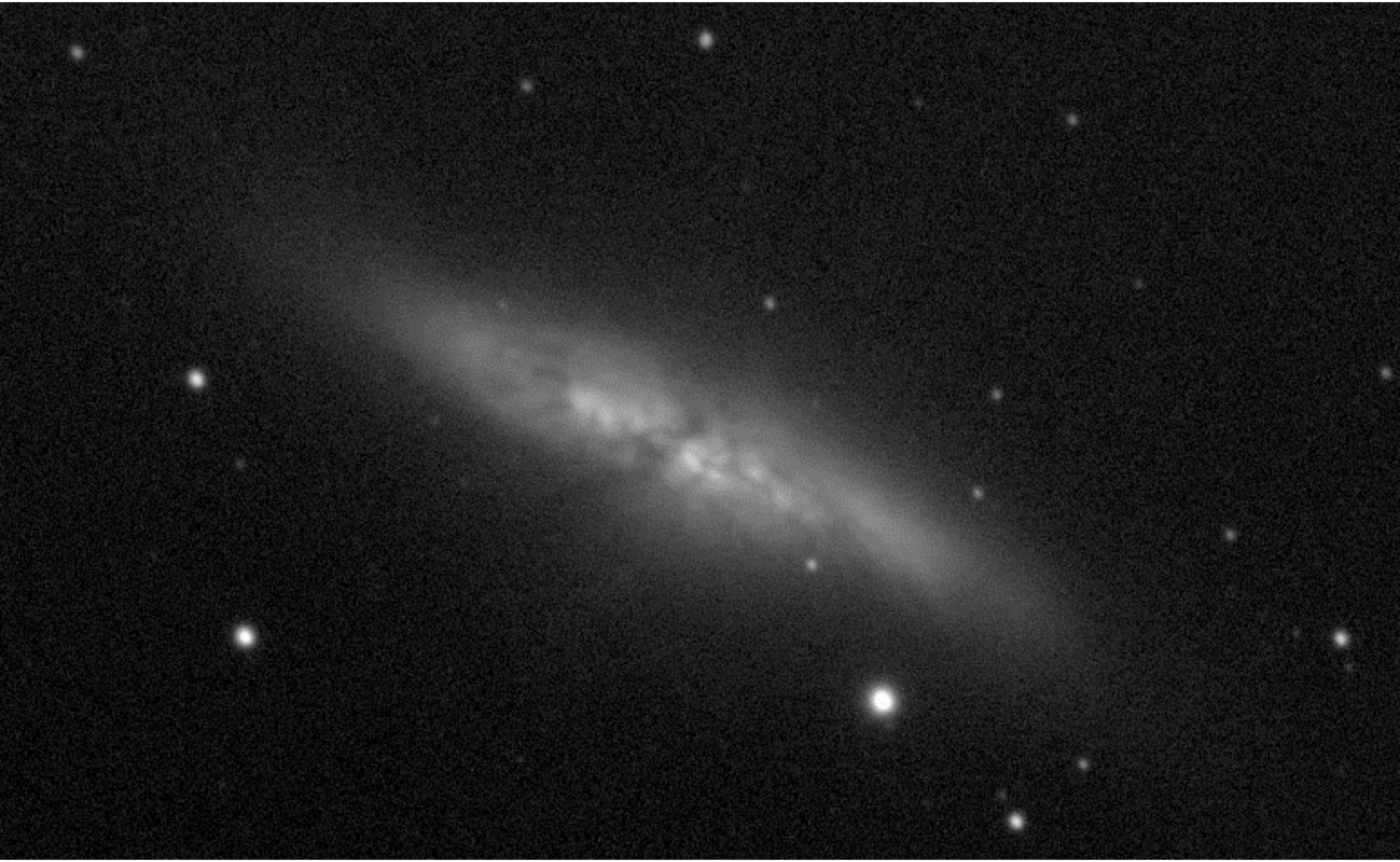
Folien zur Vorlesung KTA 1 am 27.1.2014

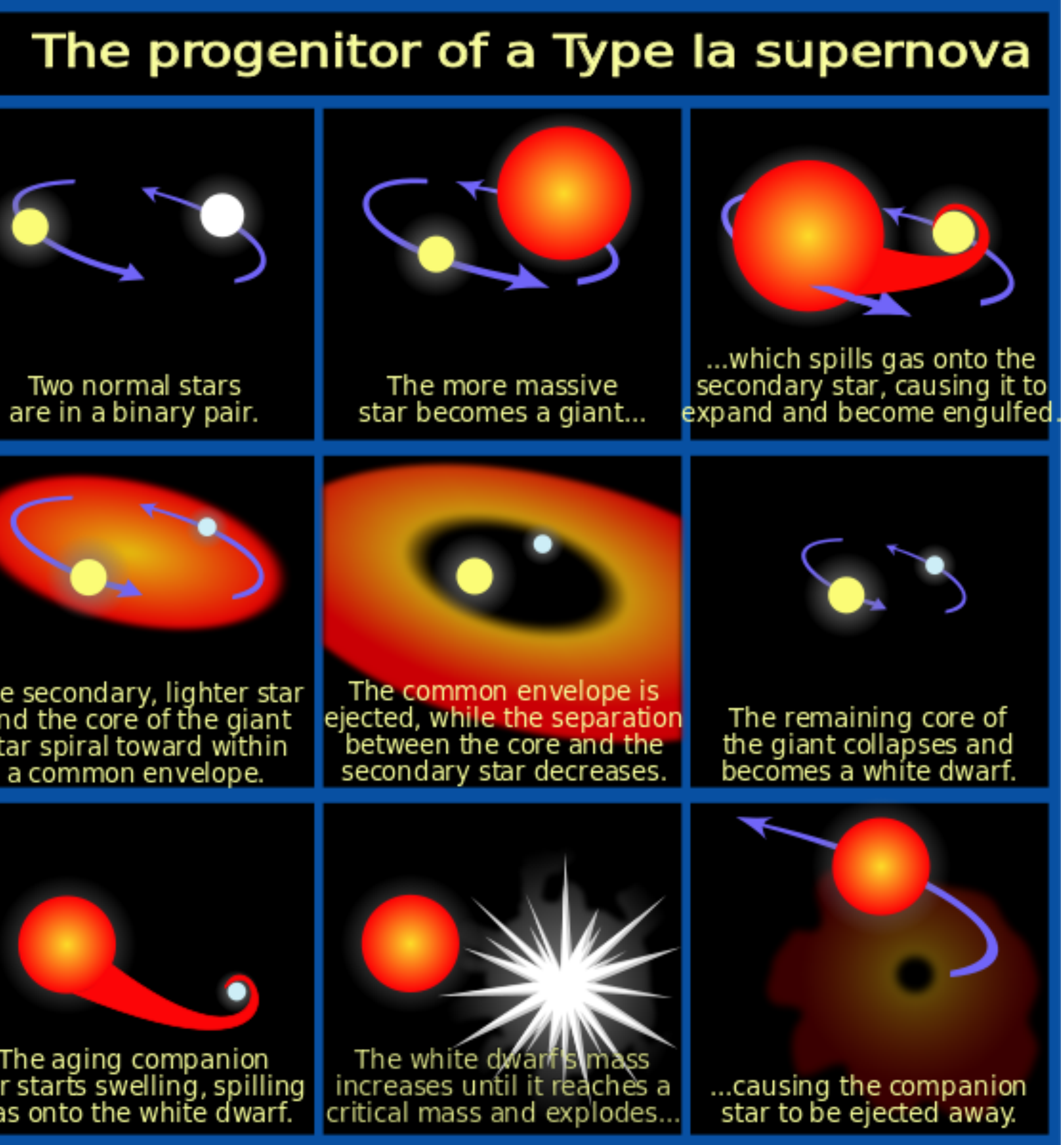
Aus aktuellem Anlass:
2014 January 21.81 UT
Supernova **Type Ia** in M82 (Ursa Major Konstellation)
PSN J09554214+6940260

