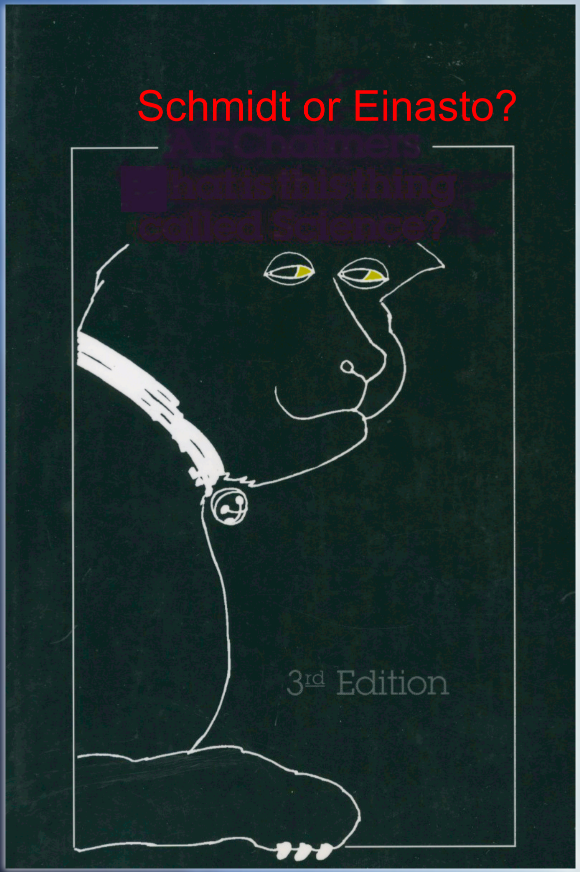
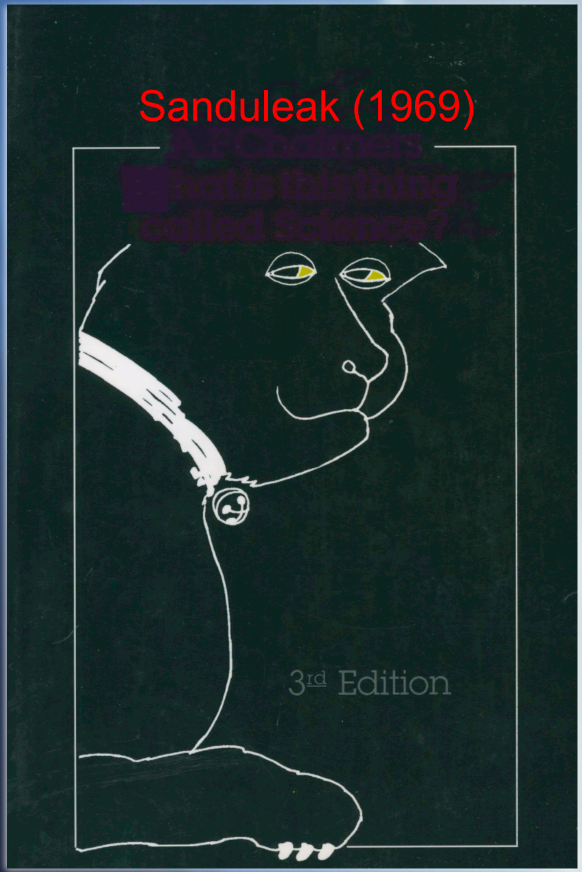


“The Rate of Star Formation”

M. Schmidt vs. J.Einasto

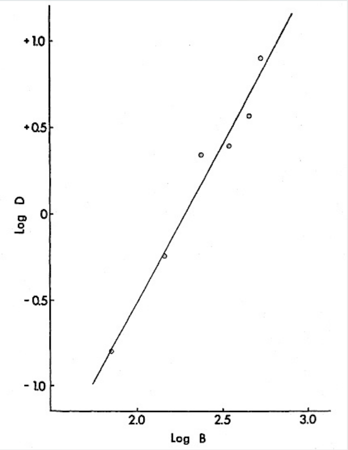


This is what started it all.

