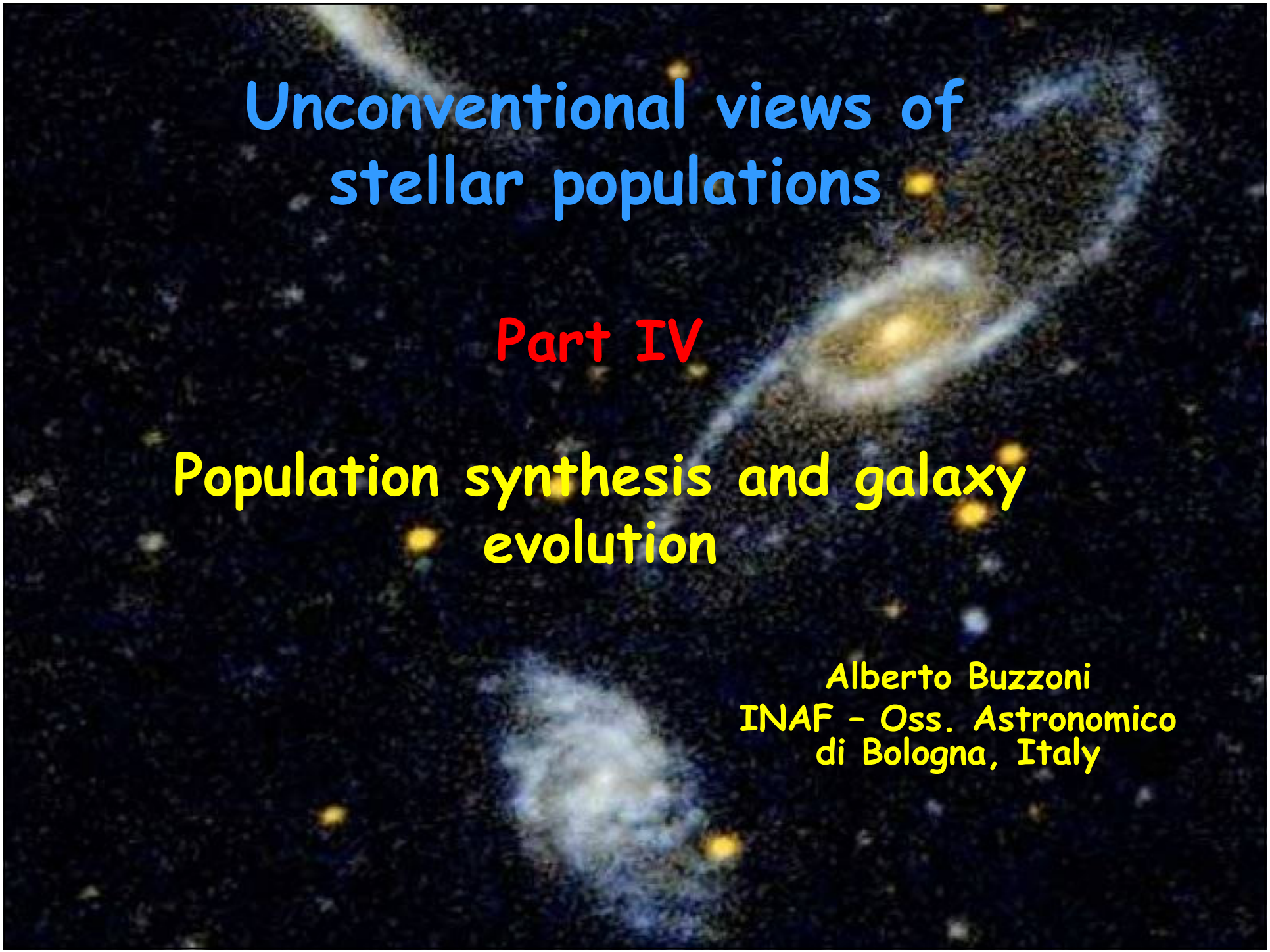
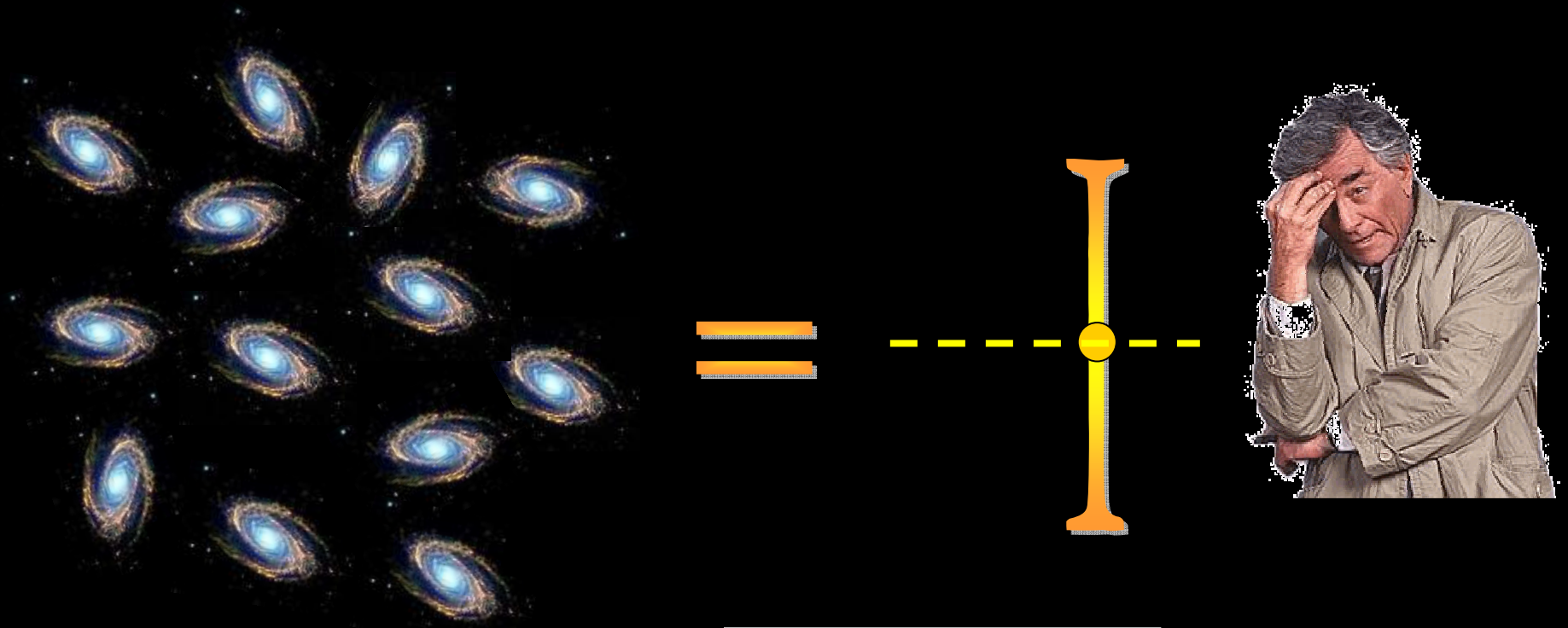

Unconventional views of stellar populations
Part IV
Population synthesis and galaxy evolution
Alberto Buzzoni
INAF – Oss. Astronomico di Bologna, Italy

Much is good... (?)