Entfernung: ca. 11.5 Mio Lichtjahre

siehe auch:
http://en.wikipedia.org/wiki/SN2014J

(Vgl. SN1987A (Type II):
168.000 Lichtjahre; bzw. 51.47 kpc)





Masse des Weissenzwergs nimmt zu und C-Brennen beginnt. 'Runaway' Reaktion innerhalb weniger Sekunden führt zu einer Thermo-nuklearen Explosion des Weissen Zwergs. Energiefreisetzung ca. 10^{44} J

N.B.: Kein Core-Kollapse! (Type II)

http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/popular-physicsprize2011.pdf

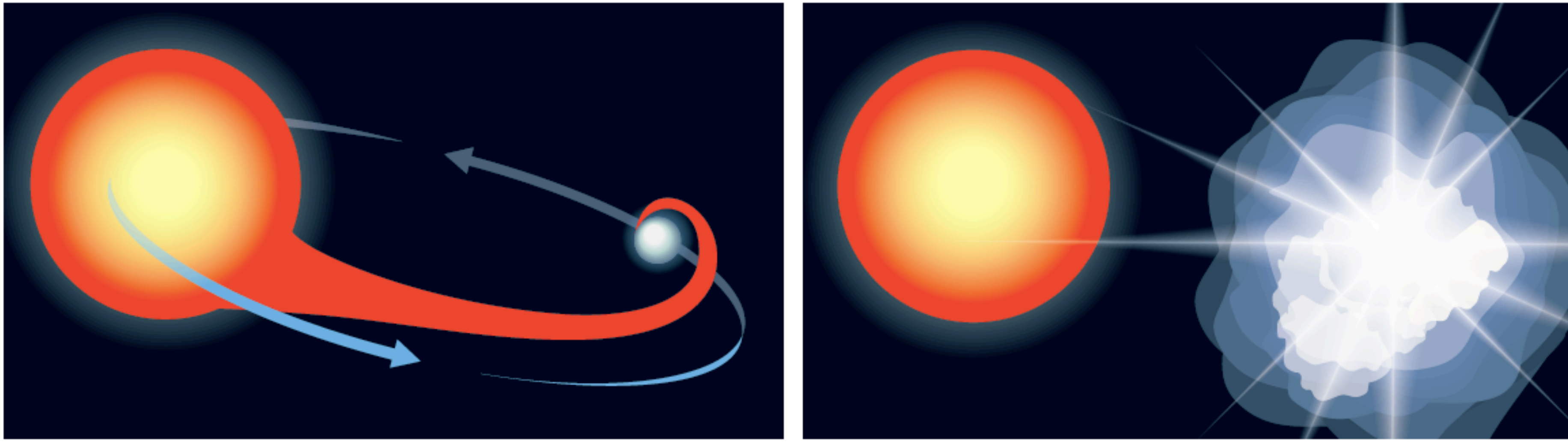


Figure 3. Supernova explosion. A white dwarf steals gas from its neighbour using its gravity. When the white dwarf has grown to 1.4 solar masses, it explodes as a type Ia supernova.

