

# Maps with Meaning

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**Figure 1: Different kinds of maps: left to right (i) John Ogilby 1673 road map of London to Buckingham; (ii) five mile to one inch tourist map of Swansea area; (iii) satellite image of same area as (ii); (iv) close-up of Cardiff in personal map of Wales; (v) map of Troedrhiwfuwch before the village was demolished.**

## ABSTRACT

Maps are not mere simulacra of the ground, but imbued with meaning. This is true at a geopolitical scale, but even more so for local community mapping. However, whilst digital mapping has made it easy to embed and customise maps in local websites or printed resources, it also runs the risk of de-humanising these resources, replacing rich meaning with unnecessary precision. This paper explores examples of how meaning can sit alongside the digital in map-based interactions. It then uses this backdrop to consider new challenges to help a living community where their physical village has been all but obliterated.

## KEYWORDS

local empowerment, co-production, mental models, map-based interfaces

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## 1 INTRODUCTION

Since I can remember, I have been a lover of maps, from ragged atlases and a small metal globe to my first cloth-backed Ordnance Survey map, one of the summits of cartographic practice; the magic of transporting oneself to places far away that one might never visit but can imagine.

Maps are the novel of the physical world, rivers, mountains and tides reveal landscapes expressed in dots, circles and lines, creating worlds in the mind. Often fantasy and cartography meet, in the detailed maps of Narnia or Middle Earth, or the mixing of fictional and real landscapes in Arthur Ransome’s imaginary of the English Lake District [6].

Maps are not mere transcription of topography, but have meaning and purpose. In this position paper I will revisit familiar territory concerning the relations between maps and meanings whilst

grounding these in several projects I have been involved with concerning community and individual maps.

## 2 THE CARTESIAN TRADITION

In 1946 Borges lampooned the cult of precision in his one page article/story ‘Of exactitude in science’. Although his target was broader, the story was about map making:

“the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it.” [4]

While the farcical nature of this is evident, the cult of exactitude is not past. Fine art moved on from the obsession of Renaissance linear perspective and (effectively if anachronistically) photorealism, and yet the ease and availability of digital mapping seems to promote precision over purpose. Well before the rise of online maps, when writing about the Common Ground Parish Maps project, Barbara Bender [3] referred to the “homogeneous Cartesian grip” of Post-Renaissance maps. Now Google Maps and Open Streetmap are replacing the hand sketched town plans and route maps, that were once in every local tourist destination.

Precision is of course often essential, for example the detection of gravitational waves [24], which requires measurements of fractions of an atomic diameter across distances of many kilometres. However, often precision can be unnecessary or misleading. Google Maps positions the Computational Foundry in Swansea University at (51.6191548,-3.8815369), that is a precision of approximately 1cm for a building about 100 metres across. Possibly this precision is derived from GPS (Global Positioning System) accuracy, but should be set in the context that land movements of up to a few centimetres are possible due to natural phenomena; a few years ago the weight of flood waters of Hurricane Harvey pushed the surface of Texas down by 2cm [17]. At the extreme the precision of digital mapping can be as risible as the empire map of Borges’ story: locations in



Figure 2: Frasan app: (left) map view; (right) information for a location

KML files exported from Google Earth have a numerical precision of molecular scale.

Cartographers understand this, and do not simply draw scale drawings. Figure 1.ii shows a portion of a tourist map of Wales. The map is at a scale of 5 miles to the inch, that is about 300,000:1. At this scale a motorway would be about 200 microns wide, the width of a single strand of hair, and ordinary roads would be near invisible, as is evident from the satellite image of the same area (Figure 1.iii). Of course on the actual map the motorway is drawn approximately 3mm wide, which would correspond to around a kilometre if scaled to the ground.

The *purpose* of the road map is not to draw everything in precisely the dimensions on the ground, but to help a driver navigate. As well as annotations such as placenames and tourist destinations, roads and junctions are exaggerated to make them usable. This is perhaps even more obvious in metro and underground maps drawing on Harry Beck’s iconic 1931 London Underground map, which bears scant relation to the precise geography of stations on the ground.

