

Aula Inaugural de Física Estatística

Prof. Fabiano Lemes Ribeiro

DEX - UFLA



PROGRAMA DE PÓS-GRADUAÇÃO EM FÍSICA ASSOCIAÇÃO AMPLA



Profa.Dra. Maria Aline B. do Vale
Prof. Dr. Luiz Cleber. T. de Brito
Prof. Dr. Péron P. Neves



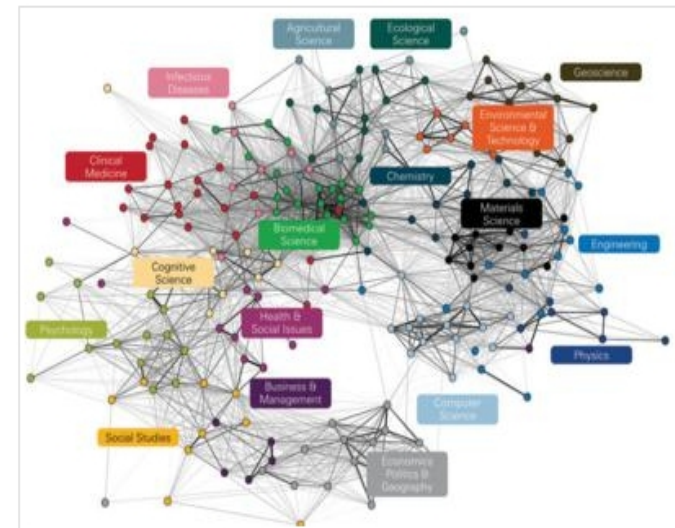
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IC-COMPLEX

O IC-complex é um grupo de pesquisa formado por pesquisadores e estudantes de diferentes áreas do conhecimento. O objetivo principal do grupo é a aplicação de técnicas matemáticas e computacionais para o estudo de sistemas físicos, biológicos, sociais, entre outros.

Entre os estudos em desenvolvimento, podemos destacar:

- Modelos de evolução social;
- Modelos de emergência de Linguagem;
- Redes Neurais e evolução do Cérebro;
- Dinâmica de Populações.



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Laboratório de Física I **Física Estatística** Modelagem Matemática

Conteúdo Pragmático:

Revisão de Termodinâmica: Experimentos; Revisão de Termodinâmica: 1. Lei; Revisão de Termodinâmica: 2. Lei, entropia e potenciais termodinâmicos; Revisão de Probabilidades; Interpretações para Entropia; Micro e Macro Estados de um sistema; Ensemble Microcanônico; Ensemble Canônico; Ensemble Grande Canônico; Gás Ideal Quântico; Gás Ideal de Fermion e Estatística Fermi-Dirac; Gás de Bósons e Estatística Bose-Einstein; Modelo de Ising; Transições de Fase.

Documentos

Plano de Curso

Listas de Exercícios

[lista1: revisao termodinâmica](#)

[lista2: revisao probabilidades I](#)

[lista3: revisao probabilidades II](#)

[lista4: Ensemble Microcanônico](#)

Conteúdo Pragmático: .

Revisão de Termodinamica: Experimentos; Revisao de Termodinâmica: 1. Lei; Revisao de Termodinâmica: 2. Lei, entropia e potenciais termodinâmicos; Revisao de Probabilidades; Interpretações para Entropia; Micro e Macro Estados de um sistema; Ensemble Microcanonico; Ensemble Canonico; Ensemble Grande Canônico; Gás Ideal Quântico; Gás Ideal de Fermion e Estatística Fermi-Dirac; Gás de Bósons e Estatística Bose-Einstein; Modelo de Ising; Transições de Fase.

Documentos .**Plano de Curso****Notas de Aula** .

Notas de aula de Probabilidade (revisão)

Notas de aula de Termodinâmica(revisão)

Listas de Exercícios .

lista1: revisao termodinâmica

lista2: revisao probabilidades I

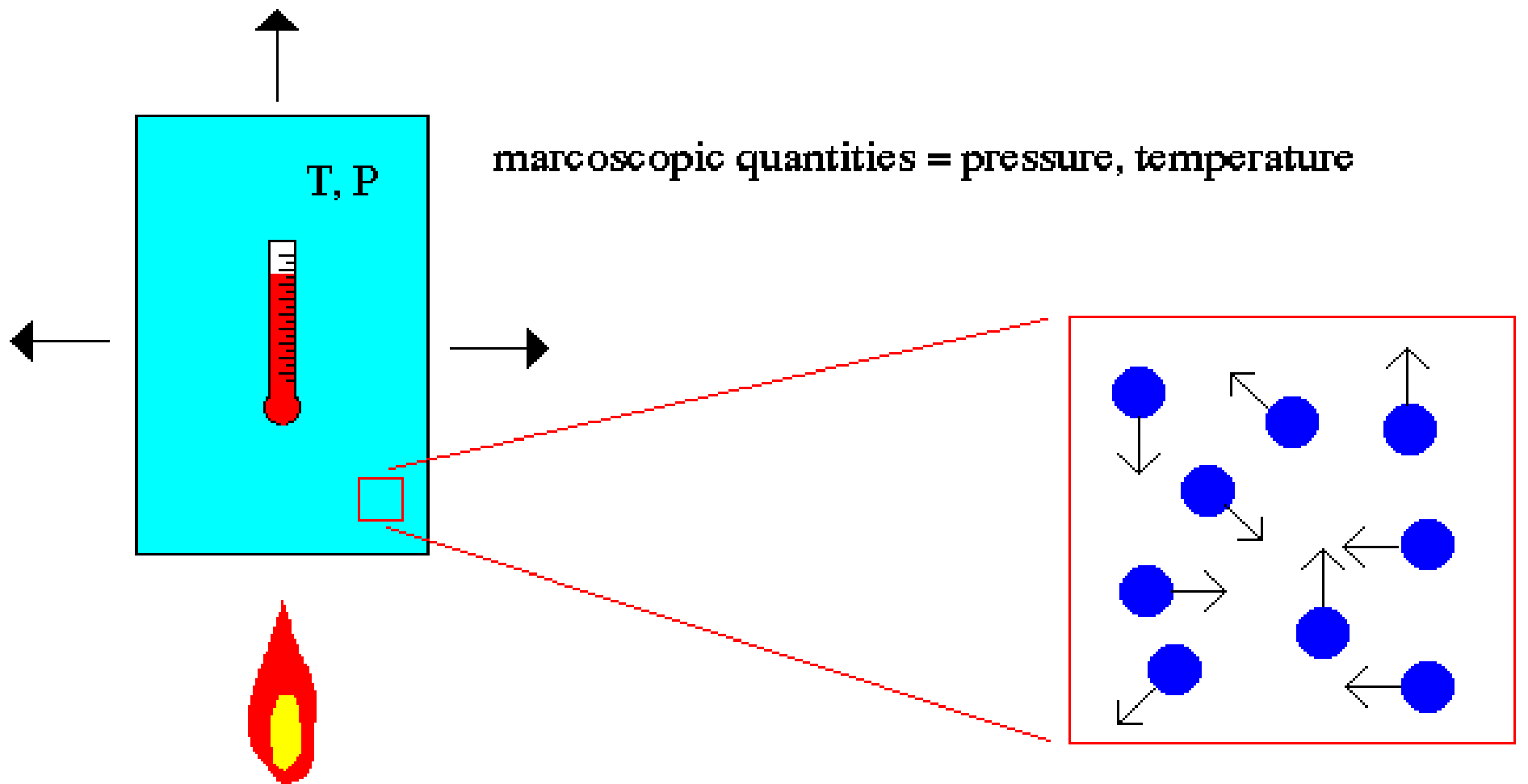
lista3: revisao probabilidades II

lista4: Ensemble Microcanônico

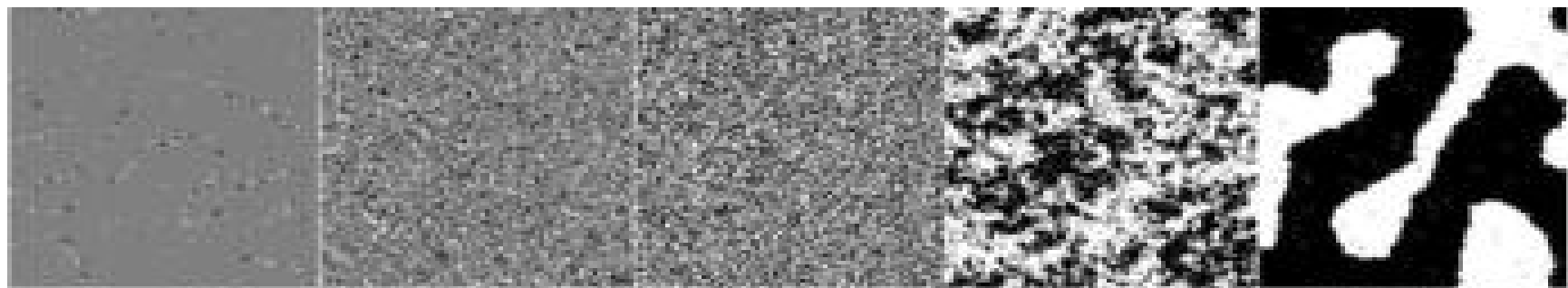
Livro/Apostila .

