excitation spectrum at maximum light, with the high-excitation nebular spectrum ensuing when the shell becomes transparent toward minimum light.

*University of Michigan Observatory,
Ann Arbor, Mich.*

Musen, Peter. Note on Hansen's general perturbations.

A new expression for Hansen's function W is derived, using vectorial transformations. The obtained expression, unlike Hansen's expression for W , does not contain the partial derivative of the disturbing function with respect to eccentric anomaly. As a consequence, the described method requires the harmonic analysis only of the cube of the inverse distance.

*Cincinnati Observatory,
Cincinnati, Ohio.*

Northcott, Ruth J. and Bakos, Gustav A. A new eclipsing spectroscopic binary, HD 200391.

The star HD 200391, (1900) α 20^h58^m1, δ +27°24', m_v 7.5, Go (Harv.), was found to be a double-lined binary in 1946. Spectrograms taken during 1949 to 1951 with the 74-inch reflector of the David Dunlap Observatory, using a dispersion of 33 Å/mm at $H\gamma$, led to the solution of the orbit. Sterne's method for small eccentricities was used. The spectrographic elements are:

P	0.69809 m.s.d.	$a_1 \sin i$	1.326×10^6 km
e	0.017 ± 0.007	$a_2 \sin i$	1.433×10^6 km
ω	$62^\circ 6' \pm 29^\circ$	m_1/m_2	1.078
γ	-25.22 ± 0.78 km/sec	$(m_1 + m_2) \sin^3 i$	1.73 $\odot$
K_1	138.49 ± 1.39 km/sec	Pri. spec.	GoV
K_2	149.32 ± 1.39 km/sec	Sec. spec.	G5V
T	3130.752 ± 0.001 JD		

Of particular interest was the very short period. It was suspected that the star might prove to be an eclipsing binary. This, in fact, has been found to be true; on Aug. 7, 1955, Mr. Bakos, using photoelectric equipment on the 19-inch reflector, found the magnitude changed by over a tenth of a magnitude. The period was improved to the value 0^d.698084. Later the star was observed more extensively in yellow and blue light, although more observations are needed before the elements of the light curve can be obtained.

Epoch of min.: JD 2435050.5524

Yellow mag. (Johnson's system):	max.	7.29
	pri. min.	7.45
	sec. min.	7.43

It appears that the light varies continuously between minima, and that the secondary mini-

mum, although not well observed, is much narrower than the primary.

*David Dunlap Observatory,
Richmond Hill, Ont.*

Osvalds, V. The astrometric orbit of δ Aquilae.

The star δ Aquilae is an unresolved astrometric binary. Its visual magnitude is 3.4, spectrum F0, period 1250 days. The distance between the components is of the order of 0".2. Henroteau (1923) has observed a rapid change in radial velocity with $P = 0^d.16$ which he ascribes to the pulsation of this so-called β Canis Majoris star. The duplicity of δ Aquilae was discovered astrometrically by Alden (1936) in 1929. There is no information about the spectrum and luminosity of the companion. The system had been observed for parallax at the Allegheny and the McCormick observatories before 1920, but the first extensive series of 131 plates, covering 5 periods, have been taken and an orbit derived by Alden (1936, 1944) at the Yale Southern Station. Considerable additional material, 170 plates taken more or less regularly at the McCormick Observatory during the years 1914–1955, is included in the present discussion. The agreement between Alden's previous results and those derived now is quite satisfactory, and the duplicity of the star is unquestionable.

		Alden	Present
Period	P	1250 days	1250 days
Parallax, abs.	π_a	$+0''.060 \pm 0''.003$	$+0''.067 \pm 0''.004$
Semi-major axis	a	$0''.045 \pm 0''.003$	$0''.058 \pm 0''.003$

Only a guess can be made about the mass. If δ Aquilae were a single star, its mass should be about $2 \odot$. Allowing some mass to the companion we may assume the mass of the system, M , to be between 2 and 4 times that of the sun's. With this assumption the mass of the primary, m_1 , and that of the companion, m_2 , and the distance between them, A , has been computed.

M	m_1	m_2	A
2.0	1.40	0.60	0".194
2.5	1.80	.70	.208
3.0	2.21	.79	.221
3.5	2.62	.88	.232
4.0	3.04	.96	.243

There are sporadic spectroscopic observations of δ Aquilae but they do not suffice to determine the direction of motion in the true orbit. It is necessary to know the radial velocity at the nodal points. The next two nodal passages according to the present orbit will take place on