To equilibrate, or not to equilibrate, that is the question

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We consider an overdamped Brownian particle subject to an asymptotically flat potential with a well around the origin. When the temperature is small compared to the well depth, there exists a range of timescales over which physical observables remain practically constant. This range can be very long, of the order of the Arrhenius factor. For these quasi-equilibrium states, the usual Boltzmann- Gibbs (BG) recipe does not work, since the partition function is divergent due to the flatness of the potential at long distances. However, we show that the standard BG statistical framework and thermodynamic relations can still be applied through proper regularization.