

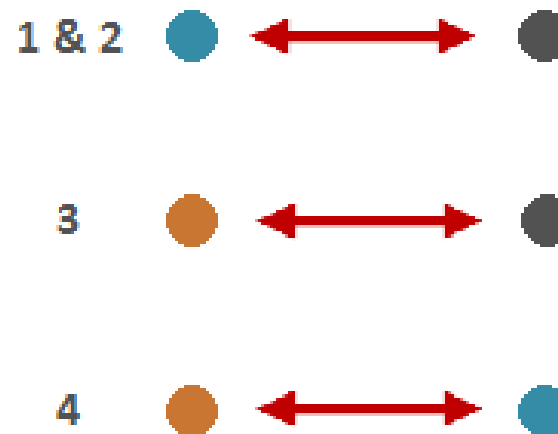
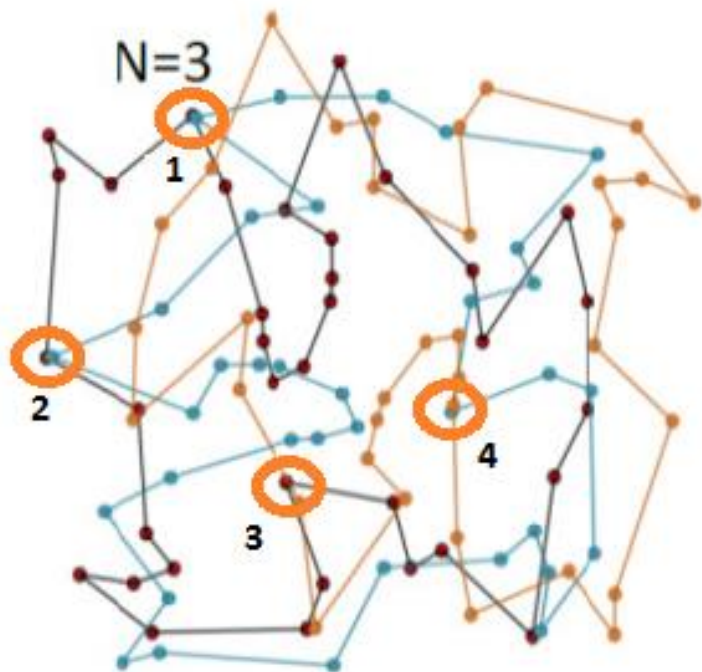


# Collisional exchange as a paradigm for an industrial process

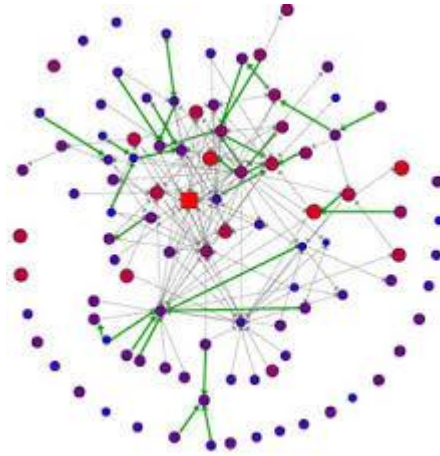
F.Cattani, P.Piccione, C. Grosjean  
Bath ITT - January 2017

