Exercise	1	2	Total
100%	4	6	10
Points			

Name:
Stellar Astrophysics

Homework - Lecture 7 - Radiation

Due date: September 29

1 Blackbody radiation

The average person has $1.4\,\mathrm{m}^2$ of skin at a skin temperature of roughly 306 K (92°F). Consider the average person to be an ideal radiator, standing in a room at a temperature 293 K (68°F).

1. Calculate the energy per second radiated by the average person in the form of blackbody radiation. Express your answer both in units of $\mathrm{erg\,s}^{-1}$ and in watts.

2. Determine the peak wavelength λ_{max} of the blackbody radiation emitted by the average person. In what region of the electromagnetic spectrum is this wavelength found?

3. A blackbody also absorbs energy from its environment, in the case from the 293 K room. The equation describing the absorption is the same as the equation describing the emission of blackbody radiation: $L = A\sigma T^4$. Calculate the energy per second absorbed by the average person, expressed both in units of $\mathrm{erg\,s}^{-1}$ and in watts.

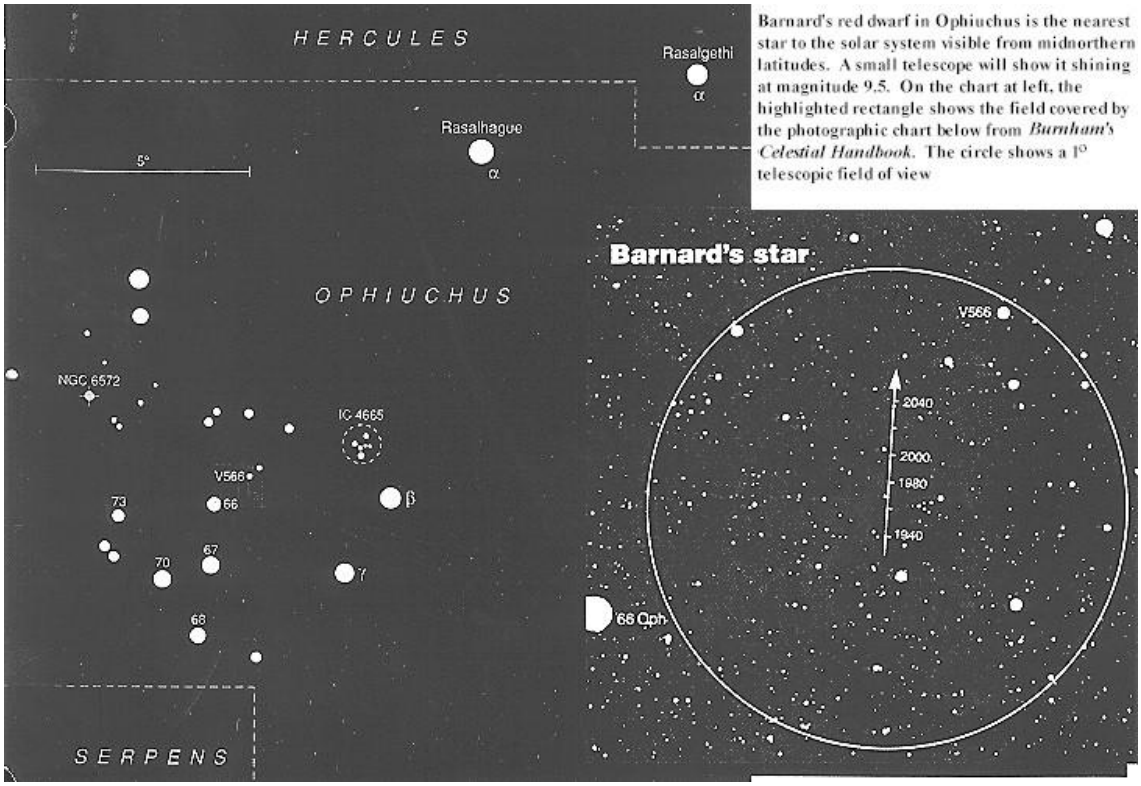
4. Calculate the net energy per second lost by the average person due to blackbody radiation.

In case you have problems with this homework, look into Carroll & Ostlie, Section 3.4 about the "Blackbody Radiation"

2 The effect of starspots on eclipse timings in binary stars

Barnard's star is an orange star in the constellation Ophiuchus. It has the largest known proper motion ($\mu = 10.31'' \,\mathrm{yr}^{-1}$) and the second-largest parallax angle ($p = 0.552''$). In the spectrum of Barnard's star, the H_α absorption line is observed to have a wavelength of 6560.44 Å.

1. Determine the radial velocity of Barnard's star.



Barnard's red dwarf in Ophiuchus is the nearest star to the solar system visible from midnorthern latitudes. A small telescope will show it shining at magnitude 9.5. On the chart at left, the highlighted rectangle shows the field covered by the photographic chart below from *Burnham's Celestial Handbook*. The circle shows a 1° telescopic field of view

Figure 1: Barnard's star, named after the American astronomer Edward E. Barnard, is an orange star in the constellation Ophiuchus.

2. Determine the transverse velocity of Barnard's star.

3. Calculate the speed of Barnard's star through space.

In case you have problems with this homework, look into Carroll & Ostlie, Section 5.1 about "Spectral Lines".