

Difusão

Difusão anômala

Séries temporais

Instituto Nacional de Ciência e Tecnologia –
Sistemas Complexos
INCT-SC

Difusão

-

Difundir

s. f.,

acto ou efeito de difundir ou
difundir-se;

derramamento de fluido;

disseminação;

propagação;

prolixidade;

falta de concisão;

Quím.,

mistura de gases de diferentes
densidades.

v. tr.,

espalhar;

disseminar;

dilatar;

estender;

irradiar;

propagar;

divulgar;

multiplicar;

v. refl.,

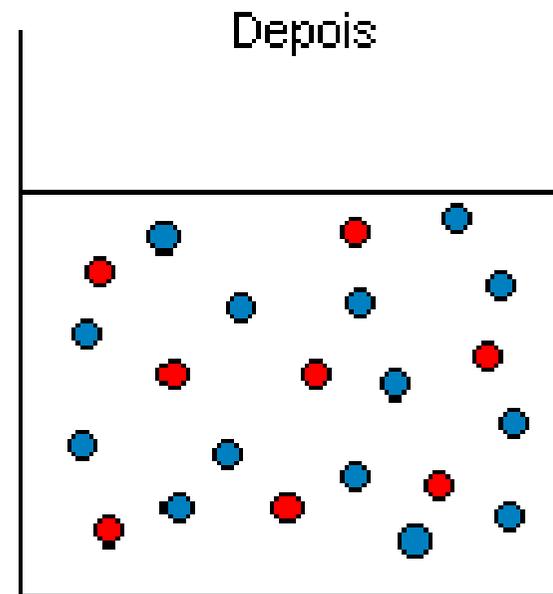
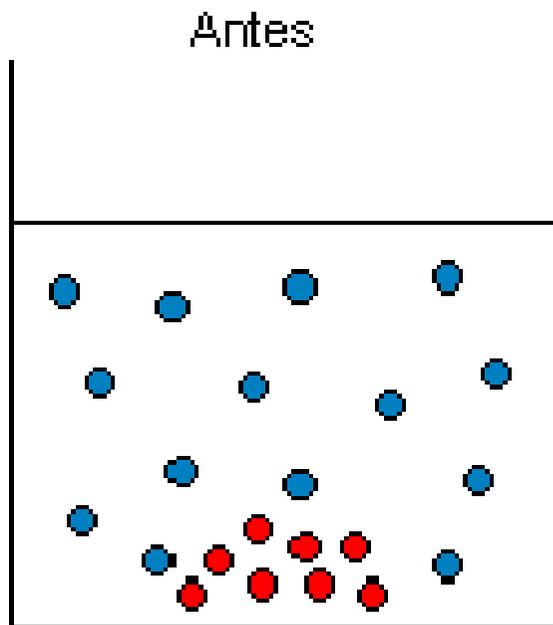
derramar-se,

estender-se;

propagar-se,

divulgar-se.

Difusão de partículas



- A difusão ocorre das regiões de **alta** concentração para as de **baixa** concentração.
- A difusão ocorre na direção do **equilíbrio**.
- Difusão é um dos processos mais comuns na natureza.

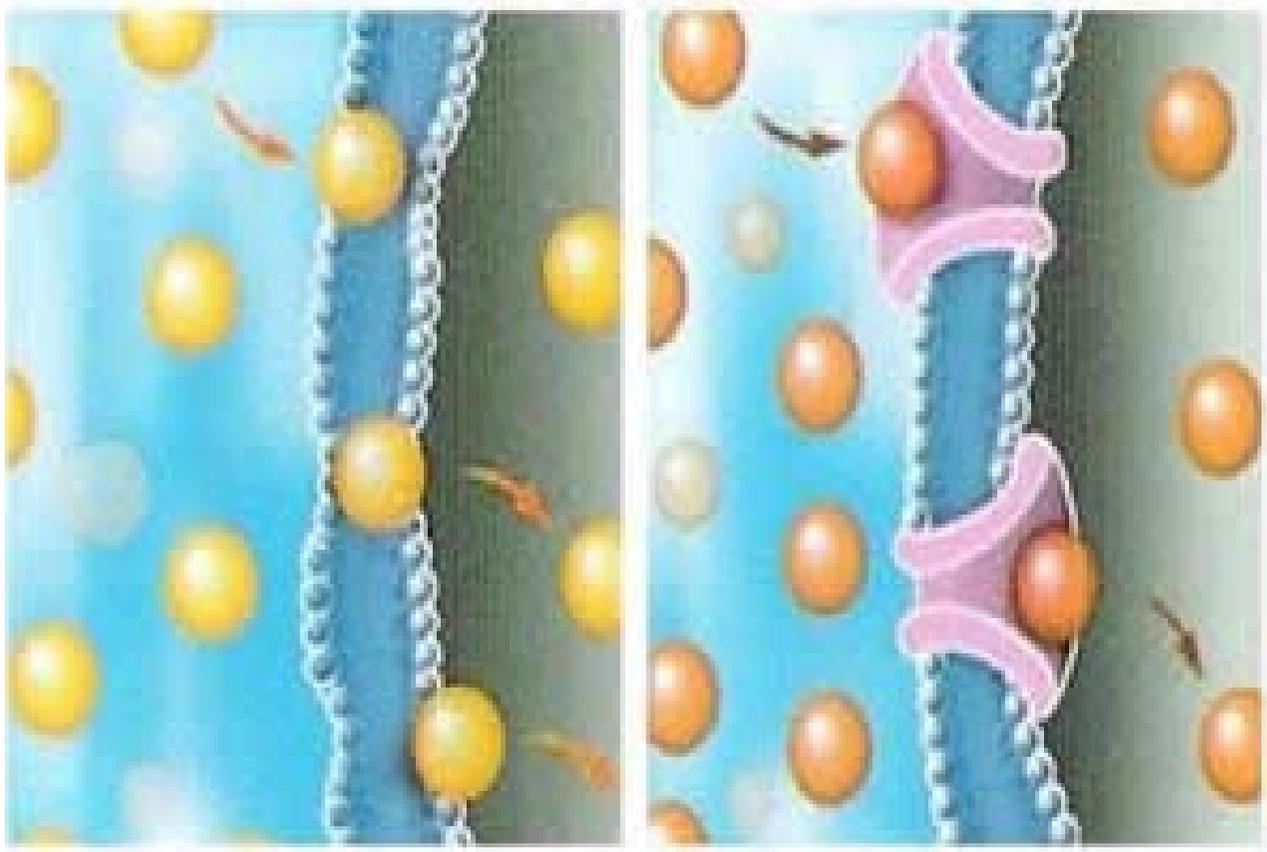
Velocidade de difusão

Propriedades do meio

Tamanho relativo das partículas

Temperatura

Difusão em membranas de células



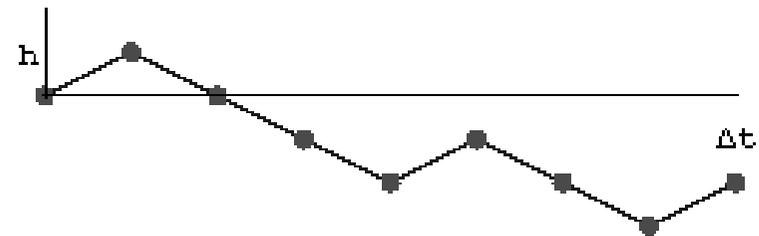
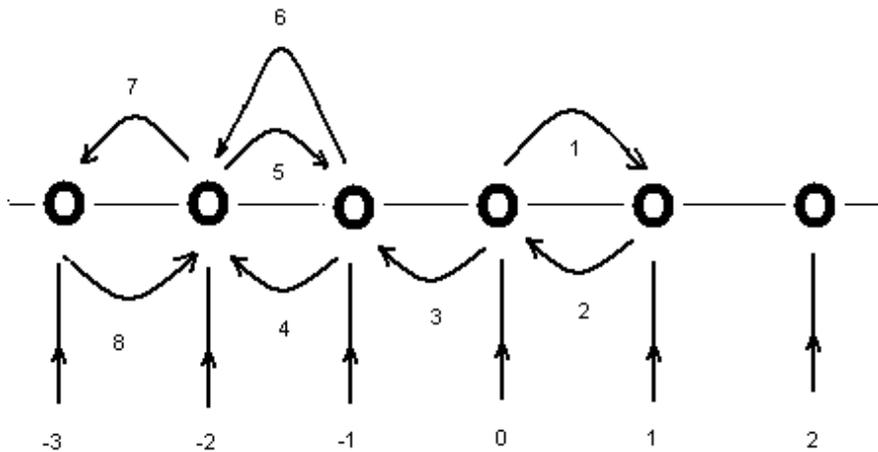
Difusão simples

