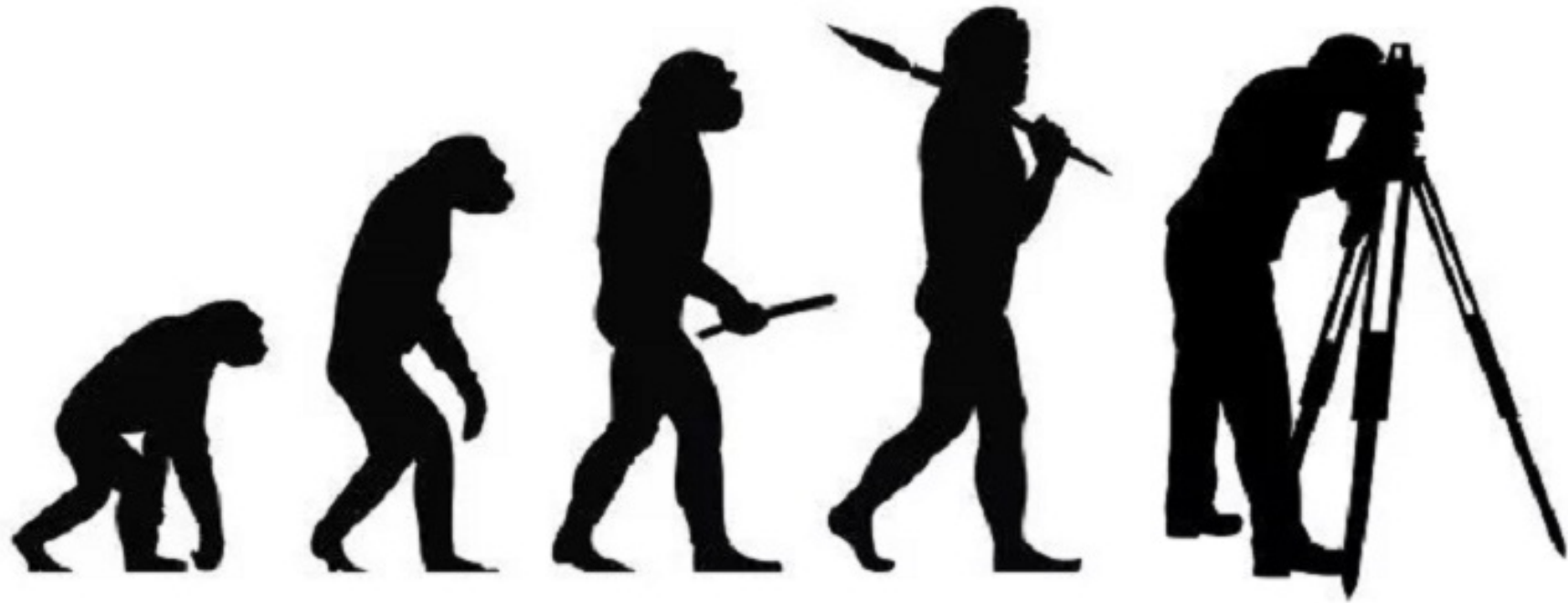


Introduction: Digital Surveying



<https://www.satpalda.com/blogs/evolution-in-surveying-techniques>

Digital Surveying

- House Rules
- Introductions
- What is it all about?
- What am I expected to do?
- How will it be assessed?
- Overview of surveying



About Me:

Gavin Traylor (Gavin is fine)

- **Subject Experience in Digital Surveying.**
- Chartered Architect with over 20 years of experience, working within the public and private sector.
- Since April 2019, a Lecturer in Construction @ uwtsd teaching on both the Built and Architecture portfolios.
- Prior to working at uwtsd was Operational Manager for the multidiscipline 'in house' design and construction management for Cardiff Council. 45 staff consisted of, Architects, Architectural Technologists / Technicians, Structural engineers, Mechanical & Electrical Engineers, Construction Project Managers, Quantity Surveyors, Principal Designer (CDM), Clerk of Works and Business Support Team.
- Studied at the Welsh School of Architecture at undergraduate level (RIBA Part 1) and Birmingham School of Architecture at postgraduate level (RIBA Part 2 and Part 3)
- Former Chair of CLAW Design Group and client board member SEWSCAP Procurement Framework.
- Chair of Design Circle & RSAW Council Member

.....but much more importantly.....



What is it all about?

