

Collaborations with Industry

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Outline

- Background to my role
- Why collaborate with industry
- Finding industrial partners
- Funding for industrial work
- Starting a project
- During the project
- Closing a project

What is ECFP?

Researchers
(experimentalists,
computer simulators
and theoreticians)
working in the Soft
Matter and
Biological Physics
Group

INDUSTRY

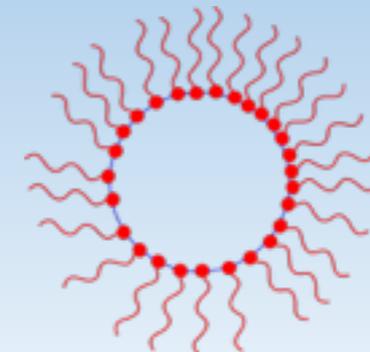
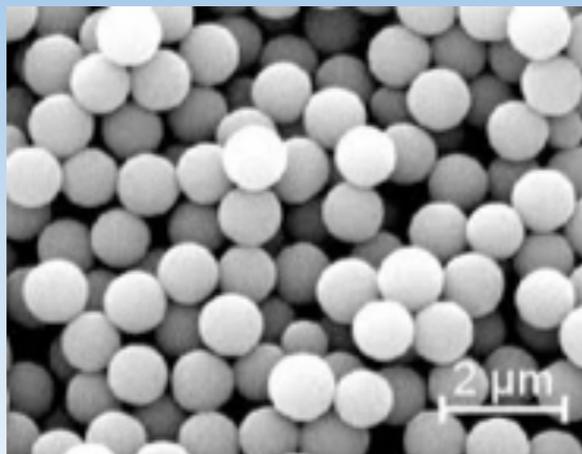
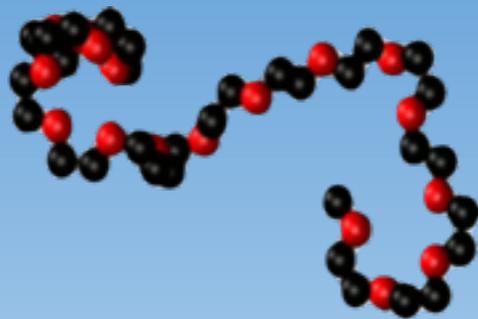


ECFP 



What do Soft Matter Physicists Do?

Seek generic principles that govern the interactions and dynamics of “*mesoscopic*” components (independent of chemical detail)



What are formulations

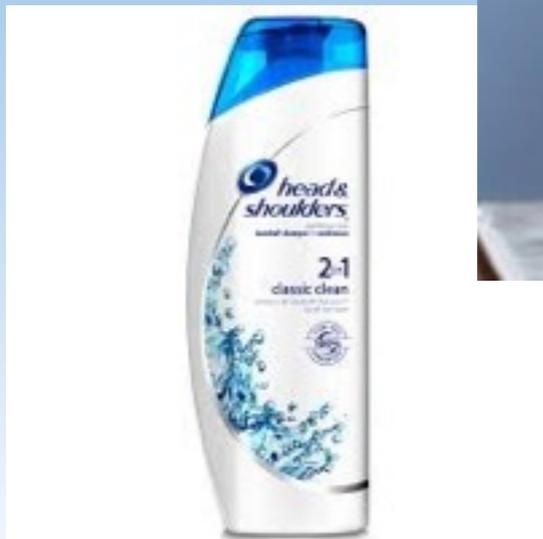
A mixture or structure prepared according a **specific** procedure and formula /recipe