Difusão facilitada

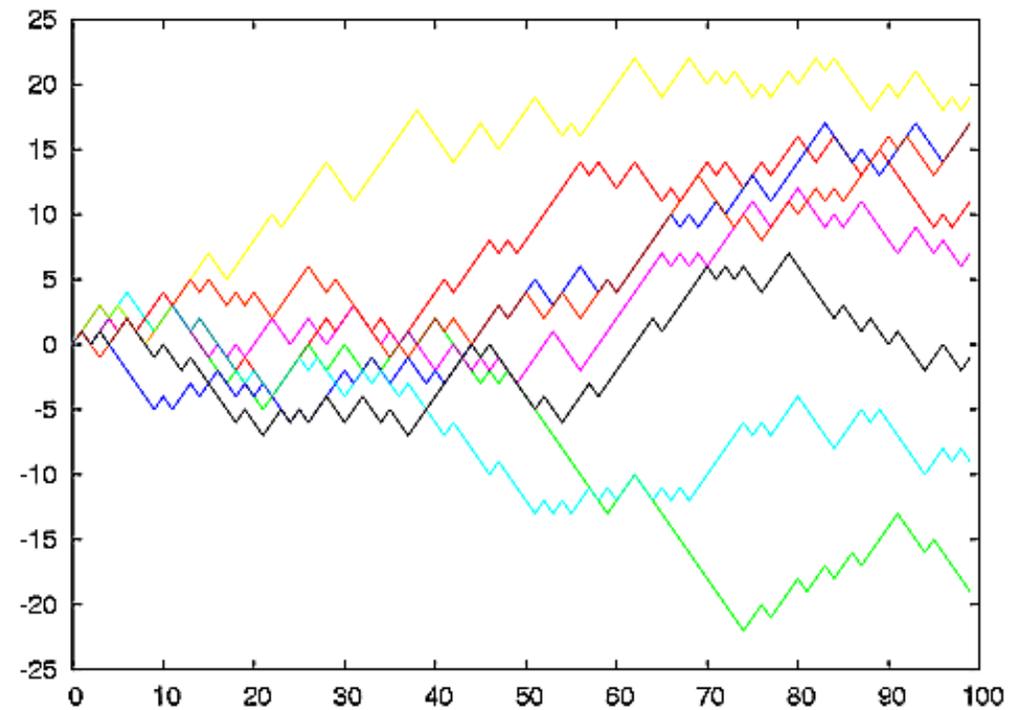
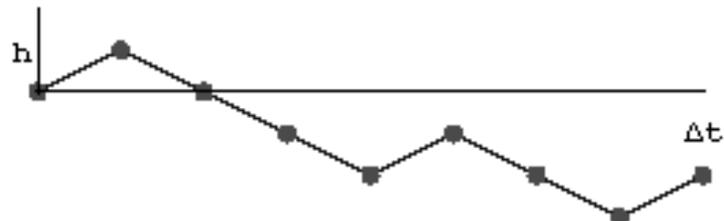
- Difusão de **partículas**
- Difusão de **algo**
- Exemplo: Difusão de **temperatura**
- Exemplo: Difusão de **calor**

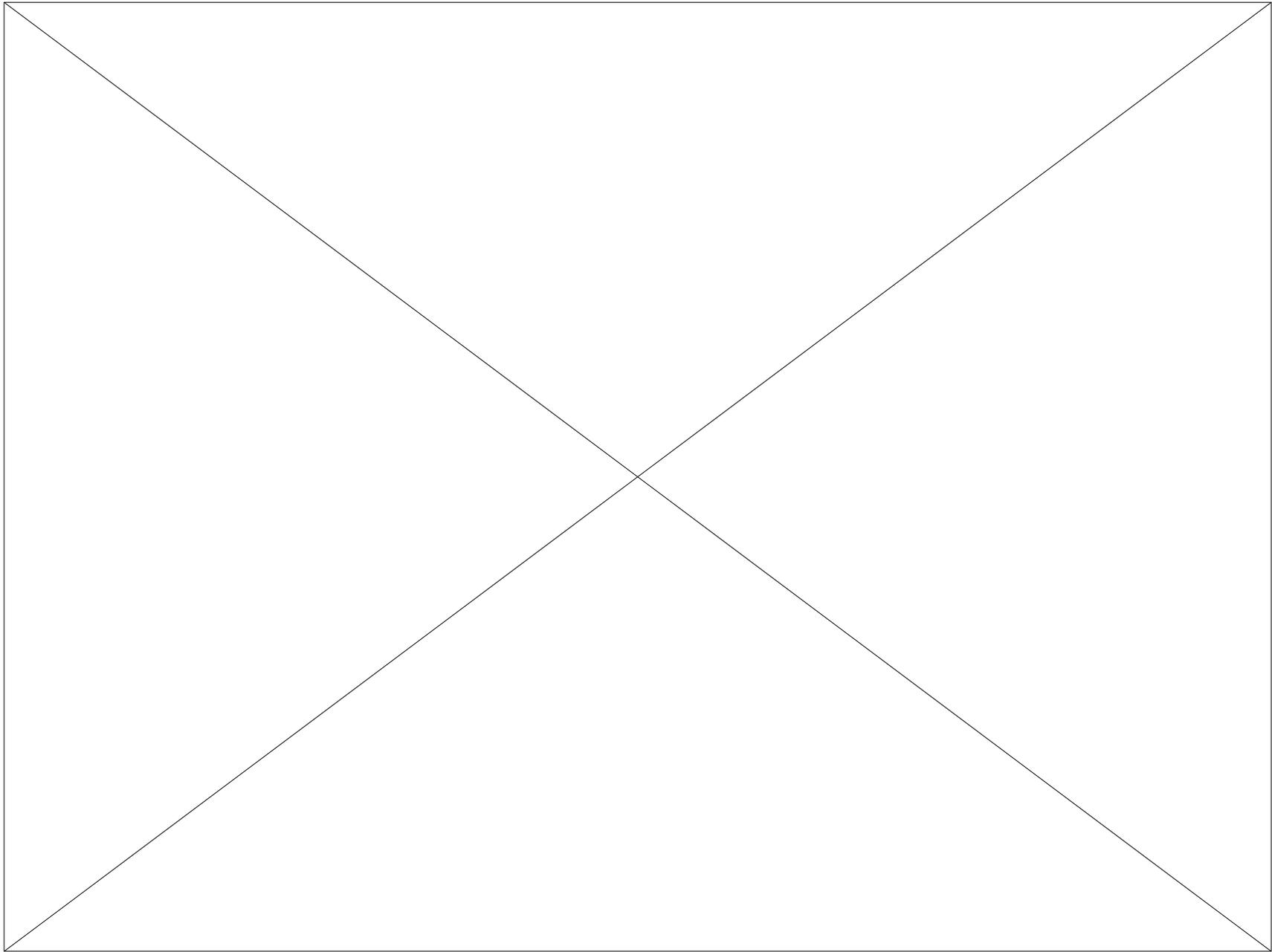
Difusão e caminhada aleatória

- Uma partícula sofre choques aleatórios devido as demais partículas.

