Prognostics & Divinations

Image references

Divinations
Image references

AEROMANCY: Divination interpreting **atmospheric conditions**.
There are several different forms including:
Austromancy (wind);
Ceraunoscopy (thunder & lightning);
Chaomancy (aerial visions);
Meteormancy (meteors, especially shooting stars).

AILUROMANCY: Divination through interpreting the appearance and behavior of **cats**.
A form of augury.

ALECTORMANCY, ALECTROMANCY, ALECTRYOMANCY: Divination through interpreting the appearance and behavior of **sacred chickens** (originally); current versions include the interpretation of fowls eating grain and marking the cock's crow as letters are recited. A form of augury.

ALEUROMANCY: Divination with flour is attested in cuneiform tablets from the 2nd millennium BCE. Flour was poured out in small heaps and the interpretation was based on the observation of their shapes and orientation.
In its original form, slips of paper containing philosophical writings would be baked inside of cakes or cookies, which would then be distributed to those wishing their fortunes to be told. Similarly, the Greeks would bake slips of paper with sentences on them inside of balls of flour, mix the balls nine times, and distribute them. Modern fortune cookies are a variant on these forms of divination.
Another form of aleuromancy consisted of interpreting patterns of flour left in a bowl after a flour and water slurry had been mixed in it and poured away.

ALOMANCY: Divination by interpreting **salt**.
The origin of misfortune associated with spilled salt. Also known as Halomancy.

ALPHITOMANCY: A divination practice to identify guilty parties **by feeding an individual or group a loaf of barley**. Innocent people would feel no ill effect but guilty ones would experience indigestion.
Alphitomancy was often used to identify criminals or adulterers. Also known as Cursed Bread.

AMNIOMANCY: Divination by inspecting and interpreting the **caul of a baby at birth**.

ANTHROPOMANCY, ANTINOPOMANCY: Divination interpreting the **entrails of human sacrifice**.
Recorded instances of anthropomancy are from ancient Egypt and Rome and were documented as heinous acts at the time of their occurrences. Also known as Splanchomancy.

APANTOMANCY: Divination through interpreting any objects (or beings) that happen to present themselves. A common form of apantomancy is interpreting the appearance and behavior of animals during chance meetings (a form of augury). The superstition associated with a **black cat** crossing one's path is Apantomancy.

ARACHNOMANCY: Divination by interpreting the appearance and behavior of **spiders**.
A form of augury.

ARITHMANCY, ARITHOMANCY, ARITHMOMANCY: Divination by interpreting **numbers**.
Greeks used the number and value of the letters in the names of two combatants to predict the victor. This form of divination has been adopted and modified by many cultures over the millennial. One of its evolved forms is the current magical system of **Numerology**.

ARMOMANCY: Divining by inspecting the **shoulders of a person**.
Used originally to determine the suitability of a person for sacrifice to the gods.

ARUSPICY: Divination by interpreting **animal entrails.** Aruspicy is sometimes considered to be a form of augury (interpreting form and behavior of animals). Similar to Anthropomancy (interpretation of human entrails) and Heiromancy (interpretation of sacrificed animals)
Also known as Haruspicy, Extispicy, Extispicium

ASPIDOMANCY: Divining by entering casting a circle and summoning an entity.

ASTRAGALOMANCY, also known as **ASTRAGYROMANCY**, is a form of divination that uses **dice** specially marked with letters or numbers.
Originally, as with dice games, the "dice" were knucklebones or other small bones of quadrupeds. Marked astragali (talus bones) of sheep and goats are common at Mediterranean and Near Eastern archaeological sites, particularly at funeral and religious locations. For example, marked astragali have been found near the altar of Aphrodite Ourania in Athens, Greece, suggesting astragalomancy was performed near the altar after about 500 BC.

ASTROLOGY, ASTROSOPHY: Divination by interpreting the movements of heavenly bodies, particularly the major planets.

AUGURY: Often used synonymously with divination to mean the interpretation of signs and omens. More accurately, it is divination based on **the appearance or behavior of animals**.
Includes:
Alectryomancy (chickens);
Arachnomancy (spiders);
Entomomancy (insects);
Hippomancy (horses)
Ichthyomancy (fish);
Myomancy (mice);
Ophiomancy (snakes);
Zoomancy (any animal);

AUSTROMANCY: Divination by interpreting **wind**. A form of aeromancy.

AUTOGRAPHY, AUTOMATIC WRITING, AUTOMATIC SPEAKING:
Spirit communication done unconsciously by an individual often in trance, obsession or possession states. Automatic communication has occurred with people in a fully conscious state without their awareness of the action and distinct personality and knowledge variants (e.g.: fluency in an ancient language) have been documented. Autography and Automatic Writing apply to written communication and are also known as Psychography. They are distinct from Direct Writing where a spirit writes directly without human or mechanical assistance. All forms are distinct from Psychomancy where the diviner summons the spirit consciously for communication.

AXINOMANCY, AXIOMANCY: Divination using an **ax or hatchet**.
Both the handle and the blade are used in various forms.

BELOMANCY: Divination through interpreting **arrows**.
This type of divination is expressly forbidden in the Koran. Also known as Bolomancy.

BIBLIOMANCY: Originally, the divination used to assess the guilt or innocence of a person accused of sorcery. The person was weighed against the great Bible in the Church and if the person weighed less than the bible they were deemed innocent.
Today, bibliomancy refers to divination **interpreting randomly chosen passages in books** and is also called stichomancy. The most common form is opening a book to a random page to answer a question. The Bible is still the most frequently used book, although any book may be used. Using books by Virgil and Homer specifically is called stoichemancy. The variant of using a book of poetry is called rhapsodomancy.

BOTANOMANCY: A form of pyromancy, interpreting **burned or burning tree branches and leaves.** Originally the branches of brier and verbena were used and the question was carved into the branch. Often used today to refer to divination by the interpretation of plants.

CAPNOMANCY: Divination by interpreting **smoke** rising from a fire, especially sacred fires.
A form of pyromancy.
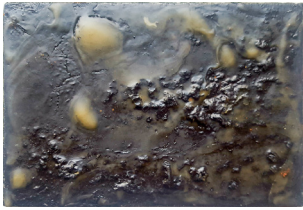
CARROMANCY: Divination by interpreting **melting wax** (usually poured into cold water).
Also called Ceromancy, Ceroscopy.

CARTOMANCY: Divination using modern playing cards. Some sources include **Tarot** and other **Divination cards** in this category.
Apollos Musen Tempel, - ein Orakelspiel, Vienna, 19 c.

CATOPTROMANCY, CATOXTROMANCY, CATTOBOMANCY: Divination by interpreting **images in a reflective or transparent object** such as a mirror, crystal globe or pool of water.
The earliest recorded form of catoptromancy turned a mirror toward the moon to catch moonbeams. Also known as Crystallomancy, Crystalomancy, Dubjed, Enoptromancy, Scrying.

CAUSIMOMANCY, CAUSINOMANCY: Divination from observing the behavior or reaction of **objects placed in a fire.** It is a particularly good sign if combustible materials do not catch fire.

CEPHALOMANCY: Divination interpreting the **skull or head of a donkey or goat.**
Also known as Kephalonomancy.

CERAUNOSCOPY: Divination by interpreting **thunder and lightning.** A form of Aeromancy.

CHAOMANCY: Divination by interpreting **aerial visions.** A form of Aeromancy

CHEIROMANCY, CHIROGNOMY, CHIROLOGY, CHIROMANCY: Divination through **analysis of hand shape, fingers, fingernails and the palms**.
According to legend, it is one of the oldest Witch skills, taught to mortals by Aradia, daughter of Lucifer and Diana.
Also known as Palmistry.

CLAIRAUDIENCE: Divination through **hearing the future**. Clairaudience is often categorized under the broader heading of Clairvoyance.

CLAIRVOYANCE: Divination through **seeing the future**. Clairvoyance specifically refers to the visual image of future events, but other forms of "seeing" the future are commonly called clairvoyance including:
Clairaudience (hearing);
Metagnomy (induced through hypnotic trance);
Precognition (inner knowing); and
Psychometry (induced through contact with a physical object).

CLEIDOMANCY: A form of radiesthesia (divination using a pendulum) using a suspended key as the **pendulum**. Also known as Clidomancy.

CLEROMANCY is a form of sortition, casting of lots, in which an outcome is determined by means that normally would be considered random, such as the rolling of dice, but are sometimes believed to reveal the will of God, or other supernatural entities.

CRANIOSCOPY: Divination and character analysis by studying the shape and structure of the **human skull**. Also known as **Phrenology**.

CRITHOMANCY, CRITOMANCY: Divination by interpreting **food**, usually cakes and breads, that are offered in sacrifice.

CROMNIOMANCY: Divination by interpreting **onions or onion sprouts.**

CRYSTALLOMANCY, CRYSTALOMANCY: See Catoptromancy. Scrying.

CYCLOMANCY: Divination by interpreting revolving **wheels**.

DACTYLIOMANCY, DACTYLOMANCY: Divination using **rings**. Most frequently dactylomancy is done in the form of radiesthesia (divination using a pendulum) and the ring is suspended over various objects. One form uses rings of various metals placed on the fingernails in patterns in conjunction with the planets. Sources indicate it is often used for dowsing.

DAPHNOMANCY: Divination by interpreting a **burning laurel branch**. If the fire crackles it is a positive sign. A form of pyromancy.

DEMONOMANCY: Divination by evoking **demons** to reveal information.

DENDROMANCY: Divination interpreting **trees**, especially oak or mistletoe.

DERVISHING: The practice of **whirling into a state of ecstasy.** Sometimes cited as a form of Gyromancy (divination by interpreting the fall of a person who whirls until they are dizzy and fall down).

DOWSING: Divination **to find a person, place, thing or element buried in the earth**. Dowsing will often involve using a pendulum (radiesthesia) or divining rod (rhabdomancy).

ENTOMANCY: Divination interpreting the appearance and behavior of **insects**. A form of augury.