Rascunhos iniciais de uma Apostila/Livro sobre "Ferramentas Matemáticas para Estudo de Sistemas Complexos":
versão fev/2013

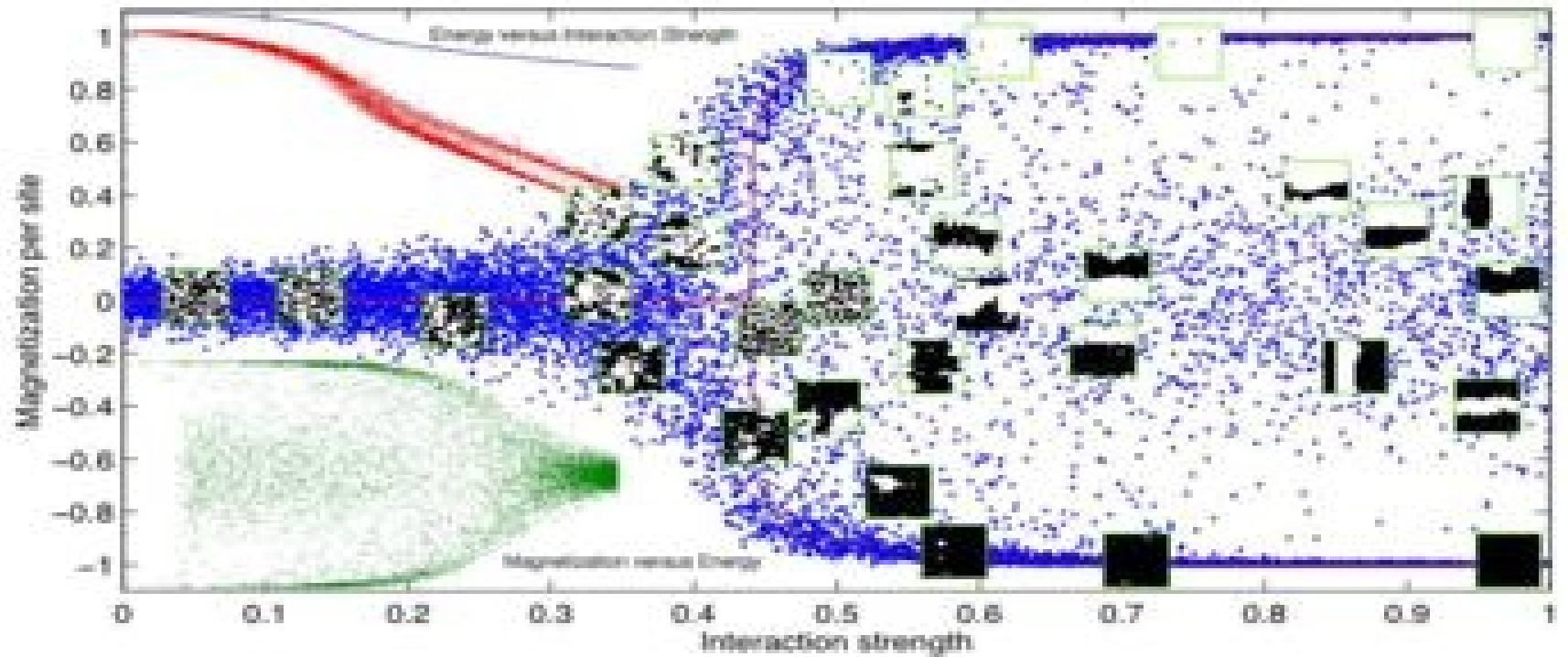
O que é Física Estatística?



microscopic quantities = kinetic motion
of atoms
= velocity, momentum



$B=0, J=-0.8$ $B=0, J=-0.4406868$ $B=0, J=0$ $B=0, J=0.4406868$ $B=0, J=0.8$







Plxmac.com 46684053



Stock market crash of 1987:
S&P500© Stock Index



SNIPER Market Timing - 2002 - <http://www.sniper.at>

James Clerk Maxwell (1831-1879)



Velocity Distributions in Potassium and Thallium Atomic Beams*†

R. C. MILLER‡ AND P. KUSCH
Columbia University, New York, New York

(Received February 23, 1955)

A high-resolution, high-intensity, spiral velocity selector has been designed for the study of the velocity distributions of the components of atomic and molecular beams. It has been found possible to design oven slits which closely approximate the ideal aperture of kinetic theory. An analysis has been made of the velocity distributions in beams of potassium and thallium over a range of velocity from 0.3 to 2.5 times the most probable velocity in the oven. The agreement between the observed distribution and that deduced, on the basis of the assumptions that the distribution in the oven is Maxwellian and that the aperture is ideal, is very good.

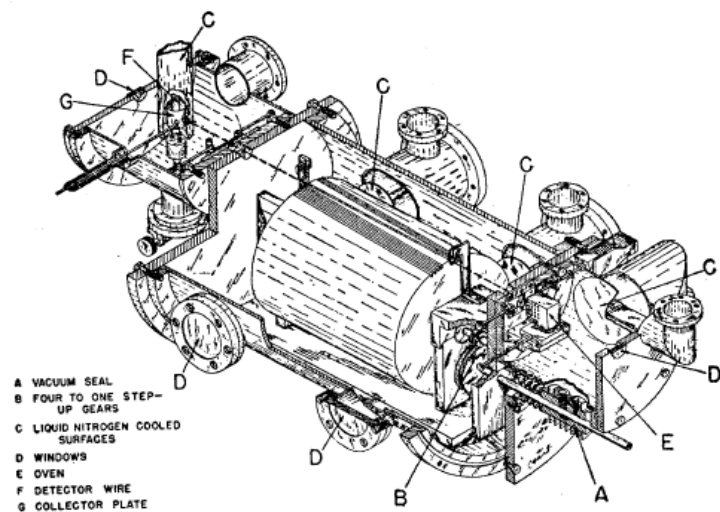


FIG. 2. Schematic diagram of the apparatus designed to measure velocity distributions.

