

1 Starter slide Click

2 *Good morning. I wish to thank the organisers of this conference for the opportunity to present the results of my work on lunar alignments. I begin with some introductory slides*

. Click

3. (a) **Alexander Thom's Lunar Investigations (1960's + 70's)**

Thom found a considerable number of precise lunar alignments dated to about 1700 BC which he believed were not due to chance but had been intentionally set up.

*A precise alignment typically **Click** consists of a backsight, usually a standing stone **Click**, indicating a skyline region **Click**, containing a feature as a foresight, **Click** potentially giving 1' arc precisionClick*

4. (b) **Alexander Thom's Lunar Investigations (1960's + 70's)**

Professor Clive Ruggles carried out a detailed reassessment of Thom's work and found a number of problems with it including:

Click *Many lines not properly indicated*

Some errors of identification

Selection of horizon features

Variable types of backsight

Click... *And also a Wide Geographical Spread.....Click*

Thus the general view was that chance could explain the results

*It is important to recognize that Professor Ruggles has said that his work did **not prove that planned precise lunar alignments did not exist.***

*Only that Thom had failed to prove that they did. **Click***

5. **Precise Alignments post Thom**

*Thom found that some precise alignments exist, so there are two key questions:- **Click***

Are they common?

*Are they chance or **were** they planned?*

Click

*The present investigation set out to try to answer these questions. **Click***

6. The Present Investigation – Acknowledge and address the above criticisms

Click *Choose One area only A number of observers have made this point. Also ...*

Click *Only Standing Stones, pairs and short rows with an indicated direction as backsights*

*And, (within this group).....**NO** selection*

*It seems that no such investigation of possible precise alignments in a limited region has been done before. **Click***

*(The essential question of Real or Chance is discussed later.) **Click***

7. Major Standstill - North

*The dots represent the declination of the moons' centre at each lunation, the moon passing through the Standstill Maximum in a series of waves. Declination values are for the Early Bronze Age **Click***

*The amplitude of the waves from the mean is the lunar perturbation That is the 'wobble' (or Delta) and is about 9' of arc **Click***

*Consider part of the diagram **Click***

8,9,10 (Pause) *The Moon's apparent size is nearly double the 18' shown .*

Click *At the top of the wobble...The two limbs are in unique and measurable positions (The middle of the moon cannot be observed with sufficient accuracy)*

Click *Likewise at the bottom of the wobble*

Click *With no wobble there is no unique position*

Click *Taken together these three images give us the Lunar Band*

11. (Pause)**Click** Meaningful...etc.....

Click ...53' **Click**

12. *There are 8 lunar bands... Rising/Setting..Major and Minor Standstills*

The following 3 slides explain the method used to find indicated foresight features if they exist

Click

13. Indicated direction from the Backsight

Click *The region of indicated skyline is markedClick*
Theodolite measurements are made of the sun and of the azimuth and elevation of skyline features in the indicated direction.

A levelled photograph is taken

Click *The lunar band (if any) in the indicated region is identified.*

Click *A larger scale in B/W is produced*

14. Click *From the measurements the Azimuth/Elevation grid is drawn*

Click *The lunar wobble declinations are drawnClick*

Click **Click**

With a foresight found (here the lower limb of the rising moon with wobble to the north)Click

15. *the final diagram is drawn*

*I wish to mention here that I do not believe that I have chosen the foresight features. **IF they are there the method used finds them.***

That is, I believe that the features originally used are rediscovered.

Click

This diagram is for Ford in Sept. The rising moon would be at the 3rd quarter

....Click

16. Summary of the results

*(After this summary 4 more alignment diagrams are given) **Click***

In the region examined :-

There are 34 sites

At 12 Sites the stones have fallen, trees obstruct etc and are not surveyable

5 of the stones have no indicated direction and/or have plausible other explanations e.g. Waymarkers

1 remains of a stone circle

3 Uncertain

*. This leaves 13 sites. In accordance with the earlier statement, within this group there has been **NO selection.** **Click***

They ALL gave a precise lunar alignment

*Some of the results **Click***

17. Achara *Achara The LHS of the large stone indicates a skyline region which contains a foresightClick*

On each slide there is the declination of the foresight

Click *....And the relevant lunar declination*

From the literature, it is generally agreed that a precise lunar alignment should be within 2' of the theoretical value, as it is here

Click....Also shown is the relevant declination in the Lunar Band.....Click

26 Declination Values Found

Declination Values Found

Click *Both values for delta are given. For simplicity I have used 9'
Thom latterly used the more strictly correct 8.6' /10'*

Click *Note that the RMS value found for both values of Δ is less
than 1' arc*

Copies of this sheet and of others will be available afterwards

Click

27 Theodolite Measurements

Theodolite Measurementsfor five of the sites.