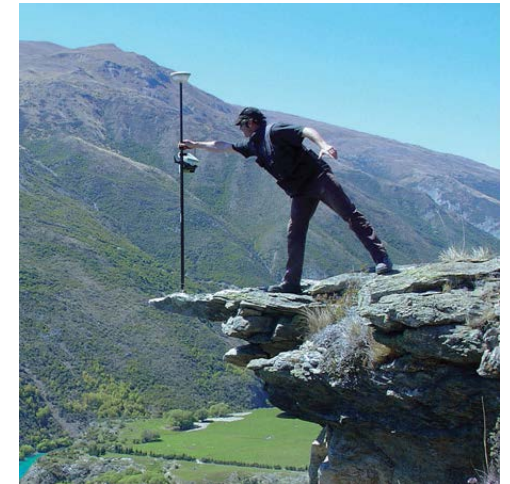
Aim: To provide learners with the skill in linear surveys, levelling surveys, measured building surveys and construction projects.

Learning Outcomes

- Demonstrate knowledge of underlying concepts and basic principles of Surveying.
- Present, and interpret data obtained through linear and levelling surveys to produce drawings and vertical differentiation.
- Conduct and evaluate measured building surveys.



<https://i.pinimg.com/736x/16/64/0e/16640e288633101c51faac36fa130c19--vintage-denim-vintage-style.jpg>



<http://www.orefind.com/images/blog-figures/gps-land-surveying.jpg?sfvrsn=0>

What am I expected to do?

Mixture of lecture based and practical activities over two semesters.

General Overview (Me)

- Introduction to practical surveying and basic survey methods.
- Survey equipment types and measurement techniques.
- Surveying terminology and data recording.
- Drawing - sketching and digital formats.
- Cartographic detailing for construction works.

General Overview (You)

- You need to know how to use the Library and Online resources
- You need to attend all timetabled activities
- You need to manage your time and meet deadlines
- Ask Gavin if you have any problems regarding the module



"WHATCHA TAKIN' A PICTURE OF?"

https://archives.profsurv.com/assets/magazines/articles/70927/Apr_EN_image_02.jpg

How will it be assessed?

Module Credit 20

30% Scheduled Learning and 70% Independent Learning

Assessment Component 1		
Mode of Assessment	Word Limit	Weighting
Practical and written report	2000 Words	50%

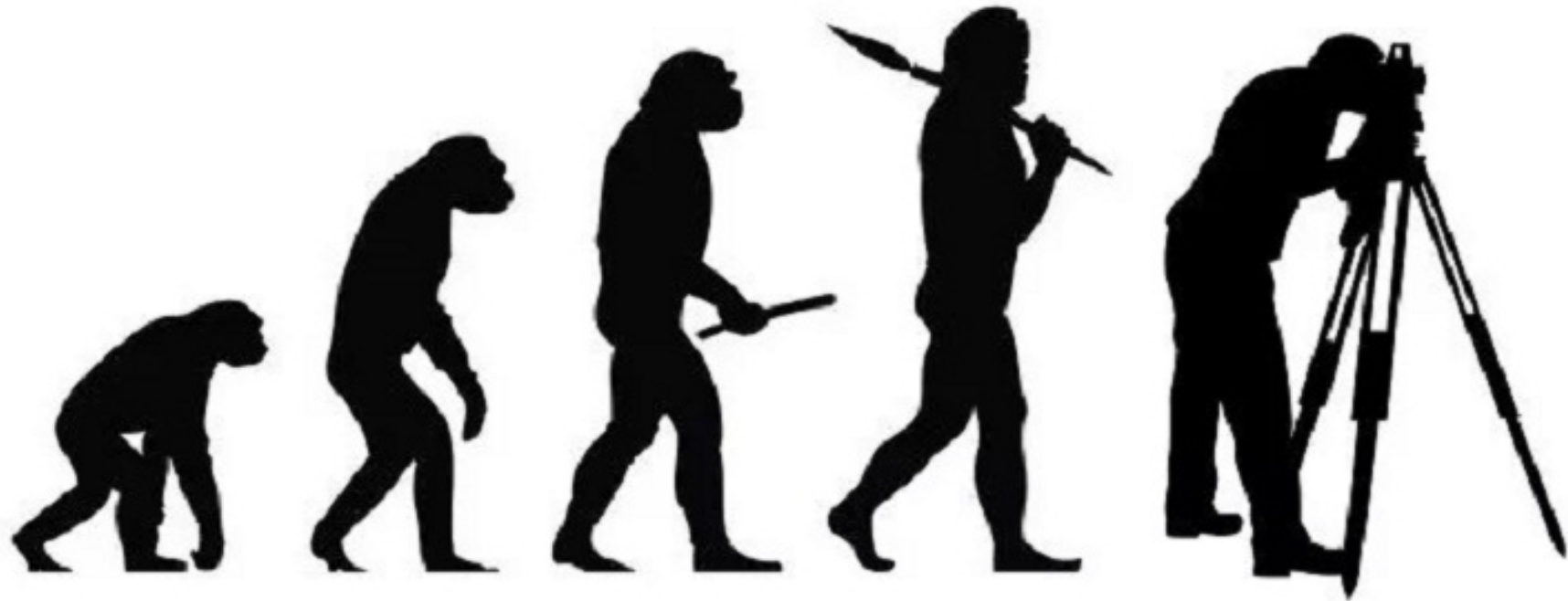
Assessment Component 2		
Mode of Assessment	Word Limit	Weighting
Essay	2000 Words	50%



