

justement en Juillet. Dans leur désir de trouver cet astérisme, toutes les combinaisons d'étoiles d'un aspect cruciforme, ou en losange, étaient immédiatement supposées la représenter.

Pendant les premiers temps de mon séjour dans cette colonie, cela s'est répété souvent (jusqu'à ce que la Croix du Sud devint bien visible) et c'est ainsi que j'ai été amené à me faire une opinion sur ces diverses croix supposées.

La plus ressemblante de ces configurations et qui, évidemment, peut se confondre avec la vraie Croix du Sud, pour peu que l'observateur ne soit pas bien sûr de son fait, c'est le quadrilatère  $\epsilon$ ,  $\iota$  Carinae,  $\delta$ ,  $\kappa$  Velorum.

Son aspect est entièrement semblable à celui de la Croix du Sud, mais symétriquement retournée de droite à gauche, un peu plus grande comme dimensions et formée d'étoiles un peu moins brillantes en général. Même la petite étoile accessoire,  $\epsilon$  Crucis, trouve sa correspondante dans les étoiles  $\delta$  Carinae, sans parler d'autres ressemblances encore.

Depuis longtemps on désigne ce groupe par le nom de «fausse Croix du Sud» (port. Cruzeiro Falso, angl. False Cross) et, sans aucun doute, il suffit d'un peu d'inadvertance pour pouvoir être induit en erreur par cette image trompeuse, surtout lorsqu'elle se trouve dans une position inclinée ou renversée, peu d'accord avec les dessins habituels, et lorsque la vraie Croix du Sud est invisible.

Mais si à l'occasion on ne voit au ciel ni la vraie  
Lisbonne (Tapada), 1921 Août.

Croix du Sud ni cette fausse croix, deux autres combinaisons peuvent aussi facilement donner cause à une telle erreur chez ceux qui ne connaissent pas assez bien l'aspect véritable. L'une d'elles est  $\alpha$ ,  $\beta$ ,  $\gamma$  Triang. aust.,  $\alpha$  Centauri, l'autre  $\beta$ ,  $\theta$ ,  $\nu$ ,  $\omega$  Carinae qui ont toutes deux une forme en losange assez analogue à celle de la célèbre constellation.

Sur les cartes célestes ces aspects se trouvent considérablement masqués, en conséquence des signes conventionnels adoptés pour les diverses grandeurs. L'atlas du ciel austral par *Behrmann* est le seul, peut-être, où l'éclat relatif des étoiles par rapport à leurs distances donne un effet suffisamment comparable à la réalité. Mais au ciel ces groupes sont beaucoup plus caractéristiques, dès qu'on se préoccupe de trouver une croix sans bien la connaître. À l'oeil nu je les ai trouvés absolument frappants, auffallend, comme on dit en allemand; ils sautent véritablement aux yeux, même non prévenus.

Quant à la ressemblance de la fausse Croix, elle est extraordinaire et pourrait assurément devenir une grave source d'erreurs pour les pilotes qui commettraient la méprise de s'en servir, à la place de la vraie Croix du Sud, en appliquant les règles pratiques, minutieuses et exactes données par *João de Lisboa* dans son admirable «Regimento do Cruzeiro do sul». Le dessin de la constellation s'y trouve justement un peu déformé et pourrait être mal compris.

Fr. Oom.

## On Systematic Errors in the Right Ascensions of our Present Catalogues. By C. D. Perrine.

I am glad to accept the invitation of the Editor to contribute to the Jubilee Number of the Astron. Nachrichten.

When one contemplates the expansion which has taken place in astronomy in that one short century, it is not necessary to dwell upon the importance of its founding. A glance at the volumes shows how well it has fulfilled its mission, its contents forming a very good history of progress in that time. I shall leave to others an analysis of its progress and that of the science and take the occasion to record briefly the uncovering of a term in the right ascensions which appears to explain satisfactorily the systematic errors in our present catalogues and to mark an important step in the history of fundamental positions.

The weakness of positions in the southern sky and a desire to obtain strictly fundamental right ascensions from clocks which could be depended upon for twenty four hours led me, upon assuming charge of the Córdoba Observatory in 1909, to formulate plans for taking up that work. Dr. Thome had ordered a modern meridian circle of large aperture (190 mm) from Repsolds and a Riefler Constant Pressure Clock. These were received after his death. It had evidently been his intention to try for greater accuracy in observing, but whether he intended to undertake fundamental work is not known. A second Riefler Clock was obtained and both were mounted in a small room in the massive brick foundation which Dr. Thome had prepared for the new circle. This room was kept at a constant temperature. Recently both clocks were installed in a subterranean vault where the temperature of the ground is constant throughout the year. The meridian

circle and mire have proven unusually stable and the performance of the clocks has been highly satisfactory.

Beyond realizing the possibility of isolating unknown sources of error and effects by increasing the accuracy of observations I entertained no expectations of a specific advance in any particular direction nor of uncovering the important effect on the right ascensions which First Astronomer *Zimmer* found almost at once he began observing and which has already been explained by him<sup>1)</sup>.

