Ms3 WHAT CAME BEFORE THE ENGLISH STATUTE SYSTEM, NOT ROMAN, BUT ANCIENT METROLOGY.

SYNOPSIS

There is a lack of acceptance by many researchers, given the timescale from prehistory to medieval, that there could possibly be a continual transference of mathematics or measures. In fact, Megalithic measures are thought to be only a mere possibility following mathematical analysis. Research, or the aggregation of extant research to fully investigate this subject, is therefore limited.

This paper endeavors to redress the balance that is required in research, and, indicate why it is necessary in archaeological matters to translate surveys for comparison against putative and accepted earlier measures. This will at least add to the corpus of research, and assist in the resolution of the question, "Megalithic measure, what is megalithic measure?"

MEGALITHIC COINCIDENCES

Just how do we know when there is deliberate action by ancient man, or when a series of diverse coincidences alter from fortuitous to deliberate? Those are the questions this section of the paper poses through the investigation of ancient man's actions at such diverse sites as, Sarn Y Bryn Caled*, Smalandsstenar*, Avebury*, Clava Cairns* and several others. In other words, well known megalithic monuments spread throughout Europe.

The major survey of megalithic sites in Europe available to the British researcher, is to be found in the papers of the THOM and MERRITT families held by the RCAHMS in Edinburgh*. There are other surveys of sites, country by country, such as France, but these are not as comprehensive or presented in a manner that fully permits further analysis.

Preceding the Megaliths, although sometimes coincident, are the Timber Circles, the super Henges, the man made forests of upright poles. The major paper concerning these Timber Circles is by Alex Gibson*, titled, Sarn Y Bryn Caled. Thus utilizing both sets of surveys, ancient man's works can be compared and the evidence of any similarity indicated. Similarities of megalithic structures were indicated by Thom* when a composite diagram of several stone circles was drawn indicating the same stone placement over varying circle sizes.

But, there are similarities far more important than those which require analysis. Each site previously mentioned has been analysed as follows;

SARN Y BRYN CALED,* Welshpool, Powys. SJ21903491. Diagram Ms3D01

Hidden in the landscape adjacent to the A483/A490 road junction is a complex of landscape works dating from c2100BCE. The site comprises a Timber Circle, Penannular Ring Ditches and a Cursus. Our interest, the Timber Circle, comprises 20 posts set in large holes with an inner circle of 6 posts and a small separate 2 post unit. To obtain the circularity commented upon by the original authors, the post hole pits had to be located by a survey setting out. But, were the positions of the posts themselves marked upon the ground and large holes dug, thus hopefully the hole in the ground would be set out symmetrically about a fixed point; or, were the holes just dug and posts inserted to attain a near circle. The site evidence is ambivalent, but, the circularity of the final layout is not. It is a circle.

The investigations carried out in 1991/1992 indicate a surprising accuracy in the original excavated depth of the post holes. They are as follows; 17 bottom levels (given as readings to the site datum level) between 70.61 to 70.66m, a variation of c50mm; one is at 70.76 and two special posts are at 70.53 and 70.57m.. Thus, it was shown by the survey that there is an average depth of c1.45metres below original ground level.

If a post is to be set in the ground, perceived wisdom indicates that for stability it should be buried one third of its length. Thus, a depth of c1.45m would give a post length of 4.35m. It could be one quarter

length and thus 5.8m, but, the weight of pole then becomes important, let alone the tree length required.

The Sarn Y Bryn Caled circle has a diameter of c18.3m. This is also a near exact 60 statute feet (18.288m), a surprising dimension indeed. Thus perhaps we should reconsider each of the dimensions in statute measure, the precursor of our imposed metric system. The statute system, based as it is on natural elements such as the Barleycorn etc., surely has a greater affinity to any possible megalithic measure than the manufactured metric system can ever have!

The equivalent of c1.45m is c4.75ft. Thus we can carry out a mathematical check calculating the spacing of the 20 posts with a circle diameter of c60ft. The answer is c9.5 ft. In other words, the posts were 3 x 4.75ft long having 2 x 4.75ft or 9.5ft above ground level and they are spaced at 9.5ft centres around the circumference.

The simple mathematics is, 60 x 22/7 divided by 20 = 3 x 22/7 or 2 x 33/7, and 33/7 feet is 4.714 feet. This is the Unit Yard or Scandinavian Yard used throughout this text.

Thus the visual impact of the posts with their lintel timbers must have been quite spectacular, for each is a natural square of c9.5 x c9.5ft. If the pits had not been so accurately excavated by the original builders, it would not have been possible for the investigating team to discuss in a very detailed manner the extraordinary fact that the posts had, in all probability, been cut to a predetermined length.

Therefore at Sarn Y Bryn Caled in c2100BCE we have evidence of ancient man utilizing measures for post length, excavation depth and spacing around a circle. And that circle just happens to be 60 statute feet in diameter. That measure is a basic c4.75ft. But what is it; is it just a local “fathom,” or similar? Could it be a multiple of the Megalithic Yard*, 2.722ft, Prof. Thom’s so disparaged unit? The possibility exists; 22MY = 59.884ft or 18.253m, but the spacing of the 20 posts is wrong. However, we have a quantum, c4.75ft which requires analysis, but first the other coincidences.

SMALANDSSTENAR* S. Sweden Diagram Ms3D02

In 1980, Dr. A S THOM and R L MERRITT visited some 15 sites in Scandinavia. They surveyed 22 stone circles, one ellipse, three ship shaped enclosures and one square. The paper regarding their findings was published in 1983* and the appendix incorporated the following quote;

“Some evidence of the use of a quantum comes from the elliptical shape drawn through the stones in Ring B at Smalandsstenar. The ’best’ ellipse drawn on the plan is based on a three, four, five right angled triangle and its major and minor axes are respectively, 2a=47.1ft and 2b=37.7ft. Thus a=23.55ft, b=18.85ft and c=14.12ft, where c= the distance between the foci. When each of these is divided respectively by 5, 4 and 3 the result is, surprisingly, 4.71ft. Nevertheless, because of the small amount of data available from limited surveys, it is not possible to test for a quantum using Simon Broadbent’s Monte Carlo method” end quote.