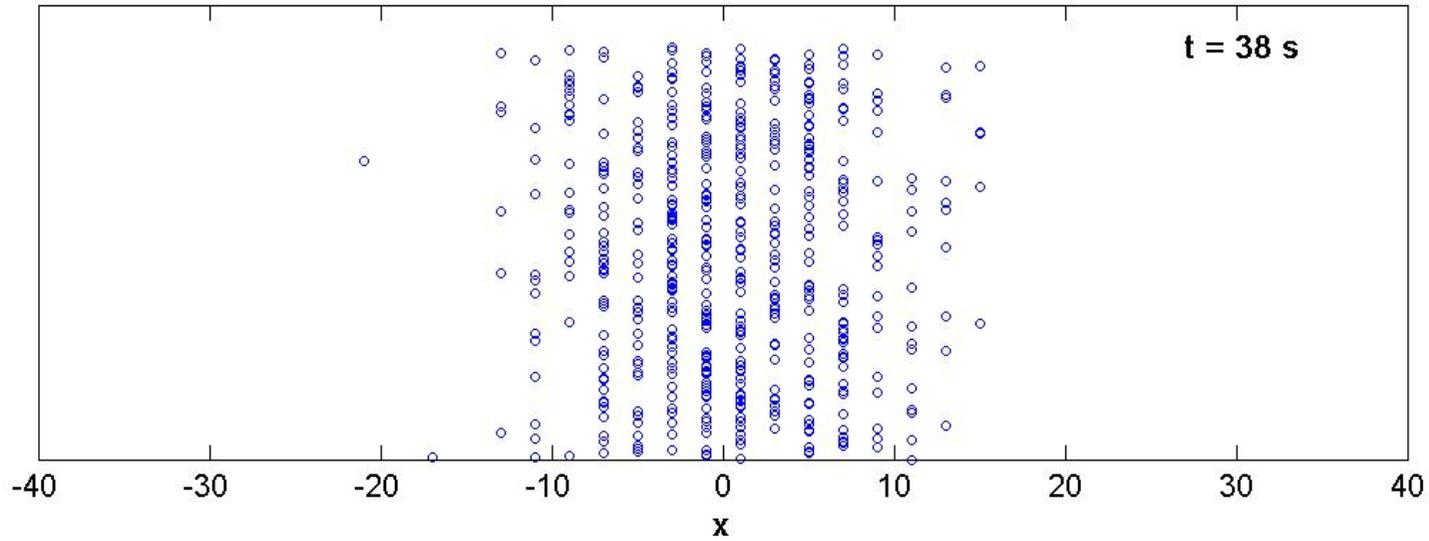


Várias caminhadas aleatórias

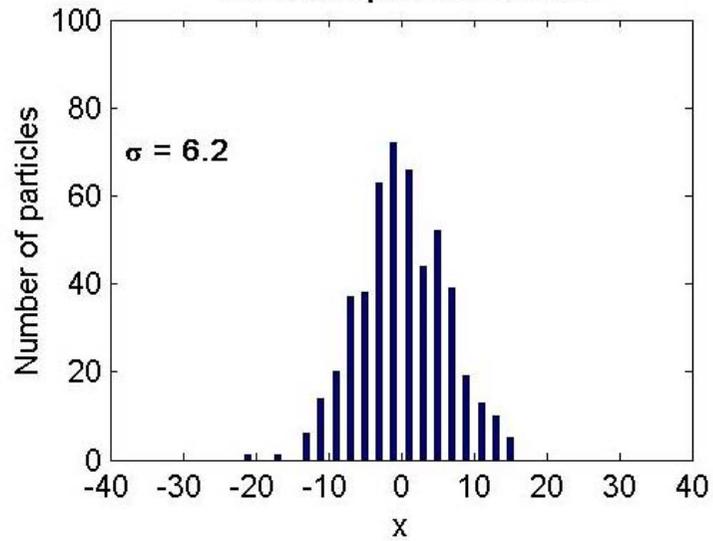




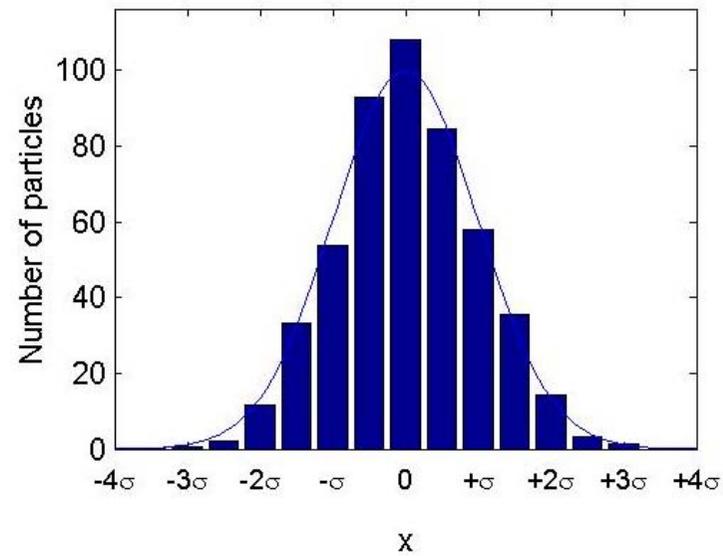
Random walk of 500 particles : $\Delta x = 1$, $\Delta t = 1$



Absolute particle location

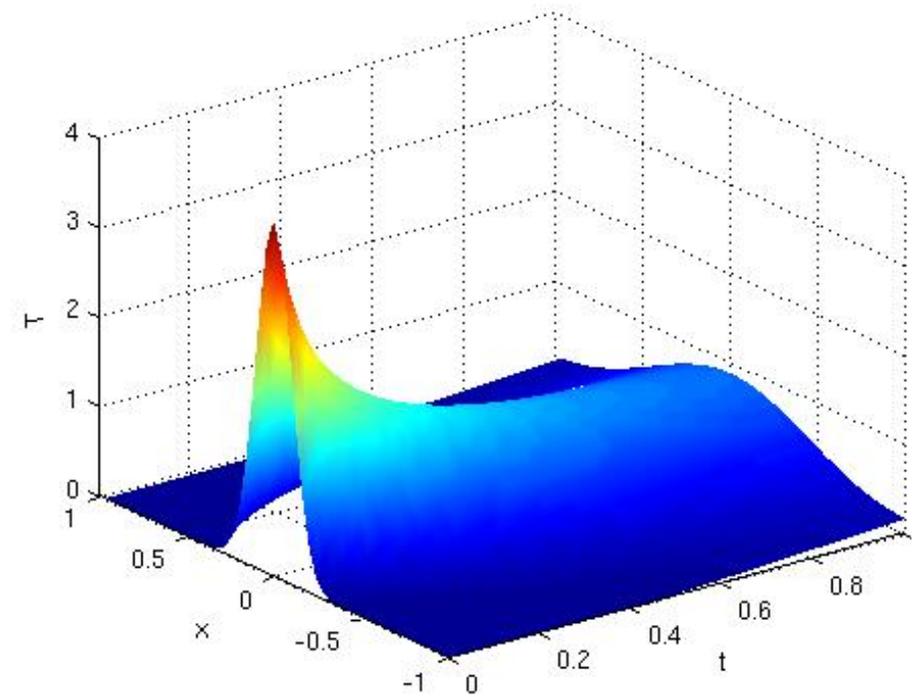
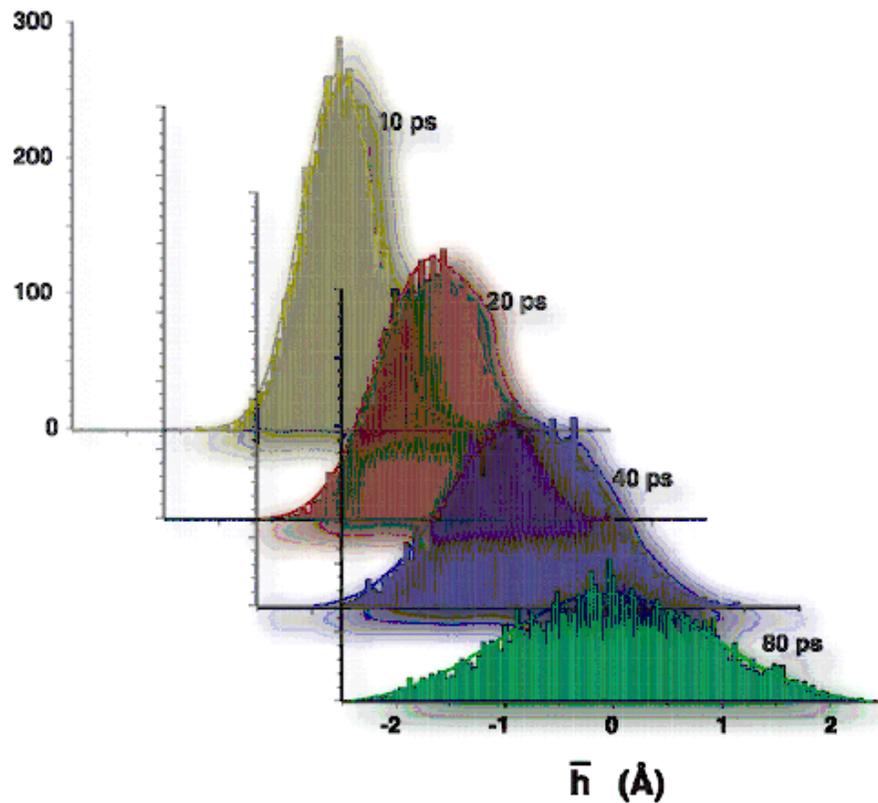
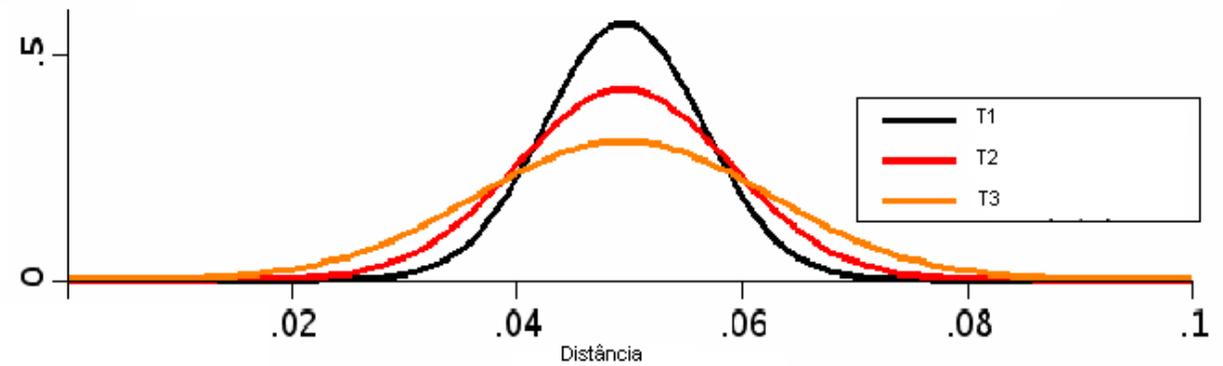


