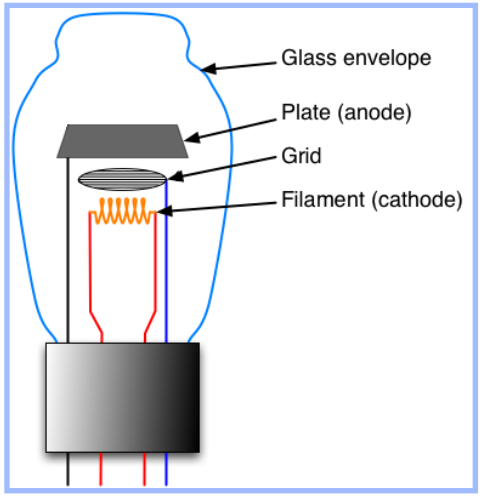
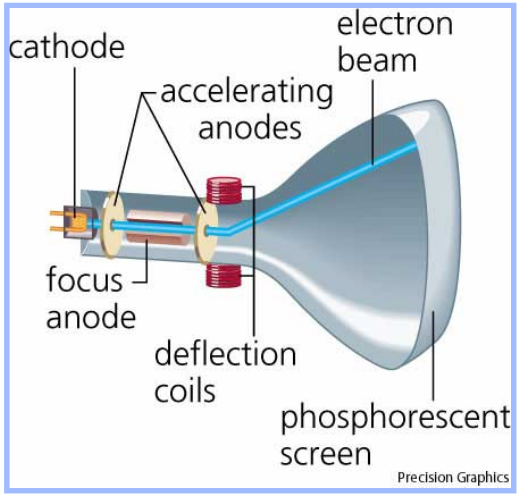
The Next Semiconductor Revolution: This Time It's Lighting!

Your Grandparents' Vacuum Triode



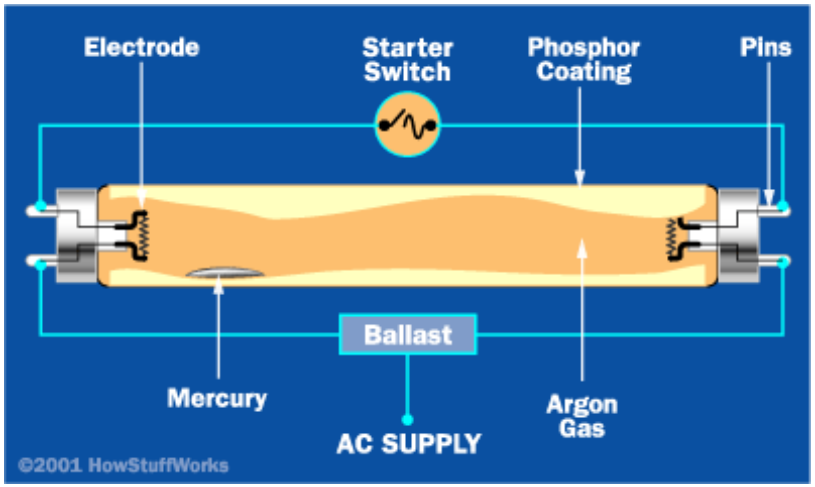
Triode vacuum tube. http://commons.wikimedia.org/wiki/File:Triode_vacuum_tube.png

Your Parents' Cathode Ray Tube (CRT)



From Dictionary.com. http://dictionary.reference.com/illus/illustration.html/ahd4/cathode-ray%20tube/cathry