FRACTOMANCY: Divination by interpreting the structure of **fractal geometric patterns.**

GASTROMANCY: Divination by interpreting the **sounds or signs on the belly.** Gastromancy is most frequently reported as a voice emanating from the belly and it has been dismissed by most occult investigators as a form of ventriloquism and trickery.

GELOSCOPY: Divination by interpreting **laughter**.

GEMATRIA: A system of discovering **truths and hidden meanings behind words**, using numerical values for letters of the alphabet. Each letter corresponds to a number. The numerical values of words are totaled and interpreted in terms of other words with the same numerical value. Gematria dates back to the 8th century B.C. Babylon, and has been used by most mystics since that time including the Magi, Gnostics, and Quabbalists. Notarikon is a form of gematria in which the first and last letters of a word or phrase are put together to create a new word, or to turn a word into a phrase. Temurah is a form of gematria that creates anagrams through systematic letter substitutions. See also: Numerology.

GENETHIALOGY: Divination by interpreting the **influence of the stars at birth** to predict the future. A form of astrology.
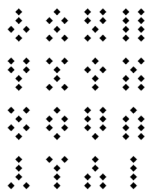
GEOMANCY: ("earth divination") is a method of divination that interprets **markings on the ground** or the **patterns** formed by tossed handfuls of soil, rocks, or sand. The most prevalent form of divinatory geomancy involves interpreting a series of 16 figures formed by a randomized process that involves recursion followed by analyzing them, often augmented with astrological interpretations.
Geomancy was practiced by people from all social classes. It was one of the most popular forms of divination throughout Africa and Europe, particularly during the Middle Ages and the Renaissance.

GRAPHOLOGY: Divination and character analysis by interpreting **handwriting**.

GYROMANCY: Divination by **walking or whirling in a circle until dizzy** and interpreting the point of the person's fall. The circle used is often laid out with letters. Some sources include Dervishing (whirling into an ecstasy) as a form of gyromancy.

HALOMANCY: See Alomancy.

HAKATA: Bones, dice, seeds or shells used for divination.

HARUSPEX: See Ariolater.

HEPATOMANCY, HEPATOSCOPY: Divination by examining **the liver of an animal**. A form of aruspicy (divination with animal entrails).

HIEROMANCY, HIEROSCOPY: Divination by interpreting **sacrificial objects** such as burnt offerings or slaughtered animals. Similar to aruspicy (interpretation of animal entrails).

HIPPOMANCY: Divination by interpreting the appearance and behavior of **horses**.
A form of augury.

HOROSCOPE: An **astrological chart** for a specific person or group that charts and correlates the signs of the zodiac as they are crossed by the sun, moon and planets and the position of planets in the twelve astrological houses.

HOROSCOPY: Divination and character analysis by interpreting a **horoscope**

HYDATOSCOPY: Divination by interpreting **rainwater**. A form of Hydromancy.
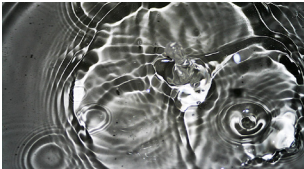
HYDROMANCY: Divination by interpreting **water** including its color, ebb and flow, or ripples produced by pebbles dropped in a pool. Also known as Ydromancy.

ICHTHYOMANCY: Divination interpreting the appearance and behavior of **fish**.
A form of augury (divination by interpreting the appearance or behavior of animals);
Divination interpreting the **entrails of fish**.
A form of aruspicy (divination by interpreting animal entrails).

IDOLOMANCY: Divination by interpreting **idols, images or figures**.

LAMPADOMANCY: Divination by interpreting a candle or lamp, usually the **flame**.
A form of pyromancy.

LECANOMANCY: Divination by interpreting the sound or image of an object or substance falling into a body of water.

LIBRANOMANCY: Divination by interpreting **smoke from incense**.
A form of capnomancy. Also known as Livanomancy.

LITHOMANCY: Divination using precious or semiprecious **stones** either by interpreting light reflected from stones (crystallomancy, scrying) or casting them and interpreting the way they fall.

LIVANOMANCY: See Libranomancy.

LOGARITHMANCY: Divination by interpreting **logarithms**.

LUNOMANCY: Divination by interpreting moonlight on a person's face dusted with silver.
A form of Selenomancy.

LYCHNOMANCY: Divination by interpreting the flames of three candles.
Similar to Lampodomancy.

MACHAROMANCY: Divination by interpreting **knives or swords**.

MARGARITOMANCY: Divination using **pearls** and interpreting the light reflected or the way they fall. Similar to Lithomancy.

METAGNOMY: Divination by interpreting **visions received in a trance state**.

METEOROMANCY: Divination by interpreting **falling stars** (meteors). A form of aeromancy.

METOPOSCOPY: Divination and character analysis through interpreting **facial lines and wrinkles, especially of the forehead.**
La metoposcopia, Spontone Ciro (1642.)
First published in 1626 this a reprint of the 1637 second edition of this treatise on the art of determining character by the study of lines on men's foreheads, finely illustrated with small cuts of heads. Such methods of divination were especially in vogue in the 16th century, with numerous works on chiromancy, etc., and had lost favor by the 17th century but still found some supporters.

MOLEOSCOPY, MOLEOSOPHY: Divination and character assessment by interpreting **moles on the body.**

MOLYBDOMANCY: Divination by interpreting **molten tin** or **lead**.

MYOMANCY: Divination by interpreting the appearance and behavior of **mice**.
A form of Augury.

MYRMOMANCY: Divination by interpreting the appearance and behavior of **ants**.
A form of augury.

NECROMANCY: Divination through **communication with ghosts or corpses**. The spirits of the dead are sought for information because they are supposedly able to access information beyond that available to the living. Necromantic rites are not practiced in Witchcraft or Wicca. Necromancy differs from other forms of divination involving contact with spirits because it is specifically geared to summoning those spirits that are not existing in a "natural" state and therefore they are assumed to be unhappy and/or malicious.

NOTARIKON: A form of gematria in which the first and last letters of a word or phrase are put together to create a new word, or to turn a word into a phrase. Gematria is a system of discovering truths and hidden meanings behind words, **using numerical values for letters of the alphabet**. Each letter corresponds to a number. The numerical values of words are totaled and interpreted in terms of other words with the same numerical value. Gematria dates back to the 8th century B.C. Babylon, and has been used by most mystics since that time including the Magi, Gnostics, and Quabbalists. Temurah is a form of gematria that creates anagrams through systematic letter substitutions. See also: Numerology.

NUMEROLOGY, NUMEROMANCY: The system of magic and divination developed by Pythagoras. In numerology, all words, names and numbers may be reduced to single digits which correspond to certain occult characteristics that influence one's life. Numerology is used to analyze a person's character; assess weaknesses, strengths and natural gifts; predict one's future and fate; determine the best place to live; and discover the best times to make decisions and take action. See also: Gematria.

OCULOMANCY: Divination by interpreting the **eye**.

OENOMANCY, OINOMANCY: Divination by interpreting **wine**.

OMEN: A sign, preferably found in nature, that foretells either good or bad events.

OMPHALOMANCY, OMPHILOMANCY: Divination by interpreting the **navel** (bellybutton). Originally omphalomancy involved counting the number of knots in the umbilical cord to predict how many more children a mother would have.
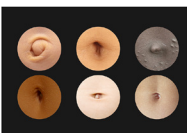
ONEIROMANCY, ONIROMANCY: Divination by interpreting **dreams**.

Egyptian dream book

ONOMANCY, ONOMOMANCY, ONOMATOMANCY: Divination by interpreting **names**.

ONYCHOMANCY: Divination by interpreting the fingernails. The original form was to study the reflection of the sun in the nails of a young boy.

OOMANTIA: Divination by interpreting the shape, color, and patterns (when dyed) of an **egg**.

OOSCOPY: Divination by **nurturing an egg and observing the hatching of a chick**.
Often used to determine the sex of an expected child.

OPHIOMANCY: Divination by observing the appearance and behavior of **serpents**.
A form of augury.

ORACLE: A person who speaks directly to a Deity to divine or prophesize.
Also known as Prophet, Theomancer. See Also: Ariolater, Aruspex, Clairvoyant, Diviner, Haruspex, Seer, Soothsayer.

ORNISCOPY, ORINITHOMANCY: Divination by interpreting the appearance and behavior of **birds**, especially their flight or song. A form of augury.

OUIJA, OUIJA BOARD (French, oui: "yes"; German, ja: "yes"):
A divination tool with the alphabet and numbers laid out on a board. Also called a Spirit Board.

OVOMANCY: Divination by interpreting the **yolk of an egg**.

PALLOMANCY: Divination interpreting the **movements of pendulum**, often used in dowsing.
Different forms of pallomancy include:
Cleidomancy (using a key);
Coscinomancy (using a sieve);
Dactylomancy (using a ring);
Also known as Radiesthesia.
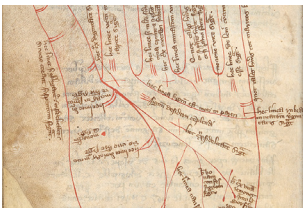
PALMISTRY: See Cheiromancy.

PAPYROMANCY: Divination by interpreting folding paper.

PEDOMANCY: Divination by interpreting the **footprint of a person**, usually encased in clay.
A form of podomancy (interpreting the feet).

PEGOMANCY: Divination by interpreting **sacred pools, springs, wells or fountains**.
A form of Hydromancy and often used in conjunction with scrying.

PESSOMANCY: Divination by casting or drawing **marked pebbles or beans**.
A form of Sortilege. Also known as Psephomancy.
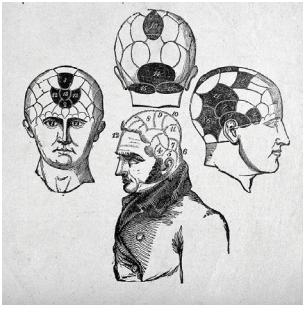
PHRENOLOGY: See Cranioscopy.

