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Opening a window into the world at the tip of a laser beam: in situ monitoring laser processing.

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Though lasers are ubiquitous in manufacturing, the vast majority of applications involve no depth control due to the inherent beam nature of light. Even the most deterministic of processes (like ultrafast micromachining) suffer from variability when scaled up to sufficient repetition rates and powers to provide material removal rates to meet industrial needs. Instead of trying to control the light-matter process, we exploit coherent imaging to monitor laser depth in situ at high speeds (>200 kHz). Full sample morphology during processing can be recorded with micron precision even in the presence of intense laser light, plasma and black-body radiation. Monitoring is so robust that we have achieved fully closed-loop control of laser cutting and welding. Laser Depth Dynamics was formed in 2012 to commercialize this approach and has sold systems in Europe, North America and Asia primarily in the fields of automotive and aerospace manufacturing.

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