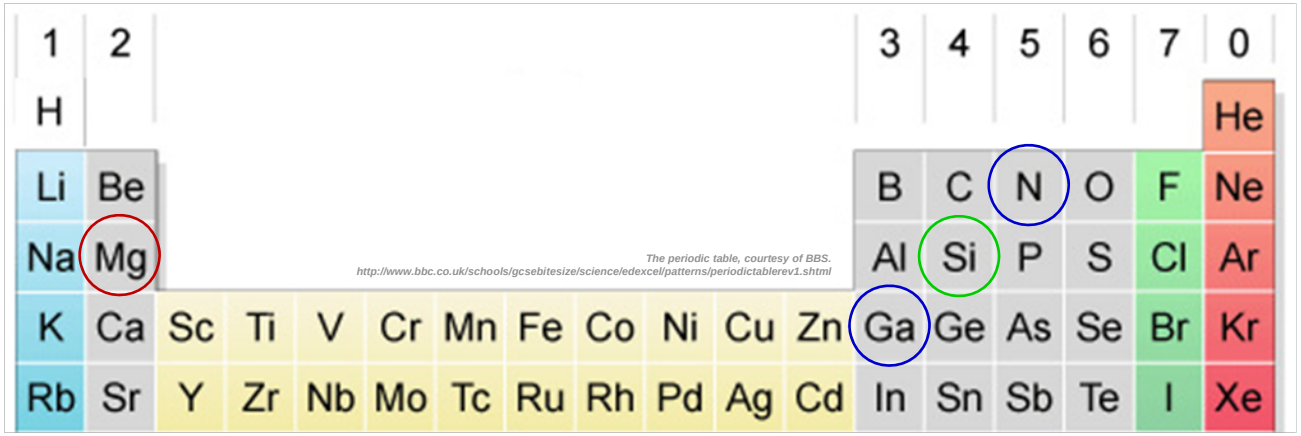
Your Fluorescent Tube

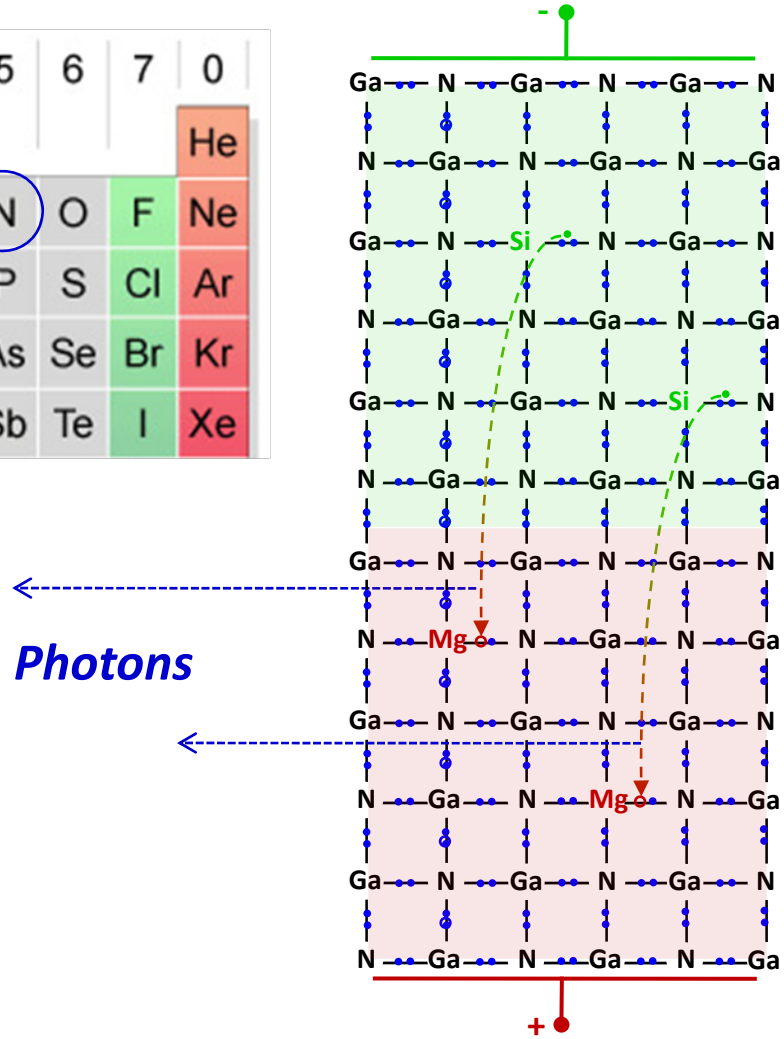


How Fluorescent Lamps Work. http://home.howstuffworks.com/fluorescent-lamp4.htm

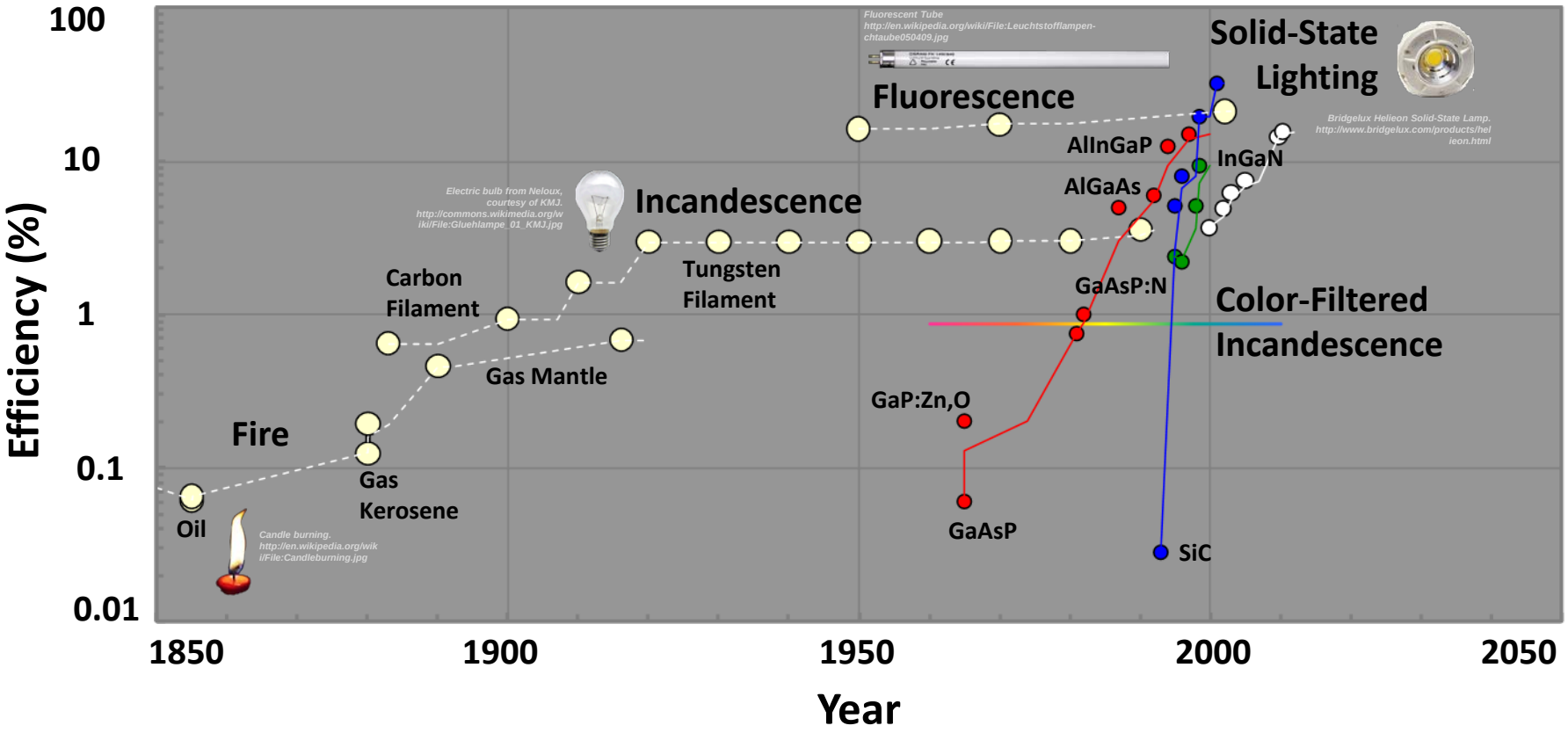
Jeff Tsao · Physical, Chemical & Nano Sciences Center · Sandia National Laboratories

Semiconductor Light-Emitting Diode (LED)





200 Years of Lighting Technology



Light-Emitting Diodes and Applications for Colored Light

Rear Combination Lamp (LumiLeds)

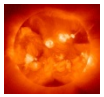
LED Traffic Light, courtesy of Syafiqshahalam. http://en.wikipedia.org/wiki/File:LED_Traffic_Lights.jpg

NASDAQ's Giant Video Display in Times Square, New York (Jeff Tsao)

