

Extended halos on planetary nebulae

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Limit photographs of a selection of planetary nebulae show extended halos of large diameter on a majority of the limited sample studied.

INTRODUCTION AND DISCUSSION

DURING a study of factors influencing the sky-limited photography of faint nebulosity, the planetary nebula NGC 6543 was chosen as a candidate from visual inspection of the blue exposure from the Palomar-National Geographic Sky Survey. A 1-h-30-min exposure on a nitrogen-baked Kodak spectroscopic plate, type IIIa-J, was made with the Kitt Peak National Observatory 2.1-m reflector at the $f/7.5$ focus. Inspection of the plate revealed an extended halo, approximately 380 arcsec in diameter, which is substantially larger than previously reported (Kaler 1974). A second plate made with the Mayall 4-m reflector gave a diameter of 386 arcmin for the extended halo, confirming its existence and eliminating the optical characteristics of the specific telescope used as its cause. Subsequently, limit photographs were made by similar techniques on the limited selection of planetary nebulae listed in Table I. With the exception of NGC 6804, the objects studied exhibited angular extensions considerably larger than previously reported. The nature of the halos varies considerably from object

to object: The photographs of NGC 650/651, NGC 6543, and NGC 6826 are reproduced as Plates II, III, and IV (p. 1331-1333).

Despite the relatively bright nature of the planetaries reported on here, sky-limited photographs with modern techniques have produced new information about the extended nature of these objects. Extensive study of other planetary nebulae would be useful, based on the success ratio from this limited sample.

ACKNOWLEDGMENTS

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REFERENCES

Kaler, James B. (1974). *Astron. J.* **79**, 594.

TABLE I. Angular diameter of faint halos of planetary nebulae.

Obj.	Max. θ'' (arcsec)			Details of plate material (AGM)			
	Becvar ^a	Kaler ^b	AGM ^c	telescope	Exp. time	Plate	Filter
NGC 650-651	157	...	290	4 m	45 ^m	IIIa-J ^d + GG-385	
NGC 1592 (M-1)	360	...	424	4 m	45 ^m	IIIa-J ^d + GG-385	
NGC 6309	19	...	64	4 m	30 ^m	IIIa-J ^d + GG-385	
NGC 6543	22	150	386	4 m	20 ^m	IIIa-J ^d + GG-385	
NGC 6543			381	2.1 m	1 ^h 30 ^m	IIIa-J ^d	...
NGC 6804	63	...	64	4 m	30 ^m	IIIa-J ^d + GG-385	
NGC 6826	27	65	142	4 m	30 ^m	IIIa-J ^d + GG-385	
NGC 6853	480	...	907	4 m	30 ^m	IIIa-J ^d + GG-385	

^a Becvar, A. (1950). *Atlas of the Heavens-II*.

^b Kaler, James B. (1974). *Astron. J.* **79**, 594.

^c This work.

^d Kodak spectroscopic plate, type IIIa-J, baked in N₂ for 4 h at 65°C.