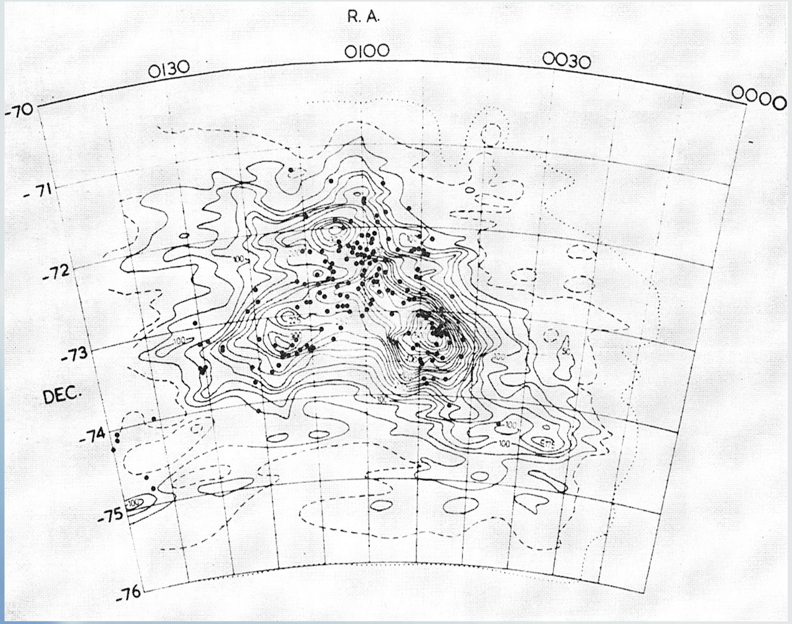
A Neutral Hydrogen map and

170 Individually Resolved

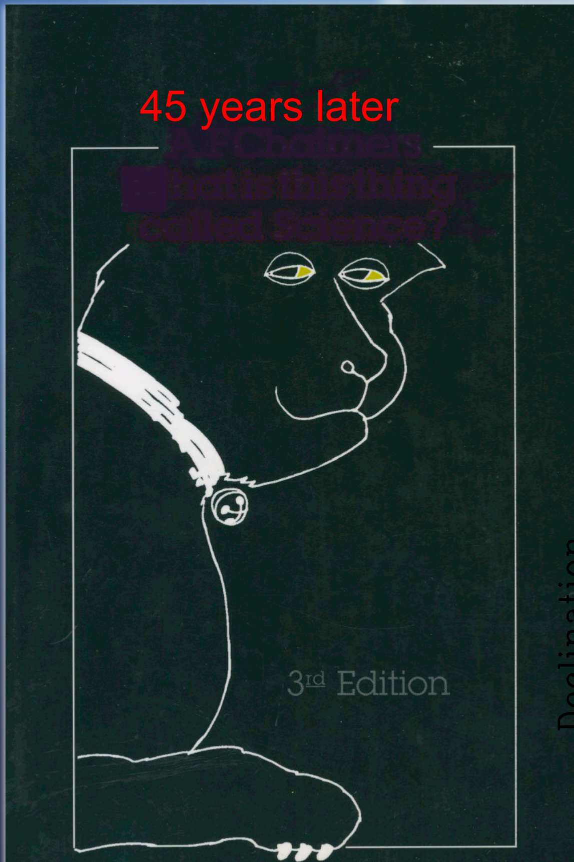
OB Stars in the SMC

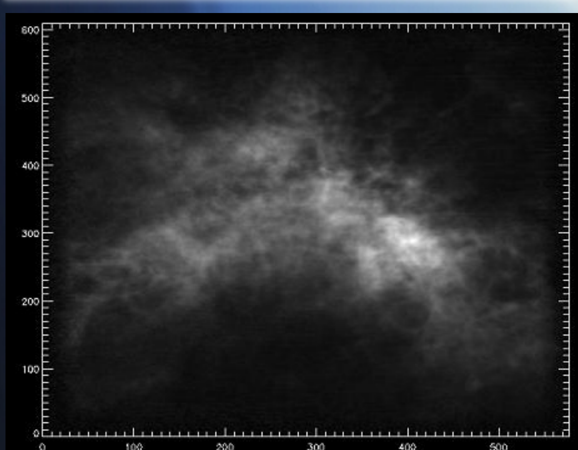


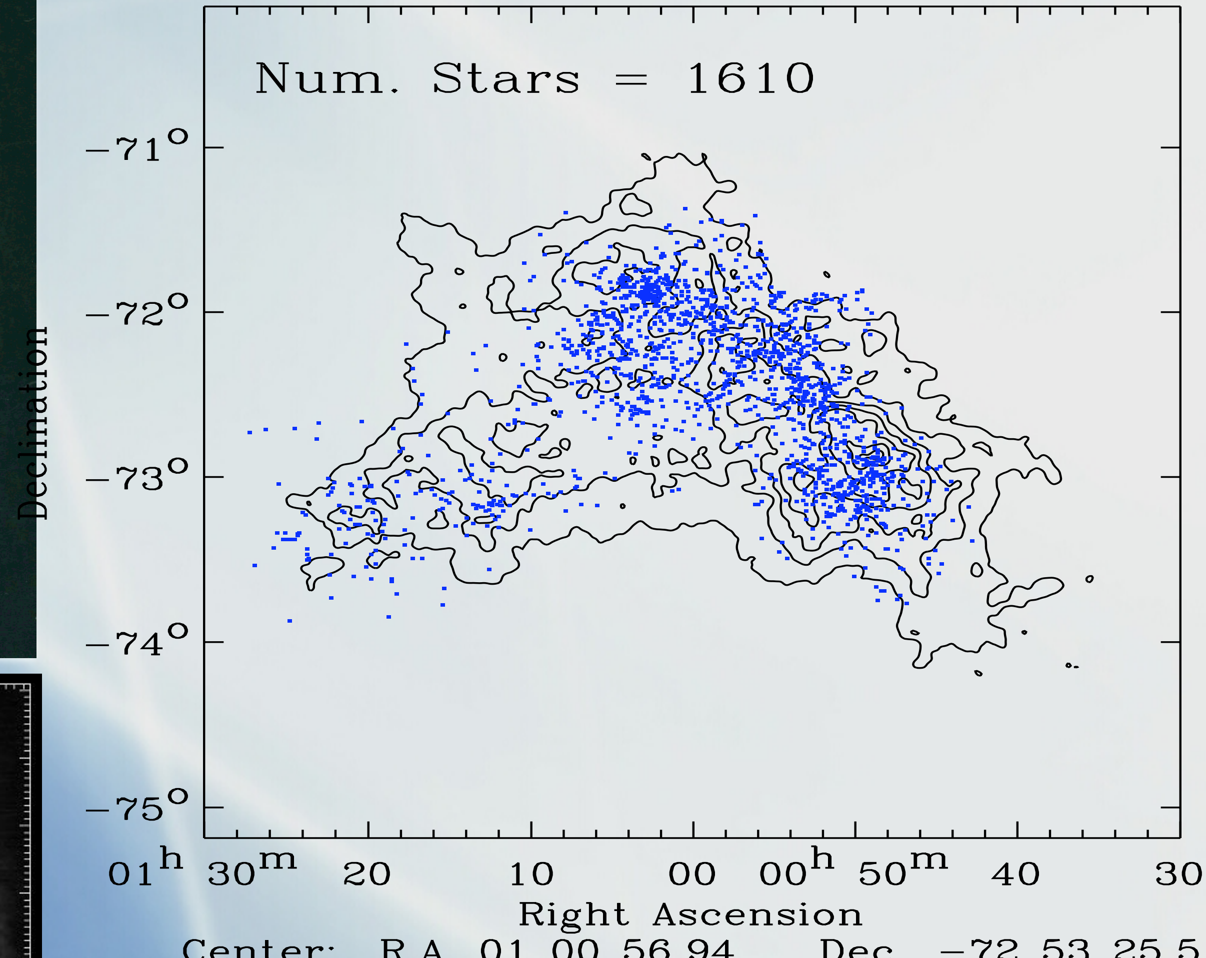
Sanduleak (1969)



Back to the SMC (2011)

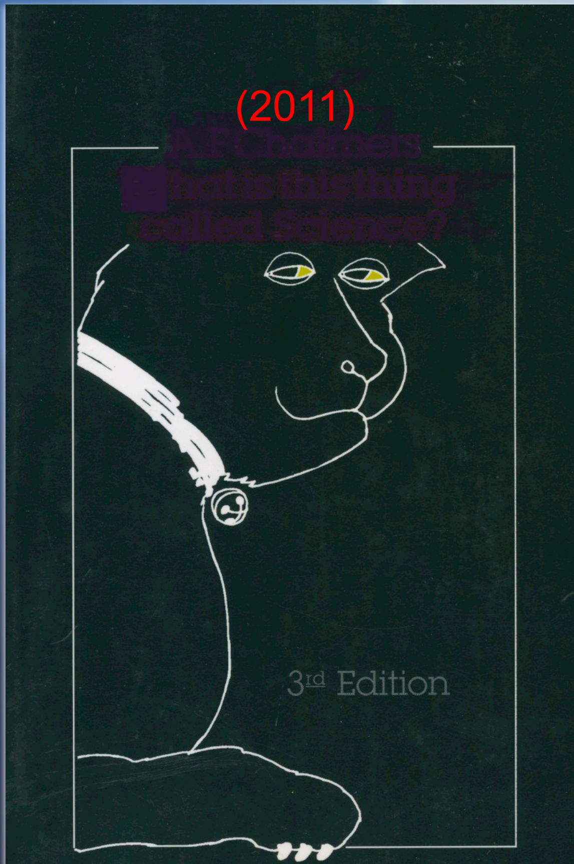




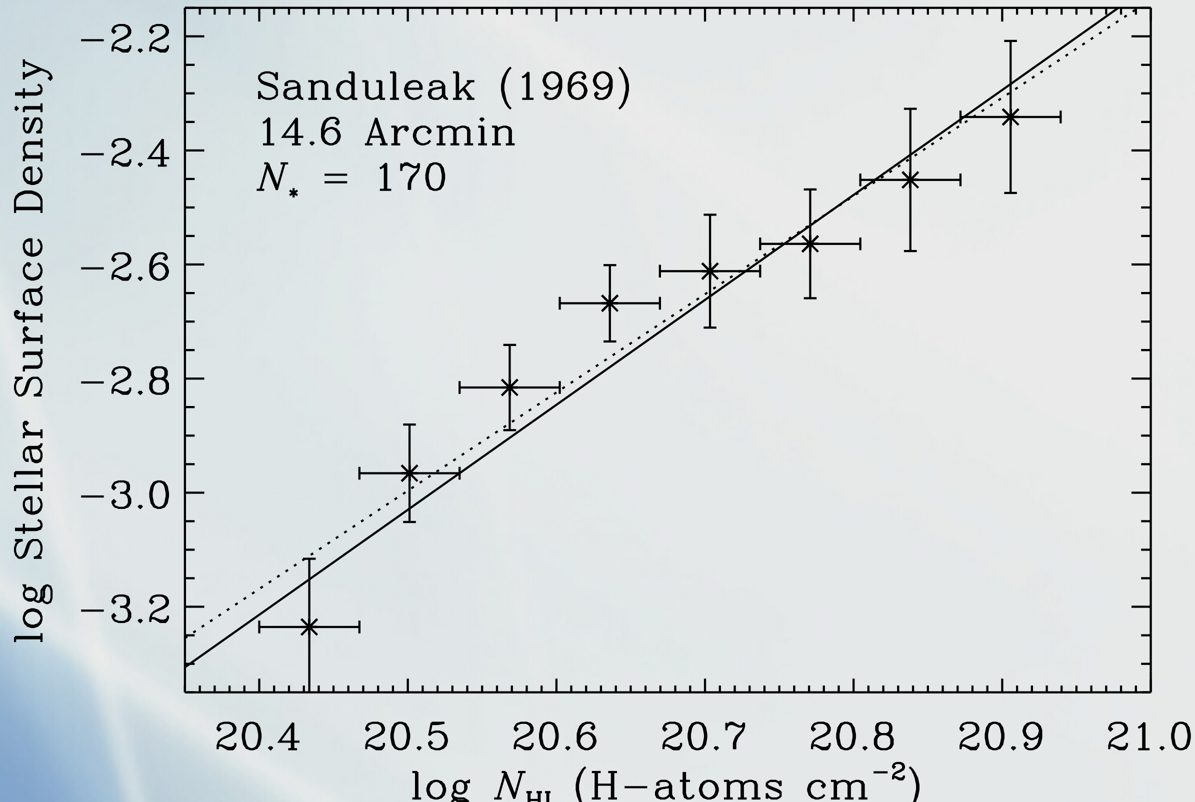


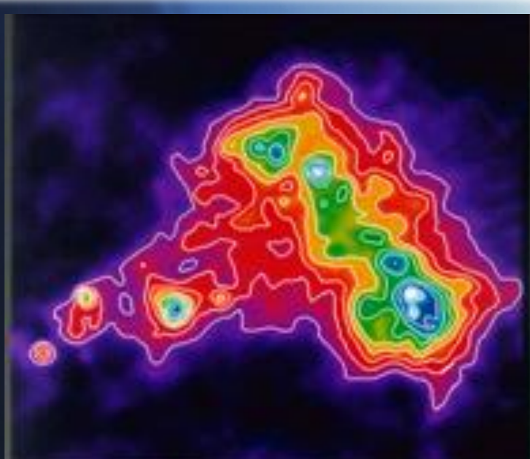
UBVR (85K) Catalog: Massey, P. 2002, ApJS, 141, 81

