

# Ribbons of superparamagnetic colloids in magnetic field

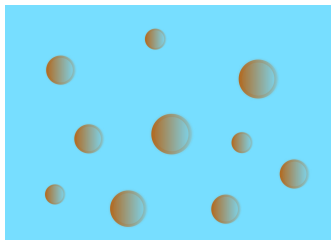
A. Darras, J. Fiscina, M. Pakpour, N. Vandewalle, and G. Lumay

March Meeting 16, 2017

# Colloids

Everyday life :

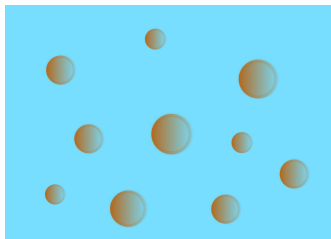
Particles suspension



# Colloids

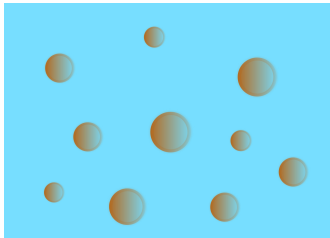
Everyday life :

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Particles suspension

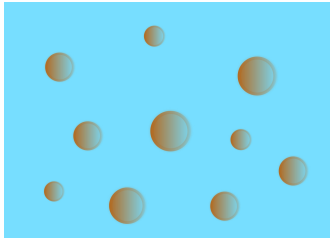


Everyday life :



# Colloids

Particles suspension

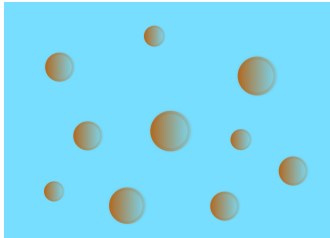


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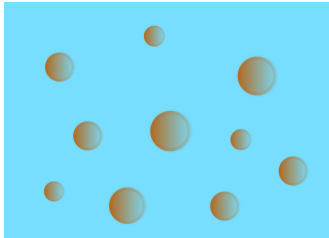


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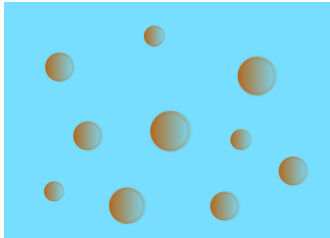


Everyday life :



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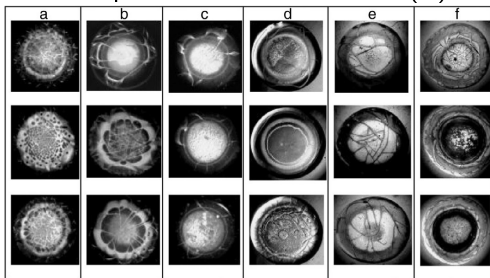
Everyday life :





# Colloids

## Blood deposits : health indicator ( ? )



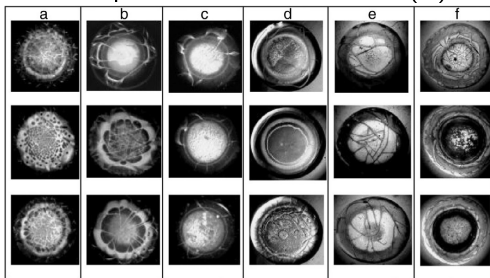
T.A. Yakhno *et al.*, IEEE Eng. Med. Biol. Mag., 24(2), 96 (2005)

- Interactions ?
- Model system ?

=> Superparamagnetic colloids :  $\vec{\mu} \propto \vec{B}$

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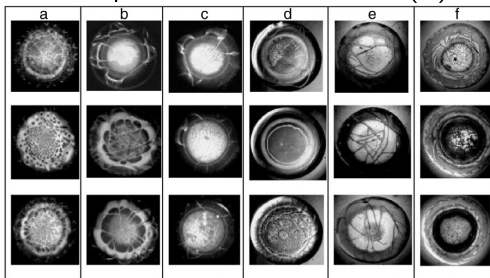
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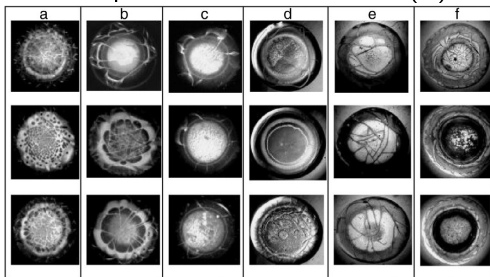
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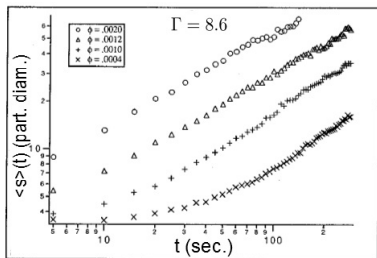
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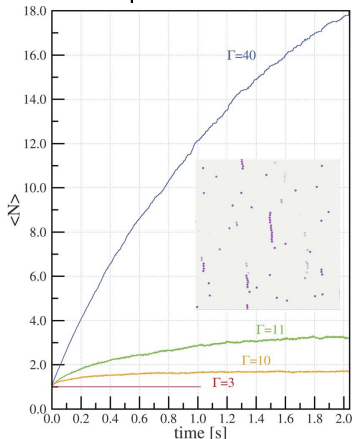
# Growth And saturation