Microvision Pico Projector. http://www.microvision.com/pico_projector_displays/application_gallery.html

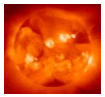
Sharp QuadPixel RGBY LED-backlit LCD Display. http://www.macworld.com/article/145541/2010/01/sharp_quadpixel.html

Light from the Sun and Moon: Trilobites, Birds, Mammals, Primates, Humans



Full-disk view of the X-ray Sun and was produced by the Yohkoh solar observatory in 1991. http://en.wikipedia.org/wiki/File:Yohkohimage.gif

Full moon view from Earth in Belgium, courtesy of Luc Viatour. http://en.wikipedia.org/wiki/File:Full_Moon_Luc_Viatour.jpg



Bridgelux Helieon Solid-State Lamp. http://www.bridgelux.com/products/helieon.html

Asaphus species (Trilobite) picture taken by DanielCD. http://en.wikipedia.org/wiki/File:Asaphus_species_trilobite.jpg

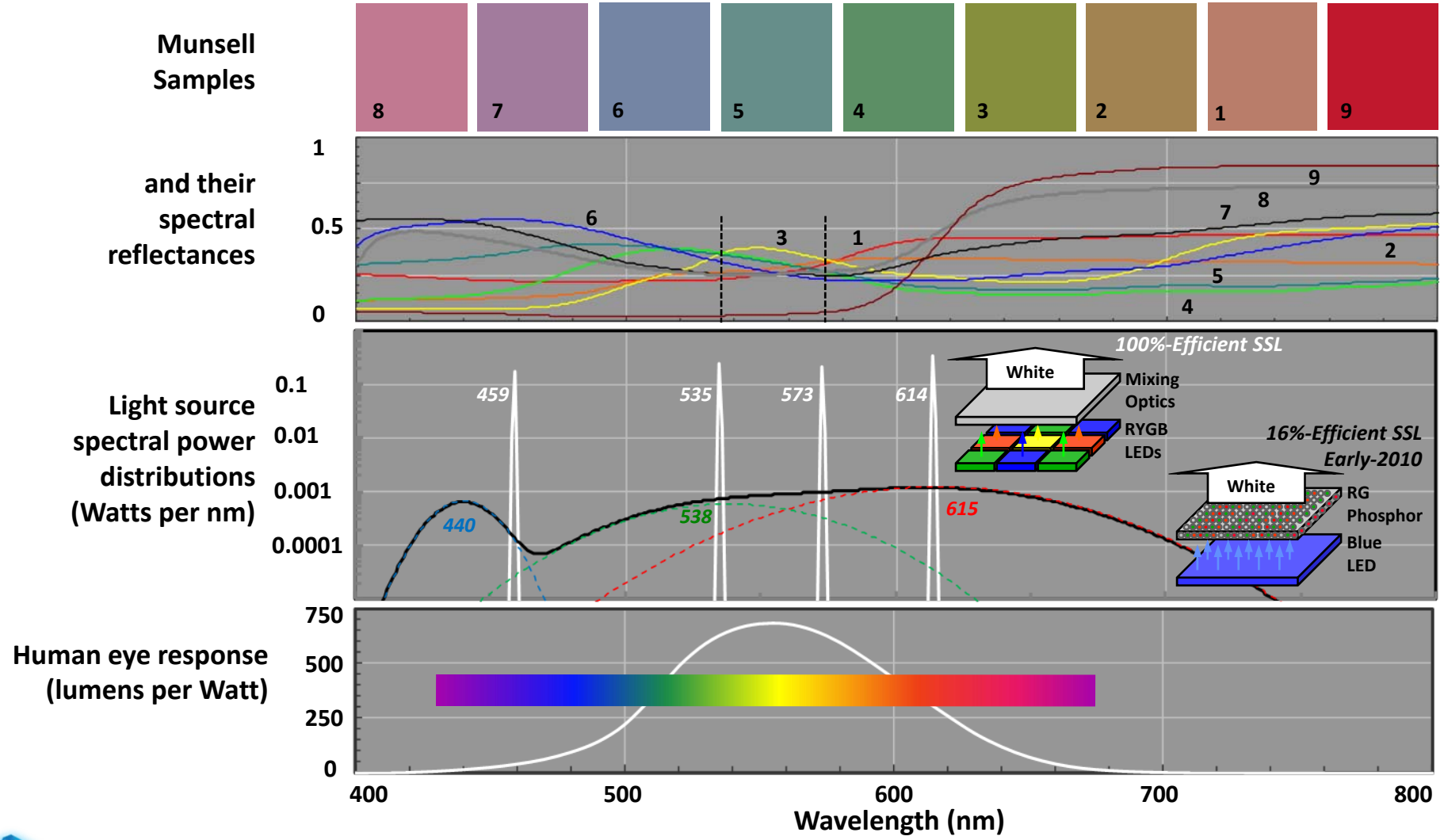
Red Lory (Eos bornea) upper body preening feathers. http://en.wikipedia.org/wiki/File:Red_Lory_%28Eos_bornea%29-6.jpg