Despite this, it is still common to hear the history of mapping described as if it were a teleological path to current ‘correct’ maps. Personally, it was hearing such a discussion at AVI 2000 that ignited my own interest in maps as a subject of study [8, 9].

These issues surfaced at a practical level around 10 years later when working on Frasan, a mobile-phone-based application designed to bring the contents of the An Iodhlann archive on the Isle of Tiree out of the building and into the island [10]. Archive items were photographed and geocoded and then presented in a fairly standard map-based format (Figure 2).

For detailed views Ordnance Survey maps were used as the backdrop (Figure 2, left), but for the high-level all-island view, we wanted to use the maps that were on tourist leaflets and postcards.



Figure 3: Discover Tiree map used in tourist information. (N.B. base map only; place names and symbols are added to this depending on context.)

One of these is used by the local tourist organisation Discover Tiree and was based closely on the Ordnance Survey map (Figure 3). It is simplified showing only the ‘main’ roads (themselves mostly single track), partly to reduce clutter, but also to encourage tourists away from the smallest roads where they might impede agricultural activity or local traffic. This reduction in detail is a standard cartographic technique, evident also in the Wales tourist map in Figure 1. In addition, the roads near the shore are set slightly inland to make both road and shore distinguishable. Because this map was nearly standard, it was easy to map GPS coordinates to the map to enable real-time tracking of location while in the island.

The other map was taken from a mural on the outside of Macleod’s, one of the local shops (Figure 4) and used on some postcards of the island. As is evident, it is more interpretative and hence more complex for digital processing. If you look at the shape compared to the Discover Tiree map it is evidently more ‘stubby’ with the neck of land at the north east thicker and the main body of the island slightly rounder. In addition road positions are more stylised, so that a simple transformation of GPS coordinates would lead to very odd map positions, in the sea or well away from a road.

To deal with this, we used a version of rubber sheeting techniques as often used for historic maps [22]. Key reference points were marked on both the Macleod’s map and an Ordnance Survey map. These were then used to create a Voroni (Delaunay) triangulation, which enabled any GPS location (within the bounds of the island) to be transformed into the local map coordinates. This meant it was possible to drive round the island using the postcard-style map in a similar fashion to using Google Maps ... with the added bonus that poor mobile signal meant that Google Maps was not available over most of the island at the time!

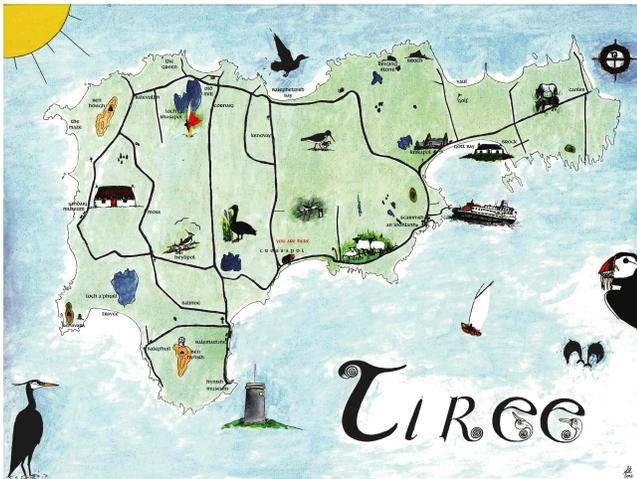


Figure 4: Macleod’s mural map appearing on post cards

### 3 BEYOND DISTORTION

Within the AVI community, we are familiar with fish-eye visualisations [11], which distort 1D or 2D space to make particular features more prominent. The word ‘distort’ is problematic as it gives precedence to one view or another, assuming one is normative. Arguably our idea of ‘flat’ 2D space is the distortion, given the curvature of the earth.