Particle location in terms of σ

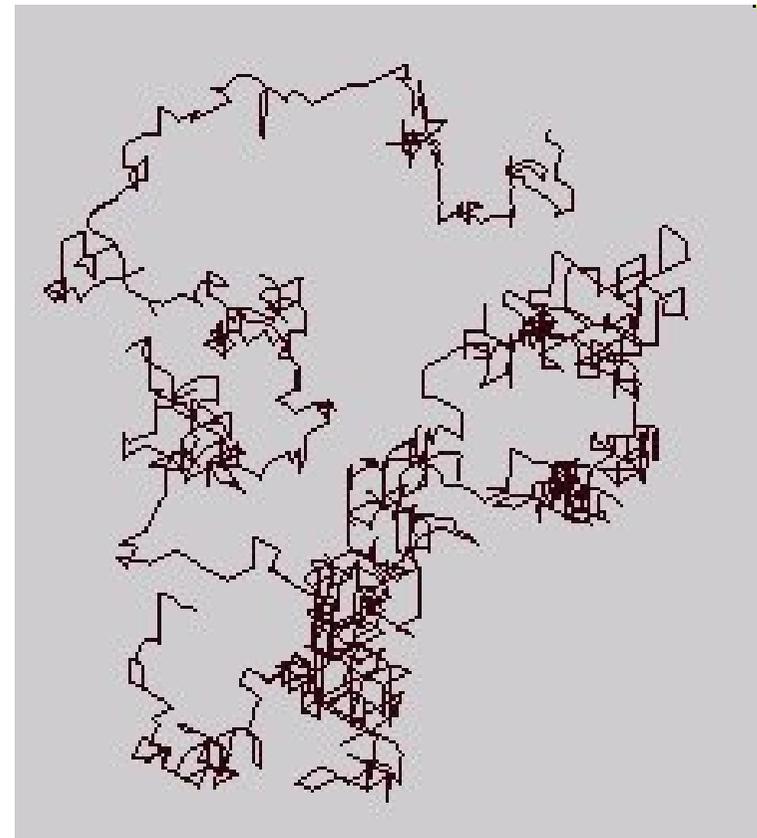
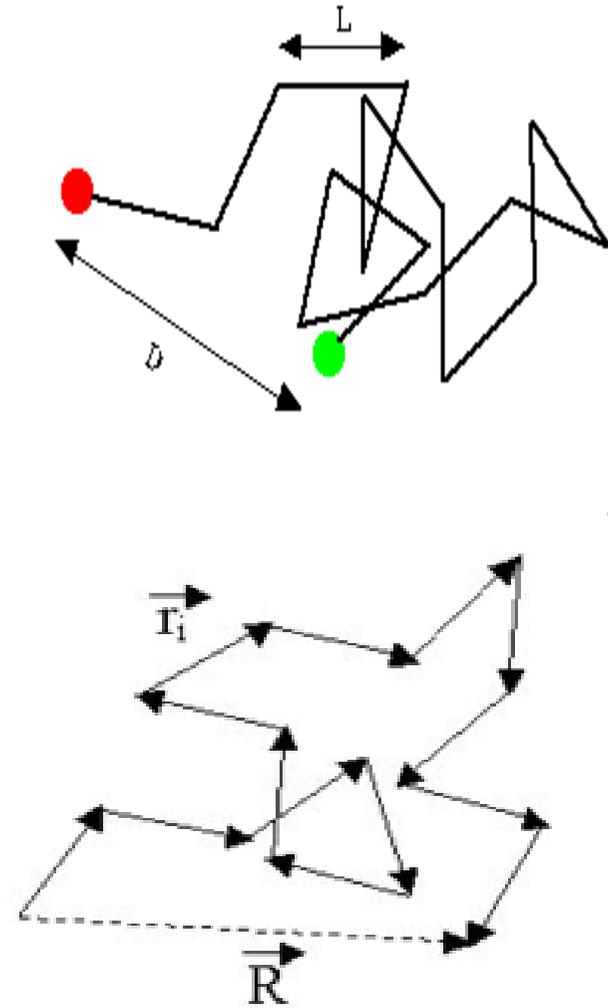


Representação gráfica

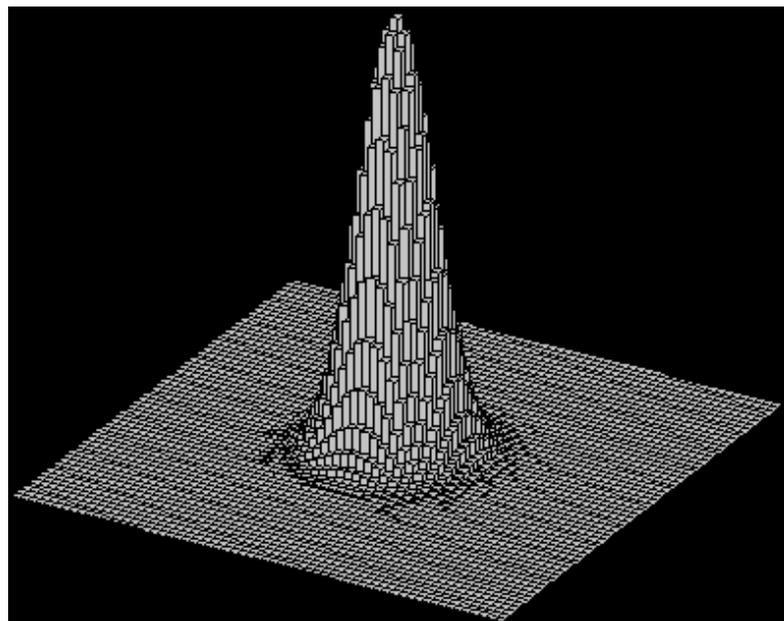
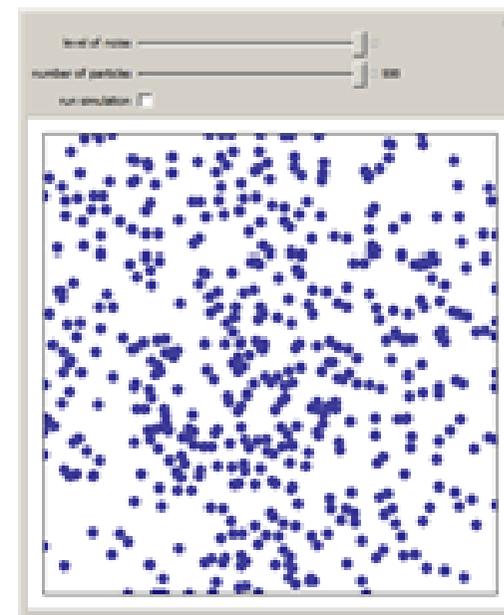
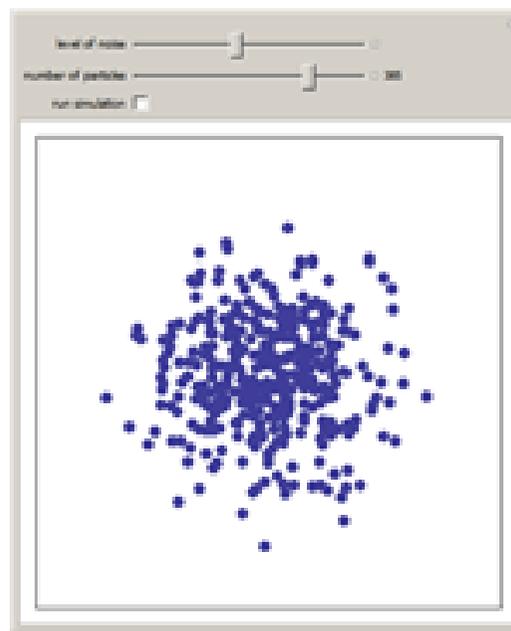
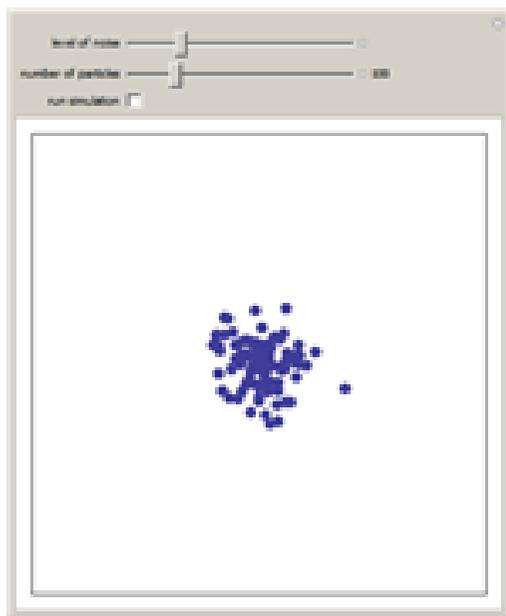
Evolução temporal com $T1 < T2 < T3$



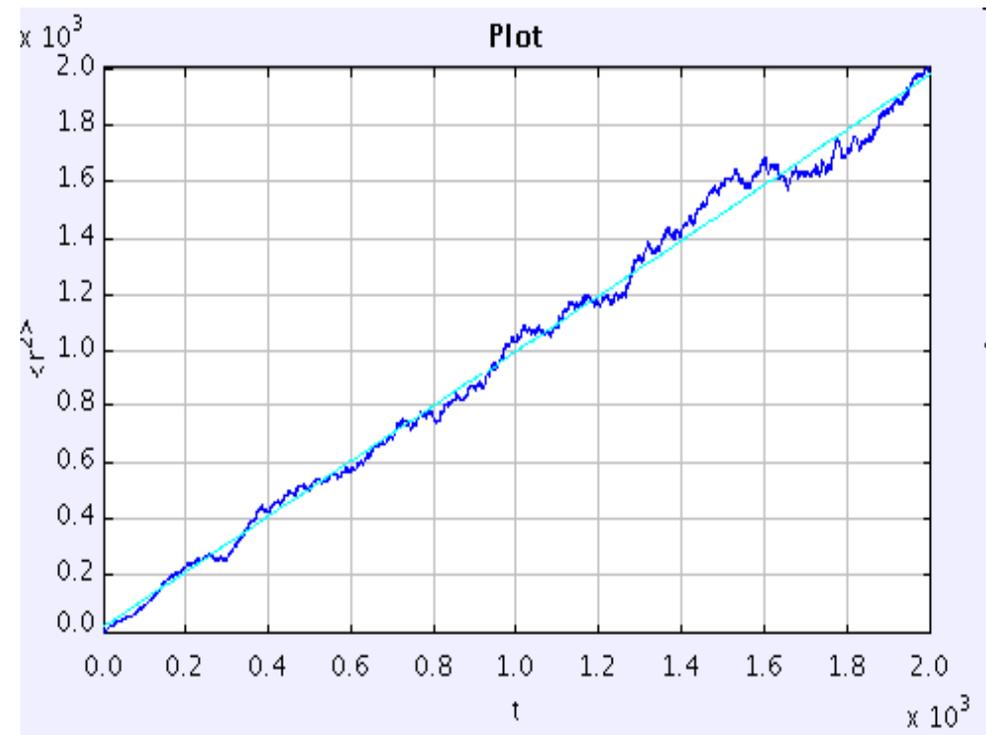
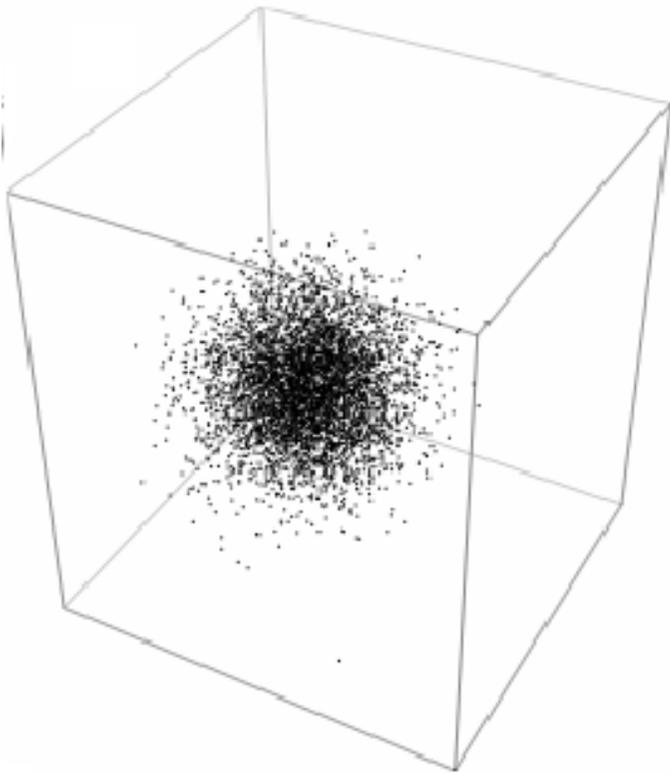
Caso bidimensional