Gray wolf, canis lupus, courtesy of Chris Muiden. http://en.wikipedia.org/wiki/File:Canis_lupus_265b.jpg

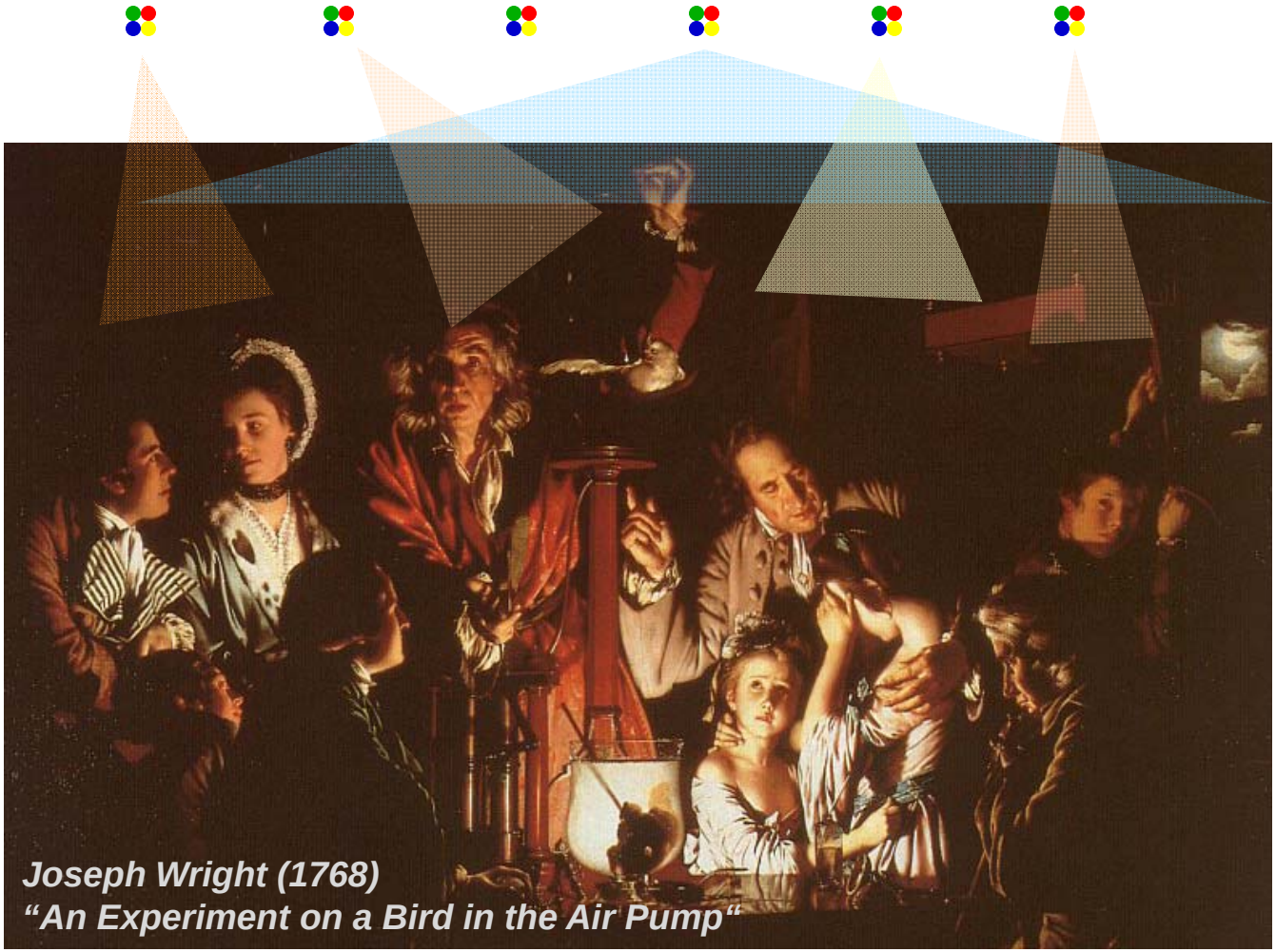
Olive baboon in Kenya; courtesy of Ryan Harvey; http://en.wikipedia.org/wiki/File:Male_Olive_Baboon_2.jpg

