

THE EXPANDING UNIVERSE

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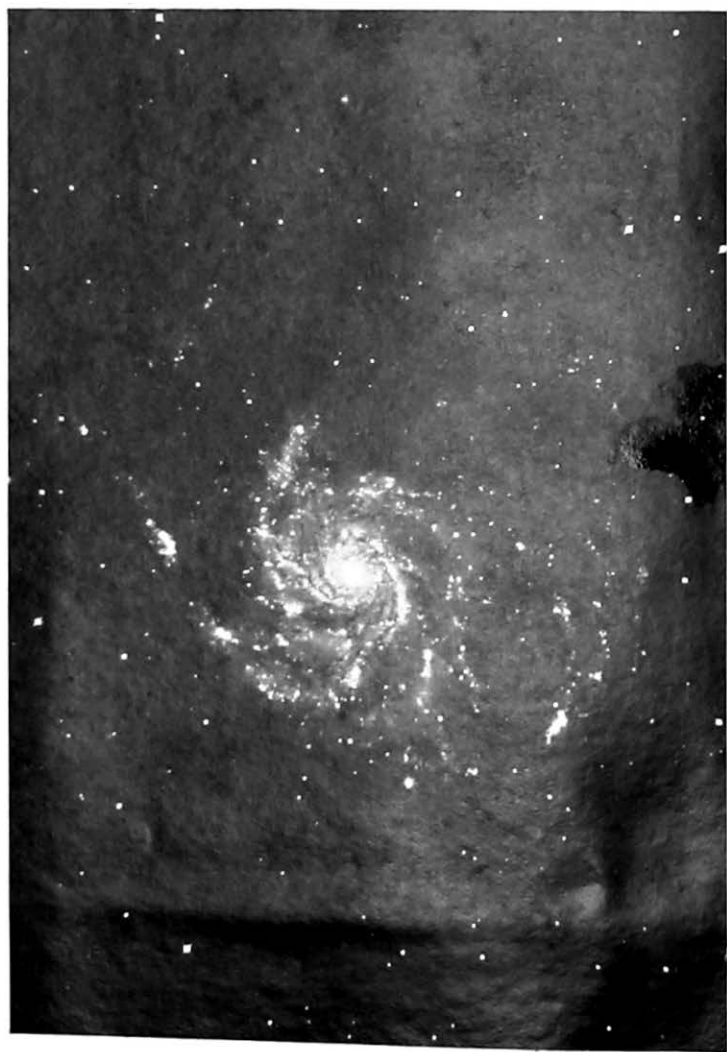
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PLATE I



SPIRAL NEBULA

Ritchey

Messier 101 in Ursa Major. Receding velocity, 300 km. per sec.
Estimated distance, 1,300,000 light-years.

THE EXPANDING UNIVERSE

by

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P R E F A C E

THIS book is an expanded version of a public lecture delivered at the meeting of the International Astronomical Union at Cambridge (Massachusetts) in September 1932. It also furnished the subject-matter of a series of three addresses which were broadcast in the United States shortly afterwards.

I deal with the view now tentatively held that the whole material universe of stars and galaxies of stars is dispersing, the galaxies scattering apart so as to occupy an ever-increasing volume. But I deal with it not as an end in itself. To take an analogy from detective fiction, it is the clue not the criminal. The "hidden hand" in my story is the *cosmical constant*. In Chapter IV we see that the investigation of the expanding universe falls into line with other methods of inquiry, so that we appear to be closing down on the capture of this most elusive constant of nature.

The subject is of especial interest, since it lies at the meeting point of astronomy, relativity and wave-mechanics. Any genuine progress will have important reactions on all three.

I am treating of very recent developments; and investigations both on the theoretical and on the observational side are still in progress which are likely to teach us much more and may modify our views. It might be argued that at this stage a book is pre-

PREFACE

mature; but I have ventured to assume that in the mystery stories of science the reader may be as much interested in the finding and weaving together of clues for the detection of the criminal as in his final capture and execution.

Suppose then that half-way through the chase one of the blundering detectives is here summing up what has been found out and where the strongest suspicion lies. You read his discussion, not because you have confidence that he has reached the point of identifying the criminal, but because it is presumably a necessary stage in the solution of the mystery. In real life (unlike the stories) it is possible that the suspicion already rests on the right person; be that as it may, it is worth while to set forth and analyse the present state of the inquiry.

In the astronomical part of the book I follow generally the theory of Lemaître; there is a difference in our views of evolution (see p. 59), but from my point of view this is a very minor divergence. Several counter theories of the apparent recession of the nebulae have been proposed; an explanation of my general attitude towards them is given on p. 61.

The book will be found to be of uneven difficulty; and the reader who finds himself out of his depth in Chapter II may discover that the going becomes easier further on. I have endeavoured to make the explanations as simple as possible; but the book is not intended solely as a semipopular exposition, and I have not hesitated to plunge into matters of extreme difficulty when it seemed necessary for an adequate discussion of the problem.

PREFACE

In remembrance of the occasion of its delivery, I add here the opening words of the lecture:

This is an International Conference and I have chosen an international subject. I shall speak of the theoretical work of Einstein of Germany, de Sitter of Holland, Lemaître of Belgium. For observational data I turn to the Americans, Slipher, Hubble, Humason, recalling however that the vitally important datum of distance is found by a method which we owe to Hertzprung of Denmark. As I must not trouble you with mathematical analysis, I have to pass over Levi-Civita of Italy whose methods and ideas we employ. But I must refer especially to the new interest which arises in the subject through its linkage to wave-mechanics; as a representative name in wave-mechanics I mention that of its originator, de Broglie of France.

My subject disperses the galaxies, but it unites the earth. May no "cosmical repulsion" intervene to sunder us!

A. S. E.

CAMBRIDGE, ENGLAND

October 1932

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PLATE I

Spiral Nebula *frontispiece*

PLATE II

Spectra of Nebulae *facing page 16*

Masters, I am to discourse wonders: but ask me not what; for if I tell you, I am no true Athenian. I will tell you everything, right as it fell out.

A Midsummer-Night's Dream