NRAO ONLINE 57.4
Epilogue – Ovenden's Critique New Coordination System of July 1959[1]
(See ESM_26.5.pdf)

On 14 October 1959, Colin Gum pointed out to Blaauw (with some alarm) that M.W.Ovenden had published an article in the review journal *Science Progress* (vol 147, July 1959, page 476) entitled "Revision of the Definition of Galactic Coordinates". Ovenden was a senior lecturer at Glasgow University[2]. Basically, he was pleased with the choice of the new galactic plane (zero of latitude) but critical of the choice of the zero for longitude.

Ovenden described in detail the newly defined HI principal plane. He was impressed with the fine-scale concentration in the plane of the Milky Way, but was wary about the solution of the new longitude scale:

> [T]he degree of concentration of the neutral hydrogen to the galactic plane is quite remarkable. For distances of up to 8 kilo-parsecs from the galactic centre the zone of maximum density never differs from a single plane by more than *75* parsecs, and within 6 kpc of the centre this deviation is less than 30 parsecs**,** or roughly 0.01 of the diameter of the galactic disc …
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> The redefinition of the galactic pole in this precise fashion will everywhere be welcomed as clearing away a great deal of unavoidable ambiguity. **The new definition of galactic coordinates involves a second part [longitude], about which it is possible to have some reservations.** (our emphasis) During discussions, it was pointed out that the existing definition of galactic longitude had a zero of galactic longitude that was unrelated to the properties of the galaxy. It was [earlier] defined … by the intersection of the celestial and galactic equators … [But then the location of the galactic centre at optical wavelengths was quite uncertain due to extinction, close to 327 degrees old scale, but with possible errors of some 10s of degrees.] … The essential ambiguity lies in the variety of ways that the "centre" could be defined [in the new system] …

[1] The major references for this text were obtained from the Blaauw archive in Groningen: Groninger Archieven, based on the finding aide by P. Huisinga "Plaatsingslijst van het archief van Prof Dr A. Blaauw, astronoom en directeur van het Kapteyn Instituut, 1940-2008." Also from the NAA, the galactic coordinate collection in C3830 C25/7 (Parts 1,2,3) as well as Pawsey correspondence in C3830 Z3/1/6, 7, 8,9 (1955 to 1959).
[2] Later in his career he moved to the University of British Columbia, in 1966.

> On radio wavelengths, there is a discrete radio source, called Sagittarius A, for which considerable circumstantial evidence in favour of its being identified with the galactic nucleus exists**.** However, it would not be desirable to define the zero of galactic longitude to be the position of Sagittarius A, as this would then cause variations in the galactic longitude of all objects **as different positions for the Sagittarius A source are given by various observers -and the definition, from radio observations, of the position of a discrete source cannot be very precise**. [our emphasis] So a conventional zero of galactic longitude can be chosen to be as near as possible to the presently determined position of Sagittarius A, but not to be identified with this object …

Ovenden then described the new definition of the zero point in longitude. The new zero was to be defined by the great circle from the new galactic pole at a position angle of 123 degrees at equinox 1950.0. This was a "radical departure from the type of definition used hitherto in astronomical coordinate system".

Ovenden concluded with a mixed assessment:

> … [In] my view, it is a pity that a definition of a coordinate system should have been adopted that is not capable of refinement as the accuracy of all relevant observations increase …
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> It is to be hoped that the new coordinates will be generally adopted as soon as possible and that they will remain the recognised coordinates for galactic research. The new system is a formal recognition of the entry of radio astronomy into the field of galactic studies, a field which is likely to lean heavily on radio techniques to come.

From the viewpoint of six decades of experience (1959 to 2020), it is remarkable that the 1958 coordinate system has remained a successful endeavour. The position of Sgr A* (the compact radio source associated with the 4 million solar mass black hole at the centre of the Milky Way) was not an inspiration for a revision of galactic coordinates and was only really determined at the sub-arc sec level by Bruce Balick and Robert L. Brown[3] in February 1974, as the radio source associated with the massive black hole at the galactic centre.
In May 2018, Mark Morris, Cornelia Lang and W.M. Goss had an informal half day discussion: **An assessment of the "Galactic Co-ordinates (1958 Revision)" after 50 years.** These cursory

[3] Goss, Brown and Lo ((2003). The Discovery of Sgr A. *Astronomische Nachrichten: Astronomical Notes*, *324*(S1), 497-504) have described the dramatic events of the discovery (including the competition between the successful Green Bank group of Balick and Brown and Dennis Downes and Miller Goss from the Max Planck group in Bonn).

remarks are described at the conclusion of ESM_26.5.pdf. Three of their tentative eight conclusions are:

> The system did stand the test of time. However, the claim by the 1958 sub-commission that the system would never need to be modified was likely premature. In particular, their choice of zero longitude was within their known errors, but still in error by about 4 arc min.
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> Current problems exist due to the galactic coordinates of Sgr A* (l^{ii} b^{ii} , -3.4′ , -2.8′). There are components a few arc min north of Sgr A* with **negative** longitudes. Also, for sources within a few degrees of the galactic centre, a calculation of offset positions cannot be carried out in a straightforward manner. If the real centre were at l=0 and b=0, the offset coordinates would be simple to calculate.
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> A revision to l^{III} might well be considered in the next decades, with a revision of the galactic coordinate system l^{iii} centred on (1) the sun or (2) a galactic coordinate system centred on Sgr A*, a **galactocentric system**. Both systems would need to be time variable due to the 5.90 milliarcsec/yr motion of Sgr A* (e.g. Reid et al 1999, "The Proper Motion of Sagittarius A Star. 1. First VLBA Results") due to the orbit of the sun around the galactic centre (see Additional Note 2).