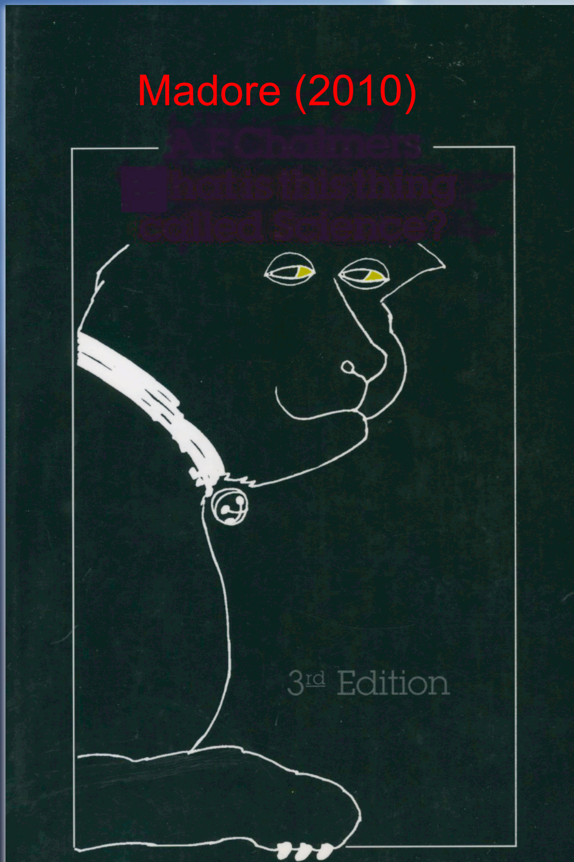
HI Map: Kim et al. 1998, ApJ, 503, 674



Star Formation traced by OB Supergiants







Cloud-Collapse and Star-Formation

Stagnation Timescales

(Madore, B.F., 2010, ApJL, 716, 131)

$$f_{SFR} = \frac{M_*}{\tau} = \frac{\epsilon V \rho_g}{(\tau_* + \tau_c)}$$

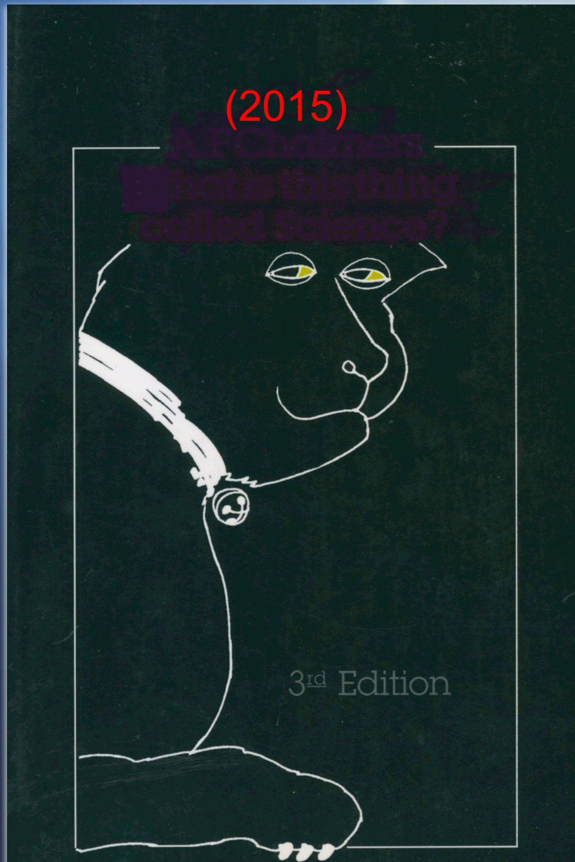
$$= \frac{A\rho_g}{(\tau_* + B(\rho_g/\rho_c)^{-n})}$$

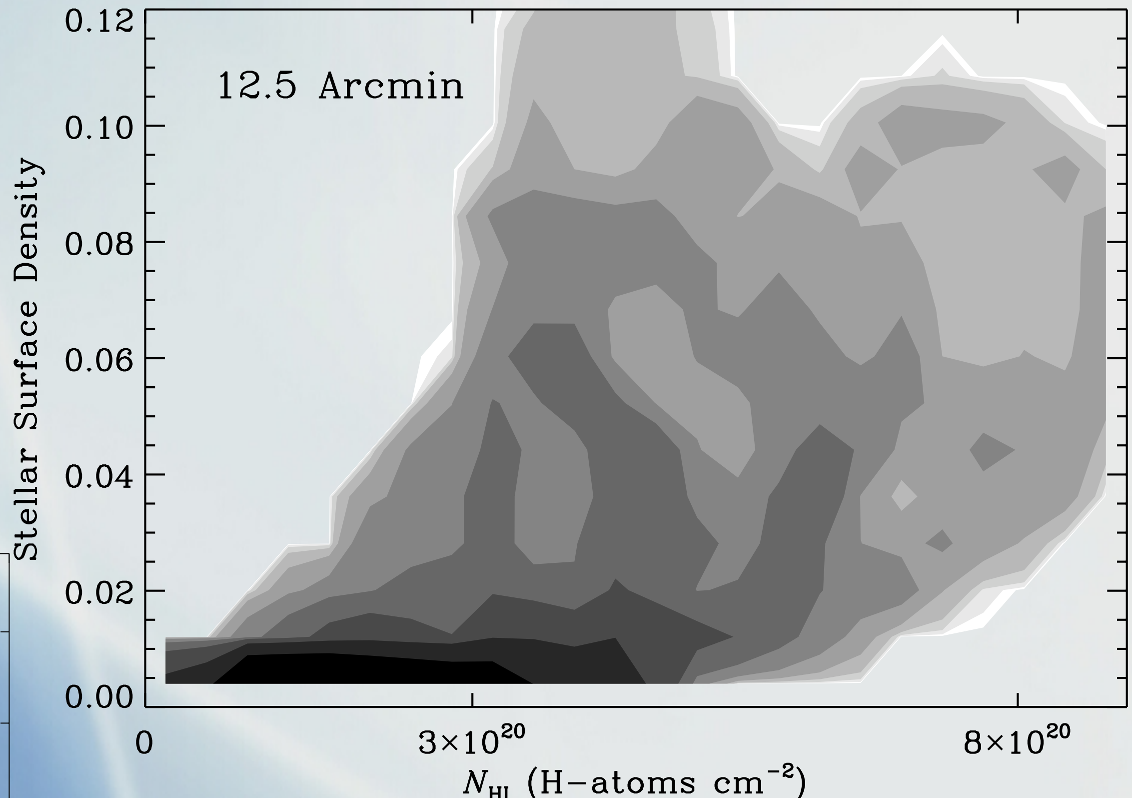
$$= \frac{A\rho_g/\tau_*}{(1 + (B\rho_c^n/\tau_*)\rho_g^{-n})}$$

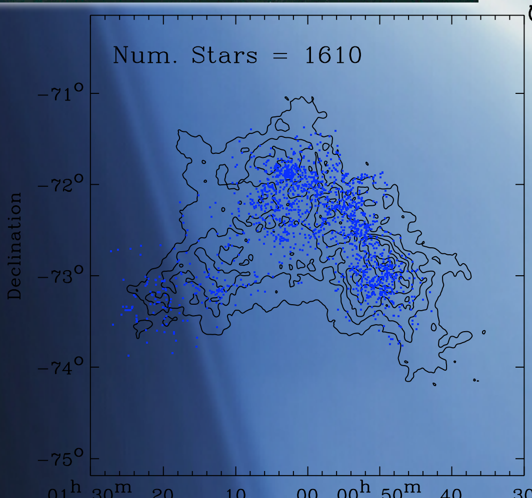
$$= \frac{\alpha\rho_g}{(1 + \beta\rho_g^{-n})} \qquad (1)$$

where $A = \epsilon V$, $\alpha = A/\tau_*$, $\beta = (B\rho_c^n\tau_*)$ and it is assumed that $\tau_c = B(\rho_g/\rho_c)^{-n}$.