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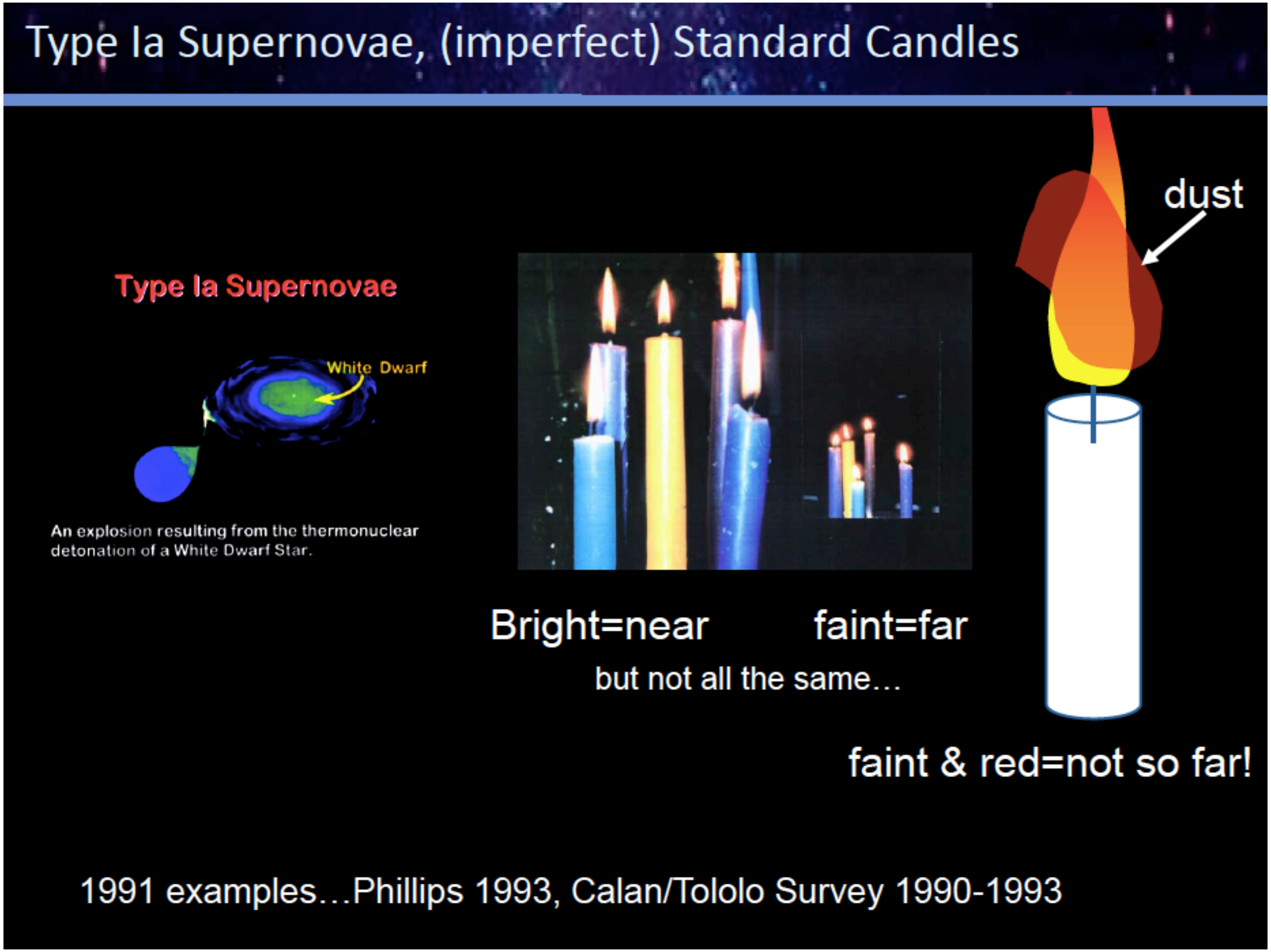
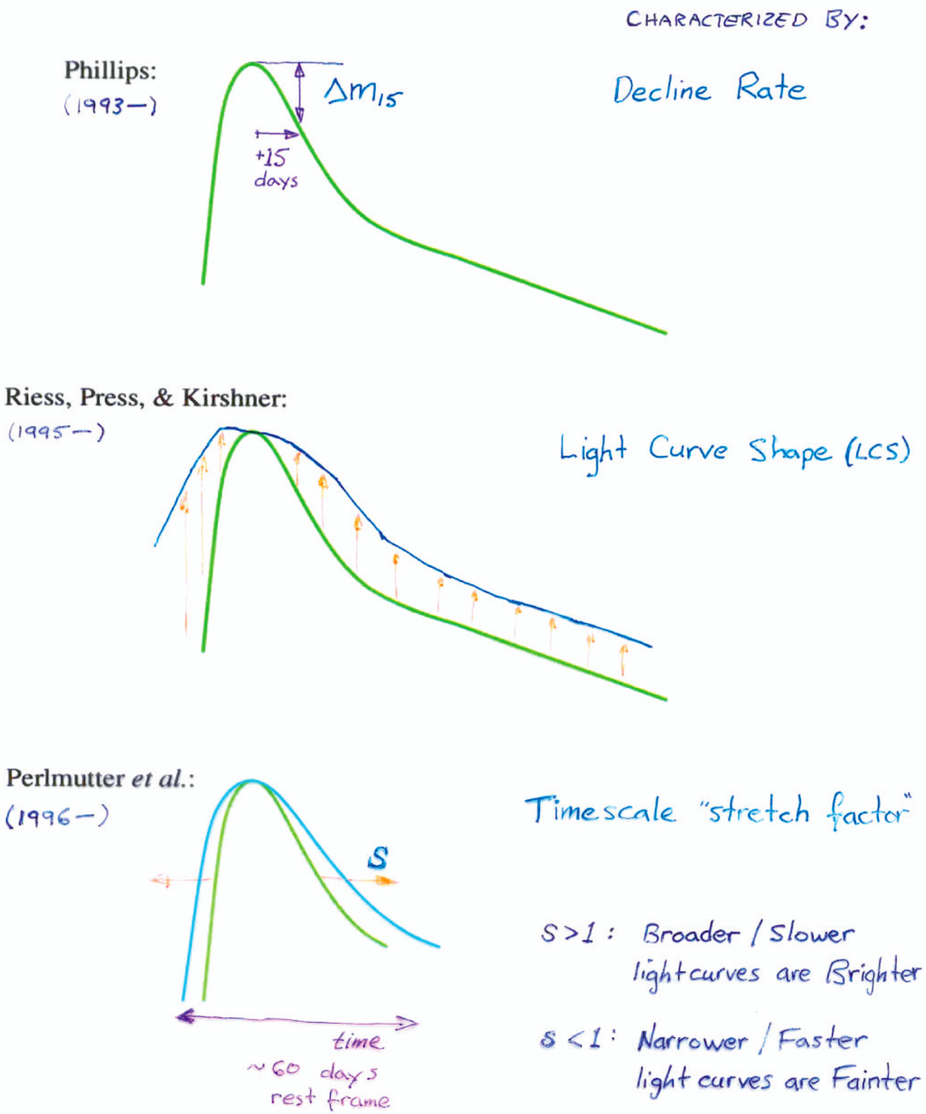
N.B.: Keine Core-Kollapse SN wie z.Bsp. SN1987A! (Type II)