Classification: INTERNAL USE ONLY

# The abstract/general problem

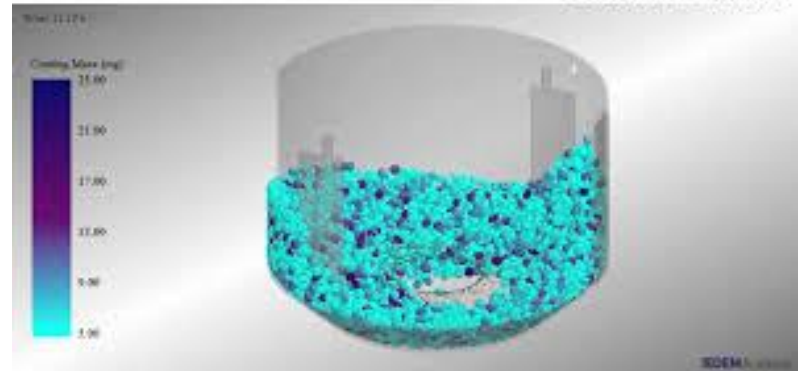


# Imagine...

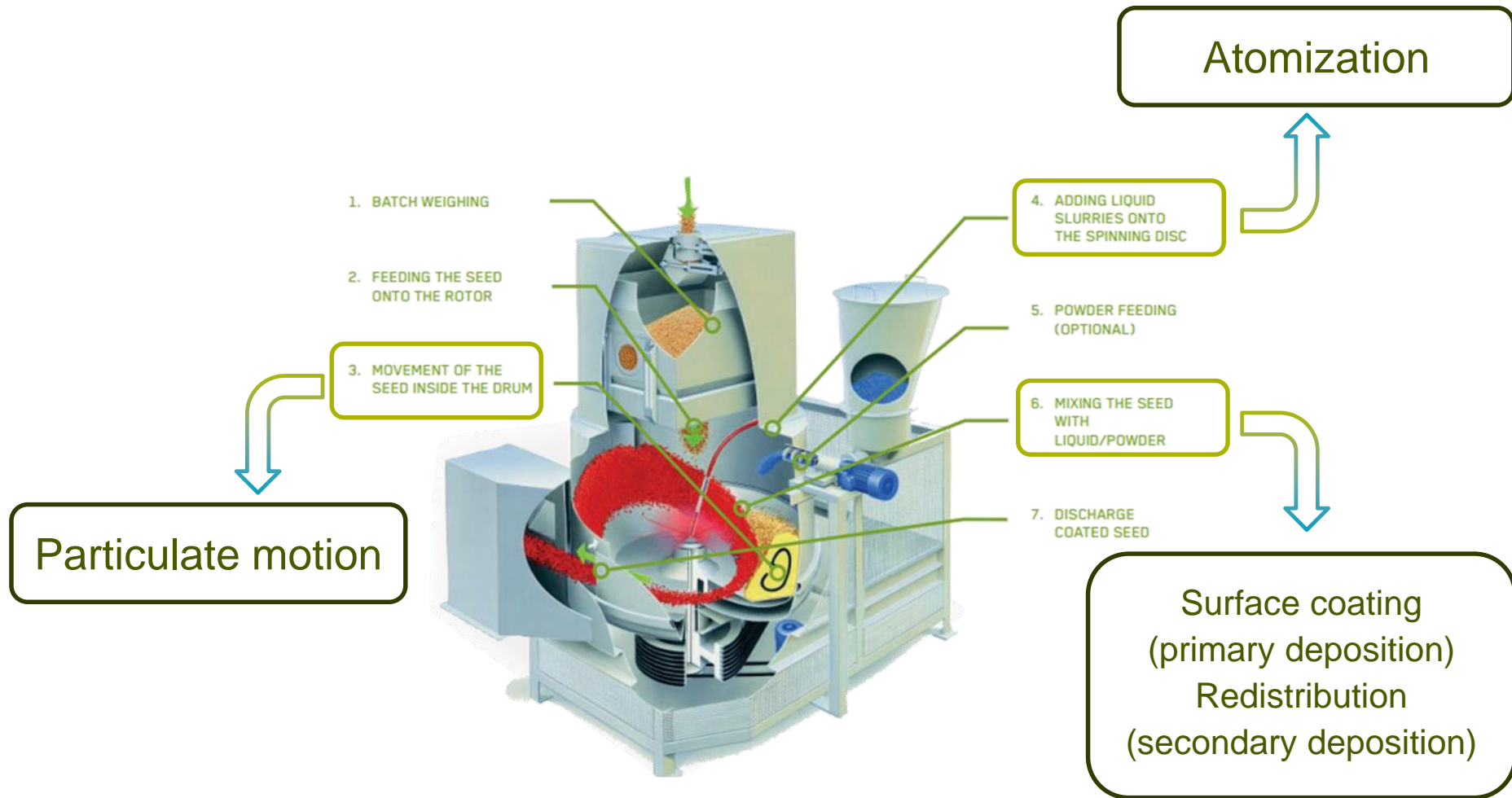


Simulation of Particle Coating using EDEM  
Author: Mehرداد Pasha

UNIVERSITY OF LEEDS



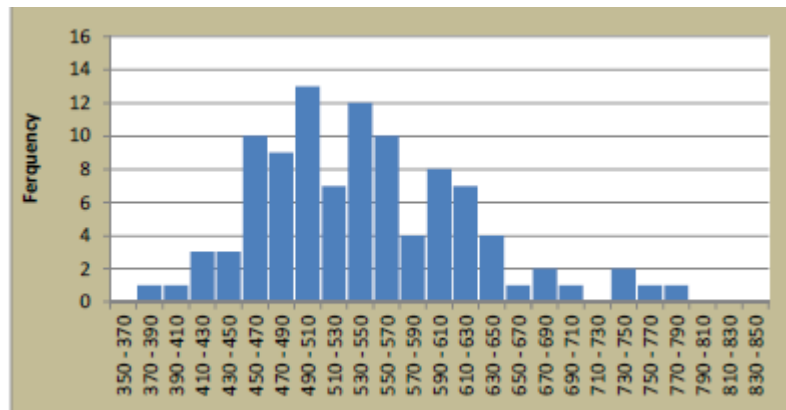
# Seeds coating processes.



