



THE OHIO STATE UNIVERSITY



## ”ASTRONOMY AND BEYOND”

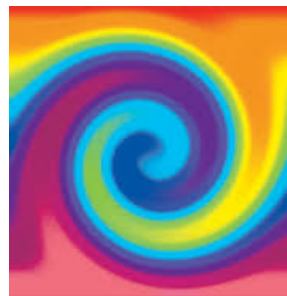
SULTANA N. NAHAR

Astronomy, Ohio State University, Columbus, Ohio, USA

- Adjunct Professor, Aligarh Muslim University, India

- Adjunct Professor, Cairo University, Egypt

- Founder: International Society of Muslim Women in Science



KHWARIZMI  
SCIENCE SOCIETY

## ”MUSLIM WOMEN IN SCIENCE & TECHNOLOGY”

### Webinars of KHWARIZMI SCIENCE SOCIETY

Lahore, PAKISTAN

August 23, 2020

# ASTRONOMY: Study anything beyond our earth

Three types scientists (in general term) in Astronomy:

- Observers - use earth or space based telescopes to get images, spectra of astronomical objects
- Modelers - model the observed image/spectrum to get information, physical conditions, chemical compositions of the object
- Astrophysicists - study the underlying science of the observation and provide data to modelers, observers for atomic/molecular processes
- I am an atomic astrophysicist - study atomic processes that give out light in the stars, galaxies. The four atomic processes that give out or absorb light are:
  - excitation by a photon
  - excitation by an electron
  - ionization by a photon
  - electron recombining to an atom by giving out a photon

# DINOSAURS RULED THE EARTH 65M YEARS AGO

An asteroid impact on earth depleted them

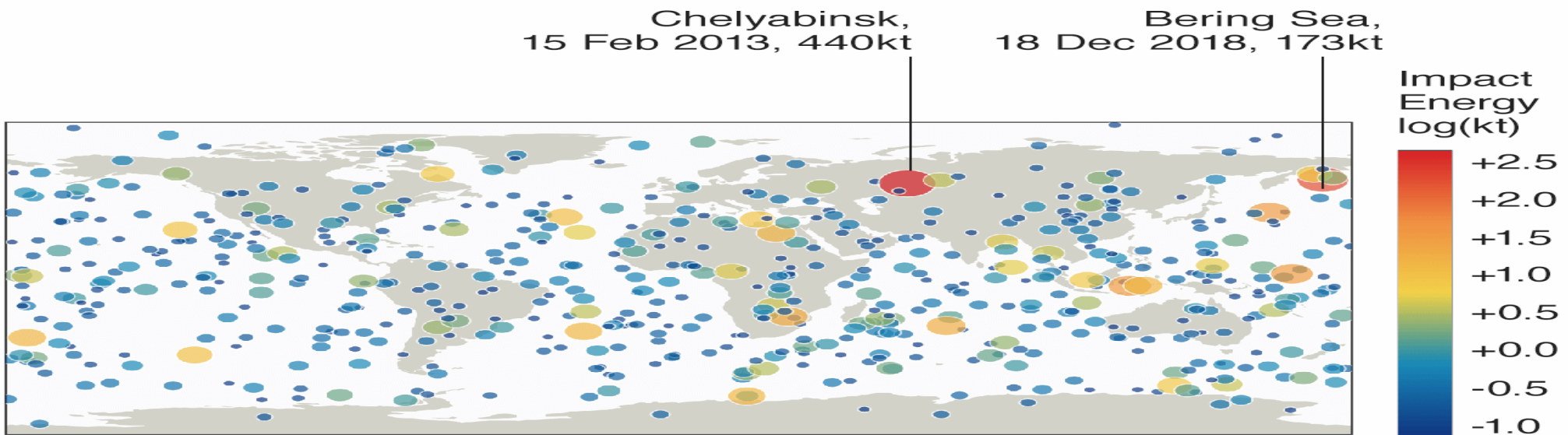


# ASTEROID CONTINUES TO HIT ON THE EARTH

- A huge fireball exploded in the atmosphere, Dec 2018



## Fireballs reported by US government sensors, 15 Apr 1988 - 15 Mar 2019



# METEOR LAKE KARAKUL, Pamir Mountains, TAJIKISTAN



- A lake on the roof of the world, about 4,000m, formed by a meteorite that struck the Earth some 25 million years ago
- We need advanced technology for protection