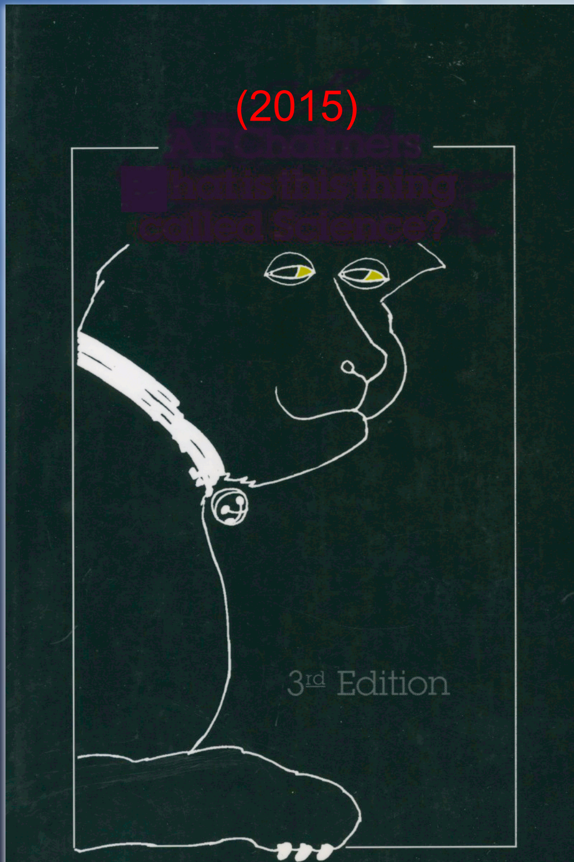
The Hess Diagram for Star Formation

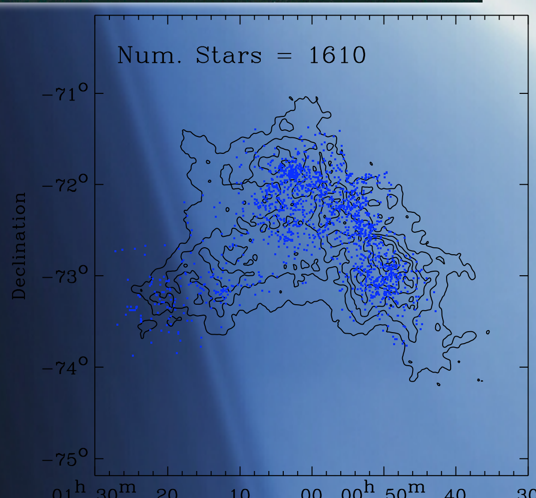


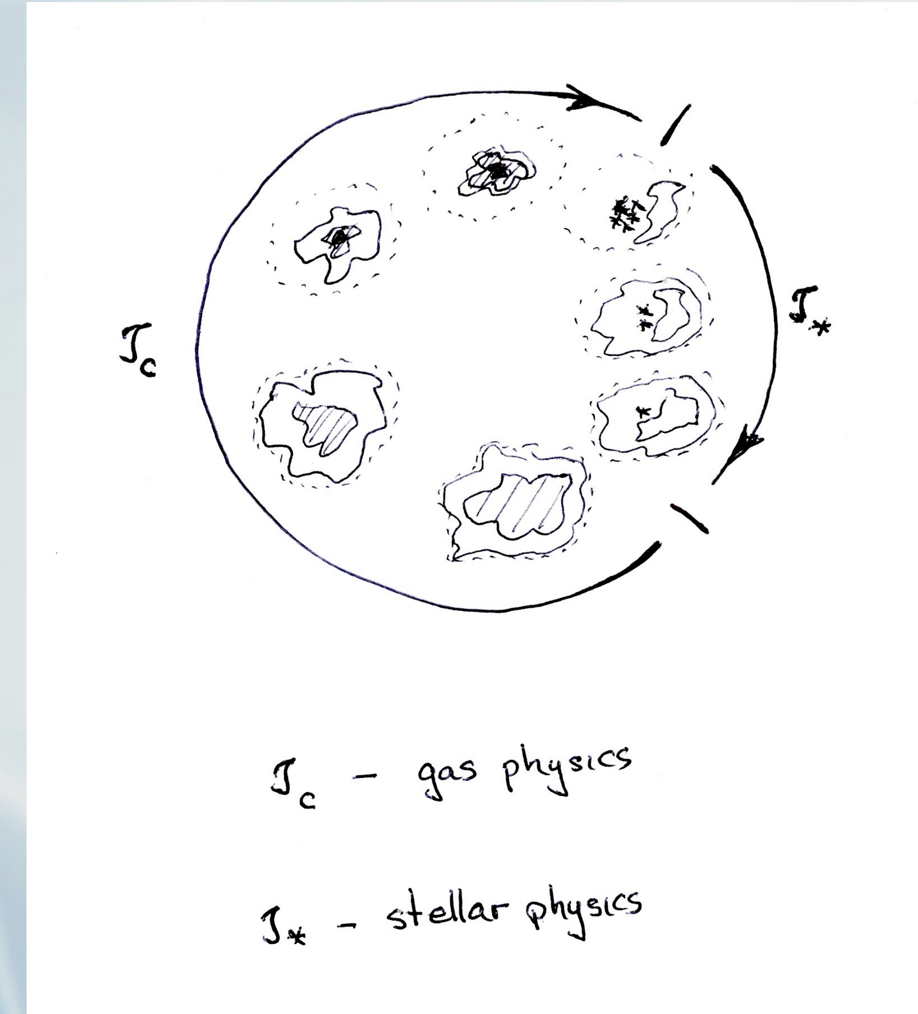




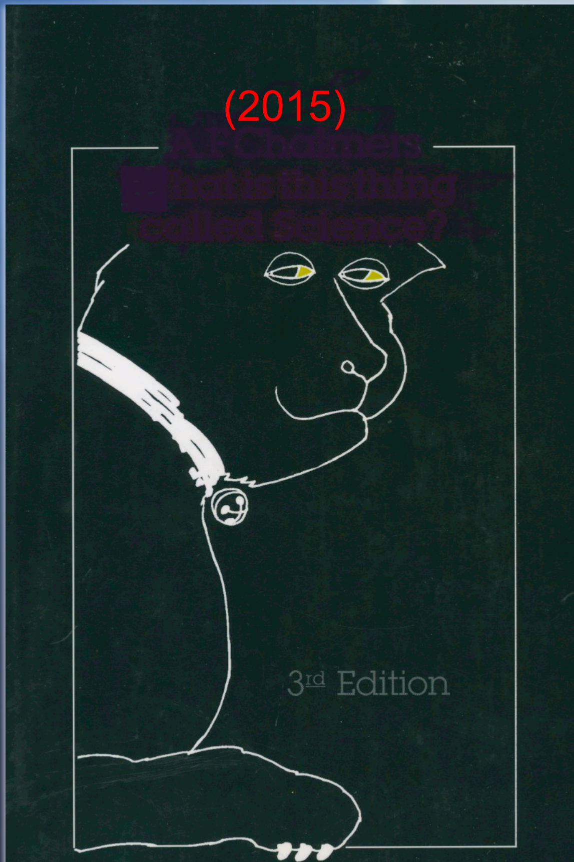
The Cycle of Star Formation

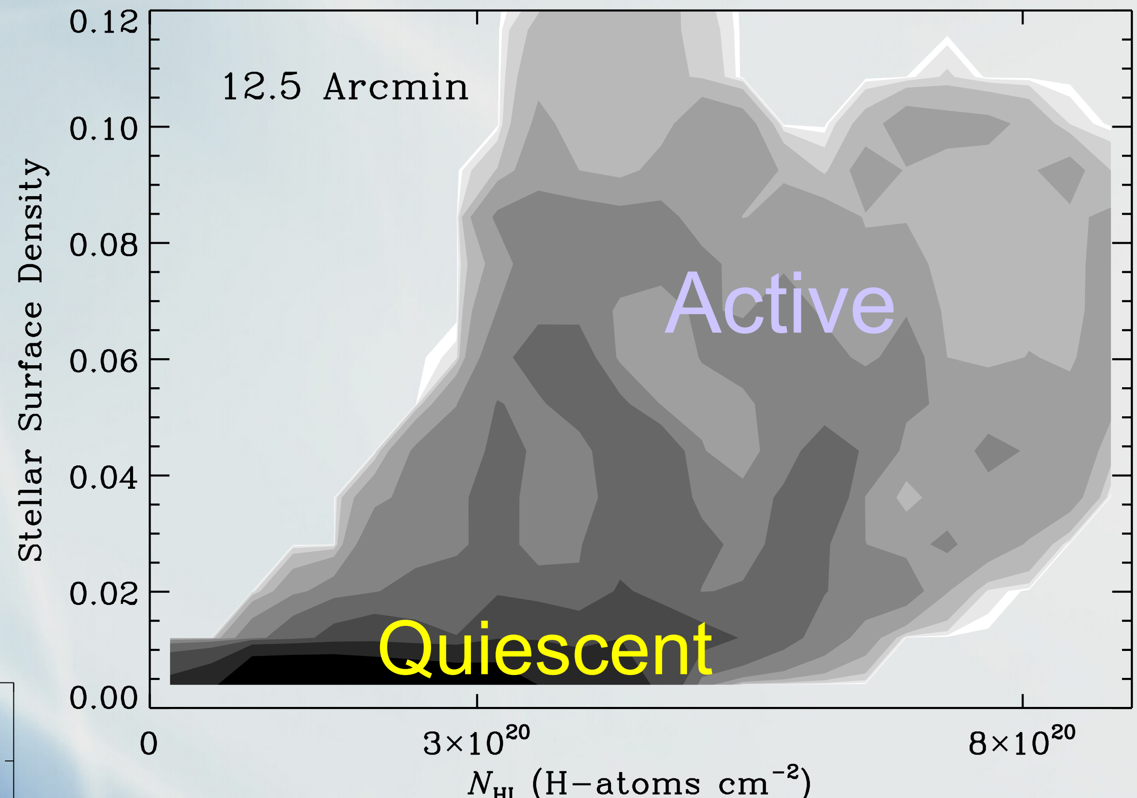


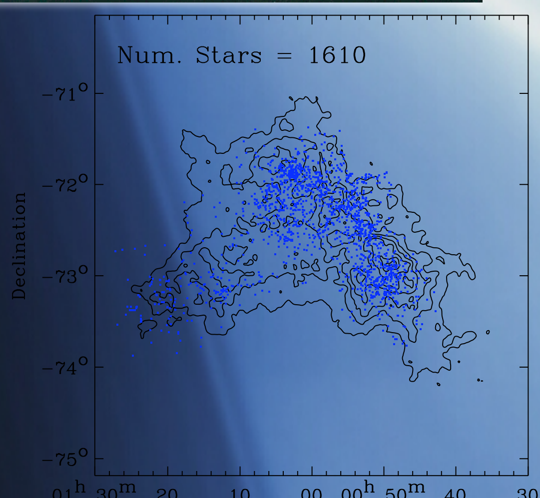


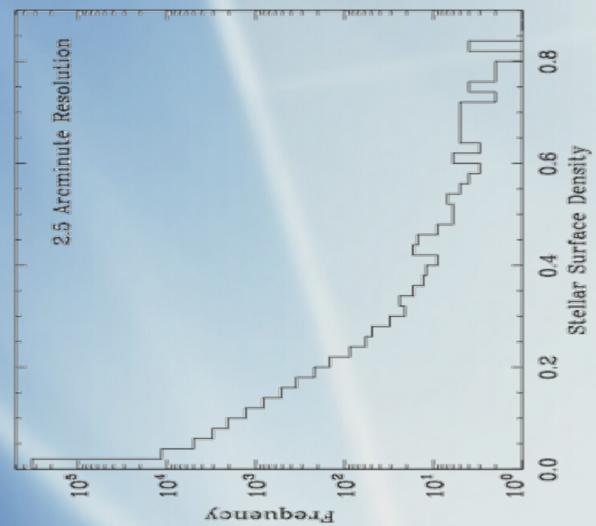


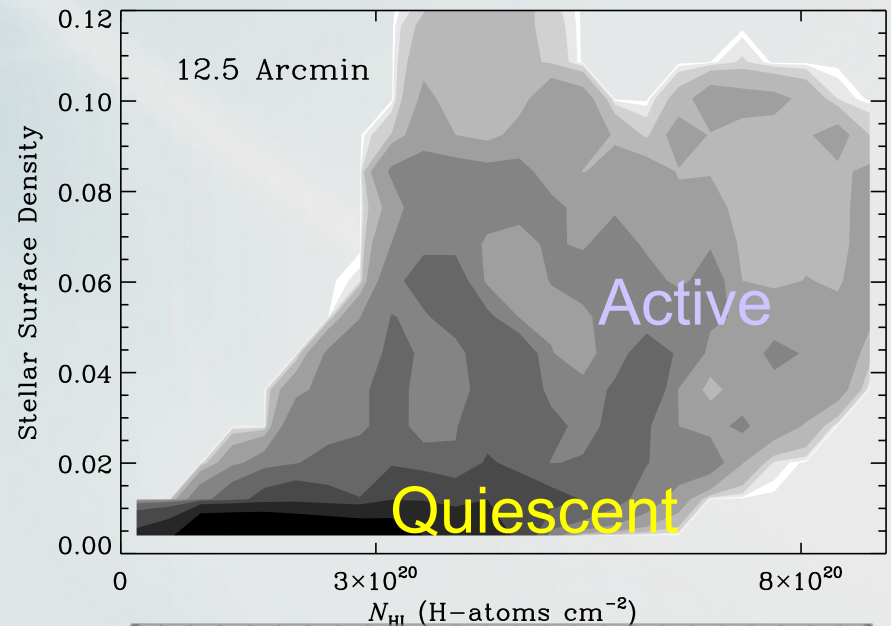
