So far as the program has gone, therefore, all the evidence points to a great distance for these objects. As the spirals are undoubtedly in revolution—any other explanation of the spiral form seems impossible—the failure to find any evidences of rotation would indicate that they must be of enormous actual size, and at enormous distances from us. At a distance of one-thousand light-years, supposing mass conditions to be the same as in our solar system, a nebular structure one minute of arc in apparent distance from its nucleus, or 60 times the distance of Neptune from the Sun, would have a yearly angular movement of only 53", or a maximum yearly displacement in a given component with reference to the nucleus of only 0.015". A much greater time interval will probably be necessary before nebular rotations can be definitely established by measures of position, unless a nebula abnormally close to us be found.

Wolf and Slipher have reported the observation of rotation in the spiral nebulae Messier 81 and N. G. C. 4594, respectively, by means of the velocity-displacements of lines in the spectra of these bodies. The spectrographic method, here as elsewhere, is independent of the distance or absolute size of the object.

DISCOVERY OF THE NINTH SATELLITE OF JUPITER

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The Ninth Satellite of Jupiter was discovered on photographs taken with the Crossley Reflector of the Lick Observatory, on July 21 and 22, 1914. The photographs were of two and one-half hours exposure, and were taken to secure observations of the Eighth Satellite. The new satellite is fainter than the Eighth, and is estimated as nineteenth magnitude. The identity of the object as a satellite was established from the observations of July 22, 27, and 31 by Leuschner's Method of Direct Solution of Orbits of Disturbed Bodies. The motion is retrograde, and the first estimate of the period places it at about three years. The remaining elements of the orbit resemble those of the Eighth Satellite. Additional observations of the satellite have been secured in August and September. A detailed account of the discovery and observations, and of the investigation of the orbit, will be published in a Lick Observatory Bulletin.