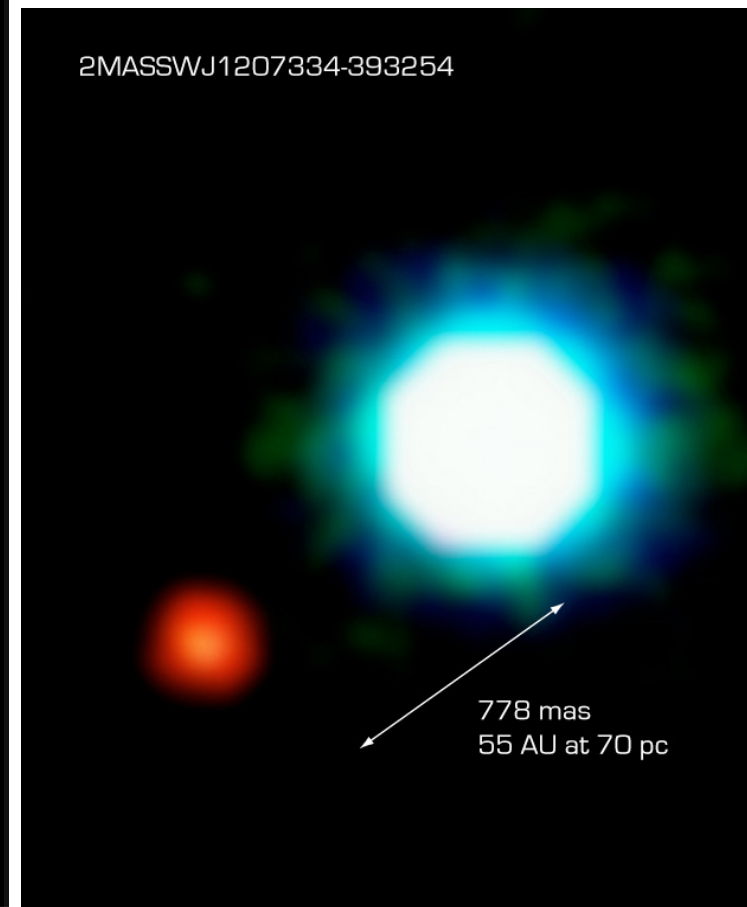
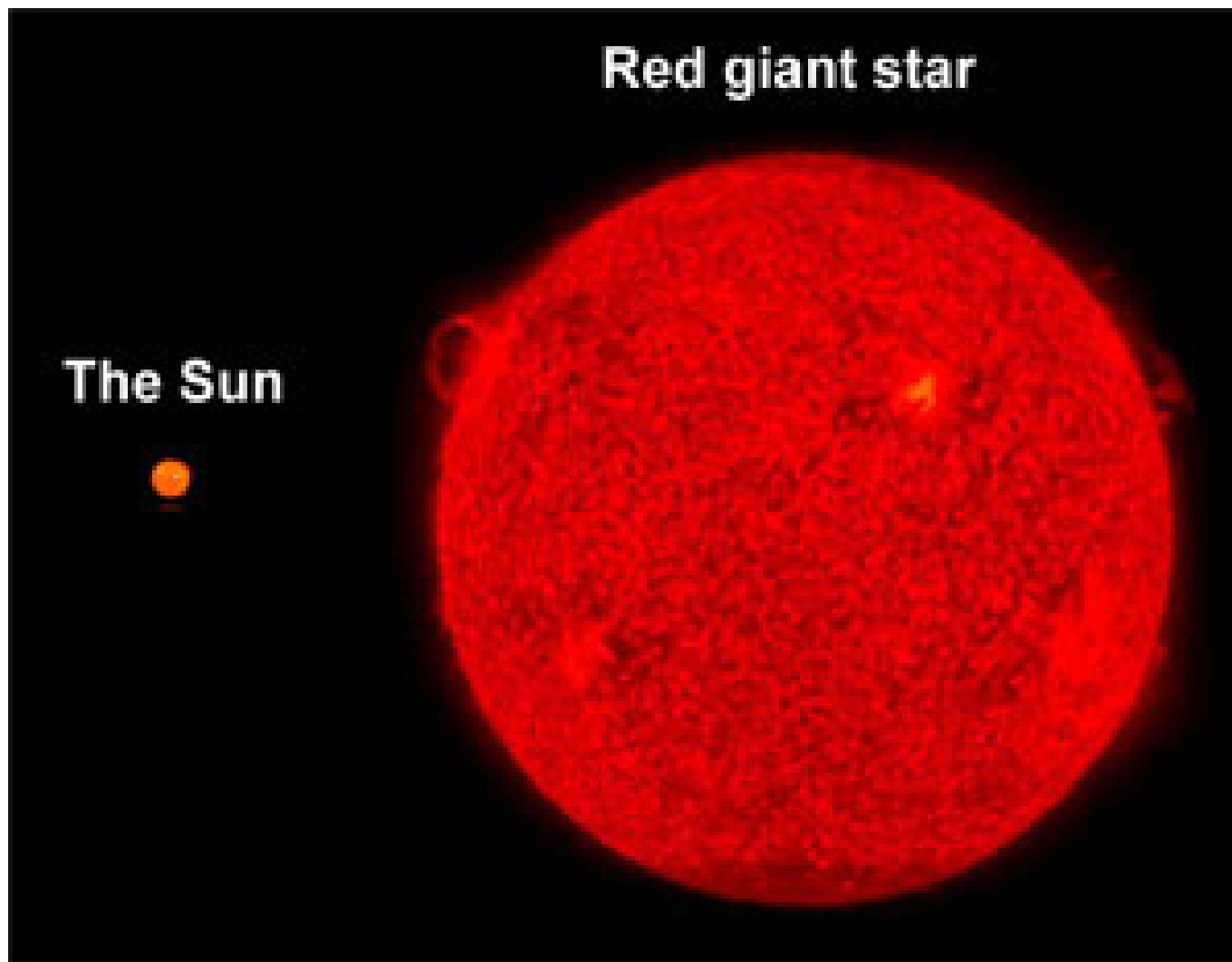
# OUR IDEAS FOR SURVIVAL: LASER TRACTOR BEAM FOR DEFLECTION OF THE ASTEROID (STAR TREK)

