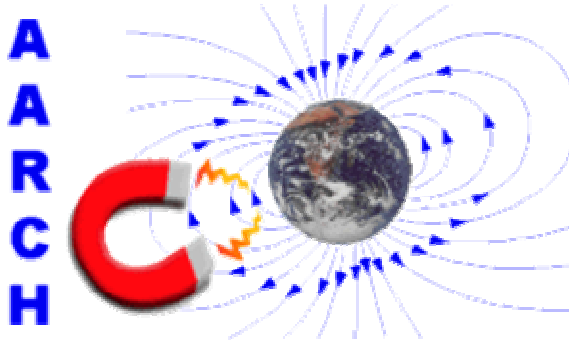

The AARCH Glossary

(English version)

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AD
Abbreviation from the latin anno domini. Denotes the time period after the birth of Christ.

A/m
Ampère per metre. Unit of magnetisation when expressed per unit of volume. Typically, the natural remanent magnetisation of a baked clay is in the order of 1 A/m and of a sediment 10^{-3} A/m.

Am^2
Ampère times metres squared. Unit of the magnetic moment.

Am^2/kg
Ampère times metres squared per kilogram. Unit of magnetisation when expressed per unit of weight.

Anhysteretic remanent magnetisation (ARM)
Remanent magnetisation imparted to a sample the laboratory by applying a decaying alternating magnetic field in the presence of a steady magnetic field.

Anisotropy of magnetic susceptibility (AMS)
Variation of magnetic susceptibility with direction. Generally, dominated by the form of the ferromagnetic grains and due to an alignment of elongated or flattened grains.

Antiferromagnetism
(see also ferromagnetism). Form of ferromagnetism in crystalline material with two oppositely and equally magnetised sublattices. The quantum mechanical exchange interaction at short distance between cations via an anion (indirect interaction) favours an antiparallel alignment of the individual magnetic moments of atoms or ions. The resulting magnetisation is zero. The magnetic susceptibility is weak. Antiferromagnetics become paramagnetic (see also paramagnetism) beyond the Néel-Temperature. Example: haematite. Antiferromagnetics often

have ferromagnetic properties due to impurities (parasitic ferromagnetism, e.g. in goethite, haematite) or because of an imperfect antiparallelism of the magnetic moments (canted antiferromagnetism, e.g. haematite).

Archaeointensity

Estimated intensity of the geomagnetic field in the past, based on measurements of remanent magnetisation of baked clays, that acquire their natural remanent magnetisation as thermoremanent magnetisation. Reheating experiments in a known laboratory field allow to determine absolute values of the ancient geomagnetic field.

Archaeomagnetic dating

A date obtained by comparing the values of the ancient geomagnetic field elements (declination, inclination, intensity) corresponding to the ChRM of baked clays with standard secular variation diagrams of the local geomagnetic field elements during the past.

Archaeomagnetism

(see also palaeomagnetism) For the archaeologist a dating method based on the remanent magnetisation of baked clays. Study of the magnetic properties of archaeological materials (mainly baked clays) of historical or pre-historical age.

Archaic Period

Cultural period in Greece between 750 and 500 BC, subsequent to the Dark Ages and followed by the Classical period. This period is characterised by the naturalistic representation of the human figure, the formation of city-states and the rise the aristocracy.

Azimuth

Angle between the vertical plane through the observation sight-of-line and the geographical meridional plane.

Bayesian statistics
Statistical theory of Thomas Bayes. The probability of an event higher in hierarchy is calculated on the basis of the probability estimates derived from an event lower in hierarchy or from empirical data.

Blocking temperature
Associated with thermoremanent magnetisation. On cooling of a substance containing suitable magnetic minerals, the temperature at which thermoremanent magnetisation becomes frozen in. This temperature will depend on the precise mineralogical composition of the substance as well as its crystalline organisation (e.g. large or small grains). When considering the heating of materials to remove their remanence, may be referred to as unblocking temperature. Blocking and unblocking temperature must not necessarily be equal.

BP
Before present. 14C dating before its correction in calendar years.

Bronze-age
Denotes a time period in the development of the human society subsequent to the Stone-age. Period of advanced metalworking. Techniques of smelting copper from natural outcrops and alloys like bronze were developed. The starting date differs from culture to culture: in Britain the Bronze-age lasted from 2200 to 700 BC; in central Europe from 1800 to 700 BC and in the Aegean the Bronze-age is associated with the Minoan period. The Bronze-age is followed by the Iron-age.