This term is a function of the hour angle of the Sun at the time of a star's observation on the meridian. It has now been found by others also and with the extensive observations made here its reality is considered as established. It is a sine term,  $+0.02 \sin(\alpha - \odot)$ , for the stars of his list which are bright and behaves, as far as our present knowledge goes, as parallax would. If it is not parallax it cannot now be separated from parallax. It differs in size for different stars by more than the probable errors of their determinations and those stars with large known relative parallaxes show the largest values. If what may be taken as a constant is removed from the term the excesses, upon a parallax interpretation, agree closely with geometrical relative parallaxes which have been determined for such stars. It is not my intention to discuss here the underlying cause. The behavior of the term, the evidence which is accumulating that it is peculiar to fixed stars and the existence of a term in the latitude variation (with a smaller coefficient) which behaves as parallax in declination would, may make it necessary to seriously consider a parallax explanation and to reexamine the bases upon which

<sup>1)</sup> Astronomical Journal, Vol. 32, 1, 169, 1919, 1920.

the present evidence rests. Whatever its underlying cause its behavior appears to be sufficiently well known to enable positions to be freed from its effects. This can be done by combining the observations (or making them) in such a way as would free them from the effect of parallactic displacement, or if the coefficient is known for a given star by applying a correction.

Two facts, aside from its possible relation to parallax, are especially noticeable about this term. It is of the form to cause the systematic errors which exist in practically all catalogues but is larger. If in general the bulk of the observations upon which such catalogues are based were made between the early hours of darkness and midnight as was probably the case, the full effect of such a term would not be introduced, but a coefficient of about the value found would remain. Its behavior explains how it is possible for systematic errors to enter into a new series of observations made with great care, although based upon fundamental stars which have supposedly been freed from systematic error.

The second fact is that when treated to eliminate the effects of this term, observations made at widely different times agree well within probable errors of 0.010 to 0.015.

Observatorio Nacional Argentino, Córdoba, July 5<sup>th</sup> 1921.

This of itself indicates the elimination of systematic error.

Observations here have extended over more than four years and number some twenty thousand. Many of them have been made with the definite object of testing some point or question which has arisen. Every possible explanation of a cause (even unlikely ones) that could be thought of and all the bearings that presented themselves, have received attention. The amount and accuracy of the data and the attention which has been given to the problem justify the belief that the present conclusions that it is a sine term behaving as would parallax will not be changed materially and that the catalogue of some 250 right ascensions, which will be ready to issue shortly, will be essentially free from this form of error. Large corrections have been found to the right ascensions of many of the stars of the existing fundamental catalogues. It is planned to extend the observations to the northern hemisphere and ultimately to form a homogeneous fundamental system covering the entire sky.

A redetermination of the fundamental constants based upon observations free from the effect of this term now seems desirable and it is hoped to undertake it at an early date. An investigation of declinations along similar lines is also desirable.

C. D. Perrine.

## The Cause of Temporary Stars. By T. J. J. See.

(With plate 5.)

Authentic records handed down by the Greek astronomers show that in the year 134 B.C. a New Star appeared between  $\beta$  and  $\rho$  Scorpii, in the path of the Milky Way, and was carefully observed by *Hipparchus*, who is said to have been thus induced to form his celebrated catalogue of stars. During the next 17 centuries several other New Stars blazed forth, also near the Milky Way, but the records are less complete than in the case of the nova observed by *Hipparchus*.

*Tycho Brahe* observed very carefully the New Star which suddenly appeared in the constellation Cassiopeia, Nov. 11, 1572, and has left us a detailed account of the phenomenon, with physical suggestions analogous to those handed down by the Greeks. The philosophers *Anaxagoras* and *Democritus*, as *Aristotle* tells us, regarded the Milky Way as due to the accumulated light of certain stars, (cf. *Aristotle*, *De Meteorologica*, Lib. I, Chap. VIII, § 4, §§ 15-17; or the author's *Researches on the Evolution of the Stellar Systems*, vol. 11, 1910, p. 624).

Yet other philosophers regarded the luminosity of the galaxy as due to irresolvable nebulousity, like that in the tails of comets. In this way *Aristotle* himself explained the light of the Milky Way as due to self-luminous incandescent matter; and *Tycho* adopted this view (cf. *Progymnasmata*, p. 795) of the outburst of Nova Cassiopeiae, 1572.

Perhaps we may add that the disputes relative to the nature of the Milky Way were finally brought to a close by *Galileo's* discovery of the telescope, 1610, and the announcement in the *Nuncius Sidereus* that the Milky Way is made up of stars, ten fold more numerous than those previously known.

The proximity of Nova Cassiopeiae to the Milky Way did not escape the penetrating notice of the youthful *Tycho*,

who gave great attention to the outburst, — since the nova was of such unprecedented brilliancy that, at its brightest, the lustre equalled that of Jupiter, and rivaled Venus, being plainly visible by daylight.

In 1604, another New Star, less brilliant than that of 1572, but yet very conspicuous, blazed forth in the constellation Ophiuchus, and was carefully observed by *Kepler*, who followed *Tycho's* tradition of making very detailed observations of this strange outburst. And, as in the case of *Tycho's* star of 1572, and others recorded in history, *Kepler* was struck with the appearance of the New Star of 1604 very near the plane of the Milky Way.

Thus it was remarked by both *Tycho* and *Kepler*, over three centuries ago, that nearly all the new stars which have suddenly blazed forth, and afterwards died down to comparative obscurity, have appeared near the course of the Milky Way, while the regions of the heavens remote from the galaxy have seldom or never been illuminated by the outburst of temporary stars.

This tendency of the novae to follow the Milky Way has attracted increasing attention among modern astronomers, and been especially emphasized by *E. C. Pickering* and his associates at Harvard College Observatory, who have detected a number of novae in the photographic search for stars having peculiar spectra.

Yet in spite of the fact thus established, by the observations since the time of *Hipparchus*, *Tycho* and *Kepler*, the only explanation of the observed distribution of the temporary stars along the course of the Milky Way is that given by the present writer in 1910. As the proof gains in probability each year it is desirable to recall the simple theory then advanced to account for these stellar outbursts.