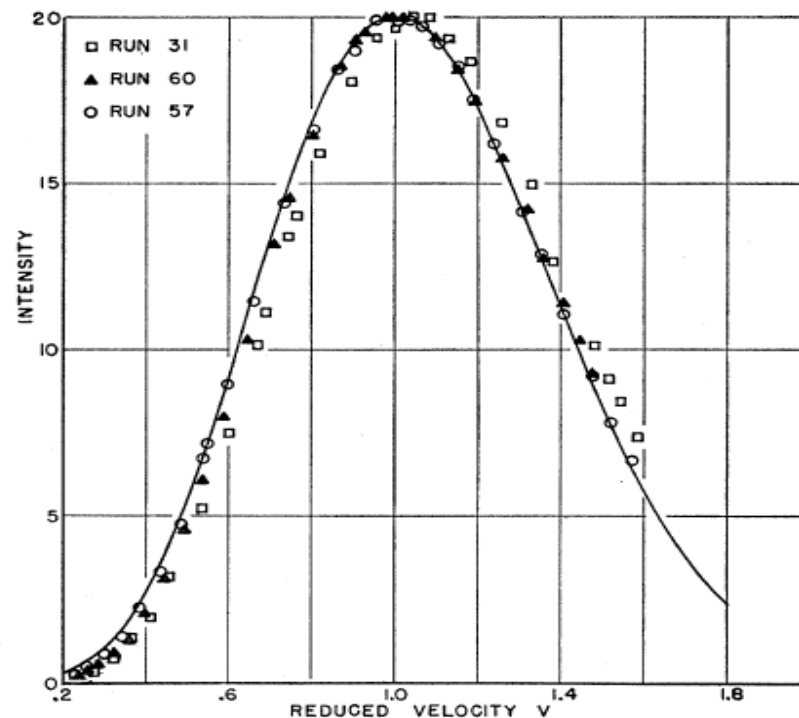
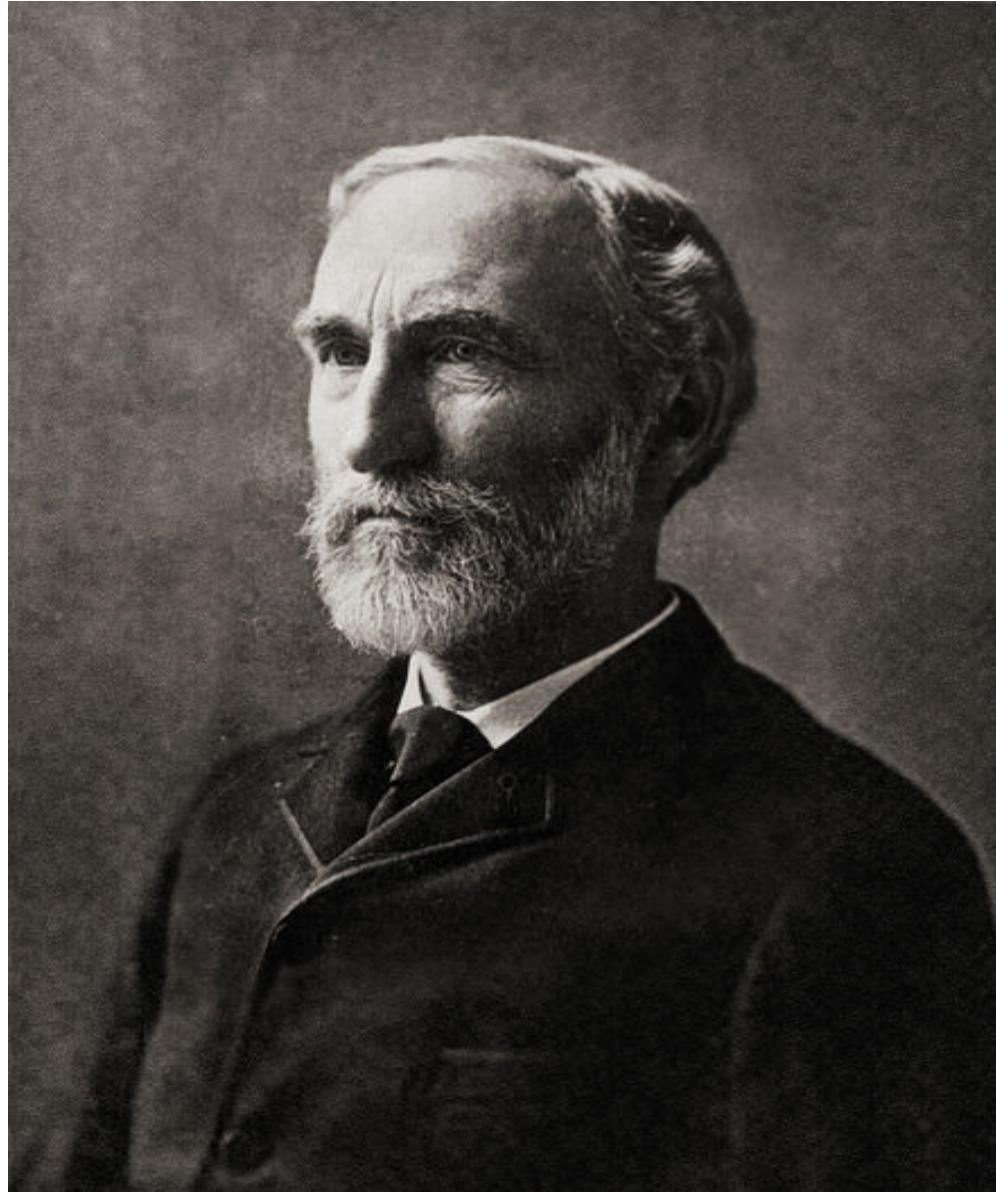


FIG. 4. Typical potassium velocity distributions. The vapor pressures in the ovens are given in Table II. Run 31 was made with thick oven slits and runs 57 and 60 with thin slits.

Ludwig Boltzmann (1844-1906)



Josiah Willard Gibbs (1839-1903)



Albert Einstein (1879-1955)



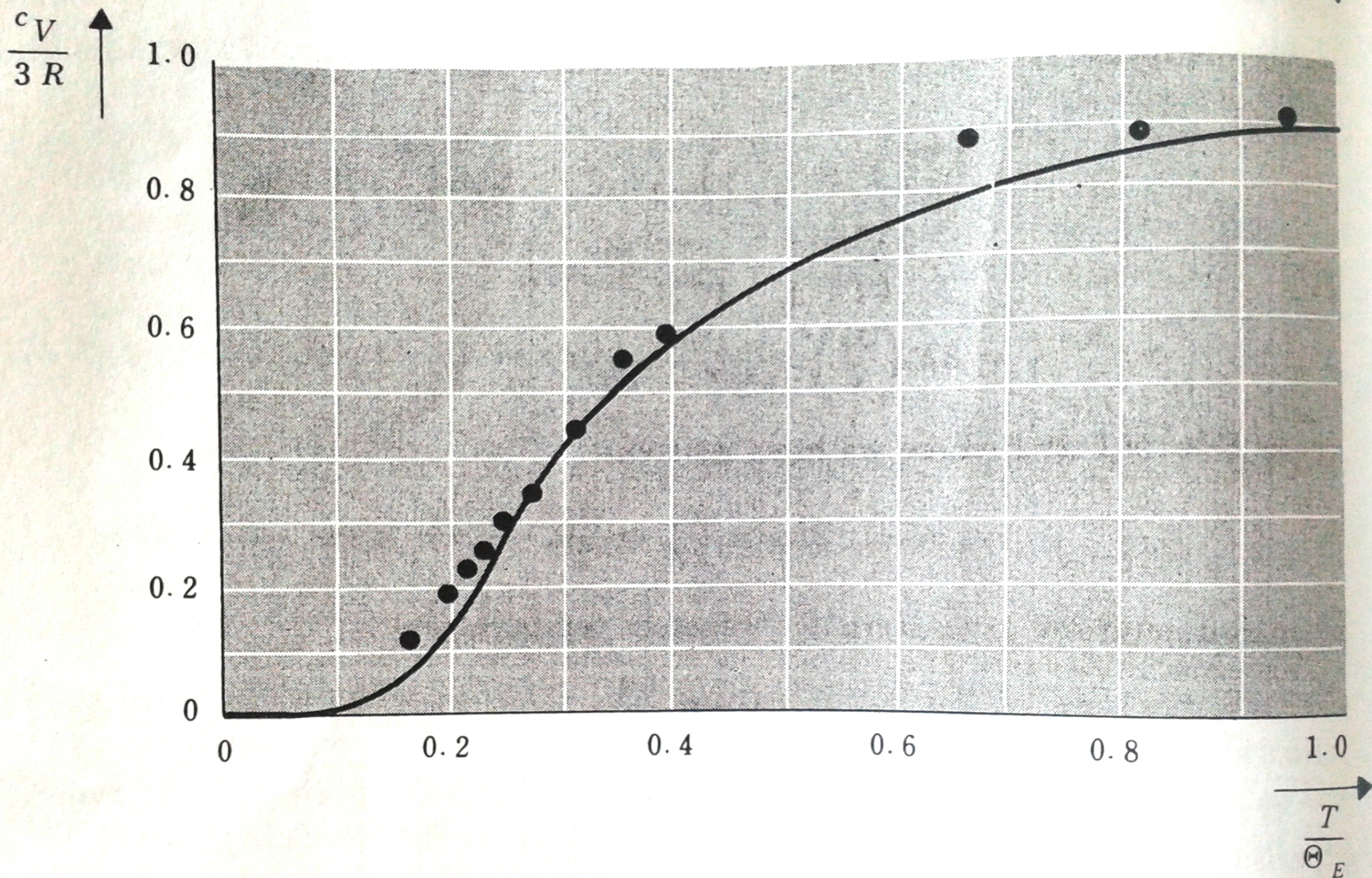
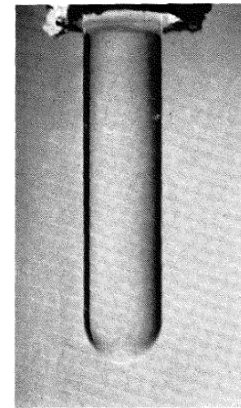
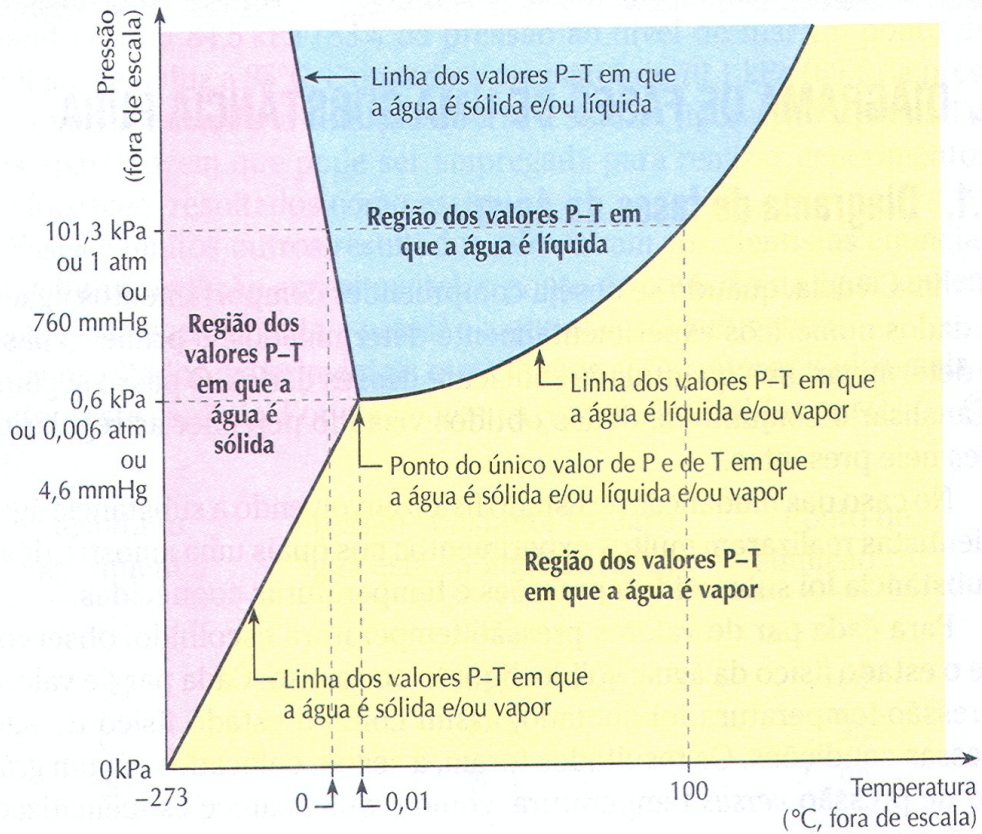
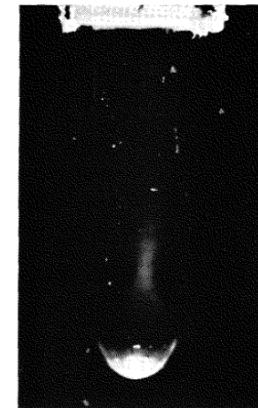


