# AGE DISTRIBUTION OF GALAXIES

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## 1. Introduction

This paper is concerned with the two questions: how might the large scale study of the universe assist the study of the evolution of individual galaxies, and how might a knowledge of the evolution of individual galaxies assist the large scale study of the universe, particularly in regard to the choice between evolutionary and steady state cosmologies?

We first bring together certain simple general results concerning ages of galaxies in known cosmological models. We then briefly discuss the observational results for the actual universe. Finally, we return to the two questions just stated.

The reader need not be familiar with the mathematics of current cosmological theory. A few simple results are quoted here and their significance should be evident without a knowledge of their derivation. However, the derivation can readily be found in any published exposition of the theory.

## 2. Evolutionary cosmology

We consider first evolutionary cosmology or, as it is commonly called, relativistic cosmology. The most interesting cases under this heading are probably the so called "big bang" cosmologies.

We restrict attention to smoothed out, homogeneous isotropic cosmological models, and to observations by observers who share in the general motion of the material present. In any such model there must exist a parameter $t$ that labels the stage of evolution as seen by any observer. If $t$ is measured in units of the proper time of any observer, then $t$ is known as *cosmic time*. If $t = 0$ is some singular state of the universe, then $t$ is also the *age of the universe* in the neighborhood of the observer.

In any such model, the motion of the material relative to any observer must be radial and spherically symmetric. Therefore, there must exist a parameter $T$ such that, in the neighborhood of the observer, to the first order in distance the motion must be of the form

(2.1) speed of recession = distance divided by $T$,

where $T$ depends upon the cosmic epoch $t$ at which the motion is observed. Since the motion of the whole system is the aggregate of the motions seen by all the local observers, who are all equivalent because the model is postulated