Byzantine period
Cultural period between 324 AD and 1453 AD denoting the supremacy of the Byzantine Empire in southeastern Europe, Syria, Egypt, Israel, and North Africa. Byzantium – the other name for the east-Roman empire – rose from the Roman empire and disappeared with the invasion of the ottoman Turks.

Capping

The capping or also topping of a (Roman) kiln comprises the material used as temporary covering for the open end of the superstructure. Its purpose was to prevent the loss of heat but also in the case of reducing firing, to prevent oxygen intrusion.

Carolingian

Denotes a time between the 8th and 10th century AD were a dynasty of Frankish rulers (amongst them Charles the Great) and their successor ruled parts of Europe (mainly territories in the present day France, Germany and Austria).

Characteristic remanent magnetisation (ChRM)

Remanent magnetisation obtained after removal of less stable remanent magnetisation components. It represents in general the record of the Earth magnetic field at the moment of cooling of a baked clay (see also remanence).

Chemical remanent magnetisation (CRM)

Remanent magnetisation acquired during the crystallisation of magnetic minerals in a magnetic field.

Classical Period

Cultural period in Greece between 500 and 336 BC subsequent to the Archaic period and followed by the Hellenistic period. Developments culminated in Athens in politics (Pericles), culture (Sophocles, Euripides) and philosophy (Socrates, Plato).

Coercivity

Magnetic field that must be applied to a material to change its magnetisation in the opposite direction. The coercivity depends inter alia on grain size and grain shape.

Coercivity spectrum

A variety of grain sizes and shapes exist in a sample or specimen. Hence, the coercivity is rather a distribution of values than a single value. This is called coercivity spectrum.

Combustion chamber

Part of a kiln, where the fire burns and from which hot gases percolated upwards through the raised oven floor to the overlying oven. In single chambered sunken kilns it is also called oven-pit.

Concentration parameter k

Approximation for the concentration parameter κ of the Fisherian statistics. Indicates the statistical distribution of point on the surface of a sphere and is a scatter estimate of for ChRM directions. $\kappa \sim k = (N-1)/N-R$); N – number of directions, R – modulus of the vector sum of all unit vectors. A mean ChRM direction of a site should have values of $k > 80$ to be considered as reliable result.

Confidence factor α_{95}

Semi-angle of the cone of confidence around the mean direction in which the true direction occurs with a confidence level of 95%. It is calculated from the following formula $\alpha_{(1-P)} = \cos$-1(1- (N-R)/R[(1/P)1/N-1-1])). N – number of directions, R – modulus of the vector sum of all unit vectors, P – is the probability and is usually 0.05. This means that one is 95% to find the unknown true mean direction within the α_{95} of the calculated mean. For a mean direction of an archaeological site α_{95} should not be more than 2°. In order to assess the accuracy of a mean direction, the concentration parameter k should also be considered, because smaller α_{95} can be obtained by increasing the number of samples.

Context dating

Relative dating of an archaeological structure or object based on other archaeological findings around with known age.

Cryogenic magnetometer

Instrument to measure the remanent magnetisation of rock and baked clay samples based on certain superconducting properties. The sample to be measured is inserted in a superconducting coil in which it induces a persistent electrical current. This current is send to another coil via a magnetic flux transformer. The amplified current is then detected by a sensor called SQUID-sensor, in reality a weak magnetic field detector. The superconducting coil consists in fact of

three pairs of orthogonal coils that can measure simultaneously the three orthogonal vector components of the magnetisation. Its main advantages compared to the spinner magnetometer are its high sensitivity, short response time and a signal independent of the velocity with which the sample is inserted in the detection coil.

Crystalline remanent magnetisation (CRM)
Remanent magnetisation acquired during the crystallisation of magnetic minerals in a magnetic field.

Curie, Pierre
French physicist (Paris 1859 – Paris 1906). He studied the magnetism of materials as a function of temperature and deduced from it the "principle of symmetry": the symmetry of elements of causes of physical phenomena must be found back in the effects. He deduced from it also a law, $\chi = C/T$, expressing the decrease of the magnetic susceptibility of paramagnetics with increasing temperature, known as the Curie-Weiss law. With his wife Marie Curie he studied the phenomenon of radioactivity and discovered with his brother Jacques, piezoelectricity. He obtained the Nobel Price in 1903.

