UCCS Department of Mathematics
Math Colloquium Series

DR. STEFAN C. MANCAS
EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
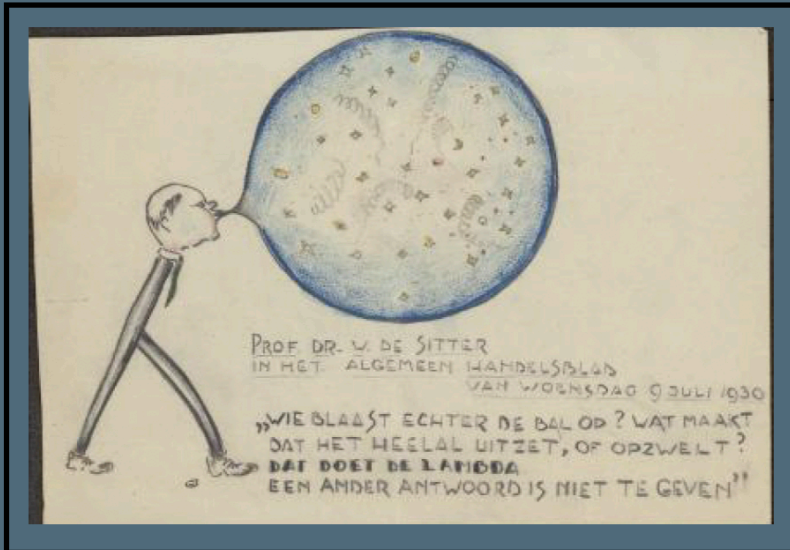

DATE:
MARCH 10, 2020

TIME:
12:30PM-1:30PM
(REFRESHMENTS AT 12:15PM)

LOCATION:
UNIVERSITY CENTER
#122

The Cosmological Vacuous Bubble Inside a Water Tank

Abstract: In this seminar we will try to elucidate why de Sitter wondered about the possibility to describe the universe as a bubble. To achieve this we will first present an analysis of the Rayleigh–Plesset (RP) equation for a three dimensional vacuous water bubble. By neglecting the surface tension we find the radius $R(\tau)$ and time $t(\tau)$ of the evolution of the bubble as parametric closed-form solutions in terms of hypergeometric $2F1$ functions. By including capillarity we show the connection between RP equation and Abel's equation, and we present parametric rational periodic solutions in terms of Weierstrass $\wp$ functions. Second, we show an analogy between the generalized RP equation including a cosmological constant-like term with a reformulation of Einstein's field equations for spatially curved Friedmann–Robertson–Walker cosmology with perfect fluid matter which include both viscous and capillarity effects. We leave the conclusions and comments for the audience

For More Information please contact the UCCS Math Department at
(719) 255-3311 www.uccs.edu/math