- Requires much scientific advances for such a beam

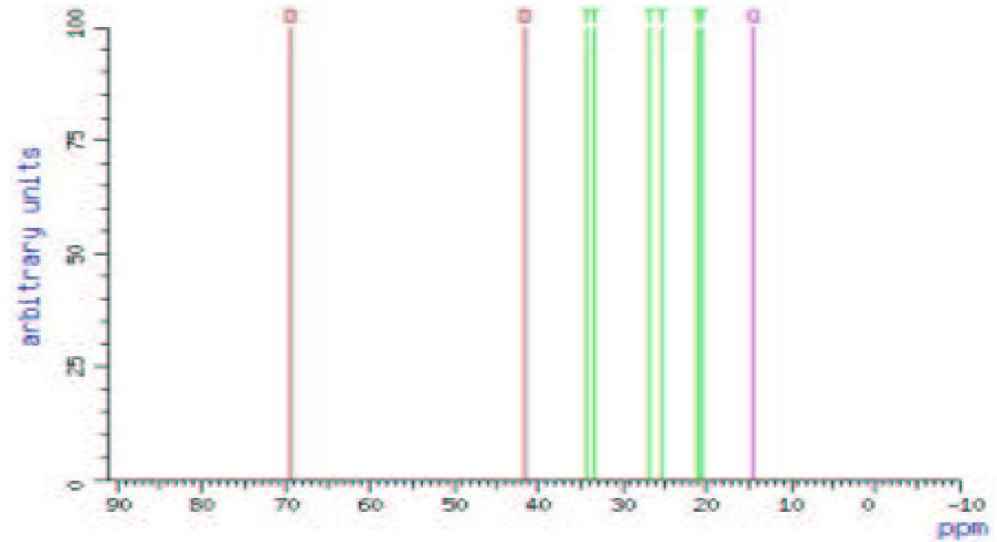
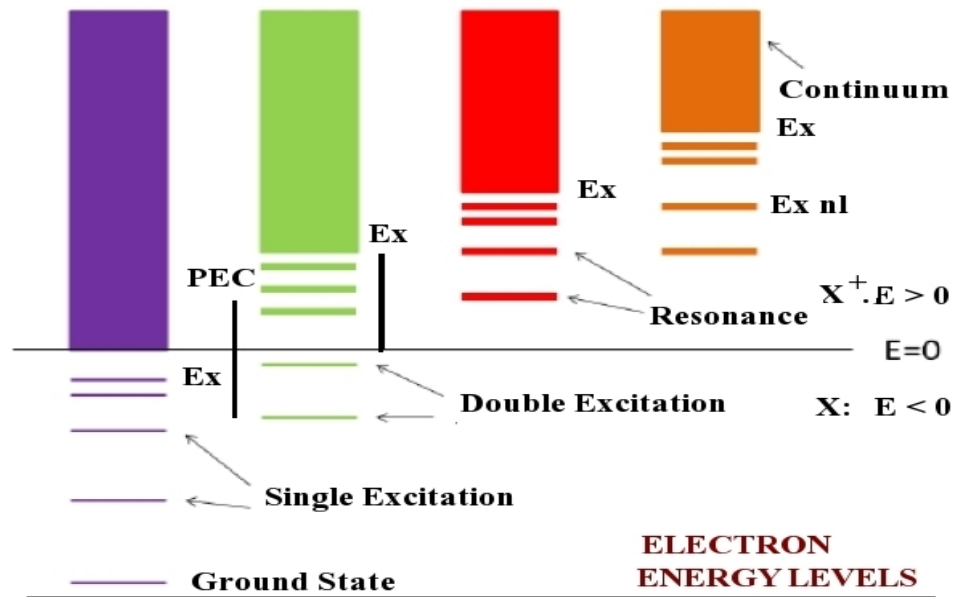
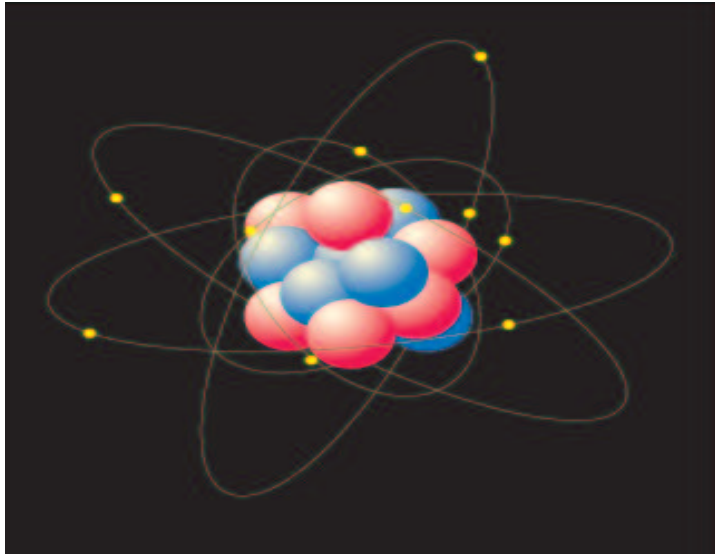