Module Code	ACBA4002	
Module Title	Digital Surveying	
Classification	Reading List	Electronic *
Essential	Swallow, P. et al. (2016). Measurement and Recording of Historic Buildings Abingdon, Oxon: Routledge	☐
Essential	Royal Institution of Chartered Surveyors (2014) Measured Surveys of Land, Buildings and Utilities. 3 rd Ed. London: RICS,	☒
Essential	Clancy, J. (2011) Site Surveying and Levelling. 3 rd Ed. Abingdon, Oxon: Routledge	☐
Essential	Bannister, A. (1999) Solving Problems in Surveying. 2 nd Ed. Harlow: Pearson Education Ltd.	☐
Further	'Professional Surveyor' magazine	☒



Lecture 1: Digital Surveying



<https://www.satpalda.com/blogs/evolution-in-surveying-techniques>



DIGITAL SURVEYING
PRACTICAL EXERCISE. SAINT FAGANS VISIT (25/09/2019)

The visit will include different heritage buildings with traditional materials and construction methods. You will be allocated a building that you must review in your group and prepare the following.

- Measure and Draw a dimensioned Site Plan, Typical Floor Plan and Elevation. Each person must prepare one drawing of the set.
- Complete the details in the box show below for your allocated building.
- Explain any difficulties with the survey? Have you made any assumptions?

You should present your work in class next Monday morning as a group (maximum 10 min).

Lecturers will be with you today all day and you can ask any questions you have.



MODULE NUMBER: ACBA 4002
MODULE NAME: DIGITAL SURVEYING

STUDENT NAME:

THIS DRAWING SHOWS:

BUILDING NAME:

DATE OF CONSTRUCTION:

DESCRIPTION OF BUILDING:

TYPE OF CONSTRUCTION USED:

ASSUMPTIONS / LIMITATIONS:



Melin Bompren Corn Mill



Cilewent Farmhouse

46



Kennixton Farmhouse and buildings



Rhyd-y-car Terrace



Abernodwydd Farmhouse



surveying in British

(sɜːˈveɪɪŋ )

Word Frequency



noun



1. the study or practice of measuring altitudes, angles, and distances on the land surface so that they can be accurately plotted on a map
2. the setting out on the ground of the positions of proposed construction or engineering works

Collins English Dictionary. Copyright © HarperCollins Publishers

Measurement and Recording



Pre- history

or

Prehistoric



https://1.bp.blogspot.com/-1DE11BYwQwg/WFQPfyd_0FI/AAAAAAAAAGnk/KPOS9bhEopE-mXMkfetLib3kTltDpBxVwCK4B/s1600/10.JPG



<https://www.flickr.com/photos/rod munch/20051894452>

surveying in British

(sɜːˈveɪɪŋ 🔊)

Word Frequency 🔴 🔴 🔴 🔴 🔴

noun

1. the study or practice of measuring altitudes, angles, and distances on the land surface so that they can be accurately plotted on a map
2. the setting out on the ground of the positions of proposed construction or engineering works

Collins English Dictionary. Copyright © HarperCollins Publishers



Measurement and Recording



Mathematics and Writing

Ancient History or Antiquity



Pyramids of Giza, Egypt
Great Pyramid
Constructed 2560BC
By Pharaoh Khufu
440 cubits side base
280 cubits high



