Sport Physics I : Swimming & surfing

Energetically, there is a real advantage to fly close to the sea surface but a deep disadvantage to swim close to it. Except if you manage to surf !
This is the summary of the first lecture where we will first address the influence of an interface on both the induced drag and the wave drag. In a second part, we will study the transition from the Stokes' drift to the surfing regime and show how this later regime uses the free surface to reduce the cost of locomotion.

Sport Physics II : How to break records ?

The variational approach has been introduced in Physics at the time where the belief in God (or Nature) pushed Physicists like Fermat to believe that the surrounding world results from the optimisation of a given quantity : "La nature agit toujours par les voies les plus courtes". This approach was found very efficient via the least time principle in Optics and the least action in Mechanics.
In this second lecture, we will use it in Sports, where the "records" consist in minimising the time for a given distance (races) or in maximising the distance for a given projectile (throws), or in maximising the raised mass for a given athlete weight (weightlifting). Following the footsteps of JB Keller, we will try to show the physical rules which enable to break records in these different disciplines.