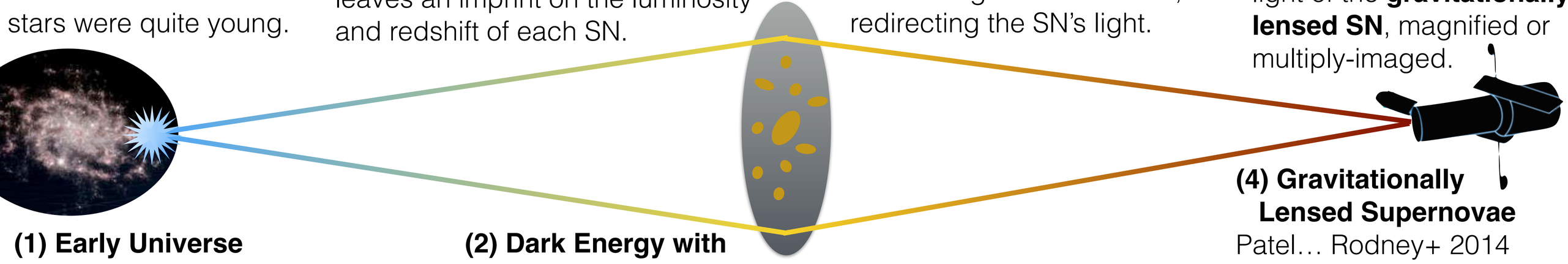
(1) A star explodes as a **supernova** (SN), when the universe and all its stars were quite young.

(2) The accelerating expansion of space, driven by **dark energy**, leaves an imprint on the luminosity and redshift of each SN.

(3) The **dark matter** of an intervening **galaxy cluster** creates a gravitational lens, redirecting the SN's light.

(4) Space telescope observations capture the light of the **gravitationally lensed SN**, magnified or multiply-imaged.



(1) Early Universe Supernova Progenitors

Rodney & Tonry 2010b
Rodney+ 2014
Graur, Rodney+ 2014
Strolger, Dahlen, Rodney+ 2015

(2) Dark Energy with Distant Supernovae

Rodney+ 2012
Jones, Rodney+ 2013
Salzano, Rodney+ 2014
Rodney+ 2015b

(3) Dark Matter in Galaxy Clusters

Treu… Rodney+ 2015
Priewe… Rodney+ 2016
Grillo… Rodney+ 2016

(4) Gravitationally Lensed Supernovae

Patel… Rodney+ 2014
Rodney+ 2015a
Kelly, Rodney+ 2015
Rodney+ 2016
Kelly, Rodney+ 2016
Kelly… Rodney+ 2016