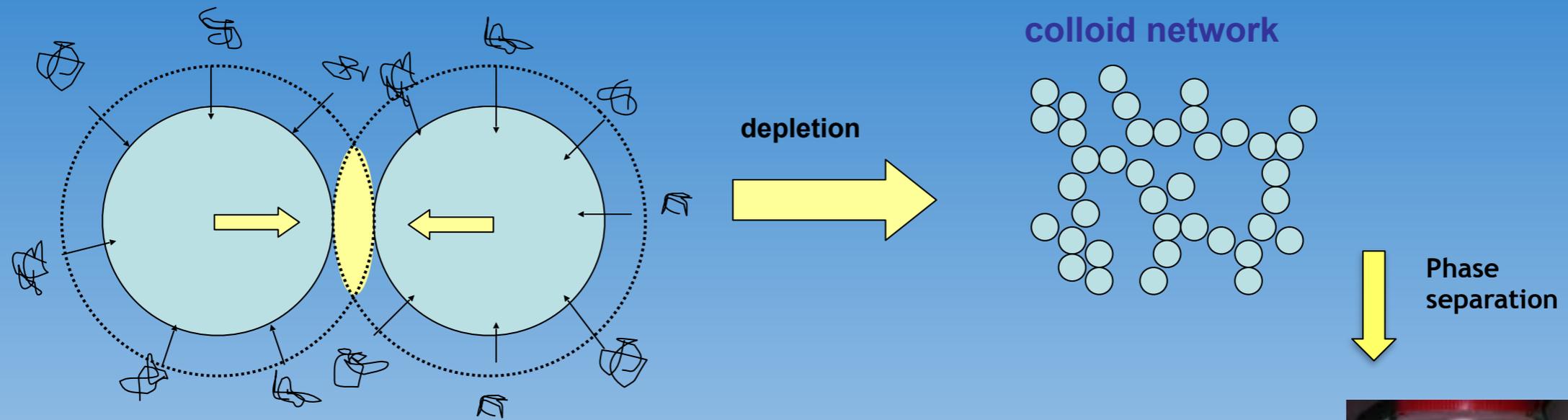
are soft materials



were soft materials



A generic principle in Action