Fig. 7·7·1 Temperature dependence of c_V according to the Einstein model. The points are experimental values of c_V for diamond, the fit to the curve being achieved by choosing $\Theta_E = 1320^\circ\text{K}$ (after A. Einstein, *Ann. Physik*, vol. 22, p. 186 (1907)).

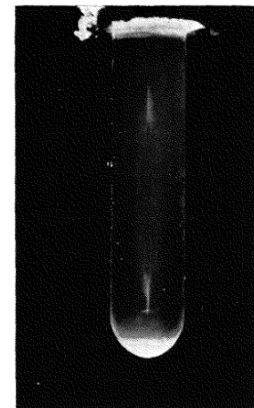
Transição de Fase em sistemas Físicos



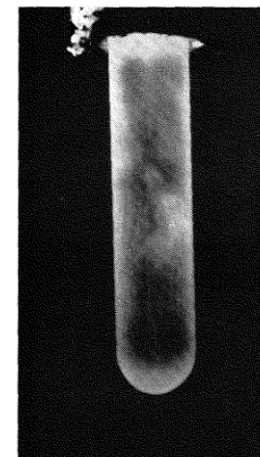
a



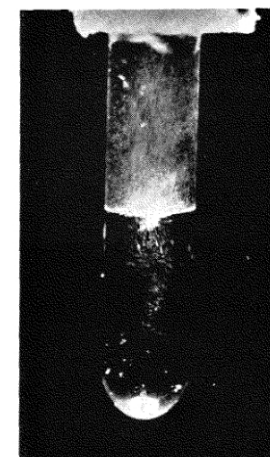
b



c



d



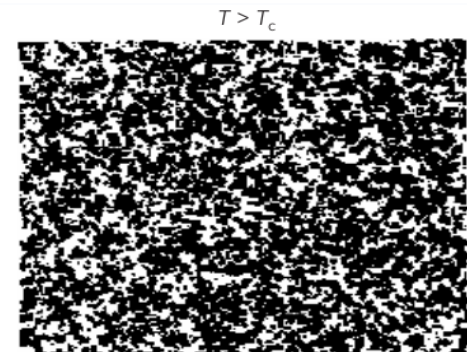
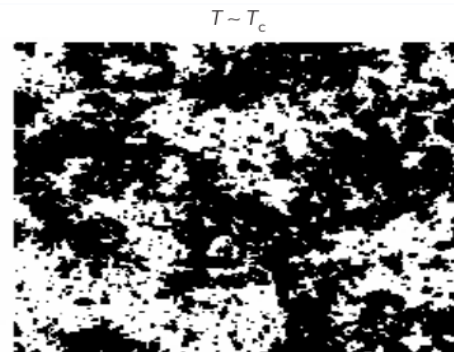
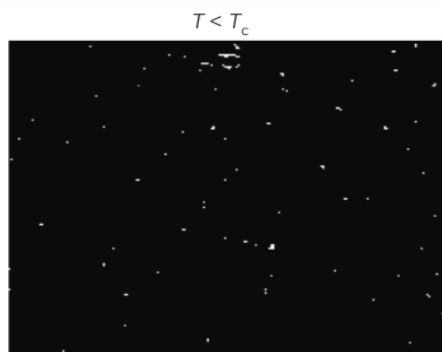
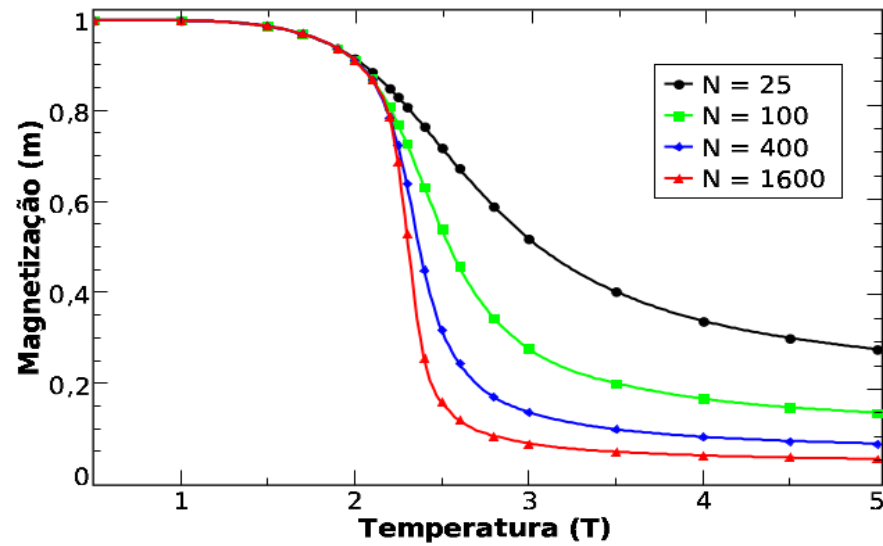
e

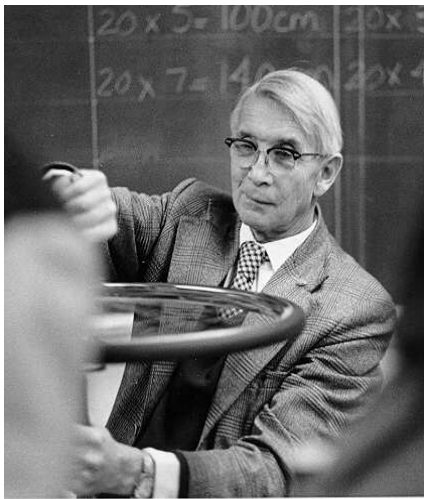


f

FIG. 1.6. Behaviour of a fluid as the temperature is lowered past the critical temperature: (a), $T \gg T_c$; (b), $T \gtrsim T_c$; (c), $T \simeq T_c$; (d), $T \lesssim T_c$; (e), $T < T_c$; and (f), $T \ll T_c$. The fluid shown is the binary mixture cyclohexane-aniline. After Ferrell (1968).