PHYLLORHODOMANCY: Divination by interpreting **rose petals**. The original form involved slapping a rose petal against the palm of the hand and interpreting the sound made.

PHYSIOGNOMY: Divination and character analysis by interpreting the **face**.
Similar to Metoposcopy (interpretation of facial lines).

PODOMANCY: Divination by interpreting the **feet**.

PRECOGNITION: **An an inner knowledge or vision of future events**, especially those that appear to be inevitable. Similar to Premonition (a vague image or sense of the event).

PREMONITION: **A warning of an impending event**, experienced as foreboding, anxiety and intuitive sense of dread. Premonitions tend to occur before disasters, accidents and deaths. Similar to Precognition (a clear image of the event).

PROPHECY: **A prediction of future events**, usually divinely inspired.

PROPHET: See Oracle.

PSYCHOGRAPHY: **Spirit communication done unconsciously** by an individual often in trance, obsession or possession states. Automatic communication has occurred with people in a fully conscious state without their awareness of the action and distinct personality and knowledge variants (e.g.: fluency in an ancient language) have been documented. Psychography is the term applied to written communication and is also known as Autography and Automatic Writing. Psychography is distinct from Direct Writing where a spirit writes directly without human or mechanical assistance. All forms are distinct from Psychomancy where the diviner consciously summons the spirit for communication.

PSYCHOMANCY: Divination by interpreting the **soul** of a person, their values, beliefs and morals. Also known as Soul Reading.

PSYCHOMETRY: Divination by interpreting **an object to obtain information about its history and/or owner.** Considered to be a form of clairvoyance and often used to locate missing persons or to assist in solving crime. The term was coined in the mid-nineteenth century by Joseph R. Buchanan, an American physiologist.

PYROMANCY: Divination by interpreting **fires, flames or burning objects**.
There are many different forms of pyromancy including:
Botanomancy (burning branches and leaves);
Capnomancy (smoke);
Causinomancy (burning flammable objects);
Daphnomancy (burning a laurel branch);
Lampadomancy (lamps or candles);
Pyroscopy (burning paper);
Sideromancy (burning straw).

PYROSCOPY: Divination by interpreting **burning paper**. Originally, pyroscopy was the interpretation of the stains left on a light surface after burning paper, current practice includes observation of the paper as it burns. A form of pyromancy.

RADIESTHESIA: See Pallomancy.

RHABDOMANCY: Divination using a **stick, wand or divining rod**.
Rhabdomancy is often used in dowsing.

RHAPSODOMANCY: Divination by interpreting **randomly chosen passages in a book of Poetry**. The most common form is opening a book to a random page to answer a question. The variant of using any book is called bibliomancy or stichomancy and using books by Virgil and Homer is called stoichemancy.

ROADOMANCY: Divination by interpreting the **stars.**

SCAPULOMANCY: Divination by interpreting the **patterns, cracks and fissures of the burned shoulder blade of an animal.** Sometimes considered to be a form of augury (divination by interpreting the appearance and behavior of animals). Also known as Spatulamancy

SCATOMANCY: Divination by interpreting **excrement**.
A form of Spatalamancy (divination by interpreting skin, bones or excrement).

SCIAMANCY, SCIOMANCY: Divination by **communication with spirits.**
Distinct from Necromancy in that the spirits are voluntary participants in the divination.

SCRYING: See Catoptromancy.

SEER: See Ariolater.

SELENOMANCY: Divination by interpreting the appearance and phase of the **moon.**

SIDEROMANCY: Divination interpreting **straw placed on a hot iron surface**.
A form of pyromancy (divination interpreting fire).

SKATHAROMANCY: Divination by interpreting the **tracks of a beetle crawling over a grave**, especially that of a murder victim.
A form of augury (interpreting the appearance or behavior of animals).

SOUL READING: See Psychomancy.

SPATULAMANCY: See Scapulomancy.

SPIRIT BOARD: See Ouija.

SPLANCHOMANCY: See Anthropomancy.

SPODANOMANCY, SPODOMANCY: Divination by interpreting **ashes, soot or cinder**s, usually from sacrificial fires or burnt offerings.
Also known as Tephramancy, Tephromancy or Tuphramancy.

STICHOMANCY: See Bibliomancy.

STOLISOMANCY: Divination by interpreting **people's clothing and style**.

SYCOMANCY: Divination by interpreting the response of a written question to moisture.
Originally, questions were written on fig leaves, the slower the leaf dried out, the more favorable the prediction. Today, sycomancy is done with paper (observing the response to steam) or tree leaves (observing the drying time).

TAROT: Divination by interpreting a set of cards.

TASSEOGRAPHY, TASSEOMANCY: Divination by interpreting **tea leaves and coffee grounds**.

TEMURAH: A form of gematria that creates **anagrams through systematic letter substitutions**. Gematria is a system of discovering truths and hidden meanings behind words, using numerical values for letters of the alphabet. Each letter corresponds to a number. The numerical values of words are totaled and interpreted in terms of other words with the same numerical value. Gematria dates back to the 8th century B.C. Babylon , and has been used by most mystics since that time including the Magi, Gnostics, and Quabbalists. Notarikon is a form of gematria in which the first and last letters of a word or phrase are put together to create a new word, or to turn a word into a phrase. See also: Numerology.

THEOMANCY: Divination through **direct contact with a Deity**.
Practitioners are usually referred to as Oracles, Prophets or Theomancers.

THERIOMANCY: Divination by interpreting the **movement of groups of animals**
(e.g.: flocks of geese, herds of cattle).
A form of augury (divination by interpreting the appearance or behavior of animals).

URIMANCY, UROMANCY: Divination by interpreting **urine**.

URIM V'TUMIM: Divination by interpreting the **sacred stones attached to the breast plate of a 'High Priest'.**

XENOMANCY: Divination by interpreting meetings with **strangers**.

XYLOMANCY: Divination by interpreting kindling or other **wood pieces that can be found ready for burning**. Interpretations include where they are found, their shape and type or how they burn.

ZOOMANCY: Divination by interpreting the appearance and behavior of **animals**.
Synonymous with one of the definitions of augury.

ZYGOMANCY: Divination by using **weights**, the original form of Bibliomancy (being weighed against the Bible) is a form of zygomancy.

Prognostics
Image references

Albrecht Dürer: **The Four Horsemen of the Apocalypse**, woodblock print, 1497/98

The Beatus of Facundus, p 441. Three unclean spirits come out of the mouths of the Dragon, the Beast and the false prophet, their mission is to gather the kings of the whole world for a war against God.
The Beatus of Facundus is an illuminated manuscript copied by a certain Facundus on behalf of the King of Spain Ferdinand I of León and Castile and his wife Sancha. Copied from the Beatus of Liébana it was completed in 1047 and contains a commentary on the Apocalypse.

The Silos Apocalypse, Silos, Spain, 1091
Manuscript in the Pierpont Morgan Library. New York.

"Joseph Enthroned" from the **Falnama (Book of Omens)**, one of the most splendid tools ever devised to foretell the future in ancient Islamic world, written between the 16th and early 17th centuries. Created at the end of the Islamic millennium, it speaks to the universal fear of what the future holds and the quest to know the unknown.
The way the book worked was not unlike an ancient cootie catcher. The seeker of omens would first perform ritual ablutions and recite certain prayers before opening the over-sized manuscripts to a random page that would answer a question.

"The Moon", painting from the **Falnama (Book of Omens)**, created in Northern India, second half of the 16th century CE.

The Prophet Solomon and the Phoenix's agreement is witnessed by members of his court;
the two yogis in the foreground represent the assembled jinns.
Untitled tale of *Solomon and the Phoenix* from the Tipu Library. British Library, IO Islamic 1255.

"The Gentleman's Dream" or "Dillusion with the World" is a 1650s vanitas painting by Spanish artist Antonio de Pereda.
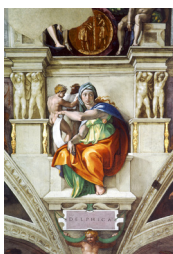
The Delphic Sibyl (detail from the ceiling of the Sistine Chapel in the Vatican), 1508-1512.
Michelangelo Buonarroti (1475-1564)

BOOK OF CHANGES: An ancient Chinese system of oracular divination that reveals patterns of subtle forces. The questioner is required to interpret the information provided through deep introspection and intuitive thought. *The Book of Changes*, also known as the **I Ching**, dates back to about 2852 B.C.

Page from a Song Dynasty (960-1279) print of the **I Ching** (Yi Jing, Classic of Changes or Book of Changes)

Bone oracles made out of tortoise plastrons. The shell or bones where carefully prepared for divination rituals or sessions, in which the shell or bone was anointed with blood and then subdued to an intense heat source, producing a crack. The form or the sound of the crack where sources for interpretation of questions asked to the bone oracles.

Chinese Bone oracle. In ancient Chinese divination tradition, bone oracles where made up of many different kinds of bones, including ox, boars, sheep and deer scapulae, ox rib bones, and some other animal bones. Earliest evidence of this is dated as late as the fourth millennium BC. With time, the use of tortoise plastron became increasingly normal.
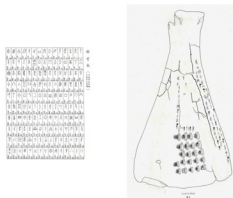
Chinese Bone oracle. See above

The Liver of Piacenza is an Etruscan artifact found in a field on September 26, 1877, near Gossolengo, in the province of Piacenza, Italy. The liver is subdivided into sections for the purposes of performing **haruspicy** (hepatoscopy) – the reading of omens specifically from the liver; the sections are inscribed with names of individual Etruscan deities. The Piacenza liver is a striking conceptual parallel to clay models of sheep's livers known from the Ancient Near East, reinforcing the evidence of a connection (be it by migration or mere cultural contact) between the Etruscans and the Anatolian cultural sphere.

Clay model of a sheep's liver used for instruction in liver divination in a Babylonian Temple School, c. 2000 B.C.

