

# REPORT ON THE YALE-COLUMBIA SOUTHERN PROPER MOTION PROGRAM

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This program is best introduced by saying that it constitutes the southern counterpart of the well known Lick proper motion program. In fact, it has been designed to be almost identical to that so that when the work on the materials from both hemispheres has been completed, a homogeneous set of data will be available for the entire celestial sphere.

The Lick program has been described on several occasions by Vasilevskis and Klemola (Vasilevskis and Klemola, 1970; Deutsch and Klemola, 1973, 1974). Since the Lick astronomers are about twenty years ahead of us, they are solving many problems of our program even before we become aware of them. We are indebted for their leadership in many ways.

The details of the program and the progress made at the time of writing this Report are given in the Table I.

The Southern Proper motion program was initiated by D. Brouwer and J. Schilt as a joint enterprise of the Yale and Columbia Universities. It is financially supported by the National Science Foundation. The telescope is a double astrograph; the two refractors being designed respectively for photography in the blue and in the yellow. It is located at El Leoncito, a remote place in the Western Andes in the province of San Juan in Argentina, at an altitude of 8000 ft. Observing of the first epoch plates was begun vigorously only in 1966 with Klemola as the first observer. A. G. Samuels took over in 1967 and continued until 1971 when J. Gibson succeeded; he is still continuing.

The objective gratings and the two exposures of different duration both serve to give proper motions for stars between 6<sup>m</sup> and 18<sup>m</sup> essentially free of magnitude error.

We mentioned in the introduction that for the solution of many of our problems we receive guidance from the Lick astronomers, for which we are duly grateful. However, there are difficulties which are entirely our own. When it became known that the NSF support would be only moral as from January 1, 1974 some changes had to be made in the observing policy to save the first epoch to best advantage.

Originally we pursued observing the same field until acceptable plates had been secured in the blue as well as in the yellow. As from March 1971 the observations are continued in both colours as before. However, a field is considered satisfactorily observed whenever a good blue plate has been secured, regardless of the quality of the yellow photograph. With the new policy we may reasonably hope that the blue plates are all of acceptable quality and have been taken for 99% of Program I at the time financial support is ending.

TABLE I  
Details of telescope and program

	Blue	Yellow
Aperture of refractors:	20 in.	20 in.
Mean effective wavelength:	4300 Å	5550 Å
Mean scale 1 mm:	55"036	55"136
Size of plates:	17 × 17 in.	
Size of plates:	6'3 × 6'3	
Designer of optics:	J. Baker	
Manufacturer of optics:	Perkin Elmer	
Designer of mechanical parts:	B. Hooghoudt	
Manufacturer of mechanical parts:	Rademakers	
Distance of adjacent declination zones:	Five degrees	
Distances between centers of adjacent fields within same zone do not exceed five degrees.		
Plate overlap:	At least one degree	
Difference in magnitude between central image and first order images due to objective grating:	3.5 mag.	
Exposure times of two exposures on same plate:	Two hours and two minutes	
Limiting magnitude long blue exposure:	19 <sup>m</sup>	
Limiting magnitude long yellow exposure:	18 <sup>m</sup>	
Expected accuracy of annual proper motions with twenty years between epochs:	± 0"005	
Program I: zone -25° and further south including -90°.		
Program II: zone -20° and further north including the zone of 0° declination.		
Total number of fields Program I:	598	
Total number of fields Program II:	360	
	958	
Total number of fields satisfactorily photographed (status in July 1973) at the first epoch:	Program I: 560	Program II: 63

We are steadily working on Program II, the overlap with the more northern fields already observed by the Lick observatory. For Program II we follow the same policy with regard to acceptance of blue and yellow negatives as for Program I.

It is certain, that Program II which has second priority after Program I, will not be finished at the time of closure of the southern observatory. However, enough plates of this program have been secured on the first epoch that a worthwhile comparison with Lick results may be anticipated in due course (Deutsch and Klemola, 1973, 1974).

There has been some discussion in the past about the number of years that Yale-Columbia shall allow to lapse before beginning the observing for the second epoch. Vasilevskis and Klemola maintain that an interval of 10 yr with the southern telescope will give an accuracy comparable to 20 yr with the Lick instrument (Vasilevskis and Klemola, 1970). It is true that a number of problems can be solved satisfactorily with an interval as short as ten years between epochs.

On the other hand there are problems which require a higher accuracy than is obtainable with our telescope in ten years. It is in these cases that a longer time base

will only be good enough. It is for these problems that Prof. Blaauw recommended an interval as long as 20–30 yr. There are factors, other than astronomical, which may decide what is to be done in the future and when. Whatever will happen cannot now be predicted and depends on the interest, patience and financial resources of future generations. Few things improve by postponement of action: Proper motions do.

### References

- Deutsch, A. N. and Klemola, A. R.: 1973, *Contrib. Lick Obs.*, No. 399.  
Deutsch, A. N. and Klemola, A. R.: 1974, this volume, p. 193.  
Vasilevskis, S. and Klemola, A. R.: 1970, in W. J. Luyten (ed.), 'Proper Motions', *IAU Colloq.* 7, 167.

### DISCUSSION

*Bok*: We should speak out strongly in support of the effective rounding out of the Yale-Columbia programme. We should stress that it is in the interest of fundamental research that the first phase of the programme as originally proposed should be *completed in full* and that the second phase – the taking and measuring of the second epoch plates for determinations of proper motions – should be undertaken at a time set by purely scientific considerations.