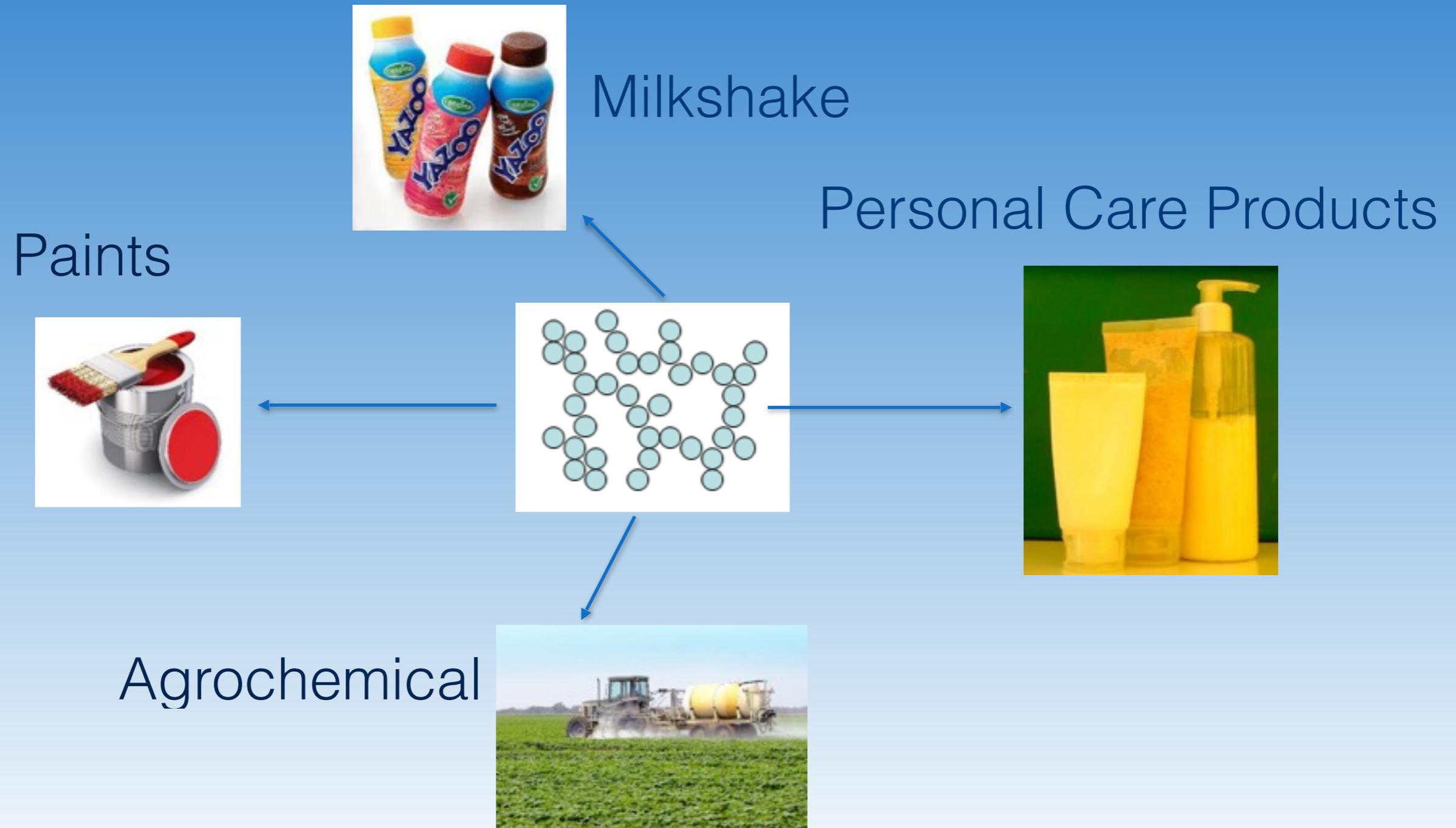


This is a *generic* phenomenon, depletants can be:

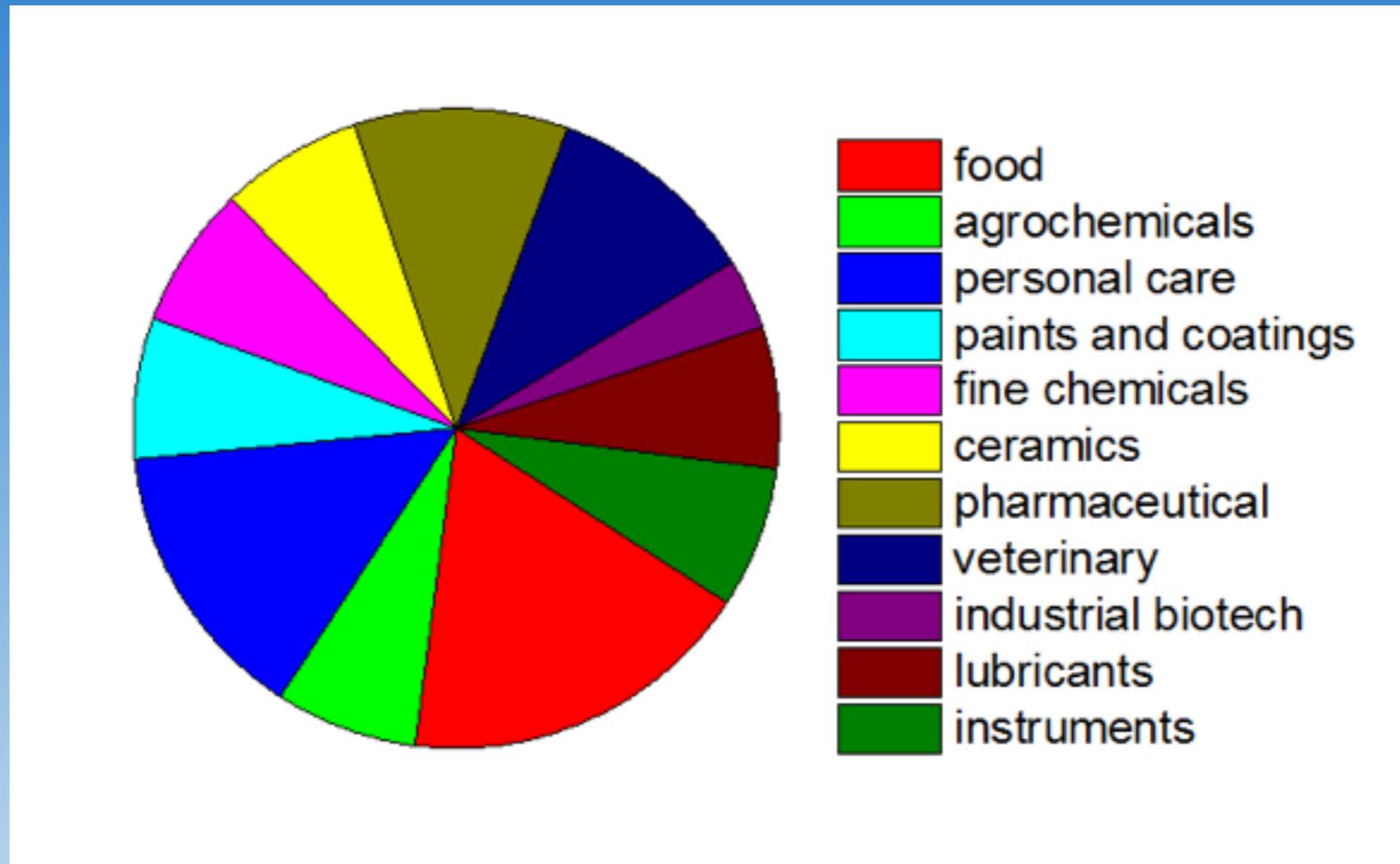
- non-absorbing polymers
- nanoparticles
- surfactant aggregates (micelles)
- globular proteins