620 extragalactic nebulae

Abstract. There are three main sections to the present discussion. Part I contains redshifts of 620 extragalactic nebulae observed at Mount Wilson and Palomar. Included in these data are redshifts for 26 clusters of nebulae. Part II contains redshifts for 300 nebulae observed at Lick, together with a comparison of results for 114 nebulae in common with the Mount Wilson-Palomar lists. Part III is a discussion of these new redshift data in combination with photometric data.

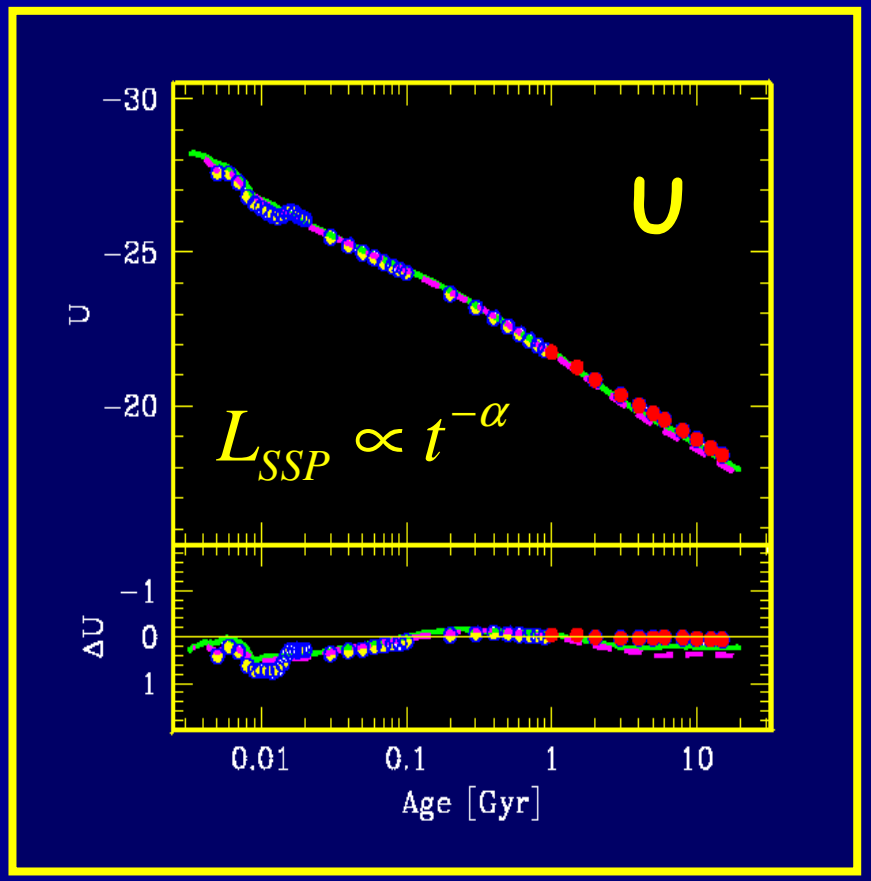
Humason, Mayall & Sandage (1956)

358,046 objects

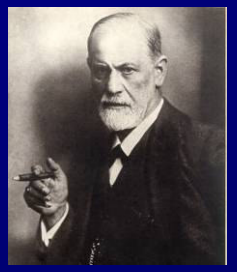
ABSTRACT

We have matched 358,046 objects in 1[illegible] deg^2 of overlap between the *Galaxy Evolution Explorer* (*GALEX*) and the Sloan Digital Sky Survey (SDSS). This Letter provides matching statistics at Medium Imaging Survey

Seibert + 26 co-authors (2005)



Short-term vs. Long-term memory



$L_U \propto t^{-1.1}$

$L_B \propto t^{-0.95}$

$L_V \propto t^{-0.85}$

$L_K \propto t^{-0.72}$

Short α>1

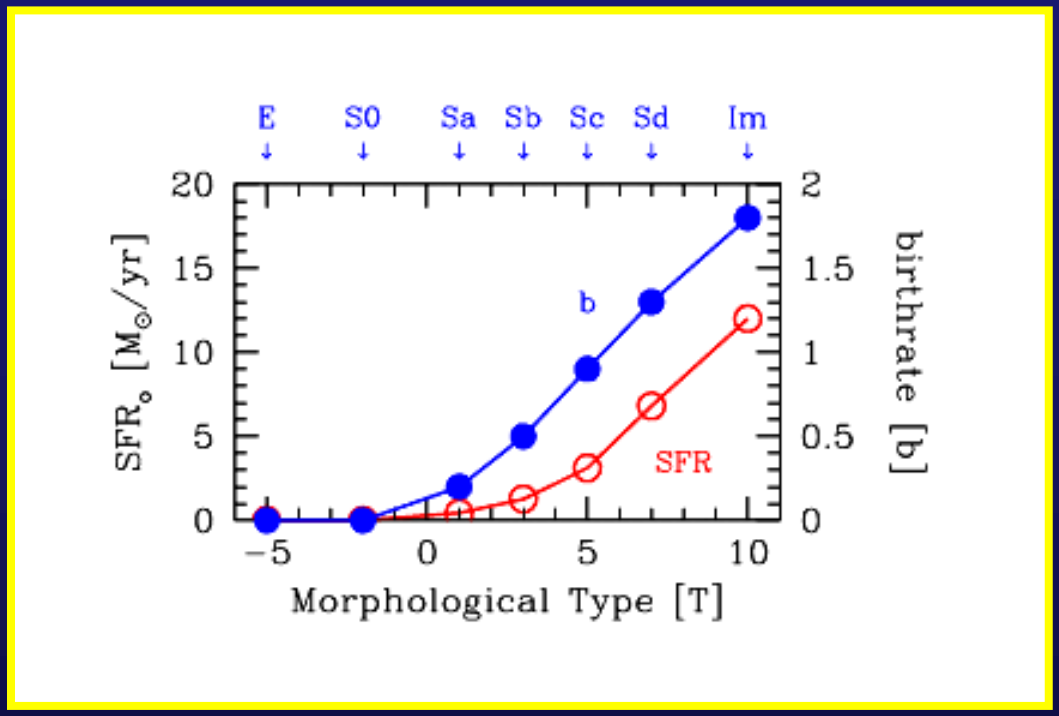
Long α<1

- Buzzoni (2005)
- Bressan et al. (1994)
- Bruzual & Charlot (2003)
- Leitherer et al. (1999)

$$L_{CSP}(t) = \int_{t\,\min}^{t} L_{SSP}(\tau) SFR(\tau - t) d\tau$$

$$L_{DISK} \propto [t^{(1-\alpha)} - t_{\min}^{(1-\alpha)}]$$

Constraining current and past SFR



$$b = \frac{SFR_o}{\langle SFR \rangle}$$

Buzzoni (2002)

Schmidt's vs. Levy's Laws

$$b(t) = \frac{SFR(t)}{\langle SFR \rangle}$$

Schmidt (n=1)

