Fundamentals of mixing: a unified framework for mixing dynamics

Marseille, January 17th to 21st 2022 — Aix-Marseille Univ. & CNRS

	Morning	Afternoon
D1	Travel	**Welcome** **14h00** Presentation of CoPerMix & workshop programs, PhDs introduce themselves & PhD projects. **History of mixing & motivation** **16h00** **E. Villermaux** Mixing across ages. The eternal quest of mixing. **Welcome cocktail** **17h30**
D2	**Prerequisite on hydrodynamics & transfer** **9h00** **M. Dentz** Brownian motion, random walk, Fick's law, Diffusion equation, Gaussian & Erf solutions, Advection-diffusion, Péclet number, Elementary fluid mechanics (Navier-Stokes, Reynolds number, Stokes reversibility, basic concepts of turbulence).	**Applications of mixing 1** **14h00** **E. Santanach Carreras — Total** **Discussion between consortium members** **15h30** (secondments, collaborations, EU requirements, deliverables...) **Diner at '1860'** **19h30** (for CoPerMix members)
D3	**Lamellar approach** **9h00** **E. Villermaux** Diffusion on a moving substrate, Ranz's transform, Mixing time, Batchelor scale, concentration field & concentration distribution, Case of a simple shear, of a log-normal stretching, Limits of Ranz's transform, Taylor-Aris dispersion.	Outdoor activity **Diner at 'Les Arcenaulx'** **19h30** (for CoPerMix PIs)
D4	**Stirring protocols** **9h00** **T. Le Borgne** Some stirring protocols, Dispersion, Chaotic flows, KAM tori, Lyapounov exponent, Statistics of stretching, origin, noise & drift, Coalescence, phenomenology & modeling.	**Experimental techniques** **14h00** **B. Metzger, H. Lhuissier** (for CoPerMix members only) Practical: Perform a basic mixing experiment (imaging, fluorescence, PIV, concentration field & distributions), Discuss experimental limits (spatial resolution, background noise, photobleaching). Demonstration: Brownian motion & Taylor reversibility experiment.
D5	**Numerical methods** **9h00** **J. Schumacher, P. Meunier** Principles of Direct Numerical Simulation, Diffusive Tracers Methods, Diffusive Strip Method, Technical aspects & computational times, Strengths & limits (low/high Péclet number, flow separatrix...). **End of the workshop** **12h30**	Travel