Curie-temperature T_C
Temperature below which, magnetic moments of ferromagnetic materials are parallel. Beyond this critical temperature they become paramagnetic.

Dark Ages
Cultural period in Greece between 1100 and 750 BC, subsequent to the Mycenaean age and followed by the Archaic period. During this period Greece was occupied by the Dorians.

Dating
Determination of a date, in absolute chronology, in the Christian reference system [before Christ (BC), after Christ (AC); before or after our era).

Declination (D)
Angle between geographic north (true north) and magnetic north of the geomagnetic field. Also

angle between geographic north and the horizontal component of the magnetic remanence of a sample.

Demagnetisation

Action to eliminate the remanent magnetisation of a sample.

alternating field demagnetisation

Demagnetisation by applying a sufficiently strong alternating magnetic field which decreases smoothly towards zero.

thermal demagnetisation

Demagnetisation by heating above the Curie-or Néel-temperature followed by cooling in zero magnetic field to room temperature.

Depositional remanent magnetisation

Remanent magnetisation acquired by a sediment at the air/water sediment interface, by alignment of the magnetic particles. This remanent magnetisation may not be preserved at geological timescales due to bioturbation, cryoturbation, incomplete mechanical blocking of magnetic grains and diagenetic processes (see also post-depositional remanent magnetisation).

Detrital remanent magnetisation

General expression for the remanent magnetisation acquired by field alignment of magnetic particles during the deposition of a sediment (see depositional and post-depositional remanent magnetisation).

Diamagnetism

In materials with paired electrons (even number of electrons). All materials brought in a magnetic field show the effect of diamagnetism often masked by other more important effects of paramagnetism or ferromagnetism. The diamagnetic susceptibility is weak and negative. Examples: the most important constituents of rocks (quartz, feldspar, calcite).

Dipole field

The Earth magnetic field resembles to the field of a magnet placed at the centre of the Earth and inclined with respect to the Earths rotation axis and characterised by a magnetic north and south pole (dipole). Other forms of fields, designated multipolar fields, are called non-dipole fields.

Earth magnetic field

see geomagnetic field

Exhaust vent

One ore more holes on top of the superstructure through which the gases could escape into the atmosphere. At certain stages these holes were either open or closed in order to increase or decrease draught upwards.

Ferrimagnetism

Form of ferromagnetism in crystalline material with two oppositely but unequally magnetised sublattices. The quantum mechanical exchange interaction favours a parallel or antiparallel (via an anion) alignment of the magnetic moments as domains and one observes a resulting magnetisation. Ferrimagnetics become paramagnetics above the Néel-temperature TN. Examples: magnetite Fe_3O_4 (T_N = 585 °C) and maghaemite γ-Fe2O3 (T_N ~ 620 °C). (see also ferromagnetism). Ferrimagnetica have weak hysteretic properties.

Ferromagnetism

Magnetic state in a solid with unpaired electron spins (odd number of electrons) and atomic distances such that the quantum mechanical exchange interaction causes an alignment of the individual atomic magnetic moment as domains. Each domain has a maximum magnetisation, called spontaneous magnetisation. Ferromagnetics have a strong magnetic susceptibility, a strong remanent magnetisation and show the property of hysteresis. Ferromagnetics become paramagnetic above the Curie-temperature TC. The transition elements iron (Fe), nickel (Ni) and cobalt (Co) are ferromagnetic.

Fire-tunnel

Part of a kiln, connecting stokehole and combustion chamber. Other names are flue and sometimes, furnace or praefurnium. A part of the fire burnt at this place, with the flames directed towards the combustion chamber.

Fisherian-statistics

Statistic applied to a population of vectors when they are normally or Gaussian distributed in azimuth. It is used in archaeomagnetism to describe the spatial distribution of magnetisation directions. The probability density function is called Fisher-distribution (after Sir Ronald Fisher), which is a bivariate distribution as these are two variables: declination and inclination. The probability for an observation falling in a small element of area δA at an angular distance ψ from the true mean direction is given by $P_{\delta A}\ \delta A = \kappa / 4\pi \sinh(\kappa)\ e^{\kappa\cos(\psi)}\ \delta A$, with δA being $\sin(\psi)\ d\psi\ d\varphi$, where φ is the azimuth (or longitude) of the observation about the mean direction and ψ the co-inclination (or co-latitude). Application of the Fisher distribution assumes that declinations are randomly distributed and that the inclinations are exponentially distributed. The Fisherian statistics allow to define an error of true mean ChRM direction of the population, called the cone of confidence at given probability; in general 95% (see also concentration parameter, confidence factor).