This is also true visually. Look ahead. If you have full vision, you will see an approximately 200 degree vista in front of you, but the middle 30 degrees will occupy around a half of your perceptual field, corresponding roughly to the amount of retinal surface it projects onto (area, not density of light receptive cells, which is even more centre weighted).

While fish-eye visualisations are purely algorithmic mappings, hand-crafted representations often focus far more on specific areas. This is evident in the Macleod’s map, and even more so in many town plans which are rendered in ‘hill’s eye’ perspective and often show shrunken views of the outskirts and environs of the town compared to the main shopping and tourist streets.

Figure 5 shows a very individual map of Wales given to the author by his daughter just before he started his walk around Wales in 2013. At first glance the overall shape is familiar, but explored in greater detail there are areas that are of very different relative scales than a ‘standard’ map. In addition, the named places are not the most major towns and cities and are not in their geographic positions, and Cardiff is shown expanded as a sort of fish-eye view. This is of course not meant to be a cartographically precise map, nor used for navigation, but rather an exploration of places and events of mutual significance, a story writ across the landscape.

This raises research questions about how such semantically rich and geographically complex ‘maps’ can connect into digital representations. It would not make sense to attempt to translate arbitrary GPS coordinates to points on this map, and yet the named places are potential points of connection. Maybe this would better treated like names mentioned in free text or people in photographs. However, that would overlook the loose geographic nature of the map.

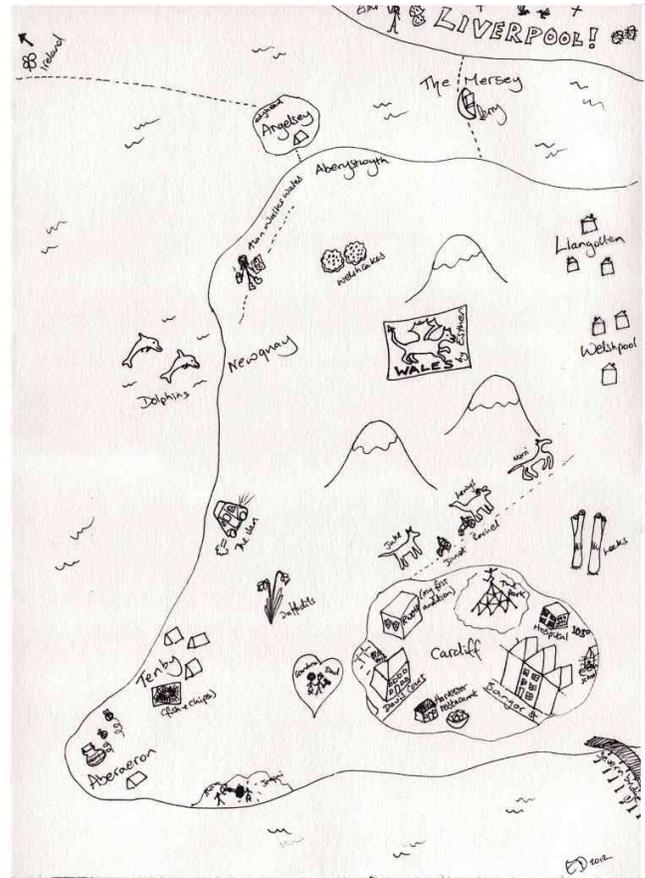


Figure 5: A personal map of Wales. Original by Esther Dix

While this is an extreme example, it is not unique: a map of Cardigan was knitted into a giant cardigan for the town’s anniversary [2] and one of my own high points while walking round Wales was visiting the hand-sewn community relief map of the Dysenni Valley at Llanfihangel-y-Pennant (Figure 6).

### 4 MAPS AND MEANING

When we are dealing with personal or community maps, these questions of meaning are often as important or more important than purposes of navigation or location.