The car "feels" the gasoline level in the tank and decelerate accordingly

$$SFR \propto e^{-t/\tau}$$

$$b(t) = \frac{t}{\tau\left(e^{t/\tau} - 1\right)} \Rightarrow 0$$

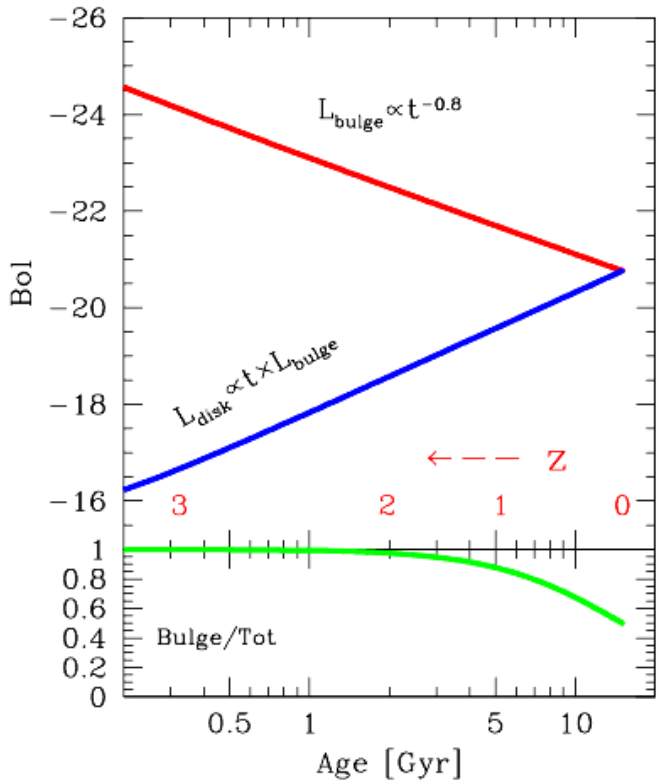
Levy

The car proceeds steady with the same (distinctive) power

$$SFR = Ct^{-\eta}$$

$$b = (1 - \eta)$$

Bulge vs. Disk evolution



Bulge

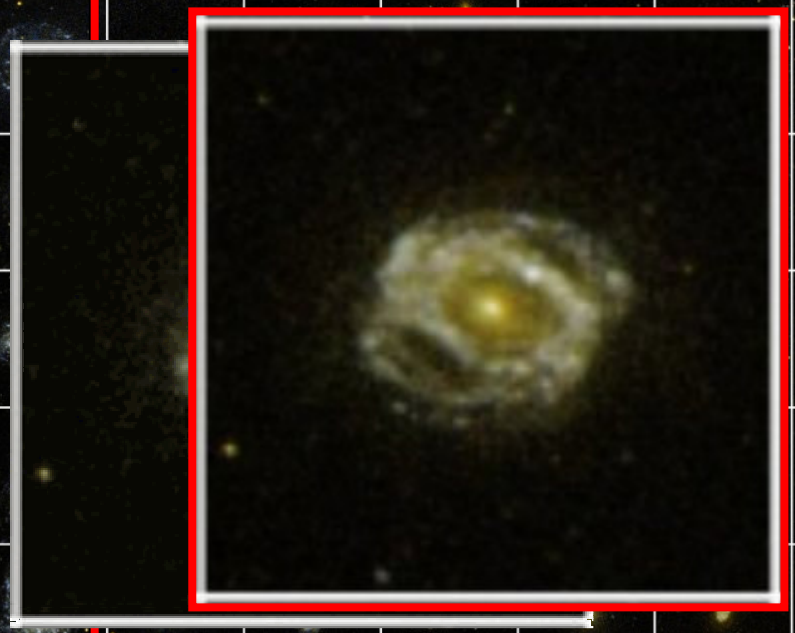
$$L_{SSP} \propto t^{-\alpha}$$

Disk

$$L_{CSP}(t) \propto \int_0^t \tau^{-\alpha} d\tau \Rightarrow t^{1-\alpha}$$

One, two, three... zone models

One–zone models $SFR_{gal} \propto e^{(-t/\tau)}$



Two-zone models: Bulge+Disk

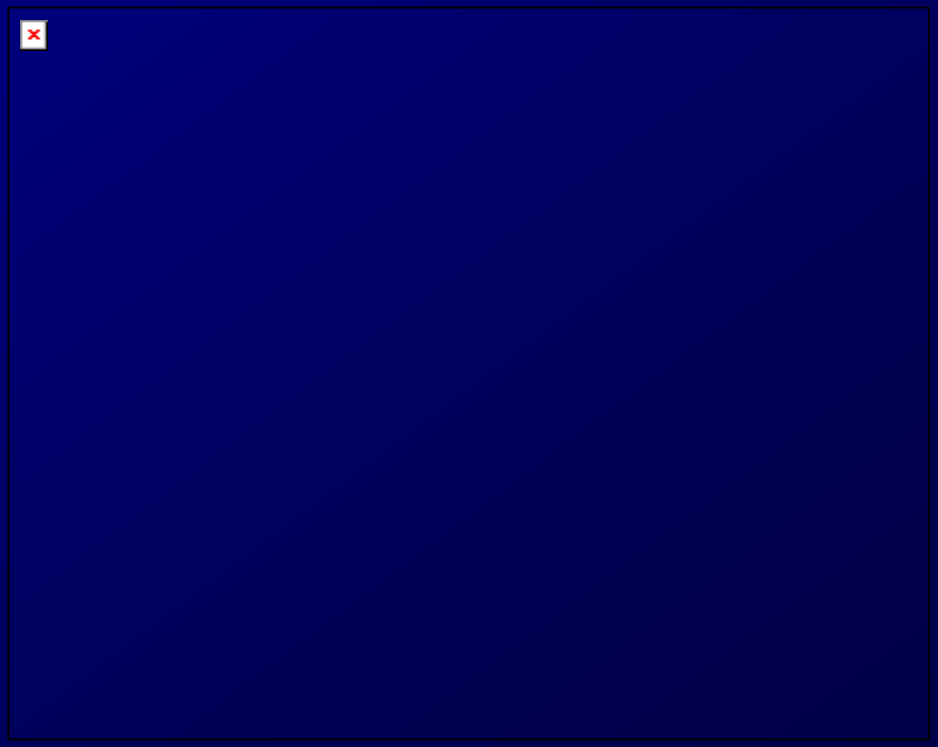
$Bulge_{SSP}$ + $SFR_{DISK} \approx t^{-0.5}$
(Buzzoni 2005)

Bulge vs. Disk evolution
(more spiky galx's @ high z!!)