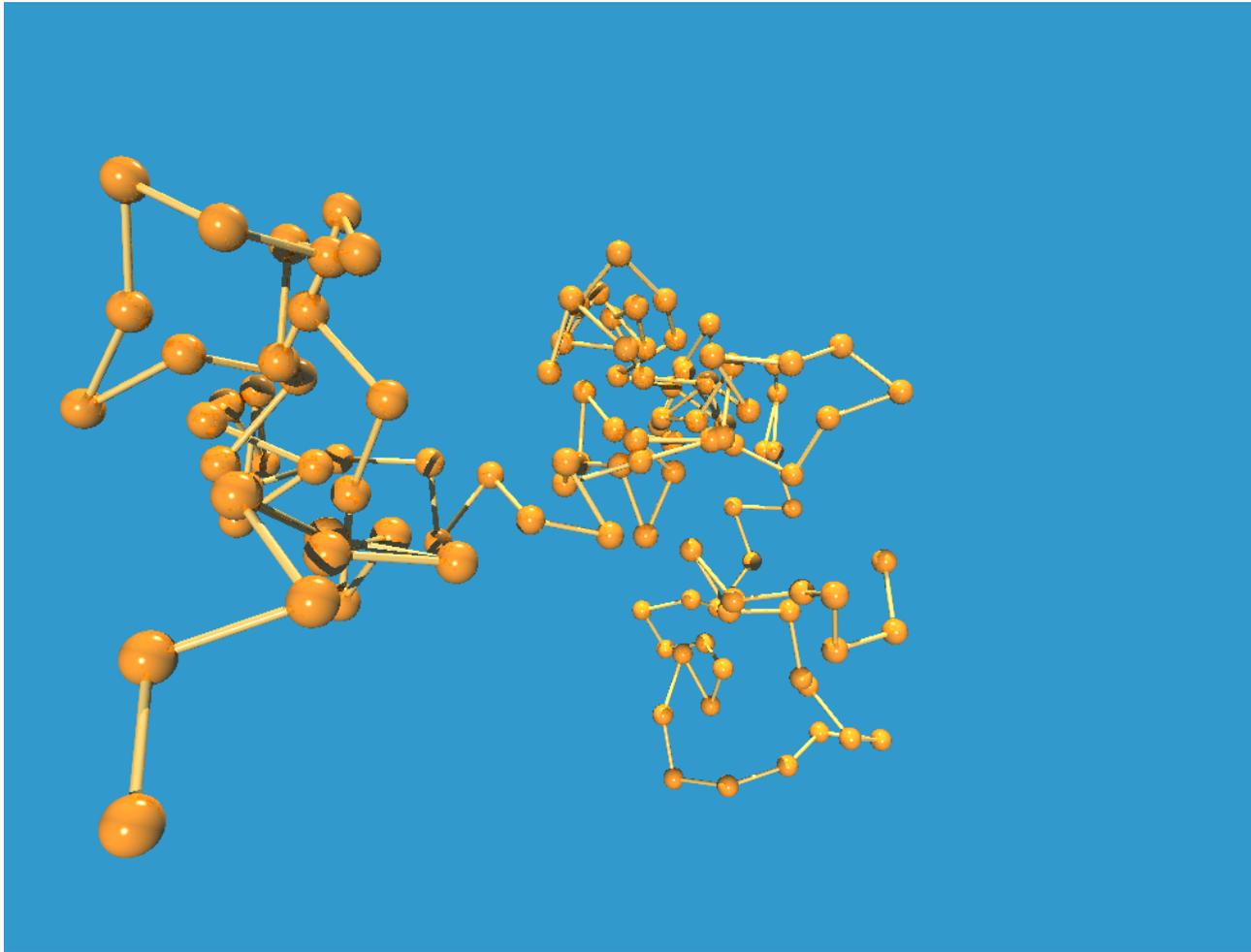
Outras visualizações



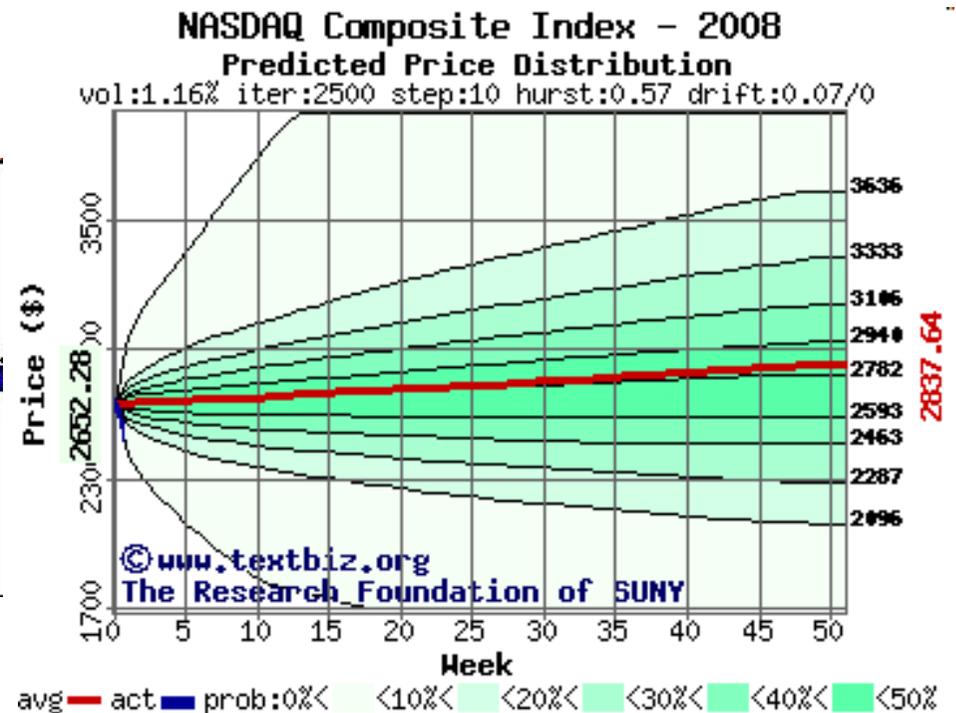
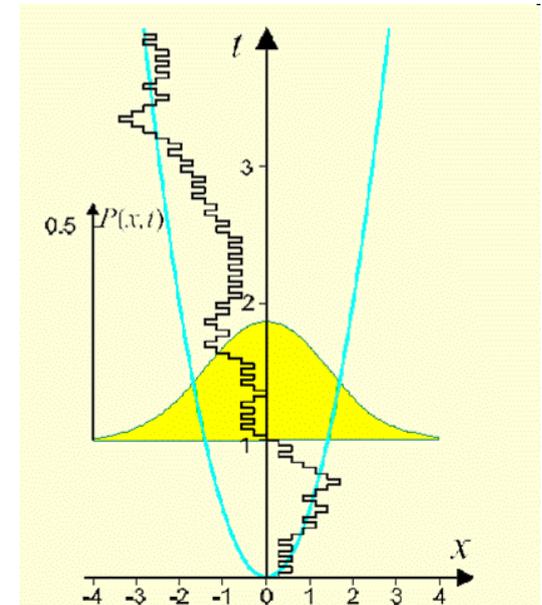
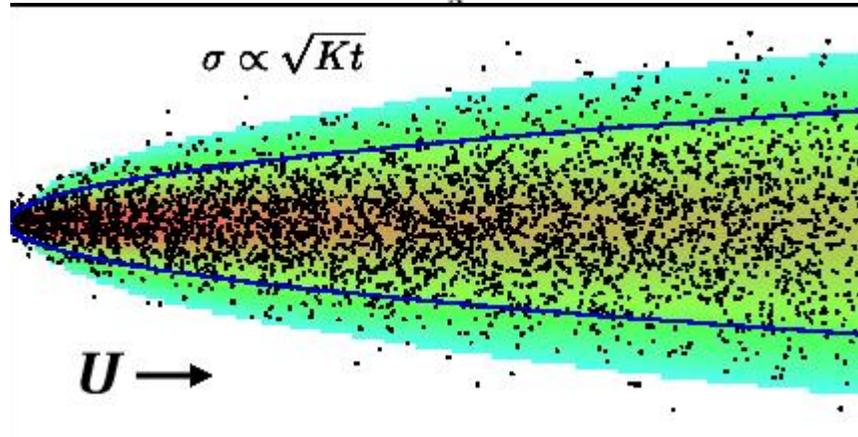
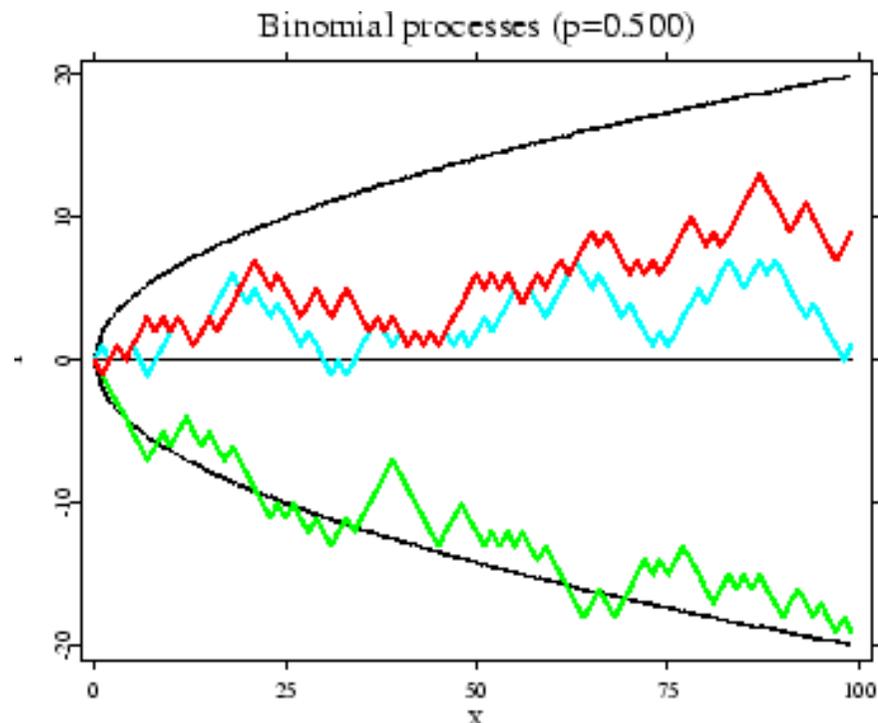
Caso tridimensional



