GENERAL ASTRONOMY ARTICLES

DÉLIMITATION SCIENTIFIQUE DES CONSTELLATIONS (TABLES ET CHARTS)

or the

SCIENTIFIC DEMARCATION of the CONSTELLATIONS (TABLES and CHARTS)

By E. DELPORTE

Astronomer at the Royal Observatory of Belgium

INTRODUCTION to the TEXT

By Andrew James ; Update May 2013

The following article is an English translation of the final report of naming and adoption of the modern constellations made almost eighty-nine years ago. Delporte was a Belgian-French astronomer who was central character in preparing a report for International Research Council of the International Astronomical Union (Union Astronomique Internationalé) (now I.A.U.) with Commission No. 3 specifically finally both scientifically and universally define the constellations and determining the boundaries. Deleporte, also known for his work as a draughtsman, then produced two maps that positioned the boundaries of all the constellations. Between 1925 and 1928, the members of the Commission had sort additional approval from the Variable Star Commission. It seems that the Commission members wanted to keep the variable stars with their original constellation designations. General observers that use sky-maps may have noticed the apparent boundaries making odd directional and seemingly illogical outlines. The classical southern example is the variable star Y Circini. This is placed some 1.1° inside what we normally would considered to be in the next door constellation of Muscal

Final approval of the translated text below was presented to the Commission at Linden Congress in 1928, who meet to decide the final submission to the IAU. This was later printed in 1930 in French by Cambridge University Press. I have sighted only one English translation that was oddly quite incomplete. This version that has been translated is a bit more useful and especially with astronomical terms. This final result of this IAU report meant that the constellations became finally ratified in 1930, and whose application is still firmly held today. This will likely remain unchanged till the beginning of the 22nd Century, when some debate on adding some slight corrections to the positions may become essential and absolutely necessary.

I would humbly like to thank the now late Mme. Monique Léger-Orine of the International Astronomical Union (IAU) in obtaining copies of several of the original IAU papers and documents, which proved most useful in creating this page and the various endnotes. Monique became the Executive Assistant at the IAU Secretariat in Paris but she sadly passed away in Paris on 22nd January 2008. Her interest to many amateurs and professionals in such matters as these were significant, and it is very sad that she died just one year before her formal retirement.

J'adresse sincèrement mes mercis à toi.

SCIENTIFIC DEMARCATION of the CONSTELLATIONS (TABLES and CHARTS)

HISTORICAL BACKGROUND

By E. DELPORTE (1930)

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In their descriptions, the ancients left us a star-studded sky divided into asterisms, but without any clear-cut boundaries. Bode was the first astronomer to add to the symbolic figures in his celestial atlas demarcation lines for the constellations. C. L. Harding, in his *Atlas Novus Coelestis* (Gottingue, 1822), kept the boundaries but left out the figures. Those who came after him took great liberties with the boundaries, which differed from one atlas to the next. John Herschel's own attempt to locate the constellations within spherical quadrilaterals seemed too radical: his approach moved too many major stars from one asterism to another. F. Baily, in the preface to the *Catalogue of Stars of the British Association* (1845), presented a new set of rules whose application, according to him, would give stable boundaries to the constellations while at the same time remaining sufficiently in keeping with Ptolemy's descriptions of the sky. No practical application was attempted. At the same time, Br. Argelander published his *Uranometria Nova*. The Astronomische Gesellschaft in 1867 expressed the wish that the boundaries he gave to the constellations of the northern hemisphere be considered as accepted *ne varietur*. However, subsequent producers of celestial atlases did not take note of this wish, and it can be said that the usual atlases were essentially different from one another as far as the boundaries and the number of the constellations were concerned. Besides, Argelander's lines cannot be defined mathematically.

The precise demarcation of the constellations is of utmost importance for a great deal of astronomical work such as the systematic observation of meteors **(1)** (and bolides), the study and denomination of variables, the observation of novae, etc.

B.A. Gould's work (*Uranometria Argentina; maps*, 1877) presented amendments for the southern hemisphere, the boundaries of the constellations being formed by meridians of right ascension and parallels of declination for the equinox **(2)** (Epoch) of 1875.0 and, in particular cases, by curves which are as close as possible to great circles of the spheres **(3)** and whose position is given by intersections with meridians and parallels.

In 1923, the Belgian National Astronomical Committee, at the suggestion of its president, Professor P. Stroobant, examined the question of the revision of the boundaries of the constellations of the northern hemisphere. The Congress of the International Astronomical Union, held in Rome in 1922, had already embarked on the initial stages by codifying the abbreviations of the 88 constellations making up the entire sky.