Morphological evolution conspires against the detection of (quiet) grand-design spirals (Sb-Sc) at high z

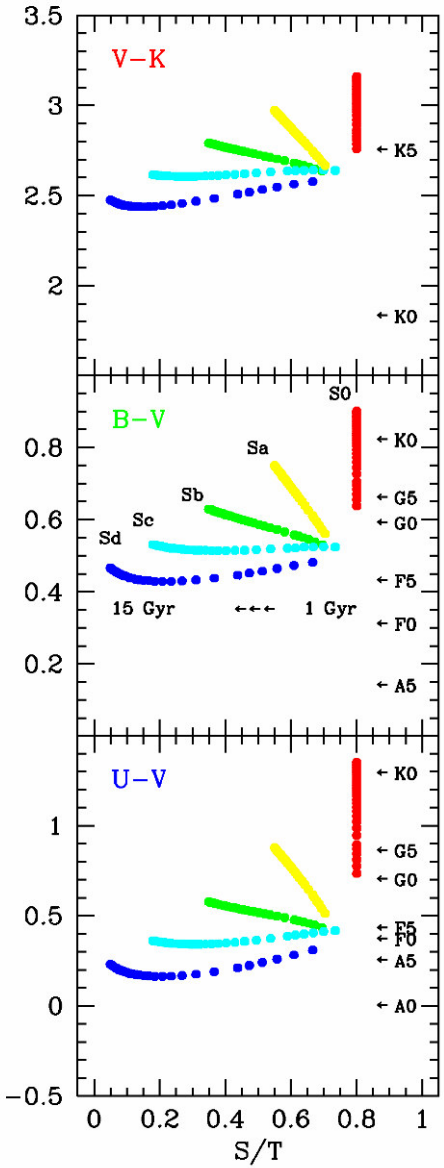
Red-Bolometric

Ultraviolet

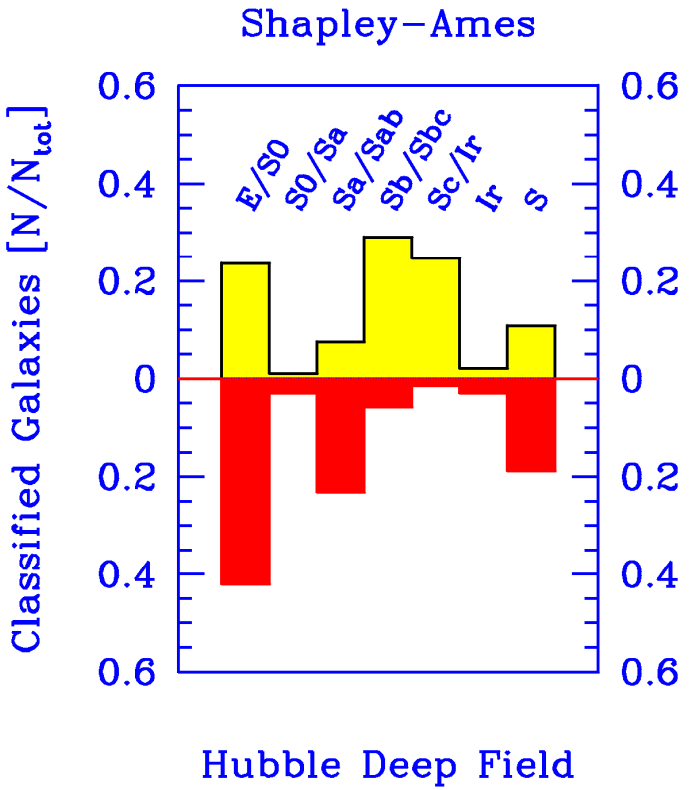


$$S/T = \frac{\text{Spheroid}}{\text{Total}}$$

Biased morphologies



Buzzoni (1998)



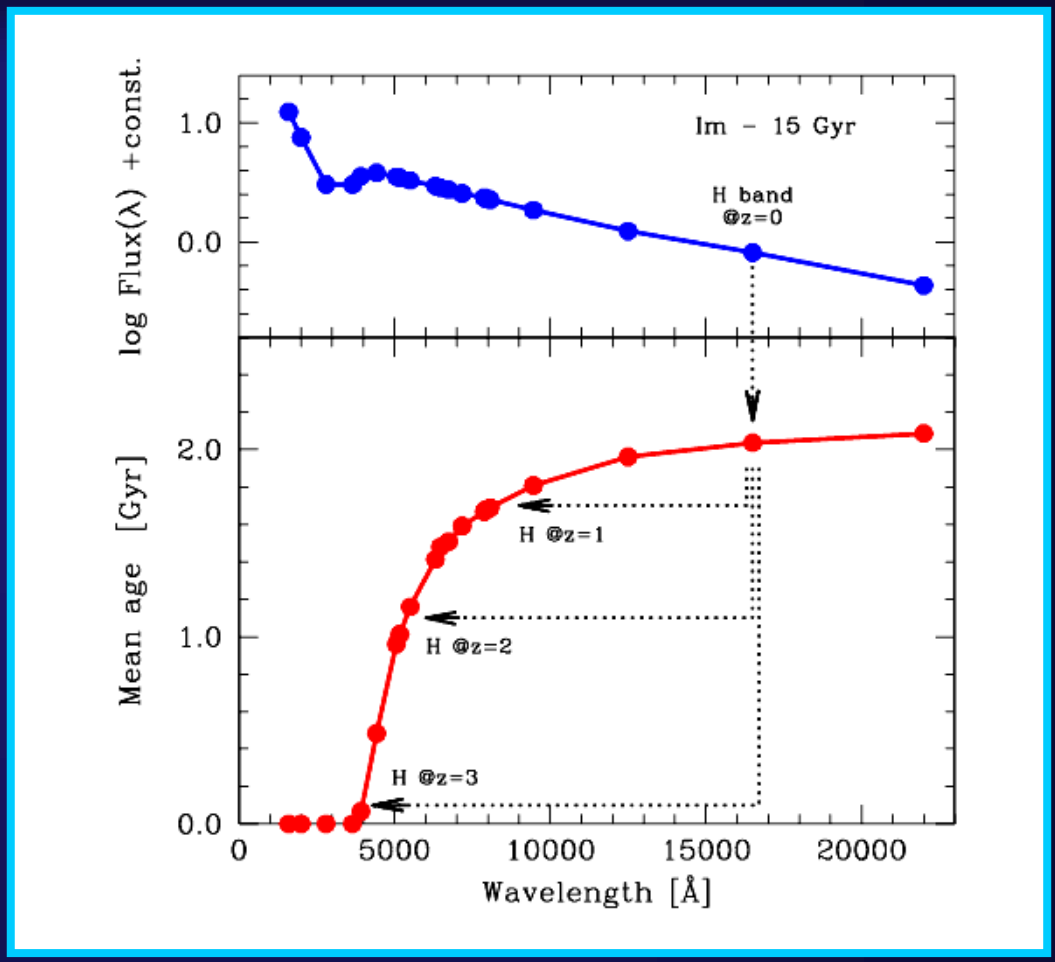
van den Bergh et al. (1996)

Age bias vs. Redshift

$$L_{SSP} \propto t^{-\alpha}$$

$$SFR(t) \propto t^{-\eta}$$

$$\bar{t}_* = \frac{\int_0^t \tau\, L_{\rm SSP}(\tau) SFR(t-\tau)\, d\tau}{L_{\rm tot}(t)}.$$



$$\bar{t}_* = \frac{\int_0^t \tau^{1-\alpha}\,(t-\tau)^{-\eta}\, d\tau}{\int_0^t \tau^{-\alpha}\,(t-\tau)^{-\eta}\, d\tau} = \frac{1-\alpha}{2-\alpha-\eta}\, t.$$