Sometimes maps create very explicit and legal meaning in a cartographic version of Searle’s [21] illocutionary acts of declaration, including the 49th Parallel between the United States and Canada or the Treaty of Tordesillas in 1494 when the Pope drew a line on the map dividing South America between Spain and Portugal. Not surprisingly, there is often conflict when these cartographic lines cut across established peoples and languages, as frequently happened following colonial occupation, particularly where these lines do not also reflect natural topographical boundaries [9].

For local maps the formal boundaries are often less important than an overall sense of identity. Names can be critical, and the Frasan app also included a subset of the 3000+ Gaelic place names collected on Tiree, often with associated stories [14].



**Figure 6: Dysenni Valley relief map at Llanfihangel-y-Pennant**

Harrison and Dourish [13] brought the distinctions of place and space from human geography into the HCI discourse. Space is mere coordinates, but place is space imbued with social and cultural meaning. These are precisely the locations most likely to be highlighted in local maps. Augé identified the way shopping malls and similar spaces are non-places [1], homogenised spaces without cultural significance. Is there a danger that the proliferation of digital maps with uniform labelling and representation may make every space a non-place?

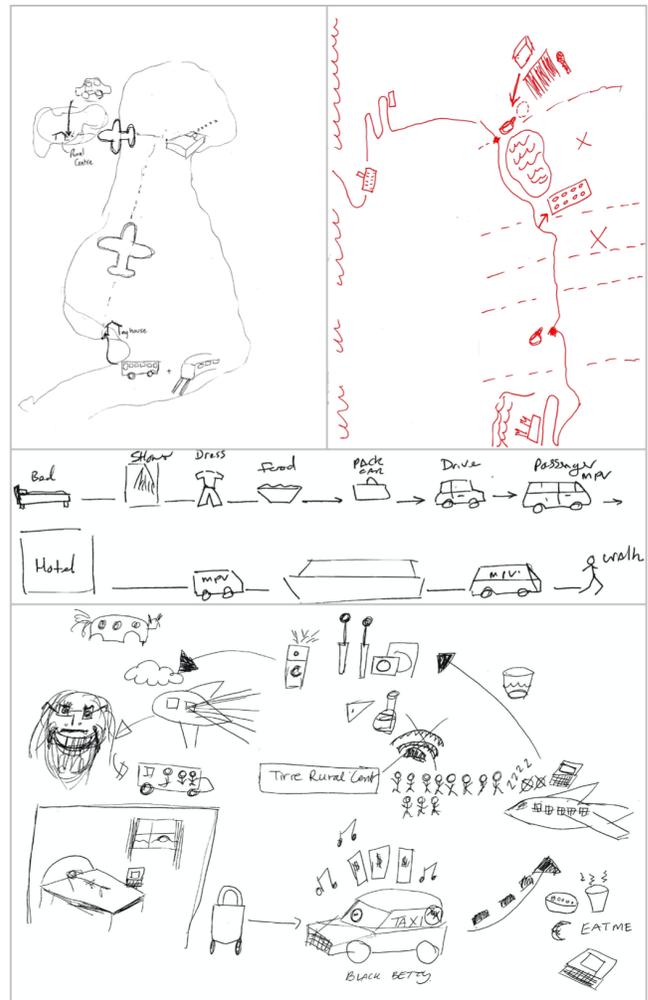
This is not to say that there are not times when community maps need to be precise, especially when they are being used as part of campaigning [5], land disputes [12], or environmental projects [15, 23]. However, this can itself be problematic when the very idea of boundaries and ownership may be externally imposed on an indigenous culture [16, 19].

