“FROZEN IN TIME” SPLASH OF OXIDIZED LIQUID METAL DROPLETS

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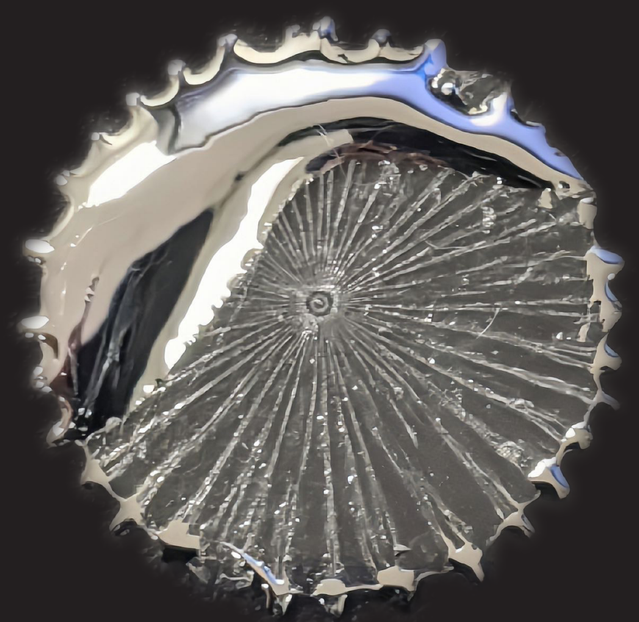
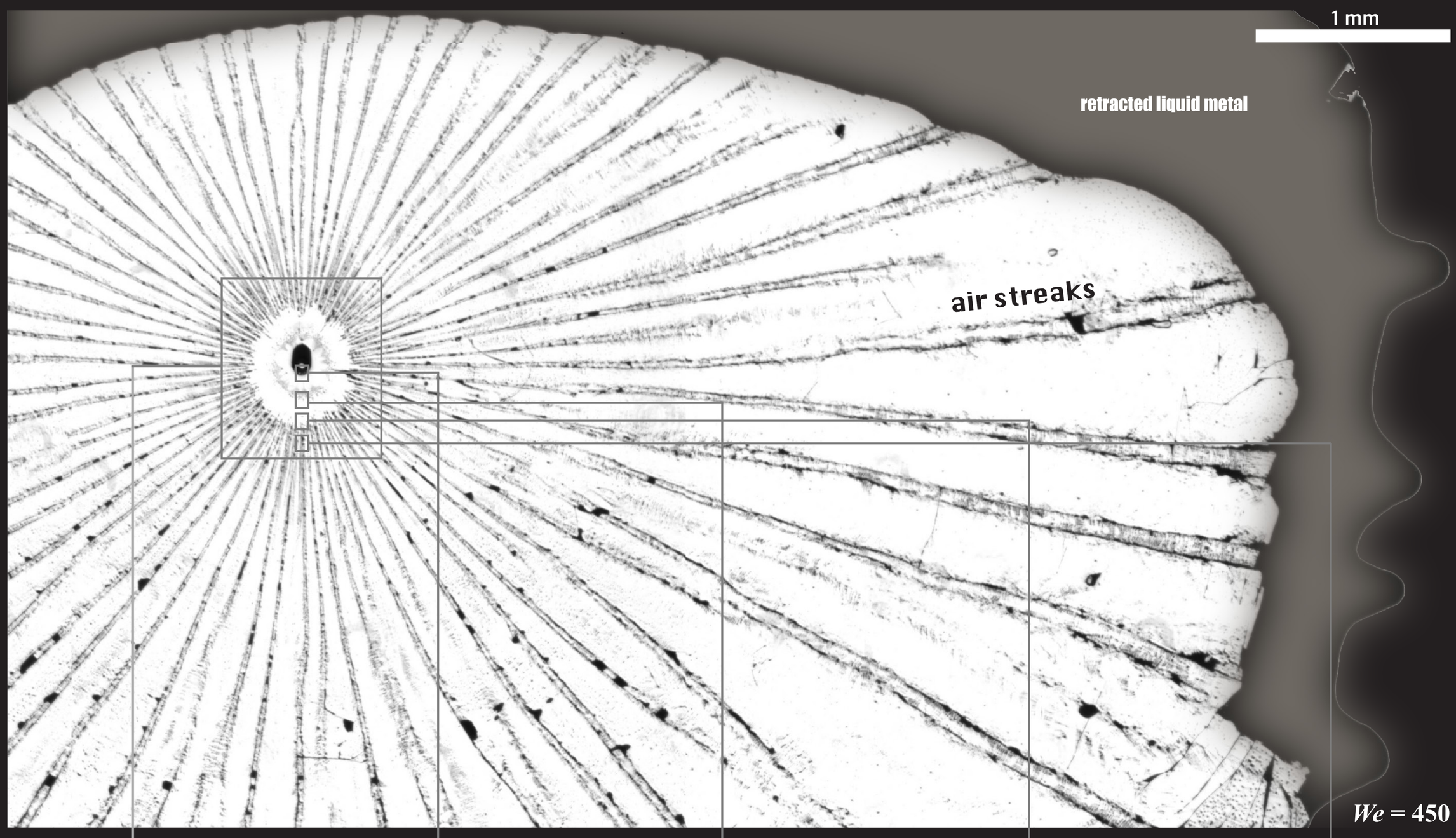
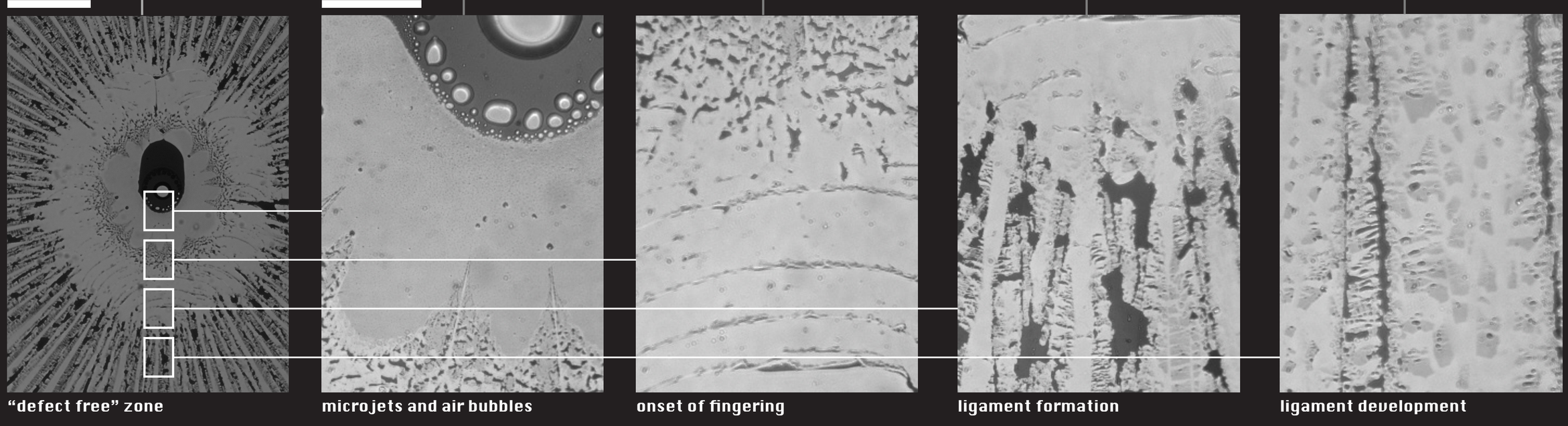
Since the Renaissance, the splash of a drop has attracted numerous studies on late-time fingering instability. An oxidized layer forms at the Galinstan–air interface and adheres to the solid substrate as the lamella advances. This ångström-thick (~0.5 nm) oxide film “freezes” the ephemeral early undulation (~100 ns) and subsequent fingering, to capture the entirety of which would necessitate contemporarily unattainable ultra-high-speed imaging endowed with exceptional field of view and extreme resolution.







A few seconds later, the restoring-induced retraction reveals an aesthetic instability pattern. From millimetric to micrometric scales, the splash encompasses entrained air bubbles, microjets, ligament streaks, etc. Such visualization therefore provides invaluable insights into the underlying mechanisms, i.e., Plateau-Rayleigh and Rayleigh-Taylor instabilities, with industrial significance in additive manufacturing on suppressing delamination.