# LIFETIME OF OUR SUN: SEARCHING FOR A HOME

- Sun's fate after 6-7 billion years - Red Giant which will engulf the planets. **We need to survive.**
- Searching habitable exoplanets - expect to have 11 Billion planets in our galaxy - Milky Way.
- **With current technology a spacecraft will take 18 thousands years to reach the nearest star Proxima a**



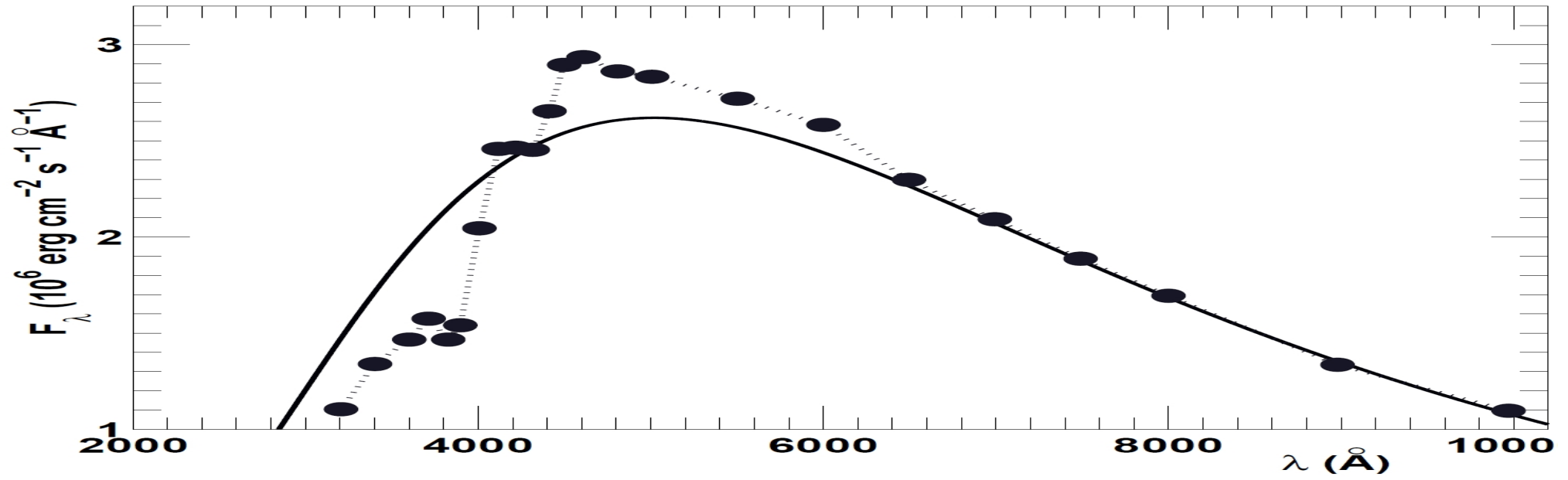
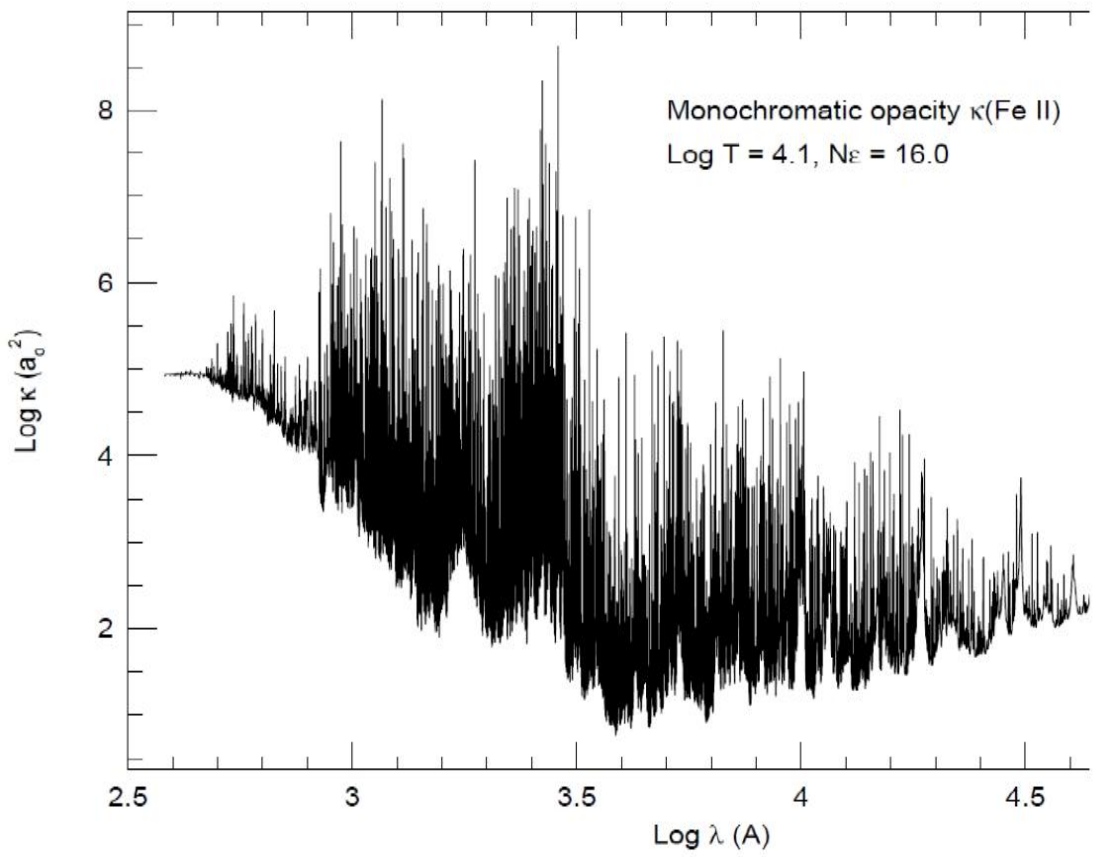
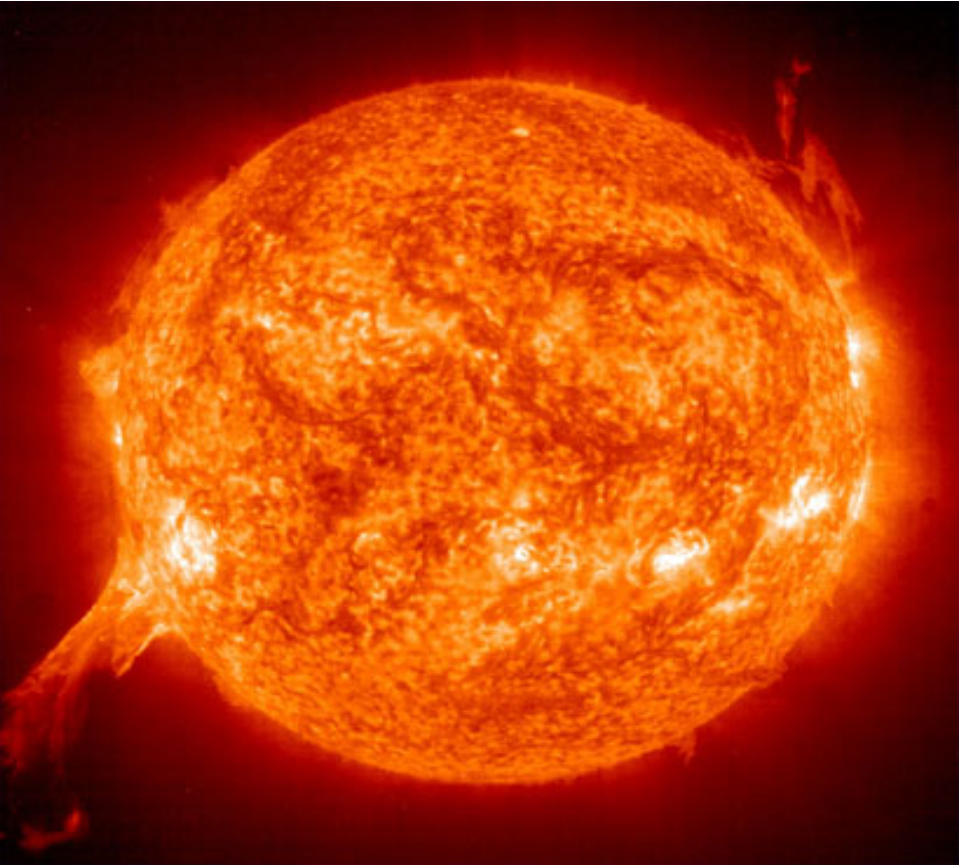
# RADIATION FROM ATOMS & SPECTRUM