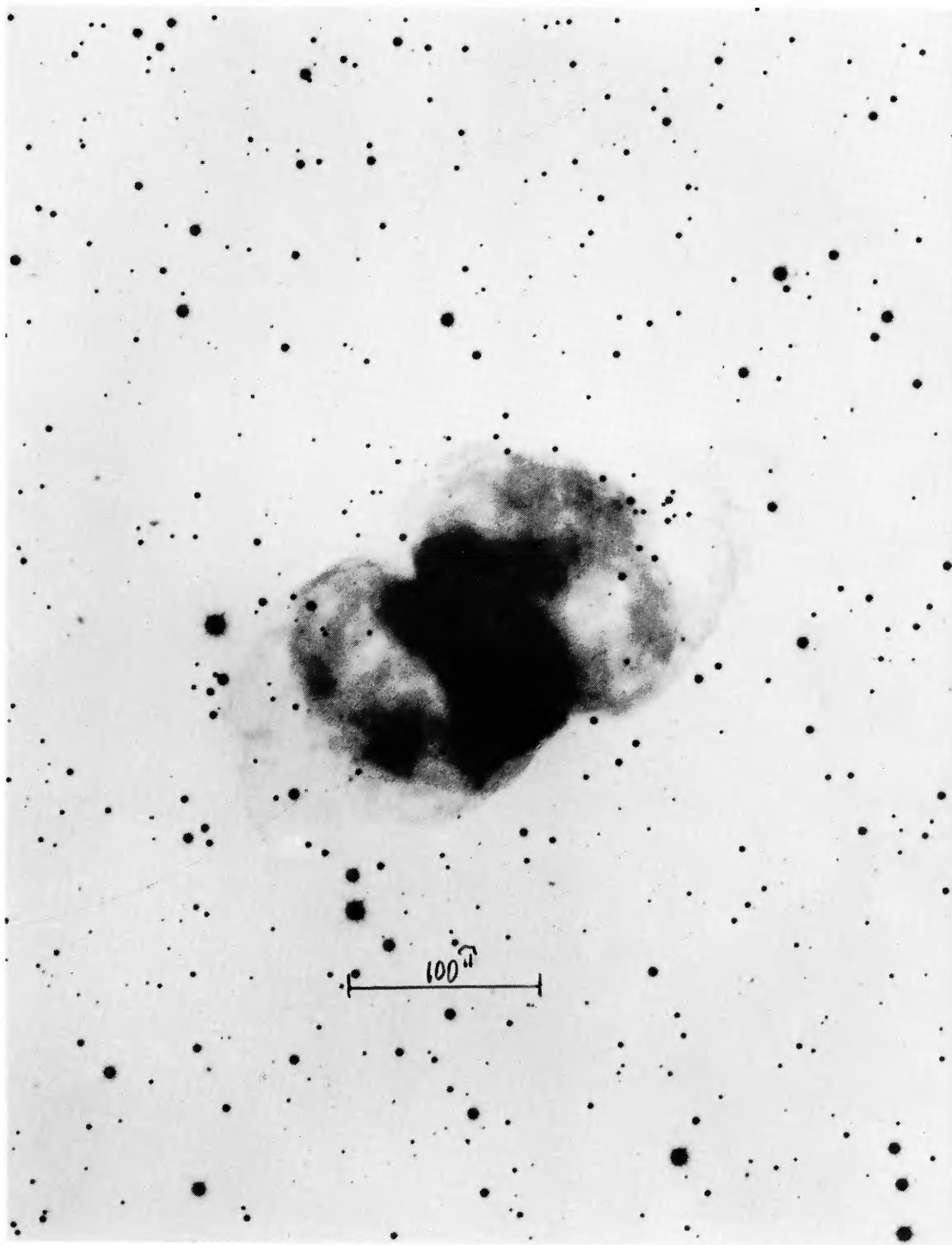


PLATE II (Millikan, p. 1259). NGC 650-651 45-min exposure on Kodak spectroscopic plate, type IIIaJ, KPNO 4-m telescope.

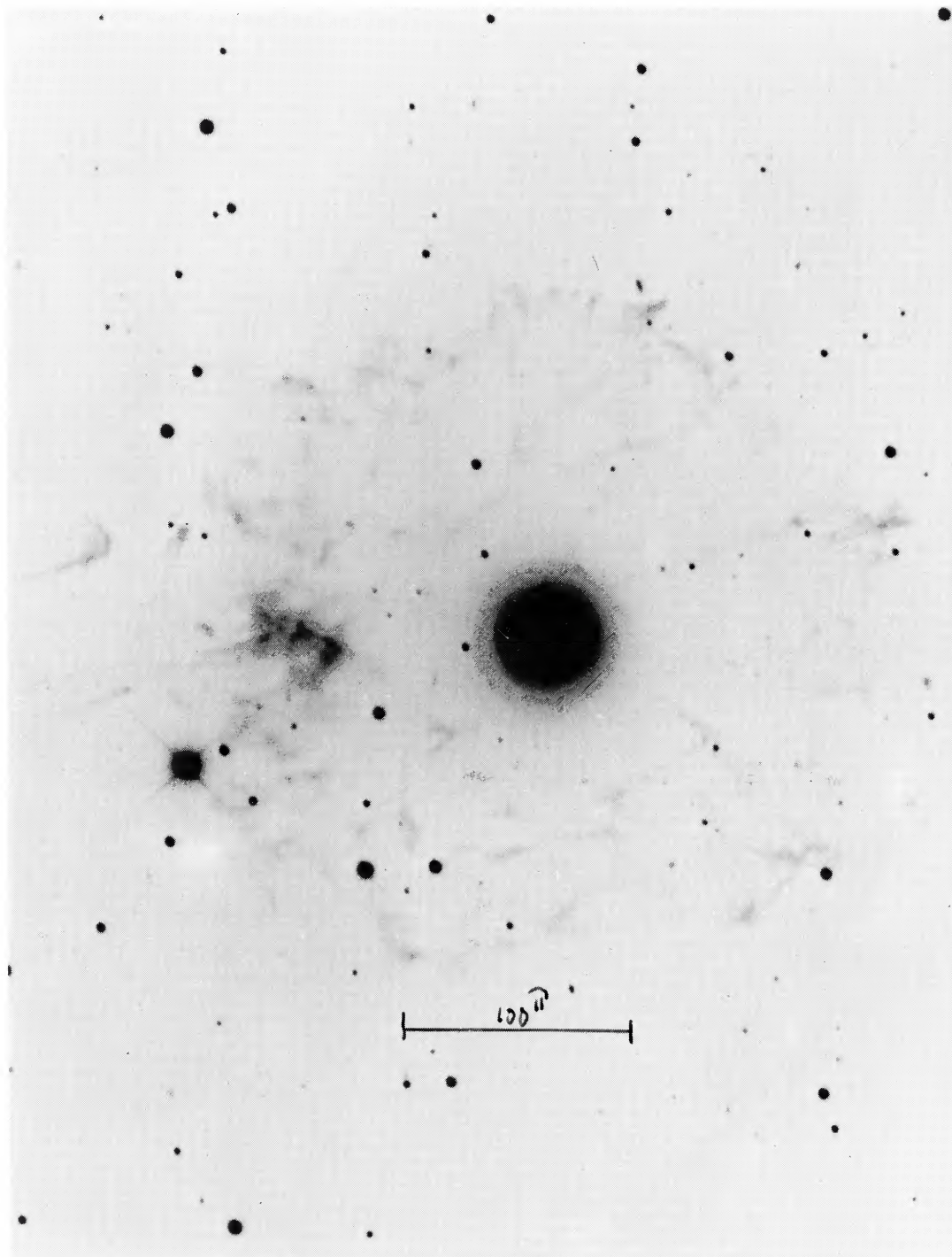


PLATE III (Millikan, p. 1259). 20-min exposure on Kodak spectroscopic plate, type IIIaJ, KPNO 4-m telescope.