

STATISTICAL MOLECULAR THERMODYNAMICS

Christopher J. Cramer

Video 1.2

Benchmarking Thermoliteracy

YOU'RE TAKING THERMODYNAMICS?

Lasciate ogni speranza, voi ch'entrate...

Thermodynamics has long been recognized as one of the most powerful and useful tools in chemistry and physics and all the physical sciences.

The **first** Nobel Prize in chemistry, 1901:

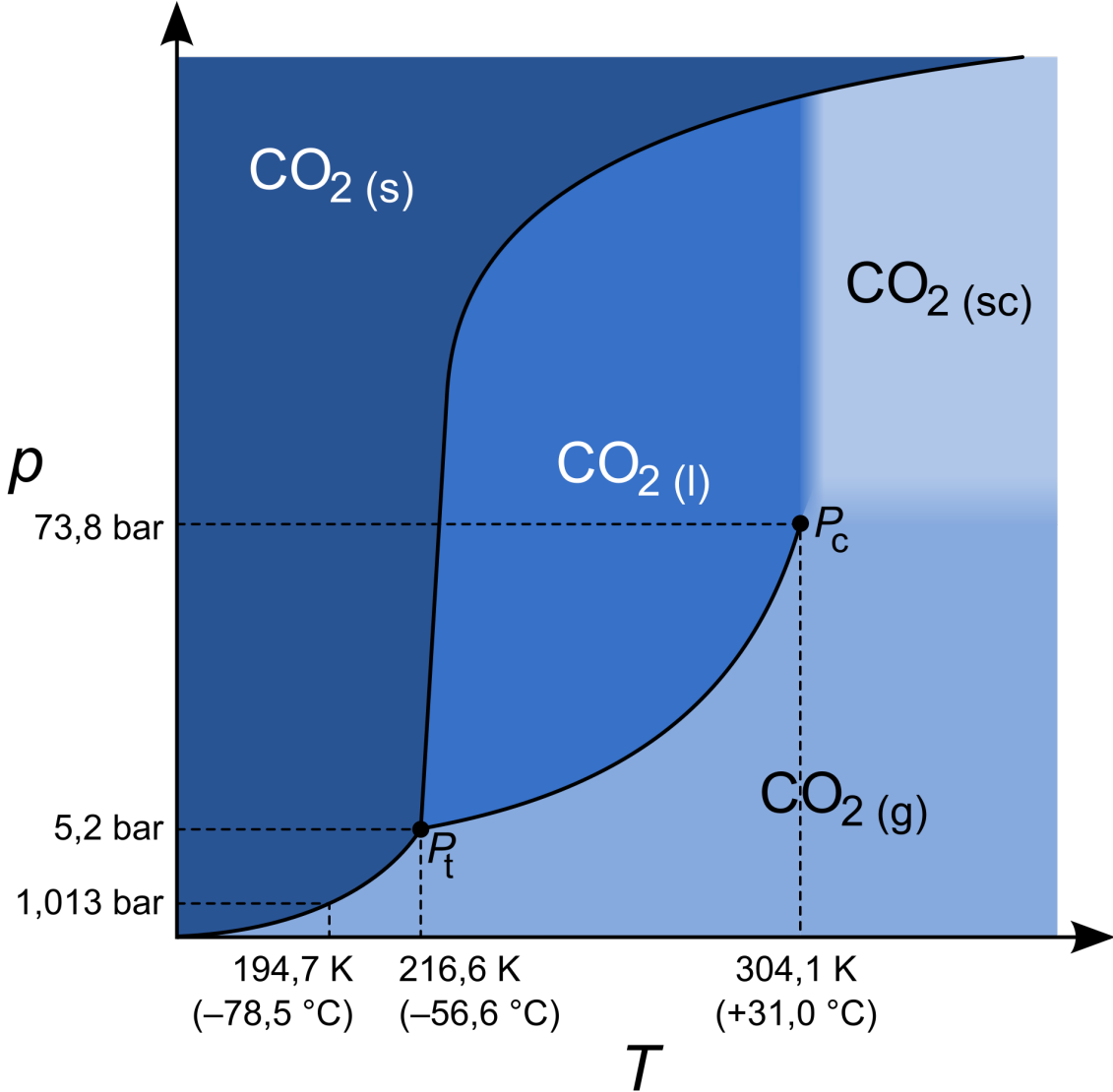
Chemical Equilibrium

$$\Delta G = -RT \ln K$$

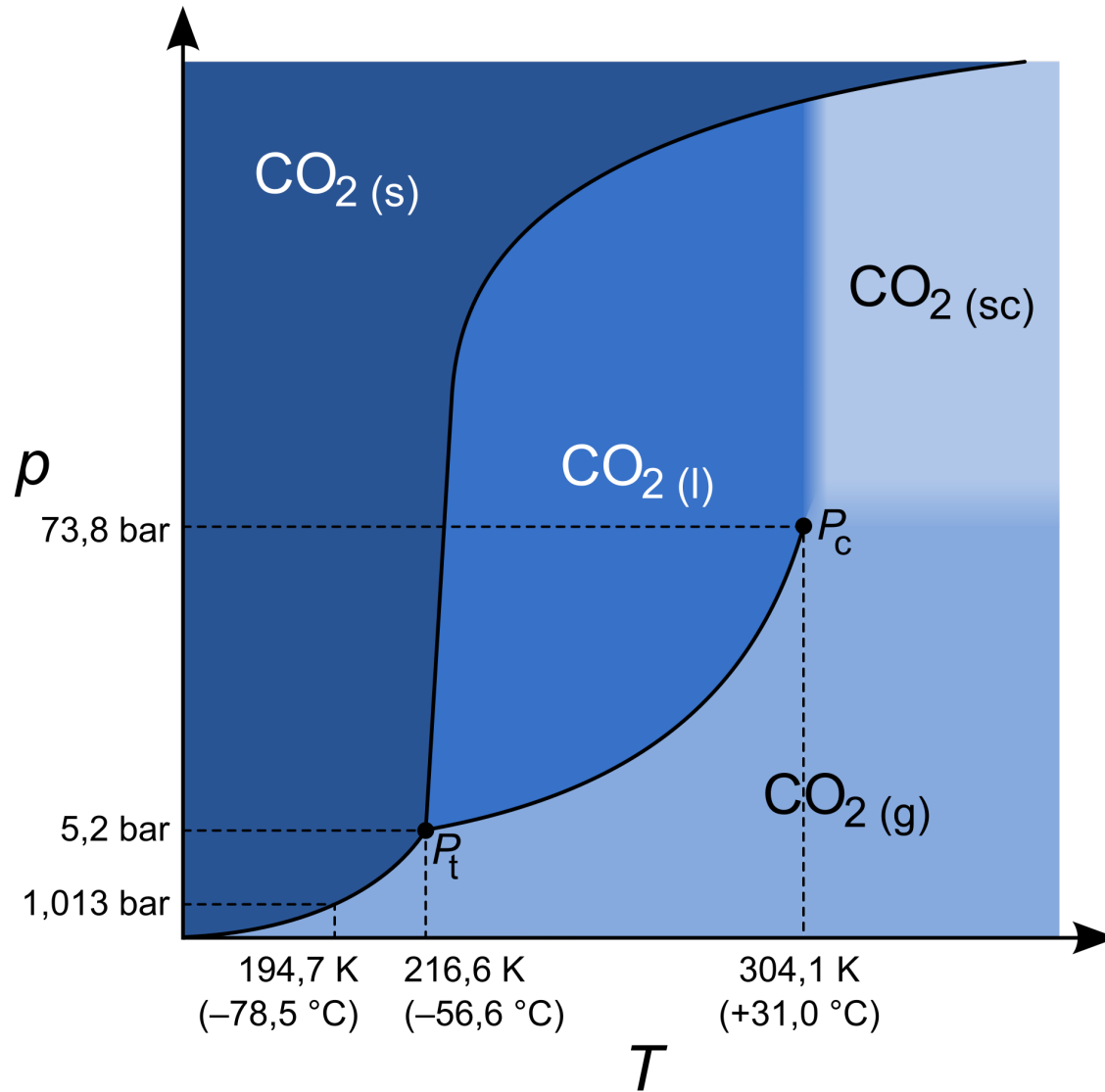


Jacobus Henricus van't Hoff

PHASE DIAGRAM — CARBON DIOXIDE



PHASE DIAGRAM — WHATEVER (YAWN)



CARBON DIOXIDE DRY CLEANING!



Fluid CO₂ and a CO₂-soluble detergent can be used to clean clothing. Both the CO₂ and the detergent are recycled for repeated use!

The *chemist* who invented this process certainly took advantage of his knowledge of Thermodynamics!

Tuesday, February 4, 2003

1:25 PM - B75 Amundson

Professor Joseph M. DeSimone
Department of Chemistry, UNC
"The CO₂ Technology Platform"

