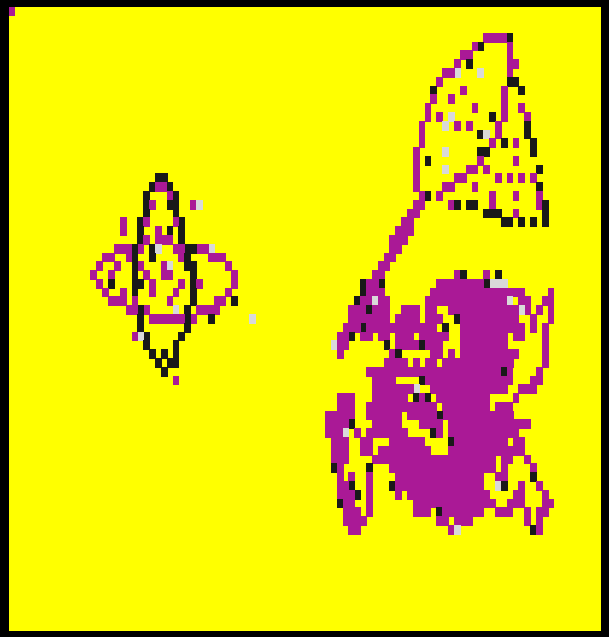
Health Physics

Occupational Health and Safety

Radiation Protection and Training

What is Health Physics?



- Radiation Health and Safety
- A support group for you!
- Phone (301) 975 - 5810
- Room A-132

After hours HP support page control or dial 6292

How Can We Help You?

Our Philosophy: You are here to do good research. We are here to help you be safe
(and stay within the regulations.)

- We train you to understand the risks and work safely around the beams
- We monitor the radiation conditions
- We assist with facility and experiment design
- We assist with radioactive sample shipping
- We document regulatory compliance

