1145-83-2652 **Arthur E. Fischer*** (aef@ucsc.edu). *Friedmann's Equation and the Creation of the Universe.*

In this paper we present *mathematical evidence* that the beginning of the universe did not occur at the big bang with the universe in a state of infinite density, but occurred at $t = -\infty$ with the universe in a state of infinite dilution. We show the essential importance played by the *native quadratic structure* of a generic Friedmann's equation

$$\dot{a}^2 = F(a)$$

in the time derivative $\dot{a}$ in arriving at this conclusion and show how this quadratic structure, together with the accompanying *time-reversal symmetry* of Friedmann's equation, has profound physical consequences in building Friedmann models of the universe. We conclude that classical cosmological models can be *extrapolated backwards through the big bang* into the infinite past and thus that viable cosmological models based on the native quadratic form of Friedmann's equation, and thus on Einstein's equations, show that global spatial singularities need not signal an end to spacetime. Thus, classical big bang cosmological models based on Friedmann's equation, without the need for quantum gravity, when globalized to all-time models, show that the universe did not begin at the big bang. Thus encoded in Friedmann's equation is previously undiscovered information about how the universe began. (Received September 25, 2018)