



# Welsh Monastic Skyscapes Project: The Cistercians in Wales

## Skyscapes Module

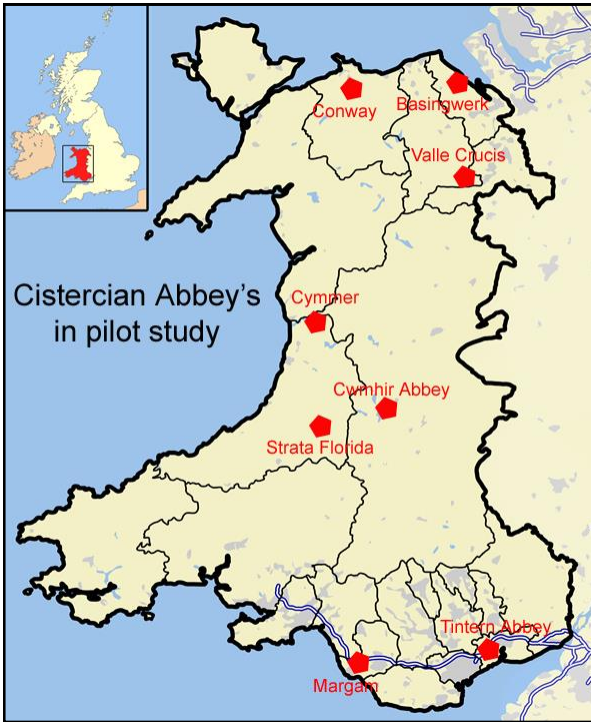
Bernadette Brady, Darrelyn Gunzburg and Fabio Silva  
And Pam Armstrong helping with field work.





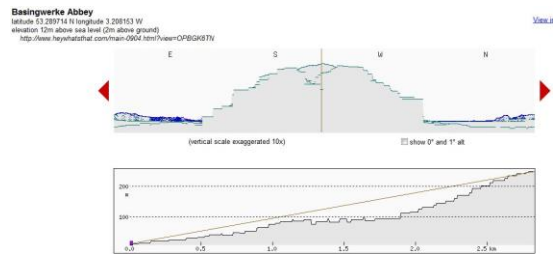
## Aim and Methodology

- ❖ Our aim is to understand the skyscapes of all extant Welsh monastic sites where the particular skyscape was seen as the complex union of the monastery's unique relationship to the heavens in its landscape, along with its own story, architecture, stone work, and local topography.
- ❖ To achieve this aim we are using an interdisciplinary methodology drawing together the fields of **anthropology, archaeology, astronomy, art history, and medieval history.**



Azimuth measurements were taken using Suunto KB-14 compasses (with an advertised precision of  $0.33^\circ$ ). The altitude measurements were taken using Suunto PM-5 clinometers (precision of  $0.25^\circ$ )

Where the horizon view was obscured then HeyWhatsThat online service was used to construct a virtual horizon.



This paper focuses on Cistercian Abbeys. There are eleven remaining Cistercian Abbeys in Wales, all of which are in ruins. Our research indicated that the surrounding landscape is a key part of these abbeys.



The true azimuths of the eleven Welsh Cistercian abbeys range from  $70^\circ$  to  $106^\circ$ , a range of over  $36^\circ$  plus they sit within varying landscapes.



