# TEXAS A&M UNIVERSITY

# PHYSICS LECTURE DEMONSTRATIONS

Colleagues,

The Physics Demonstration Program has been reorganized and updated for implementation in the new George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy and the George P. Mitchell '40 Physics Building. Click here to view Optics Demonstrations.

The labeling system of the demonstrations has also been changed. The new labeling will incorporate the Demonstration Classification System (DCS) suggested by PIRA, the Physics Instructional Resource Association. The goal of the PIRA Demonstration Classification Scheme is to create a logically organized and universally inclusive taxonomy giving a unique number to every lecture demonstration.

External website references have been added to the demonstration notes when possible. These references have information (historical and practical) to supplement the notes listed in the demo page.

If you are interested in using one of these demonstrations in your classroom, you may send me an email with your class information and the demonstration number and name. Please allow at least two class days notice for the demonstration requests.

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# Optics

## Geometric Optics

6A20.35 MIRAGE (REFLECTION FROM CURVED SURFACES)
6A44.40 LIGHT THROUGH A THICK FIBER OPTIC
6A60.10 WHITE BOARD OPTICS (CONCAVE AND CONVEX LENSES)
6A60.30 IMAGE FORMATION WITH LENSES

## Interference

6D10.10 WHITE LIGHT AND CORNELL SLIDES
6D20.15 DIFFRACTION GRATING / LASER
6D20.20 DIFFRACTION GRATING / SPECTRUM OF DISCHARGE TUBES

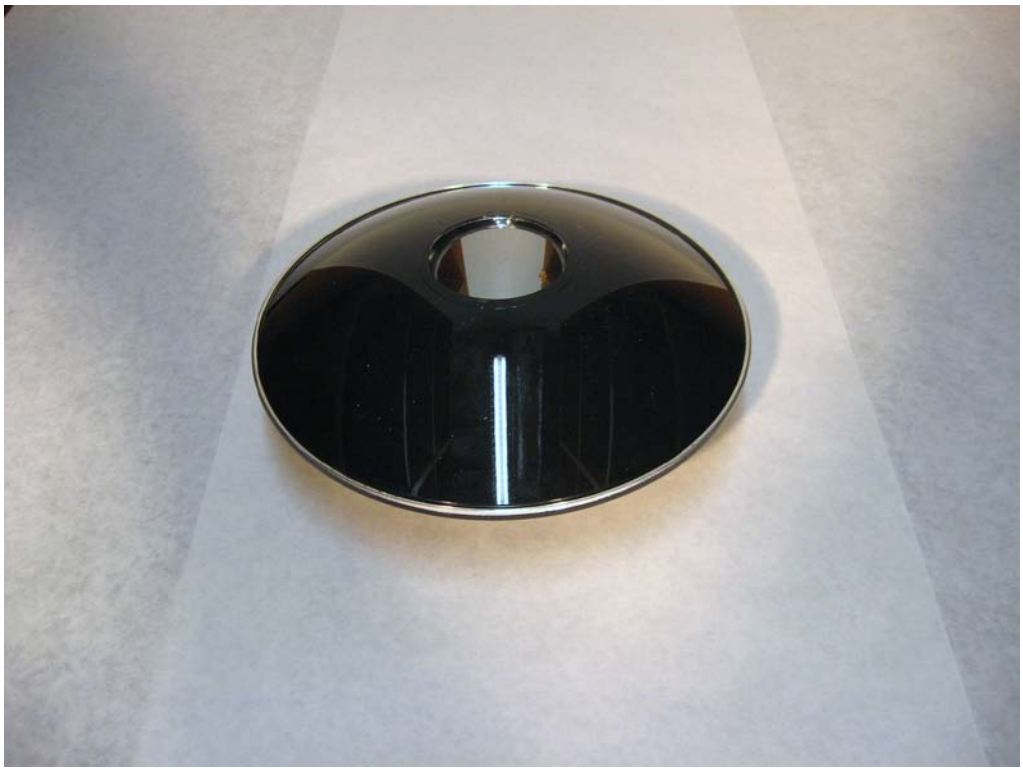
## Color

6F30.10 DISPERSION OF LIGHT BY A PRISM

## Polarization

6H10.10 POLAROIDS ON AN OVERHEAD
6H10.20 MICROWAVE POLARIZATION
6H50.00 DEPOLARIZATION BY SCATTERING USING WAXPAPER

## 6A20.35 MIRAGE (REFLECTION FROM CURVED SURFACES)



***Apparatus:*** Mirage mirrors and a small pig

***Notes:*** Inside the mirage are two concave mirrors opposite each other. The image (a small pig) is placed inside. This soft figure is used to prevent scratching the mirror. The pig appears to be floating on top of the mirage fixture. A web cam could be used to make this demo more visible.