Helligkeit => Entfernung
Rotverschiebung => Fluchtgeschwindigkeit

http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/riess-lecture_slides.pdf

Lightcurve Width-Luminosity Relation



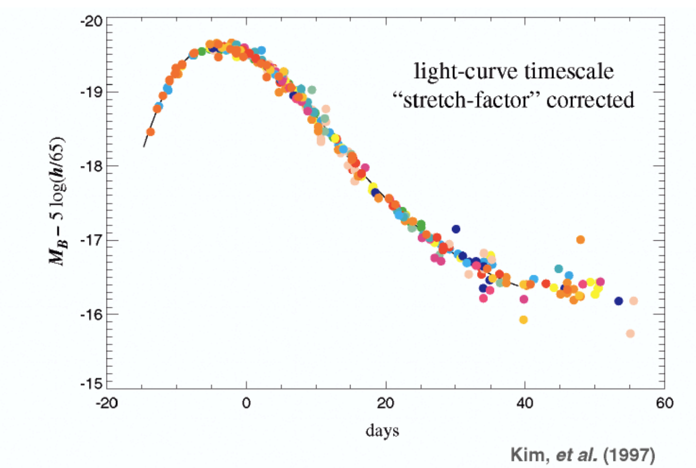


Figure 16. It is possible to "correct" each Type Ia supernova light curve by appropriately brightening the faster ones (low "stretch factor") and dimming the slower ones (large "stretch factor") while stretching or compressing their timescales. The lower panel shows the result of this, using a linear relation between the stretch of the light curve timescale and its peak luminosity.

http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/perlmutter-lecture.pdf

The Nobel Prize in Physics 2011

Photo: U. Montan

Saul Perlmutter

Photo: U. Montan

Brian P. Schmidt

Photo: U. Montan

Adam G. Riess

The Nobel Prize in Physics 2011 was divided, one half awarded to Saul Perlmutter, the other half jointly to Brian P. Schmidt and Adam G. Riess *"for the discovery of the accelerating expansion of the Universe through observations of distant supernovae"*.

