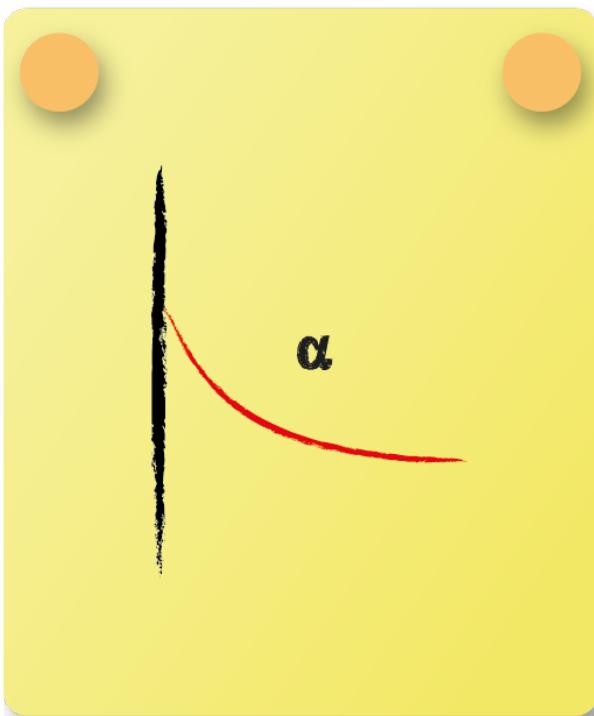


## Lecture 1 - Question 6



Why can we stand it in the sauna at 100C but washing our hands at 60C water temperature hurts?



To investigate this problem it is suitable to compare convective heat transfer from air to skin (sauna) and water to skin (washing). Heat flux is proportional to temperature difference of body and fluid such as to the heat transfer coefficient  $\alpha$ . Assuming a nusselt number of the same order of magnitude in each case the heat transfer coefficients differ due to a difference in thermal conductivity of the fluids. Since thermal conductivity of water exceeds the value of air to about a factor of 20, it is obvious that despite the smaller temperature difference still a greater amount of heat is transferred while washing our hands. This translates into a higher local temperature at our skin which eventually is recognized by our body and causes pain.