***References:*** http://spie.org/etop/2007/etop07methodsV.pdf

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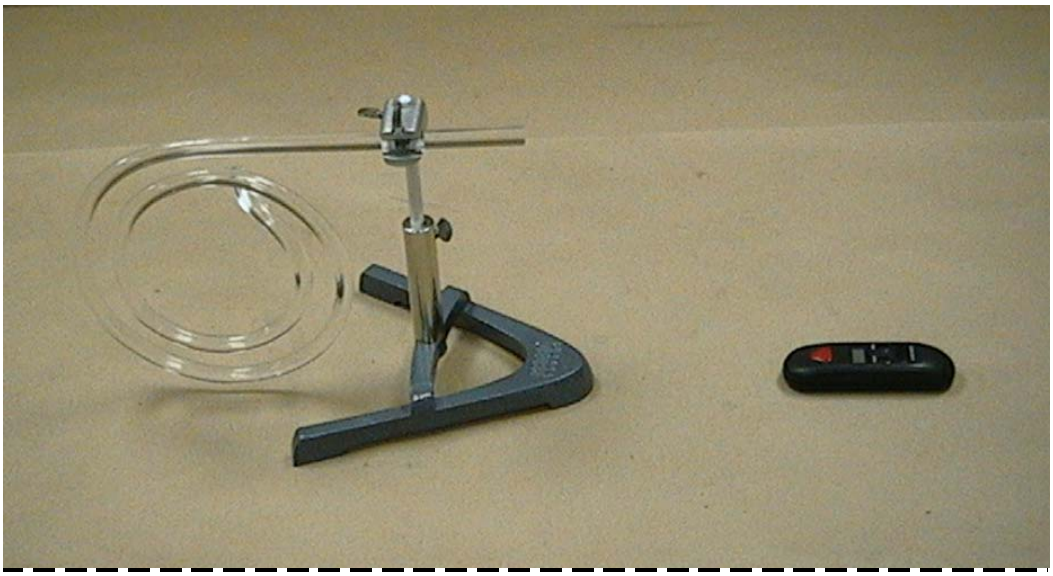
## 6A44.40 LIGHT THROUGH A THICK FIBER OPTIC



