Key points from Lecture 13 of ASTR 350

1. Gamma-ray bursts were discovered accidentally in 1967 through a US program designed to detect nuclear weapon tests in space. In 1973 it had become clear that these were astronomical phenomena, so the information was released publicly.
2. Gamma-ray bursts are (a) fairly common (a few per day happen overall), (b) isotropic on the sky, (c) come in "short" and "long" forms.
3. Counterparts in other wavelengths, which can be localized much better than gamma rays, show that GRBs are cosmological, i.e., they can come from high redshift (and also from low redshift, but with smaller probability).
4. Their great distance and high flux means that these are tremendously energetic. Additional study shows that these are highly beamed: we see a GRB when we are in its jet, and that jet has a Lorentz factor of at least a few hundred (at least $10\times$ larger than any other bulk Lorentz factor in the universe, e.g., from supermassive black holes).
5. Now understood that long gamma-ray bursts are from a particular type of core-collapse supernova, and short gamma-ray bursts are from inspiral and merger of two neutron stars (and possibly in some cases from the inspiral and merger of a neutron star and a stellar-mass black hole).
6. The clear identification of (at least one) cause of short GRBs came from the gravitational wave event GW170817, which was a double neutron star merger.