The possible quantum is noted as 4.71ft, but the histogram accompanying the text is based on 4.75ft., with no explanation. Thus we have a possible link from Scandinavia to Wales, which according to some perceived wisdom is not possible in the Megalithic period. But, Smalandsstenar comprises four stone circles, referenced A to D and the ellipse, E. The ellipse is set out by a pair of perpendicular axes. The major axis is set significantly at c30 degrees west of north. The foci for the ellipse are 3x 4.71ft and 4 x 4.71ft apart, set centrally about the cross point. This naturally gives a 3; 4; 5 ratio triangle of size, 1.5:2:2.5 x 4.71ft as the setting out basis. But the ellipse also has the 3 x 4.71ft measure and quite remarkably 3 x 4.714ft equals 10root2 feet, i.e. 14.142ft. However ancient man did not have a decimal calculator, hence, any calculation, any subdivision of a measure must have been on a fractional basis. Thus as has been shown 4.714ft equals 33/7ft and we have mathematical simplicity. We have 3 x33/7 equals 10root2 and as will be shown in ancient times root2 was thought of as 99/70. Thus simply put we have 3 x 33/7 = 10 x 99/70. Coincidences are happening! But when we look at the residual dimension of the ellipse 3.5 x 4.714 ft and multiply it out, we have 16.5ft, the English Rod, Pole or Perch, that other rather enigmatic dimension. This is all quoted from Scandinavian sites, peoples who settled the United Kingdom.

Further analysis of the site, the main circles A to D indicates that two have natural diameters of 11 x 4.714 ft, one of 6 x 4.714ft and one of 13 units. Thus a quantum of 4.714 or 33/7 ft is possible.

AVEBURY*, Wiltshire — Diagram Ms3D03

It is possible to criticize Prof. Thom's survey setting out of Avebury* just by stating 'it is impractical as promulgated'. But, the diagrams do indicate a simple triangle ratio hidden in the proposed radii and arc/chord lengths. The radius given is 707.72ft and the chords are 471.5; 349.3 and 531 feet. If we subject these to a simple 4.714 or 33/7 feet quantum test, we see the following results;

Radius	707.72/4.714 = 150 units;	actual dimension 707.1ft, a 1:1150 discrepancy.
Chord LM	471.5/4.714 = 100 units;	actual dimension, 471.4 ft.
Chord GH	349.3 / 4.714 = 74 units;	actual dimension, 348.86ft, a 1:800 discrepancy
Chord FG	531 / 4.714 = 112.5 units;	actual dimension 530.36ft, a 1:800 discrepancy.

Could the quantum derived from the coincidental evidence so far presented be accepted for Avebury? The difference between 707.72 and 707.1ft is 7.5 inches and as such at a ratio of 1;1150 error well within the survey manual error guidelines.* But, 471.5 is 471.4 feet or 100 units, the decimal unit.

CLAVA CAIRNS, Scotland — Diagram Ms3D04

Whilst analyzing various papers for a possible quantum, the work of Ian Angell* was studied, and the opportunity taken to utilize the four stone rings discussed, Boscawen-Un; Black Marsh; Kerry Pole and Clava, as well as Easter Delfour from his second paper*. Prof. Thom quotes the diameters as follows; B-U = 82.6ft or 30MY; B M = 76ft or 28MY; K P = 86.9ft or 32MY; C = 103.7ft or 38MY and E D = 59.84ft or 22MY. Thus we can compare the quantum measure as listed below;

Boscawen-Un	(S1/13)	82.6-30MY = 17.5 x 4.714 or 82.495ft ie., 1.26 inches out.
Black Marsh	(D2/20	76-28MY = 113/7 x 4.714 or 76.097ft ie., 1.164 inches out
Kerry Pole	(W6/1)	86.9-32MY = 18.5 x 4.714 or 87.209ft; ie., 3.71 inches out
Clava	(B7/1)	103.7-38MY = 22 x 4.714 or 103.707 feet
Easter Delfour	(B7/10)	59.84-22MY = 38/3 x 4.714 or 59.711ft ie., 1.55 inches out
Easter Delfour outlier		52.3ft = 11 x 4.714 or 51.854ft ie., 5.35 inches out.

In fact, a diameter of 75.42 feet or 16 x 4.714 feet perfectly fits Black Marsh. The stones having been surveyed by this author, along with the adjacent circle of Mitchell's Fold, (D02/2 and D02/1). This was to ascertain that the superimposition of new data on the original survey diagrams was correct. It proved that Professor Thom's surveys are very accurate and can be used to investigate other quanta.

Another site surveyed by this author to confirm the original measures was The Rollright Stones in Oxfordshire, Thom site S6/1. Prof Thom's dimension was 103.6 feet diameter, but it is equally 103.708 feet, i.e. 1.3 inches difference, and thus a precise 22 x 4.714 feet, or 22 unit yards.

DISCUSSION

The quantum unit being discussed, 4.714 feet or 33/7 feet is mathematically linked to root2 and therefore to PI, such that 33/7 = 3/2 x PI and 10/3root2. In other words we have a dimension and two irrational numbers, PI and Root2, formulated to the same divisor. Is it fortuitous, or coincidence? If we also ask, why the ellipse at Smalandsstenar was set at 30 degrees west of north, the answer is, that it is the simplest part of a triangle, 30:60:90 degrees, and that triangle has automatic side ratios of 1/root3/2..The significance of that fact will become so very apparent.