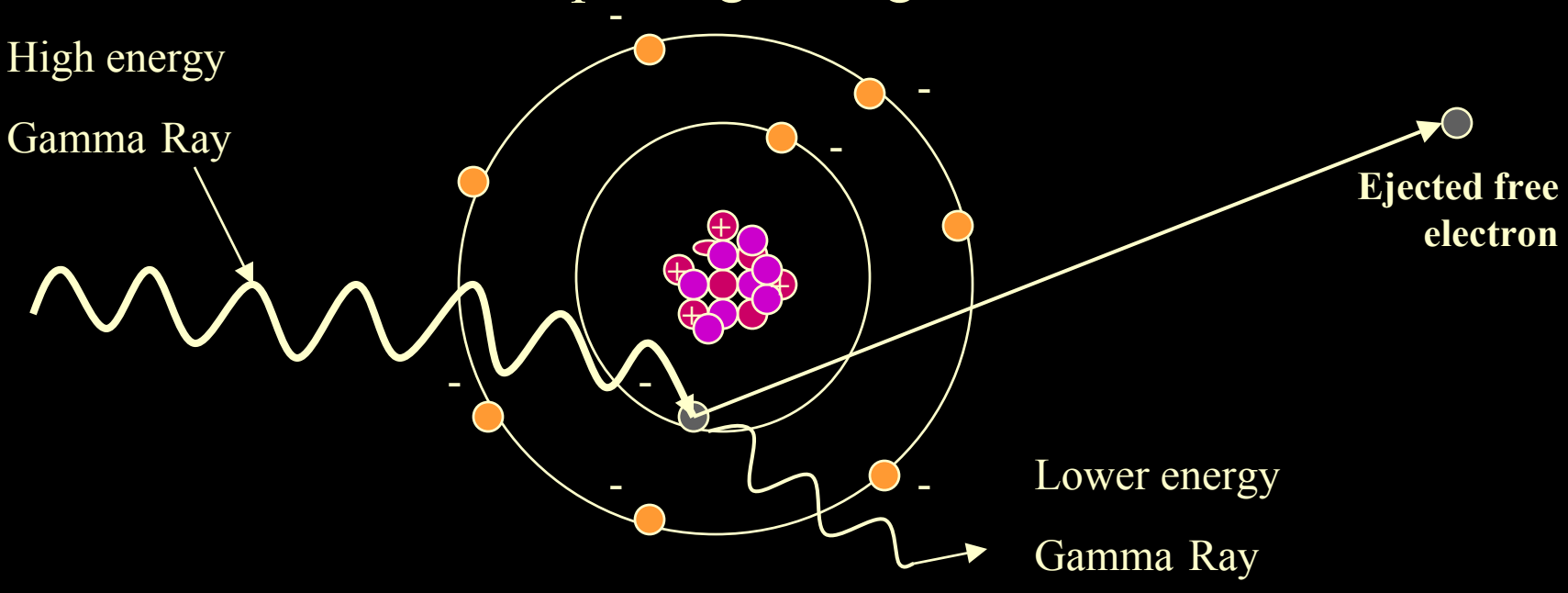
Basic Radiation Science

(in less than five minutes)

- What is ionizing radiation?
- How does it interact with us?
- What is the risk? What are my risks?
- How do I protect myself?

Ionizing Radiation

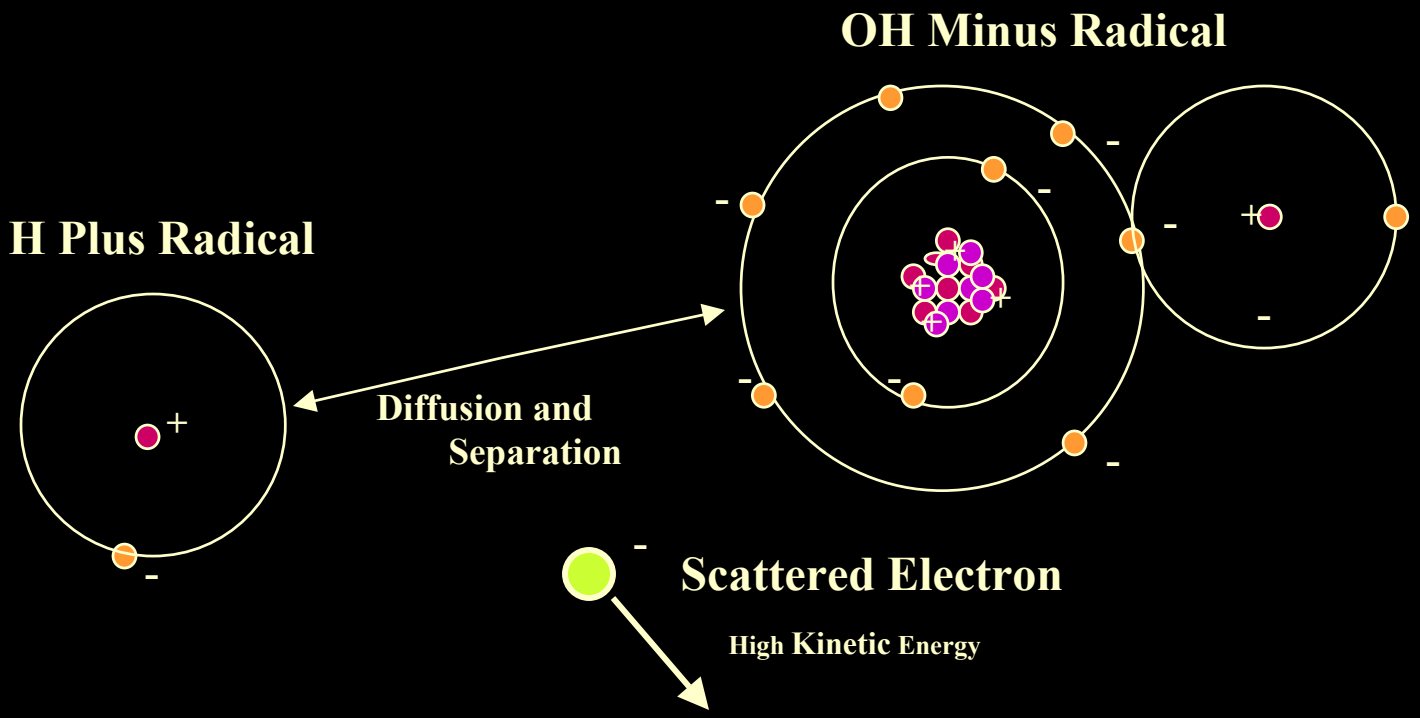
Any electromagnetic wave or particle radiation
capable of producing ions
(knocking electrons out of orbit)
either by direct hits or indirect (magnetic) effects
while passing through a material