O Modelo de Ising





Ernst Ising (1900-1998)

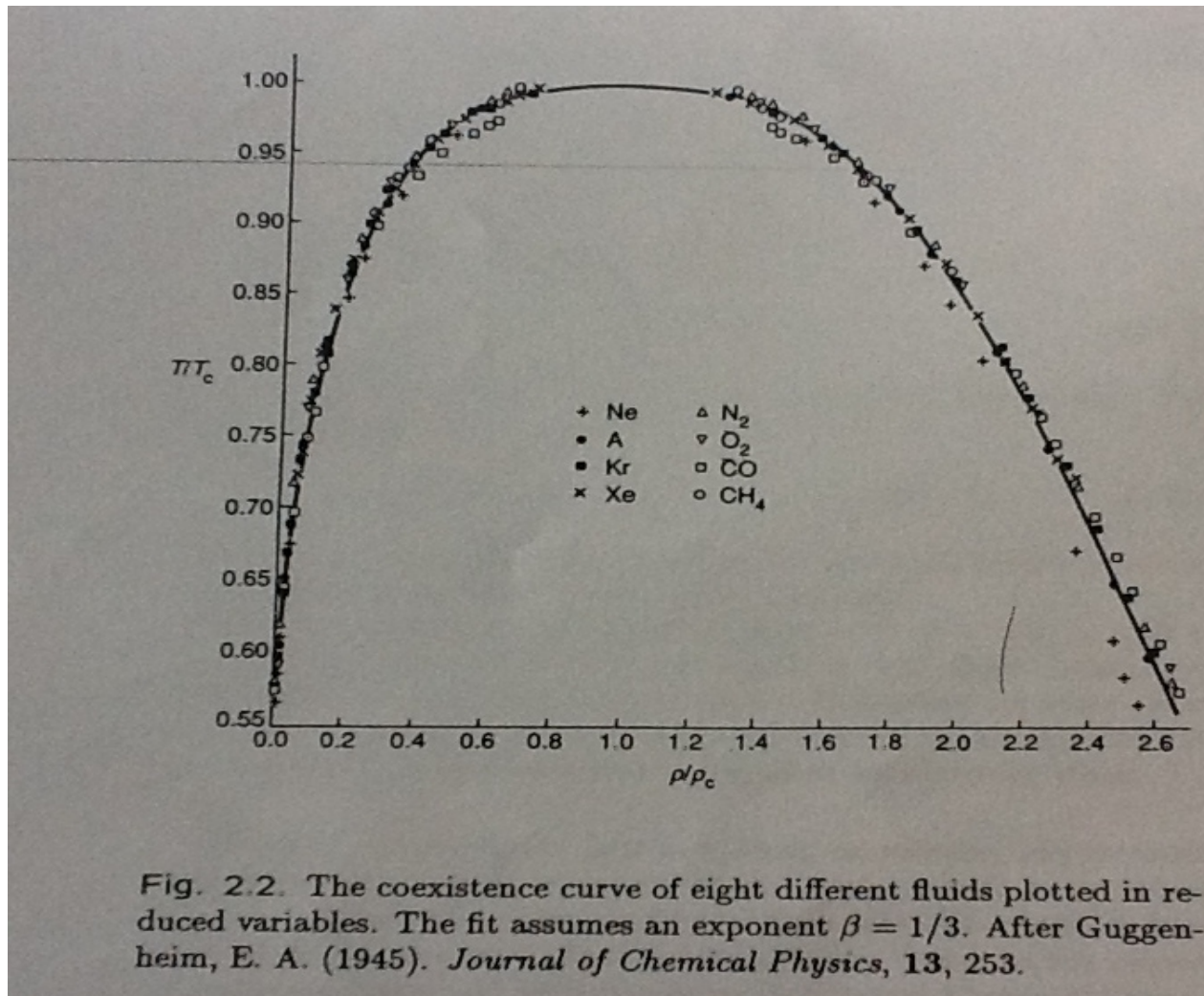


Wilhelm Lenz (1888-1957)

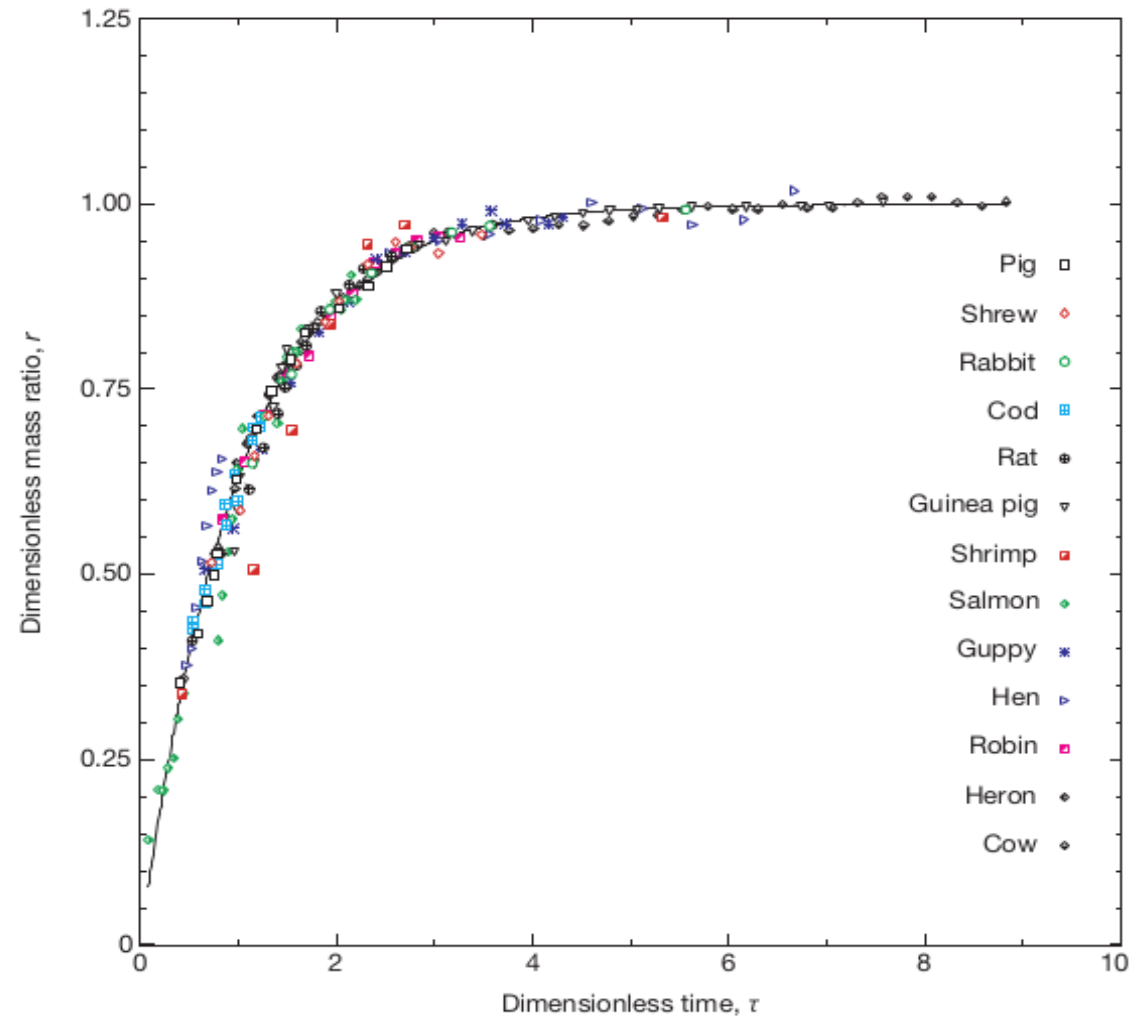
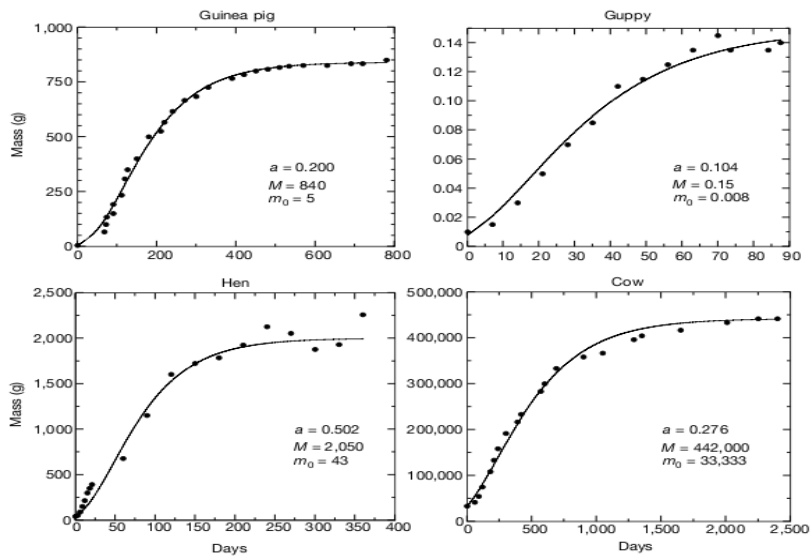