Irreversible aggregation in diluted solution  
 $\Rightarrow$  Power-law growth



J. H. Promislow et al., J. Chem. Phys. 102, 5492 (1995)

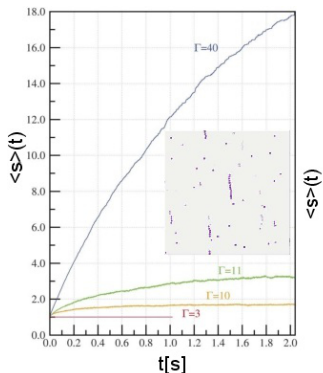
But... equilibrium exists!



J. Faraudo et al., Soft Matter 9, 29 (2013)

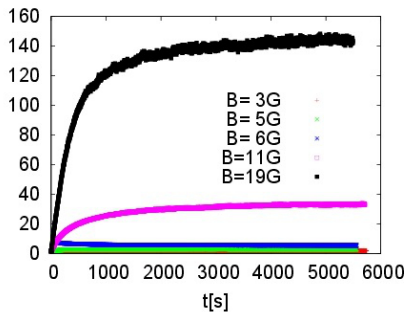
# Saturation

Simulations :



J. Faraudo *et al.*, *Soft Matter* **9**, 29 (2013)

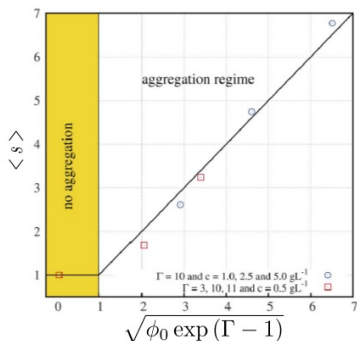
Experimental results :



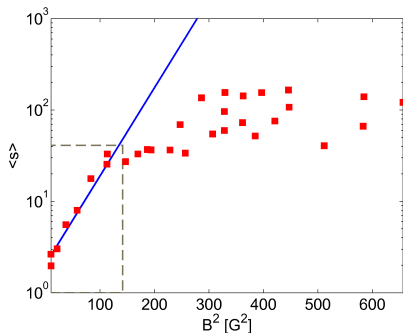
Chains length saturation is observed  
 $\Rightarrow$  Results consistent with simulations

# Saturation evolution

Fitting the analytical model with our measurements :



J. Faruado *et al.*, *Soft Matter* **9**, 29 (2013)

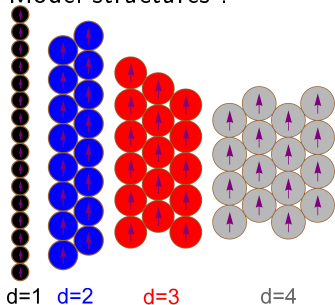


A. Darras *et al.*, *EPJ-E*, **39(4)**, 1-6 (2016)

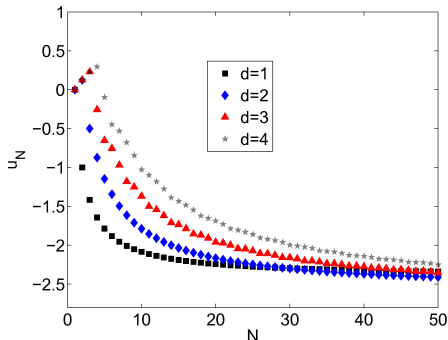
# Ribbons

Divergence between model and experimental data ?  
 Existence of more complex structures

Model structures :



Energy per particle :



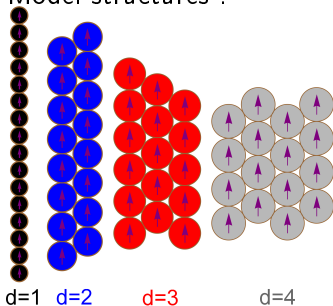
A. Darras *et al.*, EPJ-E, 39(4), 1-6 (2016)