Radiation Effects on Materials

Breaking the Ties That Bind

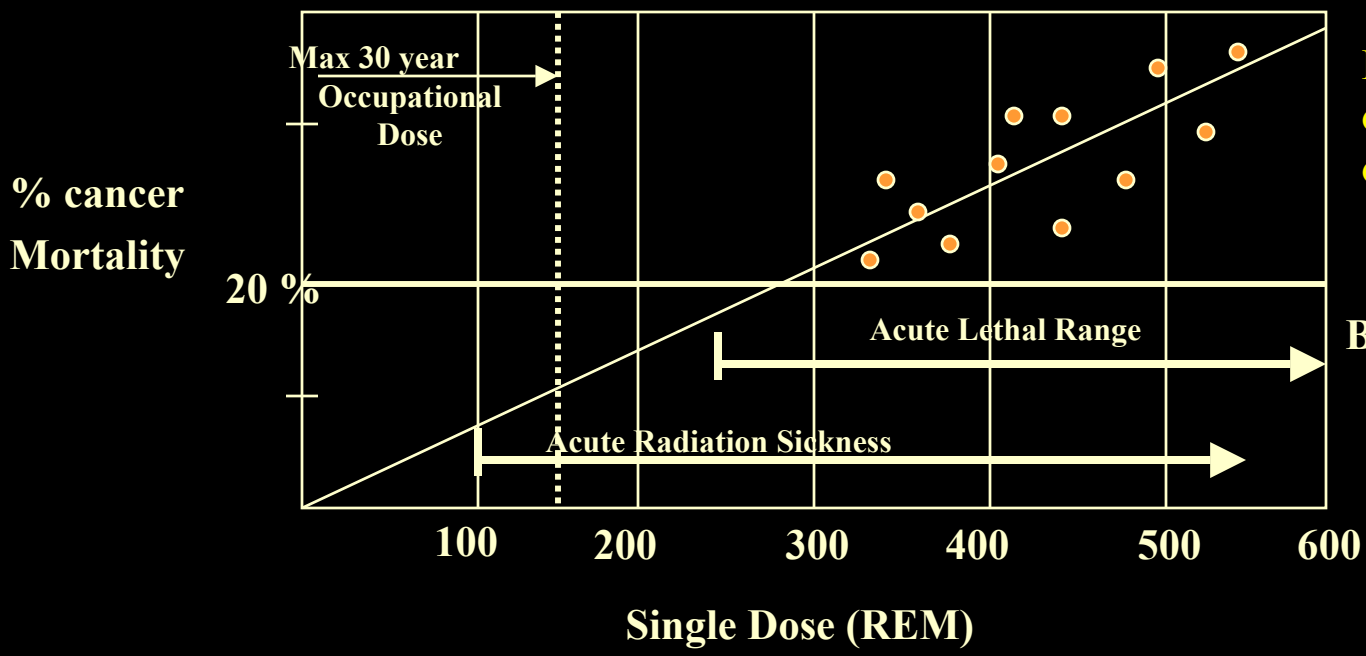
- **Molecular bonds break since the "shared" electrons are missing**



This free radical chemical effect dominates biological response.