Fluxgate-magnetometer

In a fluxgate magnetometer the steady magnetic field due to the sample is measured by a so called fluxgate sensor, which works on the induction principle, similar to a transformer. The sensor consists of a primary drive coil and a secondary pick-up coil, both winded around a highly permeable core that does not exhibit hysteresis. Alternating voltage is applied to the primary coil and induces a secondary alternating voltage in the pick-up coil. The presence of a sample causes an additional steady magnetic field. This field is superposed to the field that is caused by the primary coil and the sum of both is detected by the secondary coil. The voltage change per time at the pick-up coil is analysed by splitting the signal with Fourier-analysis into harmonics. The amplitude of the second harmonic is proportional to the steady magnetic field produced by the sample and which is only present if a steady field is present. Tri-axial fluxgate sensors can be used to measure the three orthogonal components of the magnetic field (depending on the position of the sensor), but also to measure the remanent magnetisation of a baked sample.

Gauss, Carl Friedrich
German mathematician (1777 - 1855), in the beginning of the 19th century known for his works in physics and mathematics. He did for the first time an absolute measurement of the intensity of the geomagnetic field and a global analysis of the geomagnetic field, called spherical harmonical analysis. He is also known for the law of Gauss, which allows to define an error at a given level of confidence for the estimation of the true mean of a series of observations.

Geographic meridial plane
Plane containing the local vertical and the rotation axis of the Earth.

Geographic north/south pole
Point on the surface of the Earth in the northern/southern hemisphere, situated on the Earths rotation axis.

Geomagnetic field
Magnetic field of the Earth. Resembles the field of a centric magnetic dipole inclined about 11.4° to the rotation axis of the Earth. It is defined in each place at a certain instant of time by its direction (declination, inclination) and intensity. The geomagnetic field is divided in an internal part (the main part), which is caused by fluid movements in the outer fluid core of the Earth and other sources in the upper Earth mantle and the Earth's crust, and an external part which is caused by currents in the ionosphere and magnetosphere. A complete mathematical description of the potential of the total magnetic field was developed by C.F. Gauss based on spherical harmonics.

Geomagnetic north/south pole
Poles based on a global analysis of the observed geomagnetic field limited to dipole terms. The geomagnetic poles corresponding to the International Geomagnetic Reference Model (IGRF) of 2005 are situated at:

North geomagnetic pole: 79.7° N and 71.8° W
South geomagnetic pole: 79.7° S and 108.2° E

Geomagnetic reversal

The phenomenon of polarity changes of the geomagnetic field. Currently, the south magnetic pole is situated in the southern hemisphere and the north magnetic pole in the northern hemisphere (normal polarity). This was not always the case in the Earth's past. If the magnetic poles are oppositely situated compared to now (i.e. the magnetic north pole was in the southern hemisphere) one speak about reversed polarity. Such polarity switching occurred many times in the geological past. The time between geomagnetic reversals is termed chron. We are presently in the Brunhes chron, after Bernhard Brunhes (1867-1910). The foregoing chron, when the magnetic poles were oppositely situated compared to now, is called Matuyama, named after Motonori Matuyama (1884-1958). The last geomagnetic reversal occurred 778 000 yeas ago and is called Matuyama/Brunhes.

Goethite

Antiferromagnetic mineral, but exhibits a weak ferromagnetic moment due to defects in the crystal structure. Acicular or fibrous, but in general isometric and of irregular form. Colour: brown-black, yellowish brown to red. In powder from yellow-brown to yellow-orange colour. Metallic to ashen reflectance. Hardness 5 to 5.5. Very common as alteration product in certain soil and sediments. Remains stable in recent soils of the temperate and humid climate zones, but can be transformed into fine-grained Haematite with time. Identified in 1806 as a new mineral named in honour of the German poet Johann Wolfgang von Goethe, also a great collector of minerals.