THE WEST KENNET AVENUE* Wiltshire — Diagram Ms3D05

In his book "STONEHENGE", Prof. John North discusses the West Kennet Avenue and in particular the spacing of the Stones, pair by pair. Quote, "*The ratio of the length of such cell to the width of the Avenue will be 1.732 to 1 "end quote.*

And what is 1.732, but root3. Thus the cell having a width of 18 Megalithic Yards, as is stated, automatically has a length of 18 x 1.732 or 18 x 4.714 feet. In other words the cell comprises two 30:60:90 degree triangles back to back to form the rectangle. The coincidence of it being such a triangle cannot be

lightly dismissed. Neither can the mathematical consequences of the dimensions of the West Kennet Avenue. Thus if we study Prof. Thom's survey data, we can evaluate sections of the Avenue to understand the underlying metrology. The diagram has the survey data for 'cells' 32 to 37 evaluated as both megalithic measure and Scandinavian yard/Unit Yard. Surprisingly this section indicates that the overall ratio of cell varies from 1: root3:2 to 1:root2: root3, maintaining the megalithic/Scandinavian ratios but in doing so ensuring a constant cell diagonal of 20 Scandinavian Yards. The accuracy of the diagonals to a 20 quantum is too great for it to be another or megalithic measure. The survey data would also appear to indicate that the stones were surveyed cell to cell by using a rope radius 20 U Y long diagonally. The metrology indicated is correct and therefore a re-evaluation of the methodology is required.

A COINCIDENCE TOO FAR! OR DESIGN? Diagram Ms3D06

Professor Thom postulated a Megalithic Yard of 2.722 feet and a Megalithic Fathom of 5.444 feet. The data presented by the Thom family included a quantum of 4.714 feet. Megalithic man appears to have chosen a ratio of 1; root3; 2, a simple 30:60:90 degree triangle for the monumental landscape works. If that same triangle is used to evaluate the two quanta, 2.722 and 4.714 feet, the most surprising coincidence occurs. Substitute the quanta for the ratios of the triangle and the evolution of Megalithic Measure appears;

1	root3	2
2.722	4.714	5.444

There is thus a special triangle created by these Megalithic Measures and each quantum is a function of the other. Thus Megalithic Yard x root3 = Scandinavian or Welsh unit. It is thus that we also have a geometric construct for the resolution of root3 and can ascribe to it a ratio based upon the original root2 of 99/70. The measures, even if they were in Feet and Inches would have been fractional units; thus 2.722 feet equals 49/18 feet and as we have seen 4.714 feet equals 33/7 feet, The mathematics are;
49/18 x root3 = 33/7 or root3 = 33/7 x 18/49 which = 594/343. This fraction can be further refined to root3 = 3 x 198/343 and thus root3 = 343/198 or 49 x 7/2 x 99, a real function of root2.

The questions requiring an answer are now quite obvious!

1) Why does a 1: root3: 2 ratio triangle represent so exactly two quanta from Megalithic Sites?
2) Why are there landscape features using a 1: root3: 2 ratio triangle as a setting out marker?
3) Why does a fractional measure in FEET of a quanta, 33/7, mathematically suit the irrational units PI; 22/7 or Root2, 99/70 and Root3, 343/198?

FROM ROOT2, METROLOGY, HISTORY, PRACTICE AND STATUTE Diagram Ms3D07

'Man', from any previous age, marking a square onto a surface, would have had control of the length of the squares side. Should the diagonal length be required, it could only be measured by ratio to the side length. That ratio would have generally provided an irrational unit measure. Thus the problem "solve the ratio of side to length" would have been posited. Integers were a necessity.

We know that the Greek scholars resorted to geometry and physical methods to solve problems, as is illustrated on diagram 7, by the laying of tiles on a sand board. But, far earlier than that, the Babylonians resolved the same equation by mathematics. We therefore have at least one method ancient man could have used in the resolution of the ratios for root2, root3, root5 etc. If a square has a finely drawn grid, like a sheet of graph paper, then by trial and error the length of the squares diagonal, as a whole number, an integer, can be arrived at. The diagram illustrates the methodology involved .
Thus, with a side length of 70 units, the diagonal measure without appreciable discrepancy is 99 units. This is the acknowledged ancient ratio for root2; 99/70. The veracity of the ratio and its extraordinary accuracy is mathematically checked as part of the diagram.
But , the beginnings of the whole system can now be seen, as in any square $1/70^{th}$ of the side length equals $1/99^{th}$ of the diagonal length and thus when we have a 10 unit side the diagonal length is 99/7 units, which is of course 3 x 33/7 units. Thus in 'base 10' triangles, as the diagram 7 illustrates there is an automatic 33/7 multiple. There must also be an automatic root2 and root3 multiple.

We therefore have the start of a 7 based system with root2 = 99/70; PI = 22/7 and a quantum of 33/7, with each a function of the other. But very few metrological systems or mathematical systems have a ‘base7’ subdivision. In such a system the irrational numbers would ALL have to be ‘base7’ for the mathematics to be resolved. The nominal 1/7th part is very awkward to say the least!. But we do find such anomalies in the world metrologies that indicate a ‘base7’ mathematical metrology existed.

THE BASQUE SYSTEM OF MEASUREMENT

The BASQUE* system of language and metrology, thought to be one of the most ancient survivors from prehistory is a 7 based system. The units are as follows;

	CO	GO	PO	AM	ES	OI	ZE	ZEH	
CORDS		1	12	28	42	84	588	882	1176
GORAPILLAK			1	2.33	3.5	7	49	73.5	147
POSTURAS			1	1.5	3	21	31.5	42	
AMALAUONAK				1	2	14	21	28	
ESTADOS					1	7	10.5	14	
OINAK (feet)						1	1.5	2	
ZEHABETEAK								1	1.5
ZEHAMEAK								1	

The integers of the system are simply 2, 3 & 7 thus 1176 = 2 x 2 x 2 x 3 x 7 x 7.

Other intriguing systems* are those of Armenia, where the Armenian Mile is subdivided into 7 units called Grand Asparez, and most surprisingly of all , the Austrian Miele which is exactly 4.714 or 33/7 Statute English Miles. The number 7 comes to prominence in the Mesopotamian sexagesimal system, where it is noted as the first prime and ordinal number, which cannot be fractional, and thus is deified.[see item 26] Prior to the continuation of research into the ancient measures, the English Statute system must be briefly studied.

THE ENGLISH STATUTE SYSTEM*

The remarkably complex system that is the Statute Weights and Measures is usually portrayed as a living system, one that developed from nature. The basis is from the Barleycorn to the Arm’s length. The Foot is of course the most natural description for a length, as is the Hand or Handsbreadth. The Venedotian Code* of Wales prefers the Step and Leap. But we are now witnessing the final chapter in the life of our Statute Measure so carefully defined in “ The Statute for Measuring Land, 33 EDWARD 1, Stat.6 of 1305AD”, and subsequent statutes of HENRY VII (1497) and ELIZABETH 1 (1588). They have left us with some surprising anomalies and enigmatic units.