At the request of the Belgian National Astronomical Committee, the issue was placed on the agenda of the 1925 Cambridge meeting. At this meeting, Mr Delporte presented a pilot study resulting from a project undertaken in Uccle with Mr Casteels, fellow at the University of Ghent. The General Assembly of the Astronomical Union considered the revision of the boundaries of the constellations of the northern hemisphere to be useful, and requested that a general project be presented to the 1928 Leiden meeting.

A subcommittee answerable to the Notations Committee (no 3) was given the responsibility of preparing the project, which, in accordance with the wishes of the Variable Stars Committee, was to take into account the already established designations of the variable stars and to preserve these stars in their respective asterisms.

The subcommittee consisted of Messrs G. Bigourdin, member of the French Institute, L. Casteels, fellow at the University of Ghent (Belgium), E. Delporte, astronomer at the Royal Observatory of Belgium, J. C. Duncan, director of the Whiting Observatory, Wellesley, Mass., U.S.A., E. B. Knobel, FRAS., London (England), Miss Mary Proctor, F.R.A.S., London (England) and R. K. Young, Professor of Astronomy at the University of Toronto (Canada).

According to Mr. Delporte's proposals, the starting points were as follows: to carry out a scientific demarcation of the constellations of the boreal **(4)** hemisphere, the boundaries being mathematically defined with respect to a determined epoch (equinox), and deviating as little as possible from the non-defined lines found on modern atlases, so as to avoid as much as possible the moving of stars from constellation to constellation, and with the express condition of preserving the existing names of catalogued variable stars.

In the interests of consistency, the sharing of the demarcation task was not recommended. **(5)**

Therefore, Mr Delporte took on the responsibility for the entire theoretical demarcation. As the task proceeded, he wrote four reports, spread over the period from October 1925 to the end of September 1927, in which he communicated to the members of the subcommittee the results already obtained, requesting their advice, which was taken into consideration as he continued the work.

The epoch (equinox) chosen was 1875.0 so as to form a whole with Gould's charts of the southern hemisphere.

The lines are composed solely of hour circles and of parallels of declination. A simple calculation of precession applied to the coordinates of a star determines with absolute certainty its position in a constellation. **(6)** The contour of the constellations follows as closely as possible the line of the principal existing atlases.

All the currently named variable stars which appear in M. R. Prager's Catalogue (Kleinere Veröffentlichungen der Universitäts-sternwarte zu Berlin-Babelsberg, nr 3, Katalog und Ephemeriden Veränderlicher Sterne für 1928.) [Ephemeris and Catalogue of Variable Stars for 1928 - University of Berlin-], as well as those included in the most recent list, published 1 June 1928, in A. N. no 5565, Band 232, Bennenung von veränderlichen Sternen, have been taken into consideration. Without exception, the variables remain in their constellations. **(7)**

The theoretical demarcation completed, the charting was also undertaken at Uccle. The desire for complete uniformity led Mr Delporte to choose the projection networks adopted by Gould in his Uranometria Argentina. They were therefore reproduced on the same scale. The stars are represented up to the magnitude of 6.5.

For the final drawing of the charts, Mr Delporte was assisted by Mr Coutrez, calculator **(8)** at the Royal Observatory of Belgium. He is pleased to have the opportunity to pay tribute to the dedication and perseverance of his collaborator, who made it possible to complete the work successfully and in due time.

As present circumstances do not allow the atlas to be published on the same scale as Gould's, the theoretical demarcation is accompanied by small-scale reproductions of the thirteen charts making up the whole of the northern hemisphere. The numbers of the principal charts are indicated for each constellation. A fourteenth chart covering the whole hemisphere shows the boundaries of the constellations without depicting the stars. On this last chart, the indexed meridians and parallels facilitate the task of classifying special stars.

The work in its present form received, at the 1928 Leiden Congress, the approbation of the Notations (no. 3), Meteors (no. 22) and Variable Stars (no. 27) Subcommittees, to each of which the General Assembly had sent the work for examination.

The Leiden Congress expressed the desire to have rectified those parts of the boundaries of the constellations of the southern hemisphere where Gould had used either obliques or arcs of great circles defined by the coordinates of their extremities.

At the suggestion of Mr Schlesinger, current President of the Notations Committee (no 3) of the Astronomical Union, Mr Delporte has taken on the responsibility for this rectification. Some parallels or meridians used by Gould have also had to be changed to include in their respective constellations the following variables: TV Ophiuchi, UW Ophiuchi, DG Aquilae, RR Normae, T Circini and U Tucanae. The modifications to the boundaries have been carried out without transposing any stars in Gould's Catalogue. Charts have also been prepared for the southern hemisphere. **(9)**

Translated by Margaret Hennessy
and Andrew James, August 1998

Merci bien de votre aide, Margaret!