Grain

A macroscopic sample of a crystalline mineral will generally consist of multiple conjoined crystals of varying shapes and sizes. Each of these crystals, within which the atoms are arranged on a single regular lattice, is termed grain

Haematite

Antiferromagnetic mineral, but due to slightly imperfect antiparallelism of the magnetic moments it exhibits a weak ferromagnetic moment. Common in oxidised volcanic rocks and in sediments formed in an oxidising environment. It is the final product of prolonged oxidation of magnetite or maghaemite. It is also formed by dehydration of goethite. May also from a solution by precipitation in certain sediments (red sediments) and in hydrothermal veins. Very common in

tropical and subtropical soils. The name is derived from the Greek word aima, meaning blood. Mentioned by the Roman poet Vergilius in the 1st century BC in the *Eneid*. Also called oligist from the Greek work oligos, meaning very few, because it contains a lower percentage of iron compared to magnetite. Colour: steel gray to black. In powder from it has a red cherry or blood colour to reddish brown. Metallic reflectance. Hardness between 5 and 6.5. It occurs in massive forms as drused, botryoused or as fibrous concretions or also as an aggregate of laminar crystals or in rose like form. Occurs also as hexagonal platelets, but in general isometric and of irregular form. Iron ore. Utilised as a precious stone, or colourant, abrasive and as a polishing product.

Hellenistic Period

Cultural period in Greece (336-146 BC) between the conquest of the Persian Empire by Alexander the Great and the establishment of Roman supremacy.

Inclination I

Angle between the geomagnetic field and the local horizontal plane. Also the angle between a remanent magnetisation of a sample and the horizontal plane.

Induced magnetisation

Magnetic moment per unit of volume (A/m) or per unit of weight (Am^2/kg) of a magnetised sample, measured in the presence of a inducing magnetic field. The induced magnetisation is the sum of two components: the *remanent magnetisation* (magnetisation that remains when the magnetic field is removed) and *transient magnetisation* (magnetisation that disappears when the magnetic field is removed).

in-situ

The term in situ means, to an archaeomagnetist, unmoved since it acquired its original magnetisation – whether deliberately or accidental. It is thus far more specific than for an archaeologist for which the terms usually means that the object is not foreign, i.e. from outside the site.

Intensity F, M

The value or magnitude F of the geomagnetic field expressed in Tesla. Also the value or magnitude M of the remanent magnetisation of a sample expressed in A/m or Am^2/kg.

International geomagnetic reference model (IGRF)

Model for the global geomagnetic field of internal origin. It is based on a global spherical harmonical analysis and takes also temporal variations of the field into account. Calculate the geomagnetic field at your location for certain year:
http://nssdc.gsfc.nasa.gov/space/model/models/igrf.html

Iron-age

Denotes a time period in the development of the human society at which iron working was the most sophisticated form of metalworking. Its hardness, high melting point and the abundance of iron sources favoured its use. The Iron-age is subsequent to the Bronze-age. The Iron-age lasted in Britain from around 500 BC to 500 AD or until the Roman conquest (43 AD – 303 AD). In central Europe it lasted from about 800 BC until the Roman conquest.

Isothermal remanent magnetisation (IRM)

Remanent magnetisation acquired by a sample after the application of a constant or steady magnetic field and removal of the field.

Kiln

Fire place for producing pottery, glass ware, tiles, bricks, but also for melting metal. It consists of a stokehole, a fire-tunnel, a combustion chamber, the support, the raised oven-floor, the oven, the superstructure, exhaust vents and the capping.

Laplace equation

Linear partial homogeneous differential equation of second order and elliptical type. Used for the estimation of scalar potential fields (i.e. free of sources), such as the geomagnetic field at the Earths surface (or between surface and ionosphere). The Laplace equation can be solved in spherical coordinates by the expansion of the potential into spherical harmonics.

La Tène
A continental European Iron-age culture beginning around 450 BC and ending with the Roman conquest. Named after a Swiss lake site.

Maghaemite
Ferrimagnetic mineral. Utilised in certain magnetic recording tapes. Alteration product (fully oxidised from of magnetite), present in certain soils. Chemical formula γ-Fe2O3. Maghaemite is metastable, when heated and transforms into haematite.

Magnetic anisotropy
Variation of magnetic properties with direction.

Magnetic dipole
Ensemble of two equal magnetic charges of opposite sign.

Magnetic domains
Regions in a solid, where the magnetic moments of the atoms are parallel; separated by walls. They form spontaneously to minimise the potential energy of a magnetised material. For certain grain or crystal sizes, an entire grain may magnetised in the same direction (single domain behaviour). Equidimensional grains of magnetite are single domain between grain sizes of 0.025 to 0.060 micrometres (10^{-6} m). The single domain range for equidimensional haematite is much larger, it ranges from 0.025-0.030 up to 15 micrometres.

