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Orogens, modern and ancient - what they tell us about mountain building

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Modern mountain belts such as the Alpine-Himalayan chain have pronounced vertical and lateral (along-strike) variations in structure that yield insight into different stages of the orogenic cycle, from rifting through subduction to collision. Their topography also gives valuable clues on the interaction of surface and deep-seated processes; however, the inner workings of the orogen are hidden from direct observation. In contrast, ancient orogens like the Caledonides, Variscides or Precambrian orogens are more uniformly and deeply exhumed, allowing a better view of deep crustal processes, but in many cases preserving little, if any, of the orogenic topography and only a modest stratigraphic record of orogenesis. This contribution attempts to reconcile records of modern and ancient orogens, with particular reference to the Alps, the Variscides, and the Banda-Phillipines-South China Sea orogenic system. I will highlight the role of new imaging methods, especially passive-source seismic imaging with large station arrays, in revolutionizing our understanding of the role of the mantle in mountain building.