Lars Onsager(1903-1976)

Transições de Fase e Universalidades



Crescimento Animal



G. West et al , Nature Vol 413
(2001)

Stationary distribution of finite-size systems with absorbing states

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(Received 30 May 2005; published 26 August 2005)

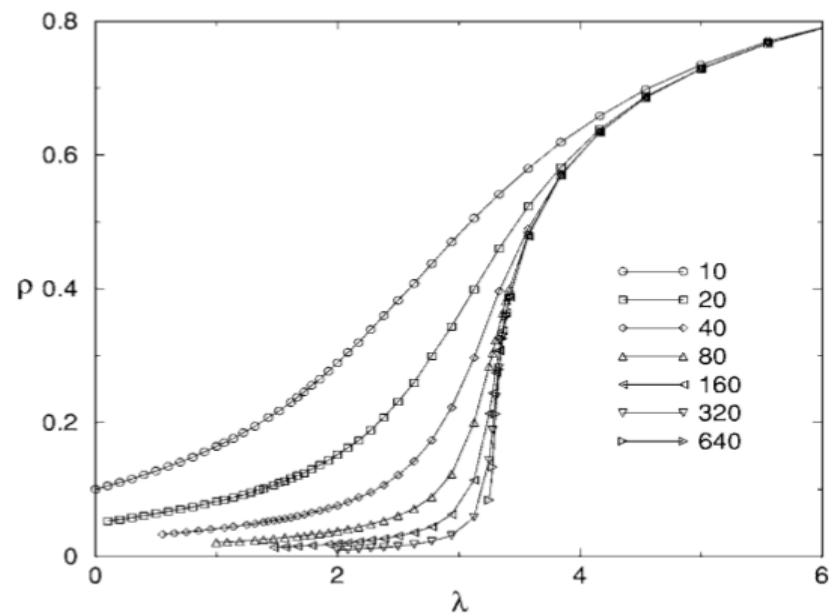


FIG. 1. Density of particles ρ for the contact process as a function of the creation rate λ for several values of the system size L .

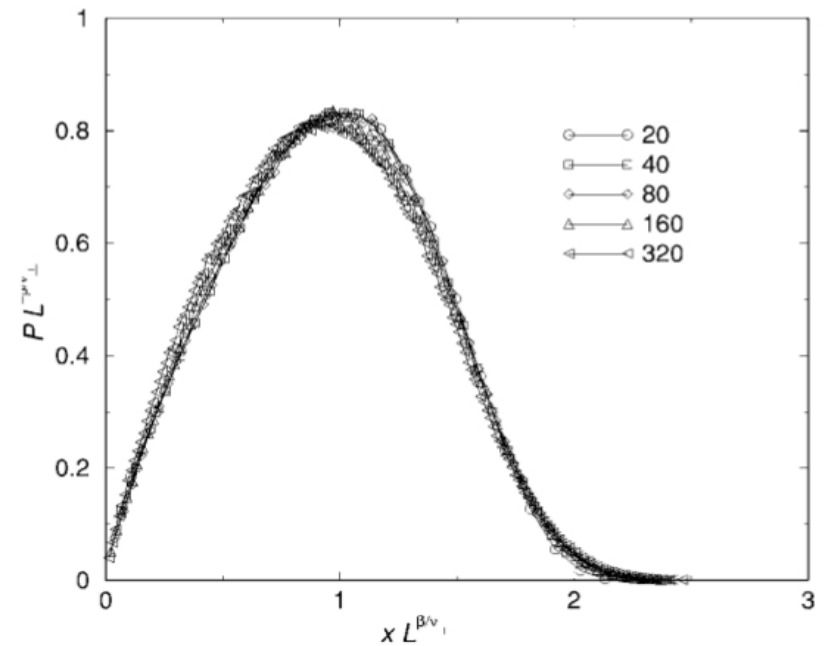


FIG. 4. Data collapse of probability density $P(L,0,x)$ at the critical point obtained for several values of L .



