

Topic F

“The HR Diagram”

Part 1. History & Basics

(Web Version: 08-15-01)

1

Sorting Out Stellar Characteristics

Correlation & Interpretation

2

Overview

- Construct an “HR Diagram”
- Understand what diagram tells about stars
- Some results

3

Part 1. History & Basics of the HR Diagram

4

The HR Diagram

- “Topic F” centered around a single graph
- Usually called the
 - “HR Diagram” or
 - “Hertzsprung-Russell Diagram”
- Most important graph in stellar astronomy!

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A Stellar Relationship


- Shows relationship between stellar
 - Luminosity & Temperature
- *Independently* discovered (1913) by
 - Ejnar Hertzsprung (Danish: 1873–1967)
 - Henry Norris Russell (American: 1877–1957)

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The HR Diagram

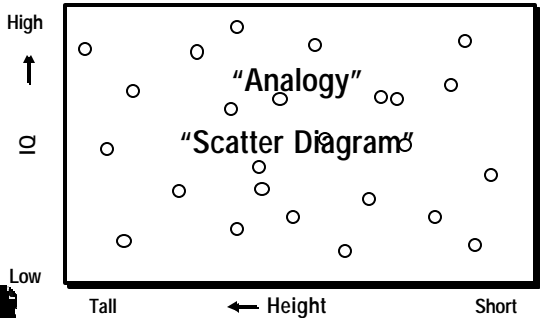
Open to *Study Guide*
Figure 13

All of Topic F
revolves around
this diagram



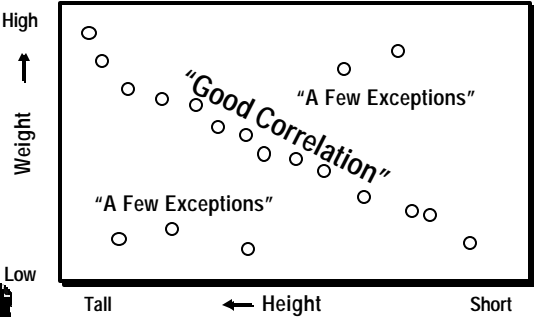
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IQ vs. Height Diagram



8

Weight vs. Height Diagram



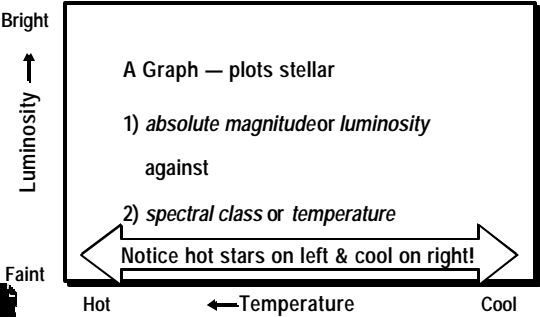
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HR Diagram

A Graph — plots stellar

- 1) *absolute magnitude or luminosity*
against
- 2) *spectral class or temperature*

Notice hot stars on left & cool on right!



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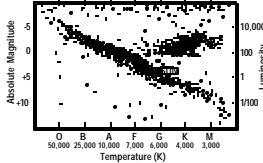
Names for Diagram

- 1) Hertzsprung – Russell Diagram M
HR
Diagram
Sp Cl
- 2) HR Diagram
- 3) Color – Magnitude Diagram M
Color-Mag
Diagram
Color Index
- 4) Temperature – Luminosity Diagram L
T-L
Diagram
T