- Energy levels are quantized,
- No excitation, no light
- An electron can be excited to higher levels. While dropping down, it gives out a photon. Radiation contains photons of many energies
- SPECTRUM: Splitting the radiation into its colors: Rainbow, C lines



# THE SUN, OPACITY, FLUX, ABUNDANCES



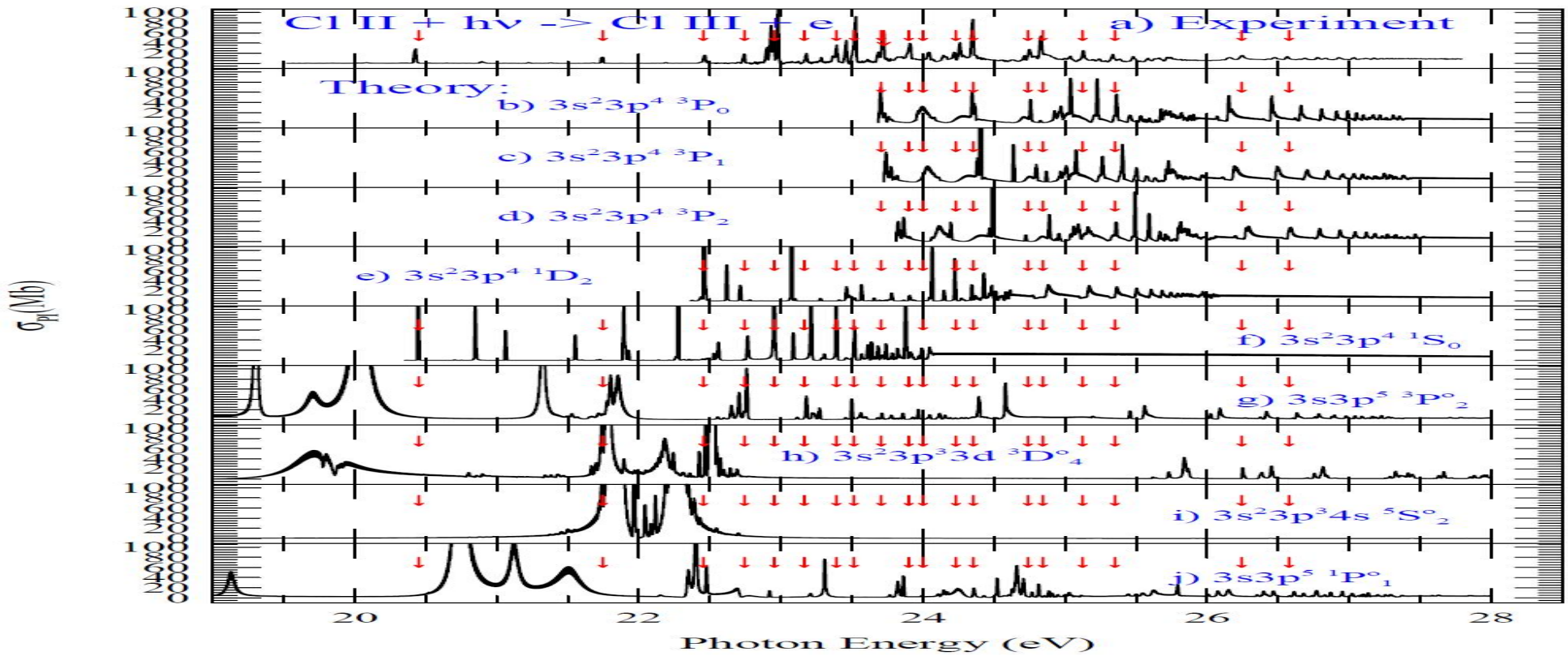
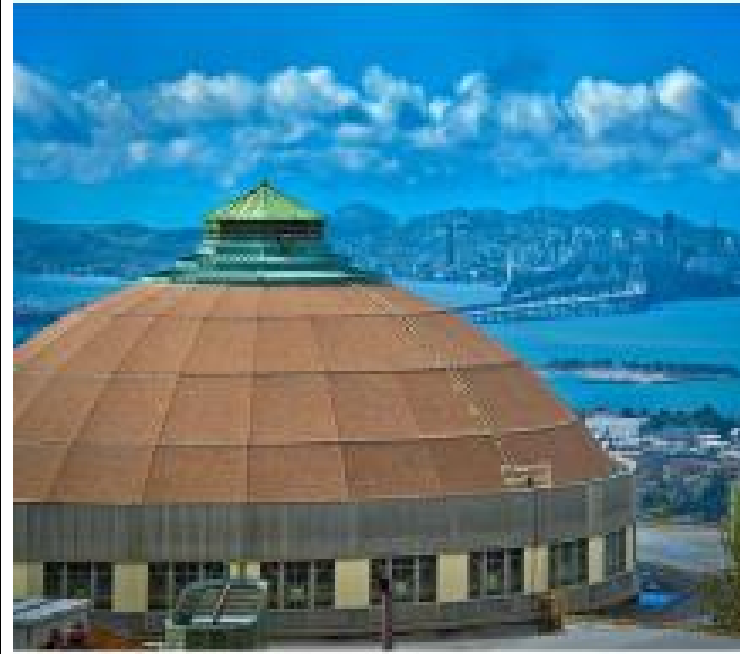
# Chlorine in Planetary Nebula NGC2818: Photoionization

Planetary Nebula NGC 2818



Hubble Heritage

NASA, ESA, and the Hubble Heritage Team (STScI/AURA) • Hubble Space Telescope WFPC2 • STScI-PRC09-05