***Apparatus:*** Clear curved lucite rod on stand
Laser pointer

***Notes:*** The total internal refraction of the lucite rod may be shown.

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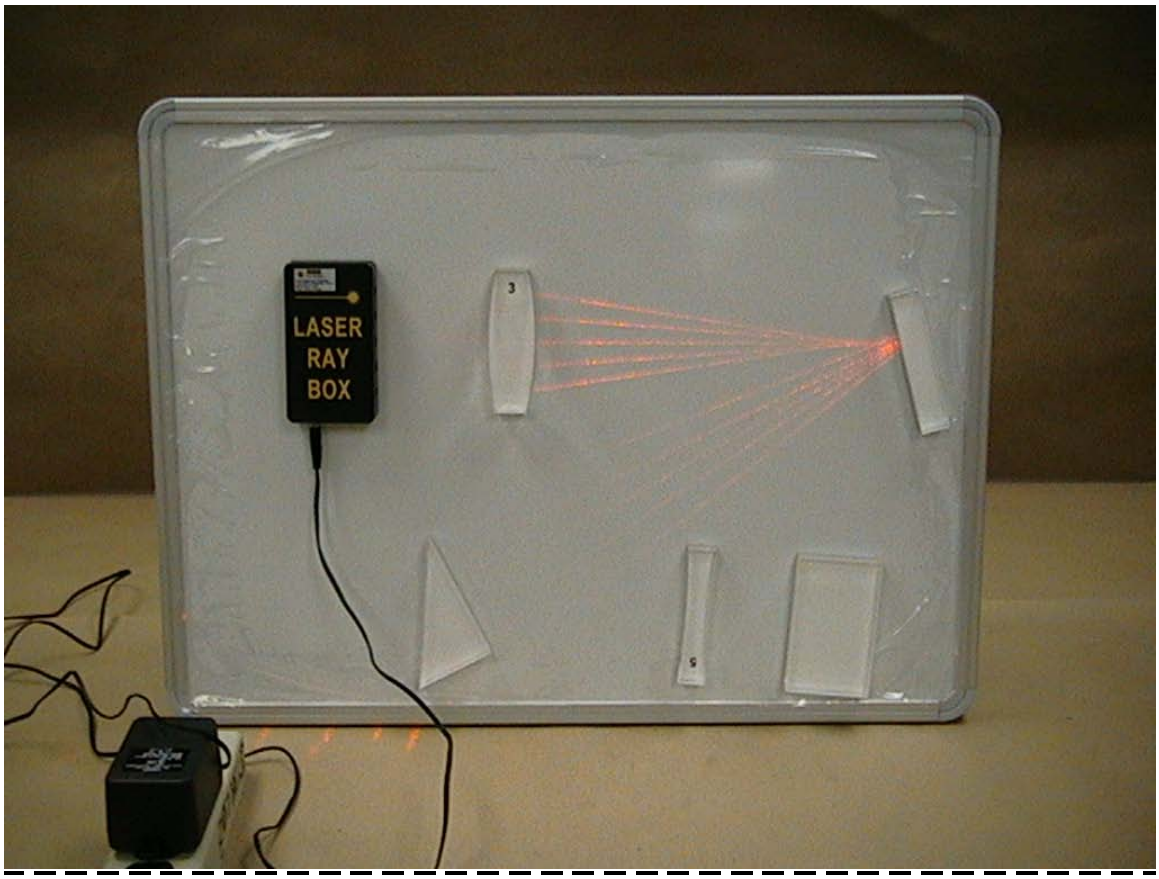
## 6A60.10 WHITE BOARD OPTICS (CONCAVE AND CONVEX LENSES)




***Apparatus:*** Ray tracing apparatus (light and adaptor)
Lenses and prisms mounted on apparatus

***Notes:*** Attach the lens or prisms on the metal screen (with the mounted magnets). The light source may be adjusted for a single light ray or multiple light rays.

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## 6A60.30 IMAGE FORMATION WITH LENSES

***Apparatus:*** Optical bench
incandescent lamp
converging lens
diverging lens
frosted plate

***Notes:*** Plug the lamp into the wall outlet and adjust the distance between the lens and the lamp to form an image on the frosted glass plate. The frosted plate should be toward the students. Is the image upside down? Focal length and magnification of a lens may be shown.

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## 6D10.10 WHITE LIGHT AND CORNELL SLIDES

***Apparatus:*** Light with a vertical filament
Box of Cornell slides
Cornell slide sheet (that shows the different patterns on the slide)

***Notes:*** The students can look through the different slits in the Cornell slide to see diffraction and interference patterns. (the slide has single slits, double slits and 4 different diffraction gratings)

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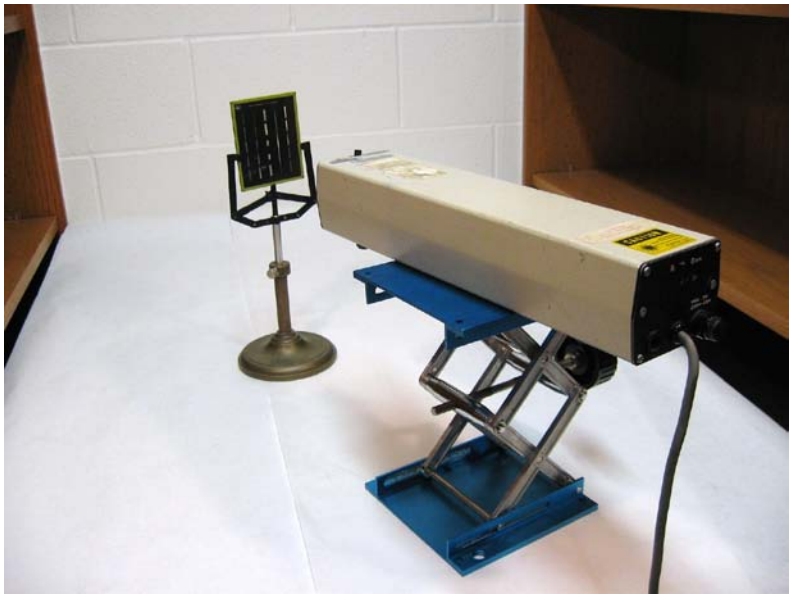
## 6D20.15 DIFFRACTION GRATING / LASER



***Apparatus:*** Cornell slide on stand
Laser on lab jack
Cornell slide sheet (that shows the different patterns on the slide)

***Notes:*** Shine the laser at the diffraction grating on the Cornell slide. These are located on the middle row of the Cornell slide. Raise or lower the lab jack to select the other 4 different gratings on the slide.