Click *Note the number of visits, **Click** the number of sunsights , **Click**
and the small declination spread*

Click

28 Alignments found at the Major Standstill with $\pm\Delta$

*The Alignments found at the Major Standstill – North and South
have been combined. The southern ones are in italics*

There were also two alignments for the Minor Standstill

(The numbers are my numbers for the stones in this region)

Click

29 Major Standstill North (Typical)

Note that the moon is not to scale. It has been made smaller for clarity

And in the South.....Click

30 Major Standstill South (Typical)

Click

31 Evidence that the results found were planned

Evidence that the results found were planned

Click..... All 13 of the stones with an indicated lunar band **give** a precise alignment for one of the 4 key declinations

Click..... There are several 'pairs' of stones with opposite 'wobble', 9' arc, symbol delta

For example Onich / Achara and others

Click..... For 9 of the 13 alignments the foresight is a stone or is rocky (and so growth of vegetation would be less of a problem than sometimes claimed.)

AlsoClick

32 Foresights chosen with care

The foresights appear to have been chosen with care thereby avoiding confusion over the foresight intended

Now we come to the key part

Click

33 Chance Alignments *Chance Alignments*

It has often been said that in hilly country chance alignments would be common and so would make the finding of planned alignments, if they existed, difficult if not impossible. **Click**

I tested this by examining a total of some 1500 degrees of random hilly horizon. This contained 30 lunar bands and so potentially 30 alignments.

Click

Three chance alignments were found

Therefore in this study about 1 in 10 random Lunar Bands contained an alignment

So they do occur but they are not common

Click

34 Let us discuss the implications of these findings
There are 13 stones **Click** for which there is an indicated lunar band.
All 13 had a precise alignment for one of the four key declinations

Using the same criteria the chance of a random lunar band yielding a precise alignment was found to be about 1 in 10

I found for 13 assessable sites 13 alignments.

Click

Using what I have found, for a random lunar band the probability of a precise alignment is about 1 in 10

So for two random lunar bands the probability of BOTH giving a precise alignment is about 1 in 100

....of three random lunar bands ALL giving a precise alignment about 1 in 1000

For 13 random lunar bands all giving a precise alignment – !!!!!!!!

*I said at the beginning that I was addressing the criticisms of earlier studies. I have done that. **Click**.....*

I now believe that the results prove that in the EBA precise lunar alignments were set up in this region. Given the evidence if anyone thinks that statement is wrong I would like to hear their rationale.

I realise that this does not agree with the current paradigm, but it is what I find.

Click

35 Earlier I had a slide regarding precise lunar alignments:-

Are they common?

*Are they chance or were they planned? **Click***

*The evidence shows that the answer is that they **are** common and **were** planned **Click***

36 The findings of this study cannot just be sidelined as an inconvenience.

Click I believe the debate about precise alignments needs to move on from finding reasons why it could not have been done to working out just how it was done and the implications for the type of society at the time. Those are tasks that should be addressed by others better qualified than I am. /////
Click

*When the above results were found I spent some time considering the objections which others have voiced to the feasibility of such alignments. And also to considering the rationale for wanting to set them up. Let me initiate the process of **explanation** in place of **objection**. **Click***

37 “It would require about 100 years to set up each site”

It has been generally assumed that because of changing parallax and the 18.6 year cycle it would require about 100 years to set up each site.

*This would seem to be a major stumbling block ... **But the fact is that the evidence shows that they were set up**.....so how? **Click***

*My suggestion is that by using a star rising or setting near a known foresight it would be simple to ‘copy’ the declination from a known site to a potential new site. (i.e. simply find an observing position for the new foresight using the star as a guide) **Click***

*This is not limited by 18.6 year lunar cycle
Change of latitude makes only a small difference
Fine tune at the next standstill **Click***

*Using this method a small team of trained observers could identify **many** possible new sites while awaiting the next 18 year standstill **Click***

38 A Possible Reason

*There **must** have been a **good** reason for setting up the alignments.*

*One possible reason concerns eclipse prediction:- **Click***

It is known that eclipses can only occur near the time of the maximum of the ‘wobble’ which occurs every 173 days. Any of the ‘wobbles’ near the maximum will serve. The 173 day periods can then be counted forwards to the next Standstill 18 years later. I hope these last two slides will help you to think about precise alignments in a different way.

*I know that there are a number of anthropologists here. They may have other suggestions. **Click***

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There is much more information on the website

www.lunarsites-scotland.net

where all of the results and a full analysis and discussion can be found.

I will be here for the week, and so if anyone would like to discuss these findings with me please come and talk to me, especially if you have criticisms.

And if any of you want to come and see the sites in Argyll, I would be pleased to accompany you. Just get in touch.

*I am happy to take questions if there is time. **Thank you***