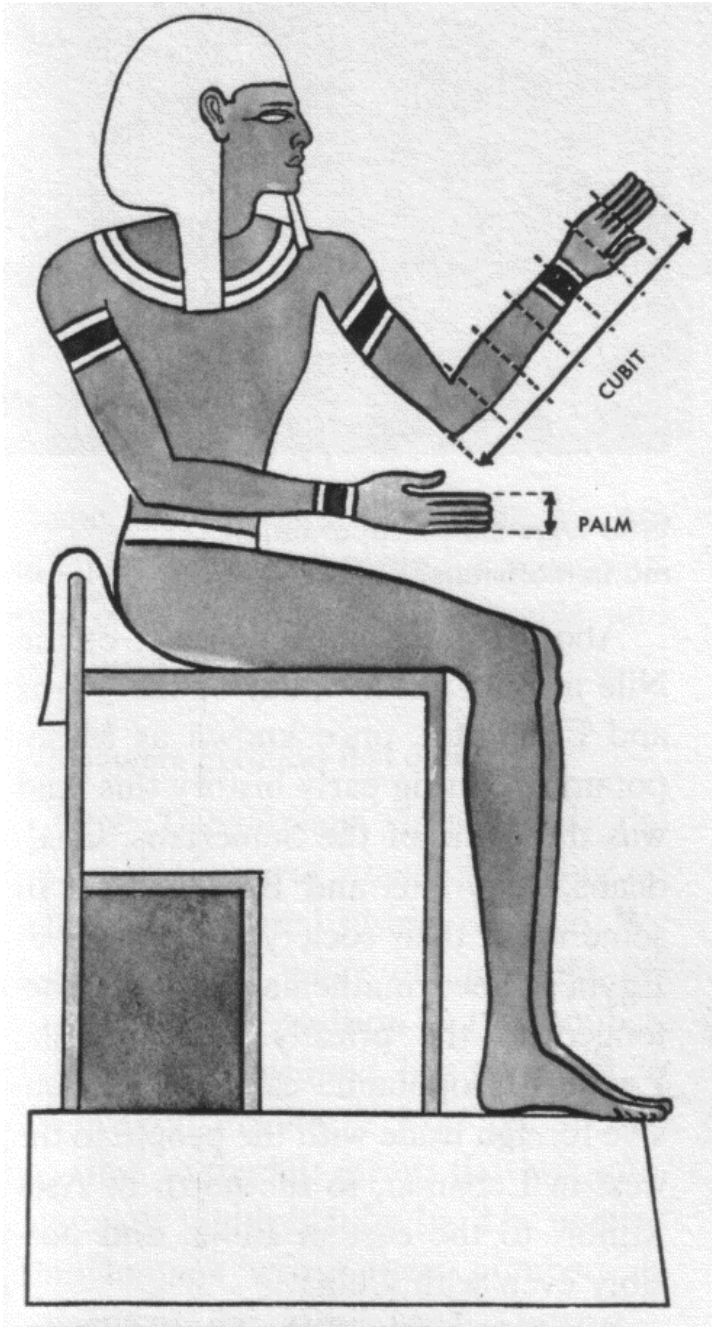
Acropolis, Greece
The Parthenon
Constructed C5th BC
By Phidias
Ratio 4:9

<http://www.hexapolis.com/2014/06/27/8-fascinating-facts-about-the-parthenon-the-cultural-icon-from-ancient-greece/>



Rome, Italy
The Colloseum
Constructed 70-80AD
Reign of Vespasian &
Titus.
Elliptical plan 640 R ft
long x 528 R ft wide

<http://colosseumromeitaly.blogspot.com/>



<http://2.bp.blogspot.com/-T2TknoeVZRE/T-IgAMIQ-vI/AAAAAAAAALo/OMk9SuTZmNA/s1600/cubit.gif>



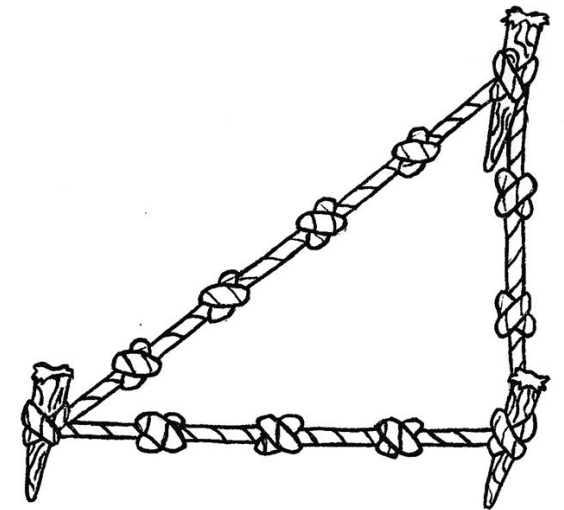
http://www.yallatours.com/blog/deir_el_medina/louvre-cubit.jpg