# WE ARE MADE FROM STARDUST: Phosphorus puzzle

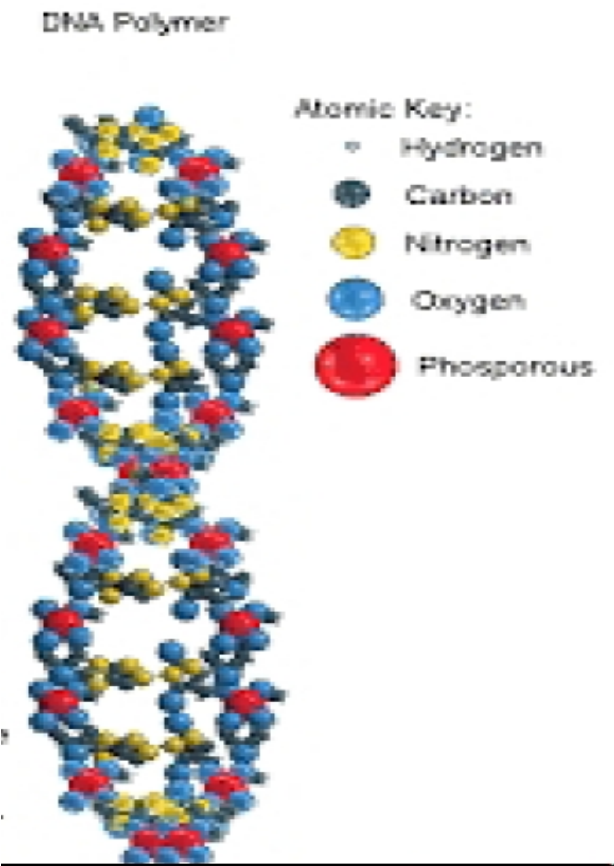