11

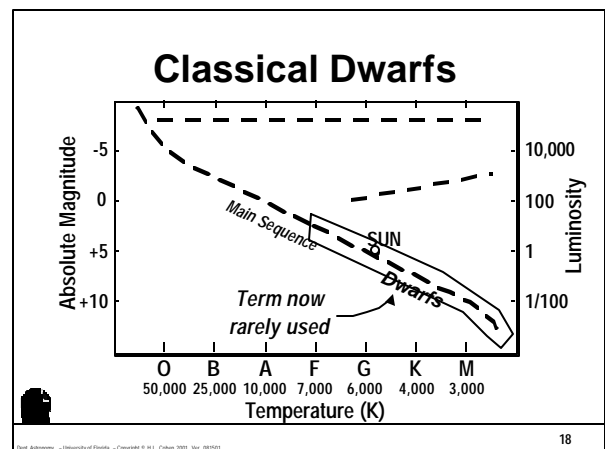
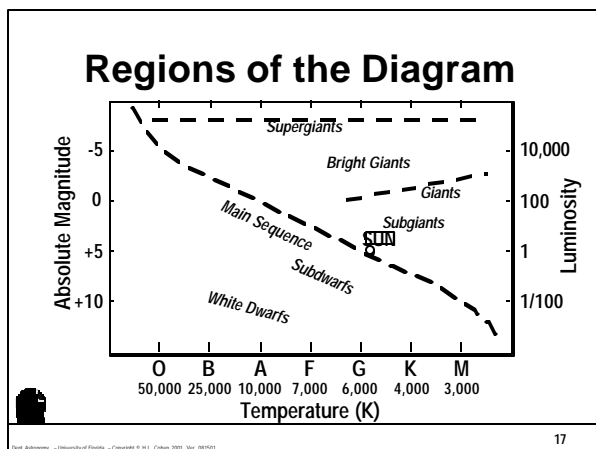
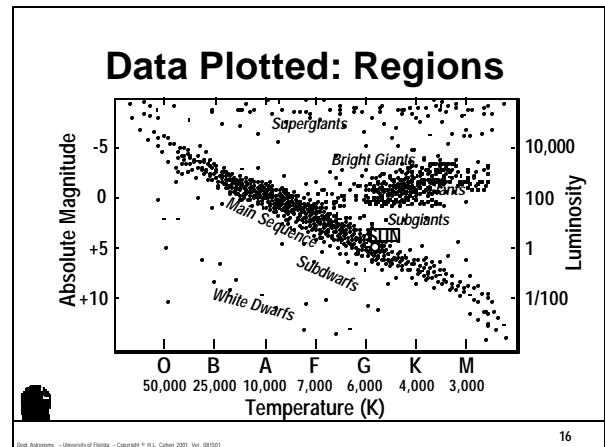
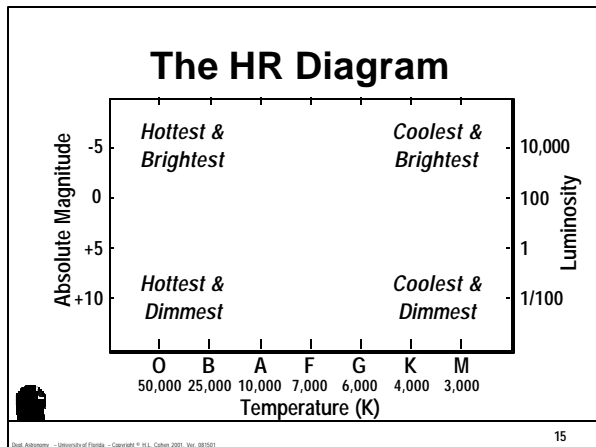
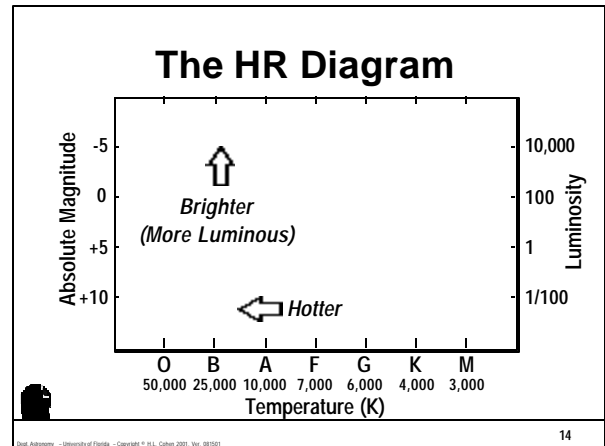
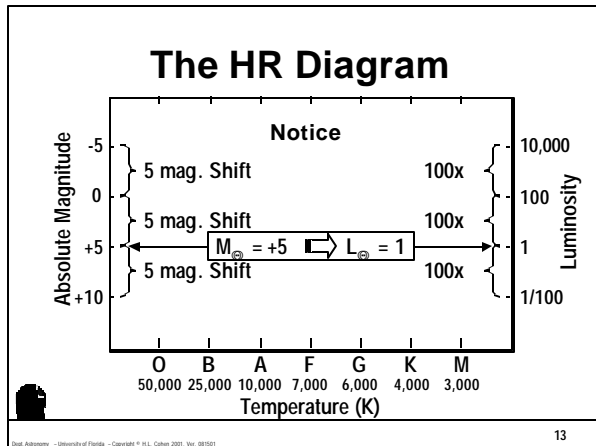
Study Guide