(mit Hilfe von SN Type Ia)

http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/popular-physicsprize2011.pdf

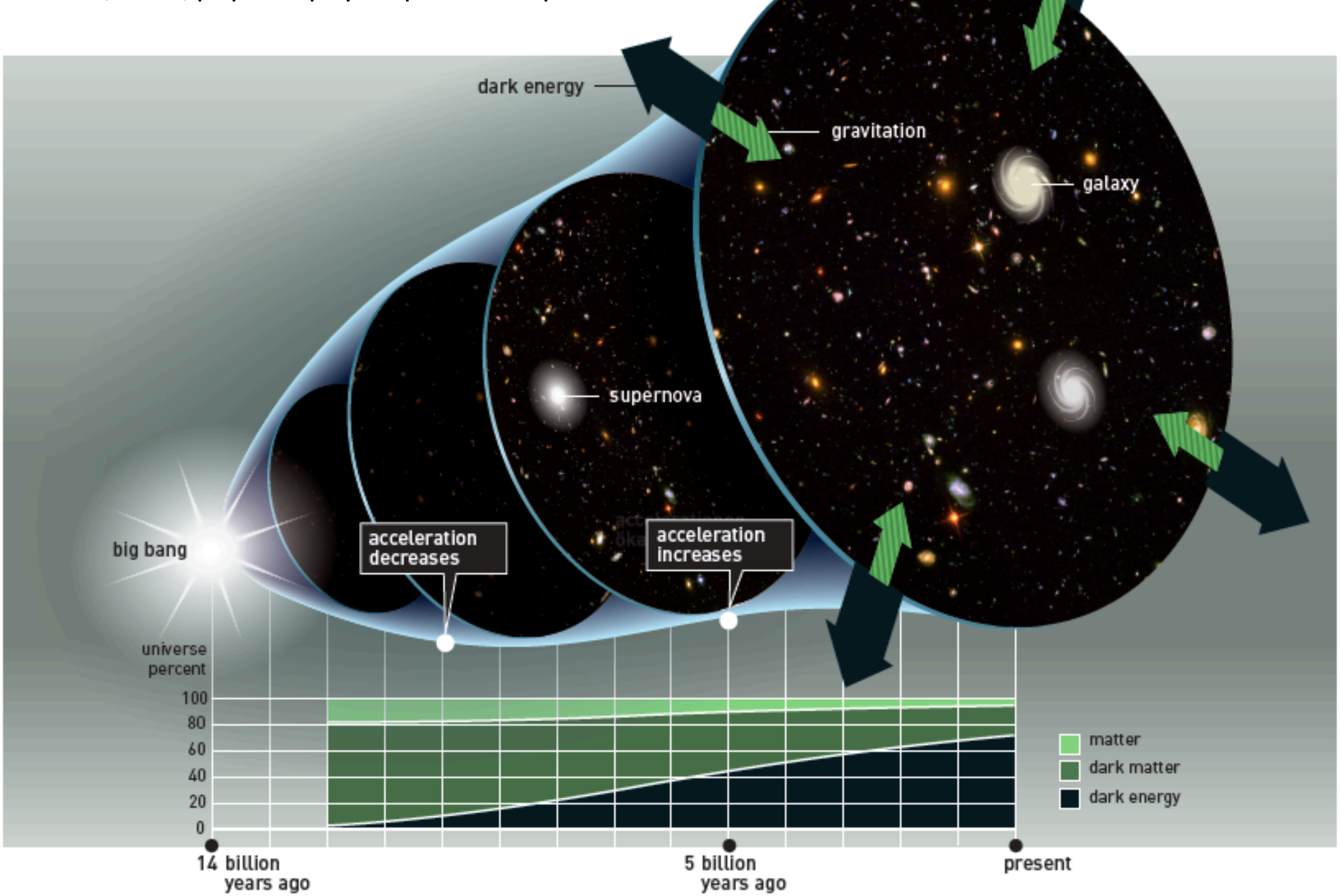
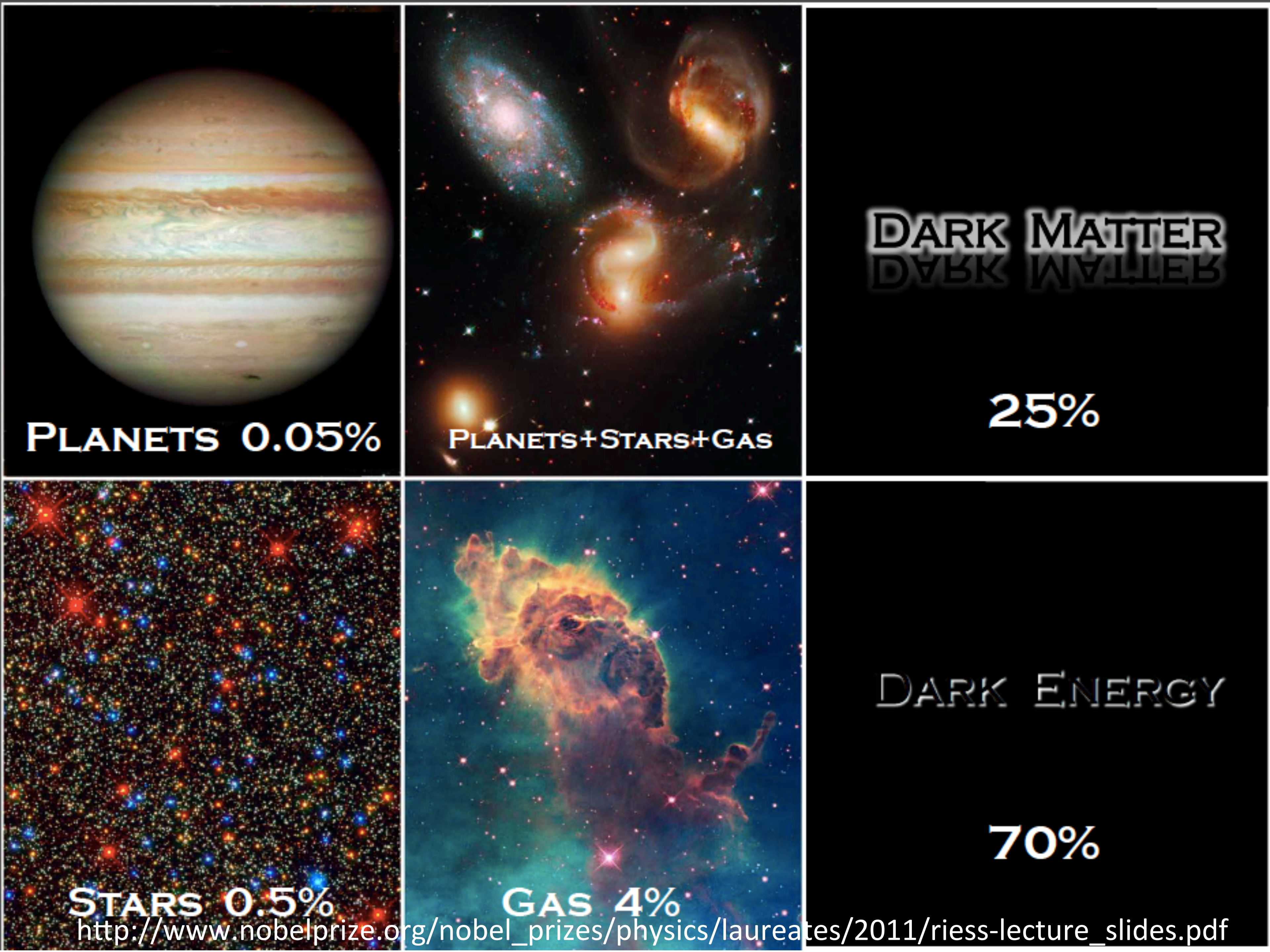


Figure 1. The world is growing. The expansion of the Universe began with the Big Bang 14 billion years ago, but slowed down during the first several billion years. Eventually it started to accelerate. The acceleration is believed to be driven by dark energy, which in the beginning constituted only a small part of the Universe. But as matter got diluted by the expansion, the dark energy became more dominant.