Drawing of the **Entrails** (probably Old Babylonian or Middle Babylonian period (second millennium BC); 94 x 106 x 28 mm; clay.

Sacrifice in front of the Temple of Jupiter Capitolinus. ca. 118—125 CE. Roman. Marble relief. Louvre Paris.

Glycon's oracle
Late 2nd century statue of Glycon, an ancient snake god with a large and influential cult in the Roman Empire during the second century. Lucian of Samosata (125 - 180 AD) claimed Glycon was created in the mid 2nd century by the Greek prophet Alexander of Abonoteichos. Lucian was ill-disposed toward the cult, calling Alexander a false prophet and accusing the whole enterprise of being a hoax: Glycon himself was supposedly a hand puppet.

Nebra Sky Disk is a bronze disk of about 30 centimeters in diameter and 2.2 kilograms in weight. The gold symbols in it are interpreted as celestial elements (including a cluster of seven interpreted as the Pleiades, the sun or the moon, among others). It is dated to 1600 BC and research suggest it was an artifact of the Bronze Age Unetice culture, Central Europe.

Astrological plaque with dice.
Iran, 1600 – 1700. This plaque and the accompanying sets of dice were made to predict the future. A diviner would throw the dice, and then interpret the results with the aid of the astrological designs on the plaque. The engraved designs include the signs of the zodiac, along with various inscriptions.

From Johannes Virdung´s "**Prognostica**", 1492. On an axis around the earth, in the center, represented as a disc with a cityscape is the dark sun at the bottom, the red moon at the top. This is flanked by one moon, each for an entrance and one for the exit from the earth shadow. The scheme is flanked on both sides by a green dragon.

Nut, Egyptian goddess of the sky with human figures representing stars and constellations, from the star chart in the tomb of Ramses VI.

Tibetan chart indicating good and bad bloodletting days and when to guard against demons. The chart also contains a smeba, 9 figures symbolizing the elements in geomancy, in the center with the Chinese pakua, 8 trigrams, surrounded by 12 animals representing months and years. Below this, symbols of the 7 days of the week. 106 compartments containing an ornamental letter in each and written in dbu indicate bloodletting days. The protector deities, top, are Manjursri, the White Tara and Vajrapani, below them the 8 fortune signs and other symbols.

Thai Divination
Date 1750-1820

Title: Divination manual.
A manual used for divination and fortune telling, known in Thailand as Phrommachat.
Illustrations in water color, ink and gilt. Pages 2-13: animals of the zodiac with explanations.
Pages 14-30: illustrations regarding lucky and unlucky omens.

Thai Divination
Date 1750-1820. See above.

The **Dresden Codex** is a Mayan book, the oldest surviving from the Americas, dating to the 13th or 14th century. The *Dresden Codex* contains accurate astronomical tables, which are recognized by students of the codex for its detailed Venus tables and lunar tables. The lunar series has intervals correlating with eclipses, while the Venus tables correlate with the movements of the planet Venus. The codex also contains astrological tables and ritual schedules.

Pages of the **Heidelberger Schicksalsbuch** (book of fate), parchment manuscript completed in the 1490s in Regensburg, Germany. In 271 pages it treats topics of astrology and magic.

Page of the **Heidelberger Schicksalsbuch.**
Parchment manuscript completed in the 1490s in Regensburg, Germany. In 271 pages it treats topics of astrology and magic.

Tibetan fortune telling cards. Watercolor, Tibet.

Tarot de Marseille
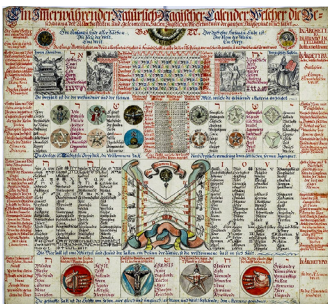
Ein Im[m]erwährender Natürlich-Magischer Calender, Welcher die Beschauung der Allertiefesten und Geheimesten Sachen, Ingleichen die Erkäntnüs der gantzen Philosophie in sich faßet, 1582.
("An everlasting natural-magical calender, which contains the contemplation of the most profound and secret things as well as the knowledge of the whole of philosophy,")

Aztec solar calendar. Historical sources state that Moctetzuma II, emperor of the Aztects in the moment of the arrival to Mexico of Spanish conqueror Hernán Cortés in the year 1519, was aware of the possible "second return" of Aztec deity Quetzalcoatl in the year 1519 – the year of the anniversary of the 10th "life cycle" since the mysterious departure of Quetzalcoatl who had promised to return to reinstate the glory to the Aztecs.

O-mikuji are random fortunes written on strips of paper at Shinto shrines and Buddhist temples in Japan. Literally "sacred lot", these are usually received by making a small offering (generally a five-yen coin as it is considered good luck) and randomly choosing one from a box, hoping for the resulting fortune to be good.

When the prediction is bad, it is a custom to fold up the strip of paper and attach it to a pine tree or a wall of metal wires alongside other bad fortunes in the temple or shrine grounds.

Nadi Palm Leaves
In Tamil Nadu, the texts are mainly written in Vattezhuthu, which is an ancient Thamizh (Tamil) script. They were written by an ancient priest or "Rishi" called Agastya who had a highly developed consciousness. These ancient records of providence were made famous by practitioners around the Vaitheeswara Temple in the state of Tamil Nadu. First, the Nadi palm leaves are located based on the thumb impressions (right for men, left for women).
Nadi leaves were initially stored in the premises of Thanjavur's Saraswati Mahal Library in Tamil Nadu. The British colonialists later showed interest in the Nadi leaves concerned with herbs and medicine, future prediction, etc. Some leaves got destroyed, and the remaining were auctioned during the British Raj (rule). Nadi leaves were obtained by the families of astrologers at the Vaitheeswaran Temple and have been passed down the years from one generation to the other. There is also another set of astrologers claiming that the content written in the palm leaf is a conversation between Shiva and Parvathi. This is called "Shiva nadi jyotisiyam".

Nggam is a type of divination found among many groups in western Cameroon. Among the best documented is its practice by the Mambila people of Cameroon and Nigeria, in which the actions of spiders or crabs are interpreted by the diviner.

Nggam, see above

Eshu, god from the **Yoruba** religion in Nigeria.
An essentially protective, benevolent spirit who serves Ifa, the chief god, as a messenger between heaven and earth. Eshu requires constant appeasement in order to carry out his assigned functions of conveying sacrifices and divining the future.

Cuba **Itoom**.
Rubbing or friction oracles are created in many forms. The best known are the *itoom* rubbing oracles of Cuba and related peoples. These may take the form of animals such as crocodiles, warthogs, dogs, and others.

Yoruba Divination Tappers.
Divination Objects are used to communicate with gods, spirits and ancestors
to understand or influence one's fate.

Yoruba, Nigeria: A bowl called 'Agere Ifa', in which the priest of the **Ifa oracle** keeps the 16 palm nuts he needs for his predictions.

Opon Ifá are divination trays used in traditional African and Afro-American religions, using mainly the system know as Ifa in the Yoruba tradition. Sixteen palm or kola nuts, the Ikin Ifá, are thrown onto the Opon Ifá's wooden surface, and the babalowo interprets which of the 256 possible sets of Odu (verses) are displayed by the nuts, through his communication with Ifá.

Baule, Ivory Coast: A 'mouse oracle', with a carved, seated, male figure. The 'mouse oracle' of the Baule people functions in the following way: the priest places a few small objects, mostly sticks, in the interior of the round vessel. They are placed in a specific order. Then he digs a small, narrow passage near the vessel and scatters some mouse food here. If a mouse comes and eats the food, it gets underneath the wooden pot – and on the lower side of the 'mouse oracle' there is a hole. The mouse crawls through this hole into the vessel, and through a second hole into the hollow in which the priest has placed his sticks. The mouse then brings them into disarray, and the priest creates his oracle based on the new position of his little sticks.

Kafigeledjo, Oracle Figure 19th–mid–20th century
A hybrid creation that lies outside the realm of anything recognizable in nature, this oracle figure deliberately provokes anxiety through its shrouded anonymity and the sense of suffocation and entrapment it suggests. These works and the ritual practice in which they are used are both known as Kafigeledjo ("He who speaks the truth").
These figures give visual representation to invisible bush spirits and function as divination devices. *Kafigeledjo* divination is used to uncover misdeeds, false testimony, and culpability. Although such works have the potential to affect all members of a Senufo community, access to this oracle is restricted to the most enlightened senior male and, occasionally, female members, who keep it shrouded in secrecy.

The Triumph of Death or The 3 Fates.
Flemish tapestry (probably Brussels, ca 1510-1520). The three fates, **Clotho, Lachesis and Atropos**, who spin, draw out and cut the thread of Life, represent Death in this tapestry, as they triumph over the fallen body of Chastity. This is the third subject in Petrarch's poem *The Triumphs*. First, Love triumphs; then Love is overcome by Chastity, Chastity by Death, Death by Fame, Fame by Time and Time by Eternity.

In Plato's *Apology of Socrates,* Socrates (469–399 BC) claimed to have a **daimonion** (literally, a "divine something") that frequently warned him—in the form of a "voice"—against mistakes but never told him what to do.

Drawing - Socrates and his Agathodaemon, Solomon, Simeon, 1840 - 1905

Precogs, or officially known as Precognitives, are individuals that possess a psychic ability to see events in the future, primarily premeditated murders.
(*Minority Report*, a 2002 American cyberpunk action thriller film directed by Steven Spielberg and loosely based on the 1956 short story "The Minority Report" by Philip K. Dick.)

In ancient Roman religion and myth, **Carmenta** was a goddess of childbirth and prophecy, associated with technological innovation as well as the protection of mothers and children, and a patron of midwives. She was also said to have invented the Latin alphabet.
The name *Carmenta* is derived from Latin **carmen, meaning a magic spell, oracle or song**, and also **the root of the English word charm**. Her original name was *Nicostrate*, but it was changed later to honor her renown for giving oracles.


