Extraterrestrial Life: Homework #6

Due, in class, Thursday April 24th

1) Make your own estimates for the values of each of the terms in the Drake equation discussed in Lecture #19. There are no "correct" values, so explain how you arrived at each estimate. Use your numbers to calculate the estimated number of civilizations presently alive in the Galaxy.
2) Suppose that a SETI search is sensitive enough to detect a 1MW signal broadcast from a civilization at a distance of 1000 light years. Suppose we wish to use the same search to look for civilizations 50,000 light years away on the far side of the Galaxy. How powerful would the alien transmitter have to be for us to have a chance of success?
3) Explain briefly what is meant by the *bandwidth* of a signal.
4) The "Galactic Communication" applet at:

   http://cosmos.colorado.edu/stem/applets/

   provides a visual depiction of some of the challenges of interstellar communication. Using the applet, you can set the birth rate of civilizations in the Galaxy (in units of civilizations born per 100,000 years), as well as the average lifetime of civilizations (note that this is a random quantity, so if you set the mean to be say 1000 years sometimes Earth's civilization will last for 500 years and sometimes for many thousands of years). By clicking the "Display Stats" button you can see the average number of messages being received at any one time *if* our SETI searches probed the whole Galaxy.

   Set the birth rate of civilizations to 100 per 100,000 years and the lifetime to 5,000 years (both arguably optimistic assumptions, but who knows!). By running the applet a few times, estimate the average number of messages that we could in principle receive at any one time given very sensitive searches.

5) Are SETI searches a worthwhile use of researchers' time and money? Give a brief (1/2 page or so) justification of your opinion.