LAND UNITS*

Diagram Ms3D08

If we look at one of the enigmatic units of the Statute System, the Rod, Pole or Perch, which has already been identified as a possible ancient measure and the unit of land area which it defines, we discover a simple metrological answer and a ‘base7’ system. The English Acre, by statute, is 66 x 660 feet or 4 x 40 poles. The pole has been shown to be 3.5 x 33/7 feet or 7/2 Scandinavian/Welsh units. Thus the Acre is actually 14 x 140 Scandinavian units. But, the Acre is not the correct land measure it is the square Furlong 660 x 660 feet, of which the Acre is the decimal part. If we revert to the 33/7 units then the square Furlong is 140 x 140 units and the diagonal of that square Furlong is 198 x 33/7 units, ie., 140 x 99/70 = 198. What easy mathematics and 7 is the base.

However, the curiosity of the English Acre does not stop at its land borders, because the Scots and Irish Acres are metrologically co-joined.

ENGLISH ACRE 43560 sq.ft which is 11 x 3960 sq.ft

SCOTS ACRE	55440 sq.ft	which is	14 x 3960 sq.ft or it is 11 x 5040sq.ft.
IRISH ACRE	70560 sq ft	which is	14 x 5040sq.ft.

The basic ratio is 5.5/7 i.e. 14/11 or 11/14 and 'base7' reappears.

But if we rewrite those equivalents in terms of our quantum we have an extraordinary set of ratios;

ENGLISH ACRE	6 English acres = 33/7 or 4.714 Scots acres.
SCOTS ACRE	33/7 Scots acres = 6 English acres
	6 Scots acres = 33/7 or 4.714 Irish acres
IRISH ACRE	33/7 or 4.714 Irish acres = 84/11 or 7 x 12/11 English Acres.

Thus we see that root2 in its second guise as 140/99 and the 14/11 ratios are used with 10/9 or 9/10 ratios. The Statute System has within its very soul the quanta found in the Megalithic Monuments, 33/7, and, that unit is the basis of land measures in the whole of these islands. Not only is it found within the measures, but, it controls the very expansion from one to the next.

NATURE INTERVENES

It could however still be a natural measure, a human based measure and even a forerunner of the Hand. Consider this; the authors hand from bulge of thumb to the line of the little finger bulge, across the palm is 120mm. The twelfth part of the Scandinavian/Welsh unit of 33/7 feet, or 4.714 feet is 4.714 inches. The metric equivalent is 119.75mm. Thus the methodology preferred by archaeologists, a reason for everything and preferably natural, could still hold the key to the resolution of these findings. Curiously though the Megalithic Yard is not so far from being 7 x 33/7 inches ie., 33 inches . But it is 32.664 inches and perhaps that is a coincidence too far.

But, man made features and the archaeological record of ancient mathematics surely predicates a more rationally evolved system following perhaps an initial use of human measure. These peoples were after all our equals. There are two examples which illustrate that fact.

THE INDUS CIVILIZATION*

One great city of the Indus Civilization is Mohenjo-Daro*. It has a remarkable feature within the Citadel, that of the Great Bath. The following extract is from "Further Excavations at Mohenjo-Daro "by E J H Mackay, page 131.

"It is constructed of specially cut bricks of varying size; the dimensions of the bath are;

WEST SIDE	*= 472 inches*	*SOUTH END*	*= 275 inches*
EAST SIDE	*= 471 inches*	*NORTH END*	*= 280.5 inches*

This is relatively accurate layout for brickwork and the slight discrepancy is amply atoned for by the careful finish of the masonry, a finish so good that the writer has not seen its equal in any ancient work" end quote.

So much fine work and they cannot measure 275 or 280.5 inches to make a rectangle! Or is it perfect?

In the book 'Historical Metrology'* its author considers that the Bath was meant to be a 1:root3:2 geometric construct. Considering the foregoing text it could be a coincidental ratio but, the Bath has a length of 471.4 inches or 100 x 33/7 inches. But, can we accept that the Inch is an ancient measure? It is after all only the thumbs breadth, used by carpenters to size timber quickly. If we can accept the premise, as there are so many such as the Danish Inch at 1.066381 inches* it would be so very hard to differentiate without very good equipment. The likelihood is that the dimensions of the' Bath' make an absolute statement concerning metrology, and that the inch is a very ancient measure with minimal variation.

The End dimensions of 275 and 280.5 inches have a mismatch of 5.5 inches. Add together the two lengths, 275 + 280.5 = 555.5 and the supposed mismatch can be seen as the 101st part of the combined lengths. But, 555.5 is also 25 x 33/7 x 33/7 inches and we have seen that 33/7 x 33/7 is actually 200/9,

decimally 22.222 but more importantly a direct link to Scandinavia and Wales in terms of metrology.

Hence we have a Sacred Bath with a hidden mathematical construct which is situated on the Indian sub-continent, home to some of the pre-eminent mathematicians of ancient times. And, that Bath is built to the decimal multiple of the twelfth part of a Scandinavian/Welsh measure c2100BCE.

THE BUSH BARROW LOZENGE* Wilsford, Wiltshire Diagram Ms3D09

One of the most enigmatic objects to be unearthed in Britain must be the Bush Barrow Lozenge, found near the magnificent megalithic monument of Stonehenge. It is of beaten gold and is very carefully incised to a splendid pattern or design. But, although it has been examined for its artistic content and the suggestion has also been put forward that it is a lunar indicator, the measurements of the lozenge have elicited little, if any, research.

Quote" *The measurements below, which you request are taken from an electrotype of the original (Bush Barrow Lozenge) made in 1922, (following) Conservation of the original in the 1980's measurements that may no longer be accurate.*

Long diagonal 186mm short diagonal 157.5mm

Sides 119.5; 122; 121; 122 (difficult as corners are rounded) " end quote.

