

Contributed Talk

QUANTUM GRAVITY: DISCOVERIES ABOUT THE EARLY UNIVERSE
INCLUDING BIG BANG, BIG BOUNCE AND A CRITICAL DISCUSSION OF
THESE

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High school students can discover the expansion of the universe from observations. Next they can model this expansion. For this purpose they can derive the Friedmann-Lemaitre equations FLE in the framework of Newtonian Cosmology and perform computer experiments on that basis. Thus they can model gravity. As a result they discover the big bang singularity with a diverging density.

The students can overcome the singularity by applying quantum physics QP at the school level and derive an extension of the FLE. Thus they can model gravity combined with QP, altogether it is called quantum gravity QG. With it they can perform computer experiments and discover the overcoming of the singularity. Finally they can critically discuss consequences like big bang and big bounce.

This topic has been treated in an astronomy club with students ranging from class 5 to 12. So the topic is treated at various levels here. At the basic level the students perform experiments about the density as well as the above computer experiments. At an advanced level the students derive the above equations.

I report on the concept as well as on experiences in the classroom.