Symbolic versus the phenomenon of sunrise or set



The west door of Valle Crucis Abbey

## Valle Crucis

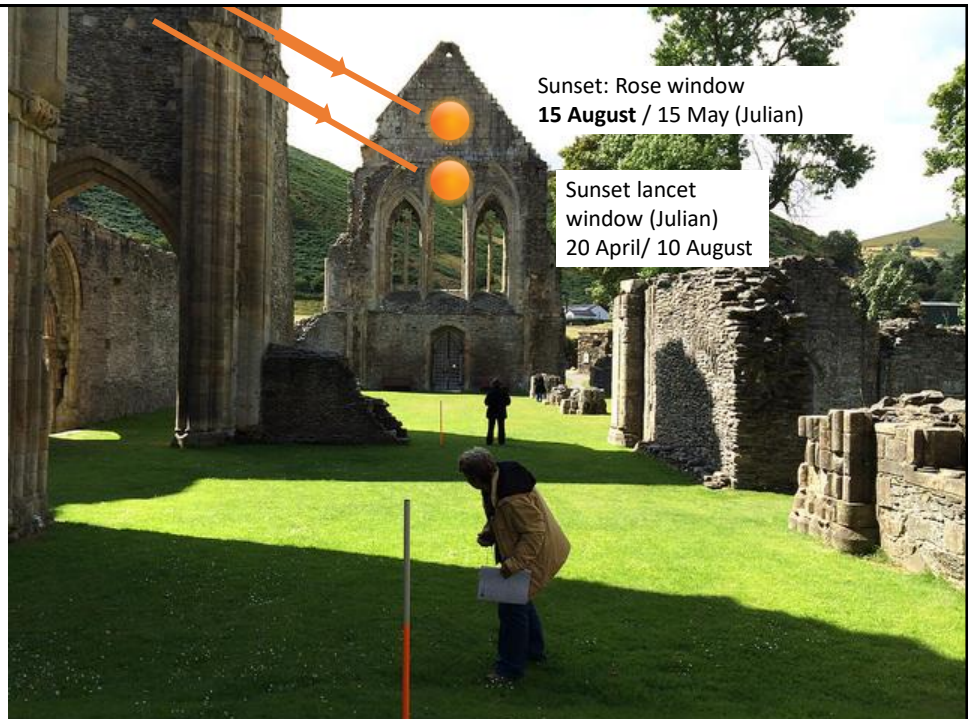
### Western end of the abbey

### Sunset

Using the Julian  
Calendar for the 13<sup>th</sup>  
century

Sunset aligns with the  
rose window in mid  
August and mid May.

Top of the middle  
lancet window, sunset  
late April early August.



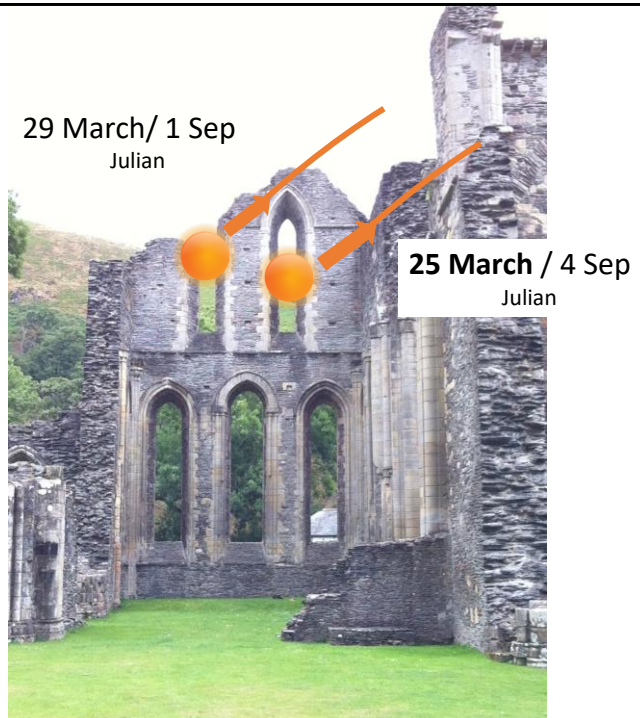
Sunset: Rose window  
**15 August / 15 May (Julian)**

Sunset lancet  
window (Julian)  
20 April/ 10 August

## Valle Crucis Sunrise Eastern Windows

Sunrise through the two  
top lancet windows:

Julian dates:  
Late March/Early Sep



## The Abbeys Landscapes and Results



The field work measurements of **azimuth and altitude**, combined with the **latitude** of the abbey were used to find the **declinations** of the eastern and western orientations of the abbeys

