
5. Dispersion and material
6. Dispersion with no deviation for one wavelength
7. Rainbow
8. Rainbow
9. Cylindrical rainbow
10. Fresnel lens dispersion

**Radiometry and Photometry**

1. *Radiometry and photometry*
2. Radiant energy
3. Power per area
4. Illumination uniformity at the screen
5. Infrared absorption
6. Brightness comparison
7. Brightness comparison

**Moiré**

1. *Moiré*
3. Moiré
4. Types of patterns
5. Distance measurement
6. Alignment and testing
7. Patterns with different periods
8. Rotation of hexagonal patterns
9. Moiré investigations
10. Shadow moiré
11. Two projectors

CONTENTS
Scattering
1  *Scattering*
2  Scattering
3  Scattering by surfaces and index difference
4  Scattering by surfaces with parallel lines
5  Scattering by particles
6  Air molecule scattering
7  Rayleigh scattering and polarization
8  Rayleigh scattering
9  Polarized input light
10 Apparatus
11 Multiple Rayleigh scattering
12 Contrast reduction by scattering

Fluorescence
1  *Fluorescence*
2  Fluorescence
3  Fluorescence of clear plastic
4  Change of wavelength
5  Light depletion
6  Different absorption wavelengths for different fluorescers
7  Absorption variation with wavelength
8  Polarization
9  Complicated colors
10 Interesting effects
11 Fluorescent liquid

Interference Colors
1  *Interference Colors*
2  Interference colors
3  Variation of color with angle
4  Complementarity of transmitted and reflected light
5  Polarization and color
6  Apparatus to observe reflected interference colors
The Grating

1. Gratings
2. Transmission grating
3. Basic setup
4. Grating frame
5. Grating structure
6. Rotation about a normal to the grating
7. Tilt about grating lines
8. Tilt about perpendicular to the grating lines
9. No change
10. Different periods
11. Prism-grating comparison
12. Prism, grating crossed
13. Successive gratings
14. Complementary patterns
15. “Special effects”
16. Decomposition

The Spectroscope

1. Spectroscope
2. Absorption spectroscopy
3. Grating spectroscopy
4. Object combinations
5. Emission spectroscopy

Color

1. Color
2. Subtractive color mixture
3. Colored objects and colored illumination
4. Additive color mixture
5. More additive color
6. A special color addition
7. Colored shadows

CONTENTS
Polarization

1 Polarization
2 The polariscope
3 Arrangement on an overhead projector
4 A polariscope
5 Some practical considerations
6 Some techniques
7 Linear Polarization and Sheet Polarizer
8 Two polarizers
9 Three polarizers
10 The half-shade device
11 Compound polarizer-analyzer combinations
12 Circular Polarization
13 Circular polarizer
14 Circular polarizer nonideal behavior
15 Circular polarization and reflected light
16 Making circular polarizer
17 Circular polariscope
18 Birefringence
19 Birefringence
20 Birefringent sheet
21 Some birefringence techniques
22 Observing nonplanar objects
23 Stress birefringence
24 Stretched plastic
25 Mapping stress lines
26 Double refraction and double images
27 Birefringence interference colors
28 Optical Activity
29 Optical activity
30 Optical activity
31 Measuring the rotation
32 Varying syrup distance through which light passes
33 Variation in rotation with wavelength
34 Optical activity and circular polarizers

CONTENTS
38 Polarization with Reflection and Transmission
40 Polarization with reflection and transmission
41 Changed polarization of transmitted light
42 All the angles at once
43 Brewster angle
44 Pile of plates polarizer
45 Miscellaneous
46 Order of elements
47 180-degree rotation periodicity
48 Flipping
49 Depolarization
50 Depolarization in transmission
51 Partial polarization
52 3D movie technique
53 Conoscopic arrangement
54 Wavelength analysis of polarization effects

Imaging

1 Imaging
3 Diffusers for imaging
4 Image recording
5 Basic Image Properties
6 Ideal imaging
7 Transverse magnification
8 Axial positions and magnifications
9 Handedness
10 Object and image rotation
11 Imaging reversibility
12 Resolution
13 Additional Optics
14 Additional lenses
15 Lens sharing
16 Imaging an image (and the field lens)
17 Defocus and Depth
19 Defocus effects
20 Defocus and illumination

Video 24:30
Overhead Projector, p.10
Overhead Projector, p.10
Video 1:12:40

CONTENTS
<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Nonround apertures</td>
</tr>
<tr>
<td>22</td>
<td>Some object types</td>
</tr>
<tr>
<td>23</td>
<td>Complementary objects</td>
</tr>
<tr>
<td>24</td>
<td>Periodic objects</td>
</tr>
<tr>
<td>25</td>
<td>Thick objects</td>
</tr>
<tr>
<td>26</td>
<td>Focus sensing</td>
</tr>
<tr>
<td>27</td>
<td>Triangulation</td>
</tr>
<tr>
<td>28</td>
<td>Aberrations</td>
</tr>
<tr>
<td>30</td>
<td>Aberrations</td>
</tr>
<tr>
<td>31</td>
<td>Aberration creation (with ripply glass)</td>
</tr>
<tr>
<td>32</td>
<td>Astigmatism</td>
</tr>
<tr>
<td>33</td>
<td>Creating astigmatism</td>
</tr>
<tr>
<td>34</td>
<td>Astigmatism by reflection</td>
</tr>
<tr>
<td>35</td>
<td>Spherical aberration</td>
</tr>
<tr>
<td>36</td>
<td>Lateral color</td>
</tr>
<tr>
<td>37</td>
<td>Distortion</td>
</tr>
<tr>
<td>39</td>
<td>Keystone distortion</td>
</tr>
<tr>
<td>40</td>
<td>Extreme distortion</td>
</tr>
<tr>
<td>41</td>
<td>Anamorphic art</td>
</tr>
<tr>
<td>42</td>
<td>Topography</td>
</tr>
<tr>
<td>43</td>
<td>Some Types of Image Degradation</td>
</tr>
<tr>
<td>44</td>
<td>Imaging through turbulent media</td>
</tr>
<tr>
<td>45</td>
<td>Imaging through scattering media</td>
</tr>
<tr>
<td>46</td>
<td>Background light and contrast reduction</td>
</tr>
<tr>
<td>47</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>49</td>
<td>Vignetting</td>
</tr>
<tr>
<td>50</td>
<td>Knife-edge test</td>
</tr>
<tr>
<td>51</td>
<td>Pinhole camera</td>
</tr>
<tr>
<td>52</td>
<td>Close facing projectors</td>
</tr>
<tr>
<td>53</td>
<td>Objects that must be vertical</td>
</tr>
<tr>
<td>54</td>
<td>Special arrangements</td>
</tr>
<tr>
<td>55</td>
<td>Projector as illuminator</td>
</tr>
</tbody>
</table>

**Bibliography**

**Author**