Further Observations of Brightness Variations in the Nucleus of M51.
T. X. Truan and D. C. Morton, Princeton University Observatory. An unaided spectrograph of the nucleus of M51 was observed over an exposure of 150
min on 1971 Sep 27 with the Princeton integrating television sensor on the coudé spectrograph of the Hale 200-
inch telescope. The spectrum extended from 4000 to 5500
Å with a resolution of 0.66 Å or 59 km s⁻¹. The slit
was only 0.68 wide, but poor seeing spread the star-like
continuum over a diameter of 3.5 at half intensity.
Faint slices of 60 III, XQ III, and XQ IV stars were also
obtained under exactly the same conditions. Intensity
values of the star spectra were smoothed by computer
and divided by the Gaussian velocity distribution
for comparison with the width of the M51 absorption
line. The best fit was obtained for the XQ III star with a line-of-sight velocity dispersion
ς = 132 ± 50 km s⁻¹. Most of the uncertainty probably
is due to the attempt to match the galaxy spectrum with a single spectral type. This value is considerably lower
than the previous determination of 225 km s⁻¹. The disper-
sion appears roughly constant out to ±35" from the
nucleus in the E-W direction. NASA supported this
investigation and the Hale Observatories provided guest-observer

time at the telescope.

Optical Variations of Four Radio Sources. B. R. Crane and J. W. Warner, The Ohio
State University Radio Observatory. We have
obtained plates of OJ227, 0K237, 0M231, and 0Q208
during the first few months of 1972; in addition
we have 12 measures of OJ208 from 1919 to 1944
from plates in the Harvard plate collection and 1
measures or limits of the brightness of OJ227 taken from plates of the University of Oklahoma
Observatory collection covering the period from
1942 to 1962. Variations of 2 magnitudes are
apparent for OJ237 from 1942 to 1962 with at
least one instance of daily variation of a full
magnitude. It is not clear that our data sup-
ports the 26.231 day period for OJ287 reported
by V. P. Tatsoulis (IAU Circ., No. 2389).

Non-Linear Spiral Structure in Flat Galaxies.
A. P. Safr, Michigan State Univ. The exact, non-linear
time-independent equations of motion and continuity that
govern the gaseous component of a flat galaxy which has a
barred spiral pattern have been examined. The equation
of continuity has been solved identically with the aid of a
stream function \( \Psi \). The equations of motion yield an
integral of motion \( C(\Psi) \), such that \( C(\Psi) \) is a constant for
a gas element moving along a streamline defined by \( \Psi \) =
constant. In fact, the quantity \( C(\Psi) \) is the energy of motion
of the gas element in the reduced gravitational potential.

The equations that follow from this analysis were
then Fourier analysed in the angular coordinate. The first
order terms in the analysis reproduce the earlier results of
Lin, Fujimoto, and others who worked in the linearized
regime. These solutions contain the familiar Lidblad
resonant denominator, which goes through zero at \( w_r = \frac{1}{2} \xi (\text{coordinate system and } \xi \text{ is the epicyclic frequency). Non-
linear effects are first encountered in the solutions of the
second order equations of the Fourier analysis. These
solutions are found to contain a new resonant denominator,
which goes through zero at \( \omega_0 = \frac{1}{4} \xi \).

We shall give specific results for the simple case
in which pressure is ignored and the spiral pattern is