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“Photo-zincography and helio-  
zincography”

*Richard Oliver*

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The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

## ***Photo-zincography and helio-zincography***

***Richard Oliver***

A couple of years ago, when the Charles Close Society's reissue of the 1920 York town map was being prepared, someone asked the question: 'What is the difference between photo-zincography and helio-zincography?' Both terms are met with on Ordnance Survey large-scale maps from the 1880s to the 1930s, though latterly it is helio-zincography that prevails.<sup>1</sup>

The first of the two processes to be developed was that of photo-zincography. The principle was developed more or less simultaneously in 1859 by John Walter Osborne in Australia and by Captain Alexander de Courcy Scott and Lance-Corporal Rider working under Colonel Henry James at the OS in Southampton.<sup>2</sup> As James had the more effective publicity machine and the bigger ego, he claimed the invention of photo-zincography for himself. From the point of view of contemporary domestic map production it was actually of very limited use, as the largest negative available was considerably smaller than the double-elephant size of a standard six-inch (1:10,560) or larger scale map of the period. Its main use in the 1860s was for producing facsimiles of historical documents, starting with Domesday Book; by the 1870s it was also being used for rapid reproduction of overseas mapping for the War Office.

The basic process in photo-zincography was that the original was photographed, producing a negative on glass. A carbon positive print on treated paper was taken from the negative, floated in water to remove gelatine on the paper, and transferred by being laid down on a grained zinc plate covered with lithographic ink. The image was transferred from the paper to the zinc by the application of considerable pressure, and after the ink had been removed from those parts not covered by the image, it was ready for zincographic printing. A disadvantage of the process was that the print had to be wetted and so lost shape: this introduced distortion of about 1/150 of length or breadth, according to paper expansion, and to counter this paper expanded by moisture was printed on and subsequently dried so as to be at the correct scale.<sup>3</sup>

Photo-zincography was first used on a significant scale for domestic map production from 1881-82 onwards, in order to speed up the production of the six-inch map. Hitherto this had been engraved, but there were increasing delays, and in the new process the linework of the parent 1:2500 was photographed down to six-inch scale. This so speeded things up that it was possible to issue the six-inch sheets before the corresponding 1:2500 sheets were complete, as the latter had to have field acreages calculated and added

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<sup>1</sup> The Ordnance Survey preferred to write both terms as a single word, rather than in hyphenated form.

<sup>2</sup> This has been explored in detail in Ian Mumford, 'Milestones in lithographed cartography from 1800', University of Reading PhD thesis, 1999, 158 ff. Osborne's process was actually for photo-lithography, i.e. laying down the transferred image on stone rather than on zinc.

<sup>3</sup> This description is derived from Duncan A Johnston (ed), *Account of the methods and processes... of the Ordnance Survey*, London: HMSO, 1901, 157, 175-9.

before being published. The drawback was that the size of available negative made a six-inch full sheet (36 by 24 inches) impracticable, and so the mapping was issued instead in quarter-sheets (18 by 12 inches). The glass negatives were stored, and once contours were surveyed they were added to the negatives by 'photo-writing'. As a result most six-inch quarter-sheets of the period 1883-91 were issued in a 'First Edition without contours' (and sometimes also a 'Second Edition without contours', probably just a reprint) before being issued in a 'definitive' contoured edition.

By 1889 it was possible to produce a double-elephant sized negative, and photo-zincography was adopted as standard for the production of the 1:2500 and larger scales. This was the period of 'the replotted counties', when first Lancashire and Yorkshire and then seven Scottish counties which had been mapped at the six-inch scale between 1841 and 1854 were remapped at 1:2500, and large-scale revision was beginning in London, Glasgow and elsewhere. As this entailed also mapping urban areas, mostly at 1:500 (1:1056 in London), huge numbers of glass negatives were generated. After a few quarter-sheets had been produced by the direct-reduction method in the extreme south of Lancashire, a new method was adopted for the six-inch, of photographing the 1:2500 down to twelve-inch, taking prints in non-photographic ferro-prussiate blue to act as drawing-keys, penning-in the necessary detail for the six-inch in black, and photographing again to produce a six-inch scale negative, for photo-zincographic reproduction by the now standard method.<sup>4</sup>

Growing output of large-scale mapping as 1:2500 survey was succeeded by revision coupled with a lack of storage space meant that from about 1894-5 the use of photo-zincography was restricted to the 'heavier' sheets covering built-up areas. 'Lighter' sheets of more open areas were produced by a manual tracing of the 1:2500 revision documents, which was laid down on zinc for zincographic printing: lack of storage space meant that the zinc plates were usually cleaned off, and reprinting could involve new tracing.