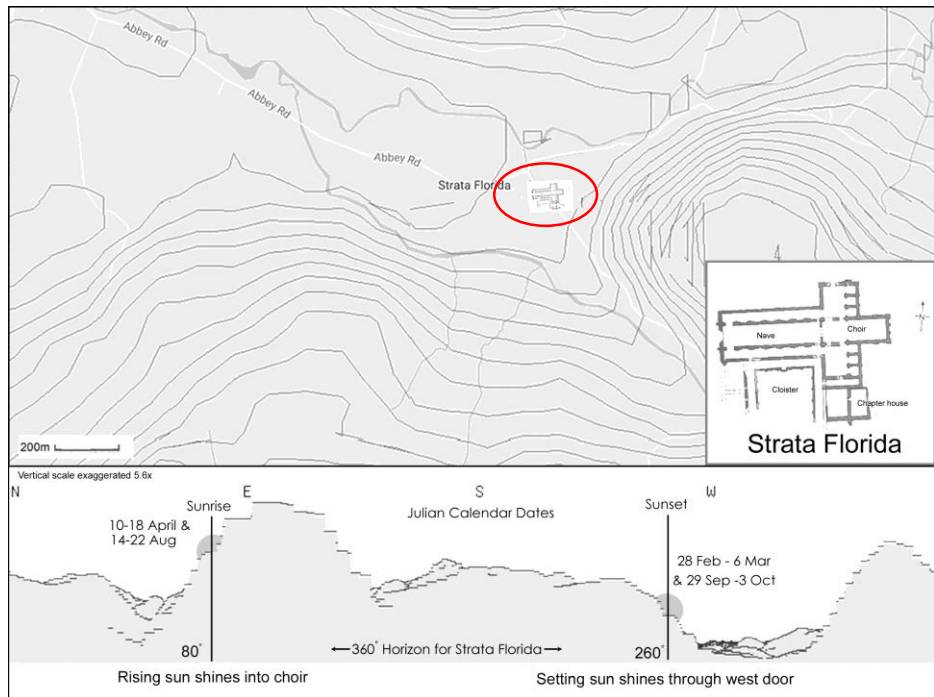


Later the declination was then looked up on such a table to convert it to the calendar date. (In comparing to the Christian calendar these dates were adjusted for the 12<sup>th</sup> century calendar – the **Gregorian Calendar**.)

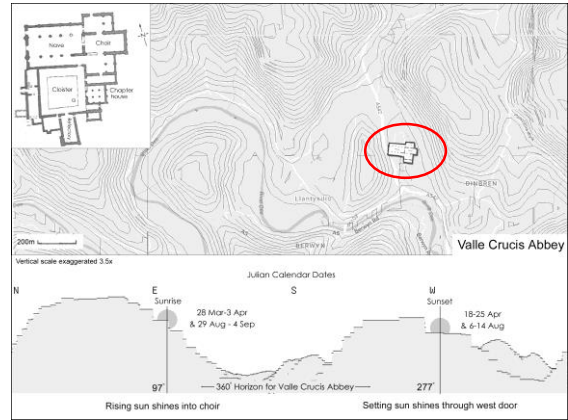
Table of the Sun's Declination  
Mean Value for the Four Years of a Leap Year Cycle

