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Equilibrium morphology of laminar rivers ERIC LAJEUNESSE, GREGOIRE SEIZILLES, OLIVIER DEVAUCHELLE, Institut de Physique du Globe de Paris — The flow of a viscous fluid over a bed of plastic sediment spontaneously generates single-thread channels. With time, these analogues of alluvial rivers reach a reproducible steady state, exhibiting a well-defined width and cross section. In the absence of sediment transport, their shape conforms with the threshold hypothesis which states that, at equilibrium, the combination of gravity and flow-induced stress maintains the bed surface at the threshold of motion.[1] If the river transports sediments, gravity pulls the moving grains towards the center of the channel.[2] Because of bed roughness, these moving grains follow a random walk in the transverse direction.[3] Consequently, sediments diffuse towards the less active areas of the bed, thus counteracting gravity by continuously rebuilding the river banks. As the sediment discharge increases, this balance requires a wider and narrower channel, until the river becomes unstable. Based on these experimental observation, we propose a theory explaining how the channel selects its size and slope for given flow and sediment discharges.

[1]Seizilles et al., **Phy. Rev. E.** 87, 052204
[2]Parker **J. Fluid Mech.** 89, 127-146
[3]Seizilles et al., **Phys. Fluids** 26, 013302

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