The diagram illustrates a reconstruction of the Lozenge using the base dimension of 119.75 or 33/7 inches and shows that the original concept would have been root2 based, a squares diagonal.

DISCUSSION

Much has been written about the veracity of Professor Thom's Megalithic Yard and this paper is not a defense or criticism. The theoretical mathematicians, statisticians and geometers have all tried to contribute to the discussion. Much of what is written requires knowledge of advanced mathematical theory. The layman, this author included, does not have the wherewithal to counter such impressive theory.

But, the theoretical discussions have all taken place against a backdrop of limited knowledge. The data that has so far been presented in this paper has been gleaned from a multitude of other papers, many of which do not mention Megalithic measures. And there is more data herein. Why on the one hand do we acknowledge that ancient man had the same mental ability as we have, but on the other not acknowledge that there could have been a sophisticated counting system* or measuring system. Is it just because we have not excavated a measuring rod.* One researcher has indicated quite clearly the Palaeoscience* that existed in the age of the Stones. The excavators of Sarn Y Bryn Caled, discussed at length the accuracy of the pit depth and timbers used. They even produced a series of diagrams which illustrated the posts in the upright position. But at no time did they remark upon the fact that there was a phenomenal coincidence between height and spacing, with perhaps a perfect square being formed by the structure.

If this is the result of the adverse criticism following the Megalithic measure, we have a problem. Perhaps it is time for us to reassess the likelihood of a megalithic measure. But, to do that, we require to for go using the metric system in our investigations and concentrate upon investigating via '0ld' units.

Survey a Roman site in Pedes and endeavor to understand the original concept, as designed.

That is not a flippant statement. Because of the ease of using a metric tape measure, or as now, a GPS system, the perception of the original measures is lost. And, if that system was an integrated mathematics and measurement system, as it appears may have existed, we will then notice the similarities as we work. At least include comparative measures as part of the whole data and not respond in the way one County Archaeological Office did when asked what the Roman Pes length was on their many sites. The response was, '*we have surveyed them in metric and not bothered to translate them to find the Roman quantum.'*

MEDIEVAL CHURCH BUILDING AND THE BASE MEASURES

Diagrams Ms3D10; Ms3D11

Whilst researching historical metrology, a paper published in 1978* produced in this author a determination to accept no excuses for not considering a measurement. The quote that was the instigator of

this attitude is as follows; "*in addition to this caveat it is worth adopting the principle of using buildings to establish only those units of measure which are already known from archaeological or documentary sources, otherwise once again the field of possibilities is so large that one can hardly avoid arriving at an answer*" end quote. With a building, the field of possibilities is actually very limited, but the presumption that *All* possible measures have already been deduced, is worrying.

Thus information gleaned from that paper was fully examined apropos the measure now being posited, 33/7 or 4.714 feet. But, we must remember that 17 Roman Pedes = 16.5 feet = 3.5 x 33/7 ft.

The first Church building mentioned is North Elmham, Norfolk. It is one of the original Bishoprics of Britannia, although the remains are dated to the 11th Century it is much older. The diagram of the Church plan has a 33/7 foot grid superimposed thereon. It is not possible to indicate the nuances of the 33/7 grid on so small a plan, but, the translation of the original survey dimensions show that there is a very positive coincidence of wall positions and measure. So much so that the overall plot is, 28 x 12 x 33/7 units or 132 x 40root2 proportions. But, 132 feet, is 8 Poles, and 136 Pedes. However the width does not make geometric sense in feet or pedes, other than the 40root2 feet.

The second Church analyzed within the original paper as Diagram Ms3D11 indicates is the Holy Roman Empires most enigmatic, the Palace Chapel at AIX LA CHAPPELLE, Charlemagne's Chapel. Yet again the spectre of the 33/7 or 4.714 foot unit pervades the planning dimensions of the original design. From the central octagon to the external wall pilasters, this unit encompasses the whole with exactness and consummate ease. Even the circular stair centre points, are located exactly by the planning grid. And, it must be recognized that such a building, a circle which encloses an octagon required a very good planning grid for the design and construction phases.

The whole of Europe was part of Charlemagne's fiefdom, and Austria still has the 4.714 or 33/7 Miele extant. However it is possible to state that the Chapel plan, which is so fine a match to the 1437mm or 4.714 foot grid, may have been planned on a one third unit of 18.857 inches, which is 4 x 4.714 inches. This is of course so very close to the Cubit, but, it is a function of 33/7 feet.

From this authors own research a single example which illustrates continuity of measures over long timescales. A Church of Saxon origin* , St. George's , Arreton, Isle of Wight, is cited in one paper used for overall research as having an internal length of c15.08m and internal width, 7,08m. Thus the Church can be described in the following geometric terms. With internal dimensions of 51 x 24 Roman pedes, it is an 8:15:17 triangle base, which is the surveyors guide to the length. Thus we have multiples of 17 pedes or 16.5 feet or 3.5 x 33/7 feet in the overall length and planning triangle. The width is less than half inch short of 280 inches which is of course 198root2 inches, or 42root2 Scandinavian units. It is therefore possible to posit a theory regarding supposedly non existent measures and illustrate at the same time they belong to an all encompassing metrology. The Isle of Wight, itself a remarkable place, has a landscape of Churches which owe their landscape positioning to ancient measures*, and an educated Romanized Clergy, who by following survey texts created the landscape.

A RENOWNED PROFESSORS VIEWPOINT*

Quote

"*Epilogue; Ox-Carts and British Rail*

As we saw earlier on, the wheel-tracks or gauge of prehistoric ox-carts, from that at Zurich of the early third millennium BC to those at Lchashen of a millennium and a half later, had maintained a remarkably consistent width of between 1.30 and 1.60m in the recorded examples, averaging 1.45m.. To anticipate, this was maintained in prehistoric Europe with horse-drawn carriages and chariots, c600-100BC, averaging 1.30m; Roman cart-ruts average 1.40m----------

In Yorkshire the Dales wagon of the last century had a gauge of 4ft 4in, the Moor wagon 5ft. When George Stephenson came to build his Stockton to Darlington railway line in 1825 he built to a local gauge of 4ft 8in., and this modified by half inch to 4ft 8.5 in., by Act of Parliament in 1828 when the line extended from Stockton to Middlesborough, was made compulsory in 1846. This has remained standard for British Railway lines until the present day-1.43m as compared with the prehistoric average of 1.45m for ox-wagons

from Switzerland to the Caucasus, and for railways on the continent from 1832. British Rail has inherited a strangely ancient legacy" end quote.