Moléculas longas



Economia



Five Rules for Financial Success

THE RANDOM WALK GUIDE TO INVESTING

BURTON G. MALKIEL

OVER 1 MILLION COPIES SOLD

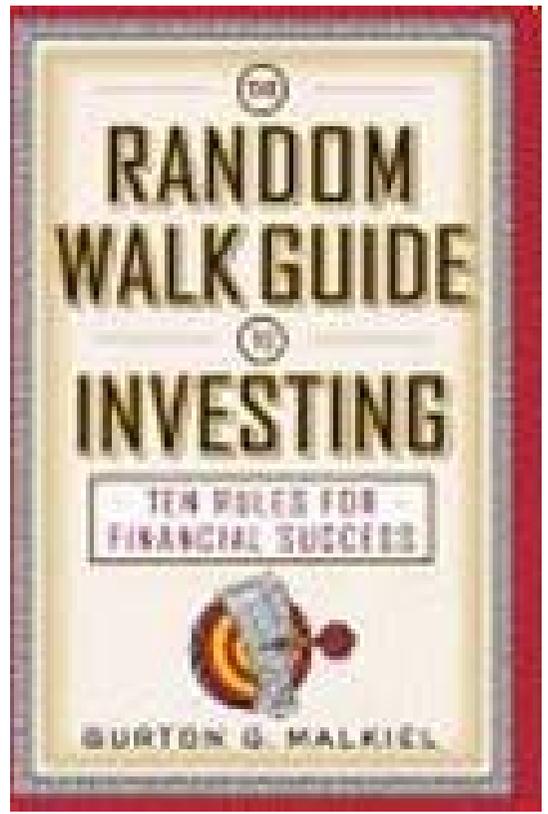
BURTON G. MALKIEL

A Random Walk Down Wall Street

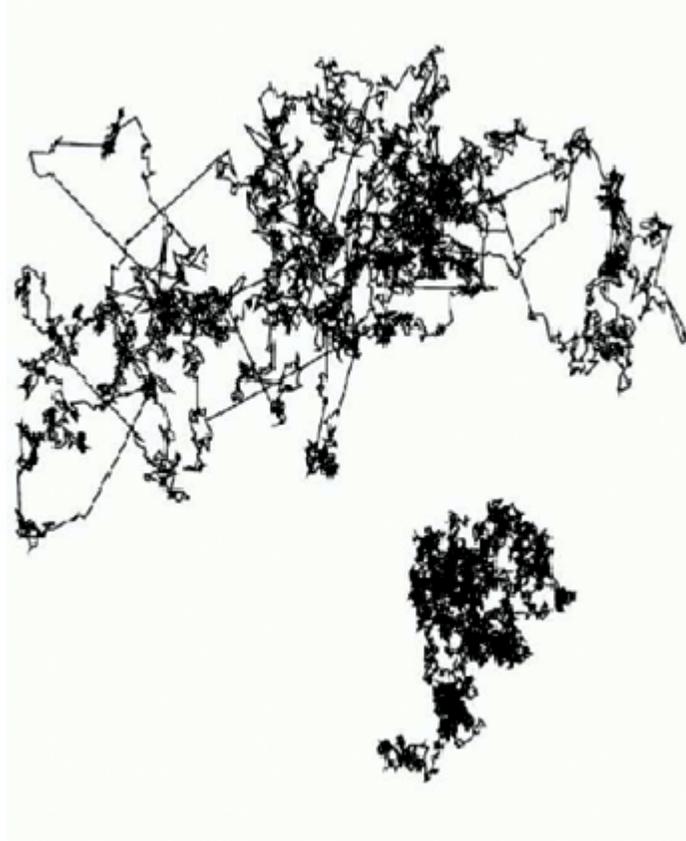
THE TIME-TESTED STRATEGY
FOR SUCCESSFUL INVESTING



COMPLETELY REVISED AND UPDATED



Difusão anômala

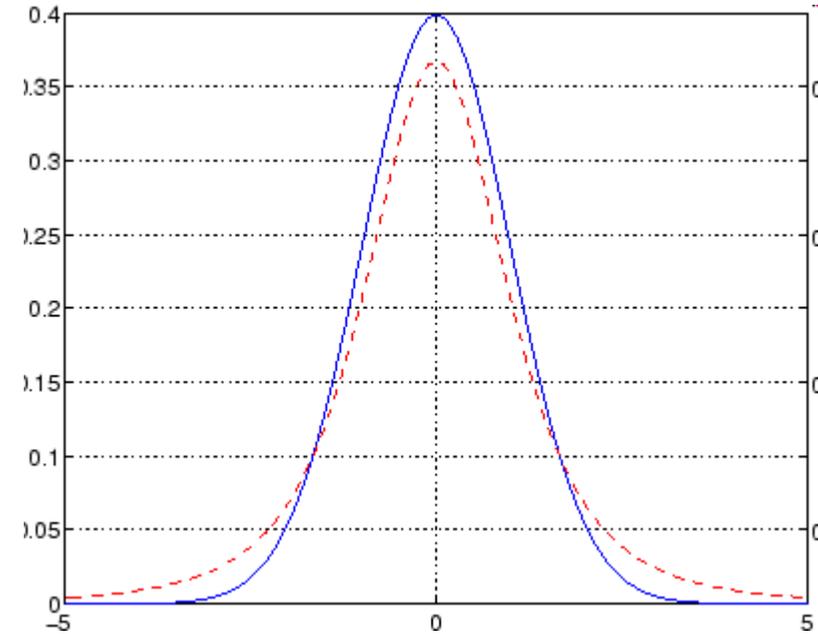
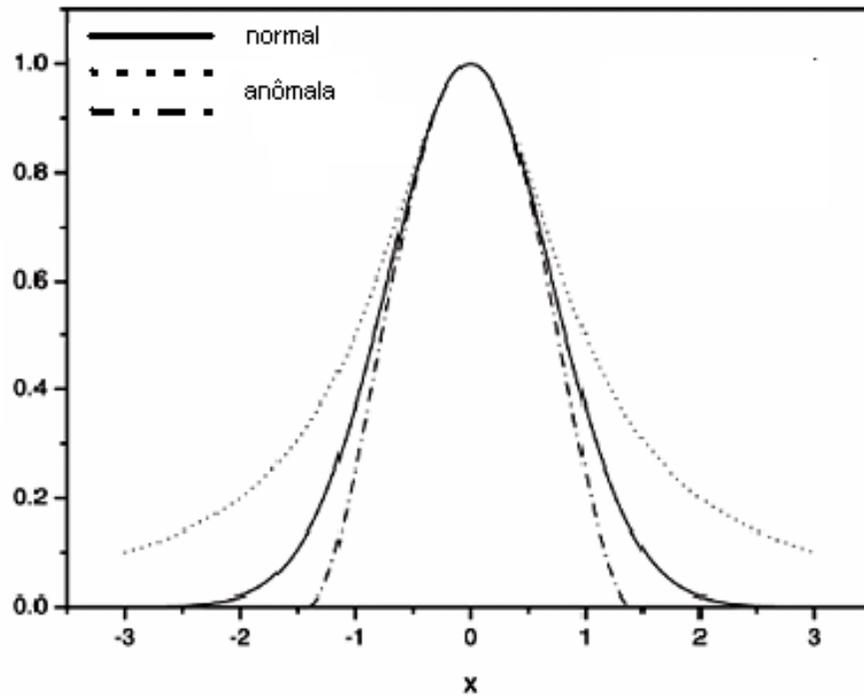


