

## Fundamentals of mixing: a unified framework for mixing dynamics

Marseille, April 4<sup>th</sup> to 8<sup>th</sup> 2022 — Aix-Marseille Univ. & CNRS

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