The Linear No Threshold Model

Currently accepted regulatory risk estimates assume a
"Linear No Threshold Response"
by extrapolating the High Dose and High Dose Rate data to Zero



Error bars on base line overwhelm signal from occupational dose levels

20 %
Base line

What are My Risks?

- I can't say for sure because it is too low for statistics
- Assuming LNT 10 mrem = a one in a million risk added to the 20 % base line
- Mother Nature gives 300 to 500 mrem/year
- Most researchers get less than 50 mrem/year.
- Your dose will be lower

Protection Strategies
For Radiation Workers

- **Time:** Less time being exposed means less Dose and proportionately less Risk

  Dose = Dose Rate X Time

- **Distance:** The intensity drops by the square of the distance

  $D_2 = D_1 (r_1/r_2)^2$

- **Shielding:** The intensity drops by an exponential of the shield thickness

  $D = D_0 \exp(-ux)$

RULES

- Stay out of the Neutron Beam!
- Read the Signs! Survey and Know the Dose rate.
- Samples may activate... Survey before handling!
- Stay with your escort!
- **A**s **L**ow **A**s **R**easonably **A**chievable

Don’t take a risk if you don’t need to.

Safety Alarm Response

- Fire or Medical Emergency dial x2222
- Weather Alert: Go to Basement
- Evacuation Alarm: Leave by nearest exit. Gather at main front door. Wait for further instructions.
- Area Radiation: Leave immediate area. Contact Reactor Operations and HP for Support.
- Always Stay with your escort.

Your First Steps to Access

(When You come back)

Four steps must be followed before a first time user can perform experiments (and obtain unescorted access) at the NIST Center for Neutron Research

1. Health Physics Radiation Safety Training:
   includes a computer-guided course, a 30-minute tour, and issuing dosimeters.
   (The computer part can be downloaded by clicking on Health Physics Radiation Safety Training at http://www.ncnr.nist.gov/access.html)

2. Please bring a letter of identification from your home institution often referred to as the "trustworthy" letter.
   (This letter should be signed by a supervisor or colleague who can attest to your trustworthiness.)

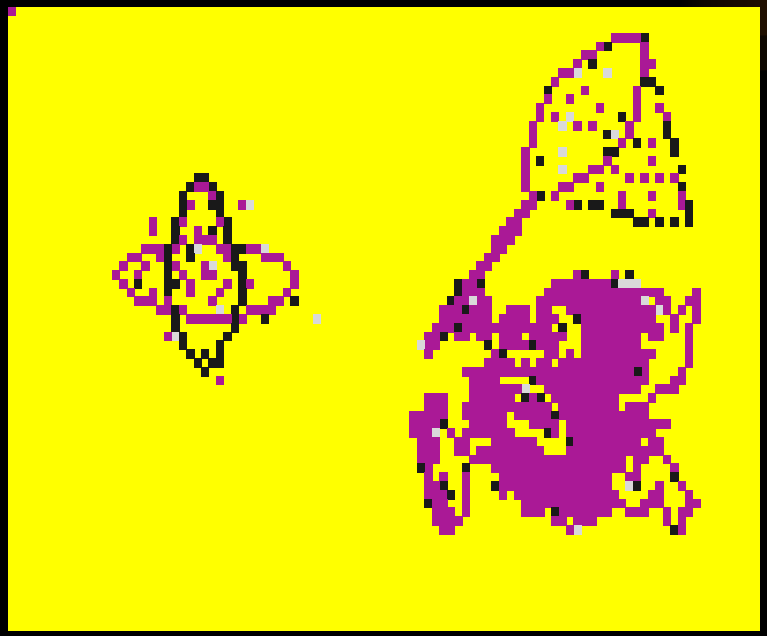
3. Complete a "Facility User Safety Awareness Checklist"

4. Complete a Signed Facility User Agreement

Ask if you have questions!

Call HP at 5810 if you need help!

Learn a lot!



Have some Fun!