

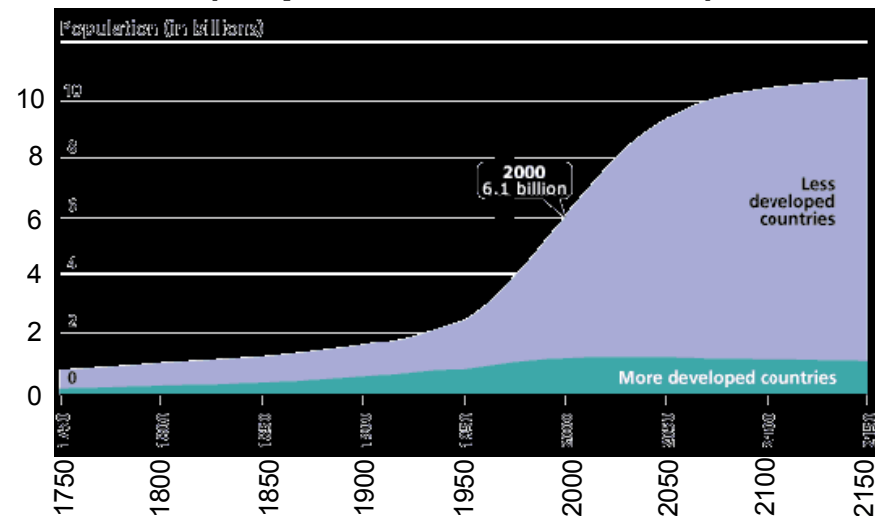
Oil Supply

- Role of Oil
- Oil as a finite resource
- M. King Hubbert
- Hubbert's method of prediction
- References

Role of Oil

- Critical commodity in industrialized countries
 - Transportation
 - Heating
 - Fertilizer
 - Synthetic materials
- Explosive growth in world population roughly coincides with the start of large-scale oil production

World Population Growth, 1750–2150
(Population in billions)



Source: <http://www.prb.org>

Oil as a finite resource

- Oil judged to be a product of organic material
- Explosive proliferation of biologic activity at start of Cambrian Period (~600 m.y.)
- Consumption rate \gg Generation rate (Generation rate is negligible)
- Oil resources are effectively finite

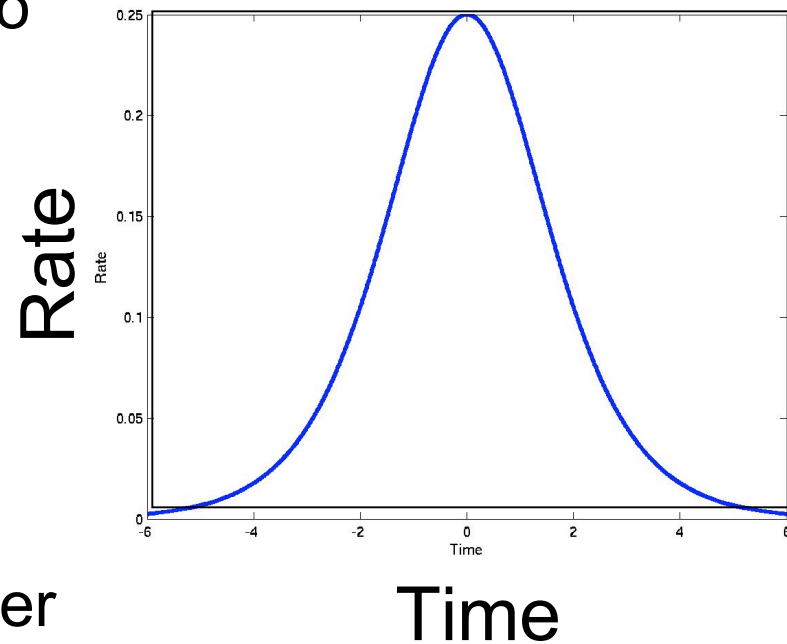
M. King Hubbert (1903-1989)

- Towering 20th-century Earth Scientist
- Vetlesen Prize, 1981
- Probably the best-known geophysicist in the world to the general public
- Seminal contributions in three areas
 - Mechanics of geologic structures
 - Physics of underground fluids
 - Earth's mineral resources and their significance in human affairs



Hubbert's Method

- Assumes recovery rate curve increases from zero, peaks, and declines to zero as resource is exhausted
- Curve assumed to be bell-shaped and symmetric
- Curve can be fit to data
- Curve can be extrapolated into the future
- Recovery equals area under curve



