

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

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

	Morning	Afternoon
J1	Travel	<p><b>Welcome</b> <span style="float: right;">1h30</span> Presentation of CoPerMix &amp; workshop programs, PhDs introduce themselves &amp; PhD projects</p> <p><b>History of mixing &amp; motivation</b> <span style="float: right;">1h30</span> <b>E. Villermaux</b> Mixing across ages. The eternal quest of mixing.</p>
J2	<p><b>Prerequisite on hydrodynamics &amp; transfer</b> <span style="float: right;">3h00</span> <b>M. Dentz</b> 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> <span style="float: right;">1h00</span> <b>E. Santanach Carreras</b> — Total</p> <p><b>Applications of mixing 2</b> <span style="float: right;">1h00</span> <b>To be updated</b></p> <p><b>To be updated</b> <span style="float: right;">1h00</span> <b>J-L. Thiffeault</b> — Univ. Wisconsin</p>
J3	<p><b>Lamellar approach</b> <span style="float: right;">3h00</span> <b>E. Villermaux</b> 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 (for CoPerMix members only)</p>
J4	<p><b>Stirring protocols</b> <span style="float: right;">3h00</span> <b>T. Le Borgne</b> 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> <span style="float: right;">4h00</span> <b>B. Metzger, H. Lhuissier</b> (for CoPerMix members only) Practical: Perform a basic mixing experiment (imaging, fluorescence, PIV, concentration field &amp; distributions), Discuss experimental limits (spatial resolution, background noise, photobleaching), Compare different stretching protocols.  Demonstration: Brownian motion &amp; Taylor reversibility experiment.</p>
J5	<p><b>Numerical methods</b> <span style="float: right;">2h00</span> <b>J. Schumacher, P. Meunier</b> 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...)  <b>Talk</b> <span style="float: right;">1h00</span> <b>To be updated</b></p>	<p>Travel</p>