The Tea-Tax-Tempest (The Oracle) by John Dixon, 1774
This allegorical scene captures a British artist's response to the American Revolution. Father Time, at left, holds up a magic lantern (an early image projector) to reveal a view of the destruction of Britain with heraldic leopards fighting. America sits in the shadows, at right, wearing products from her realm: a string of pearls, a feathered headdress, and an animal-skin wrap. Her physical separation from her companions, representing Europe, Asia, and Africa, suggests the impending imperial rupture. Using gouache paint, an unknown artist altered Dixon's original mezzotint print, which depicts a hopeful resolution to the conflict, to reveal anxiety about the outcome.
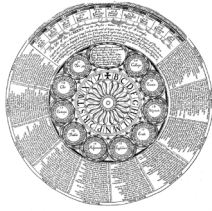
A fortune-telling game, in the collection of the British Library. Anonymous, printed in Great Britain between 1650 and 1750. "*The screene of fortune here behold which will informe both young & old. In all you desire to know. If you but burne the wheel below. Unto some letter there you'l see what tis the starrs for you decree of good.*"
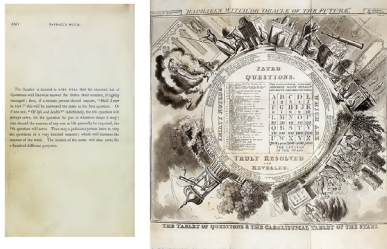
Pages from: *Raphael's witch!!! or the oracle of the future.*

Raphael's Witch, a work that was first published in 1831. Its pseudonymous author was Robert Cross Smith (1795-1832), an alchemist and astrologer with a broad interest in the occult, who supported himself by publishing astrological books and journals.

Geheime Figuren der Rosenkreuzer, aus dem 16ten und 17ten Jahrhundert: aus einem alten Mscpt. *Zum erstenmal ans Licht gestellt: erstes Heft.* (Secret figures of the Rosecrutians from the 16th and 17th cent. brought to light for the first time from an old manuscript.)

Kabbalah (Hebrew, literally "reception, tradition" or "correspondence") is an esoteric method, discipline, and school of thought in Jewish mysticism.

Painting depicting **The Great Lisbon Earthquake of 1755** (hand-colored woodcut of a 19th century illustration). The natural disaster caused huge consequences in the European Age of Enlightenment, as it served as an example to attack the notion that god wanted the best for mankind. It served also a source of inspiration to find the causes of earthquakes in science.

We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes.
— Pierre Simon Laplace, A Philosophical Essay on Probabilities
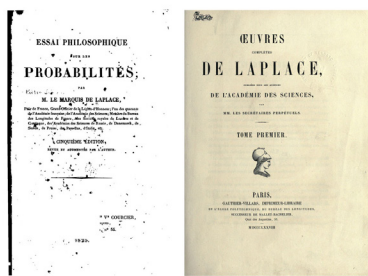
Pierre-Simon, marquis de Laplace (1749 – 1827) was a French scholar whose work was important to the development of engineering, mathematics, statistics, physics, astronomy, and philosophy. He summarized and extended the work of his predecessors in his five-volume *Mécanique Céleste* (Celestial Mechanics) (1799–1825). This work translated the geometric study of classical mechanics to one based on calculus, opening up a broader range of problems. In statistics, the *Bayesian interpretation of probability* was developed mainly by Laplace.
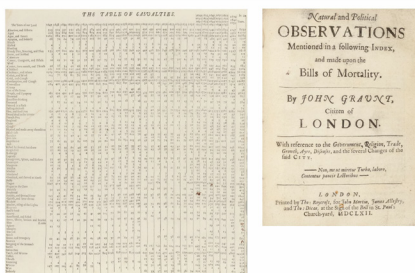
Bills of Mortality, John Graunt
His book *Natural and Political Observations Made upon the Bills of Mortality* (1662 Old Style or 1663 New Style) used analysis of the bills of mortality (weekly statistics of deaths) in early modern London as Charles II and other officials attempted to create a system to warn of the onset and spread of bubonic plague in the city. Though the system was never truly created, Graunt's work in studying the rolls resulted in the first statistically based estimation of the population of London. His work ran to five editions by 1676 and is a basis of actuarial statistics.
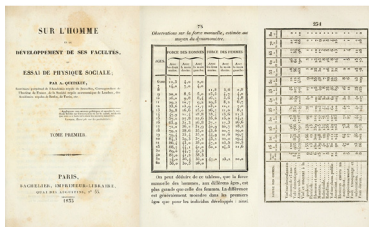
Sur l'homme et le développement de ses facultés, ou, Essai de physique sociale (1835).
Republished in 1869 under title "Physique sociale".
Lambert Adolphe Jacques Quetelet (1796 – 1874) was a Belgian astronomer, mathematician, statistician and sociologist. He founded and directed the Brussels Observatory and was influential in introducing statistical methods to the social sciences. He also founded the science of anthropometry and developed the *body mass index scale*, originally called the *Quetelet Index*.
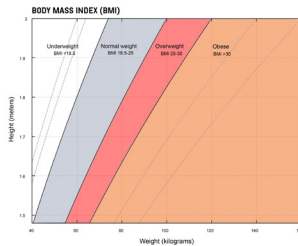
Body Mass Index
The quest for a practical index of relative body weight that began shortly after actuaries reported the increased mortality of their overweight policyholders culminated after World War II, when the relationship between weight and cardiovascular disease became the subject of epidemiological studies. It became evident then that the best index was the ratio of the weight in kilograms divided by the square of the height in meters, or the Quetelet Index described in 1832. Adolphe Quetelet's (1796–1874) pioneering cross-sectional studies of human growth led him to conclude that other than the spurts of growth after birth and during puberty, 'the weight increases as the square of the height', known as the Quetelet Index until it was termed the Body Mass Index in 1972 by Ancel Keys (1904–2004).
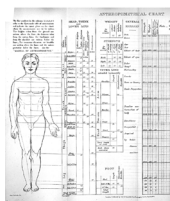
Antropometric chart
Anthropometry (from Greek anthropos, 'human', and metron, 'measure') refers to the measurement of the human individual. An early tool of physical anthropology, it has been used for identification, for the purposes of understanding human physical variation, in paleoanthropology and in various attempts to correlate physical with racial and psychological traits. Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape.
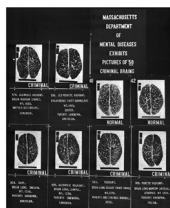
A 1920´s image from the *Massachusetts Department of Mental Diseases* attempting to associate brain types to criminal behavior (i.e. Biological Determinism)

Composite portraiture, Francis Galton, *1883.*
Beginning 1877, Francis Galton worked with the process of composite photography to verify and illustrate his study of heredity. This involved exposing an arbitrary number of individual portraits of chosen groups of people on a photographic plate, with the respective exposure time for each image made in relation to the number of used portraits. The overlapping caused the subjects' individual physiognomic qualities to vanish and accentuated common characteristics of the chosen group. The composite process resulted in producing a slightly blurred image, which, as Galton wrote, «portrayed no specific type of person, but rather an imaginary figure endowed with the average characteristics of a specific group of people. [...] [This] represents the portrait of a type and not of an individual.» Galton's process was founded on the physiognomic idea that a person's character and potential could be established through appearance alone.

Inquiries into Human Faculty and Its Development is an 1883 book by Francis Galton, in which he covers a variety of psychological phenomena and their subsequent measurement. In this text he also references the idea of eugenics and coined the term for the first time. Galton created the statistical concept of correlation and widely promoted regression toward the mean. He was the first to apply statistical methods to the study of human differences and inheritance of intelligence, and introduced the use of questionnaires and surveys for collecting data on human communities, which he needed for genealogical and biographical works and for his anthropometric studies.
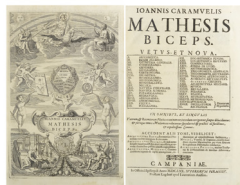

The bean machine, also known as the **Galton Board** or **quincunx**, is a device invented by Sir Francis Galton (1822 – 1911) to demonstrate the central limit theorem, in particular that with sufficient sample size the binomial distribution approximates a normal distribution. Among its applications, it afforded insight into regression to the mean or "regression to mediocrity".

Bayes' theorem is named after Reverend Thomas Bayes (1701?–1761), who first used conditional probability to provide an algorithm (his Proposition 9) that uses evidence to calculate limits on an unknown parameter, published as *An Essay towards solving a Problem in the Doctrine of Chances* (1763).

In probability theory and statistics, Bayes' theorem (alternatively Bayes' law or Bayes' rule) describes the probability of an event, based on prior knowledge of conditions that might be related to the event. For example, if cancer is related to age, then, using Bayes' theorem, a person's age can be used to more accurately assess the probability that they have cancer than can be done without knowledge of the person's age.

Ars Conjectandi (Latin for "The Art of Conjecturing") is a book on combinatorics and mathematical probability written by **Jacob Bernoulli** and published in 1713, eight years after his death, by his nephew, Niklaus Bernoulli. The seminal work consolidated, apart from many combinatorial topics, many central ideas in probability theory, such as the very first version of the law of large numbers: indeed, it is widely regarded as the founding work of that subject. It also addressed problems that today are classified in the twelvefold way and added to the subjects; consequently, it has been dubbed an important historical landmark in not only probability but all combinatorics by a plethora of mathematical historians. The importance of this early work had a large impact on both contemporary and later mathematicians; for example, Abraham de Moivre. Bernoulli wrote the text between 1684 and 1689, including the work of mathematicians such as Christiaan Huygens, Gerolamo Cardano, Pierre de Fermat, and Blaise Pascal. He incorporated fundamental combinatorial topics such as his theory of permutations and combinations (the aforementioned problems from the twelvefold way) as well as those more distantly connected to the burgeoning subject: the derivation and properties of the eponymous Bernoulli numbers, for instance. Core topics from probability, such as expected value, were also a significant portion of this important work.