A baby wearing many items of winter clothing: headband, cap, fur-lined coat, shawl and sweater. Courtesy of Andrew Vargas, Clovis, United States. http://en.wikipedia.org/wiki/File:Well-clothed_baby.jpg

Making White Light from Colored Light

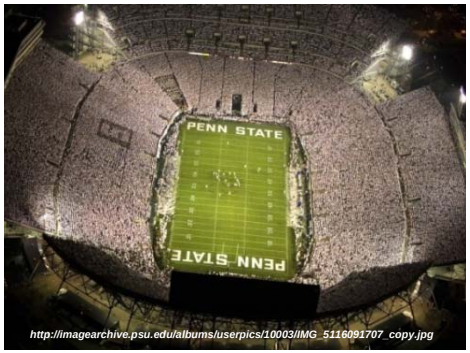


Solid-State Lighting and Applications for White Light

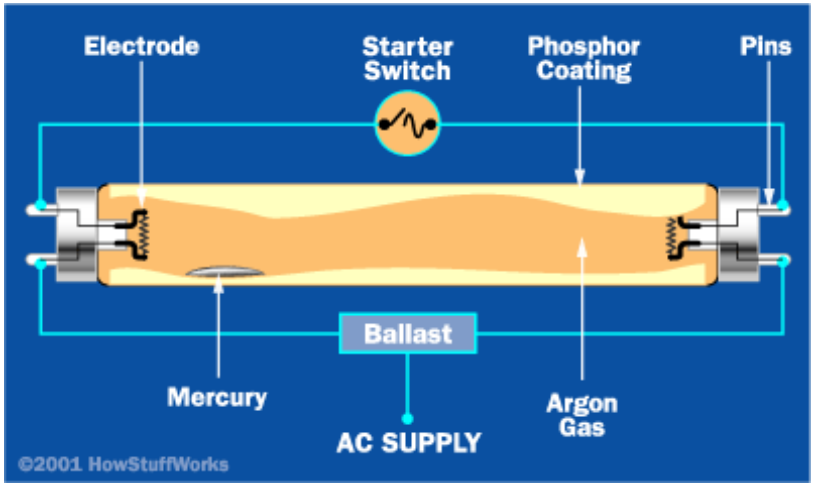


Surefire U2 flashlight.
http://en.wikipedia.org/wiki/File:SurefireU2JPG.jpg

Canon PowerShot A95.
http://en.wikipedia.org/wiki/File:Canon_PowerShot_A95__front_and_back.jpg



http://imagearchive.psu.edu/albums/userpics/10003/IMG_5116091707_copy.jpg



How Fluorescent Lamps Work. http://home.howstuffworks.com/fluorescent-lamp4.htm

Acknowledgements (colleagues):
Roland Haitz, Tom Brennan
Jerry Simmons, Mike Coltrin, Mary Crawford, and Sandia's Solid-State-Lighting Science Team (http://ssls.sandia.gov/)
Acknowledgements (sponsors):
Work at Sandia National Laboratories was supported by Sandia's Solid-State-Lighting Science Energy Frontier Research Center, funded by the U.S. Department of Energy, Office of Basic Energy Sciences. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the U.S. Department of Energy's National Security Administration under Contract DE-AC04-94AL85000.