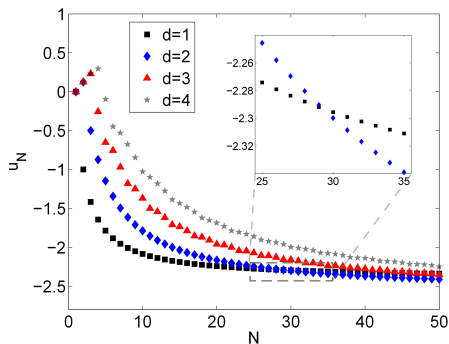
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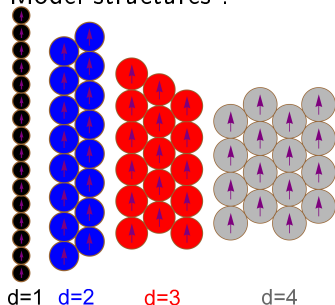


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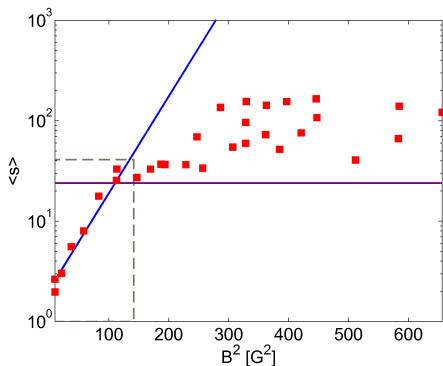
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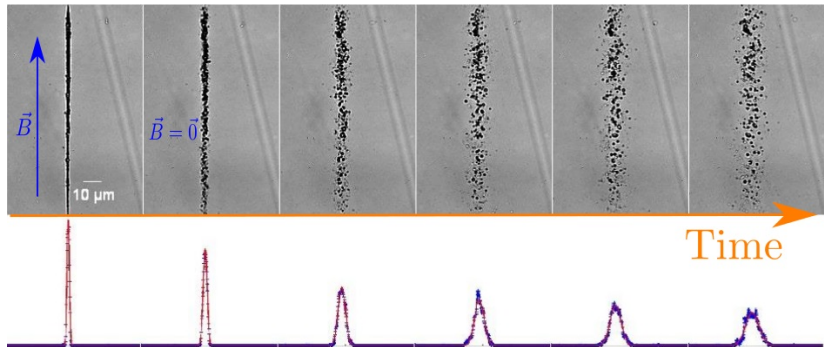


Transition prediction :



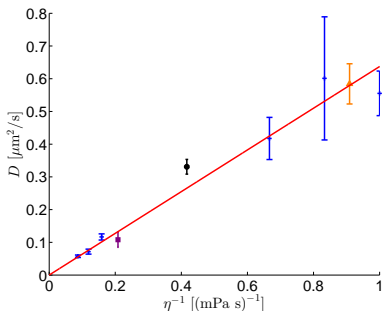
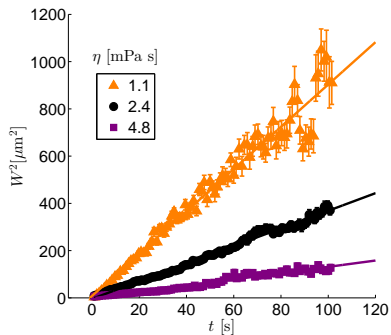
A. Darras *et al.*, EPJ-E, 39(4), 1-6 (2016)

# Diffusion



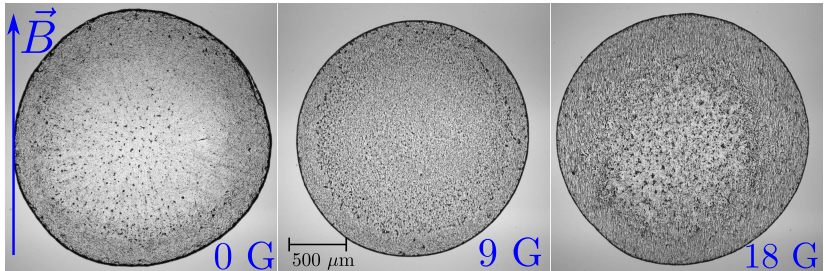
A. Darras *et al.*, AJP, *accepted for publication*, (2017)

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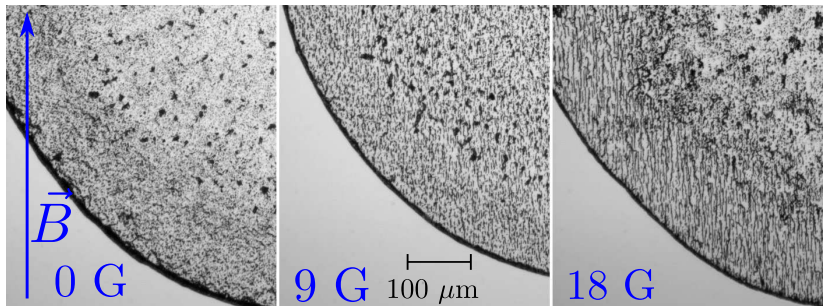


A. Darras et al., AJP, *accepted for publication*, (2017)

To be continued...



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