there is a good chance that by using somewhat larger equipment at the next eclipse, definite and accurate measurements of line width will become available.

I should like to say here how indebted we are to Professor Redman who at very short notice acquired a site for us at Khartoum and without whose assistance we should hardly have been able to set up our instruments in the short time available to us.

Mr. Sadler. I ask you to return your thanks to Prof. Brück and to all those who have taken part in this Colloquium. It is my task to predict eclipses, not to observe them but we have all found these preliminary accounts of the results expected, with varying degrees of optimism, most interesting. The meeting is now adjourned at 12^h 40^m.

PROPOSAL FOR A PROJECT OF HIGH-PRECISION STELLAR RADIAL VELOCITY WORK

By Otto Struve

With the completion of the great radial-velocity programmes of the major observatories, the impression seems to have gained ground that the measurement of Doppler displacements in stellar spectra is less important at the present time than it was prior to the completion of R. E. Wilson's new radial-velocity catalogue.

I believe that this impression is incorrect, and I should like to support my contention by presenting a proposal for the solution of a characteristic astrophysical problem.

One of the burning questions of astronomy deals with the frequency of planet-like bodies in the galaxy which belong to stars other than the Sun. K. A. Strand's[1] discovery of a planet-like companion in the system of 61 Cygni, which was recently confirmed by A. N. Deitch[2] at Poulkovo, and similar results announced for other stars by P. Van de Kamp[3] and D. Reuyl and E. Holmberg[4] have stimulated interest in this problem. I have suggested elsewhere that the absence of rapid axial rotation in all normal solar-type stars (the only rapidly-rotating G and K stars are either W Ursae Majoris binaries or T Tauri nebular variables,[5] or they possess peculiar spectra[6]) suggests that these stars have somehow converted their angular momentum of axial rotation into angular momentum of orbital motions of planets. Hence, there may be many objects of planet-like character in the galaxy.

But how should we proceed to detect them? The method of direct photography used by Strand is, of course, excellent for nearby binary systems, but it is quite limited in scope. There seems to be at present no way to discover objects of the mass and size of Jupiter; nor is there much hope that we could discover objects ten times as large in mass as Jupiter, if they are at distances of one or more astronomical units from their parent stars.

But there seems to be no compelling reason why the hypothetical stellar planets should not, in some instances, be much closer to their parent stars than is the case in the solar system. It would be of interest to test whether there are any such objects.

We know that *stellar* companions can exist at very small distances. It is not unreasonable that a planet might exist at a distance of 1/50 astronomical unit, or about 3,000,000 km. Its period around a star of solar mass would then be about 1 day.

We can write Kepler's third law in the form $V^3 \sim \frac{1}{P}$. Since the orbital velocity of the Earth is 30 km/sec, our hypothetical planet would have a velocity of roughly 200 km/sec. If the mass of this planet were equal to that of Jupiter, it would cause the observed radial velocity of the parent star to oscillate with a range of ± 0·2 km/sec—a quantity that might be just detectable with the most powerful Coudé spectrographs in existence. A planet ten times the mass of Jupiter would be very easy to detect, since it would cause the observed radial velocity of the star to oscillate with ± 2 km/sec. This is correct only for those orbits whose inclinations are 90°. But even for more moderate inclinations it should be possible, without much difficulty, to discover planets of 10 times the mass of Jupiter by the Doppler effect.

There would, of course, also be eclipses. Assuming that the mean density of the planet is five times that of the star (which may be optimistic for such a large planet) the projected eclipsed area is about 1/50th of that of the star, and the loss of light in stellar magnitudes is about 0·02. This, too, should be ascertainable by modern photoelectric methods, though the spectrographic test would probably be more accurate. The advantage of the photometric procedure would be its fainter limiting magnitude compared to that of the high-dispersion spectrographic technique.

Perhaps one way to attack the problem would be to start the spectrographic search among members of relatively wide visual binary systems, where the radial velocity of the companion can be used as a convenient and reliable standard of velocity, and should help in establishing at once whether one (or both) members are spectroscopic binaries of the type here considered.

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References

1. *A.J.*, **51**, 12, 1944; *Pub. A.S.P.*, **55**, 29, 1952.
2. *Izvestia Gl. Astr. Obs., Poulkovo*, **18**, No. 146, 1951.
3. *A.J.*, **51**, 7, 1944.
4. *Ap. J.*, **97**, 41, 1943.
5. See G. Herbig's paper presented at the Victoria 1952 meeting of the *A.A.S.* and *A.S.P.*
6. See P. W. Merrill's note on HD 117555 in *Pub. A.S.P.*, **60**, 382, 1948.