Magnetic field
Force field in the vicinity of a magnet or electrical current. Also magnetic induction or magnetic flux density. Unit is A/m. The unit of the Earth magnetic field is the unit of induction or Tesla.

Magnetic hysteresis
The magnetisation induced in a sample by a magnetic field lags behind the field. After removal of the field the sample possesses a remanent magnetisation.

Magnetic meridial plane

Local vertical plane containing magnetic north.

Magnetic minerals

Rock magnetic properties

Mineral	**Chemical formula**	**Magnetic susceptibility**	**Tc , Tn**	**Saturation magnetisation at room temperature**	**Saturation magnetisation at room temperature**
		10^{-8} m^3/kg (*)	**°C**	**kA/m**	**A m^2/kg**
magnetite	$Fe_3 O_4$	578	580-585	480	92
maghaemite	γFe_2O_3	500	~620 590-675	380	85
haematite	αFe_2O_3	25	675	~2,5	0,5
goethite	αFeOOH	0.5-1.5	120	~2	~1

Crystallographic properties

Mineral	**Chemical formula**	**Crystallographic system**	**Unit cell diameter (A)**	**Density kg/m^3**	**Transformation temperature**
magnetite	$Fe_3 O_4$	cubic inverse spinel	8.396	5.197	
maghaemite	γ-Fe_2O_3	Cubic or tetragonal spinel	8.337 (a) 24.99 (c)	5.074	250 →750°C
haematite	α-Fe_2O_3	rhombohedric	5.034 (a) 1.375 (c)	5.271	
goethite	α-FeOOH	orthorhombic	9.956 (b) 3.021 (c) 4.596 (a)	4.264	250-400°C

(*) these values are indicative, the magnetic susceptibility **depends strongly on grain size**

Magnetic moment

Expresses the magnetic intensity of a magnet. A couple of forces acting on a magnet placed perpendicular a uniform magnetic field with a magnetic flux density equal to the unit. The unit of the magnetic moment is Am^2.

Magnetic multipole

Ensemble of several even-numbered equal magnetic charges of opposite sign. A quadrupole is an ensemble of two north and two south poles. About 5% of the interior geomagnetic field are caused by a field of multipoles.

Magnetic north/south pole

Points on the surface of the Earth, where the observed magnetic inclination is +90° (magnetic north pole) or -90° (magnetic south pole) and where the horizontal component of the geomagnetic field is zero. The magnetic poles are currently situated at:

North magnetic pole *(in 2001):* 81.3° N and 110.8° W, near Elef Ringes island (Canada)
South magnetic pole *(in 2001):* 64.7° S and 138.0°E in the bay Commonwealth Bay (Antarctica)

Magnetic susceptibility

Measure of the ability of a sample to acquire a magnetisation in a magnetic field (magnetisability). Ratio of the magnetisation M induced in the sample over the inducing magnetic field H. k= M/H.

Magnetisation (M)

Magnetic moment per unit of volume (A/m) or per unit of weight (Am^2/kg) of a magnetised sample. In the presence of magnetic field one speaks about an induced magnetisation being the sum of two components: *remanent magnetisation* (magnetisation that remains when the magnetic field is removed) and *transient magnetisation* (magnetisation that disappears when the magnetic field is removed), otherwise it is called remanent magnetisation.

Magnetite

Ferrimagnetic mineral. Very common in the majority of volcanic, metamorphic and sedimentary rocks. Is also produced by certain bacteria: intracellular by magnetotactic bacteria and extracellular by iron reducing bacteria. Named after Magnès, who after Plinius the old discovered stones that attracted iron. According to another version the denomination magnetite should come from the locality of Magnesia in Macedonia where it was discovered. Magnetite forms granular to compact masses, more rarely it crystallises into tetrahedrons and dodecahedrons. The colour is

black with blue metallic reflectance. In powder form the colour is black. Strongly magnetic mineral. Iron ore. Hardness from 5.5 to 6.

Merovingian

Denotes a time when the Merovingian dynasty (dynasty of Frankish kings) who ruled territories in the present day Germany and France from the 5th to the 8th century AD.

Minoan period

Cultural period in Greece between 2000 and 1400 BC, subsequent to the Early Bronze age (2900-2000 BC) and followed by the Mycenaean age. The Greek Bronze-age civilisation was centred in Crete and the surrounding islands. The terrible eruption of the Santorini volcano around 1600 BC may be to certain extend responsible for the disappearance of the Minoan civilisation in Crete.

