Editor's Note:
The Formation of the Nebulae

by W. B. Bonnor, *Zeitschrift für Astrophysik* **39 (1956), 143–159.**

The paper reprinted in this issue seems to be the first in which one of the central puzzles of cosmology was approached by a nonperturbative method. If the Universe had been exactly spatially homogeneous at the beginning, then the structures observed today (galaxies, clusters of galaxies, etc.) must have evolved out of perturbations of homogeneity. It is natural to suppose that the initial perturbations were statistical fluctuations in density or in the velocity of flow. Then, however, the age of the Universe inferred from other observations is much too short for these fluctuations to acquire the density contrast observed today. They can grow to such a density contrast only if they are initially much larger than statistical fluctuations would be.

Today, 40 years later, the puzzle has still not found a satisfactory explanation. What makes Bonnor's paper remarkable is the fact that the author deduced this conclusion from an exact solution of the Einstein equations at a time when most researchers have still been shy of applying Einstein's theory to real (astro)physical problems, expecting unusual technical difficulties. The problem of galaxy formation became fashionable some 15 years later, and since then it has become an exclusive domain of perturbative calculations. It is fair to say that the important and elegant result of Bonnor has not been properly appreciated at all.

The paper is self-explanatory and the only comment it requires is that the cosmological parameters used in it (like the average mass-density, the Hubble constant or the age of the Universe) are today believed to have other values. With their current values, the numerical results of the paper would be somewhat different (calculating them is a simple exercise for

the readers)[1] . However, this change would not solve the problem under discussion.

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— Andrzej Krasiński, Associate Editor

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W. B. Bonnor: a brief biography

Name: William Bowen Bonnor
Born: London, 13 September, 1920
Education: County High School, Ilford, England, and University of London
Degrees: Bachelor of Science, Ph.D.(in chemistry), D.Sc.(in mathematics)
Career: I began my scientific career as a chemist in a department of the British government and later with Shell, the oil company. My transition to mathematics was accomplished in 1949 when I became an Assistant Lecturer (later Lecturer) at the University of Liverpool. In 1957 I was appointed Reader in Mathematics (later Professor) at the University of London, and have remained there since, except for temporary appointments abroad. I retired officially in 1984, and am now Emeritus Professor at Queen Mary and Westfield College.
Work: Except for brief excursions into physical chemistry and mathematical biology my research has been on gravitation, relativity and related subjects. In recent years much of my work has been on the theory of gravitational radiation. I have always tried to keep in mind that relativity must be judged by physical experience and observation, and not purely on mathematical elegance. *— W. B. Bonnor*

A more extended biography of Professor Bonnor can be found in [1] below (Editor).

REFERENCE

1. MacCallum, M. A. H., ed. (1985). *Galaxies, axisymmetric systems and relativity. Essays presented to W. B. Bonnor on his 65th birthday* (Cambridge University Press, Cambridge).

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[1] The current values are deliberately not specified here because this editor is sure they will be still different in just a few years. The exercise needs to be repeated from time to time.