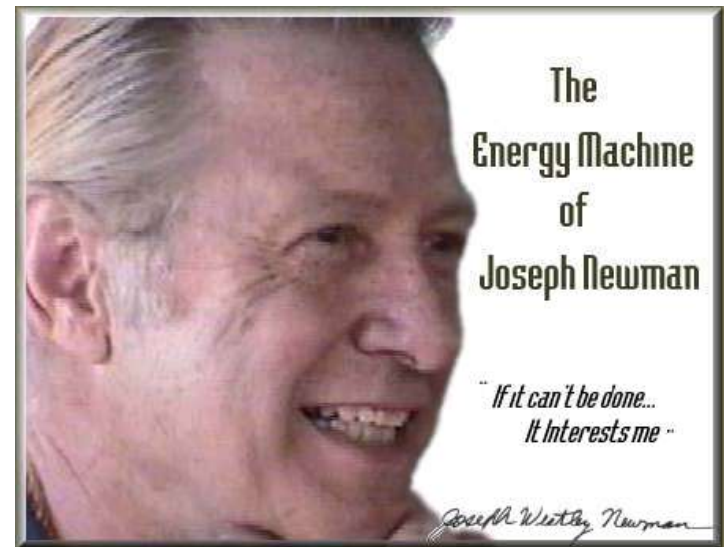


THERMODYNAMICS VS HANNUM/BARNUM

Joe Newman (1979): *More energy out than in! Invest now!*

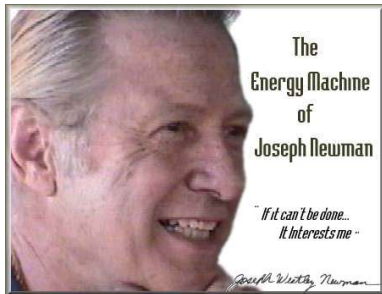
First Law of Thermodynamics: No perpetual motion machines
(US patent office says the same).

In the United States in the 1980s,
elected officials spent a lot of tax
money in order to assess which of
the above mutually contradictory
assertions was true.



MR. NEWMAN GOES TO WASHINGTON

In 1911 the US Patent and Trademark office adopted a policy that patent applications for a perpetual motion machine could not be submitted until one year after an actual operating model of the machine was deposited with the Patent Office.



Newman files suit saying his own experts proclaim that his “Energy Machine” is *not* a perpetual motion device and should not be subject to the 1911 policy.

Judge Thomas Penfield Jackson, acknowledging his own technical shortcomings, appoints a special master, former commissioner of patents William E. Schuyler, Jr., to investigate the machine.



MR. NEWMAN GOES TO WASHINGTON

To the surprise of the court, Schuyler's report says the evidence is overwhelming that the output of the Newman Energy Machine is greater than the input.



Judge Jackson is not persuaded, and sets out on his own to learn a little physics. Eight months later he holds that Schuyler's report is erroneous. **In support of his position the learned Judge cites the laws of thermodynamics.** He says that the US NIST should look at the machine, but Newman's attorneys refuse.

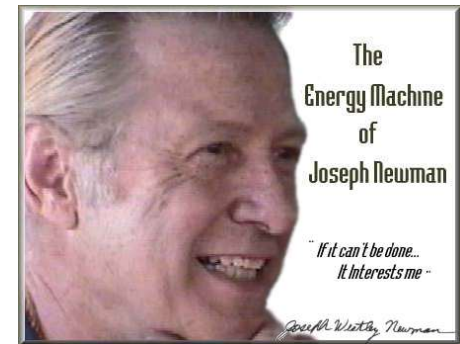
Based on TV reports, US Representative Bob Livingston (R-LA) decides that Newman is being unfairly treated—a clear abuse of power by the Patent Office. Along with 6 members of Congress a “private relief” bill is filed to force the Patent Office to issue Newman a patent.



MR. NEWMAN GOES TO WASHINGTON

Congress holds hearings! The expert from the National Bureau of Standards, John Lyons, explains various things but concludes by stating that the amount of energy going in exceeds the amount coming out (First Law upheld).

Newman testifies next and, unperturbed, cites the report of William Schuyler. He does what he does best, selling, and this time he only has to sell to Senators, not physics experts.



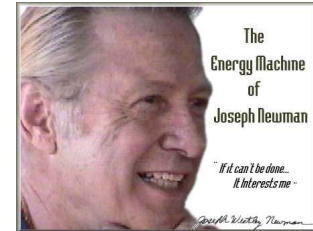
Senator John Glenn (D-OH) finally brings some reason to the proceedings, albeit not as a physical scientist...

MR. NEWMAN GOES TO WASHINGTON



Senator Glenn asks if Newman knew William Schuyler *before* his appointment by the court.

Flustered, Newman says that they met once, but Schuyler wouldn't remember him.



Glenn points out that it was Schuyler's patent-law firm that *represented* Newman before the Patent Office.

(sound of Senatorial chairs sliding back from hearing table)

The End.

Note that the US Senators, mostly lawyers, *were not swayed by violation of the First Law of Thermodynamics*, but their expertise on conflict of interest was manifest.

MACRO-GOALS FOR THIS COURSE

- Learn how the Universe really works
- End up smarter than most politicians

(the more difficult goal is, admittedly, listed first)

FORMAT OF THE COURSE

- Video “lectures” with embedded self-assessments
- Demonstrations
- Weekly homeworks/problem sets (8 x 100 pts)
- Final exam (200 pts)