Mycenaean age

Cultural period in Greece between 1100 and 600 BC, subsequent to the Minoan period and followed by the Dark ages. This period was characterised by high cultural achievement, being the basis of myths and heroes later on.

Natural remanent magnetisation (NRM)

The in-situ remanent magnetisation of rocks and other materials like baked clays.

Néel, Louis

French physicist (Lyon 1904 – Brive-la-Gaillarde 2000). He discovered new types of magnetism, ferrimagnetism and antiferromagnetism completing in this way the theories on magnetism by P. Curie, P. Weiss and P. Langevin. Also known for his theories on the remanent magnetisation for single and multidomain particles. He proposed models of self-reversal for certain reversals observed in rocks. He obtained the Nobel Price in 1970.

Néel-temperature T_N

Temperature below which magnetic moments of antiferromagnetic and ferrimagnetic materials are antiparallel. Beyond this critical temperature they become paramagnetic.

Normal (Gaussian) distribution

When number of values are distributed around the mean value as a bell-shaped curve.

nT

NanoTesla (1 nanoTesla = 10-9 Tesla). Unit of magnetic induction (flux density). Also unit of the intensity of the geomagnetic field. After Nikola Tesla (1856 - 1943)

Oven

Part of a kiln, chamber in which pottery or other material was stacked for firing and into which hot gases and flames rose from the underlying combustion chamber through the raised oven floor.

Palaeointensity

Ancient magnetic intensity of the geomagnetic field, based on measurements of remanent magnetisation of rock and sediments. Samples that acquired their natural remanent magnetisation as thermoremanent magnetisation (e.g. lavas), can be used to determine absolute ancient field intensities (absolute palaeointensity) by reheating experiments in a known laboratory field. In this case on speak about absolute palaeointensity determinations.

The ChRM intensity of certain sediments as normalised by an artificial remanence (e.g. ARM) is used as indicator for relative changes of the geomagnetic field. Here one speak about relative palaeointensity determination.

Palaeomagnetism

Study of the behaviour of the geomagnetic field during geological times based on remanent magnetisation of rocks.

Paramagnetism

In materials with unpaired electrons and when the atoms or ions, carrying a magnetic moment, are diluted (gas or ions carrying a magnetic moment in silicate matrix). The susceptibility is weak and positive. Examples: materials with rare Earth or transitional elements: clays, pyroxene, amphibole.

Partial thermo-remanent magnetisation (pTRM)

Remanent magnetisation of a sample at room temperature, acquired in a temperature interval $[T_1;T_2]$ (with $T_2 \leq$ Curie- / Néel-Temperature and $T_1 >$ than room temperature) in the presence of a magnetic field (see also total thermo-remanent magnetisation, tTRM).

Post-depositional remanent magnetisation (pDRM)

Magnetic remanence acquired by a sediment after its deposition, when all magnetic particles are fixed in the sedimentary matrix. This remanent magnetisation is preserved over geological timescales (see also depositional remanent magnetisation).

Raised oven floor

Part of a kiln, also called false floor. The raised oven floor covered the combustion chamber and upon it vessels or other ware to be burnt was stacked for firing. It was built of portable components such as bars, positioned at certain intervals, but also of solid clay perforated with vent-holes. In both cases hot air coming from the combustion chamber was able enter the oven.

Relaxation time

The time in which the remanent magnetisation decreases by 1/e (e = Euler number) of its initial value.

Remanence – remanent magnetisation

Partial persistence of a phenomenon after disappearance of its cause. Remanent magnetisation of a material is the magnetisation that remains after removal of the inducing magnetic field.

Roman period
Period of the Roman supremacy in Europe and the Mediterranean, lasting from 27 BC until 378 AD.

Sample
In archaeomagnetism, a piece or fragment of baked material taken in an in-situ baked structure.

Secular variation
The interior geomagnetic field is also a function of time. The field slowly changes its direction and intensity. This temporal change is known as secular variation. The secular variation has been discovered by the English mathematician and astronomer H. Gellibrand (1597-1637) in 1634. The secular variation can be graphically represented in a Bauer-plot (inclination vs. declination), named after L.A. Bauer (1865 - 1920). Basis of archaeomagnetic dating.