Knowledge required on **critical phenomena**

# Seed to seed analysis

Final distribution of AI on 100 seeds



Classes of  $\mu\text{g}/\text{seed}$  of AI

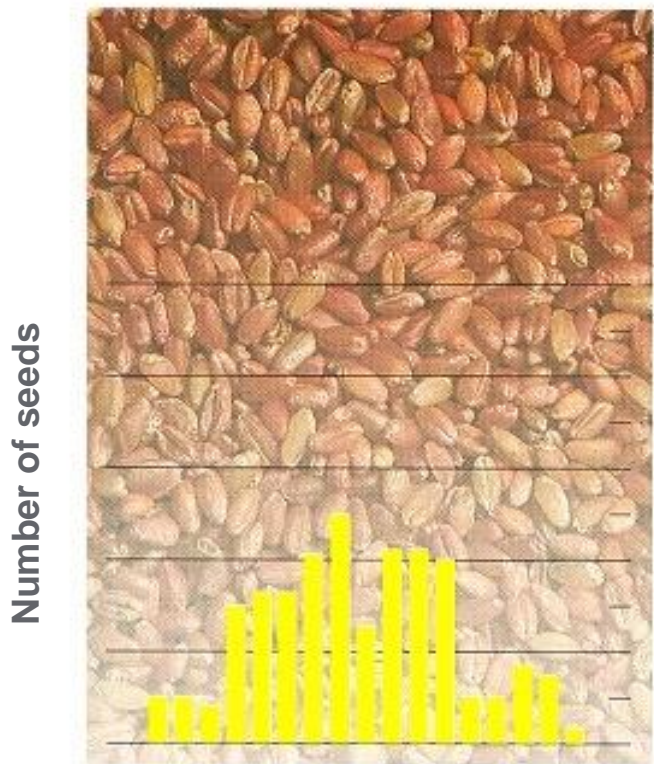




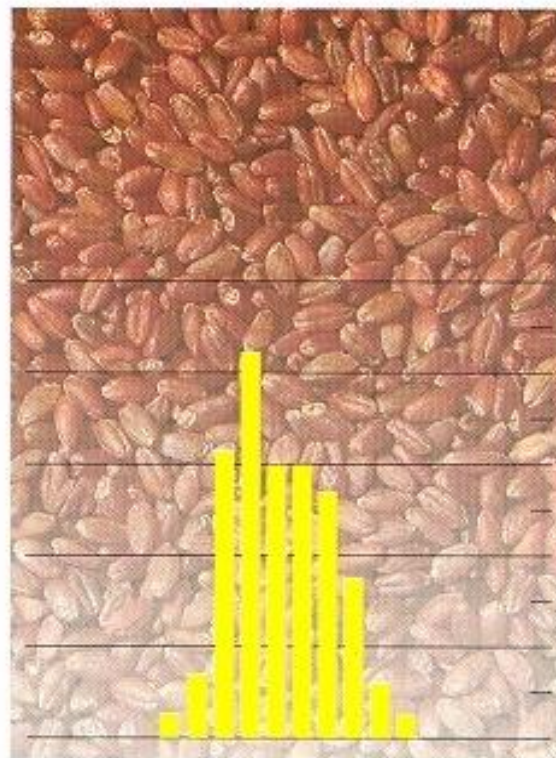
# Redistribution.

