Fundamentals of mixing: a unified framework for mixing dynamics

Marseille, April 4th to 8th 2022 — Aix-Marseille Univ. & CNRS

	Morning	Afternoon
D1	Travel	**Welcome, History of mixing & motivation** 14h00 **E. Villermaux** Presentation of CoPerMix & workshop programs. Mixing across ages. The eternal quest for mixing. **PhD projects & current research questions** 15h30 PhDs present their PhD project and the scientific question they face at the moment. **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).	**Open presentations** 14h00 **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	**Experimental techniques** 9h00 **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.	**Stirring protocols** 14h00 **T. Le Borgne** Some stirring protocols, Dispersion, Chaotic flows, KAM tori, Lyapounov exponent, Statistics of stretching, origin, noise & drift, Coalescence, phenomenology & modeling. **Applications of mixing** 17h30 **E. Santanach Carreras — Total**
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