Key points from Lecture 12 of ASTR 350

1. Accreting neutron stars and black holes are hot enough that most of their emission is typically in X-rays.
2. Because our atmosphere blocks X-rays (fortunately for us!), X-ray observations require detectors that are above our atmosphere, i.e., in satellites or sometimes in rockets or high-altitude balloons.
3. Accretion onto a neutron star can be divided into cases where the companion is high-mass (O or B stars, several solar masses and above) and where the companion is low-mass (under a solar mass). The first type tend to have high magnetic fields ($\sim 10^{12}$ or more times the Earth's surface field) and the second type tend to have lower magnetic fields ($\sim 10^8 - 10^{10}$ times the Earth's surface field, so still huge but small in comparison!).
4. The stronger magnetic fields can channel the ionized accreting matter toward the neutron star magnetic poles.
5. For weaker-field neutron stars, accreted hydrogen and helium can build up until it is unstable to nuclear fusion; a (thermonuclear) X-ray burst!
6. But some X-ray binaries have a compact star with a mass too large to be a neutron star, i.e., definitively greater than 3 $M_\odot$. Earliest and most famous example is Cygnus X-1 (the group Rush has a song about Cygnus X-1!)
7. Often difficult to distinguish accretion on a neutron star from accretion onto a black hole. NS has surface and strong ordered magnetic field (BH doesn't) and BH can be higher-mass than NS, but there is no signature that happens for all black holes and only for black holes.