This epilogue follows a chapter entitled "The Ox-Wagon from the Farmyard to the Court" and includes this sentence, *"Overall wagon lengths average around 2.0 and 2.5m, and the distance between the wheels (the track or gauge) a remarkably consistent average of about 1.45m"*

The metric 1.45m or the translated measure 1.437m or 33/7 or 4.714 feet or 12 x 4.714 inches are the British Rail measure of 40root2 inches, 4feet 8.5 inches.

CONCLUSIONS

It is thus that we return from discussing Megalithic Stone Circles, Avenues, Lozenges, Baths, Wagons and British Rail, to the original premise for this paper, Megalithic metrology, root2 and co-joined units. Was there a system? Was there a resolution for the irrational units that pervade the geometry of the universe? Contentious questions which demand an answer.

Many researchers comment that the transference of measurements, let alone ideas, over millennia is not possible. But, when the transhumance patterns are studied, this becomes quite possible. The absence of tangible evidence in the form of marks or signs, other than the carved bones found in Europe and Africa, and our ignorance of the spoken language, only add to the our problems. But, the complexity of the structures built by ancient man, as evinced by the Stonehenge and Sarn Y bryn Caled sites, indicates that there was among those peoples 'men', with a high degree of intelligence and practical ability.

One paper worth considering states the following, *"thousands of notional sequences found on the 'artistic' bones and stones of the Ice Age and the period following, as well as on the engraved and painted rock shelters and caves of the Upper Palaeolithic and Mesolithic Europe". The paper indicates that there is evidence to strongly suggest the possible attempts by these very early people living perhaps thousands of years before the building of Stonehenge, to find some kind of numerical order on sequences of notional events.[A Marshack. Lunar Notation on Upper Palaeolithic Remains. Science vol. 146, No3645, pp743/5.]*

Ancient man solved the enigma of those irrational units, root2; PI; root3 etc., by trial and error and in doing so formulated a mathematical system based upon the number 7. Why? Because it worked!

Here was no designer text, but a theoretical construct which had to work in a very practical manner. Ancient man had a number of tools with which to work, and the mathematics had to resolve, in at least reasonable fractions. This required the use of divisors which were common for irrational units. Thus we can be fairly certain that the number 7 was important in the metrology of ancient man. The Mesopotamians are probably the root for the 7 enigma*. It caused them problems and was thus revered. But, it is only through the megalithic measures of Professor Thom, or more correctly the recorded measures of Megalithic sites that Prof. Thom took, which have shown to be mathematically co-joined , that the quanta for the English system, the ancient carriage track and British Rail can be so linked over 4000 years.

Ancient man did not work by," how long is a piece of string", HE KNEW!

But then everything in this paper may just be pure coincidence.

Michael J Ferrar

STAR INDICATED NOTES *.

1) SARN Y BRYN CALED, WELSHPOOL, WALES.
Gibson Alex et al 1994; Proceedings of the Prehistoric Society, 60, 1994 pp 143-223.
Pages 182-184, post/post holes and pages 192-203 which discuss some 40+ other sites.

2) SMALANDSSTENAR S. SWEDEN.
Thom Archibald S and Merritt Robert L, 1983, Archaeological Journal 140 pp 109-119
Appendix pages 116-117 and plans MO/1 to MO/15

3) AVEBURY, WILTSHIRE.
Thom A, Thom A S, and Foord T R, 1976, ; Avebury (1) ; 'a new assessment of the geometry and metrology of the ring.' Journal of Historical Astronomy, 7, pp183-192 and,
Thom A and Thom A S, 1976,' Avebury (2); the West Kennet Avenue.' Journal of Historical Astronomy, 7, pp193-197.
These papers include full survey notes and tables of dimensions for the geometrical solution.

4) CLAVA CAIRNS, SCOTLAND.
Thom A, 1967, Megalithic Sites in Britain. Oxford Univ. Press. Site reference B7/1
Thom A and Thom A S , Megalithic Rings. B A R , British Series 81, 1980 with collated Archaeological notes by Aubrey Burl.
Each megalithic site has a full A4 diagram and enables the reader to assess other dimensions.

5) R C A H M S, EDINBURGH, SCOTLAND.
Ferguson Lesley. A catalogue of the Alexander Thom Archive held by the National Monuments Record of Scotland.
Bibliography of the Thom publications from N M R S *ORACLE* database.
The author obtained full scale copies of all of the survey drawings of the Thom's that the Record Office could safely copy. Many are annotated by the Thom's prior to the gift.
The archive of the MERRITT Family (Dr. Ethan Allen , and Robert L) has been donated to The RCAHMS but as yet, has not been fully catalogued for public usage.

6) COMPOSITE SURVEY
Thom A 1955, A statistical Examination of the Megalithic Sites in Britain. Journal of the Royal Statistical Society, Vol. 118, part III Series A (general) pp 275 - 295.
The diagram in question is Figure 6 , page 279.

7) IAN O ANGELL.
Angell I O , 1976, Stone Circles; Megalithic Mathematics or Neolithic Nonsense? .
The Mathematical Gazette, Vol 60; Number 413, October 1976.pp 189-193.
Angell I O , 1978, Megalithic Mathematics, ancient Almanacs or Neolithic Nonsense ?
The Institute of Mathematics and Its Applications. October 1978, pp253-258.

8) THE WEST KENNET AVENUE
North John, 1996, Stonehenge, Neolithic man and the Cosmos, HarperCollins London.
The West Kennet Avenue pages 252-262 and Figure 103 with notes there under p 260.
The Bush Barrow Lozenge (see later) is discussed pp503-518.

9) BASQUE SYSTEM OF METROLOGY
Frank, Roslyn M, 1980,' Basque Stone Circles and Geometry,' Archaeoastronomy Vol.III No. 1 pages 28-33
Frank, Roslyn M, 1982,' The Basque and Terrestrial Geometry,' Archaeoastronomy Vol.V No 1 , pages 24-29.
The Basque system is explained and their geometry illustrated in the landscape.

