Hydrodynamics-related injuries of high cliff divers: Leg opening at water entry

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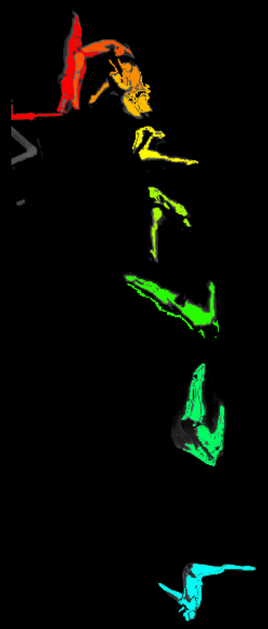
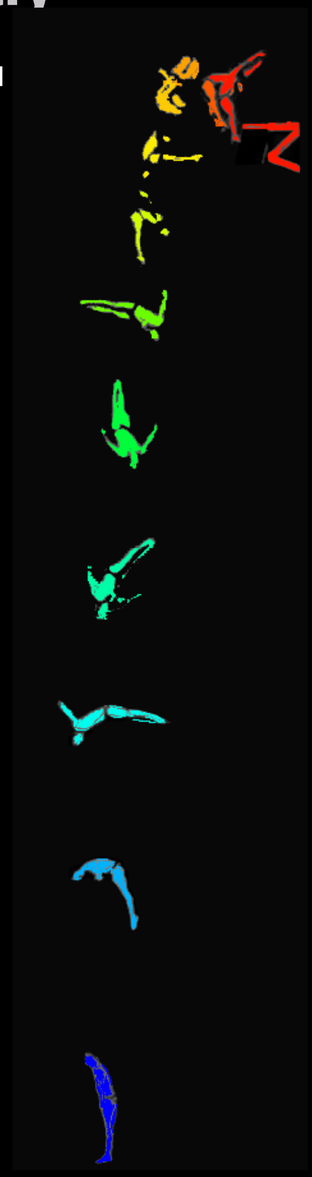
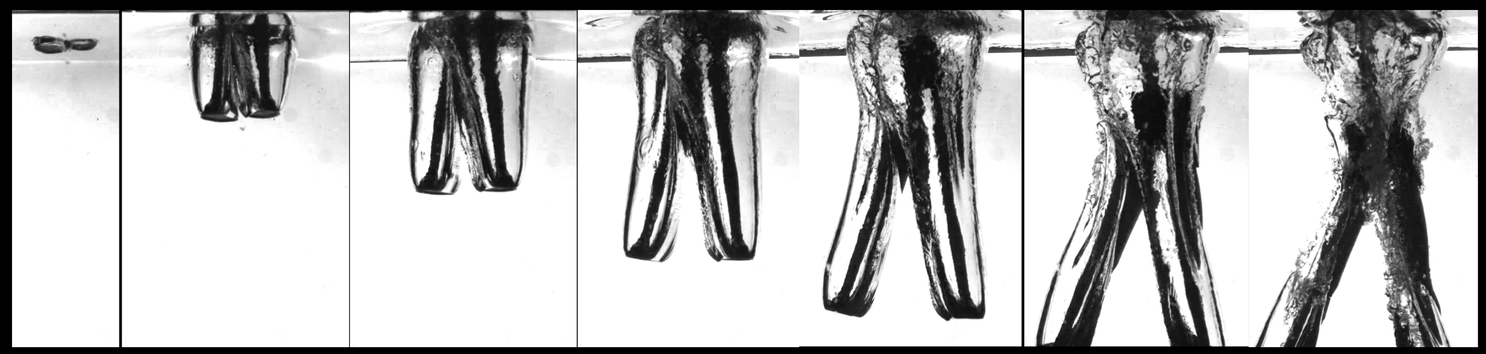
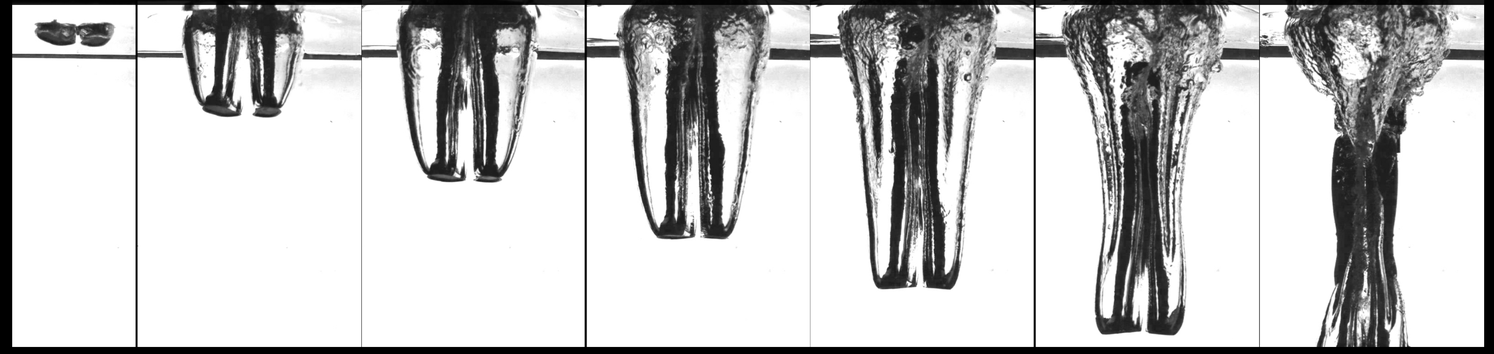




Free-legs figurine entering water at 2.45 m/s



Fixed-legs figurine entering water at 2.45 m/s



Real diver entering water at 14.3 m/s

When a high cliff diver enters water after a 27m-high jump, he/she has to face three main risks of injuries: first the violent impact with water, which forces him/her to enter the feet first; then a stretching force between his/her two legs, against which one has to be muscularly prepared; and finally a local increase of pressure when the air cavity collapses. Here, we study the hydrodynamical origines of these injuries to help this sport be safer.

The images sequences at the middle show respectively the impacts of a 25cm-high figurine in a water tank at 2.45 m/s, with legs either free to rotate (top) or attached with a force sensor (middle) and the impact of a professional high diver (1m72) at 14.3 m/s from a 10m-high jump in Area47 training pool. We show that the closeness of the two air cavities entrained by the two legs induces a repulsive force between themselves, the diver has to resist against.