## 5 TRAILS AND TALES

During my CVE'2000 keynote [8] I asked the attendees to draw sketches of their journey, and I have repeated this exercise multiple times since. Before the first exercise, I had pre-prepared a list of five types of image I was expecting to see:

- cartographic (isomorphic)
- cartographic (homomorphic)
- schematic
- linear
- episodic

With one notable exception (a sort of corridor view), the sketches produced in all of these exercises fell into these broad categories, but with a preponderance towards the linear/episodic end. Figure 7 shows examples from an exercise at a Tiree Tech Wave. The top left image tries to represent the British Isles in a level of cartographic detail, but with Tiree massively expanded in fish-eye view fashion. The other three are more or less linear, one following the rough geographic directions (schematic), one purely linear (albeit bent in two to fit); and the last including lots of small images denoting events on the way. While the last is most strongly episodic, all have



**Figure 7: Three journeys; from top left: (i) cartographic (homomorphic); (ii) schematic; (iii) linear; (iv) episodic.**  
<https://tireetechwave.org/projects/tiree-journeys/>

episodic elements; for example, the schematic image at the top right focuses on service stations where the group stopped (including one with a small lake) rather than major towns or borders.

The linear map is a classic way to show paths, including the very first road maps (Figure 1.i) as well as motorway maps in modern road atlases, hikers' maps for long-distance paths and StripeMaps, a digital version of the linear map [25]. The episodic aspect is not surprising; journeys are stories, and in all journey tales from the Odyssey to the Hollywood road movie it is the events that are as important as the geography.

## 6 CARTOGRAPHY OF ABSENCE

Absence has always held a special place in mapping. In Mappa Mundi strange creatures inhabited the outer edges, capturing half-remembered stories of weary sailors [7]. Today it is more likely to be the sites of military installations that are omitted from paper maps, and blocked out on Google Maps and similar imagery.



**Figure 8: Troedrhifwuch before and after demolition**

With colleagues, I am currently working with Troedrhifwuch, a small village in the South Wales valleys, which were once the heart of global coal production. Troedrhifwuch grew up alongside a coal pit in the mid-nineteenth century and was a thriving community until in the mid 1970s the village was deemed unsafe due to worries of rockfalls from the nearby hillsides. Over a number of years the houses were compulsorily purchased, the residents rehoused in local villages, and the houses, school, pubs and churches razed to the ground (Figure 8). Today, only two houses remain where the residents refused to be moved, along with the war memorial, commemorating the unusually high number of young men who left, many never to return, to fight in the fields of France in the First World War.

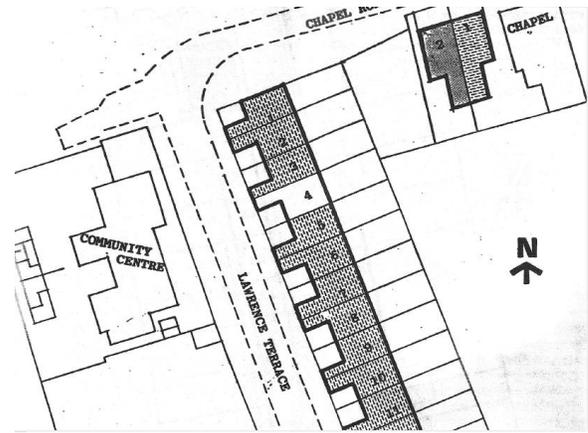
The only other physical remains are some maps, photographs, war records and the contents of one of the churches, which were moved to create a side chapel of the mother church when the small corrugated-iron church in Troedrhifwuch was demolished. However, these scant physical traces are overlaid with webs of memories, some personal, some through stories of parents and relatives, all treasured by a lively and passionate diaspora.

The community has been very active collecting and digitising materials, so that there is now a rich digital collection of over 1,400 items and extensive paper material. We are working with the community to explore ways in which this material can be further linked, annotated and then used to create living materials for past and present members of the community, schools, visitors and academics.