10) INTRIGUING SYSTEMS.
Doursther Hoarace. 1840,' Dictionnaire Universel des Poids et Measures Anciens Et Modernes.' Bruxelles.
A complete dictionary of world measure with the most obscure included.

11) THE ENGLISH STATUTE SYSTEM.
Conner R D. 1987.' The Weights and Measures of England,' Science Museum/HMSO.
This is but one of a large selection of books which endeavour to explain the English Statute System, it's origins and legal status. The other references are in the Biblio.
THE VENEDOTIAN CODE. This Welsh system is covered within the listed books.

12) LAND AREA.
Seebohm Frederic, 1914,' Customary Acres and their Historical Importance,' Longman Green.
Discusses the customary acres of UK/Europe, with comparative explanations and sizes.
Oschinsky Dorothea. 1971, Walter of Henley and other Treatises. Oxford;Clarendon Press
Ch. 28 "First know that a quartentine [acre] ought to have 4 roddes in breadth and 40 roddes In length and the Kings rodde [or perch] is sixteen foote and a halfe and then hathe the acre in Breadth 66 foote. When you have gone up and down 33 times with a furrowe of a fote broade, Then is an acre ploughed. Dated c1286AD. Thus the 33 unit is incorporated in the acre.

13) THE INDUS CIVILIZATION.
Allchin, Bridget and Raymond, 1968, The Birth of Indian Civilization, pp233 to 253 discusses 'Patterns of Settlement',Brick sizes and the Great Bath. Penguin Library Edition.

14) METROLOGY.
Berriman A E , 1953, Historical Metrology, . J M Dent and Sons. London.
Discusses the Great Bath pages 41-43 and muses upon the general possibility of ancient Metrology, including the Acre.

15) THE BUSH BARROW LOZENGE.
Thom A S and Kerr J M D and Burrows T R , The Bush Barrow Gold Lozenge, is it a solar and lunar calendar for Stonehenge. Antiquity , 62, 1988 pp492-502.

16) Personal letter dated 21st April 1997 from P H Robinson, Curator, Devizes Museum, which Exhibit's the Lozenge.

17) MATHEMATICAL THEORY.
Kendall D G . 1974, Hunting Quanta, in , The Place of Astronomy in the Ancient World, Editor, Hodson F R , Phil. Trans. Roy. Soc. London , pp 231-266.
Barnatt J & Moir G , 1984, Stone Circles and Megalithic Mathematics; Proceedings of the Prehistoric Society, 50 pp197-216.
Barnatt J & Herring P , 1986, Stone Circles and Megalithic Geometry; An Experiment to test Alternative Design Practices. Journal of Archaeological Science, 13, pp 431-449.

18) COUNTING SYSTEMS.
Burl A . 1976, Intimations of Numeracy in the Neolithic and Bronze Age Societies of the British Isles. (c3200-1200BC), Archaeological Journal, 133 pp9-32.
Burl H A W . personal communication 9th January 1998. Quote;
From this you will understand that I consider prehistoric communities in Britain and Ireland possessed counting-systems that were comparatively elementary but effective, and that there were certainly units of measurements, slightly plus and minus of Thom's Megalithic Yard, but, that these were distinctly local or regional. There seems little evidence for a national unit of any length.

19) MEASURING RODS.

Mackie Euan W , 1977, Science and Society in Prehistoric Britain. Elek Books London .
Page 12. “An elementary warning should be written with letters of fire on the mind of every Archaeologist who makes use of mathematical and statistical techniques, or of the conclusions drawn with their aid by someone else. M H Moroney puts the point clearly; ‘It is true that it is extremely difficult to interpret figures when they relate to some concrete problem It is equally true that it is extremely easy to do arithmetic. Herein lies the real difficulty. Averages can be calculated to nineteen places of decimals with astonishing ease. When the job is done it looks very accurate. *It is an easy and fatal step to think that the accuracy of our arithmetic is equivalent to the accuracy of our knowledge about the problem in hand.*(E W M italics).We suffer from “delusions of accuracy”. Once an enthusiast gets this disease, he and all who depend on his conclusions for their welfare are damned.”
COMMENT; Thus it is my contention, that the units of ancient man, must be of a fractional base, and can only be drawn from elements of structure of previous ages.

MEASURING RODS (2)

The same book as quoted, by E W Mackie, has on page 60 information regarding ‘Two Measuring Rods from Denmark, Early Bronze Age, Late second millennium BC’. Quote; “Allowing for the possibility of a little shrinkage in the rod over the last 3,000 or more years, despite the waterlogged conditions of the grave, it seems possible that BORUM ESHOJ has produced the only known European megalithic yardstick. If it was one, the divisions are of some interest. Since the megalithic yard seems to have been close to 50 Sumerian *shusi*, each $1/5^{th}$ of the rod could have been intended to be the equivalent to 10 *shusi*, and the longer space to the Sumerian foot of 20 *shusi* and to the later northern foot.”
COMMENT We are discussing metrology, from 2000BC - 1000BC, Denmark to Sumeria.

20) PALAEOSCIENCE

RUDGLEY Richard, 1998, Lost Civilizations of the Stone Age; Century London.
Chapter 4, The Signs of Old Europe; Writing or Pre-writing
Chapter 5, Palaeoscience; significant numbers 7 and 14, pp97 & 98 and 227.

21) MEDIEVAL CHURCHES

Fernie Eric, 1978, Historical Metrology and Architectural history. Art History Vol 1, No4, Pp 383-399.
Comments p385 upon Berriman 1953, (see 14) and the English Acre comparisons stating, ‘no evidence------- chronological gap. Quote used is p389 and churches info is pp390-394.

22) SAXON CHURCHES

Margham J , 2000, St. Mary’s Brading; Wilfred’s Church? Proceedings of the Isle of Wight Natural History and Archaeological Society, 16, pp117-135.
Paper discusses the internal dimensions and geometric proportions of Saxon Churches.

23) ISLE OF WIGHT.

