

SES16-2016-000083

Abstract for an Invited Paper
for the SES16 Meeting of
the American Physical Society

Record Dynamics: Direct Experimental Evidence from Jammed Colloids¹

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In a broad class of complex materials a quench leads to a multi-scaled relaxation process known as aging. To explain its commonality and the astounding insensitivity to most microscopic details, record dynamics (RD) posits that a sub-extensive set of irreversible events, so called quakes, controls the dynamics. While key predictions of RD are known to concur with a number of experimental and simulational results, its basic assumption on the nature of quake statistics has proven extremely difficult to verify experimentally. The careful distinction of rare (record) cage-breaking events from in-cage rattle accomplished in previous experiments on jammed colloids [PRL103(2009)115701] enables us to extract the first direct experimental evidence for the fundamental hypothesis of RD that the rate of quake events decelerates with the inverse of the system age. The resulting description shows the predicted growth of the particle mean-square displacement and of a mesoscopic length-scale with the logarithm of time.

¹This work had been funded partially by the NSF through grant DMR-1207431.