References: http://www.chemie.de/lexikon/e/Helium-neon_laser/

| DO NOT SHINE THE LASER LIGHT TOWARD THE CLASS. |
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## 6D20.20 DIFFRACTION GRATING / SPECTRUM OF DISCHARGE TUBES


***Apparatus:*** 2 gas discharge tubes in metal boxes
White light with vertical filament
Box of diffraction gratings

***Notes:*** Stand the discharge tube boxes and white light on the desk top or demo table. Students may use the diffraction gratings to observe the spectrum of the different gases and of the white light.

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## 6F30.10 DISPERSION OF LIGHT BY A PRISM

***Apparatus:*** Prism on a mount
Overhead projector with two card board sheets

***Notes:*** Adjust the card board sheets on the overhead projector for a slit of about 2 mm. Shine the light on the prism and adjust the prism such that a spectrum of colors is displayed on the wall or screen. The height of the prism must be in line with the head of the projector.

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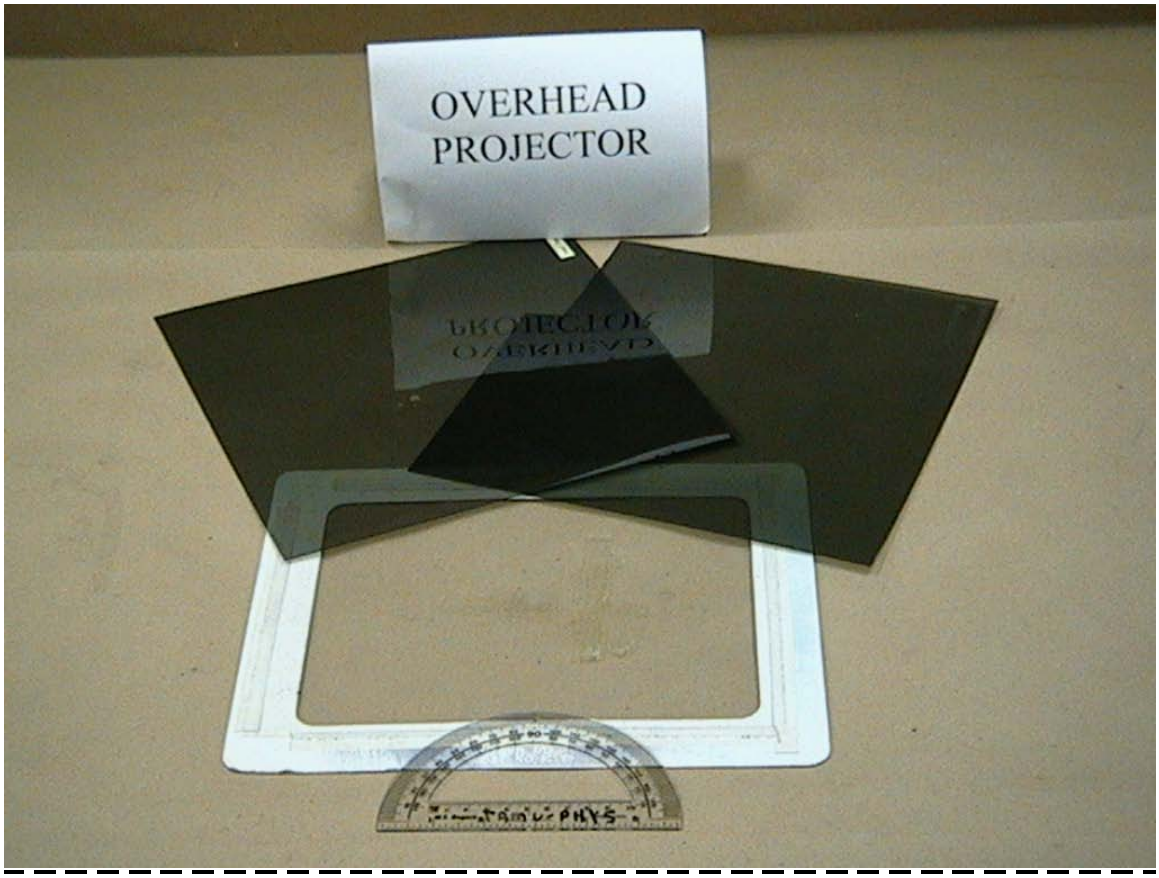
## 6H10.10 POLAROIDS ON AN OVERHEAD