Production Rate (r) as a Function of Three Variables

$$r = Ae^{-((t-T)/S)^2}$$

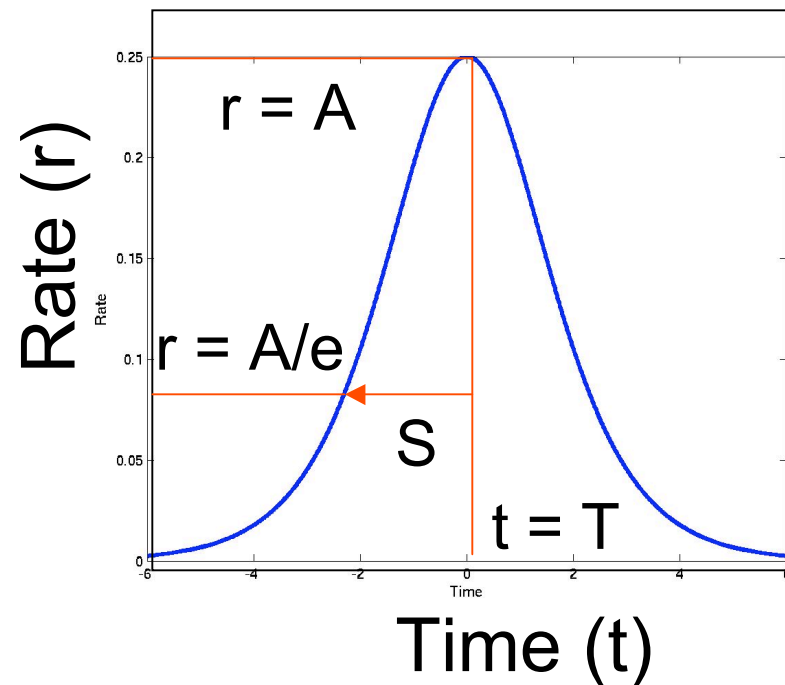
A = peak value of r

T = time where r = A

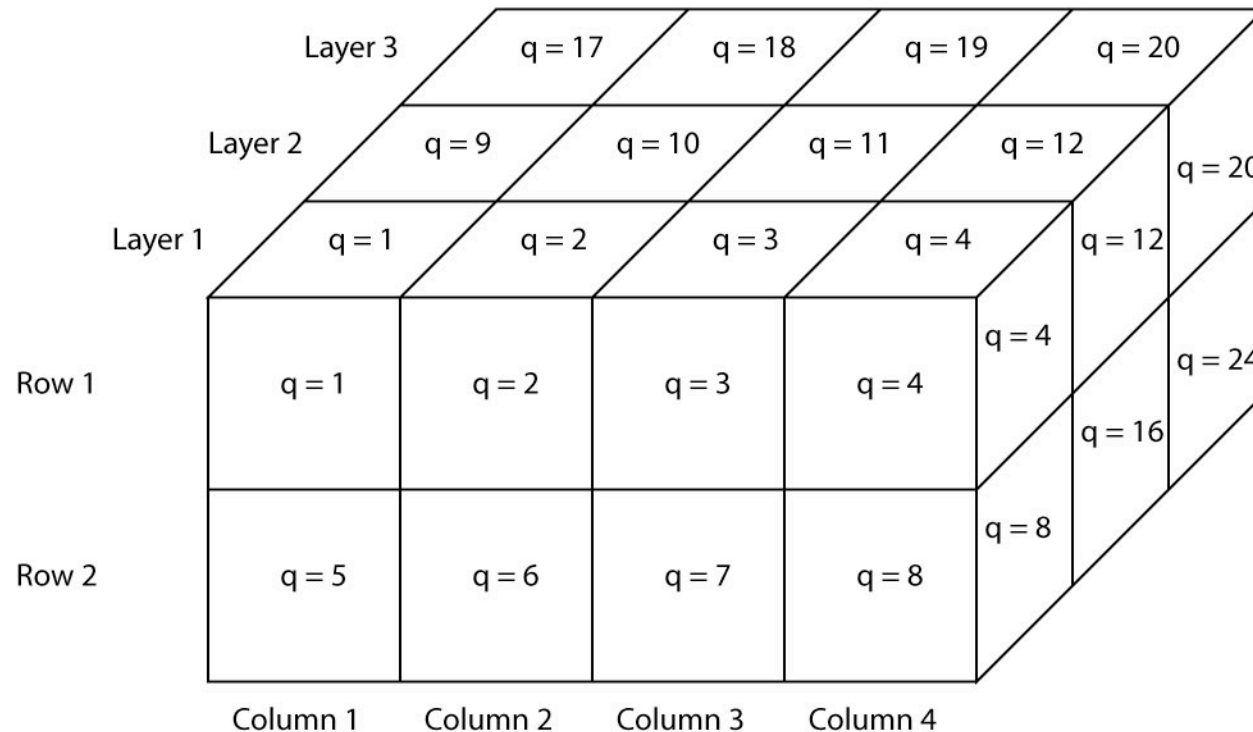
S = T - t where r = A/e

$$\approx 0.37A$$

r, (T-S) also is an inflection pt



Minimizing a Function of Three Variables



$l = \#$ of rows (here $l = 2$)
 $m = \#$ of columns (here $m = 4$)
 $n = \#$ of layers (here $n = 3$)

Find the values of A , T ,
and S to minimize r

References on M. King Hubbert

- <http://www.technocracyinc.org/webtv/articles/hub-gro.htm>
- <http://www.hubbertypeak.com/hubberty/hubecon.htm>
- http://en.wikipedia.org/wiki/Hubbert_curve
- http://en.wikipedia.org/wiki/Hubbert_peak
- http://en.wikipedia.org/wiki/M._King_Hubbert
- <http://www.hubbertypeak.com/hubberty/tribute.htm>

- Clark, Robert Dean, Geophysics: The Leading Edge of Exploration, "King Hubbert", February 1983. pp.16-24