



# Optricks Day

at the



TACO BELL  
**DISCOVERY**  
SCIENCE CENTER





# The **OPTRICKS** Suitcase *Comes to Southern California*

**Donn M. Silberman**  
The Optics Institute  
of Southern California



SJ\_SummerSchool02.ppt

**Stephen D. Jacobs**  
CENTER FOR OPTICS MANUFACTURING (COM)  
Laboratory for Laser Energetics (LLE), University of Rochester





<http://www.spinmaster.com/docs/comm/StrobeFX.mov>



**Arbor Scientific**  
**P.O. Box 2750**  
**Ann Arbor MI 48106-2750**

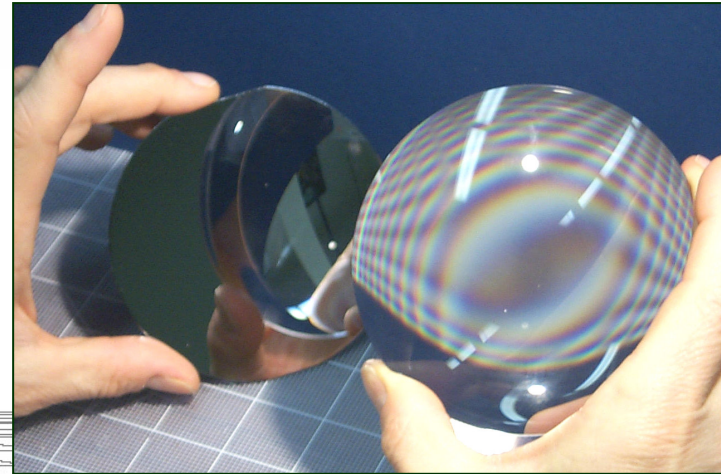
**800-367-6695**





# Optical Engineers Work with Materials That Reflect or Transmit Light

Si – polished silicon wafer mirror-like reflector



**PERIODIC TABLE OF THE ELEMENTS**

http://www.kent.edu/~chem/periodic/ev

PERIOD	GROUP	1	2	13	14	15	16	17	18										
		IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA										
1		H 1.0079							He 4.0026										
2		Li 6.941	Be 9.0122	B 10.811	C 12.011	N 14.007	O 15.999	F 18.998	Ne 20.180										
3		Na 22.990	Mg 24.305																
4		K 39.098	Ca 40.078	Sc 44.956	Ti 47.867	V 50.942	Cr 51.996	Mn 54.938	Fe 55.845	Co 58.933	Ni 58.693	Cu 63.546	Zn 65.39	Ga 69.723	Ge 72.64	As 74.922	Se 78.96	Br 79.904	Kr 83.80
5		Rb 85.468	Sr 87.62	Y 88.906	Zr 91.224	Nb 92.906	Mo 95.94	Tc 98	Ru 101.07	Rh 102.91	Pd 106.42	Ag 107.87	Cd 112.41	In 114.82	Sn 118.71	Sb 121.76	Te 127.60	I 126.90	Xe 131.29
6		Cs 132.91	Ba 137.33	La-Lu 57-71	Hf 178.49	Ta 180.95	W 183.84	Re 186.21	Os 190.23	Ir 192.22	Pt 195.08	Au 196.97	Hg 200.59	Tl 204.38	Pb 207.2	Bi 208.98	Po (209)	At (210)	Rn (222)
7		Fr 87	Ra 223	Ac-Lr 89-103	Rf 184	Db 185	Sg 186	Bh 187	Hs 188	Mt 189	Uun 190	Uuu 191	Uub 192	Uuc 193	Uud 194	Uue 195	Uuf 196	Uug 197	Uuh 198
LANTHANIDE																			
		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
ACTINIDE																			
		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103			
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			

Editor: Arjuna Venkian (arjuna@uakron.edu)

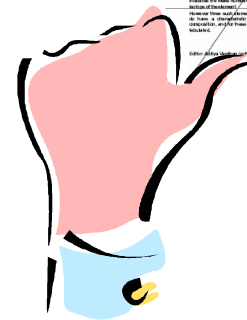
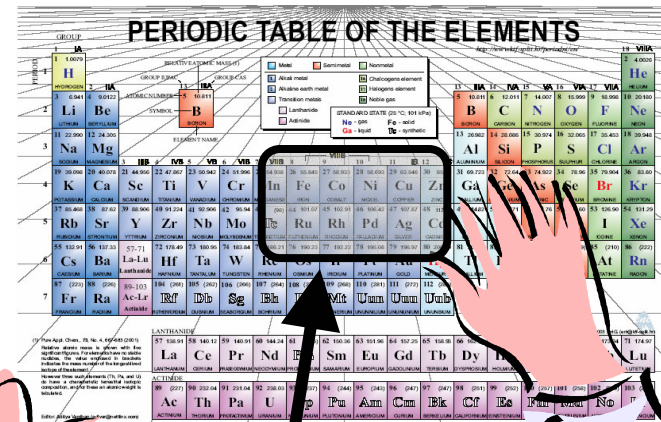
SiO<sub>2</sub> – clear silica lens focuses light



# Magic Dots

Most printed material is made up of lots of Dots!!