| Day | JAN      | FEB      | MAR           | APR      | MAY      | JUN             | JUL      | AUG      | SEP            | OCT      | NOV      | DEC             |
|-----|----------|----------|---------------|----------|----------|-----------------|----------|----------|----------------|----------|----------|-----------------|
| 1   | S23° 04' | S17° 20' | S7° 49'       | N4° 18'  | N14° 54' | N21° 58'        | N23° 09' | N18° 10' | N8° 30'        | S2° 57'  | S14° 14' | S21° 43'        |
| 2   | S22° 59' | S17° 03' | S7° 26'       | N4° 42'  | N15° 12' | N22° 06'        | N23° 05' | N17° 55' | N8° 09'        | S3° 20'  | S14° 34' | S21° 52'        |
| 3   | S22° 54' | S16° 46' | S7° 03'       | N5° 05'  | N15° 30' | N22° 14'        | N23° 01' | N17° 40' | N7° 47'        | S3° 44'  | S14° 53' | S22° 01'        |
| 4   | S22° 48' | S16° 28' | S6° 40'       | N5° 28'  | N15° 47' | N22° 22'        | N22° 56' | N17° 24' | N7° 25'        | S4° 07'  | S15° 11' | S22° 10'        |
| 5   | S22° 42' | S16° 10' | S6° 17'       | N5° 51'  | N16° 05' | N22° 29'        | N22° 51' | N17° 08' | N7° 03'        | S4° 30'  | S15° 30' | S22° 18'        |
| 6   | S22° 36' | S15° 52' | S5° 54'       | N6° 13'  | N16° 22' | N22° 35'        | N22° 45' | N16° 52' | N6° 40'        | S4° 53'  | S15° 48' | S22° 25'        |
| 7   | S22° 28' | S15° 34' | S5° 30'       | N6° 36'  | N16° 39' | N22° 42'        | N22° 39' | N16° 36' | N6° 18'        | S5° 16'  | S16° 06' | S22° 32'        |
| 8   | S22° 21' | S15° 15' | S5° 07'       | N6° 59'  | N16° 55' | N22° 47'        | N22° 33' | N16° 19' | N5° 56'        | S5° 39'  | S16° 24' | S22° 39'        |
| 9   | S22° 13' | S14° 56' | S4° 44'       | N7° 21'  | N17° 12' | N22° 53'        | N22° 26' | N16° 02' | N5° 33'        | S6° 02'  | S16° 41' | S22° 46'        |
| 10  | S22° 05' | S14° 37' | S4° 20'       | N7° 43'  | N17° 27' | N22° 58'        | N22° 19' | N15° 45' | N5° 10'        | S6° 25'  | S16° 58' | S22° 52'        |
| 11  | S21° 56' | S14° 18' | S3° 57'       | N8° 07'  | N17° 43' | N23° 02'        | N22° 11' | N15° 27' | N4° 48'        | S6° 48'  | S17° 15' | S22° 57'        |
| 12  | S21° 47' | S13° 58' | S3° 33'       | N8° 28'  | N17° 59' | N23° 07'        | N22° 04' | N15° 10' | N4° 25'        | S7° 10'  | S17° 32' | S23° 02'        |
| 13  | S21° 37' | S13° 38' | S3° 10'       | N8° 50'  | N18° 14' | N23° 11'        | N21° 55' | N14° 52' | N4° 02'        | S7° 32'  | S17° 48' | S23° 07'        |
| 14  | S21° 27' | S13° 18' | S2° 46'       | N9° 11'  | N18° 29' | N23° 14'        | N21° 46' | N14° 33' | N3° 39'        | S7° 55'  | S18° 04' | S23° 11'        |
| 15  | S21° 16' | S12° 58' | S2° 22'       | N9° 33'  | N18° 43' | N23° 17'        | N21° 37' | N14° 15' | N3° 16'        | S8° 18'  | S18° 20' | S23° 14'        |
| 16  | S21° 06' | S12° 37' | S1° 59'       | N9° 54'  | N18° 58' | N23° 20'        | N21° 28' | N13° 56' | N2° 53'        | S8° 40'  | S18° 35' | S23° 17'        |
| 17  | S20° 54' | S12° 16' | S1° 35'       | N10° 16' | N19° 11' | N23° 22'        | N21° 18' | N13° 37' | N2° 30'        | S9° 02'  | S18° 50' | S23° 20'        |
| 18  | S20° 42' | S11° 55' | S1° 11'       | N10° 37' | N19° 25' | N23° 24'        | N21° 08' | N13° 18' | N2° 06'        | S9° 24'  | S19° 05' | S23° 22'        |
| 19  | S20° 30' | S11° 34' | S0° 48'       | N10° 58' | N19° 38' | N23° 25'        | N20° 58' | N12° 59' | N1° 43'        | S9° 45'  | S19° 19' | S23° 24'        |
| 20  | S20° 18' | S11° 13' | S0° 24'       | N11° 19' | N19° 51' | <b>N23° 26'</b> | N20° 47' | N12° 39' | N1° 20'        | S10° 07' | S19° 33' | S23° 25'        |
| 21  | S20° 05' | S10° 52' | <b>0° 00'</b> | N11° 39' | N20° 04' | <b>N23° 26'</b> | N20° 36' | N12° 19' | N0° 57'        | S10° 29' | S19° 47' | <b>S23° 26'</b> |
| 22  | S19° 52' | S10° 30' | N0° 24'       | N12° 00' | N20° 16' | <b>N23° 26'</b> | N20° 24' | N11° 59' | N0° 33'        | S10° 50' | S20° 00' | <b>S23° 26'</b> |
| 23  | S19° 38' | S10° 08' | N0° 47'       | N12° 20' | N20° 28' | <b>N23° 26'</b> | N20° 12' | N11° 39' | <b>N0° 10'</b> | S11° 12' | S20° 13' | <b>S23° 26'</b> |
| 24  | S19° 24' | S9° 46'  | N1° 11'       | N12° 40' | N20° 39' | N23° 25'        | N20° 00' | N11° 19' | S0° 14'        | S11° 33' | S20° 26' | <b>S23° 26'</b> |
| 25  | S19° 10' | S9° 24'  | N1° 35'       | N13° 00' | N20° 50' | N23° 24'        | N19° 47' | N10° 58' | S0° 37'        | S11° 54' | S20° 38' | S23° 25'        |
| 26  | S18° 55' | S9° 02'  | N1° 58'       | N13° 19' | N21° 01' | N23° 23'        | N19° 34' | N10° 38' | S1° 00'        | S12° 14' | S20° 50' | S23° 23'        |
| 27  | S18° 40' | S8° 39'  | N2° 22'       | N13° 38' | N21° 12' | N23° 21'        | N19° 21' | N10° 17' | S1° 24'        | S12° 35' | S21° 01' | S23° 21'        |
| 28  | S18° 25' | S8° 17'  | N2° 45'       | N13° 58' | N21° 22' | N23° 19'        | N19° 08' | N9° 56'  | S1° 47'        | S12° 55' | S21° 12' | S23° 19'        |
| 29  | S18° 09' | S8° 03'  | N3° 09'       | N14° 16' | N21° 31' | N23° 16'        | N18° 54' | N9° 35'  | S2° 10'        | S13° 15' | S21° 23' | S23° 16'        |
| 30  | S17° 53' |          | N3° 32'       | N14° 35' | N21° 41' | N23° 13'        | N18° 40' | N9° 13'  | S2° 34'        | S13° 35' | S21° 33' | S23° 12'        |
| 31  | S17° 37' |          | N3° 55'       |          | N21° 50' |                 | N18° 25' | N8° 52'  |                | S13° 55' |          | S23° 08'        |