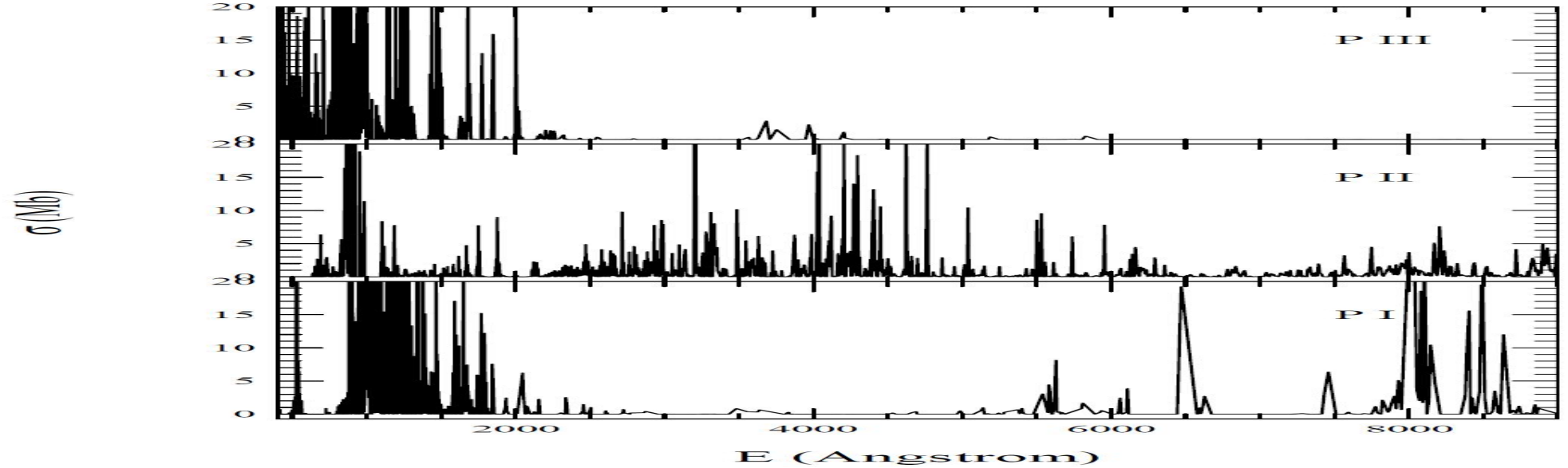
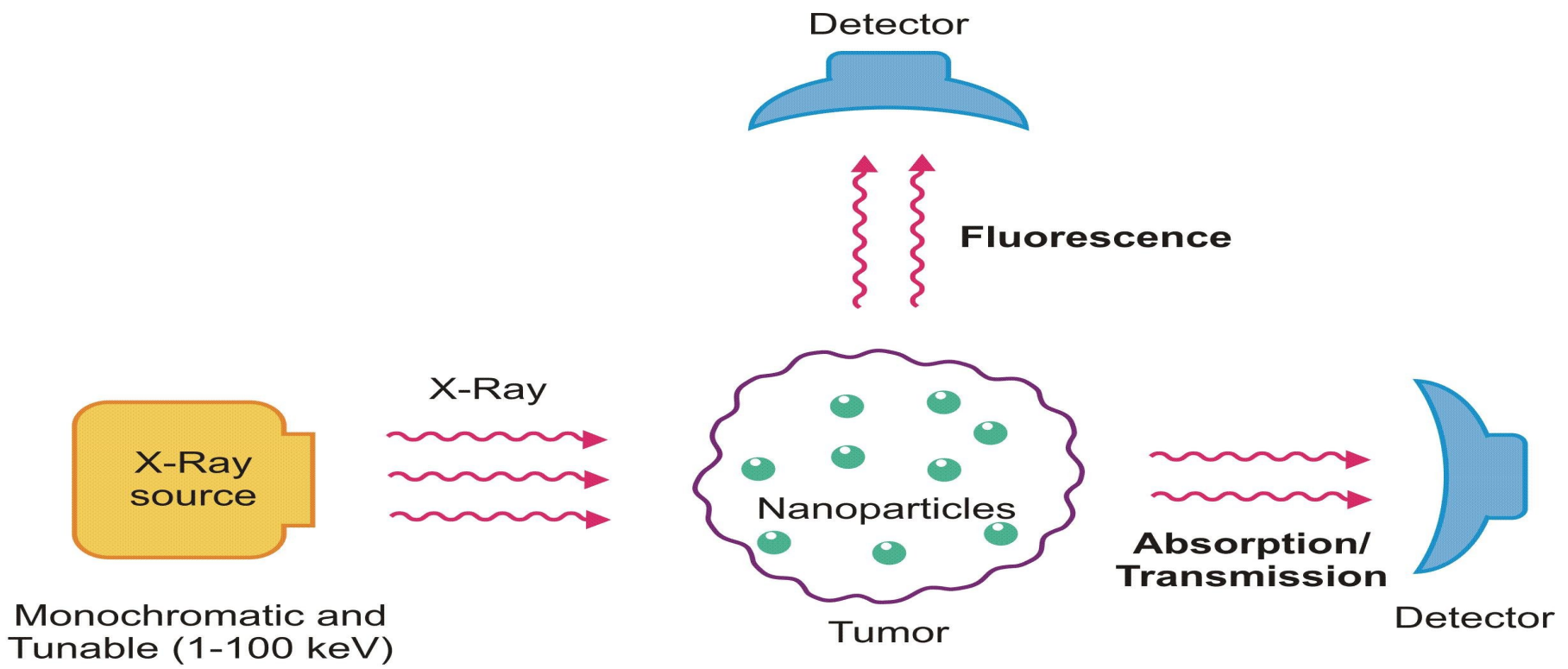
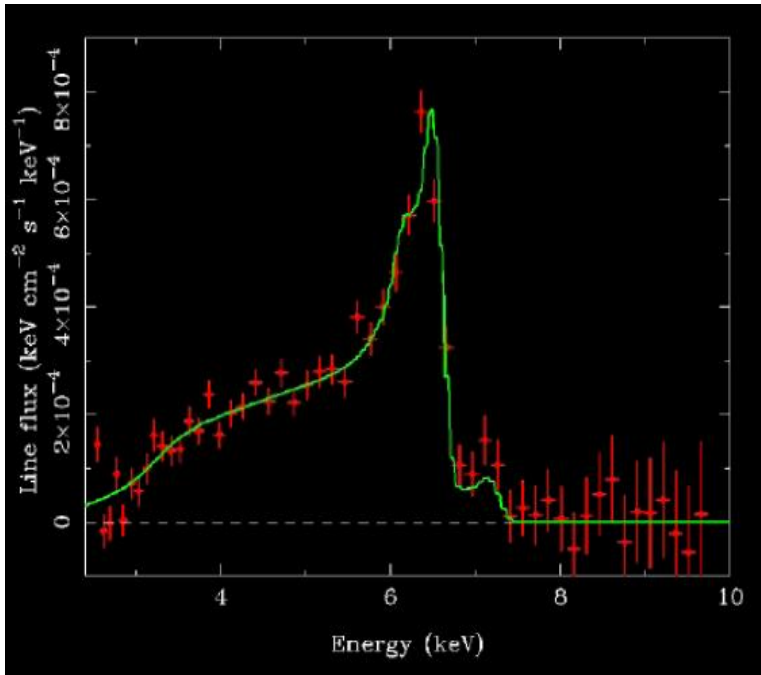


