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Assignment 6

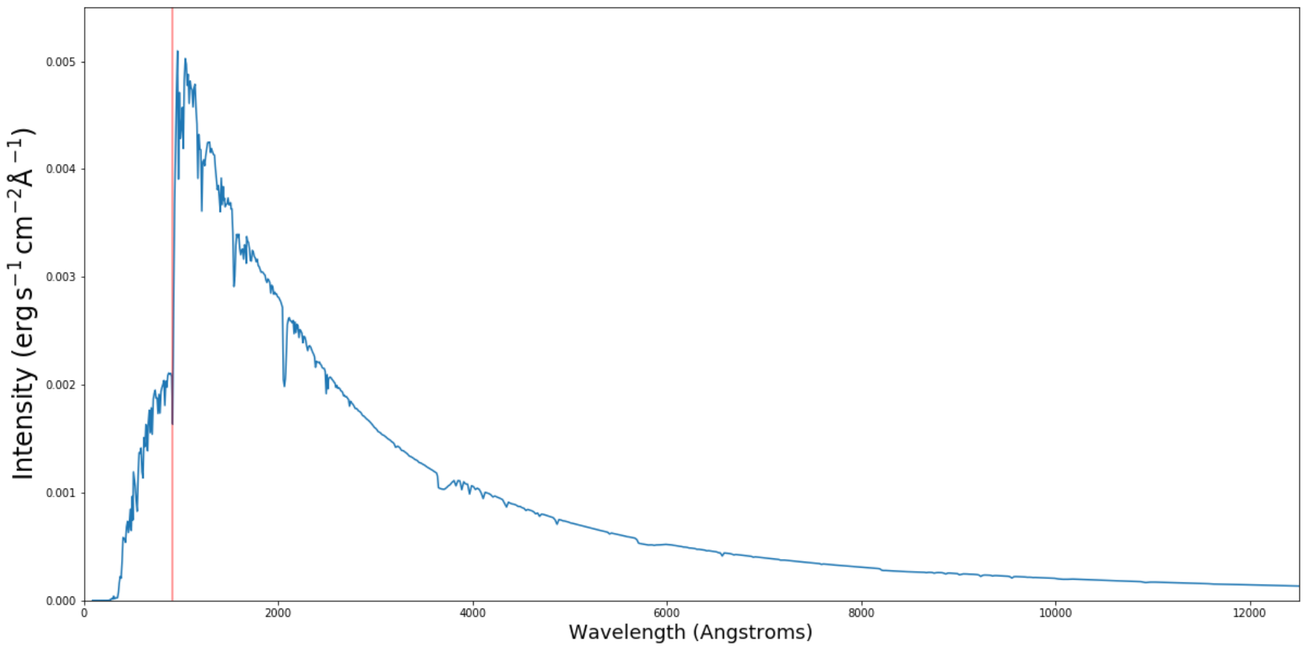
Estimate the photoionization rate for an O5 star (T=42,000 K) and a B0 star (T=30,000 K)

In [2]:
```
import numpy as np
from matplotlib import pyplot as plt
import pylab
```

