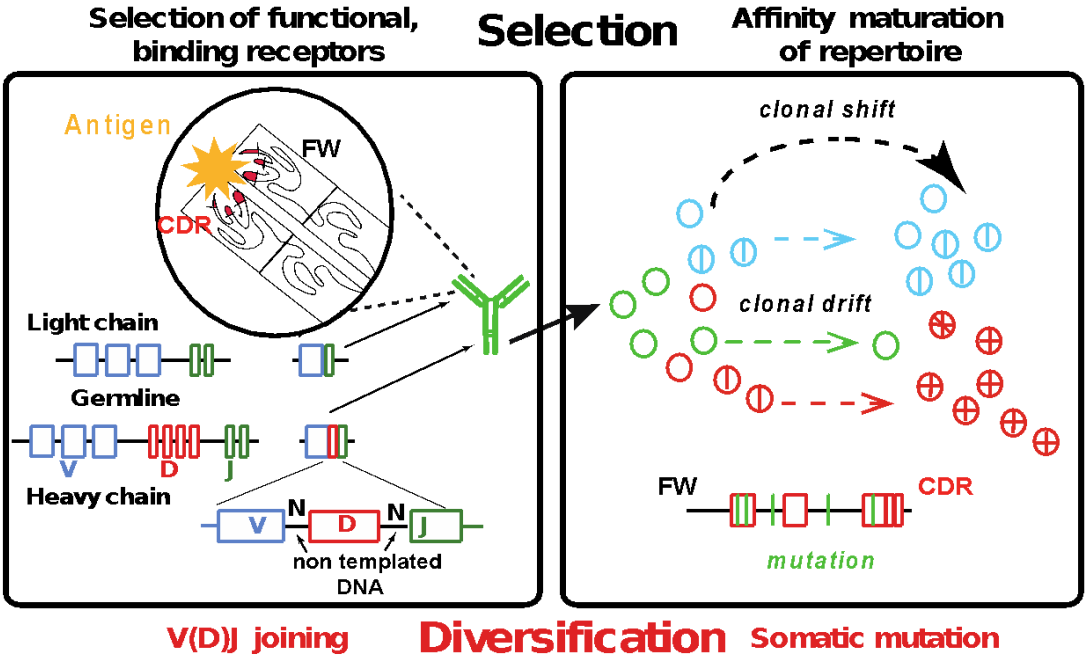

Figure - Background: Diversification and selection of the B cell populations. Left panel – Generation and selection of functional, binding receptors: The Variable regions (at the tip of the Y-shaped antibody structure, circle on left) interact with antigen, mainly through the CDRs (complementarity determining regions) with most of their structure being the result of their framework region (FWR). The heavy chain Variable regions are rearranged from V, D and J gene segments and the light chain V regions from V and J gene segments. There is additional diversity due to the addition of non-templated nucleotides in the joining region. From the immense diversity generated from V(D)J joining only those cells that express functional receptors with some specificity of antigen binding are selected. A resting population of naïve or newly formed B cells is created that has passed through this selection step. These are divided into clones– sets of B cells that are derived from a common mother cell that has a specific V(D)J combination, the red, blue and green 'cells' in the right panel.

Right panel – Somatic mutation and Affinity maturation of the repertoire: During an immune response, B cells proliferate, mutate and die, leading to the selection of mutants with high affinity to the driving antigen. Here we see a repertoire evolving over a response. Every repertoire can be divided into a set of clones (a set of B cells that are derived from a common progenitor cell with a specific germline V(D)J combination), here marked as groups of circles with the same color). The process of selection, and therefore all changes in B cell repertoires can thus be divided into two related forms of competition: ***(i) clonal shift*** (black arrow) - the competition between clones and ***(ii) clonal drift*** (colored arrows) - the competition between mutant members of each clone (mutations indicated as extra lines on circles).