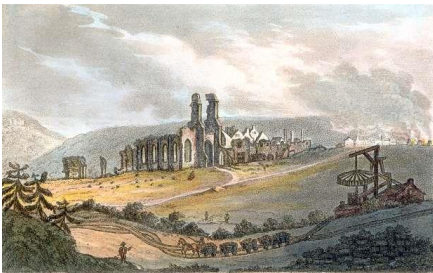
## Strata Florida



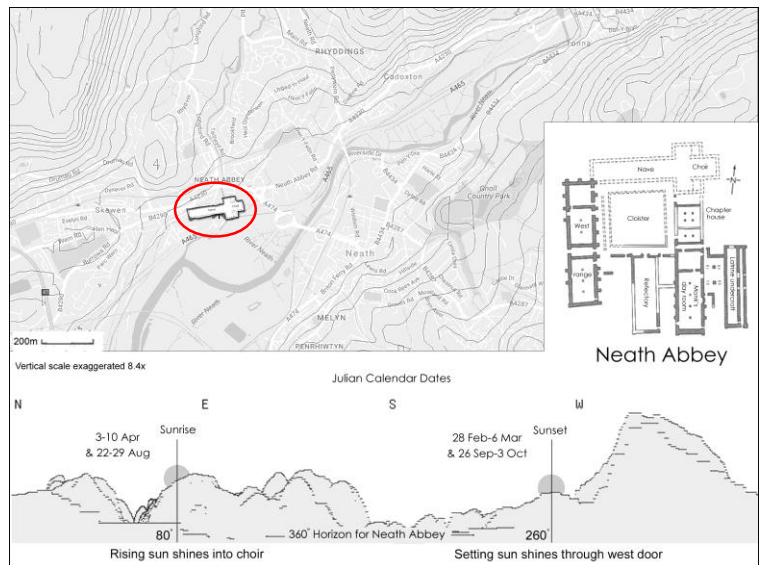
## Valle Crucis Abbey



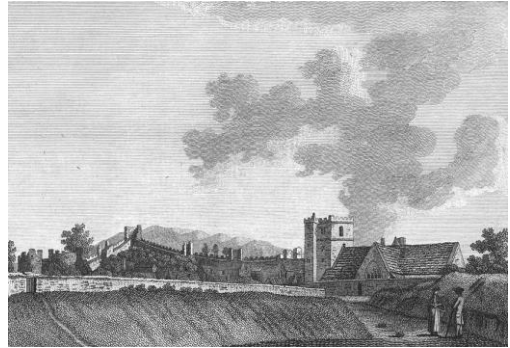
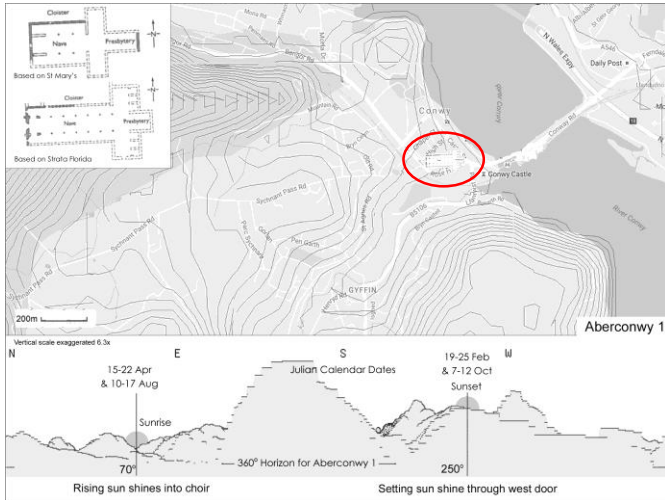
## Neath Abbey