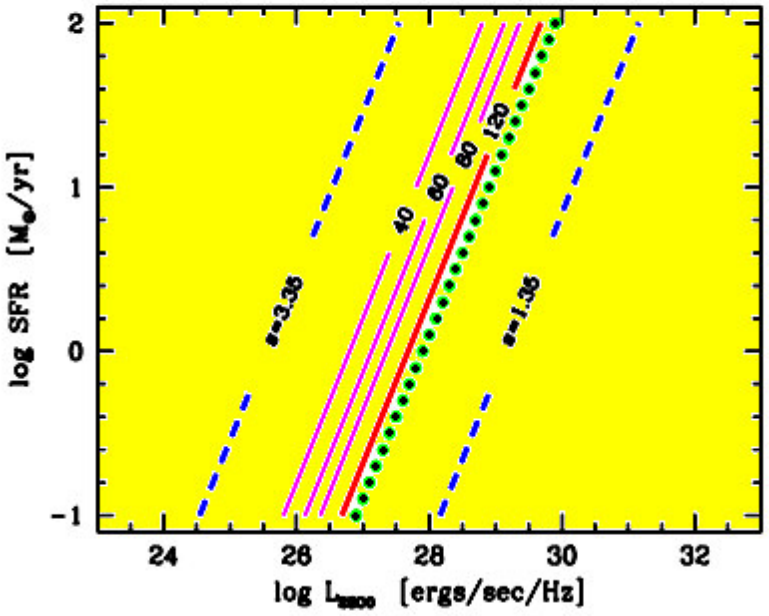
$$\bar{t}_* \approx 0.2t$$

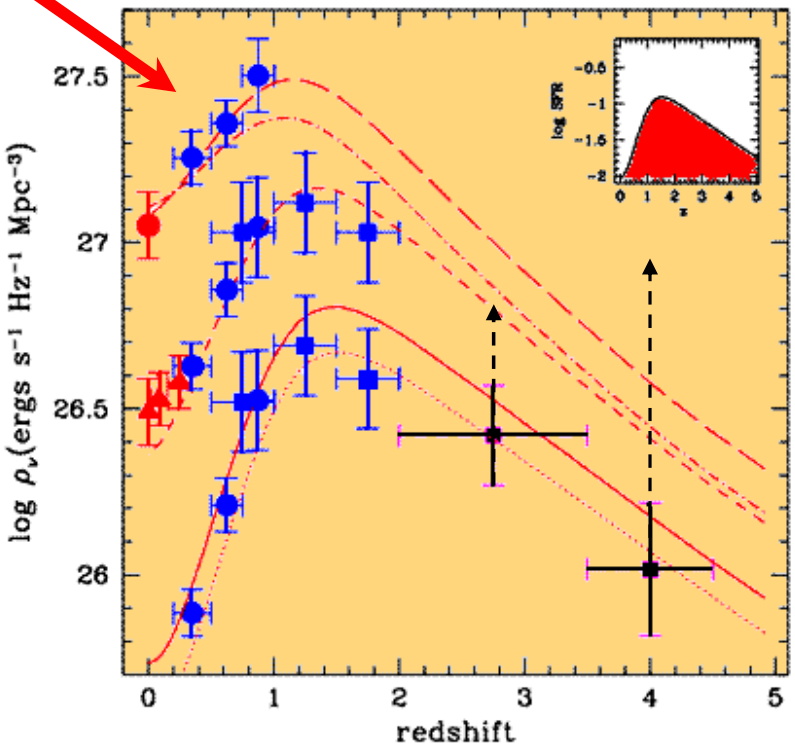
L_{UV} = SFR_o (trading UV photons)

L_{2800} [ergs s^{-1} Hz^{-1}] = 4.78 10^{27} SFR [M/yr]

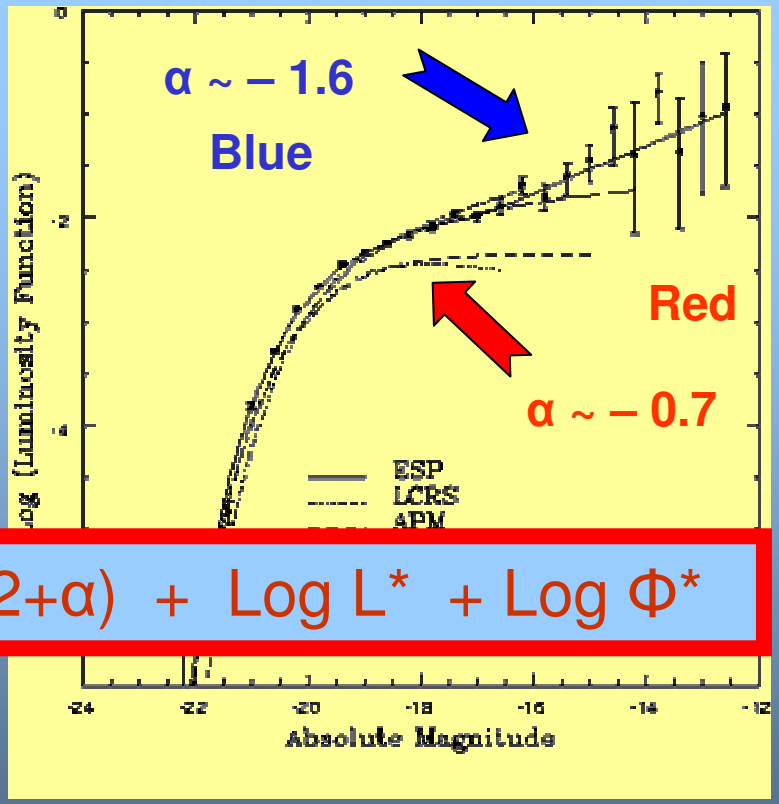
Buzzoni (2002)

Madau et al. (1998)



