

SEMINARIO DICAR

Electrohydrodynamics in Additive Manufacturing, Coating and Painting: Experiments and Theory

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 **Ore 16:00**

 **Aula Ricciardi – Piano Terra, DICAR**

Abstract

Electrohydrodynamic effects offer powerful tools for controlling liquid interfaces in additive manufacturing, coating, and painting processes. This seminar presents a unified experimental and theoretical perspective on how electric fields can be exploited to manipulate droplets, jets, and thin liquid structures with unprecedented precision. The talk will cover electrowetting-based droplet manipulation for 3D printing, demonstrating controlled motion of droplets on horizontal, vertical, and inverted substrates. The role of electrostatic (Coulomb) forces acting on ionic-conductor liquids will be discussed, highlighting their potential for printing within confined geometries. Electrostatically assisted Direct Ink Writing will be introduced as a method to significantly increase printing speed, reduce feature size, and improve deposition on rough surfaces, supported by a dedicated electrohydrodynamic theory. Further topics include electrically driven coalescence of sessile droplets, linear and nonlinear theories of electrically deformed Stokesian drops, and electrically induced fingering instabilities. The seminar will also address dielectrophoretic stretching of dielectric droplets and electrically driven deformation of conducting polymer drops. Overall, the presentation aims to provide physical insight into electrohydrodynamic mechanisms relevant to advanced manufacturing technologies, bridging fundamental fluid mechanics with emerging industrial applications.



Short CV

Alexander L. Yarin received his MSc in Applied Physics (1977), PhD (1980), and DSc (Habilitation, 1989) in Physics and Mathematics. He held positions at the Institute for Problems in Mechanics of the USSR Academy of Sciences, the Technion – Israel Institute of Technology (Eduard Pestel Chair Professor), and is currently Richard and Loan Hill Professor and UIC Distinguished Professor at the University of Illinois at Chicago. He is a Fellow of the American Physical Society and author of 6 books, 12 book chapters, nearly 500 journal papers, and 12 patents. He is co-editor of the *Springer Handbook of Experimental Fluid Mechanics* and serves on editorial boards of leading journals in fluid mechanics.