Donovan 1805

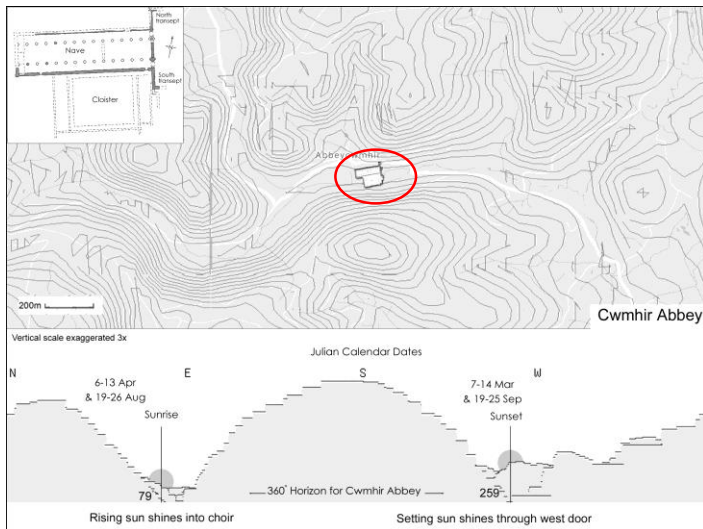


## Aberconwy 1 (St Mary's)



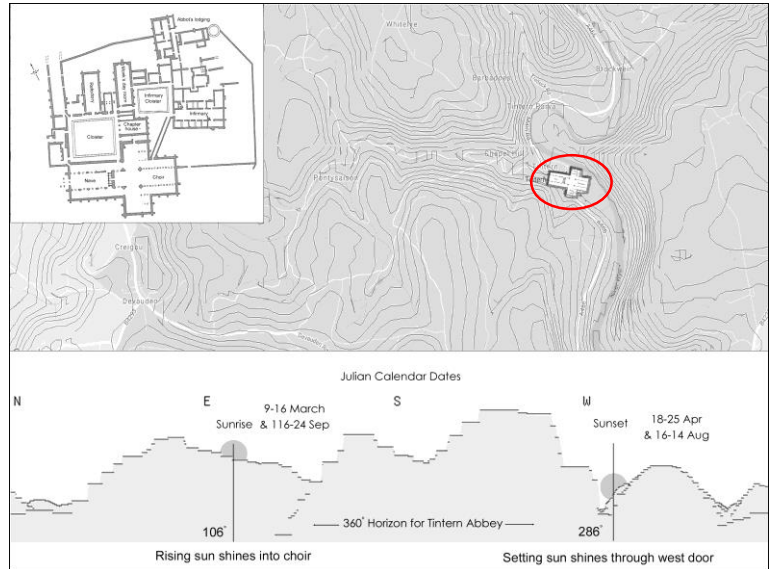
Conway Abbey J.Netwon, Copper plate engraving 1795

## Cwmhir Abbey



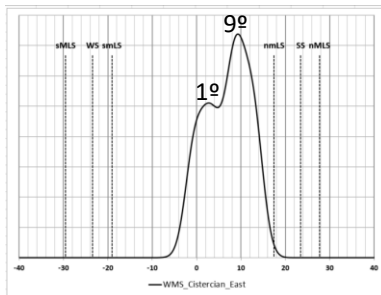
Abbey-Cwm-Hir The Parliamentary Gazetteer of England and Wales 1840 – Parishroots