By this time an alternative to photo-zincography had been developed: helio-zincography. The essential difference between the two was that what was sometimes known as 'the helio process' worked by placing the photographic negative directly in contact with the sensitised zinc plate, thereby avoiding the photo-printing and transferring processes entailed in photo-zincography. Officially the process was developed in 1893 by Colonel Duncan Johnston, 'assisted by Mr A. Algar'.<sup>5</sup>

Helio-zincography was adopted fairly quickly for six-inch and 1:2500 production, though constraints on storing negatives meant that, like photo-zincography, it was used sparingly for the larger scale. The process for the six-inch up to negative stage remained fundamentally the same up to the end of the County Series after 1939: the statement in the footnote that the mapping was 'Heliozincographed from 1/2500 plans' may well have misled some people in

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<sup>4</sup> Johnston (ed), *Methods and processes*, 160-1.

<sup>5</sup> Johnston (ed), *Methods and processes*, 157-8, 179-80.

the past into supposing, wrongly, that such six-inch mapping was prepared by direct reduction from the 1:2500.<sup>6</sup> It wasn't. Although in principle it was possible to revise by correcting the negatives, in practice six-inch revision seems to have been either by correcting existing drawings and re-photographing, or preparing wholly new twelve-inch drawings when there was enough change on the ground to warrant this.

Growing experience with 'the helio process' led to the extension of its use to small-scale mapping. In 1914 the one-inch and smaller scales were still produced mainly on the basis of engraving but by 1918 the helio process was trustworthy enough to be used for the new quarter-inch of Great Britain, and the half-inch of Ireland published in 1911-18 was the last new series to be completed that was based on engraving.<sup>7</sup> The Popular Edition of Scotland, the one-inch Fifth Edition, and the contemporary and later small-scale series were all based on helio-zincography, although (earlier Scotland Populares apart) this fact was not usually advertised in the footnotes of the maps.<sup>8</sup>

To round off the story: in 1900 a technique devised by Conductor Vandyke of the Survey of India was introduced to the Ordnance Survey. In 'Vandyking' a zinc printing plate was produced by placing a drawing in contact with a sensitised zinc plate in a vacuum frame, and exposing the combination to light: the image was copied by the action of the light passing through the drawing onto the plate. This method had several advantages: it was a photographic process which did not involve a camera or the production of a negative, and the thin zinc plates coming into use at this time were much easier to store than either the bulkier zinc plates used hitherto or glass negatives. It soon became the practice that where a drawing was to be reproduced and published at the same scale – as with the 1:2500 – Vandyke was used, and when at a different scale the helio process was used. Generally scale-transformation meant reducing a larger-scale drawing to a smaller scale for publication – as in drawing at twelve-inch for publication at six-inch – but a significant exception was the production from 1911 of 1:1250 mapping by photo-enlargement from 1:2500. This was initially undertaken under great pressure of time for land-valuation purposes: that it was practicable at all was greatly due to 'the helio process'.

References to 'helio' have probably reached a much wider audience in the past thirty years thanks to the reprints issued by Alan Godfrey Maps, and the following notes are offered as a rough guide. The various processes used can

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<sup>6</sup> The writer in his teens was one such.

<sup>7</sup> Engraving seems to have been confined to the outline and water plates. The Popular Edition of England and Wales, though completed later, was based on material engraved rather earlier. By 1914 helio-zincography was an established technique for overseas mapping produced by or on behalf of the War Office, such as the 1:100,000 series of Belgium, GSGS 2364.

<sup>8</sup> By the late 1960s, with the increasing use of synthetic colours, a more sophisticated technique was being used, of using original photographic negatives or positives to produce combined positives or negatives, with the combinations being brought into contact with the printing plates.

usually be inferred from the footnotes of the published maps. In the publication note, usually placed bottom centre, 'Zincographed' can be interpreted as the product of a tracing from revision documents, with the plate probably cleaned off once the edition had been printed; 'Photozincographed' and 'Heliozincographed' indicate that there was a new manuscript drawing which was photographed, and so there was a negative; 'Printed', which was usually employed from the mid 1900s onwards, seems to indicate that the Vandyke process of direct transfer from a manuscript drawing was being used. In reprint notes, 'Reprint', unqualified, seems ambiguous, but 'Reprinted by Heliozincography' suggests that a pull was photographed and a plate produced from the resulting negative, and 'Reprinted by Direct Helio' suggests that the Vandyke process was used, with a printed impression substituting for the manuscript drawing. Reprints of earlier mapping produced by photozincography may sometimes have a 'helio' mention: this would seem to indicate that a plate was produced directly from the negative by heliozincography, rather than by transfer to zinc of a photo-zincographed print.

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