Specimen
Cylindrical or cubic piece cut from a sample by drilling or sawing, respectively.

Spherical harmonics
The spherical harmonics are a common solution of the Laplace equation. C.F. Gauss (1839) them used for the mathematical description of the global geomagnetic field. He could show, that the total Earth's geomagnetic field is composed of external an internal fields which have certain geometries (magnetic dipole, magnetic multipoles). The IGRF model is based on spherical harmonics.

Spinner magnetometer
Instrument to measure the remanent magnetisation of rocks based on the dynamo principle. The sample is rotated in the centre of a coil. During rotation the field lines of the magnetic moment of the sample cut the coil and induce in it an electromagnetic force (signal) according to the low of Faraday. The amplitude of the signal is proportional to the magnetic moment of the sample and its phase determines the direction of the magnetic moment.

SQUID-sensor

The SQUID sensor or Superconducting Quantum Interference Device can be regarded as a ring with superconducting properties. Once a circulating current I is stimulated in the ring, it flows for ever as the resistivity is nearly zero and the current can only be changed through an external magnetic field (from a sample). When the external magnetic field is strong enough, the circulating current reaches a critical value I_c, the SQUID becomes resistive, magnetic flux enters the ring and the current drops by quantised values $\Delta I = n\Phi_0$ ($n\Phi_0$ denotes multiples of the flux quantum $\Phi_0 = \hbar/2e = 2.07$ (10-15, $\hbar$ = Planck's constant and e = electron charge) below I_c. As the current dropped below Ic, the superconducting state is achieved again. Further increase of the external magnetic field yield multiple flux changes. A critical current equal to $0.75\Phi_0$, causes the circulating current to change polarity. The number of polarity changes is proportional of the magnetic field produced by the sample and hence to its remanent magnetisation.

Stokehole

Part of a kiln. A hollow dug into the ground from which fuel was put into the fire burning in the combustion chamber. Also called stoke-pit. If the kiln is built at the surface one can speak about a stoking area.

Stone-age

Denotes a time period in the early development of the human society before the use of metals, Weapons and tools were made from stone. Began in Europe around 2 million years ago and ended around 4000 BC. It can be subdivided in three periods Palaeolithic, Mesolithic and Neolithic.

Superparamagnetism

Ferromagnetism of very small particles (in the order of 30 nm) that have relaxation times on the laboratory time scale.

Superstructure

Free-standing temporary or permanent walling of the kiln above the ground, this term applies also to the kiln structure above the level of the raised oven-floor.

Support
Protruding, recessed or raised structure, temporary or in-built located in the combustion chamber of a kiln, to support the mechanical stability of the overlying raised oven-floor. If located in the centre of the kiln as single standing element, also called pedestal.

Theodolite
Survey instrument equipped with an objective used in geodesy to measure horizontal and vertical angles and in astronomy to determine the azimuth and the apparent height of a celestial body.

Total thermo-remanent magnetisation (tTRM)
Remanent magnetisation of a sample at room temperature after cooling from a temperature higher than the Curie- or Néel-Temperature in a magnetic field, see also partial thermoremanent magnetisation (pTRM).

Transience - transient magnetisation
A component of the induced magnetisation that exits only in the presence of a inducing magnetic field.

Typology
Relative dating method in archaeology based on classification of things according to their characteristics.

Vector
The geomagnetic field as a force can be represented in each point of the Earth's surface as a vector (arrow) the orientation of which defines the direction and sense of the action of the field and the length of which symbolises the intensity.

Virtual axial dipole moment (VADM)
The same as VDM, but here the magnetic co-latitude of the sampling site is used instead of the geographic co-latitude, hence the imaginary dipole being axial.

Virtual dipole moment (VDM)

Intensity of an imaginary dipole (located in the centre of the Earth) that would produce the estimated archaeo-/palaeointensity at the sampling site. It is calculated from the archaeo-/palaeointensity and the palaeoinclination of a sample as estimated by measurements in the laboratory, and the geographic co-latitude of the sampling site.

Virtual geomagnetic pole (VGP)

Geographic position of a geomagnetic north/south pole related to an imaginary dipole (located in the centre of the Earth) which would produce the observed ChRM in a sample. The VGP is calculated from the mean ChRM direction of a sample and the geographic coordinates of the sampling site.

Viscous remanent magnetisation (VRM)

Remanent magnetisation acquired spontaneously by a sample after an exposure to a weak magnetic field.