- Irregular distribution

- Uniform treatment

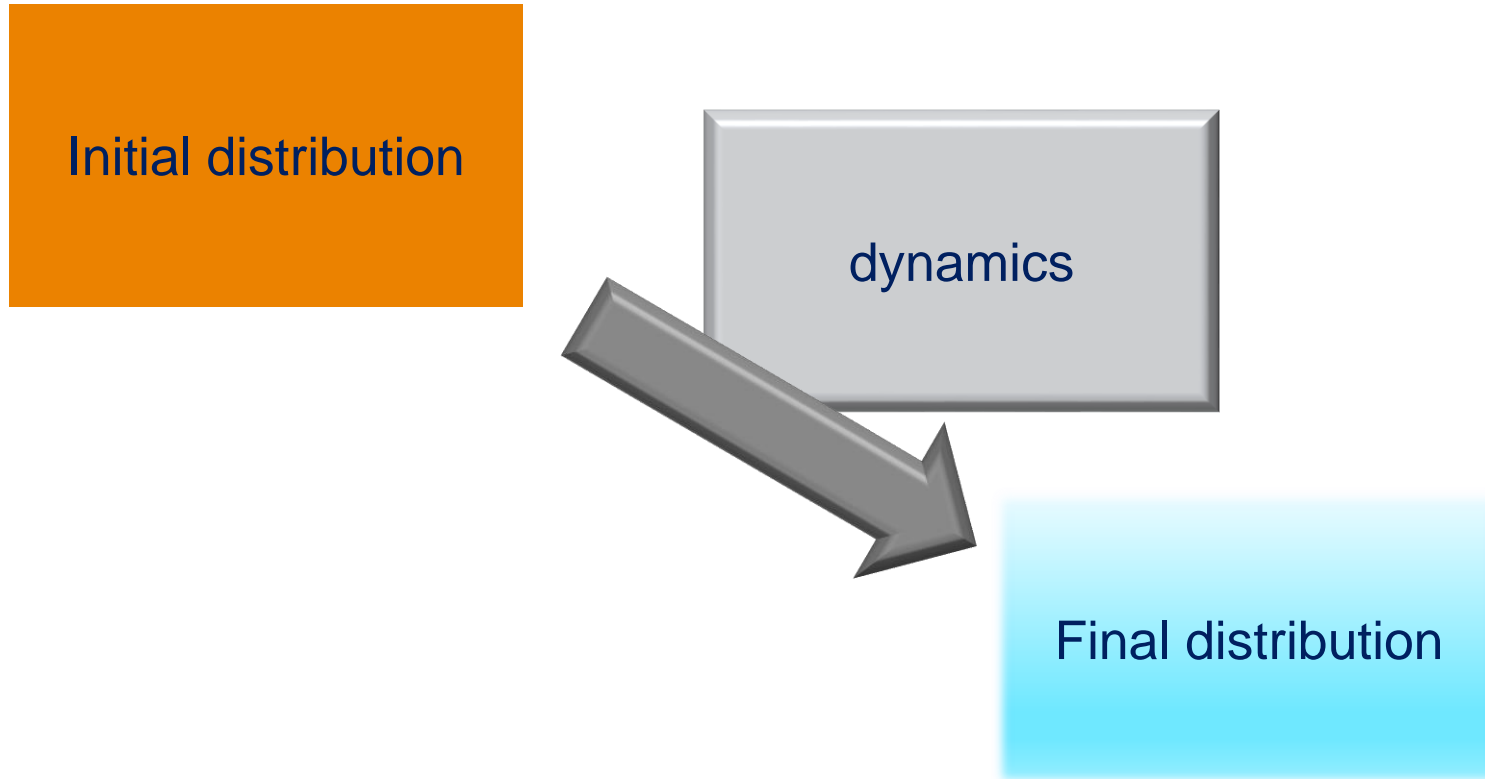


Target 'coverage'

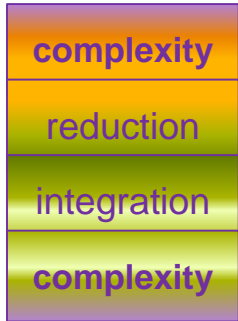


Target 'coverage'

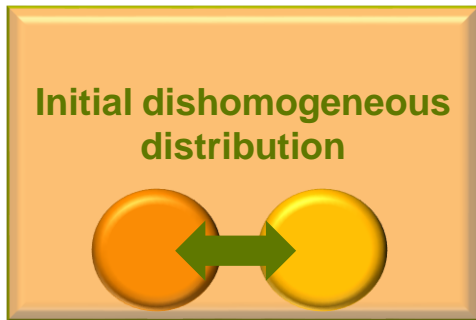
In each case:



# Possible simple test



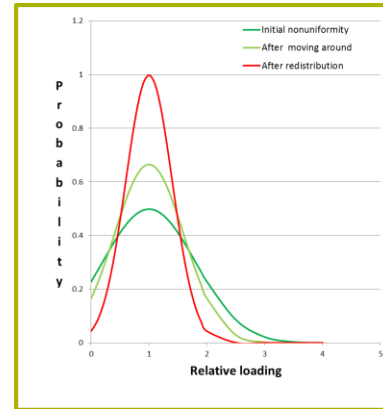
**TOOL TO SIMULATE REDISTRIBUTION:  
WHAT PARAMETERS PLAY WHAT EFFECT**



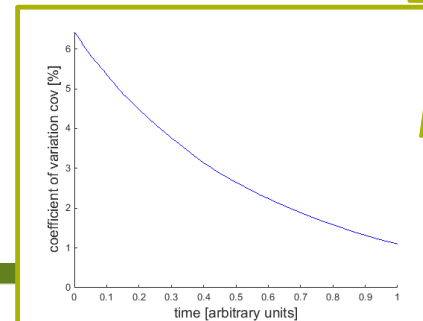
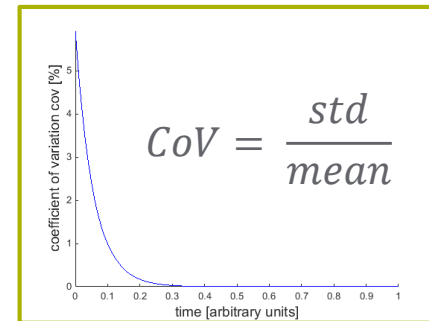
**How to describe collisional exchange**