Ferrar M J 2004,’ A Landscape of Churches.’ Within “From Italy to Ireland” paper StM1.

24) BRITISH RAIL.

Piggott Stuart, 1992, Wagon, Chariot and Carriage, Thames and Hudson , London.
Chapter 1, The Ox-Wagon from Farmyard to the Court pp 13-36, epilogue pp35-36.

25) MEGALITHIC YARD.

Professor Thom commenced with a unit of 2.72ft but later considered the final length to be 2.722 feet. The corpus of literature that exists concerning this measure is too large and varied to provide a meaningful list. This author has indicated a large number of papers (by no means All) used in the preparation of this paper, and, references to their bibliographies and notes Sections will indicate further research possibilities.

26) 7 and ANCIENT MAN

" is the case of the prime number 7. For it is only in Mesopotamian sexagesimal mathopoeic thought that this number has a special significance.

The exception to the use of 'regular' numbers as deities, was the deified 'Seven'. This 'irregular' number received special attention and treatment because it was the first cardinal, ordinal and prime number which confronted the Mesopotamian mathematician with the problem of the 'irrational': '7 does not divide' is the laconic comment in the mathematical texts. What is meant, is that the *reciprocal* of 7 cannot be expressed as a finite sum of sexagesimal fractions ($1/7^{th}$ = 0; 8, 34, 17, 8, 34, 17, 8, 34, 17, …..). The reciprocal of 7, an infinite cyclic repetition of fractions, has no ratio. This in itself, in mythopoeic thinking, would be sufficient to associate it with the gods. Indeed 'Seven' plays a unique religious role, as the first symbol of the 'irregular', the 'mystical', sacred world.

The number 7 and its multiples, also play a prominent role in mythopoeic thought beyond the borders of Mesopotamia, leading us to believe that Mesopotamia was indeed the focal point of its original diffusion. The Mesopotamian deified '7' is usually identified astronomically with the Pleides, but this is not certain. As a sacred numeral it is attested in Canaanite religious literature in the second millennium BC, and is especially prominent in the Bible. In the Hebrew creation epic, for example, only the Seventh Day, later called the Sabbath, was both blessed and *sanctified* by the Creator (Genesis 2;2). Multiples of 7, such as 14, 42, 49, and 70, figure prominently in both Judaism and Christianity. By late Antiquity, Mesopotamian astrology popularized the cosmic counterparts of the deified '7' in the form of the '7 planets', each identified with a major deity.

The very deification of selected 'regular' numbers, and the 'irregular' prime 7, indicates that the Mesopotamian mathopoeic mind saw in numerals a means of expression transcending the requirements of practical operations."

Quotation from, "Numerical structuralism and cosmogony in the ancient Near East", by Robert R Stieglitz, Dept. of Hebraic Studies, Rutgers University, Newark, NJ 07102, USA. 1982, Academic Press Inc.

27) SURVEYING

Extract from 'Land Surveying' by Ramsay J P Wilson, M & E Handbooks, 1971, page 22

2. Direct measurement.

The method of making a direct measurement depends largely on the accuracy required. It is a waste of time and money to take very accurate measurements when only a low accuracy is required. Conversely, it is useless to try and achieve high accuracy with a chain or plastic tape.

Under ideal conditions the greatest accuracy that can be expected from a chain or plastic tape is 1/2000, but in practice 1/500 or less will probably be achieved.

Comment; " Thus averages and means must play a part in the discussion of any ancient measures that we may wish to explore. Ancient man would have been no more accurate than the plastic tape. Hence we must on the one hand consider the point made by Moroney, but also be aware that when we do find some correlation of measures, they may be quite correct, although marginally different."

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HOLLINGDALE STUART, 1989,’Makers of Mathematics’ Pelikan Books/Penguin Books.
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RODGER IAN. 1969, ‘Megalithic Mathematics’; The Listener, 27/11/69, pp731/734.
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DIAGRAM TITLES
DIAGRAM 1 SARN Y BRYN CALED ; Oak post positions indicating the various radii.
DIAGRAM 2 SMALANDSSTENAR ; The four circles and the Ellipse in the landscape.
DIAGRAM 3 AVEBURY ; The Thom setting out and the radius/arc/chords.
DIAGRAM 4 CLAVA CAIRNS ; Stone circles, geometry and dimensions.
DIAGRAM 5 WEST KENNET AVENUE ; The Cell and profile.
DIAGRAM 6 TRIANGLES , 1 ; root3 ; 2 , fractional mathematics and progression.
DIAGRAM 7 SOLVING PYTHAGORAS AND ROOT2 BY TRIANGLES.
DIAGRAM 8 ACRES; The English acre and its metrological expansion.
DIAGRAM 9 THE BUSH BARROW LOZENGE ; Its probable original design.
DIAGRAM 10 NORTH ELMHAM ; The Church and the Scandinavian Yard
DIAGRAM 11 AIX LA CHAPPELLE ; The Chapel and the Scandinavian Yard.

Note; All diagrams are by the Author.

Before the 1980s, most Scottish people, although they insisted on many differences between themselves and the English, were happy to be part of the UK. But there was always some resentment about the way their country was treated by the central government in London. From the mid 1980s onwards, opinion polls consistently showed that a majority of the Scottish population wanted either internal self-government within the UK or complete independence.Â 1.1. Look through these questions before reading the text. What are the powers of the Queen from the evidence of written law? What are the real powers of the Queen? 3. The operating system is the program that makes a computer work. 4. When something is on the desktop you see in onscreen. 5. An OS that uses small pictures to represent files is a GUI .Â D Its registration fee is less than the Web Development class. 3) What is the function of CSS? A It helps improve navigation. B It decreases a website's visibility. What came before the english statute system. Not roman. But ancient metrology. â€¢ there is a very large gap in the historical records regarding metrology and surveying the ancient world. â€¢ for the majority of europe the metrology commenced with greek measures but this was soon eclipsed by roman measures.Â The megalithic measurements of 2.722, 5.444 and 4.714 statute feet have been found throughout europe. But they are co-joined by one very specific geometrical feature, a 1/ROOT3/2 triangle. The megalithic measurements.