Linear response theory: When is it valid and when not?
(with Caroline Wormell)

Mathematicians:
The measure varies roughly with the parameter in simple systems
"Typical low-dim. systems do not obey LRT"

Applied scientists:
"But it works!" does it?
"Typical high-dim. systems obey LRT"

?? Can we reconcile these two "facts" ??
Yes!
Consider a high-dimensional system consisting of low-dimensional subunits which do not obey LRT

Linear response for $E^2[\Phi]$ need both:
* $q_j$: chaotic
* heterogeneity: $\mathbf{V}(a)$ smooth

$q_j, a_j$: microscopic parameters
$\mathbf{V}(a)$: macroscopic mean field

Comment on wrong argument: Gallavotti-Cohen hypothesis makes comments only about fixed $E$, not on how measures are related when $E$ is varied.

Wormell & GAG, Chaos 29, 113127 (2019)
GAG, Wormell & Wouters, Physica D 331, 89 (2016)