Rate-Limiting States

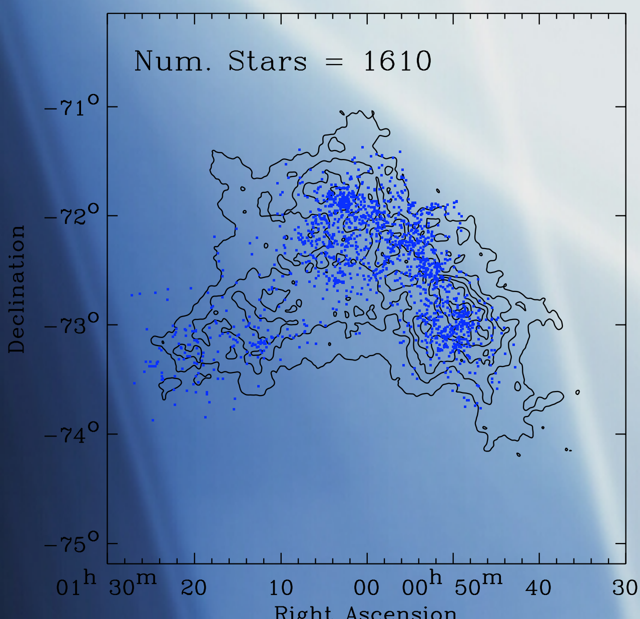


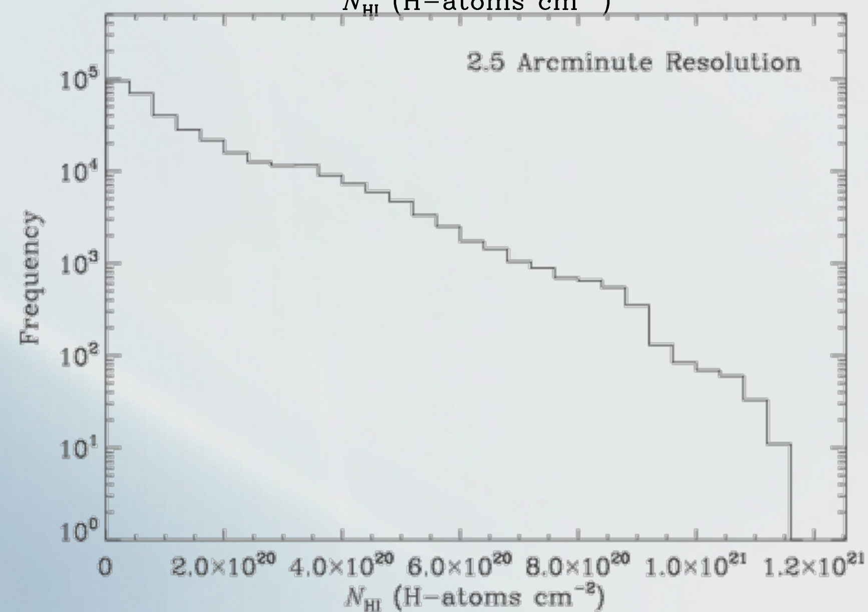


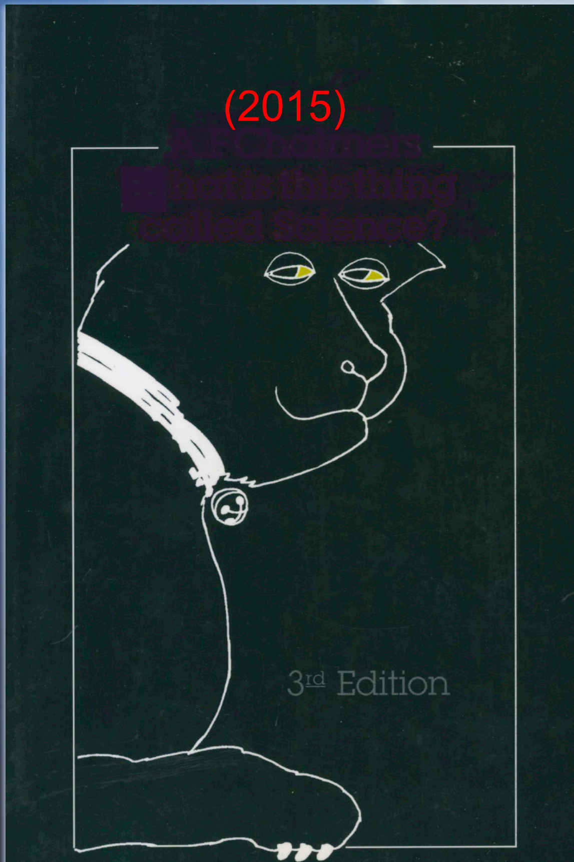


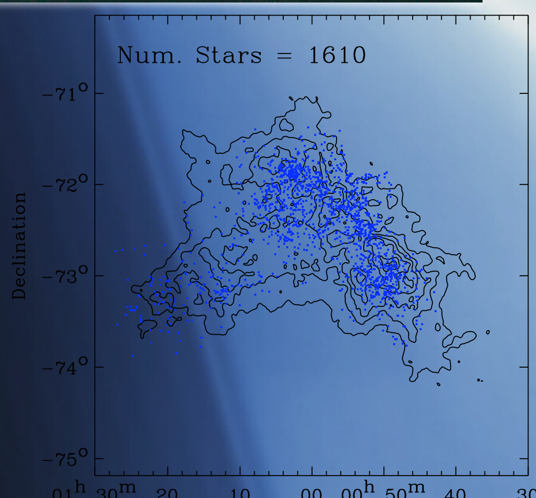

2.5 Arcminute Resolution
Stellar Surface Density
Frequency
0.0
0.2
0.4
0.6
0.8
10^5
10^4
10^3
10^2
10^1
10^0

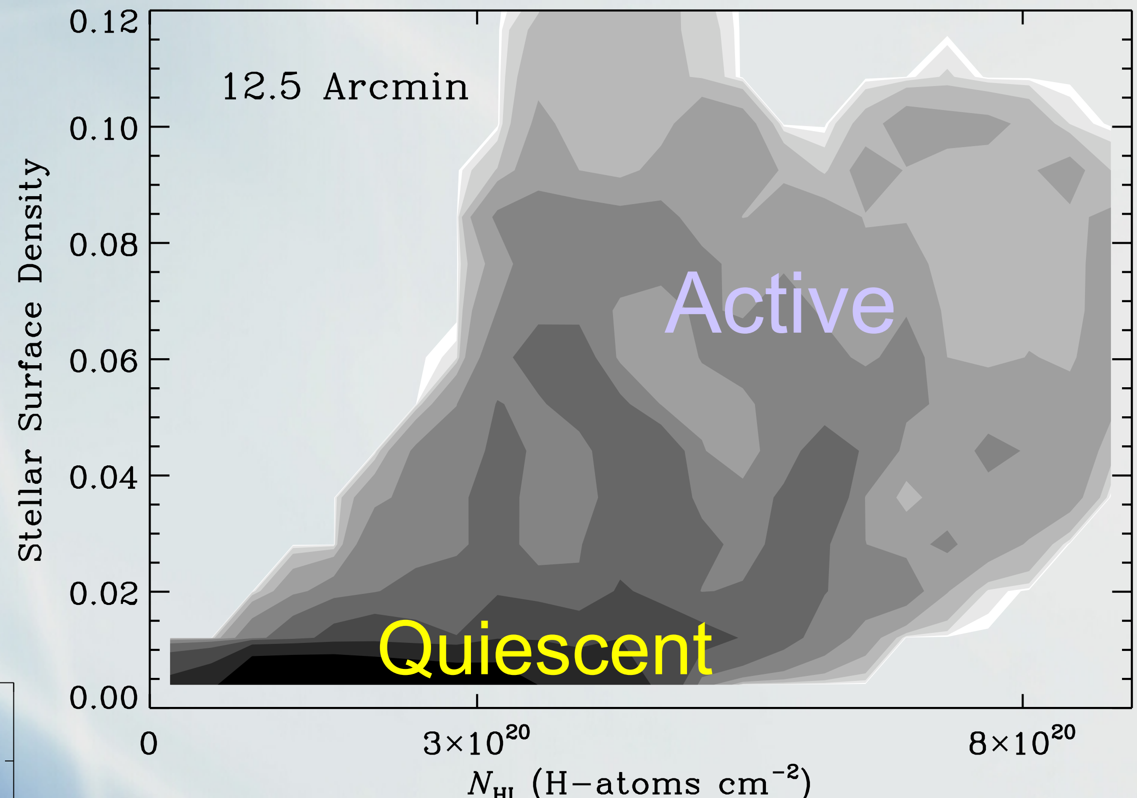

12.5 Arcmin
Active
Quiescent
Stellar Surface Density