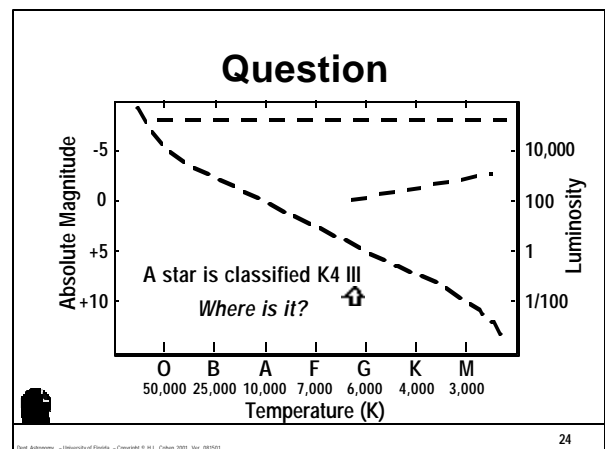
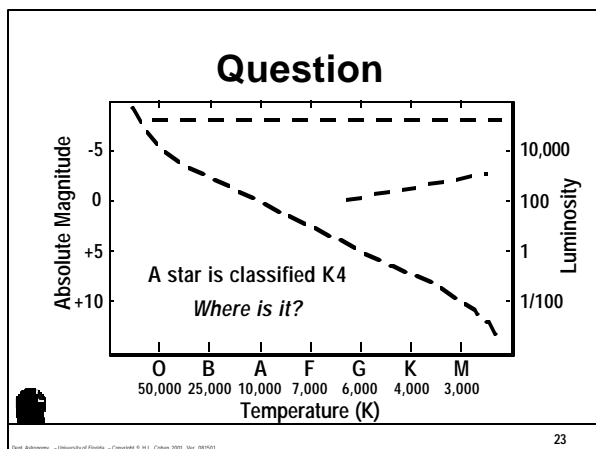
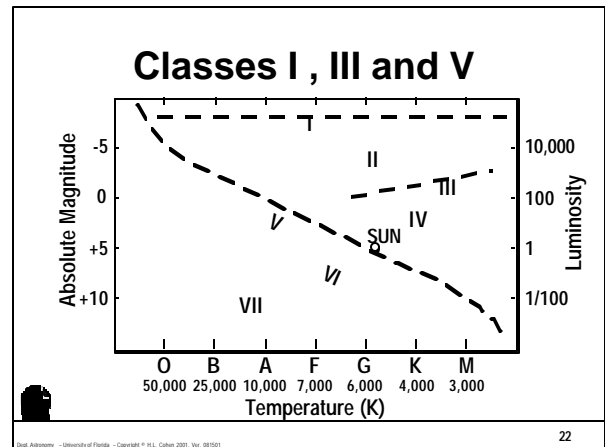
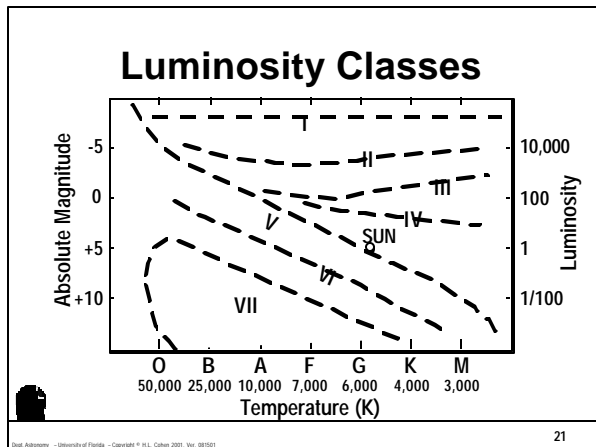
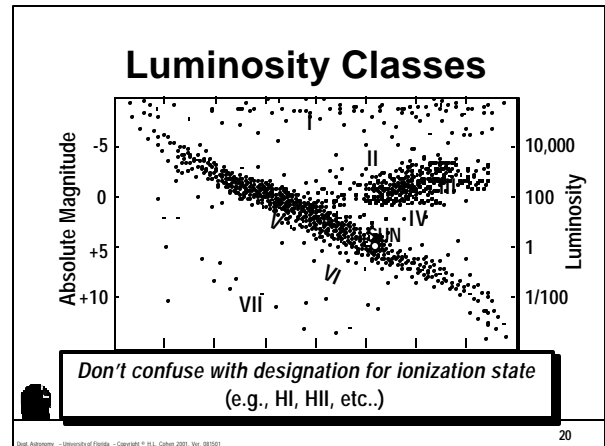
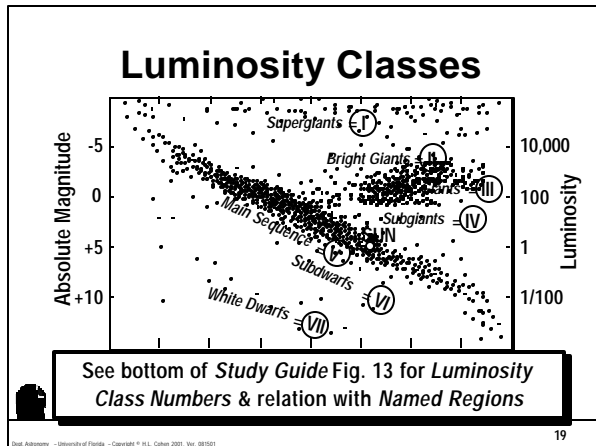
Look at Figure 13