De Ratiociniis in Ludo Aleae by **Christiaan Huygens** (1629-1695)

It is one of the amazing incidents in the history of mathematics that a seemingly simple mathematical 'sharing problem' took well over 250 years after its first manuscript appearance in Italy, and over 150 years after first being printed – in Luca Pacioli's Summa…(1494) -, as well as the effort of numerous highly skilled mathematicians during this period, to be solved correctly. Once it was solved by Blaise Pascal (1623-1662) and Pierre de Fermat (1607-1665) in 1654 (so called Problem of Points) it became the takeoff point of probability theory.

Mathesis biceps vetus et nova (1670) **Caramuel, Lobkowitz, Juan** (1606-1682)

Kybeia de Ludis, contains a reprint of the tract of Huygens De Ratiociniis in Ludo Aleae (Del Razonamiento en los Juegos de Azar) (1656), the first text on probabilities.

In July of 1654 **Blaise Pascal** wrote to **Pierre Fermat** about a gambling problem which came to be known as the Problem of Points: Two players are interrupted in the midst of a game of chance, with the score uneven at that point. How should the stake be divided? The ensuing correspondence between the two French mathematicians is widely regarded as the founding document in mathematical probability, even though it was not the first attempt to treat games of chance mathematically.

The "step reckoner" (or stepped reckoner) was a digital mechanical calculator invented by the German mathematician **Gottfried Wilhelm Leibniz** around 1672 and completed in 1694. The name derives from the translation of the German term for its operating mechanism, *Staffelwalze*, meaning 'stepped drum'. It was the first calculator that could perform all four arithmetic operations.

Blueprints of the Tabulating Machine, invented by **Herman Hollerith**. The machine provided "computer technology" based on punch cards, derived from the Jacquard Loom, in order to process the huge amounts of data gathered during the U.S Census of 1890. In 1896, Hollerith founded the **Tabulating Machine Company** (TMC), which was renamed into the **International Business Machines Corporation** (IBM) in 1924.
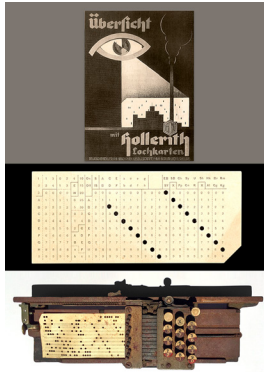
A Dehomag (IBM´s German subsidiary) poster, 1934. The approximate English translation is: "See everything with Hollerith punch-cards". As the investigative journalist Edwin Black has shown in his book "IBM and the Holocaust" which first appeared in the year 2000, the **Hollerith punch card technology** was extensively used by the Nazi regime to control its population data and was instrumental in the facilitation of the KZ prison system and the Holocaust.

Barometer - Short & Mason, Braille, circa 1900s-1930s.
A barometer is a scientific instrument that is used to measure air pressure in a certain environment. Pressure tendency can forecast short term changes in the weather. Many measurements of air pressure are used within surface weather analysis to help find surface troughs, pressure systems and frontal boundaries. The device itself was invented by Evangelista Torricelli in 1643.

Zhang's seismoscope
In 132 A.D. Zhang Heng presented to the Han court what many historians consider to be his most impressive invention, the first seismoscope. A seismoscope records the motions of Earth's shaking, but unlike a seismometer, it does not retain a time record of those motions. It was named "earthquake weathervane" (hòufēng dìdòngy), and it was able to roughly determine the direction (out of eight directions) where an earthquake came from. According to the book of Later Han (compiled by Fan Ye in the 5th century), his bronze urn-shaped device, with a swinging pendulum inside, was able to detect the direction of an earthquake hundreds of kilometres away. This was essential for the Han government in sending quick aid and relief to regions devastated by such natural disasters.
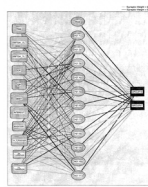

Diagram from a study on **Failure Prediction** for Hospitality Firms in U.S. and Korea using Logit and Neural Networks Models by Hyewon Youn Dr. Zheng Gu in 2007. The study attempts to analyse the financial conditions of Korean and U.S. hospitality firms in order to identify those heading for failure. Utilizing financial data of these firms, this study has developed business failure prediction models for Korean and U.S. hospitality firms using logistic regression and artificial neural networks (ANN) techniques, respectively.
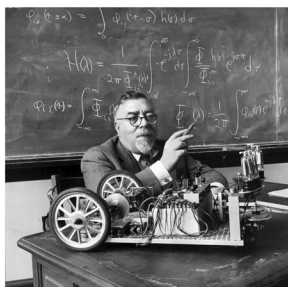

Norbert Wiener (1894 – 1964) was an American mathematician and philosopher. He was a professor of mathematics at the Massachusetts Institute of Technology (MIT). Wiener became an early researcher in stochastic and mathematical noise processes, contributing work relevant to electronic engineering, electronic communication, and control systems. He is considered the originator of cybernetics. Cybernetics encompasses the development of systems engineering technology including problem definition methods, modeling, and simulation, methods of system experimentation, human factors engineering, data and methods, systems design techniques and test and evaluation methods. Wiener is credited as being one of the first to theorize that all intelligent behavior was the result of feedback mechanisms, that could possibly be simulated by machines and was an important early step towards the development of modern AI.

Number 1 Mark III Predictor used with the QF 3.7 inch AA gun, 1941
The device is a mechanical analog computer used to track aircraft and control the attached anti aircraft weapons. It represents an early application of cybernetics. Like most of the field, during World War II, Norbert Wiener's work focused on military applications, specifically the automatic firing of anti-aircraft guns. Wiener's exploration of information theory led him to conceive of the idea of cybernetics, and he recruited a team of neuropsychologists, mathematicians, and biophysicists to conduct research in cognitive science. While this group was short-lived, it made many contributions to the emerging fields of computer science and artificial intelligence.
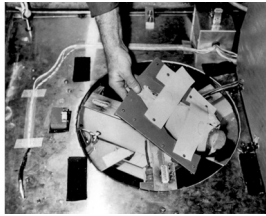
The pigeon-guided missile experiment by B.F. Skinner, commonly known as **Project Pigeon**, later renamed Project Orcon, for "organic control" (1944–1948). During World War II, both **Norbert Wiener** and **B. F. Skinner** worked on parallel research projects for the US military. Whilst Wiener together with engineer Julian Bigelow, was attempting to develop his Anti-Aircraft Predictor (AA-Predictor), a machine that was supposed to anticipate the trajectory of enemy planes, Skinner was trying to develop a pigeon-guided missile.

Weather forecasting methods, Signal Corps.
The United States Army Signal Corps (USASC) is a division of the Department of the Army that creates and manages communications and information systems for the command and control of combined arms forces. It was established in 1860 and had an important role in the American Civil War. Among its responsibilities was the development of scientific methods for weather forecasting. The image shows a weather-balloon, a measuring device, invented in 1896 by the French meteorologist Léon Teisserenc de Bort, which is still widely used today.
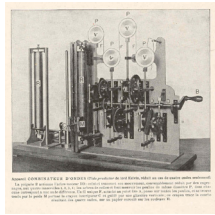
Appereil Combinateur d'Ondes / Tide Prediction Machine (Tide Predicter de Lord Kelvin, Reduit au Cas de Quatre Ondes Seulement)
The first tide-predicting machine was designed by Sir William Thomson (afterwards Lord Kelvin) and was built in 1873 under the auspices of the British Association for the Advancement of Science. This was an integrating machine designed to compute the height of the tide in accordance with the mathematical formula: $h = H_o + Sum\{ƒH \cos[at + (V_o+u) - K]\}$

Tide Predicting Machine, 1915
Developed by Dr. Jones E. Lester, (1876-1929) for the U.S. Coast and Geodetic Survey based on Sir William Thomson's device from 1873.

Predicted mean annual soil temperatures for Tennessee (°F), 1971 Data produced by the U.S. Department of Agriculture, Soil Conservation Service, Nashville Tennessee based on averages 4 yearly measurements throughout a period of 4 years at a depth of 22 inches at 44 locations by soil scientists. These prediction charts were delivered as a national service to agricultural enterprises in the U.S.s
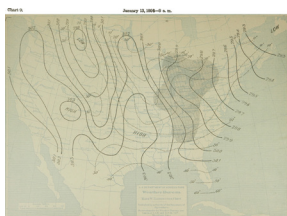
Study of weather types and storms by professors and forecast officials of the U.S. Department of Agriculture Weather Bureau (1898). These types of measurements were taken daily by scientists across the U.S. at regular intervals, twice per day, in order to establish **weather patterns intended to predict future conditions** for farming.
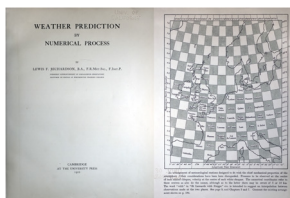
Weather prediction by numerical process (1922)
The foundations for present day computer based weather predictions were developed by Lewis F. Richardson in his publication from 1922. The image shows a map from the book, proposing a grid of ameteorological measurement stations across Europe. The collected data was intended to provide the basis for a calculated model of atmospheric conditions. However, in 1922, the necessary devices to compute such a model fast enough did not yet exist.
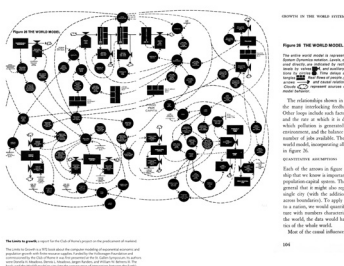
The Limits to growth; a report for the Club of Rome's project on the predicament of mankind.

The Limits to Growth is a 1972 book about the computer modeling of exponential economic and population growth with finite resource supplies. Funded by the Volkswagen Foundation and commissioned by the Club of Rome it was first presented at the St. Gallen Symposium. Its authors were Donella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III. The book used the World3 model to simulate the consequence of interactions between the Earth's and human systems.