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0
3×10^20
8×10^20
N_HI (H−atoms cm^−2)


Num. Stars = 1610
Declination
−71°
−72°
−73°
−74°
−75°
01h 30m
20
10
00
00h 50m
40
30
Right Ascension

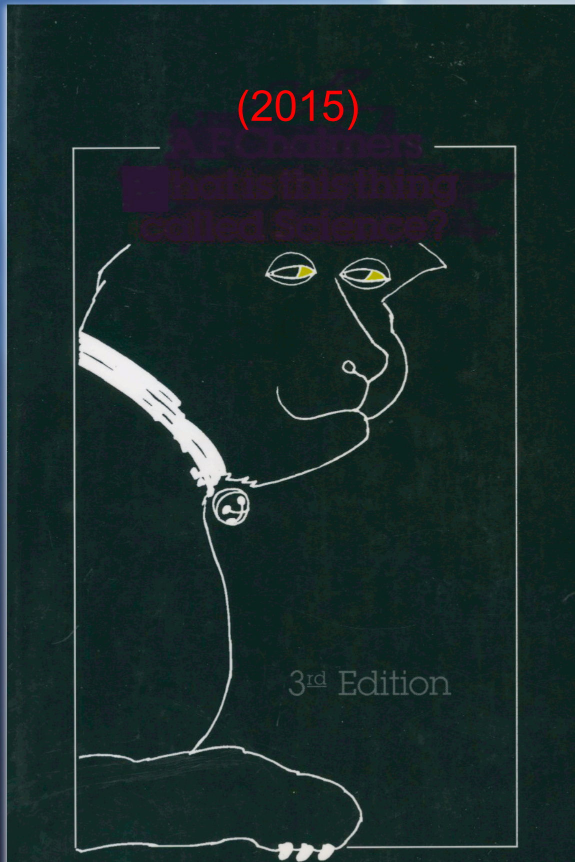

2.5 Arcminute Resolution
Frequency
10^5
10^4
10^3
10^2
10^1
10^0
0
2.0×10^20
4.0×10^20
6.0×10^20
8.0×10^20
1.0×10^21
1.2×10^21
N_HI (H−atoms cm^−2)