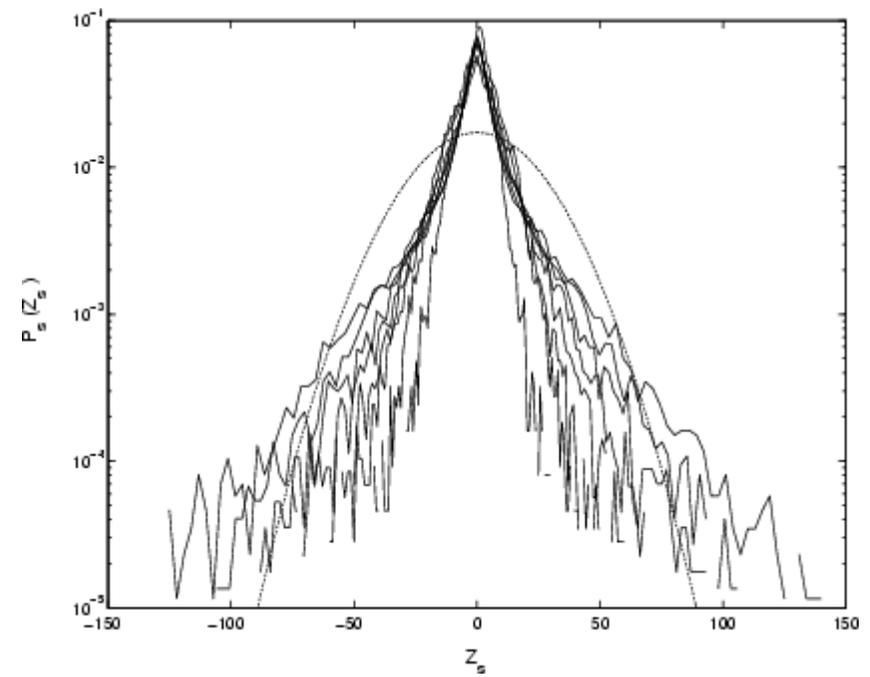
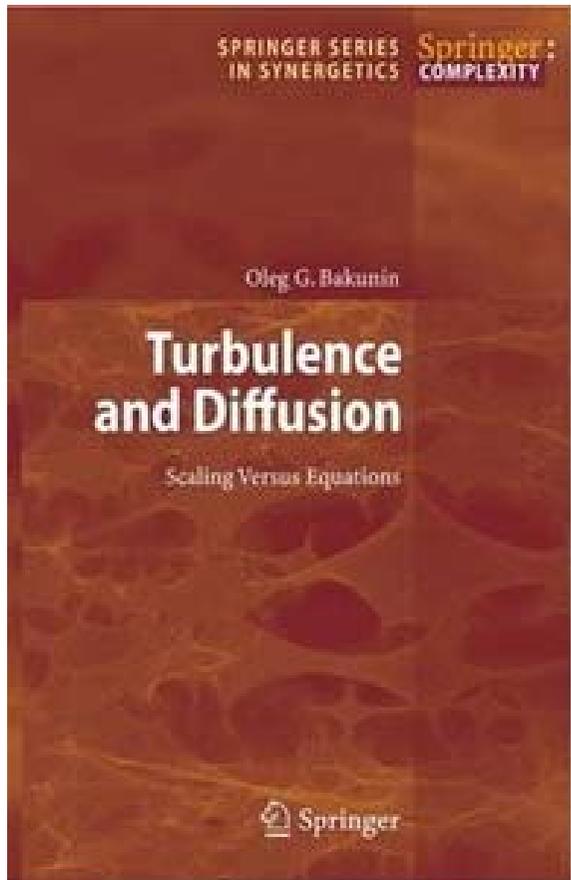
Difusão anômala

Difusão normal

Difusão anômala

Difusão anômala é aquela que não é normal.





Comportamento humano



Séries temporais

Sequência de dados ordenados temporalmente.

Muitas vezes são o que temos sobre um sistema.

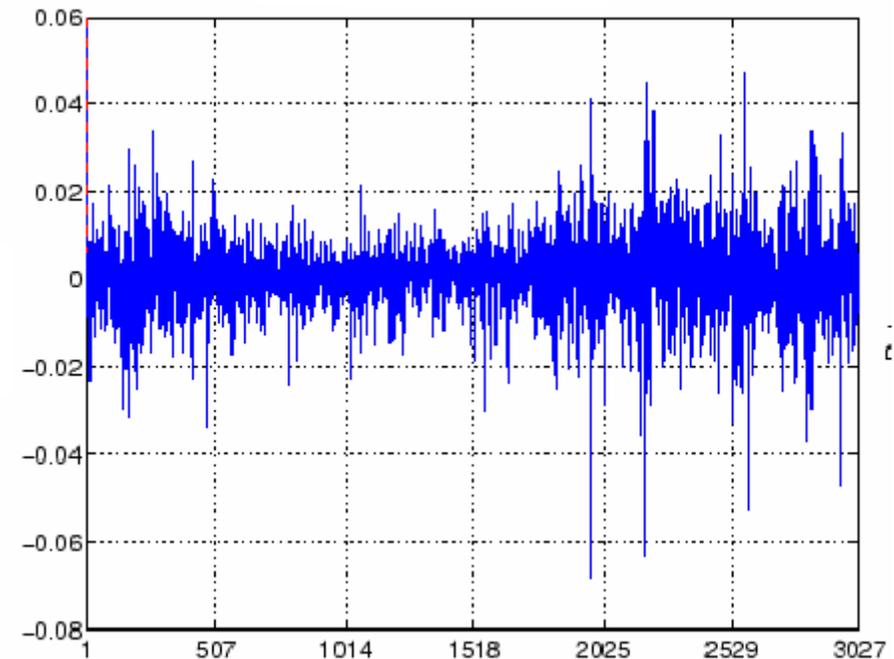
Séries temporais surgem nas mais variadas áreas de aplicação, como: física, química, biologia, ciências sociais, economia, engenharias, finanças, meteorologia, medicina, marketing, seguros etc.

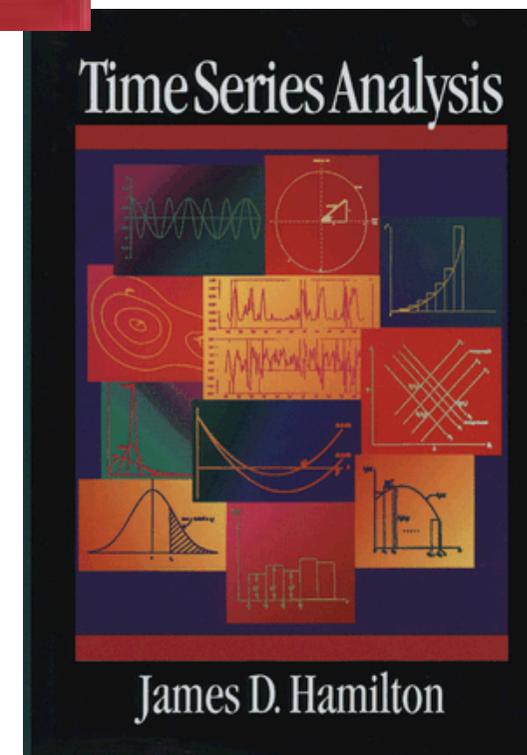
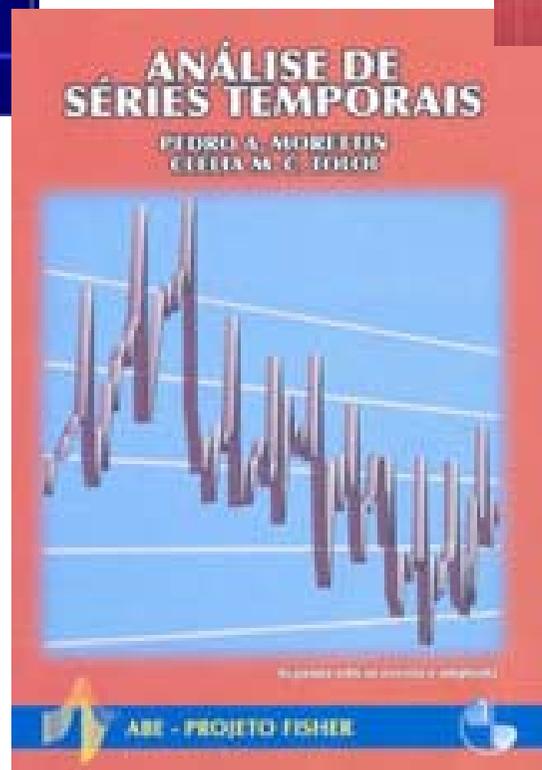
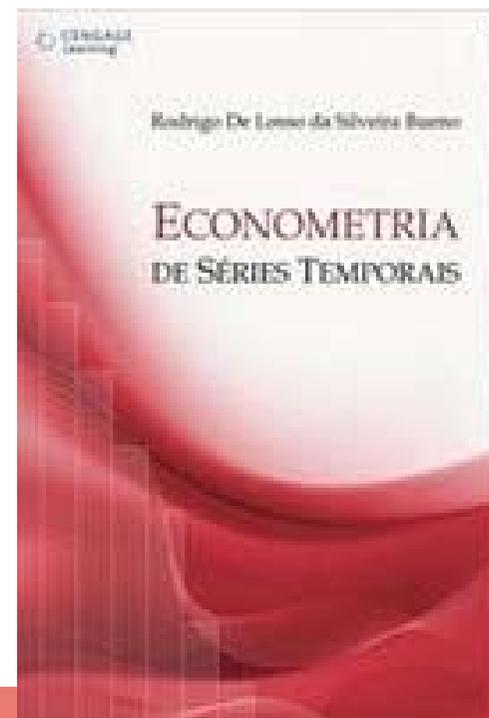
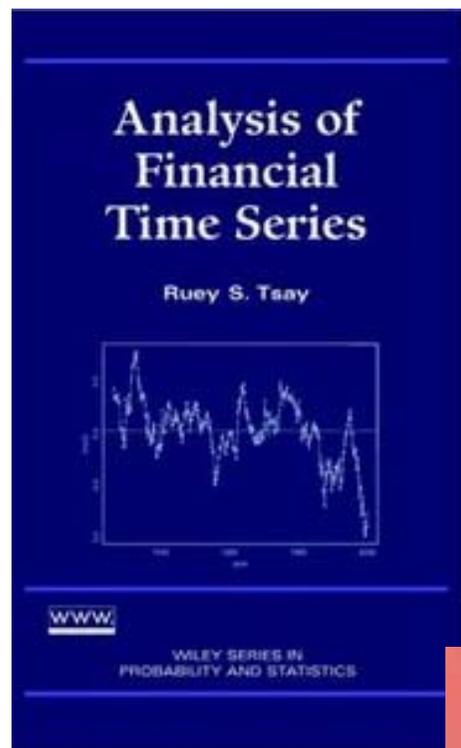
Economia e mercado financeiro