- Have you ever wondered how printing works?
- Most modern printers use lots of dots to make up the text & images that you see.
- Do you know what color ink they use?
- Use the small magnifying lens to look at the Periodic Table. Do you see the Magic Dots??

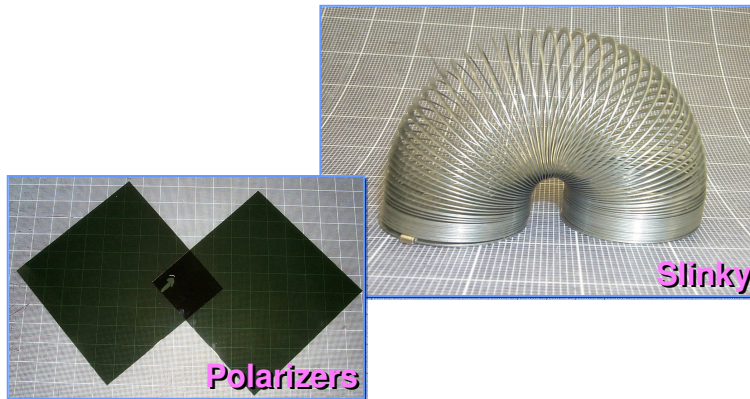


## Small Magnifying Lens

Hold the lens about 1 inch above the paper.

# Light is Like a Vibrating Wave

- We can make a slinky vibrate like a wave of light.
- A slinky vibrating in one direction is like “polarized” light.
- Optical engineers use polarizers to make light vibrate in one direction.



**It takes more than one kind of telescope to see the light**

Why we need different types of telescopes to look at outer space

NASA SPACE SCIENCE NEWS  
science.nasa.gov  
Marshall Space Flight Center

The electromagnetic spectrum. Radio has long wavelengths and low energies, while gamma rays have very short wavelengths and high energies.

**The Multi-Wave Milky Way Galaxy**

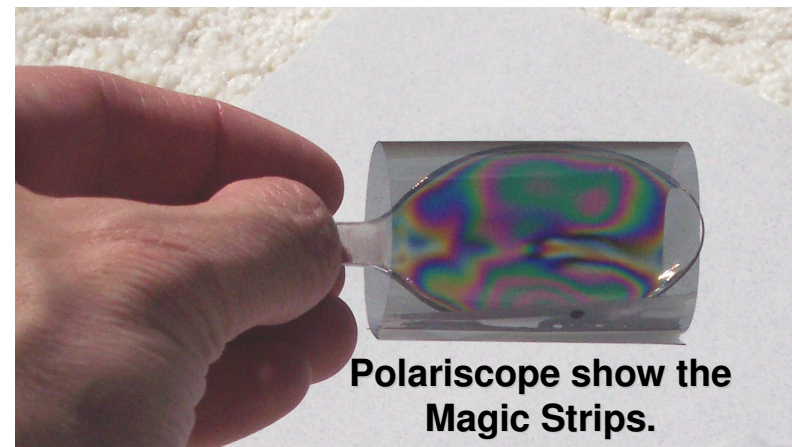
radio  
infrared  
visual  
X-ray  
gamma ray

http://science.nasa.gov/newhome/headlines/features/ast20apr99\_1.htm

- Polarizers have a “secret code.”

# Magic Stripes

- Where do the colors come from?
- Make your own polariscope and find the stripes in the plastic spoon & label.
- Geologists, identify minerals with polarized light microscopes.
- Civil engineers examine stresses inside structures with transparent models and a polariscope.





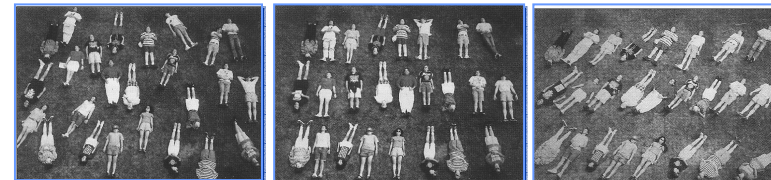
# Rainbow Peephole®

- Light from the flashlight is “redirected” in passing through the plastic peephole to the eye.
- Where do the colors come from?
- Do you see a regular pattern?
- Identify the colors. Are they the same in each spot?
- Does the pattern change if the flashlight is close or far from the peephole? How?
- Do you see colors from other people's flashlights, even those far away from you?
- Do you see colors from the room lights?
- The regular array of bumps on the plastic peephole's surface allows us to see the color in white light through “diffraction.”