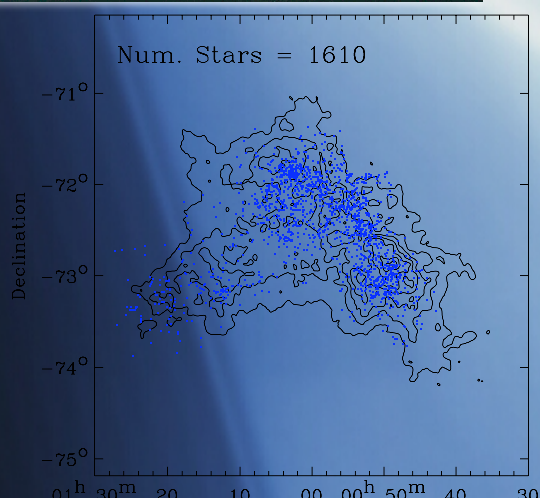


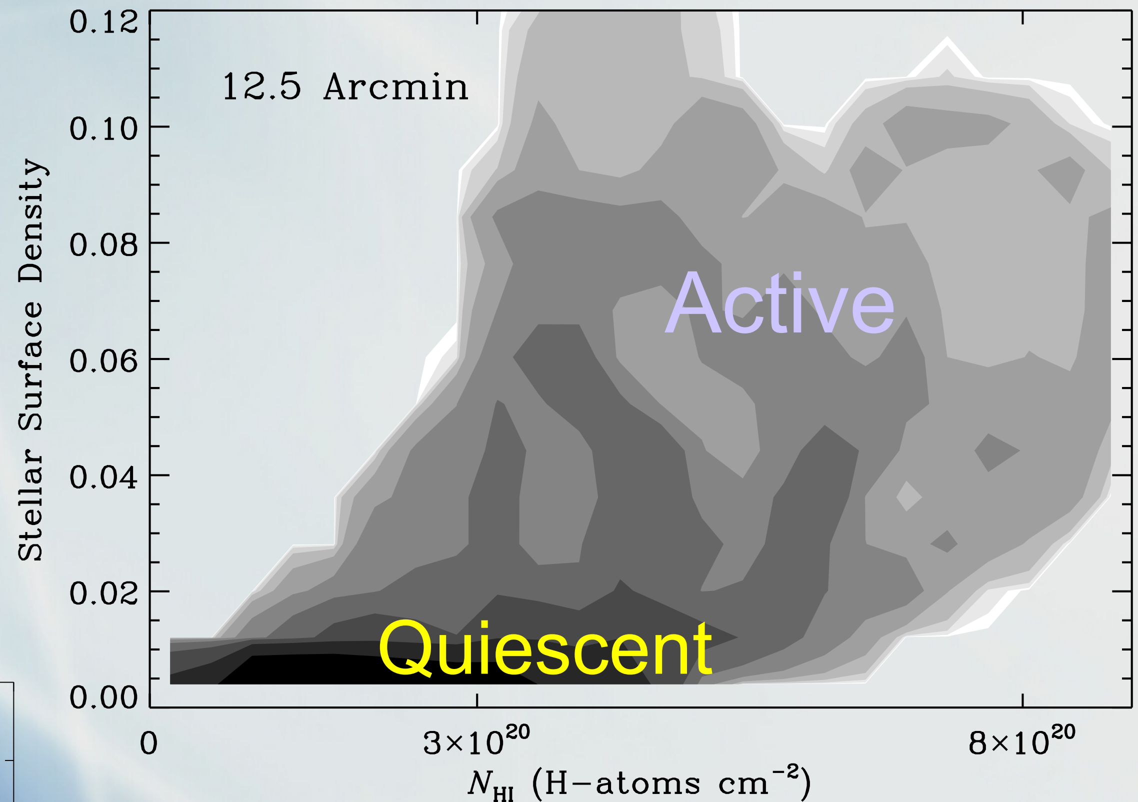




Areal frequencies ➔ Relative timescales



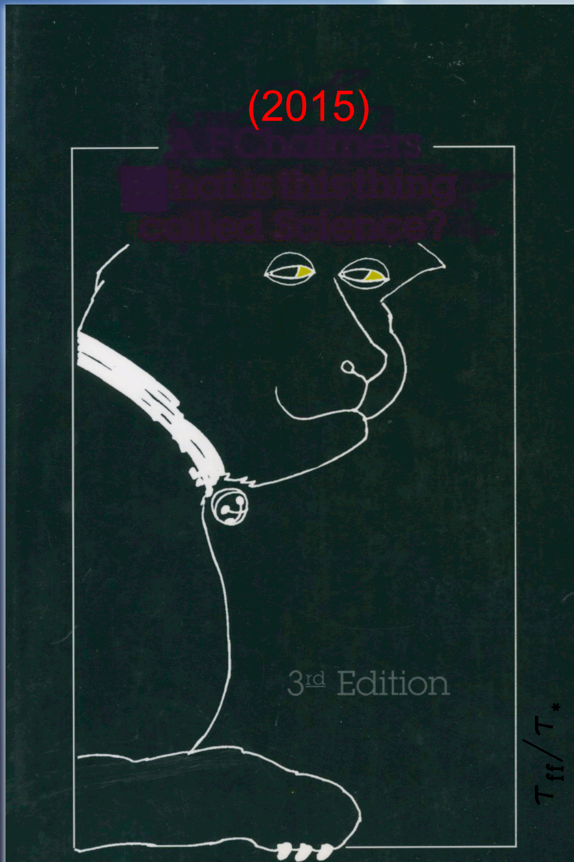


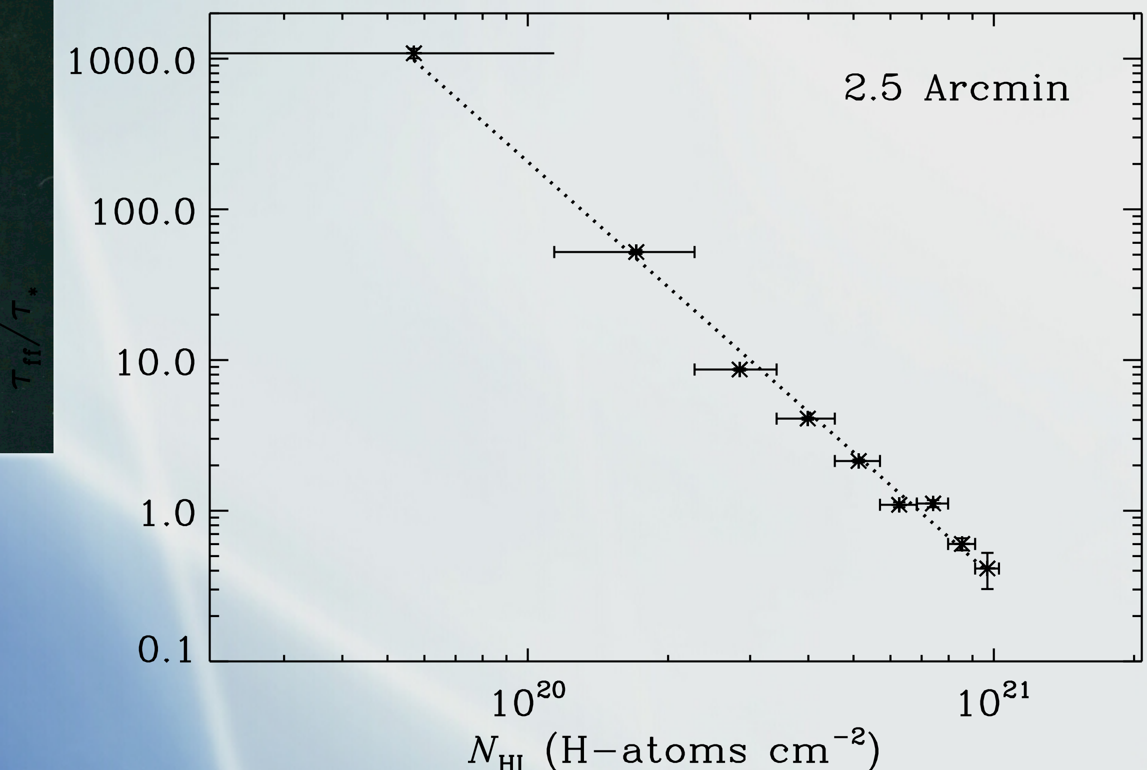


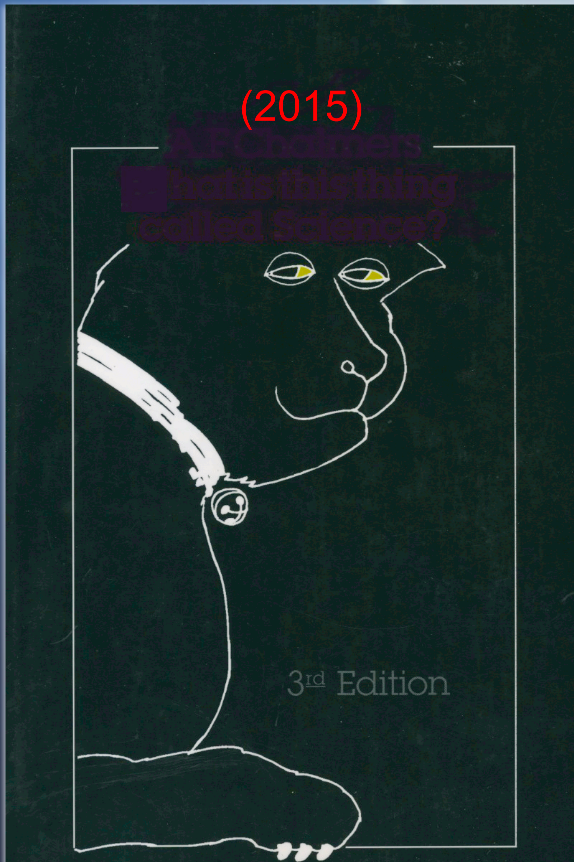
Areal frequencies ➔ Relative timescales

N(quiescent)/N(active) = t(cloud)/t(stellar)