Tentativa de predição.

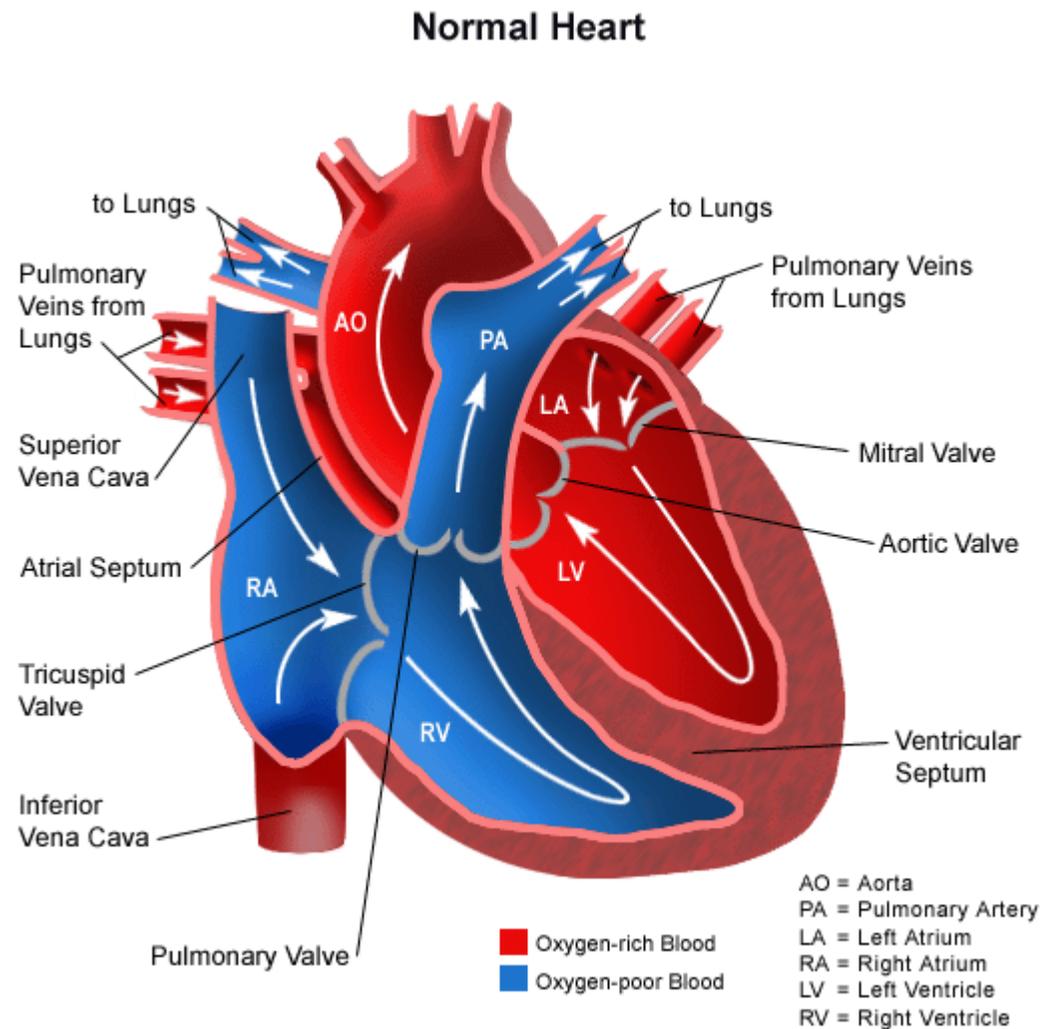
Retorno diário no mercado financeiro de Nova Iorque

Percentual de desempregados no Oregon





Dinâmica do coração



Metereologia: Piracicaba, SP (1917-2006)

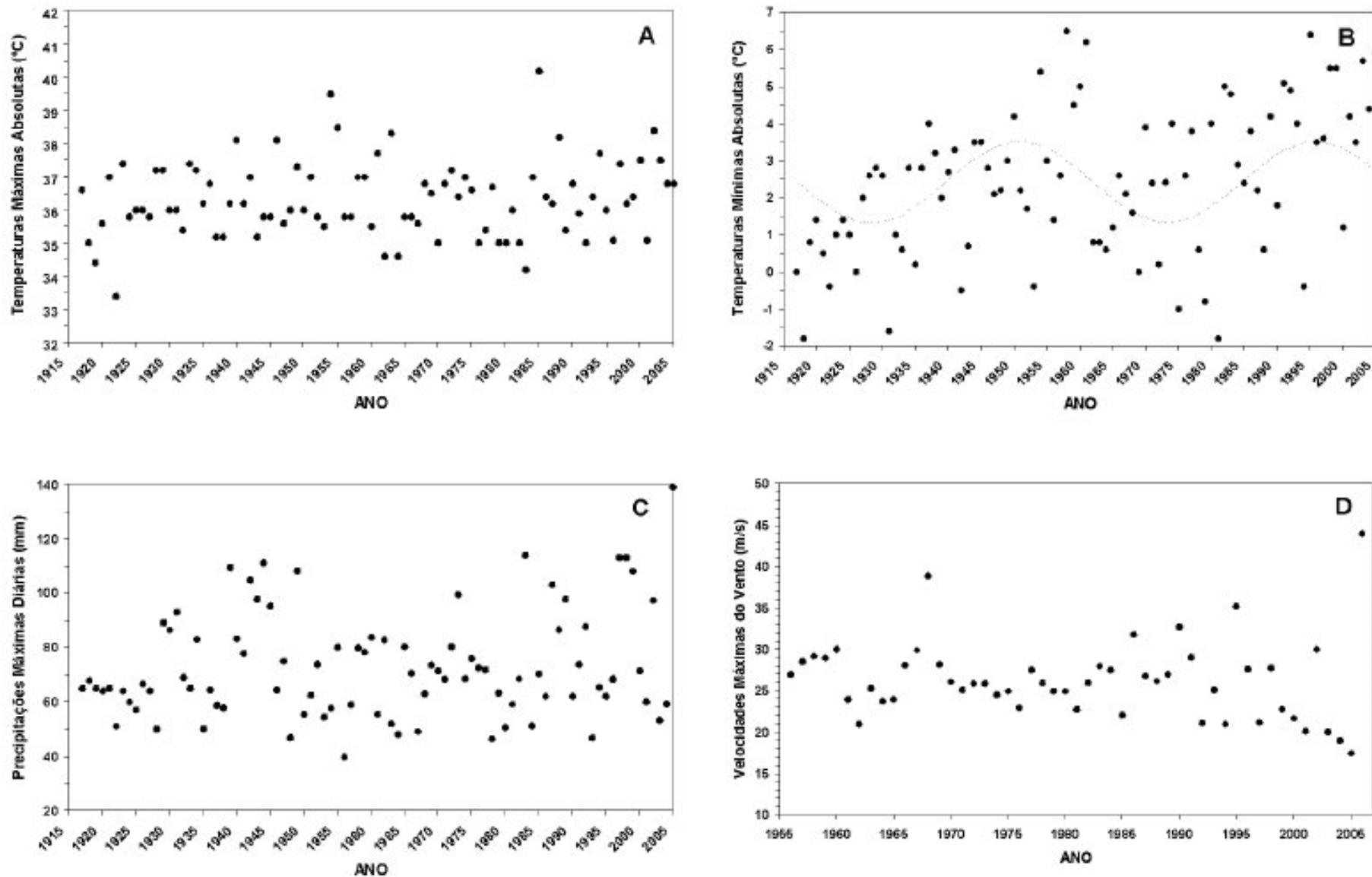


Figura 1. Séries temporais anuais dos extremos de temperatura máxima absoluta (A), mínima absoluta (B), precipitação máxima diária (C) e velocidade máxima instantânea do vento (D).

Difusão e séries temporais

- Maneiras de investigar um sistema.
- Ambas podem ser relacionados.
- Um caso especial de séries temporais conduz à difusão normal.
- Demais casos correspondem a difusão anômala.