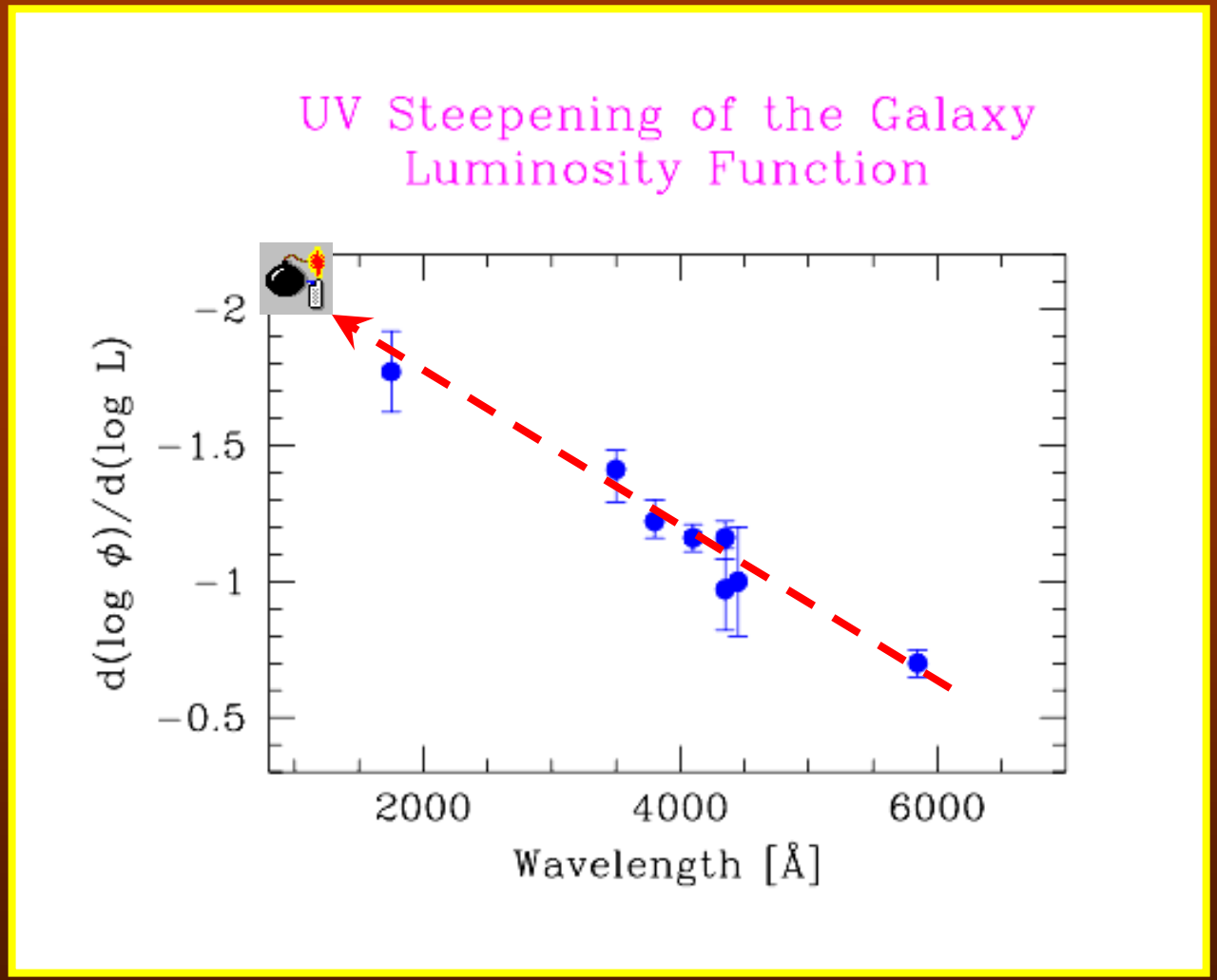


The faint-end tail of galx's luminosity function



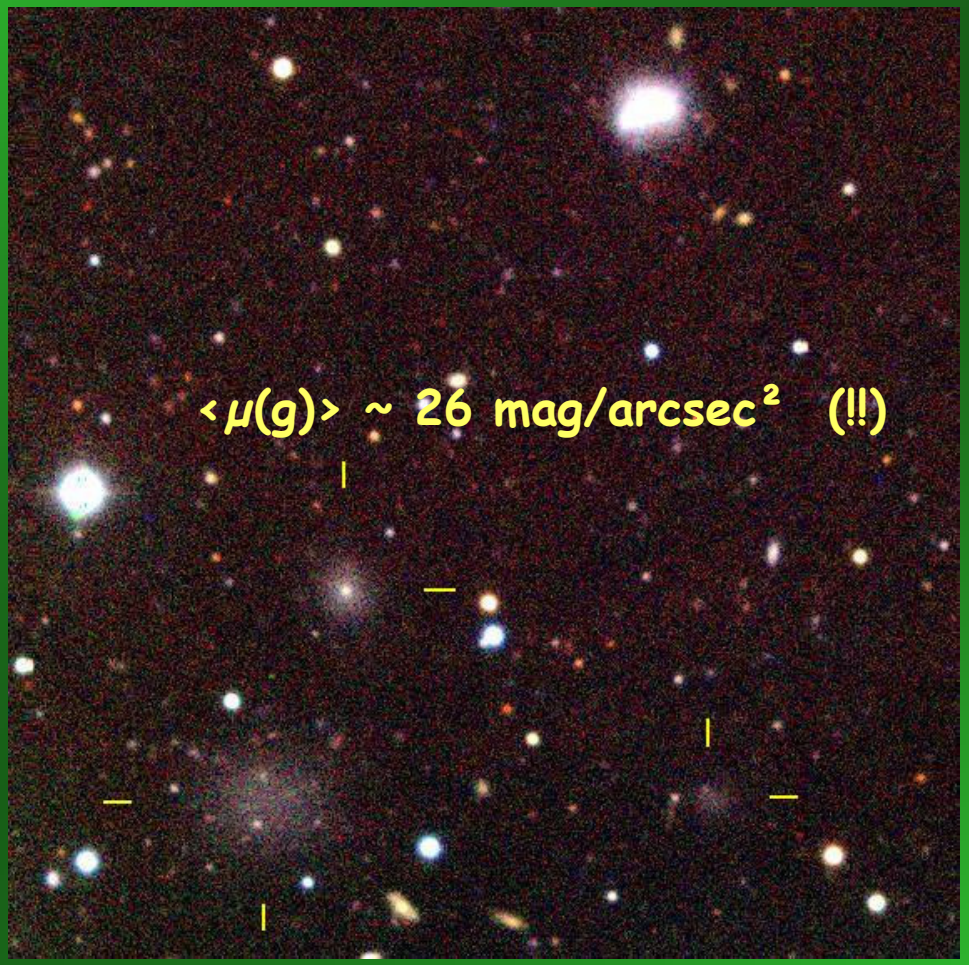
$$\text{Log } \rho = \text{Log } \Gamma(2+\alpha) + \text{Log } L^* + \text{Log } \Phi^*$$

Zucca et al. (1997)



Buzzoni (1998)