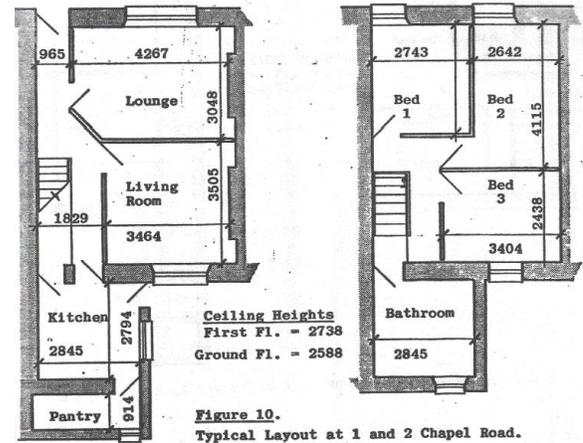
Some of this will be more textual, but we also wish to bring this material onto the ground in Troedrhifwuch. There is a memorial garden next to the war memorial and in the grounds of the old church, which has been the focus of initial work. As part of the restoration of these gardens, bushes are to be planted for each fallen WWI soldier with a small sign and accompanying QR code. However, we also wish to point people outwards from the memorial garden, into the physical footprint of the village, and here augmented reality (AR) and map-based interactions are expected to play a major part.

Until recently the best maps of the old village were still fairly small scale (see Figure 1.v). However, a copy has been recently found of the report that was distributed to all residents when the decision to evacuate the village was made [18]. This includes far more detailed maps of the location of each house (Figure 9) and even typical internal house layouts (Figure 10).

In some ways this task is similar to challenges at archaeological or historic sites where phone-based AR or specialised devices such as the AugurScope [20] have proved valuable. Indeed, we have



**Figure 9: Troedrhifwuch house locations (example from [18])**



**Figure 10. Typical Layout at 1 and 2 Chapel Road.**

**Figure 10: Troedrhifwuch house layout (example from [18])**

already created simple AR environments and are in the midst of a mini-project to recreate the church interior in situ virtually using 3D scans of the preserved materials. However, there are additional challenges. Some are connected with the physical environment, most critically the dangerous road that runs through the middle of the village site. For example, the AR environment in Figure 11 would involve standing in the middle of the road!

Less safety critical, but as important, is that the street layout, house numbers and photographs are merely the surface elements. We need ways both to project the maps and images into the empty physical environment, but also layer the human stories that add meaning to these. This may involve device-based maps and maps overlaid as AR in situ. However, we might look at other less conventional alternatives that blend physical and digital means. One idea is to simply plant lines of flowering bulbs along some of the old wall lines, so that at suitable times of the year it will be possible to see the patterns of occupation, without the danger of stepping into the traffic.



**Figure 11: Augmented reality envisionment of Troedrhifwuch High Street**

As well as being important as a way to understand and interpret local history, these marked boundaries are also important to establish ownership. When the condemned houses were compulsorily purchased by the local council, those owning their own house were compensated for the house, which was demolished, but not for the land which they still owned. This incomplete compensation meant that most were not able to buy another house and had to revert to rented accommodation. Some sought to maintain their land ownership by creating small fences around each plot, but over time these were destroyed and in some case the areas covered by rubble or the land otherwise reshaped by large adjoining landowners. In some cases, the timescale is such that legal rights may have been lost, but recreating these plots virtually would serve a powerful symbolic purpose. Here, of course, precision is important and we will seek to establish as accurately as possible the footprint of each individual house.

Another possibility is to use the old school yard, which is a relatively substantial tarmacked open space, as a place to recreate the village as a giant map. There is a tradition in the UK of model villages that are often miniatures of the location where they are built. These are typically at a scale where the streets are footpath width and the buildings knee height. One blended way to use the mapping and photographs at our disposal would be to effectively create an augmented reality scaled village within the school yard as a form of virtual model village. This would then be a locus to use map-based interactions overlaid with rich personal information, yet without the need to go near busy roads, and being more easily traversed by those with limited mobility.

## 7 SUMMARY

This paper has summarised previous work on meaning-rich community and personal maps and presents a work in progress on applying this to a new context, the formerly physical and now still socially and digitally alive village of Troedrhifwuch.

## ACKNOWLEDGMENTS

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