Emergence and loss of assortative mating in sympatric speciation

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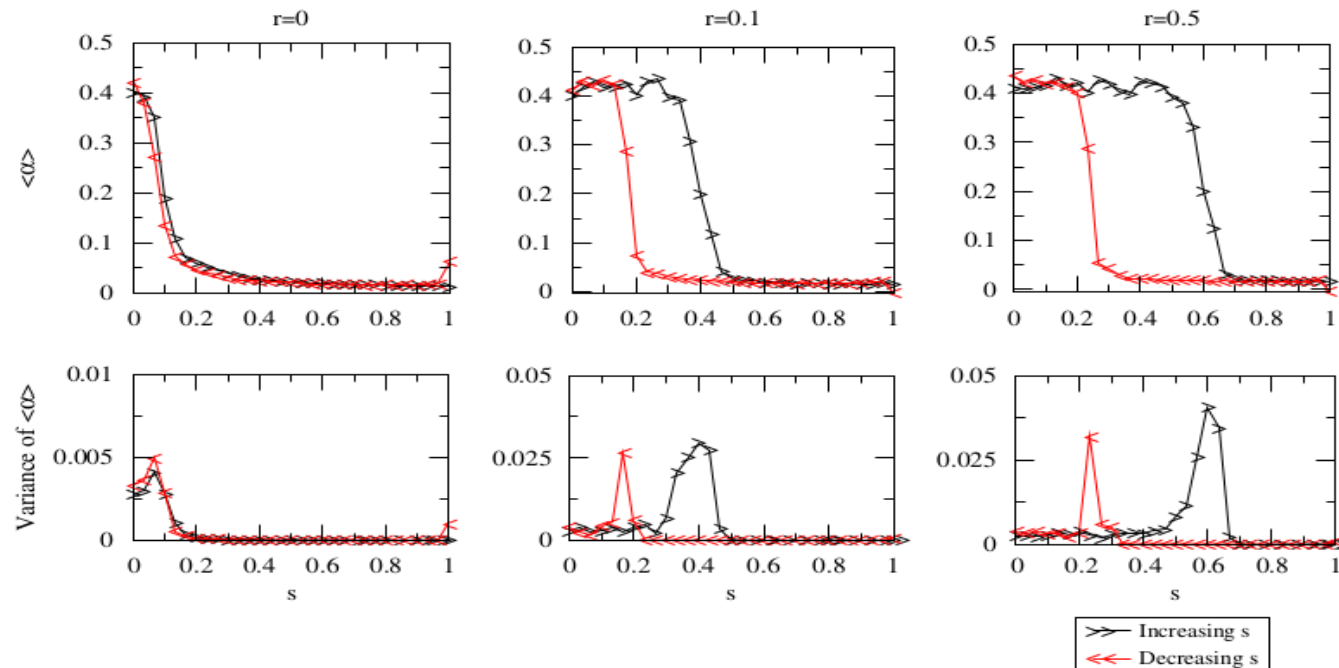
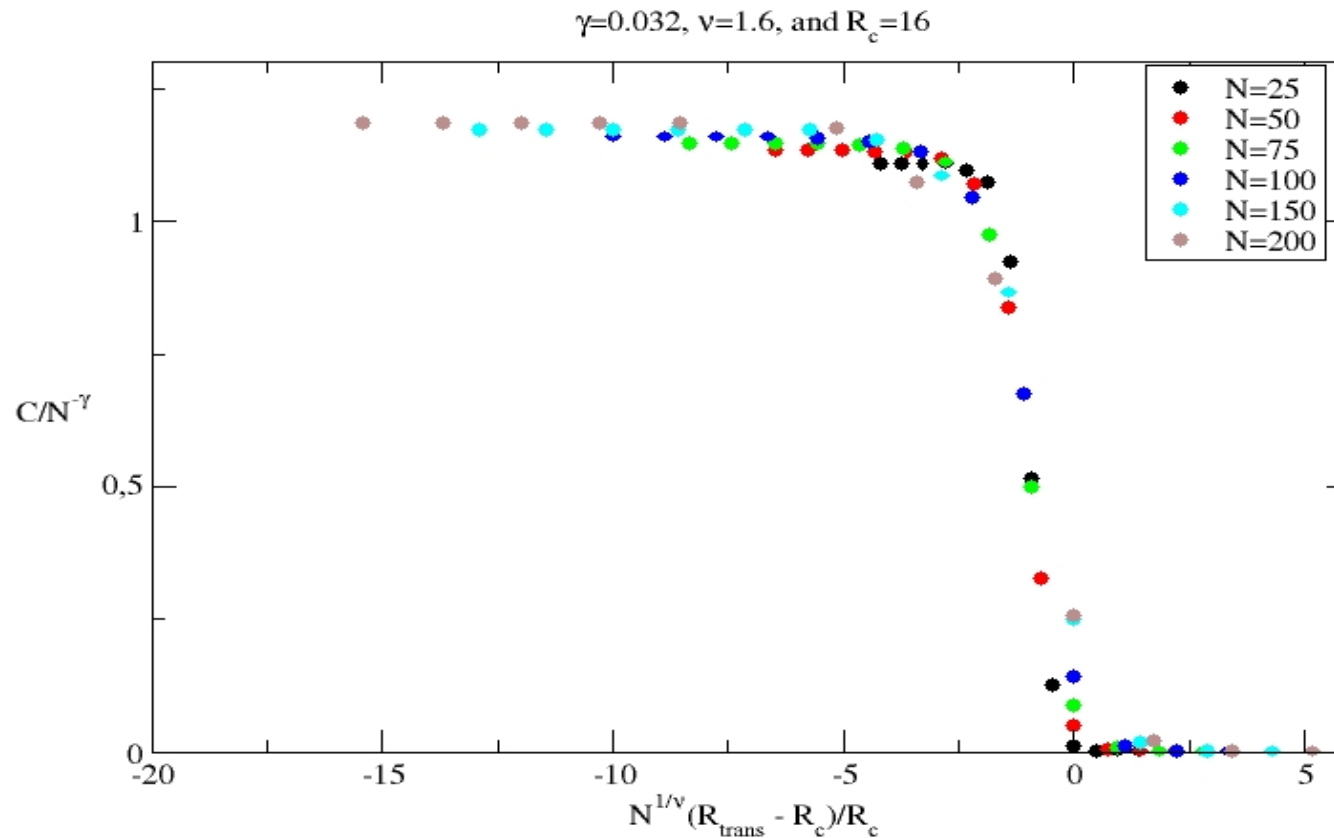
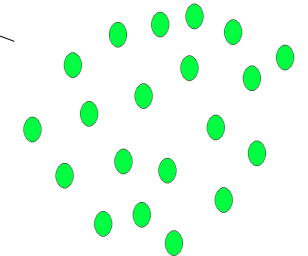
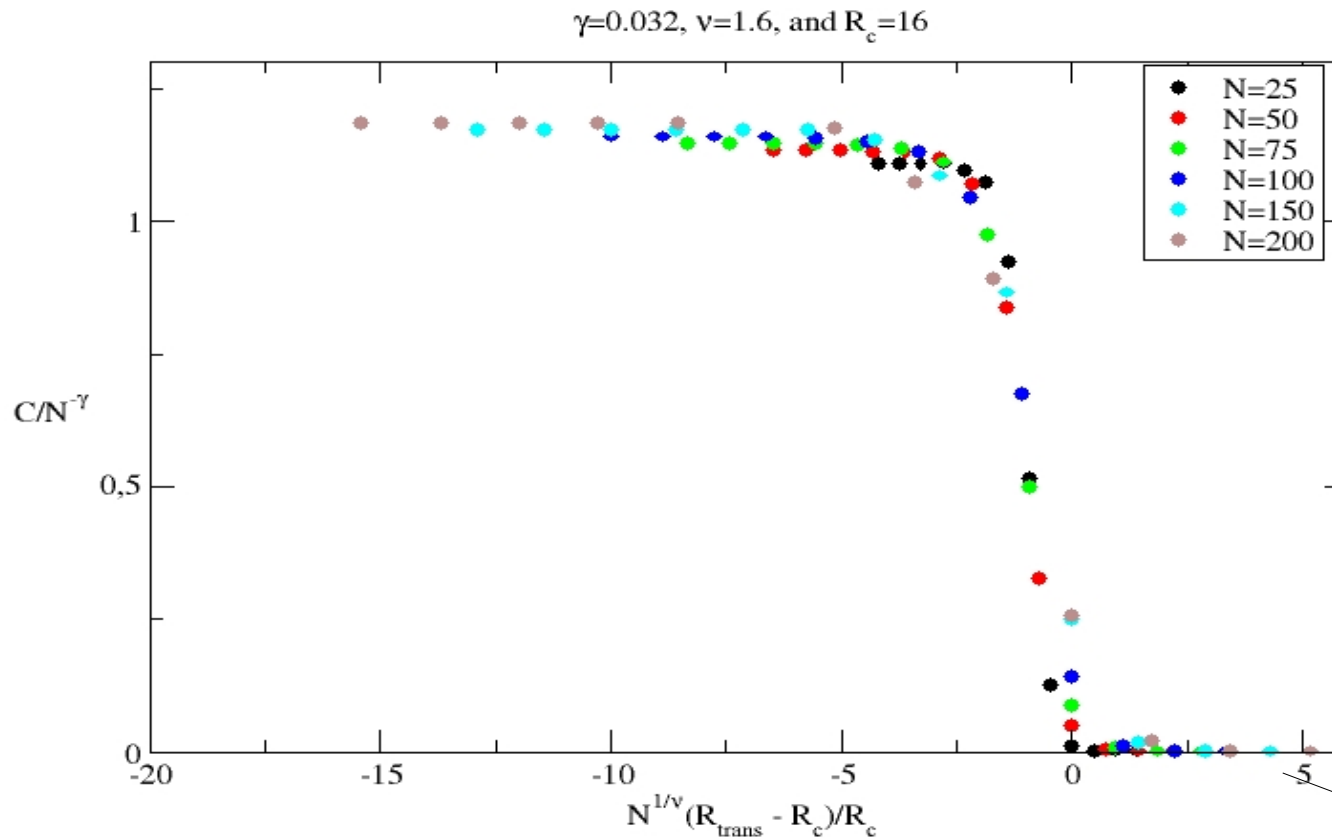


Fig. 11. Hysteresis loop for $r = 0.0, 0.1$ and 0.5 from left to right. Result of 30 different experiments with the same parameters with different random number seeds. (Top row) \hat{z} , upper curve: starting from $s = 0$, we simulate with a given value of s until equilibrium is reached then \hat{z} is measured. The next point is obtained by increasing s by an increment $\Delta s = 0.033$. The lower curve is obtained going back, the sign of Δs is reversed. The values of $\kappa = 1$ is kept fixed. (Bottom row) The variance of \hat{z} , which measures the fluctuations in the population has a strong peak at the transitions. The peak's position depends on whether s is increasing or decreasing.