Low surface-brightness galaxies



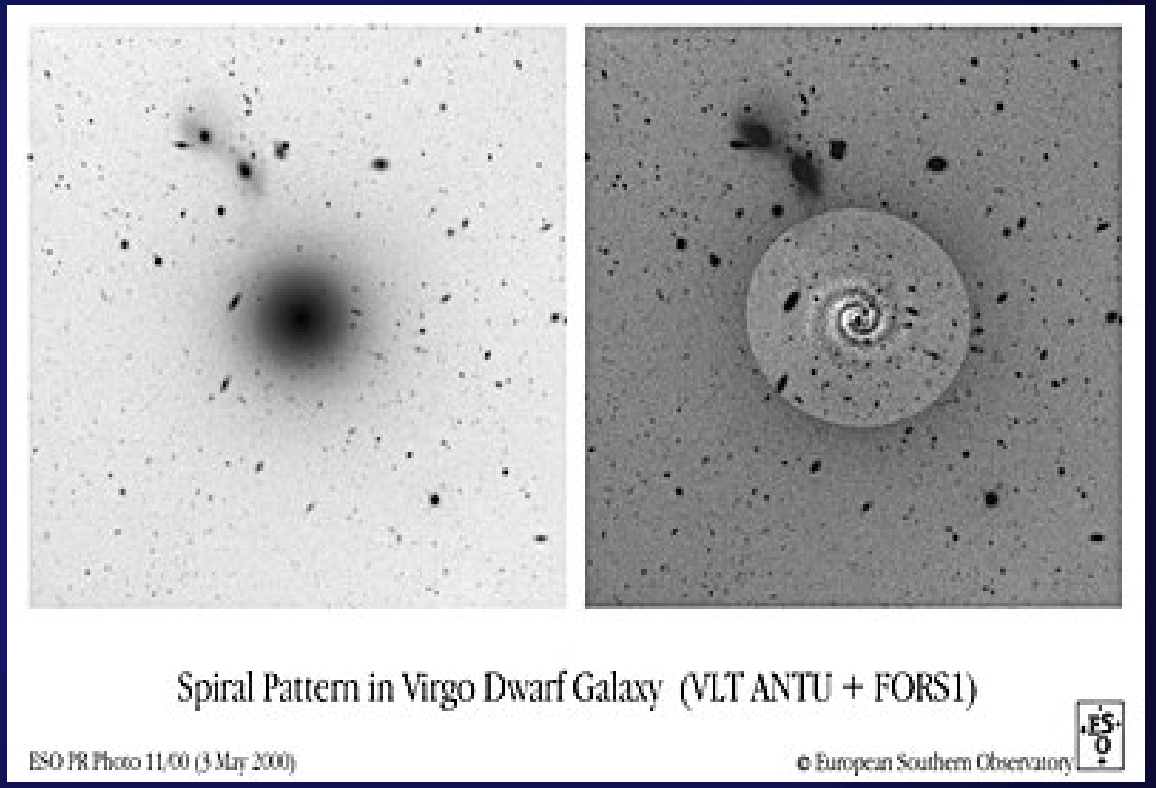
ESO 3.6m
FOSC2 – 4'x4'

"True colors"

Cellone & Buzzoni (2005)

Photometric evidence for disk structure in dwarf ellíptical galaxies

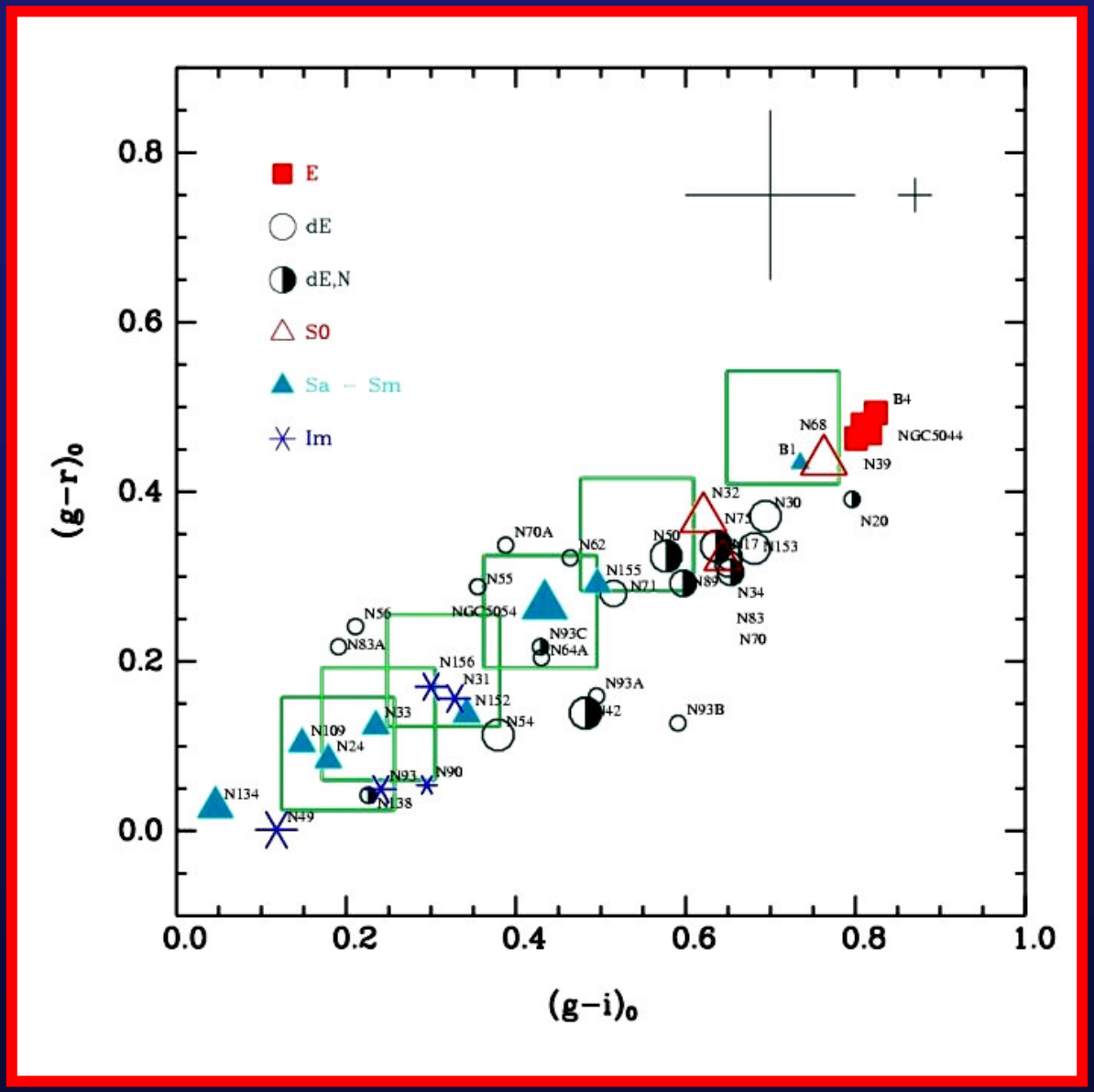
Jerjen et al. 2000, A&A 358, 845



IC 3328 (Virgo Cluster)