Ratio of size drives strength of interaction

The power of generic principles

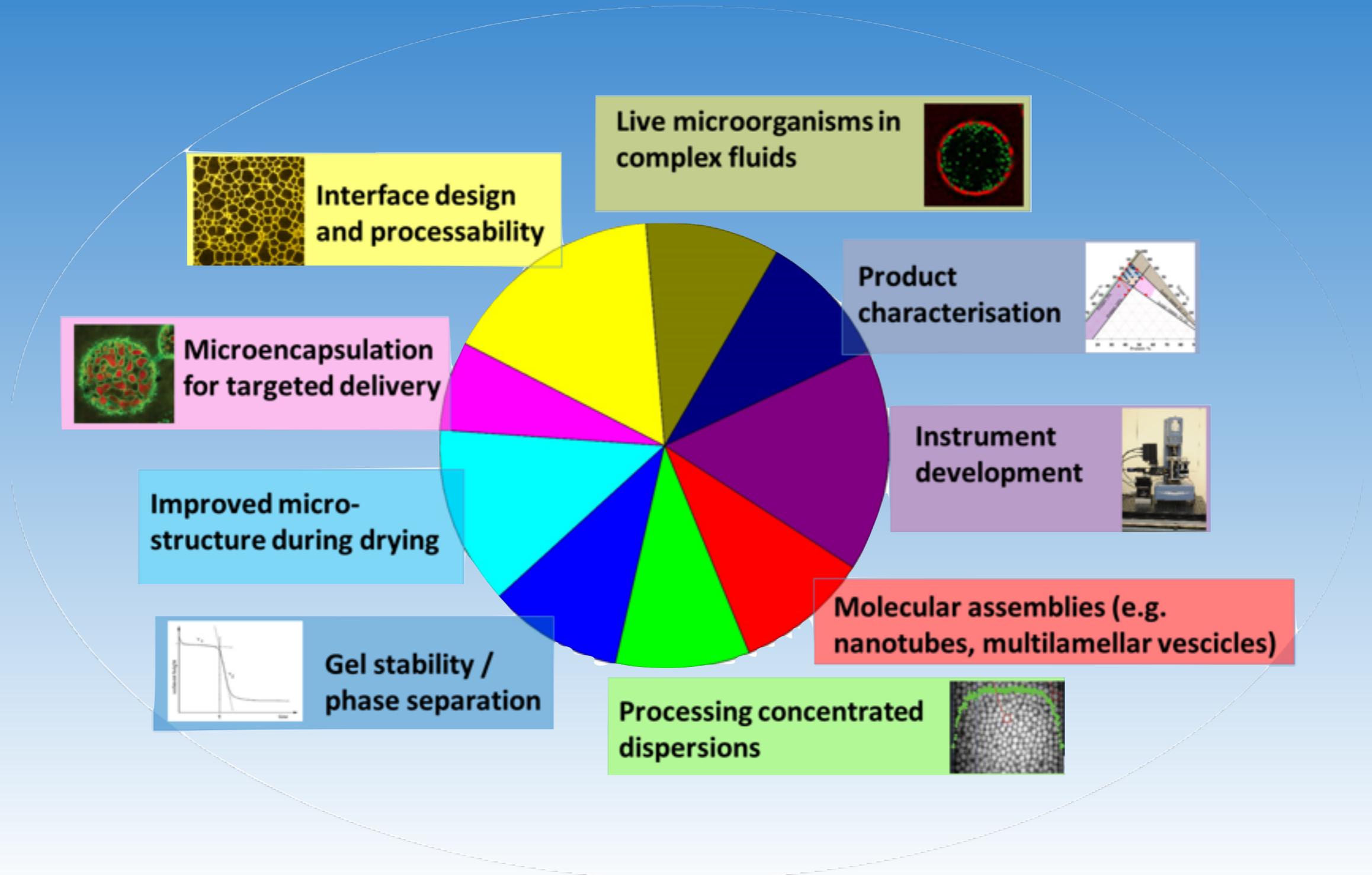


ECFP Experience



Founded in 2012 to deliver 'impact' from research, ECFP worked with 28 companies within 4 years, 17 of which are multinationals. Currently overwhelmed by commercial interest!

Types of Projects



Generic Principles

Although ECFP is only one area of physics, the generic principles can be applied across the field. In the rest of the talk I'll give a much more generic view on industry collaboration

Why Collaborate with Industry?

Similar to any other collaboration

Materials

Kit

Apply science to the “real world”

Different perspectives on the science

IMPACT!

Finding Partners -
be proactive!

Existing Contacts

Your PI may already be getting requests to collaborate and/or have existing industrial collaborations. Ask to be involved. Often they don't have time to respond to as many requests as they receive, offer to help.

Organisations who can help

Innovate UK



Your university research office



Local knowledge exchange coordinator

Events

Various types of events

Conferences

Industry focused conferences

Special interest meetings

Innovation network events

H2020 brokerage

At Events

Talk to people you don't know!

This isn't necessarily easy.

Be generous, talk to them about their work, ask questions, listen to the responses, talk about a colleagues work if yours isn't directly relevant.

After the event it's ok to feel tired, take some time to yourself if you need it.

Events

- Take a poster or give a talk
- Exhibit (costs money)
- Take:
 - Business cards
 - Paper copies of poster/papers
 - Note book and pen
 - Don't lose the attendee list!



Using Complex Fluid Concepts to Optimise IB Processes and Products
Anne C. Pawsey and Tiffany A. Wood
 Edinburgh Complex Fluids Partnership
 School of Physics and Astronomy, University of Edinburgh



THE UNIVERSITY OF EDINBURGH

Abstract

Industrial biotechnology results in the production of complex fluid components such as polysaccharides, surfactants and particulate matter (including microbes). Through understanding the underlying, generic physical principles we can optimise process control and formulation stability of IB products and processes.

Microbes in Structured Environments

Motile bacteria contained in water in oil emulsion drops. The location of the bacteria depends on their concentration. Complex structures are inherent in IB processes - by understanding structural effects on microorganism growth we can seek to optimise processes.

Madhavi et al. Phys. Rev. Lett., (2014), 113.