Collapsologie

Der französische Begriff *collapsologie*, deutsch Kollapsologie bezeichnet die fächerübergreifende Forschung über den Zusammenbruch der thermo-industriellen Zivilisation, über die verschiedenen Aspekte dieses Prozesses und über dessen Folgen.

Das Wort wurde von Pablo Servigne und Raphaël Stevens in ihrem 2015 erschienenen Essay *Comment tout peut s'effondrer : Petit manuel de collapsologie à l'usage des générations présentes* ("Wie alles zusammenbrechen kann — kleines Kollapsologie-Handbuch für gegenwärtige Generationen") geschöpft. Als transdisziplinäre Wissenschaft findet die Kollapsologie in der Umweltforschung, der Biologie, der Anthropologie, der Demografie und der Wirtschaftswissenschaft ihre Wurzel, sie öffnet sich aber für die Psychologie, die Soziologie, die Medizin, die Agrarwissenschaft, die Politikwissenschaft und die Geopolitik, die Philosophie und die Künste. Die Herangehensweise der Kollapsologie beruht auf der Vernunft und der Intuition als anzuerkennende, sich ergänzende kognitive Modi, und sie legitimiert die Emotionen der Forschungstätigen, die sich als von erkannten Entwicklungen betroffene Personen von ihrem Forschungsobjekt nicht distanzieren können. Die Kollapsologie sieht in Studien wie *Die Grenzen des Wachstums* (1972) und zahlreichen Artikeln in der Zeitschrift Nature (z. B. "A safe operating space for humanity", "Approaching a state shift in Earth's biosphere") und The Anthropocene Review (z. B. The trajectory of the Anthropocene: The Great Acceleration) ihr wissenschaftliches Fundament.

Collapsologie - requiem pour l'espèce humaine (Illustration d'un Capital)

Collapsologie

The global risks landscape 2019

Risks interconnections 2019

Global risks interconnections 2019

The Doomsday clock, 2019
The Doomsday Clock is a design that warns the public about how close we are to destroying our world with dangerous technologies of our own making. It is a metaphor, a reminder of the perils we must address if we are to survive on the planet.
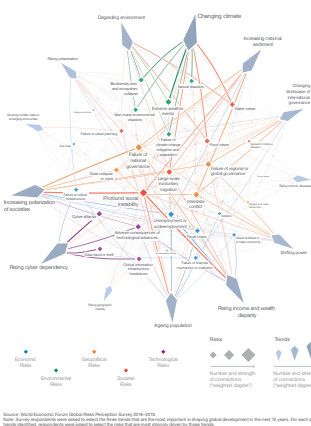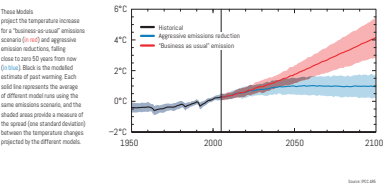When the Doomsday Clock was created in 1947, the greatest danger to humanity came from nuclear weapons, in particular from the prospect that the United States and the Soviet Union were headed for a nuclear arms race. *The Bulletin* considered possible catastrophic disruptions from climate change in its hand-setting deliberations for the first time in 2007.

Another End of The World is Possible

$$\min_G \max_D V(D,G) = \mathbb{E}_{x \sim p_{data}(x)}[\log D(x)] + \mathbb{E}_{z \sim p_z(z)}[\log(1 - D(G(z)))].$$

An AI artwork by Obvious collective based on a generative adversarial net (GAN) was sold at Christie's for $432,500 (nearly 45 times its high estimate). On one side of the logarithm is the Generator, on the other the Discriminator. Obvious: "We fed the system with a data set of 15,000 portraits painted between the 14th century to the 20th. The Generator makes a new image based on the set, then the Discriminator tries to spot the difference between a human-made image and one created by the Generator. The aim is to fool the Discriminator into thinking that the new images are real-life portraits."
An other system, which mainly produces abstract art, is CAN (creative adversarial net). It is specifically programmed to produce novelty, something different from what it sees in the data set. To some, this raises the notion that AI algorithms do not merely make pictures, but may also model the course of art history, as if art's long progression from figuration to abstraction were part of a program that has been running in the collective unconscious for half a millennium, and the whole story of our visual culture were a mathematical inevitability.

A GAN system was used to create the 2018 **painting Edmond de Belamy**, which sold for US$432,500. A generative adversarial network (GAN) is a class of **machine learning systems** invented by Ian Goodfellow and his colleagues in 2014.

A visualization of thousands of Wikipedia edits that were made by a single software bot. Each color corresponds to a different page.
Image: Fernanda B. Viégas, Martin Wattenberg, and Kate Hollenbach

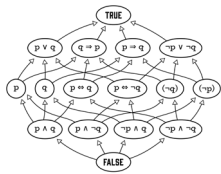**The amount and rate of warming expected for the 21st century**
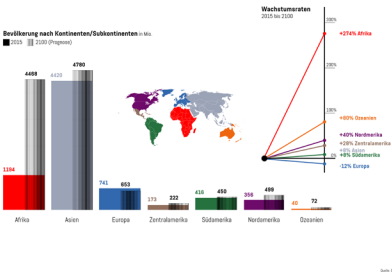

Probability density plots.
Quantum mechanics cannot predict the exact location of a particle in space, only the probability of finding it at different locations. The brighter areas represent a higher probability of finding the electron.
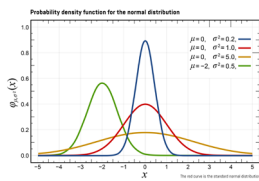
Probability density function for normal distribution.

Boolean Algebra Hasse Diagram

Bevölkerungswachstum (Prognose 2100)

Paul the Octopus (2008– 2010) was a common octopus used to predict the results of association football matches. Accurate predictions in the 2010 World Cup brought him worldwide attention as an animal oracle.

Fortune-telling Fun!
The original **Magic 8 Ball** is the novelty toy that lets anyone seek advice about their future!
All you have to do is simply 'ask the ball' any yes or no question, then wait for your answer to be revealed.
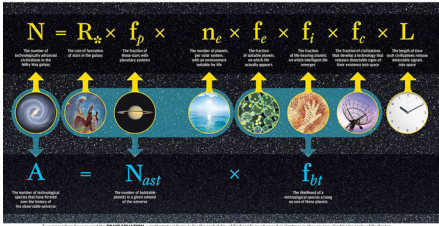
The Drake equation is a probabilistic argument used to estimate the number of active, communicative extraterrestrial civilizations in the Milky Way galaxy.
The equation was written in 1961 by Frank Drake, not for purposes of quantifying the number of civilizations, but as a way to stimulate scientific dialogue at the first scientific meeting on the search for extraterrestrial intelligence (SETI).

ROSETTA mission / PHILAE Landing

After more than 10 years in space, the landing sequence took place 510 million kilometres from Earth. Magnetic field data from Philae, combined with information from an experiment that provided an estimate of the final landing region, timing information, images from Rosetta's camera, assumptions about the gravity of the comet, and measurements of its shape, were used to reconstruct the trajectory of the lander during its descent and subsequent landings on and bounces over the surface of Comet 67P/Churyumov-Gerasimenko on 12 November 2014. Rosetta escorted the comet nucleus for more than 2 years to study, analyse and monitor the comet and to react to the unexpected environment.
Initially, Philae was seen to rotate slowly during the descent. It landed and then bounced, rotating significantly faster as the momentum of the internal flywheel was transferred to the lander. It collided with a cliff 45 minutes later, then tumbled, flying above the surface for more than an hour longer, before bouncing once again and coming to a stop a few metres away, a few minutes later. The times are as recorded by the spacecraft with signals from Rosetta taking 28 minutes and 20 seconds to reach mission control.

DEEP NEURAL NETWORKS

Deep learning is basically a machine learning technique that teaches a computer to filter inputs (observations in the form of images, text, or sound) through layers in order to learn how to predict and classify information. Deep learning has rapidly become the state of the art in machine learning, surpassing traditional approaches such as pattern recognition and signal processing by a significant margin for many widely studied benchmark sets. Although the basic structure of a deep neural network is very close to a traditional 1990s style network, a few novel components enable successful training of extremely deep networks, thus allowing a completely novel sphere of applications, often reaching human-level accuracy and beyond.

BLACK-SCHOLES-MERTON MODEL (BSM)

Introduced in 1973, Black-Scholes-Merton is a mathematical model for the dynamics of a financial market containing derivative investment instruments such as options, futures, forwards and swaps. The key property of the model is that it shows that an option has a unique price regardless of the risk of the underlying security and its expected return. The model is based on a partial differential equation, from which one can deduce the formula that gives a theoretical estimate of the correct price of European stock options. It follows a geometric Brownian motion with constant drift and volatility. The model incorporates the constant price variation of the stock, expected volatility; the decreasing time value of money; the option's strike price; and the time to the option's expiry.
Even thoughmthe 1987 stock market crash demonstrated the limitations of the model, it is perceived as one of the most important concepts in modern financial theory and the world's most well-known options pricing model. Scholes and Merton were awarded the 1997 Nobel Prize in Economics (Black had passed away before).

$$C(S_t, t) = N(d_1)S_t - N(d_2)PV(K)$$
$$d_1 = \frac{1}{\sigma\sqrt{T-t}}\left[\ln\left(\frac{S_t}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)(T-t)\right]$$
$$d_2 = d_1 - \sigma\sqrt{T-t}$$
$$PV(K) = Ke^{-r(T-t)}$$

BSM THETA

Theta measures the sensitivity of the value of the derivative to the passage of time, the "time decay." The value of an option can be analysed into two parts: the intrinsic value and the time value. The intrinsic value is the amount of money you would gain if you exercised the option immediately, so a call with strike $50 on a stock with price $60 would have intrinsic value of $10, whereas the corresponding put would have zero intrinsic value. The time value is the value of having the option of waiting longer before deciding to exercise. Even a deeply out of the money put (a bet on a highly improbable outcome) will be worth something, as there is some chance the stock price will fall below the strike before the expiry date. However, as time approaches maturity, there is less chance of this happening, so the time value of an option is decreasing with time. Thus if you are long an option you are short theta: your portfolio will lose value with the passage of time (all other factors held constant).