M_B = -17.0

The NGC 5044 group



Missing the Sun

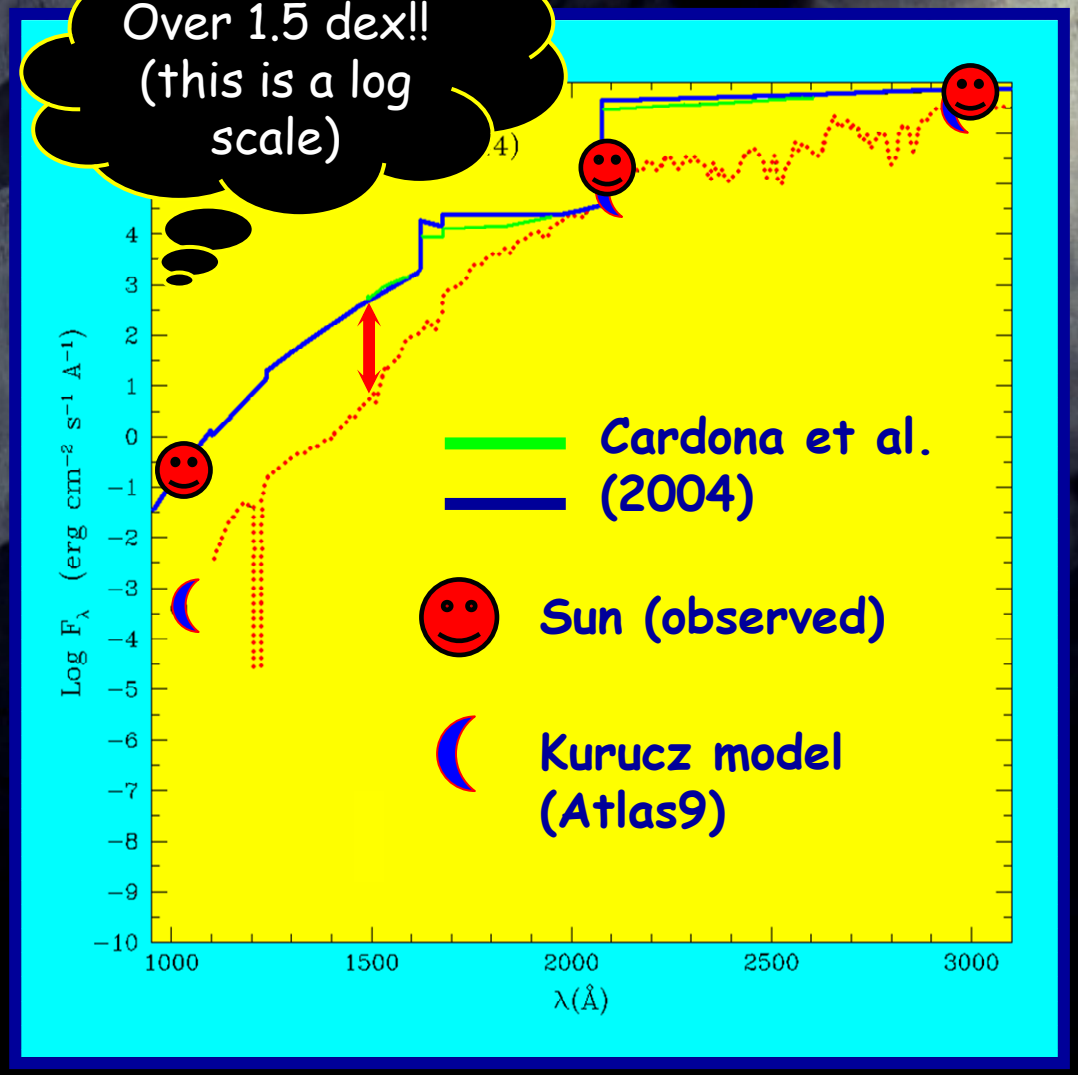


Image credits: Simon Pais @Flickr

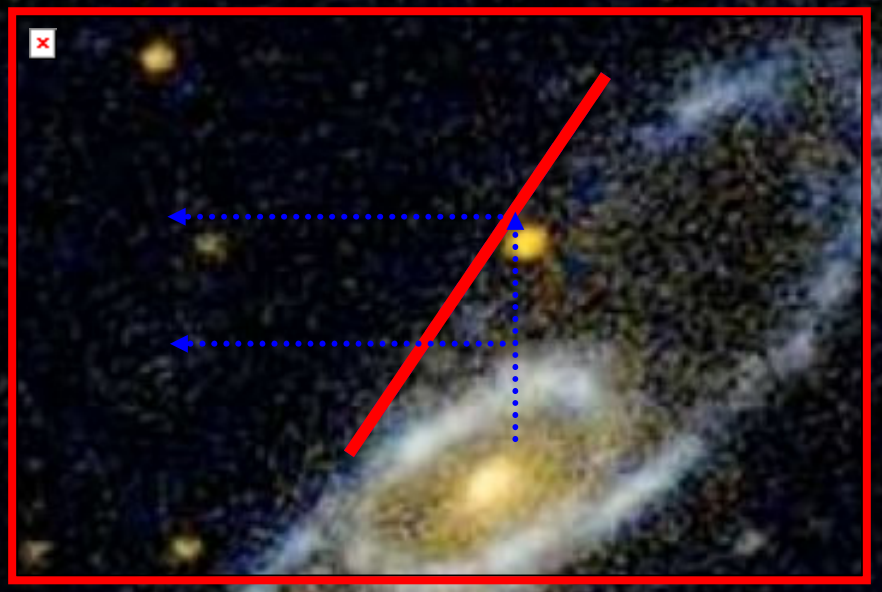
An UV catastrophe?

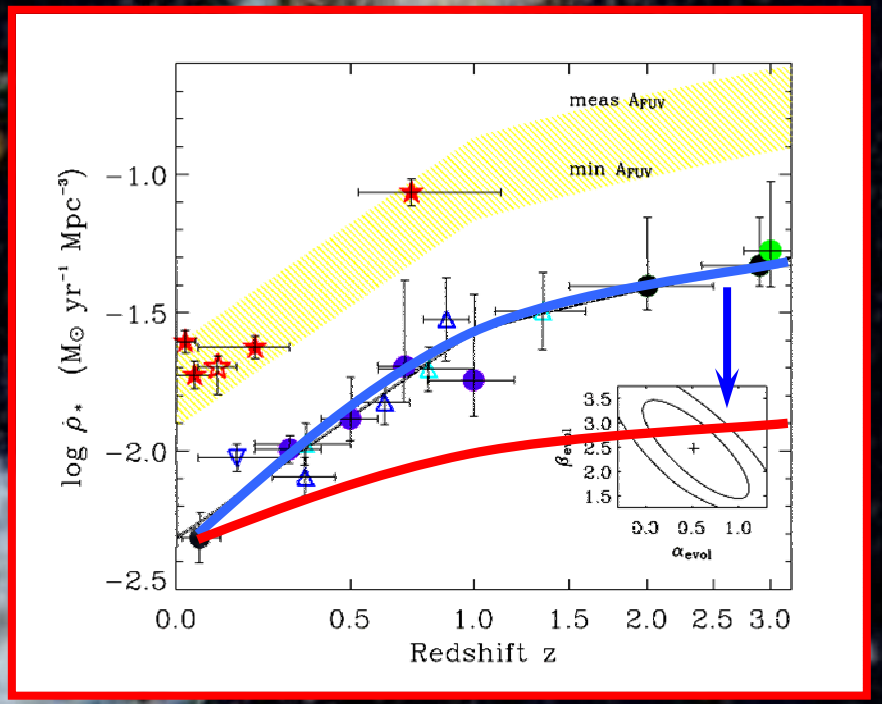
Galaxies might be intrinsically (much) brighter than expected in the FUV

=

1) A lower SFR is implied by the observed UV luminosity @high redshift

2) Luminosity distances might be larger for a given z = higher look-back time = bigger (older?) Universe & lower barionic density





Schiminovich et al. (2005)

The End