Photo-Absorption Spectrum of P I,II,III



# CONNECTION BETWEEN A BLACK HOLE & CANCER

## TREATMENT: X-RAY - WAY FOR BROAD TO NARROWBAND



# ASTRONOMY CONTRIBUTIONS IN DAILY LIFE (Astronomy Magazine May 2012)



## What has

Wireless Internet and GPS are just two of the technologies our society uses every day — and both stem from astronomy.

by C. Renée James



## astronomy done for *you* lately?

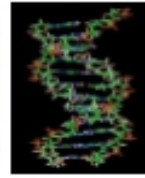
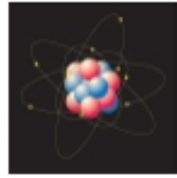
- Global Positioning System (GPS) for navigation
- Wireless Internet for networking
- RNPT - Treating cancer with astronomy research
- Optics and the JWST technologies for laser eye surgery

# STEM: SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS

- Why choose STEM fields?
  - They are part of life, needed for advances for humanity, for survivability
- Why females?
  - Half of the population - half of the intellectual power to make advances
- Women and girls are under-represented in the sciences. UNESCO Data: Less than a third of all female students choose STEM-related subjects in higher education
- Should we waste our intellectual power?
  - NO!



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



# INTERNATIONAL SOCIETY OF MUSLIM WOMEN IN SCIENCE (ISMWS)

## ISMWS CHARTER

**Founder:** Dr. Sultana N. Nahar

The Ohio State University, Columbus, Ohio, USA

April 19, 2010

- **AIM:** - encourage Muslim women in science profession, form a network for various support
- **Objective:** Stay in Science (basic or applied)
- **Motto:** Out of 24 hours a day, we keep some hours for our intellectual nourishment
- **Members:** Over 300 from 31 countries

**Web:** <http://www.astronomy.ohio-state.edu/~nahar/ismws.html>

For membership (free) - **Email:** [nahar.1@osu.edu](mailto:nahar.1@osu.edu)

# THE LONGEST RUNNING UNIVERSITY



Universit Al Quaraouiine founded in 859 in Fez, Morocco is the oldest existing, continually operating and the first degree-awarding educational institution in the world (UNESCO and Guinness World Records[5][6])

- It was founded by Fatima al-Fihri (female)





Invite to APS membership:  
**AMERICAN PHYSICAL SOCIETY**

Membership (free) info:

Contact: Sultana Nahar

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Website for details:

<http://www.astronomy.ohio-state.edu/~nahar/fip.html>

After becoming member, become a member of

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- FIP: Forum of International Physics - unit of APS - Post your resume
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