On the stochasticity in relativistic cosmology.


V. A. Belinskii, Khalatnikov and E. M. Lifshits [Adv. in Phys. 31 (1982), no. 6, 639–667, and references therein] have developed approximations for cosmological evolution near big-bang singularities which take the form of recurrence relations for certain parameters. [Reviewer’s note: The applicability of these relations to inhomogeneous cosmologies has been the subject of some controversy (see papers by Belinskii, Khalatnikov and Lifshits [op. cit.] and by J. D. Barrow and F. J. Tipler [Phys. Lett. A 82 (1981), no. 9, 441–445] and references therein).] These have been analysed in previous works by E. M. Lifshits, I. M. Lifshits and Khalatnikov [Zh. Eksp. Teoret. Fiz. 59 (1970), no. 1, 322–336] and, in the language of dynamical systems, by D. F. Chernoff and Barrow [Phys. Rev. Lett. 50 (1983), no. 2, 134–137; MR0689158]; see also Barrow’s survey paper in Classical general relativity [(London, 1983), 25–41, Cambridge Univ. Press, Cambridge, 1984; see MR0779308].

The present paper gives a self-contained exact analysis of the statistical properties of the stationary distribution which is invariant under the transformation between successive eras. To quote the abstract: “The knowledge of the source of stochasticity makes it possible to develop a quantitative statistical theory with appreciable completeness.”

*M. A. H. MacCallum*