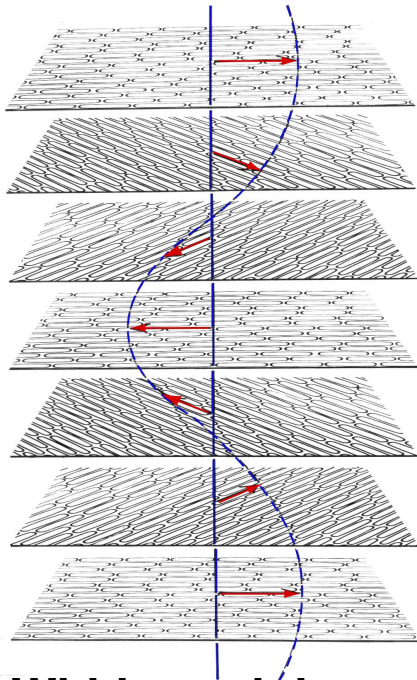


# Magic Patch

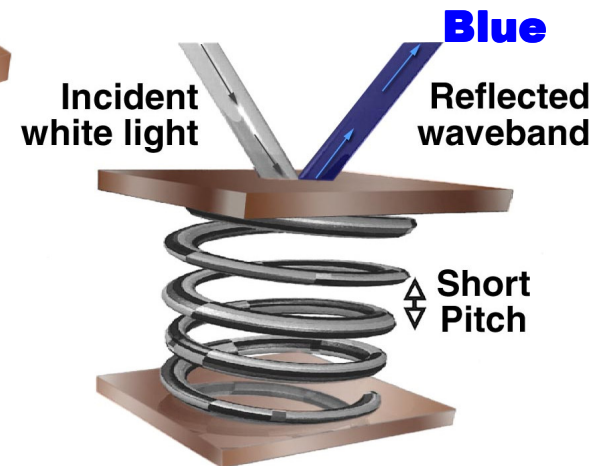
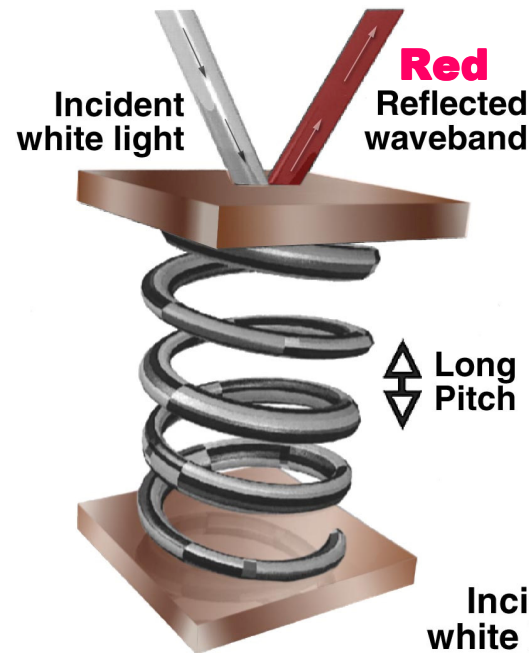
- Place the patch on your wrist and perform the “vampire test.”
- The “*Magic Patch*” changes color with the heat from your body. The “living dead” give off no heat!
- Where do the colors come from?
- Does anyone see a vein or artery?
- This is an example of “selective reflection” by liquid crystals, painted onto the black paper.
- Liquid crystal are “ordered,” just like the students across the page.
- Scientists use liquid crystals to build displays for watches and computer games.



# Selective Reflection in Cholesteric Liquid Crystals



- Within each layer, molecules (students) align with long axes (bodies) parallel to plane of layer.
- Protruding side groups force molecules in adjacent layers to be displaced, creating a twisted, helical structure.





# The Optics Institute's Teen Optics Bench Kit

- Did you have FUN today??
  - Would you like to have more OPTICS FUN??
  - The Optics Bench Kit can help you learn
  - And prepare you for college!!!
  - And it's LOTS of FUN!!
- Tell your teacher you want to participate in an....

**TEEN OPTICS CLUB**

<http://oisc.net>



# The Southern California Commitment



**Optical Society of San Diego**



**Building a Better Optics Community in Southern California**