<https://4815162342execute.wordpress.com/lost-themes/hieroglyphs/>

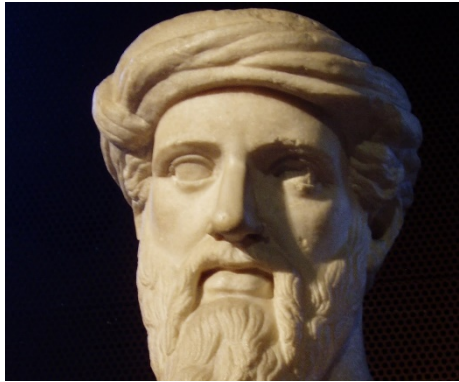


<http://www.taneter.org/Menna%20Surveying.jpg>



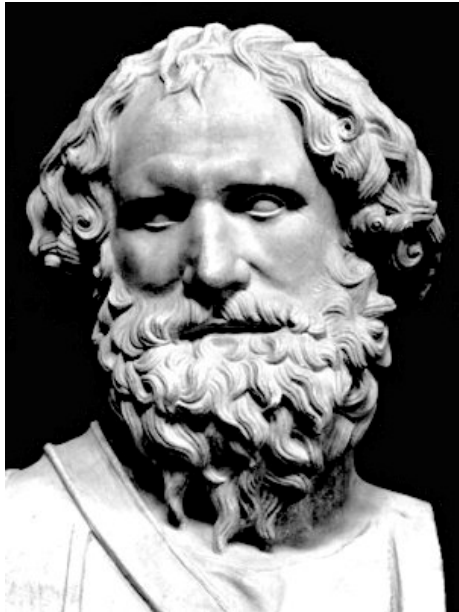
Ancient Egypt

Pythagoras born 570 BCE



<https://youtu.be/YompsDIEdtc>

Archimedes born 287BCE



<https://youtu.be/sw66gzBD9fE>



<http://edgarlowen.com/map-ancient-greece.jpg>

Ancient Greece / Hellenistic

Units of Measurement during the Greek Period

1 digit or *daktylos* - plural : *daktyloi* (19.3 mm)
2 digits = 1 *condylos*
4 digits = 1 *palaiste*
8 digits = 1 *dichas*
12 digits = 1 *spithame*
16 digits = 1 *pous* or foot - plural *podes* (309 mm)
20 digits = 1 *pygon* (called “Remen” by the Egyptians)
24 digits = 1 *pechya* or *pechys* (πεχυα) (**small cubit**)
40 digits = 1 *bema*
72 digits = 4.5 feet = 1 *xylon*

1 foot *pous* – plural *podes* (309 mm)
6 feet = 1 *orgyia* (1.854 m)
10 feet = 1 *akaina*
100 feet = 1 *plethron*
600 feet or 6 *plethra* = 1 *stadion* (185.4 m)

1 *stadion* (185.4 m) (Different variants of the stadion exist with around + - 30 m differences)
2 *stadia* = 1 *diaulos*
6 *diauloi* = 1 *dolichos*

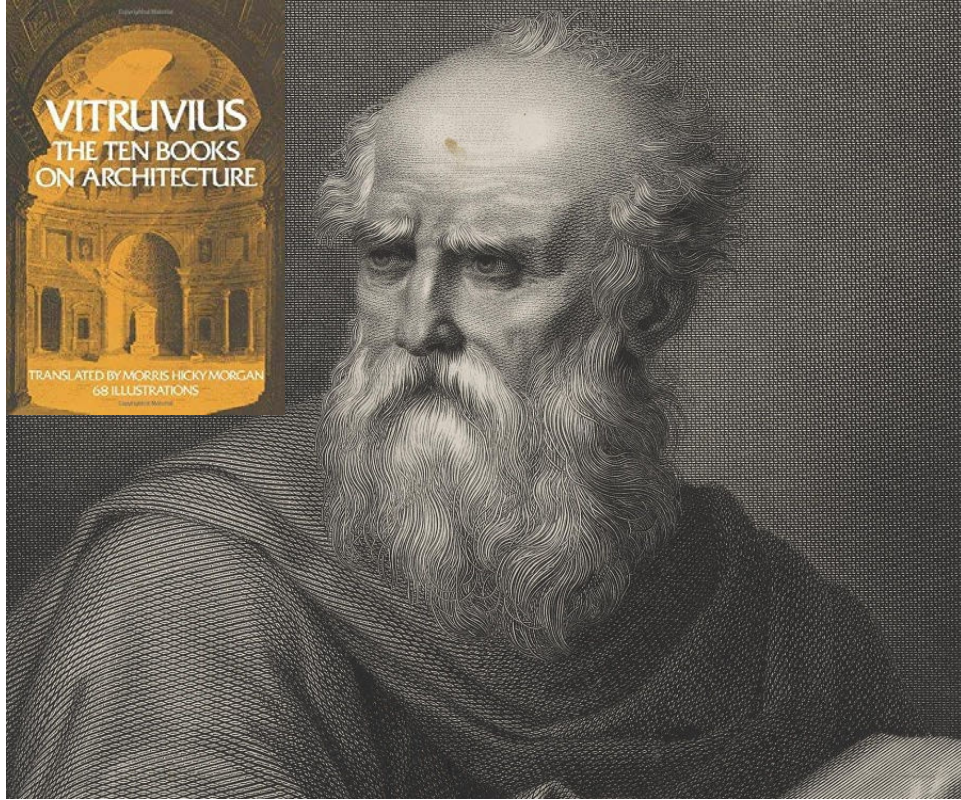
Lengths were measured by:

Schoinion, a cord of some standard length, *Schoinourgos*, the land surveyor. Heron of Alexandria knew that for example the length of the *schoinion* could change by humidity and he gave some recipes how to keep the distance as constant as possible, by hanging weights or smearing the *schoinion* with wax. The *schoinion* was 100 *cubits* divided in 8 *hammata* (knots)

halysis (metallic chain). This did not have the problems of the cord but it was probably expensive and too heavy to be used often as the *schoinion*.

kalamos measuring rod from reed or wood.

Vitruvius born 80-70 BCE



<https://www.thefamouspeople.com/profiles/vitruvius-34320.php>

Vitruvius asserts in his book *De architectura* (the ten books of architecture) that a structure must exhibit the three qualities of *firmitatis*, *utilitatis*, *venustatis* – that is, stability, utility, beauty.

Odometer:

<http://www.hellenicaworld.com/Greece/Technology/en/Measurements.html>



The odometer of Vitruvius was based on chariot wheels of 4 feet (1.2 m) diameter turning 400 times in one Roman **mile** (about 1400 m). For each revolution a pin on the axle engaged a 400 tooth cogwheel thus turning it one complete revolution per mile. This engaged another gear with holes along the circumference, where pebbles (*calculus*) were located, that were to drop one by one into a box. The distance travelled would thus be given simply by counting the number of pebbles.

Sleeswyk, André Wegener "Vitruvius' Odometer", *Scientific American* 245.4 (October, 1981), pp. 188–200

Early Roman Period

The Groma



<https://www.satpalda.com/blogs/evolution-in-surveying-techniques>

<https://youtu.be/-pIUTs2XD50>



<https://www.worldatlas.com/articles/5-important-cities-of-the-roman-empire.html>

Other surveying equipment used by the Roman included:
Dioptra, Libella and Chorobates.

Roman Empire



<https://daydreamtourist.files.wordpress.com/2014/05/harold-shot-2.jpg>

- Romans leave Britain around 400 AD
- Subsequent invasions, Anglo-Saxon (410 – 1066)
- Viking Expansion (800 – 1150) raids and settlement.
- Norman invasion 1066
- William the Conqueror – commissions the Domesday Book 1086.



<https://thelincolnite.co.uk/2017/03/931-year-old-domesday-book-coming-to-lincoln-for-special-exhibition/>

The Domesday Book is a great land survey from 1086, commissioned by William the Conqueror to assess the extent of the land and resources being owned in England (parts of Wales and Scotland) at the time, and the extent of the taxes he could raise. The information collected was recorded by hand in two huge books, in the space of around a year. William died before it was fully completed.

Britain Post Roman Period

Barleycorn: $\frac{1}{3}$ of an inch, the notional base unit under the Composition of Yards and Perches.

Digit: $\frac{3}{4}$ inch **Finger:** $\frac{7}{8}$ inch

Inch: 3 barleycorns (the historical legal definition)

Palm: 3 inches **Hand:** 4 inches

Shaftment: Width of the hand and outstretched thumb, 6 $\frac{1}{2}$ inches before 1066, 6 thereafter

Span: Width of the outstretched hand, from the tip of the thumb to the tip of the little finger, 3 palms = 9 inches.

Foot: Prior to the Anglo-Saxon invasions, the Roman foot of 11.65 inches (296 mm) was used. The Anglo-Saxons introduced a North-German foot of 13.2 inches (335 mm), divided into 4 palms or 12 thumbs, while the Roman foot continued to be used in the construction crafts. In the late 13th century, the modern foot of 304.8 mm was introduced, equal to exactly $\frac{10}{11}$ Anglo-Saxon foot.

Cubit: From fingertips to elbow, 18 inches.

