Event-by-Event Fluctuations in Charged Particle Production in Au + Au Collisions at $\sqrt{s_{NN}} = 130$ GeV

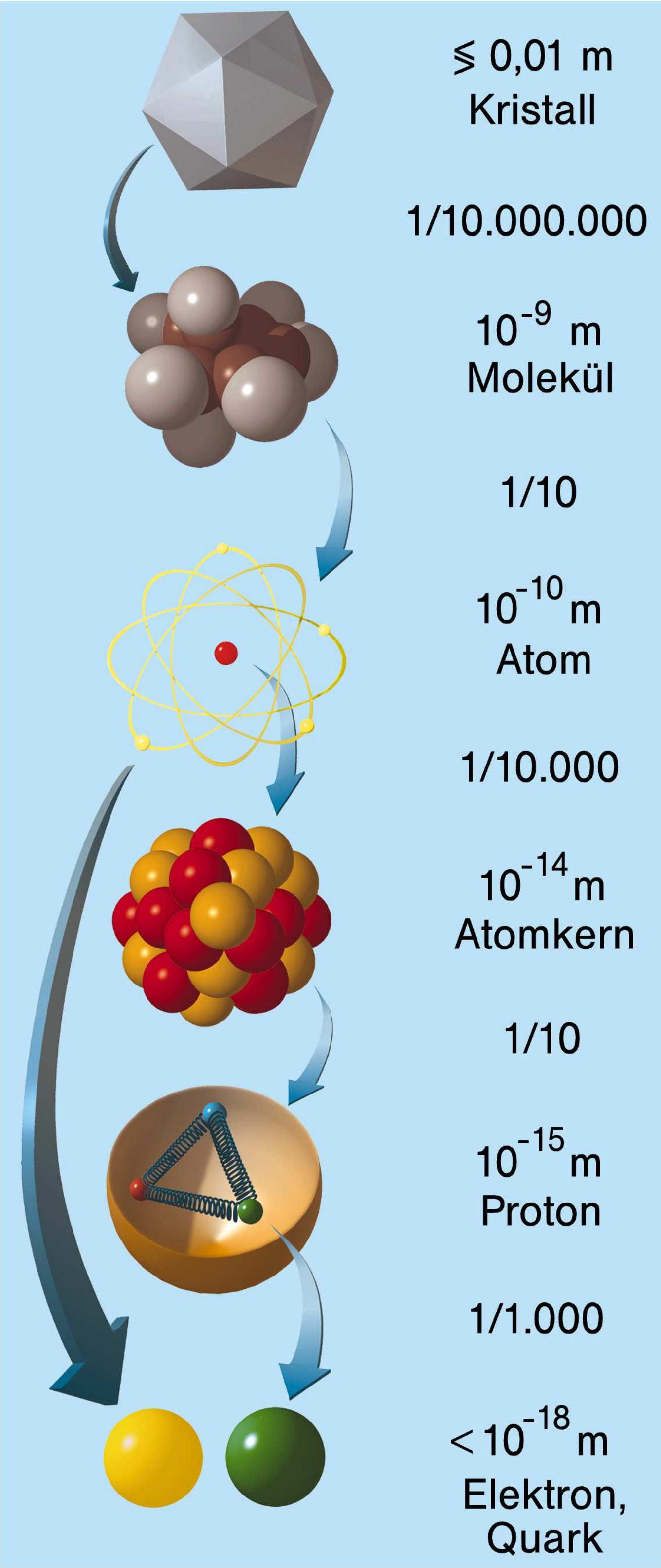
Thesis Colloquium

Erik Jakobsen
Niels Bohr Institute 2001

Outline of the talk

- Elements of Heavy Ion Physics
- The Relativistic Heavy Ion Collider
- The BRAHMS Experiment
- Charged Particle Multiplicity
- Event-by-Event Fluctuations
- Results

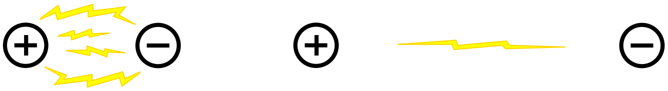
Scale


≲ 0,01 m
Kristall
1/10.000.000
10^-9 m
Molekül
1/10
10^-10 m
Atom
1/10.000
10^-14 m
Atomkern
1/10
10^-15 m
Proton
1/1.000
< 10^-18 m
Elektron,
Quark