Gives a typical, schematic (“generic”) HR Diagram
(Data taken from assorted star catalogues)

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A Complete Spectral Class

Part 1. Spectral sequence

- Main class (capital letter O, B, A, F, G, K, M)
- Subclass (numbered 0 to 9)
- Occasionally "half units" (e.g., 1.5)

Part 2. Luminosity designation

- Roman numeral (I to VII)
- Sometimes subdivided — a, ab, b (e.g., Ia, lab, Ib)
- VII (white dwarf) seldom used (letter D used instead)

See Fig. 13, Bottom

Example: Sun

Complete spectral class includes

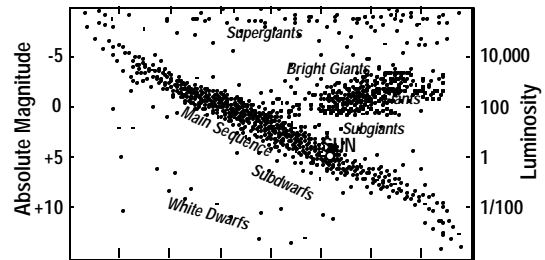
- 1) Main spectral type (cap. letter O, B, . . . , M) G
 - 2) Subclass number (Arabic 0, 1, . . . , 9) 2
 - 3) Luminosity class (Roman I, II, . . . , VII) V
- Result G2 V

Further Examples

From Study Guide — See Table 9

Sun	G2 V	(main sequence star)
Sirius A	A1 V	(hotter main sequence star)
Aldebaran	K5 III	(cool giant)
Rigel	B8 Ia	(very bright supergiant)
Betelgeuse	M2 Iab	(moderately bright supergiant)
Polaris	F5 Ib	(less bright supergiant)
Wolf 359	M6.5 Ve	(between M6 & M7)
Sirius B	A VII	(white dwarf . . . usually written DA2)

Observational Bias



Question: Are the numbers of stars plotted in each region representative of the general stellar population?

Observational Bias

- What types of stars usually observed first?
- Answer — ?
- Consequence . . .

Numbers of stars plotted in each region of HR Diagram possibly misleading

The Brightest Appearing Stars

