Following original idea leading to a discovery of Topological Insulators, we describe the recent developments of the subject in a detail. In particular we focus on Topological Superconductors and Majorana Fermions. Such Majoranas have strong potential to be used in various graphene devices as well as in future topological adiabatic quantum computers due to their non-Abelian braiding statistics. We describe the theory of topological insulators and superconductor and show how Majorana fermions and topological superconductivity may arise there considering the spinless $p_x \pm ip_y$ superconductors and hybrid systems. Graphene is not flat and has microscopic lattice nano-corrugations inherent to all two-dimensional crystals. We show that such corrugations may provide channeling opportunities for electrons that can be used in a new design of p-n junctions and transistors or for a creation of Majoranas. The graphene lattice distortions can not only generate the state of topological insulator but also induce the magnetization oscillations and the Hofstadter butterfly in graphene flakes. We discuss also physical properties of Zener tunneling nano-devices and Aharonov-Bohm effect in graphene nanoring focusing on the case when there are arising levitons. Graphene bubbles is another example where topological states may exist. We also discuss tunneling, stochastic and extraordinary magnetoresistance phenomena arising in these systems.