Tracer release of microswimming *E. coli* in an open space, and its motion in a confined space. (a) *E. coli* in an open space. (b) *E. coli* in a confined space. (c) *E. coli* in a confined space. (d) *E. coli* in a confined space. (e) *E. coli* in a confined space. (f) *E. coli* in a confined space. (g) *E. coli* in a confined space. (h) *E. coli* in a confined space. (i) *E. coli* in a confined space. (j) *E. coli* in a confined space. (k) *E. coli* in a confined space. (l) *E. coli* in a confined space. (m) *E. coli* in a confined space. (n) *E. coli* in a confined space. (o) *E. coli* in a confined space. (p) *E. coli* in a confined space. (q) *E. coli* in a confined space. (r) *E. coli* in a confined space. (s) *E. coli* in a confined space. (t) *E. coli* in a confined space. (u) *E. coli* in a confined space. (v) *E. coli* in a confined space. (w) *E. coli* in a confined space. (x) *E. coli* in a confined space. (y) *E. coli* in a confined space. (z) *E. coli* in a confined space.

E. coli in a colloidal crystal. Confining the bacteria alters their swimming behaviour.

Monitoring Microbe Health

Differential Dynamic Microscopy

A new technique to rapidly assess the health of entire communities of microorganisms.

Low resolution microscopy image



High throughput
Low resolution images
In-situ measurements

Extraction
-Swimming speed distribution
-Active fraction
-Diffusivity

Martinez et al. *BioPhys J.* (2012), 103(8), 1937

Monitoring Microbe Health



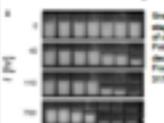
DCM can be used to give spatially resolved information about swimming speeds.

Tuning Stability



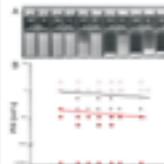
Depletants can be:
- non-absorbing polymers
- nanoparticles
- surfactant aggregates (micelles)
- globular proteins

The size ratio between the colloid and the polymer determines the strength of the interaction.



Depletion is also relevant to microbes.

Adding a polymer to a bacterial dispersion can control flocculation, to recover valuable microbes or clean solvent.



For more information please see:
www.edinburghcomplexfluids.com

Events

- Consider running your own
 - A good way to involve the wider research group
 - Can show off your facilities
- Invitations
 - Be pro-active:
 - search for local companies who do relevant work, contact information points for company lists
 - Call the companies and ask to speak to someone in product development, tell them about your event, the science behind it, and why it could be worth their time.

Follow up!

Find the business cards you collected!

Send emails,

Attach relevant papers/a copy of your poster...

Funding Sources

Innovate UK



Often need a contribution from the company, can be “in kind”
RSE and RS different, fund industry fellowships for researchers to work with an individual company...



Jargon

- TRLs (Technology Readiness Levels) are possible the most important ones to know about
- 1-3 Academia
- 5-7 Industry R&D
- 4-6 Valley of despond. There is often funding to help get through this bit.

Consulting

the company pays all the money and controls everything
about the project

Beginning (what Kate said...)

Decide what you are going to do,

write down work packages, look for sources of funding or create a consultancy agreement (your research office should handle the legal stuff!)

Agree what the deliverables will be (report, recipe images etc)

Expectation management, be clear what you can and can't deliver

Avoid over promising

Agree how you will keep the company updated, e.g. email interim reports, phone calls, meetings...

Make sure the frequency works for both parties.

During the project

Keep the company updated

Make sure you agree on what you will do

refer back to the original agreement

There may be tension between what is scientifically interesting and what the company wants

Try not to work for free!

Finishing the project (not the end...)

Deliver what you agreed

Suggest future work packages (if you thought of ideas along the way you'd be interested in, this is the time to propose them)

If you have a good relationship with the company ask them to write supporting statements for grants relevant to their work!

Keep in touch after the end of the project.

Conclusions

IS about interesting science

IS enjoyable

but DIFFERENT to pure research