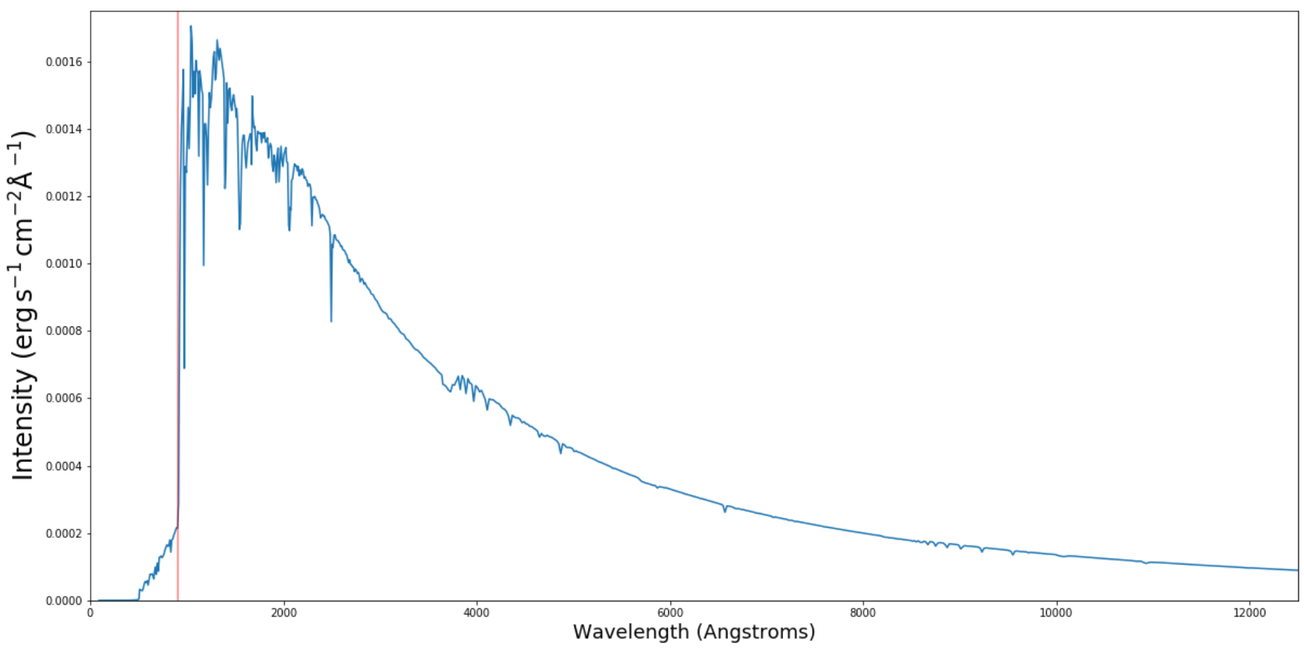
In [3]:
```
O5=np.loadtxt("O5_star.dat")
B0=np.loadtxt("B0_star.dat")

O5WL=O5[:,0]
O5INT=O5[:,1]

B0WL=B0[:,0]
B0INT=B0[:,1]

print(O5)
```

```
[[9.0900e+01 1.4276e-23]
 [9.3500e+01 4.8709e-23]
 [9.6100e+01 1.5378e-22]
 ...
 [1.2000e+06 1.3254e-08]
 [1.4000e+06 9.6586e-09]
 [1.6000e+06 7.3421e-09]]
```

In [6]:
```
plt.figure(figsize=(20,10))
plt.axis([0,12500,0,0.0055])
plt.plot(O5WL,O5INT)
plt.ylabel(r"Intensity ($\rm erg\, s^{-1}\, cm^{-2}\AA\/^{-1}$)",fontsize=24)
plt.xlabel("Wavelength (Angstroms)",fontsize=18)
plt.axvline(912,c='r',alpha=0.5)
plt.show()
```



In [7]:
```
plt.figure(figsize=(20,10))
plt.axis([0,12500,0,0.00175])
plt.plot(B0WL,B0INT)
plt.xlabel("Wavelength (Angstroms)",fontsize=18)
plt.ylabel(r"Intensity ($\rm erg\, s^{-1}\, cm^{-2}\AA\/^{-1}$)",fontsize=24)
plt.axvline(912,c='r',alpha=0.5)
plt.show()
```



Photoionization rate is number of photoionizing photons per second, so integrate flux for WLs greater than 13.6 eV (911.648 Angstroms)

In [10]:
```
from scipy.integrate import simps

print(O5WL[121])
integralO5=simps((O5INT[:121]*O5WL[:121])/(3e18*6.626e-27),O5WL[:121])
strintegralO5=str(integralO5)

print("Photoionization rate for O5 star is "+strintegralO5[:5]+r" photons s^{-1} cm^{-2}")
```

```
905.0
Photoionization rate for O5 star is 24989 photons s^{-1} cm^{-2}
```

In [11]:
```
print(B0WL[121])


integralB0=simps((B0INT[:121]*B0WL[:121])/(3e18*6.626e-27),B0WL[:121])
strint=str(integralB0)

print("Photoionization rate for B0 star is "+strint[:5]+r" photons s^{-1} cm^{-2}")
```

```
905.0
Photoionization rate for B0 star is 16123 photons s^{-1} cm^{-2}
```

As expected, the hotter star has a greater photoionization rate