Problems in the real world usually involve a multitude of scales of length and/or time due to material composition, internal physics, or external forcing. One common approach in mathematical modeling is to derive the governing equations for the most relevant scale and fill in the constitutive coefficients by experiments. A more fundamental approach is to predict the macro-scale behavior from micro-scale mechanics. The theoretical procedure for the second approach is variably called averaging, upscaling or homogenization. For linear or weakly nonlinear problems the perturbation method of multiple scales is very effective. After illustrating the typical steps by a one-dimensional example of elastic wave propagation, two examples of fluids engineering will be discussed. The first arises from a novel design for a pressure recovery devise in the process of desalination. This involves the simple analysis of convective diffusion in oscillatory boundary layers. The second is on a proposal to extract power from ocean waves by a compact array of small buoys. Other examples will be mentioned.