# Co-ordinate transforms underpin multiscale modelling and reduction in deterministic and stochastic systems

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Complex Systems II
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A persistent feature of complex systems in engineering and science is the emergence of macroscopic, coarse grained, coherent behaviour from microscale interactions. In current modeling, ranging from ecology to materials science, the underlying microscopic mechanisms are known, but the closures to translate microscale knowledge to a large scale macroscopic description are rarely available in closed form. Kevrekidis proposes new 'equation free' computational methodologies to circumvent this stumbling block in multiscale modelling. Nonlinear coordinate transforms underpin analytic techniques that support these computational methodologies. But to do so we must cross multiple space and time scales, in both deterministic and stochastic systems, and where the microstructure is either smooth or detailed. Using examples, I describe progress in using nonlinear coordinate transforms to illuminate such multiscale modelling issues.



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