Proteins that bind to specific sequences in long DNA molecules have to locate their target sites amid myriad alternative sequences, yet they do so at remarkably rapid rates, sometimes >1.10^9 M^{-1}s^{-1}. Hence, it has been asserted widely that binding to specific DNA sites can surpass the maximal rate for 3-D diffusion through solution and that this could only be accounted for by a reduction in the dimensionality of the search, in effect by 1-D diffusion (or “sliding”) along the DNA contour. It will be shown here that there is in fact no known example of a protein binding to a specific DNA site at a rate above the diffusion limit, and that the rapidity of these reactions is due primarily to electrostatic interactions between oppositely-charged molecules. It will also be shown that, contrary to popular belief, reduced dimensionality does not in general increase the rate of target-site location but instead reduces it. Finally, it will be demonstrated that proteins locate their target sites primarily by multiple dissociation/re-association events to other (nearby or distant) sites within the same DNA molecule, and that 1-D diffusion is limited to local searches covering ~50 bp around each landing site.