***Apparatus:*** Polaroid sheets (2)
Plastic protractor
Transparency sheet with “magic” tape
Overhead projector

***Notes:*** Place the polaroid sheets on the overhead projector and rotate one of the sheets. Note the polarization effect. Put the transparency sheet (with the magic tape) between the polaroid sheets. Rotate one of the polaroid sheets (to show how the light through the magic tape changes). Put the protractor between the polaroid sheets and slightly flex the protractor. This will show the stresses in the plastic (but be careful not to break the plastic).

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## 6H10.20 MICROWAVE POLARIZATION


***Apparatus:*** Microwave transmitter and receiver assembly
Metal grid plate
Aluminum plate
Wood-fiber plate

***Notes:*** On the transmitter unit, set the transmitter klystron voltage control to mid-range and the oscillator switch to internal position. On the receiver unit, adjust the receiver gain control to mid-range. The horns of the two units should be aimed at each other and about 12 inches apart. Turn on the two units and adjust the speaker volume control to a suitable level. Place the different plates in front of the horns to show polarization and reflection.

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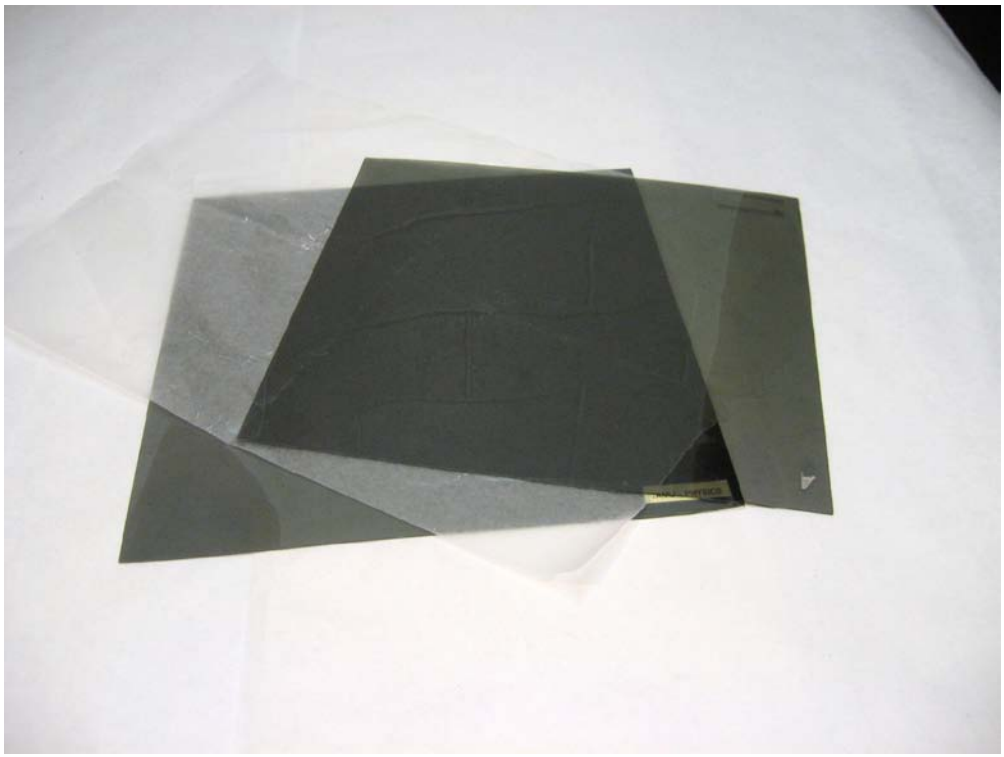
## 6H50.00 DEPOLARIZATION BY SCATTERING USING WAXPAPER



***Apparatus:*** Polaroid sheets (2)
Sheet of waxpaper
Overhead projector

***Notes:*** Place the polaroid sheets on the overhead projector and place the sheet of waxpaper between them. Rotate the polariod sheets and show how the waxpaper dispersion will not allow the light to get dark.

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