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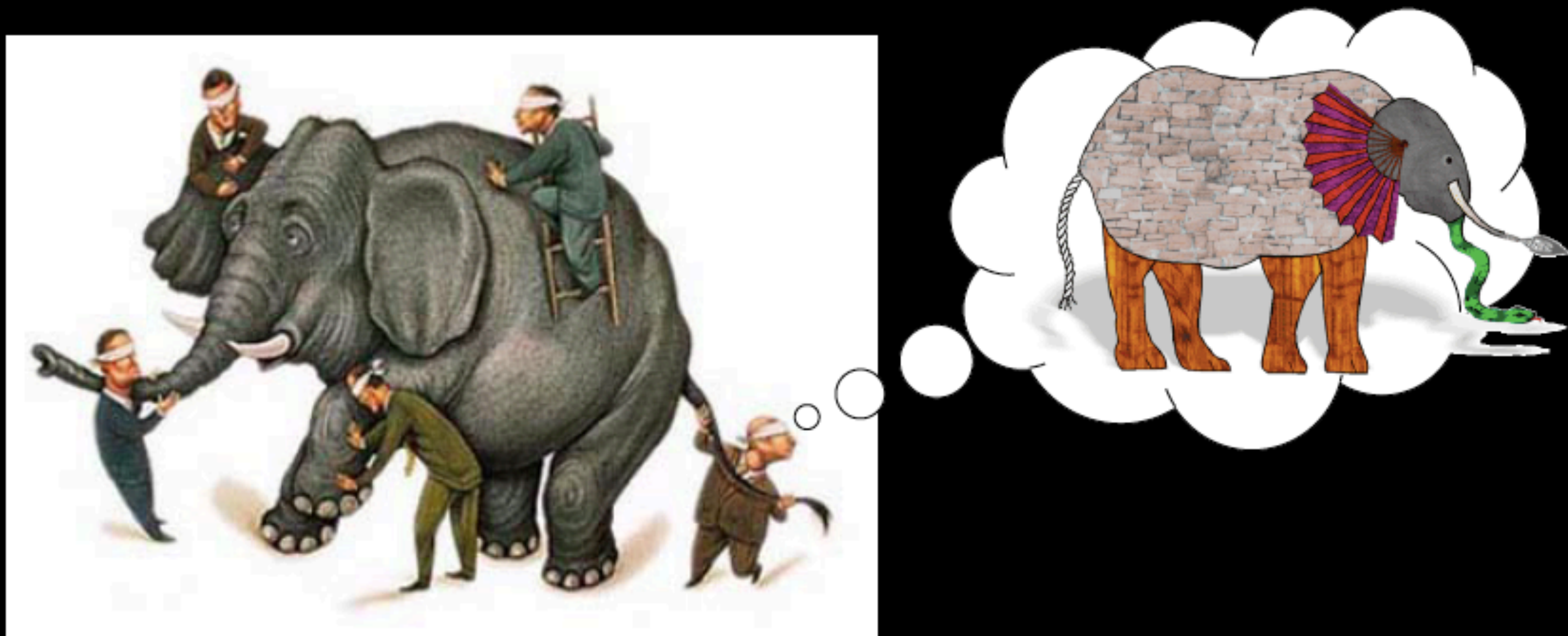
Why is Dark Energy (cause of acceleration) so important?



- Its 70% of the Universe and we don't understand it!
- It will determine the fate (origin) of the Universe
- Touches the central pillars of modern physics (QM, GR, String) It's a clue and embarrassment, 10^{120}). It is likely to lead to something interesting…

http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/riess-lecture_slides.pdf