ACKNOWLEDGEMENTS

I would like to thank the AAO for access to the current Librarian, and the now retired and previous Librarian Robin Shobbrock. Comments and other text was obtained by Monique Orine IAU Administrative Assistant, Chief Librarian, Mrs. Dalles, Dr. S. Debeautat from Paris Observatory (Astronome de l'Observatoire de Paris) and the General Secretary, Dr. Johannes Andersen. Further Information on Deleporte was obtained from the Brussels Observatory; 3, avenue Circulaire, Uccle-Bruxelles; Brussels.

Ms. Margaret Hennessy is a senior French lecturer at Sydney University, in Sydney Australia, whose considerable help is gratefully acknowledged, especially in the interpretation of French of the 1920s. Some technical support for this translation is made kindly by the I.A.U. itself.

The additional interpretation was added by Andrew James. (See Endnotes)

Andrew James
19th April 2008

ENDNOTES

1. Meteors is the astronomical term used for shooting stars. In French I think the terms are interchangeable; but in English they are different. I.e. *Romantic* astrological against the technical astronomical term. A bolide(s) are bright meteors that are technically supposed to brghtly illuminate the ground. In most foreign languages, the terms are usually interchangeable, **étoilé filante** is the modern definition; "*meteorite whose passage in the Earth's atmosphere is signalled by a streak of light.*"
2. This is hard to decipher. The older terms, c. pre-1910, seem to more commonly use a time standard for the 'precession of the equinox(es)' or sometimes simple 'equinox'. (Especially in foreign usage.) Today the term used for the time standard setting the 'precession of the equinoxes' is the standard or fundamental Epoch, defined as "*A point of time fixed or made remarkable by some great event from which dates are reckoned*". In the astronomical case the Epoch is loosely defined as; "*The time, based of the slow changes in star positions, as a consequence of the motion of the Earth's axial rotation, that influences the actual time of the year when the equinox occurs.*") The French word for Epoch is **équinoxe**.
3. The meaning of this is the lines on the celestial grid, that includes the Hour circles and the celestial equator (aequator). [The latitude and longitude, in sky co-ordinates.]
4. In this context the French usage is ambiguous. Boréal is used in the same context as 'Aurora Borealis' — 'The Northern Light's. The definition of 'boreal' is often used as the terms; 'of the north' or 'the northern wind'. It is attributed from to be derived from French into English, yet it originally derives from the Latin '*Septentriones ventri* ***Boreas***' (ln pre-1800s, aurora were thought to be winds blowing ice crystals across the sky. These ice crystals and were thought to be brightly illuminated by the Sun's rays.) The Latin term for the word aurora is '*lumen a septentrionibus orlens.*') In French boréal is defined as either; (a.) A technical term in geography and cosmology for north(ern) or (b.) Near the north pole.
5. This statement is very provocative and yet slightly ambiguous. Is Deleporte saying this on his own, or is referring to the Committee that appointed him to organise the demarcation of the boundaries? A more literal translation is "*In order to arrive at a final homogeneous piece of work, the dividing up/sharing of the task was not to be recommended.*" Note that historically it has been assumed that Delporte was given some personal freedom in his decisions — likely to avoid serious disputes based on divisive and biassed *nationalism*.
6. The calculation of this method is likely of low accuracy. I.e. First order. The earlier maps were poorly defined, however, the precession of each of the corners in right ascension and declination is likely to have been quite rigorous. Computer calculation of the boundary lines defining each corners (and segments), shows that they become very distorted with time.
7. This likely accounts for the sometimes odd shapes of some of the constellation boundaries, especially for ones in the southern sky.
8. In the 1920's, how would the Belgian/French have describe Mr. Coutrez position? Modern description would be a 'human' programmer. Secondly, this position is most unusual, as nearly all of these 'calculators' between 1870 and 1930 would actually be female. In modern French, the masculine form of this is **calculateur**, while the feminine form is **calculatrice**. Confusingly, **calculateur** also means computer, while **calculatrice** also means calculator!
9. Later, a small second modification had to be made to the southern charts after they were printed. A number of minor typesetting and line drawings had to be corrected after publication. These were corrected with an additional Circular, though later versions had this error corrected. An example is the A.A.O. copy at Epping which has the correction drawn in. The Royal Astronomical Society has a version in the London Library which is the corrected one.