Yard: (= Ulna) 3 feet = 36 inches, the practical base unit as the length of the prototype bar held by the Crown or Exchequer.

Fathom: Distance between arms outstretched, from fingertip to fingertip, equalling 6 feet.

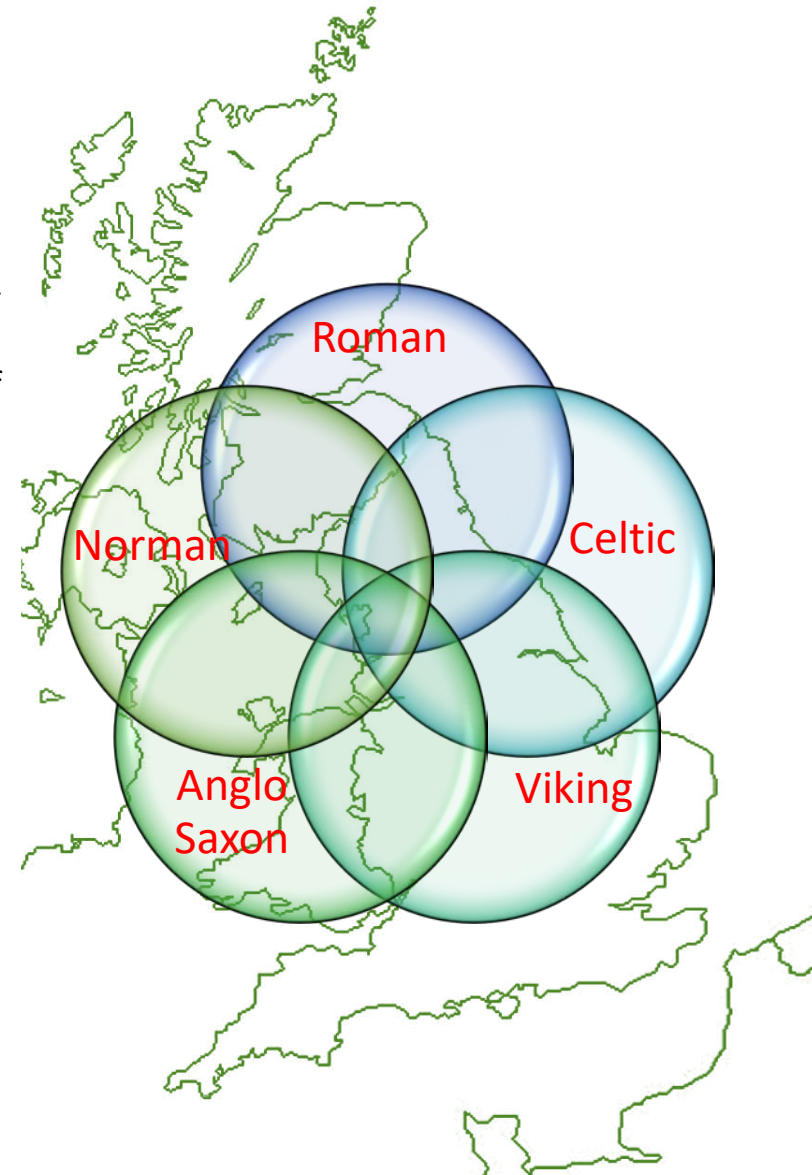
Rod: (= perch) (= pole) Used for surveying land and in architecture. The rod is the same length today as in Anglo-Saxon times, although its composition in terms of feet were changed by the Composition of Yards and Perches from 15 feet to 16 $\frac{1}{2}$. The pole is commonly used as a measurement for Allotment Gardens. (See also perch as an area and a volume unit.)

Furlong (= stade) Notionally the distance a plough team could furrow without rest, but actually a measure of 40 rods or 600 feet prior to the Composition of Yards and Perches and 40 rods or 660 feet afterwards.

Mile : Originally the Roman mile alternatively reckoned as 5000 feet, 1000 paces, or 8 stades but adjusted to 5280 feet in 1593 to account for the differences introduced to these methods of reckoning by the Composition of Yards and Perches.

League: Notionally an hour's travel, but usually reckoned as three miles. Approximate length of the traditional "mile" in German and Scandinavian countries.