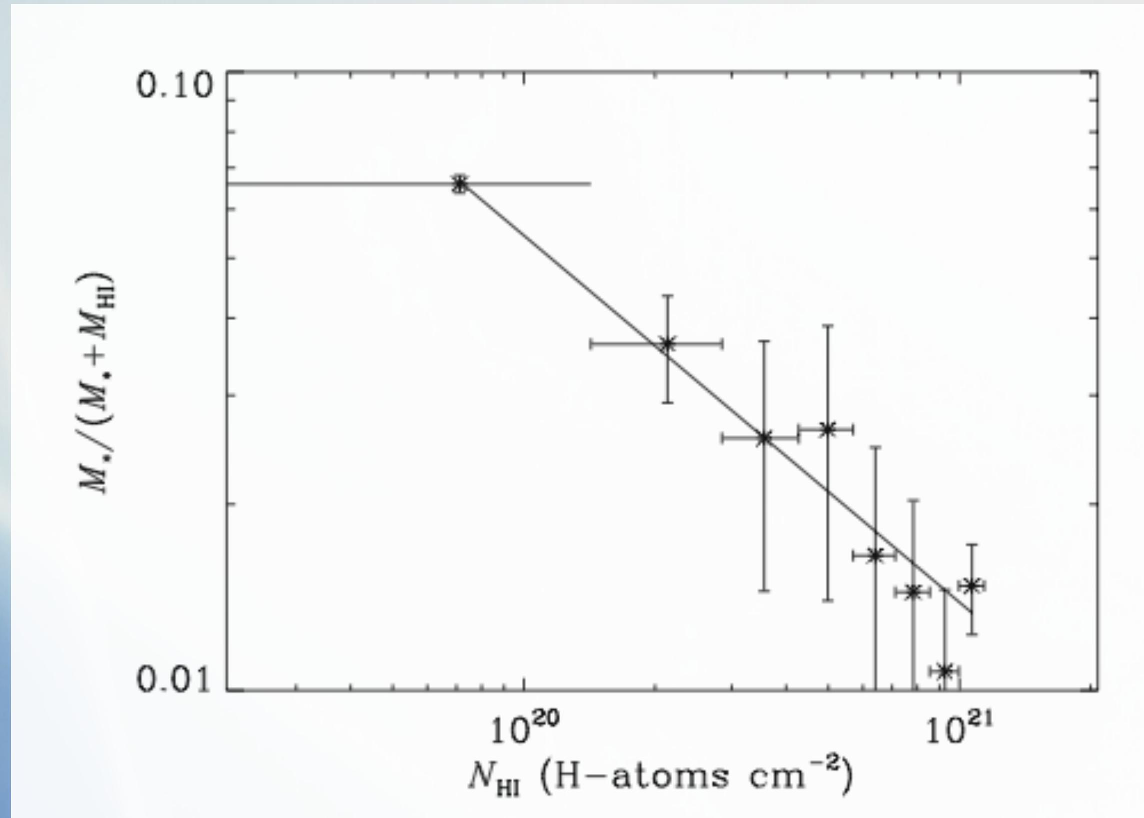
Timescales for Star Formation

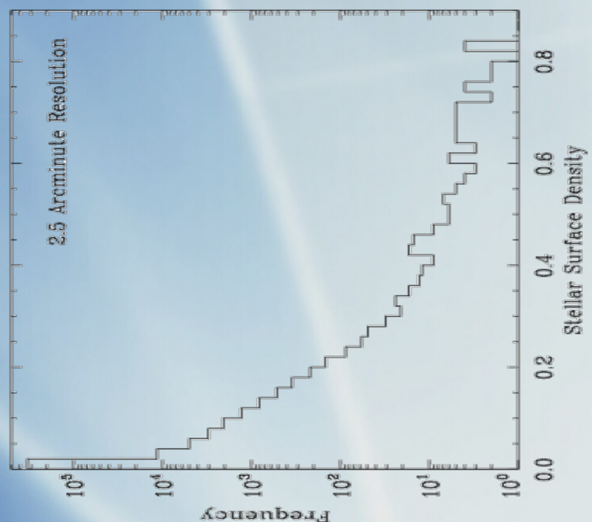


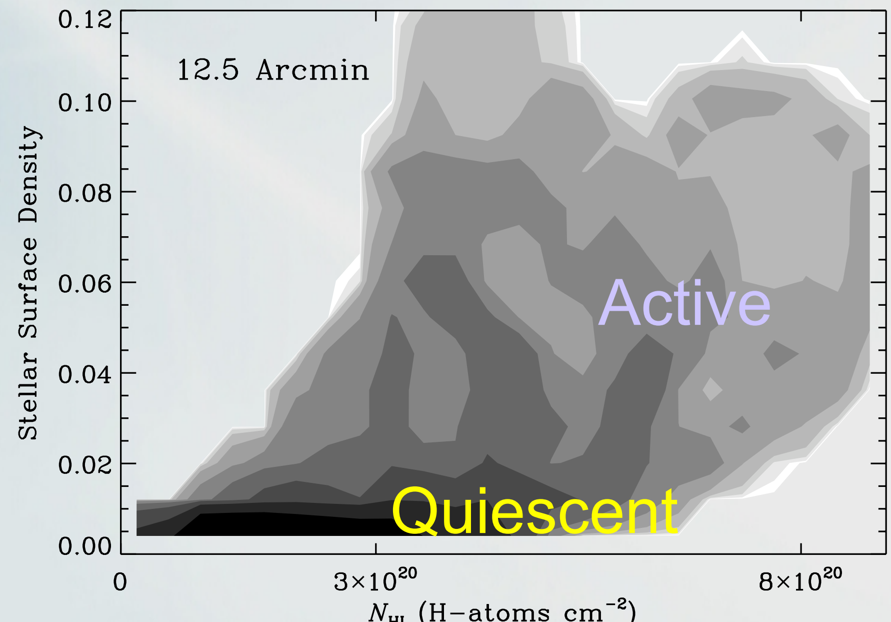


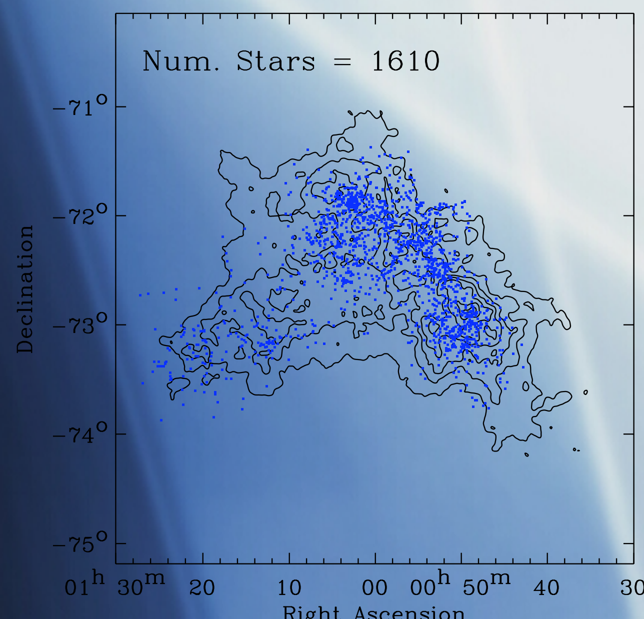


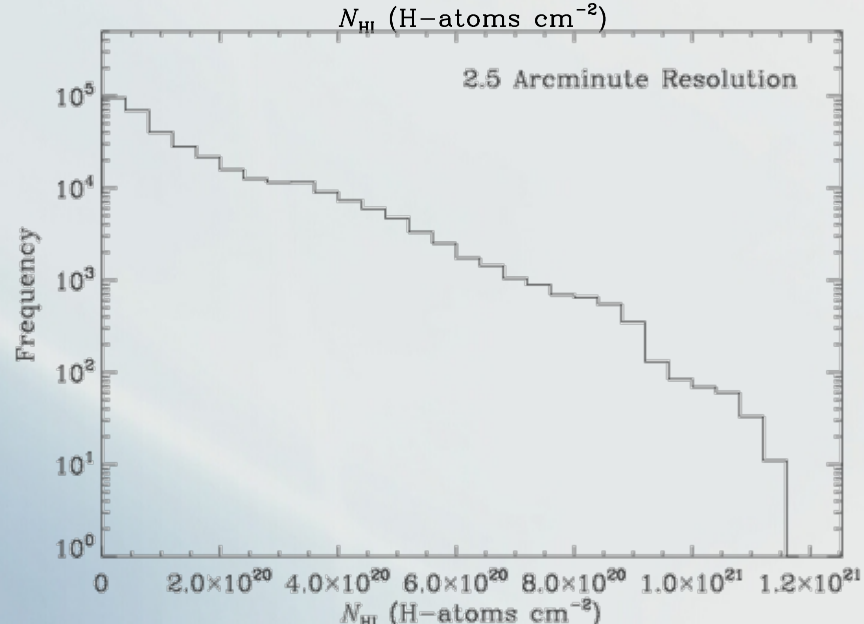
Efficiency of Star Formation



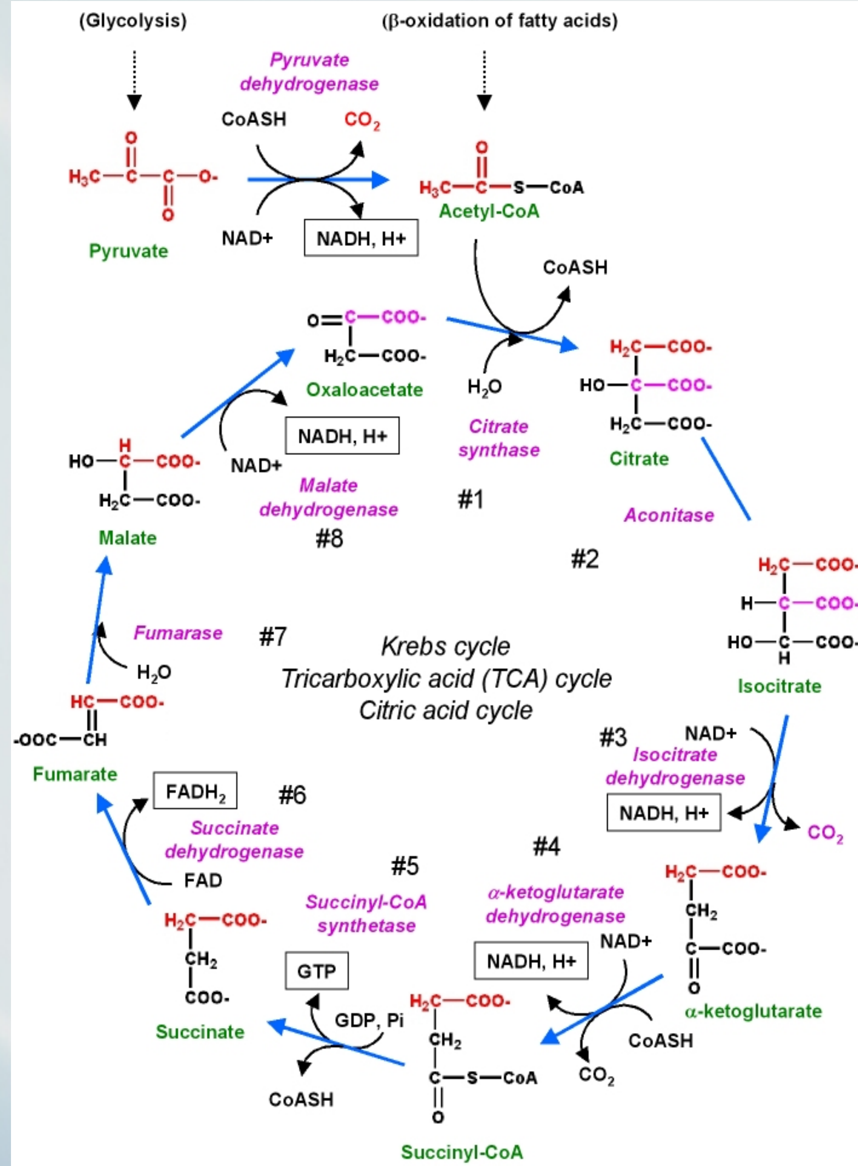

2.5 Arcminute Resolution
Stellar Surface Density
Frequency
0.0
0.2
0.4
0.6
0.8


12.5 Arcmin
Active
Quiescent
Stellar Surface Density
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
3×10^20
8×10^20
N_HI (H−atoms cm^−2)


Num. Stars = 1610
Declination
−71°
−72°
−73°
−74°
−75°
01h 30m
20
10
00
00h 50m
40
30
Right Ascension


2.5 Arcminute Resolution
Frequency
10^5
10^4
10^3
10^2
10^1
10^0
0
2.0×10^20
4.0×10^20
6.0×10^20
8.0×10^20
1.0×10^21
1.2×10^21
N_HI (H−atoms cm^−2)


“I really don’t get it”


(Glycolysis)
(β-oxidation of fatty acids)
Pyruvate dehydrogenase
CoASH
CO2
NAD+
NADH, H+
Pyruvate
Acetyl-CoA
CoASH
Oxaloacetate
H2O
Citrate synthase
Citrate
#1
NADH, H+
NAD+
Malate dehydrogenase
#8
Malate
Aconitase
#2
Isocitrate
Fumarase
#7
H2O
Krebs cycle
Tricarboxylic acid (TCA) cycle
Citric acid cycle
Fumarate
#3
NAD+
Isocitrate dehydrogenase
NADH, H+
CO2
FADH2
#6
Succinate dehydrogenase
FAD
#4
#5
α-ketoglutarate dehydrogenase
Succinyl-CoA synthetase
NAD+
NADH, H+
GTP
GDP, Pi
α-ketoglutarate
Succinate
CoASH
CoASH
CO2
Succinyl-CoA