## Tintern Abbey

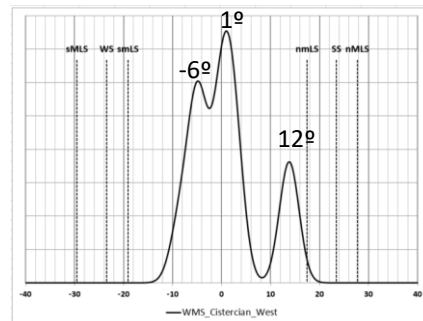


## Histograms provide only a partial view of reality.

The declinations of the Welsh Cistercian Abbeys

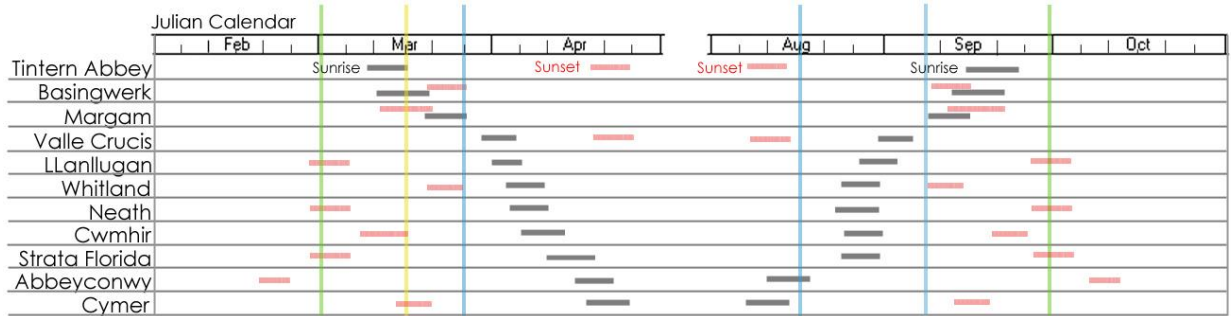


| ABBEY            | Eastern DEC |
|------------------|-------------|
| Strata Florida   | 11.4        |
| Cymer Abbey      | 13.7        |
| Basingwerk Abbey | 0.1         |
| Valle Crucis     | 6.1         |
| Cwmhir Abbey     | 9.7         |
| Tintern Abbey    | -1.0        |
| Neath Abbey      | 8.8         |
| Margam           | 2.7         |
| Abberconwy       | 12.6        |
| Llanllugan       | 9.15        |
| Whitland         | 8.48        |



| ABBEY            | Western DEC |
|------------------|-------------|
| Strata Florida   | -4.5        |
| Cymer Abbey      | 0.6         |
| Basingwerk Abbey | 2.8         |
| Valle Crucis     | 13.8        |
| Cwmhir Abbey     | -0.5        |
| Tintern Abbey    | 13.8        |
| Neath Abbey      | -4.8        |
| Margam           | 0.43        |
| Abberconwy       | -8.4        |
| Llanllugan       | -5.1        |
| Whitland         | 2.5         |

### Case study approach to the data



**Sunrises (short horizontal black lines) and Sunsets (red lines) for each of the abbeys.**

The length of these lines reflects the range of days on which the eastern or western orientation of the abbey would receive the direct light of the sunrise or set. The vertical lines, from left to right, are for **Saint David's Day (1 March)**, the **astronomical equinox (15 March Julian date)**, the **Annunciation or the theological equinox (25 March)**, the **Assumption (15 August)**, the **Nativity of the Virgin (8 September)** and **Michaelmas (29 September)**.

### The Dilemma of East

**Isidore of Seville** (560-636) in his *Etymologiae*, spoke of the need for sacred buildings to be oriented towards the equinoctial east so that when the congregation were facing the altar, 'the line from the east to the west would make the right and left parts of the sky equal'. This was echoed in the thirteenth century by the French bishop, **William Durandus** (1230-1296) who commented on the orientation of a church by stating,

*The foundation must be so contrived, as that the Head of the Church may point due East; that is, to the point of the heavens, wherein the sun ariseth at the equinox; to signify, that the Church Militant must behave Herself with moderation, both in prosperity and adversity: and not towards that point where the sun ariseth at the solstices, which is the practice of some.*

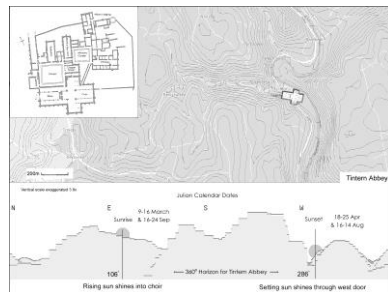
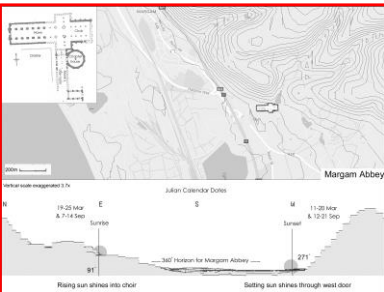
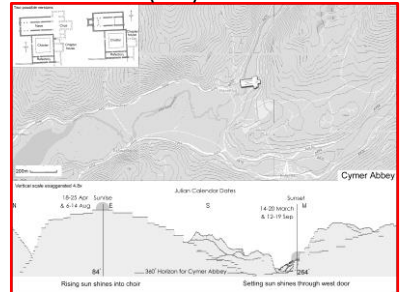
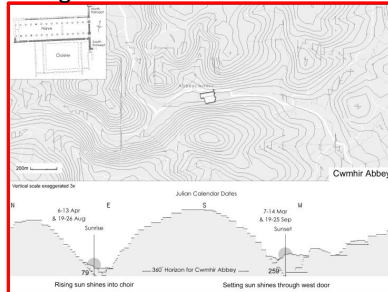
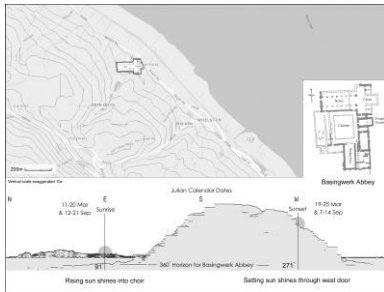
The equinoxes occur when the sun is on the equator in both March and September. On these days there is a balance of day and night hours and the sun, on a flat horizon, will be seen to rise and set due east and due west. Additionally, the sun on these days will rise and set on the local horizon at the midpoint of the span defined by its position at the two solstices.