- Parish Boundaries





https://en.wikipedia.org/wiki/Salisbury_Cathedral

Salisbury Cathedral (1220-1258)
 Stone Mason: Elias of Dereham
 Patron: Richard Poore



<https://thomasguild.blogspot.com/2013/09/the-medieval-toolchest-level-and-plumb.html>

The medieval mason was not a monk but a highly skilled lay craftsman who combined the roles of architect, builder, craftsman, designer and engineer. Using only a set of compasses, a set square and a staff or rope marked off in halves, thirds and fifths, the mason was able to construct some of the most amazing structures ever built: http://www.bbc.co.uk/history/british/middle_ages/architecture_medmason_01.shtml

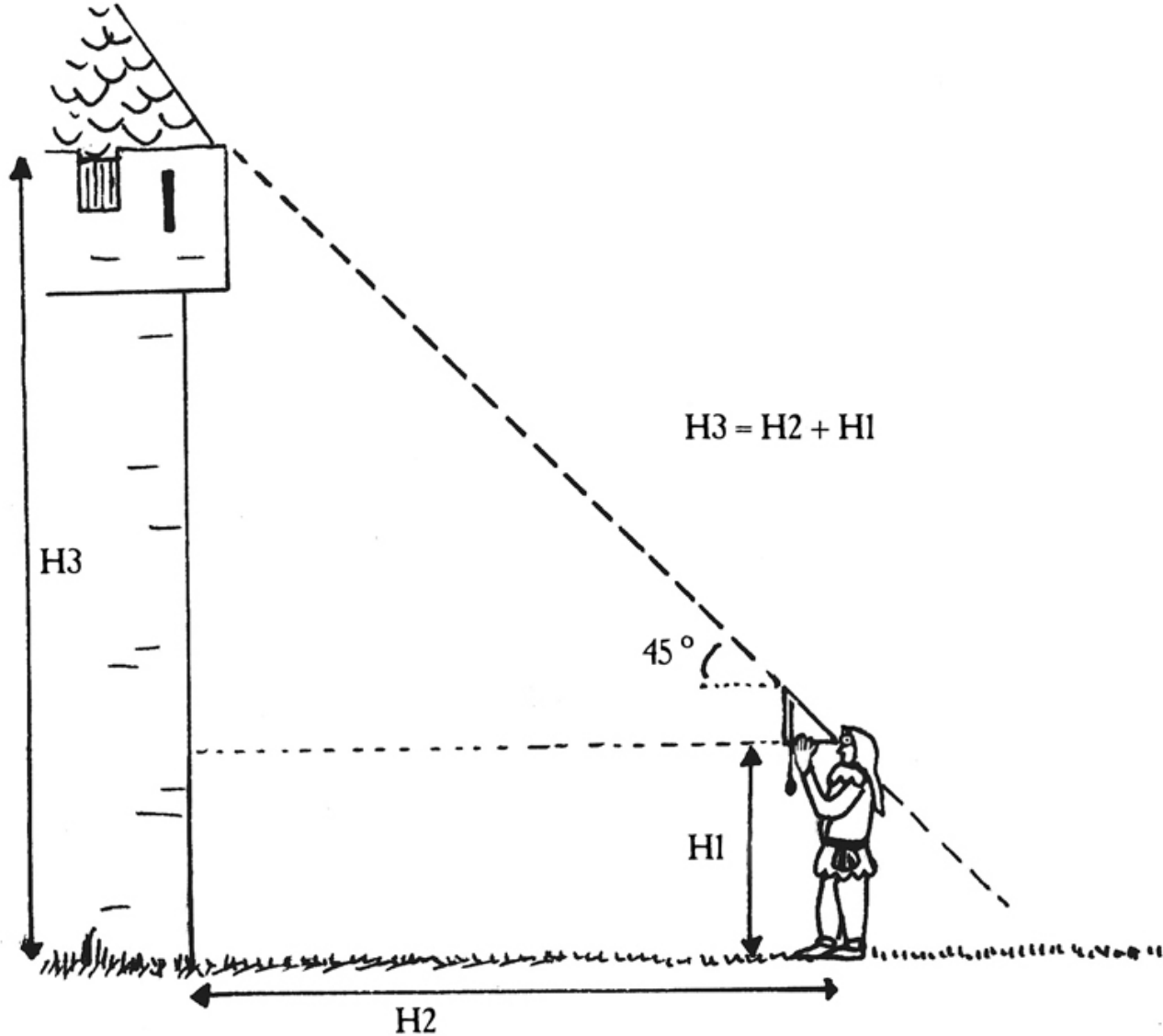


Gothic Period c1180 - 1520



https://en.wikipedia.org/wiki/Hampton_Court_Palace#/media/File:Great_Gate,_Hampton_Court_Palace.jpg

Hampton Court Palace
Completed 1525



Tudor Period c1485 - 1603



NEXT WEEK....

Modern Era, and Communicating Survey Information.