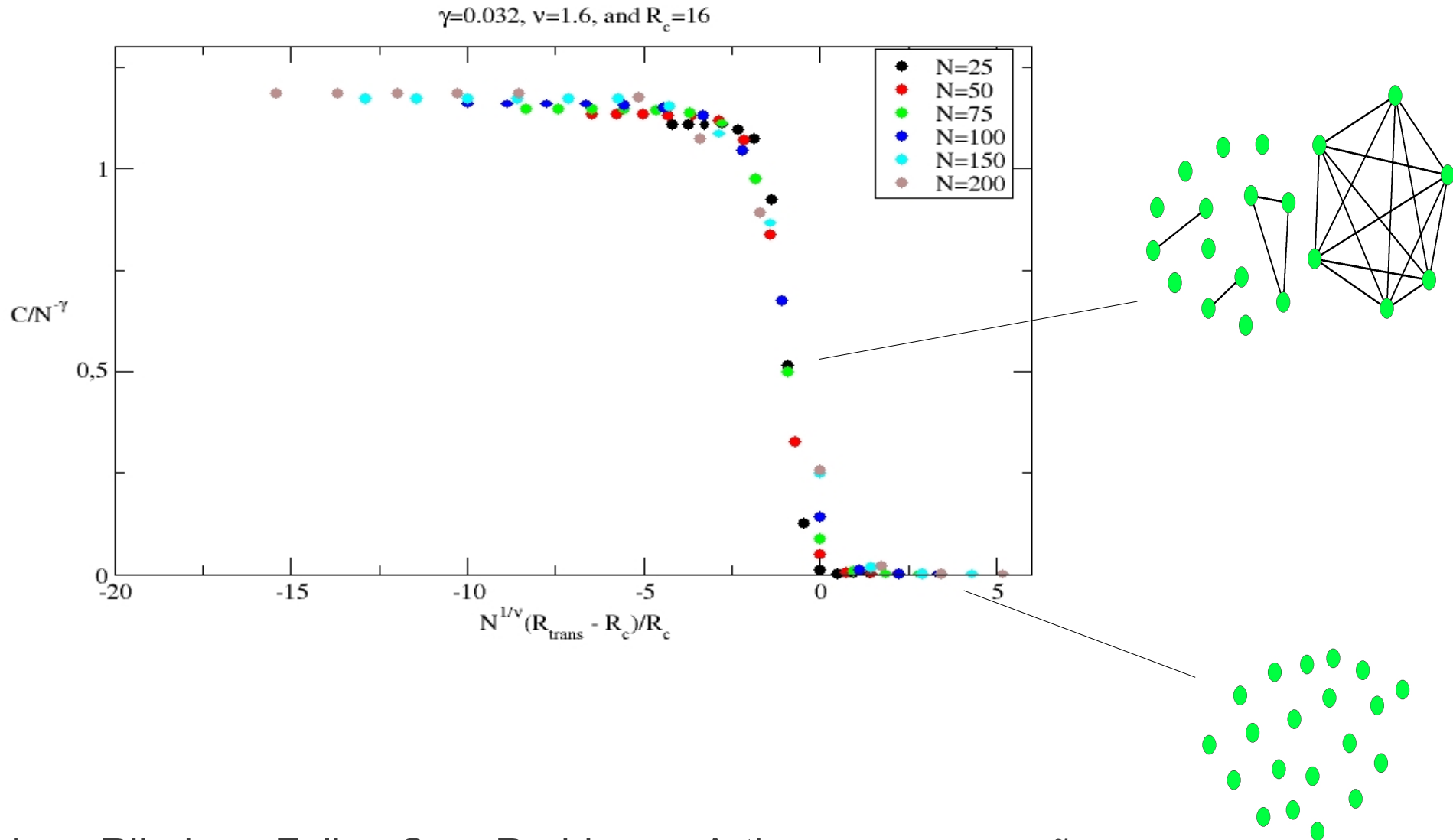
Emergência de Linguagem



Emergência de Linguagem

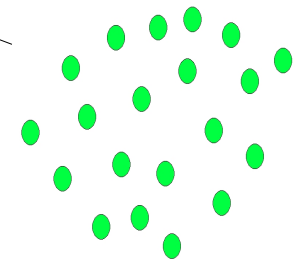
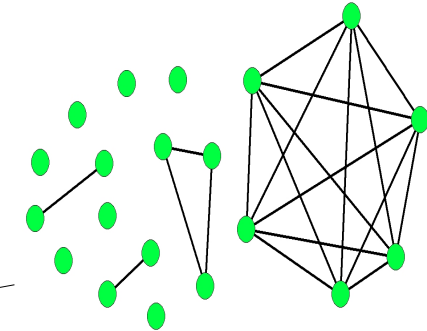
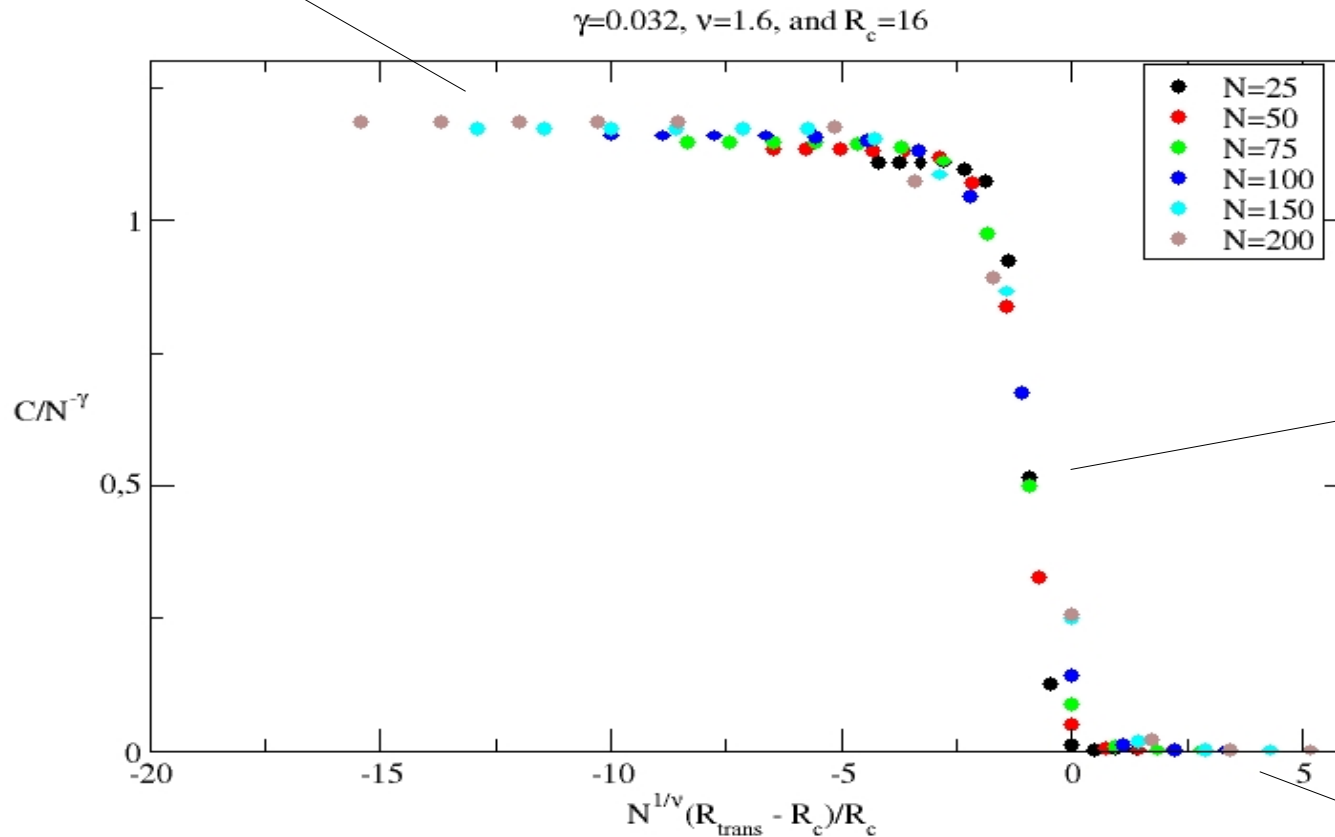
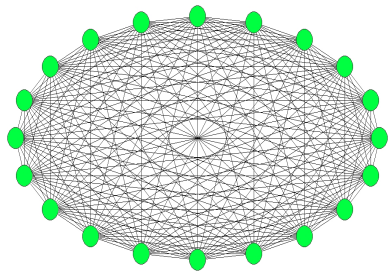


Emergência de Linguagem



Fabiano Ribeiro e Felipe Cruz Rodrigues. Artigo em preparação.

Emergência de Linguagem



富嶽三十六景 神奈川沖
波裏

舟江島一景