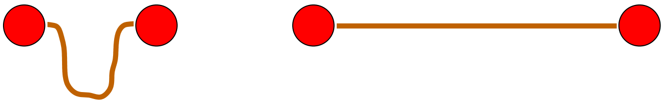
The Strong Force

The energy of the color field is proportional to the distance

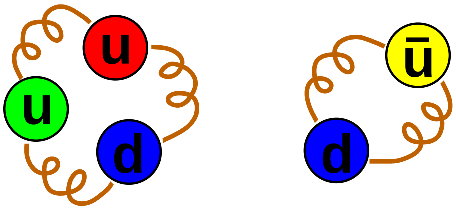
Electromagnetic force:



Strong force:

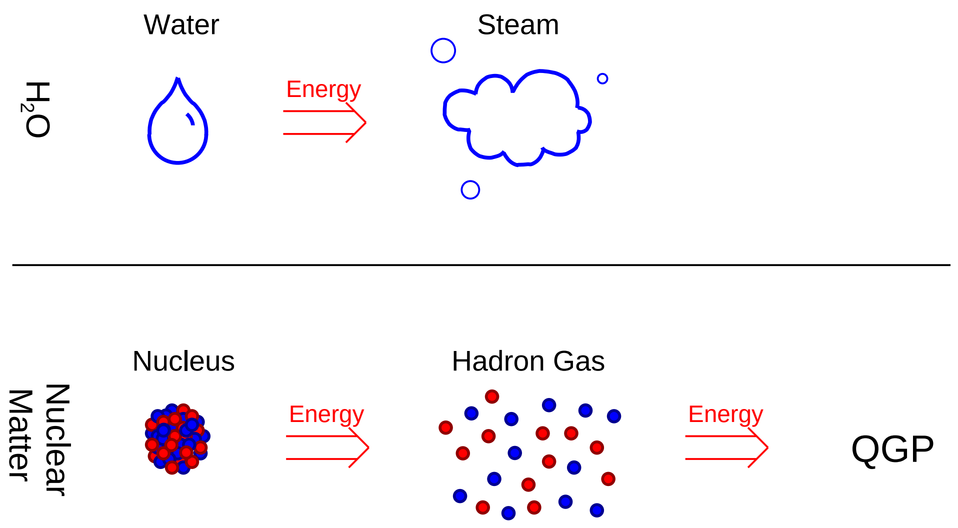


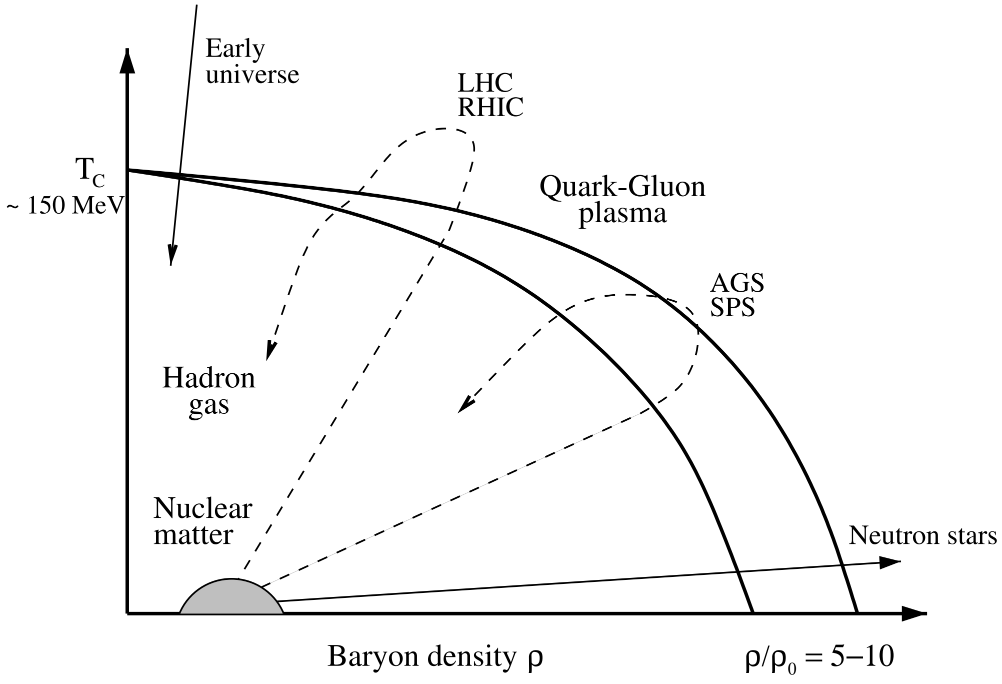
The quarks are confined in color neutral systems:



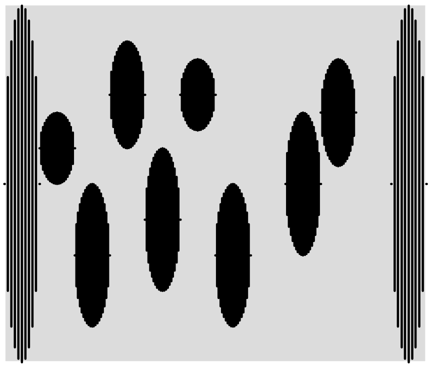
Goal

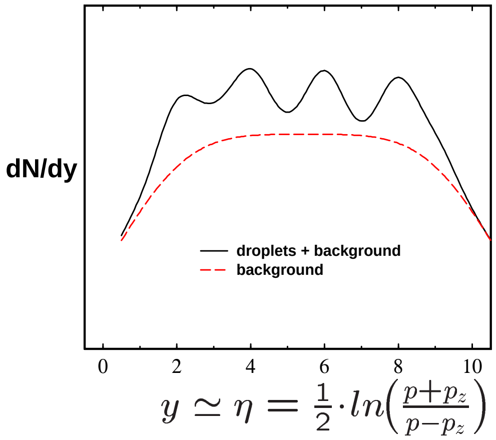
The goal of heavy ion physics is to investigate different states of nuclear matter.





Droplet Formation

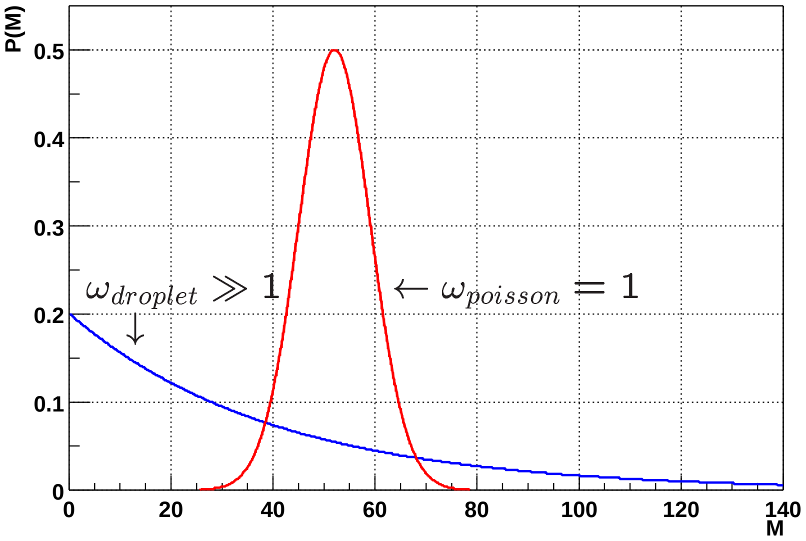




Fluctuation:

$$\omega_N \equiv \frac{\overline{N^2} - \overline{N}^2}{\overline{N}}$$

where N is the number of charged particles measured per event. Droplets are predicted to cause large fluctuations.



H. Heiselberg, *Event-by-Event Physics in Relativistic Heavy-Ion Collisions*, Physics Reports 351 (2001), 161-194.

Relativistic Heavy Ion Collider