This is the balance that Isidore of Seville referred to as, 'the right and left parts of the sky [are] equal' and why William Durandus proclaimed it as the day of balance and 'moderation, both in prosperity and adversity'.

Isidore of Seville, *Isidore of Seville's etymologies : the complete English translation of Isidori Hispalensis Episcopi Etymologiarum sive Originum Libri XX*, trans Priscilla Throop, (Charlotte, VT.: MedievalMS, 2005).XV 4.7

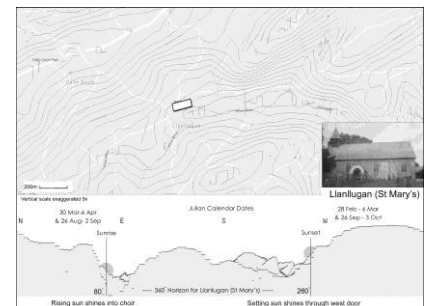
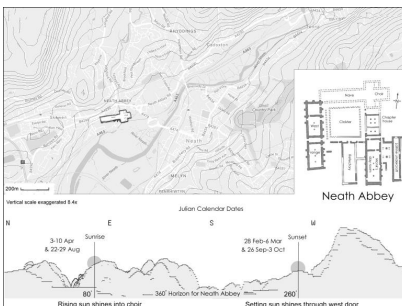
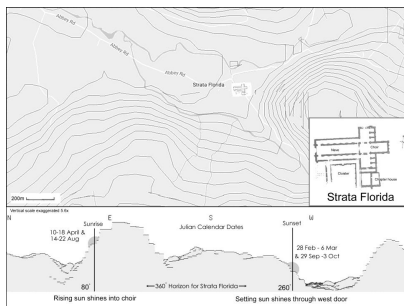
Gulielmus Bishop of Mende the Elder DURANDUS, J. M. NEALE, and Benjamin WEBB, *The Symbolism of Churches and Church Ornaments: a translation of the first book of the Rationale Divinorum Officiorum. With an introductory essay; notes, etc. by J. M. Neale and B. Webb: Leeds, 1843*, p. 21-22.

Captured in the footprint of five of the eleven abbeys is the actual position of the **astronomical equinox** sun on the local horizon – **NOT the Georgian calendar date of the equinox**.  
There was also a willingness to allow this to be a sunrise or a sunset (red)



It was evident in our results that the sentiment expressed by Isidore of Seville, cited earlier, of an equal division of the sky and also reflected in what Durandus saw as 'moderation, both in prosperity and adversity', held significance for the Welsh Cistercians.

The West: **Michaelmas on 29 September** (Julian calendar) and /or **Saint David's Day 1 March** (Julian Calendar)



Three of the abbeys appeared to be focused on their **western door** and were so arranged in the landscape that the setting sun on Michaelmas (29 Sep) shone down the length of the abbey.

(This alignment has also been found in English Cistercian abbeys and is the next stage of this research project).

## Conclusion

The true azimuths of the eleven abbeys range from  $70^{\circ}$  to  $106^{\circ}$ , a range of over  $36^{\circ}$ . Nevertheless, this seemingly diverse set of measurements falls into three groupings when the landscape of each abbey is brought into account:

- orientation to astronomical equinox;
- orientation to Michaelmas/St David's Day;
- orientations to the feast days of the Virgin.

Our research indicates that the builders of these abbeys took into account the landscape in aligning their abbeys so that they received the physical light of the sun at significantly theological days: the feasts of the Virgin, or the time of the equal division of the sky, or Michaelmas/St.David.

## Conclusion – Our results came out of:

- Working with declination rather than true azimuth
- A case study methodology

## These findings are that for Welsh Cistercian Abbeys:

- the landscape is important in understanding the orientations of the abbeys.
- the emphasis is on both sunrise and sunsets with the focus on the **astronomical equinox rather than on the theological equinox.**
- additionally, three of the abbeys were focused on the solar position on Michaelmas and/or Saint David's Day (Julian calendar).

## Implications for Cistercian Studies

It is argued that the cloisters were built or laid out first and the abbey was then set square to the cloisters. Our study suggests the importance of the orientation of the abbey and that the abbey would therefore have thus dictated the location and orientation of the rest of the buildings.

It may or may not have been built first, but our research suggests it was the first building laid out.

