

In November 2015 we celebrate the 100th anniversary of the birth of Einstein's General Theory of Relativity. To commemorate the event, there are many special conferences organized all over the world (also at Faculty of Physics University of Warsaw). Although General Theory of Relativity is one hundred years old, it is still very attractive field to study. One of the most exciting results of this theory is the existence of black holes, mysterious objects which generate extremely strong gravitational field. A horizon is a surface which divides spacetime into two separate regions: outer and inner (called black hole) where gravity is so strong that nothing - even light - can escape. Physicists have been examining mathematical features of black holes for many years, but they still hold many secrets. One of them is a proper description of the neighborhood of horizon. In our project we construct such a theory which we believe some day become a binding approach. We also analyse white holes - hypothetical object predicted by Loop Quantum Gravity models. Roughly speaking white holes behave like black holes with flipped time arrow.