**Each seed to seed collision = possible exchange**

**Stochastic process:  
Probability of collision,  
probability of exchange**



**simulations**

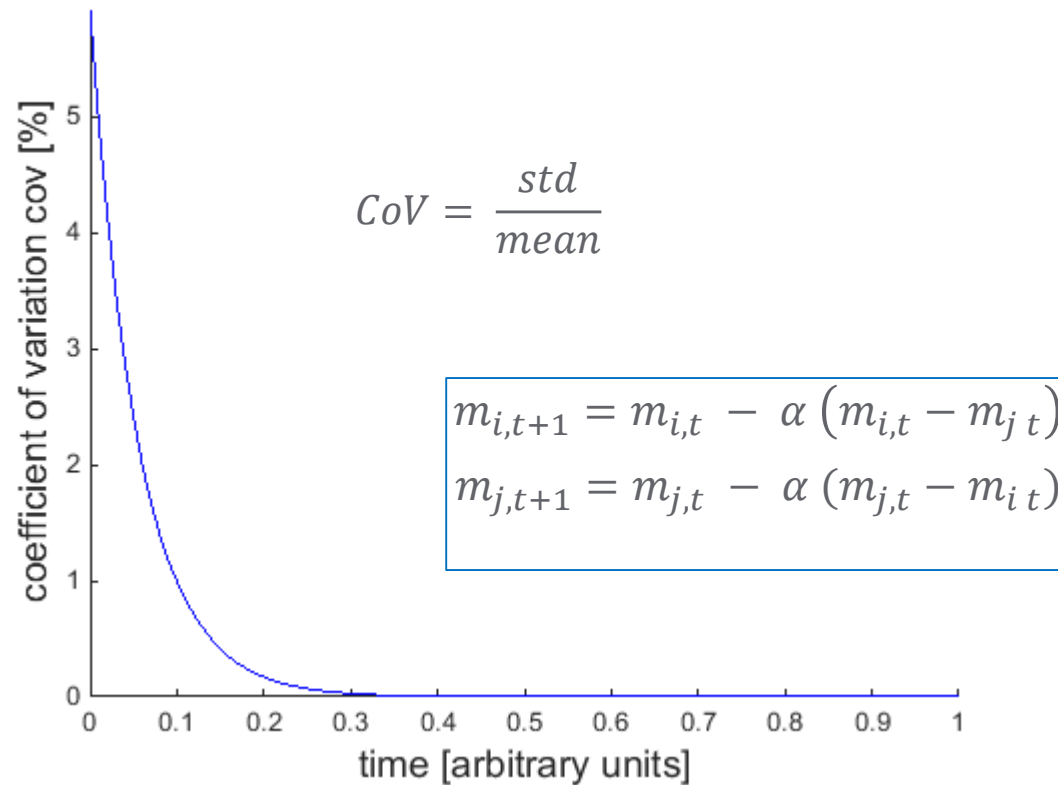


**Two different sets of input parameter**



## Possible simple test

- Dynamical evolution of CoV for the traveling traders system...



**How can the dynamics be controlled?  
Does redistribution play a role?**

## Need for an abstract model

Particles undergoing collisions  
exchanging fluid?

When is homogeneity reached?

Can it be avoided?

Can the temporal scale be  
influenced? What factors?

Does dimensionality matter?

...



## Need for an abstract model

When is homogeneity reached?

Can it be avoided?

Can the temporal scale be influenced? What factors?

Does dimensionality matter?

...

Simulate the property exchanged via collisions as a fluid?

Continuous models versus discrete ones?

How to describe stochasticity and what changes due to the nature of the system?

## Need for an abstract model

When is homogeneity reached?

Can it be avoided?

Can the temporal scale be influenced? What factors?

Does dimensionality matter?

...

How to describe stochasticity and what changes due to the nature of the system?

Markoff chains always good?

Is there a cut off phenomenon?

Is there metastability?

## Need for an abstract model

When is homogeneity reached?

Can it be avoided?

Can the temporal scale be influenced? What factors?

Does dimensionality matter?

...

How to describe stochasticity and what changes due to the nature of the system?

Simple discrete stochastic models?

Or simple continuous models to include more physics?



## Need for an abstract model

When is homogeneity reached?

Can it be avoided?

Can the temporal scale be influenced? What factors?

Does dimensionality matter?

...

Under realistic conditions, when observations are dangerous, impractical, expensive, time consuming, unreliable:

Can mathematics guide experiments?