

ON THE INTERPRETATION OF THE SPECTROSCOPICALLY OBSERVED ROTATIONS OF GALAXIES

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I.—*Observations of Spectroscopic Rotation*

1. A great deal of observational work has been done on the spectroscopic rotation of extragalactic objects. During the last ten years the rotational effects to be found within our own galactic system have been very much discussed. However, the first definite evidence of rotation was found, not in our own system, but in external galaxies. The first spectroscopic observations of the rotation of a spiral object were performed by V. M. Slipher * in 1914. Later on evidence has been obtained by Slipher, F. G. Pease †, M. Wolf ‡ and H. W. Babcock §, for the rotations of several galaxies.

According to Slipher, rotations have been definitely established for six objects. These are N.G.C. 221, 224, 1068, 2683, 3623 and 4594. Measurements of the rotations represent extremely difficult work. In general Slipher gives no numerical values of the rotational change of radial velocity. The present paper is intended as a contribution to the interpretation of the observed spectroscopic rotations. When numerical values become accessible for the above six objects it will be possible to enlarge considerably the material of the present investigation.

Very detailed informations about spectroscopic rotation are given by Pease for the two objects N.G.C. 224 and N.G.C. 4594. The rotational change of radial velocity is measured along the major axis at different distances from the centre of the object. For the Andromeda spiral the rotation is determined along the minor axis, too. For both objects the measurements extend over an interval of about $2' \cdot 5$ on each side of the centre.

The measurements of Babcock refer to the Andromeda spiral. They extend over the very large interval of $30'$ on each side of the centre of the system. Within the central core the observed rotation agrees with that found by Pease.

2. In this connection the largest interest lies in the relation found between radial velocity and distance from the centre of the object. The above measurements by Pease result in a *linear* relation. This means that the observed angular velocity of rotation is about the same at different distances from the centre. For N.G.C. 224 the rotational change of radial velocity amounts to about 29 km./sec. per $1'$, whereas a value of 167 km./sec. per $1'$ is found for N.G.C. 4594.

It is true that the measurements by Babcock show that the above linear

* *Lowell Bull.* II, 65, 1914.

† Cf. *Handb. d. Astroph.*, V, 2, 851, 1933.

‡ See *Upsala Medd.*, 40, 1928.

§ *P.A.S.P.*, 50, 174, 1938.