$$\Theta_c = \frac{\partial C}{\partial t} = -\frac{S\varphi(d_1)\sigma}{2\sqrt{T-t}} - rKe^{-r(T-t)}\Phi(d_2)$$

ITO's LEMMA

Ito's Lemma is a key component in the Ito Calculus used to determine the derivative of a time-dependent function of a stochastic process. It performs the role of the chain rule in a stochastic setting, analogous to the chain rule in ordinary differential calculus. It can be heuristically derived by forming the Taylor series expansion of the function up to its second derivatives and retaining terms up to first order in the time increment and second order in the Wiener process increment. Itō Kiyoshi is considered the founder of stochastic calculus and Ito's Lemma has important applications in stochastic differential equations (e.g. for dynamical systems disturbed by noise) and is a cornerstone of quantitative finance (it is intrinsic to the derivation of the Black-Scholes equation).

$$df(X_t) = \sum_{i=1}^{n} f_i(X_t) \, dX_t^i + \frac{1}{2} \sum_{i,j=1}^{n} f_{i,j}(X_t) \, d[X^i, X^j]_t.$$

KELLY CRITERION

Developed by J.L. Kelly, a scientific researcher at Bell Labs, in 1956, the Kelly Criterion has become one of the world's most well-known betting strategies. It is a method used to maximise the potential return of any particular bet or investment, and can be applied to any form of sports betting and has also been widely used in financial markets. While there is a level of complexity involved in its use, as well as a degree of risk, it has become popular amongst bettors.
In probability theory and portfolio choice, the Kelly criterion is a formula for bet sizing that leads almost surely to higher wealth compared to any other strategy in the long run. The Kelly bet size is found by maximizing the expected value of the logarithm of wealth, which is equivalent to maximizing the expected geometric growth rate. For an even money bet, the Kelly criterion computes the wager size percentage by multiplying the percent chance to win by two, then subtracting one. So, for a bet with a 70% chance to win (or .7 probability), doubling .7 equals 1.4, from which you subtract 1, leaving .4 as your optimal wager size -- 40% of available funds.

$$\mathbb{E}\left[\ln(1+r) + \sum_{k=1}^{n} \frac{u_k(r_k - r)}{1+r} - \frac{1}{2} \sum_{k=1}^{n} \sum_{j=1}^{n} u_k u_j \frac{(r_k - r)(r_j - r)}{(1+r)^2} \right].$$

LI's GAUSSIAN COPULA

Developed by David X. Li, a Chinese-born Canadian quantitative analyst and actuary. In the early 2000s, The Financial Times called him "the world's most influential actuary" for pioneering the use of Gaussian copula models for the pricing of collateralized debt obligations (CDOs). The model fueled explosive growth as a tool for financial institutions to correlate associations between multiple financial securities and supposedly price a wide range of investments accurately that were previously too complex to price, such as mortgages. However, in the aftermath of the global financial crisis of 2008 the model was seen, to quote a Wired magazine article of 2009, as a "recipe for disaster: the formula that killed Wall Street." In 2005, Li warned about the fallacy of his model in the hands of those who don't fully understand the research ("investors who put too much trust in it or don't understand all its subtleties may think they've eliminated their risks when they haven't) at a time when its application already measured in the trillions of dollars.

$$\Pr[T_A < 1, T_B < 1] = \Phi_2(\Phi^{-1}(F_A(1)), \Phi^{-1}(F_B(1)), \gamma)$$

MARKOV CHAIN STATE-SPACE

A Markov chain is a stochastic model describing a sequence of possible events in which the probability of each event depends only on the state attained in the previous event. In probability theory and related fields, a Markov process, named after the Russian mathematician Andrey Markov, is a stochastic process that satisfies the Markov property (if one can make predictions for the future of the process based solely on its present state just as well as one could know the process's full history, hence independently from such history, that is, conditional on the present state of the system, its future and past states are independent. Markov processes are the basis for general stochastic simulation methods known as Markov chain Monte Carlo, which are used for simulating sampling from complex probability distributions, and have found extensive application in Bayesian statistics. Markov chains have many applications as statistical models of real-world processes, such as studying cruise control systems in motor vehicles, queues or lines of customers arriving at an airport, exchange rates of currencies, population growths of certain animal species and Google's PageRank algorithm. The state space is the set of all possible configurations of a system.
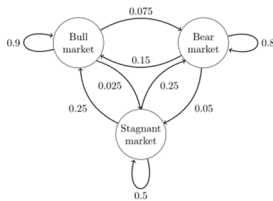
MODEL-BASED PROGNOSTICS

In contrast to data-driven prognostics, which usually use pattern recognition and machine learning techniques to detect changes in system states, model-based prognostics attempts to incorporate physical understanding (physical models) of the system into the estimation of remaining useful life (RUL). To obtain accurate predictions of component life (crucial to providing reliable condition-based maintenance decisions), a variety of sensors are often needed. However, it is typically difficult to add enough sensors for reliable prognosis, due to system constraints such as cost and weight. Model-based prognostics helps to offset this problem by exploiting domain knowledge about the system, its components, and how they fail by casting the underlying physical phenomena in a physics-based model that is derived from first principles.
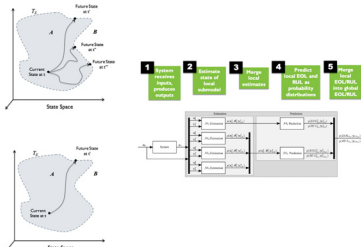
MONTE CARLO METHODS

Monte Carlo methods are a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results. In principle, they can be used to solve any problem having a probabilistic interpretation. The underlying concept is to use randomness to solve problems that might be deterministic in principle. In physics-related problems, Monte Carlo methods are useful for simulating systems with many coupled degrees of freedom, such as fluids, disordered materials, strongly coupled solids, and cellular structures. Other examples include modeling phenomena with significant uncertainty in inputs such as the calculation of risk in business and, in mathematics, evaluation of multidimensional definite integrals with complicated boundary conditions. In application to systems engineering problems, such as space, oil exploration and aircraft design, Monte Carlo–based predictions of failure, cost overruns and schedule overruns are routinely better than human intuition or alternative "soft" methods. The modern version of the Markov Chain Monte Carlo method was invented in the late 1940s by Stanislaw Ulam, while he was working on nuclear weapons projects at the Los Alamos National Laboratory. Immediately after Ulam's breakthrough, John von Neumann understood its importance and programmed the ENIAC computer to carry out Monte Carlo calculations. The image shows a Monte Carlo method applied to approximating the value of π.
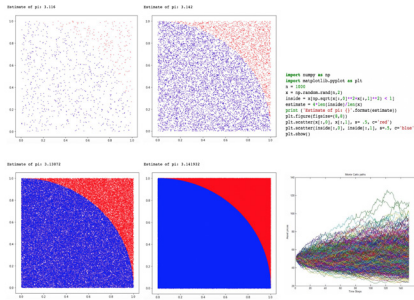
PAGERANK

PageRank is one of the principle criteria according to which Google ranks webpages. PageRank can be interpreted as a frequency of visiting a Webpage by a random surfer and thus it reflects the popularity of a webpage. Google computes the PageRank using the power iteration method which requires about one week of intensive computations. PageRank is a mathematical formula that judges the "value of a page" by looking at the quantity and quality of other pages that link to it. Its purpose is to determine the relative importance of a given webpage in a network (i.e., the World Wide Web). The idea was inspired by the way scientists gauge the "importance" of scientific papers, that is, by looking at the number of other scientific papers referencing them. The founders of Google, Sergey Brin and Larry Page took this concept and applied it to the web by tracking references (links) between web pages. It was so effective that it became the foundation of the search engine.
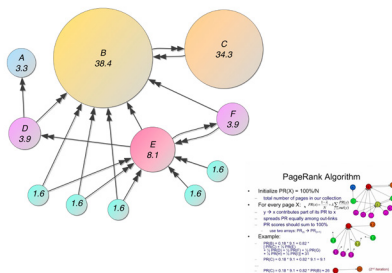
VOLATILITY SMILE

Volatility smiles should never occur based on standard Black-Scholes-Merton option theory, which requires a completely flat volatility curve with implied volatility the same for all options expiring on the same date with the same underlying asset regardless of the strike price. Yet, in the real-world, this is not the case. Volatility smiles started occurring in option pricing after the 1987 stock market crash. They were not present in U.S. markets prior. After 1987, traders realized that extreme events could happen and that the possibility for extreme events needed to be factored into options pricing.
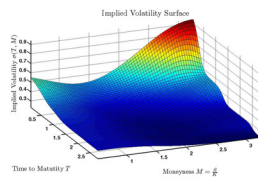
MACHINE INTELLIGENCE 3.0

"The current state of machine intelligence 3.0. Watching the appeal and applications of machine intelligence expand. … The value of code is different from data, but what about the value of the model that code improves based on that data? Once we understand machine intelligence deeply, we might look back on the era of traditional software and think it was just a prologue to what's happening now." (quoted from the O'Reilly Media website)
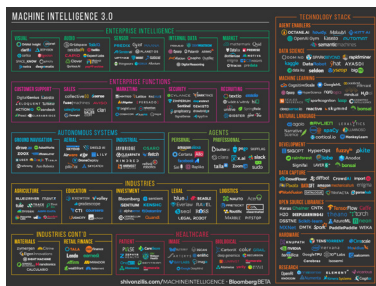
FORECASTING, PROGNOSTICS, PREEMPTION.

A selection of companies, investment vehicles, institutions and state agencies engaged in these fields (in addition to those listed in O'Reilly).

„**Dynamic-Pricing**" durch Datenverknüpfung
Mit den gewonnenen Daten, die von zwölf verschiedenen Unternehmen beim Jö-Bonusclub zusammenlaufen, lassen sich genaue Kundenprofile erstellen. Man kann sehen, welche Person welches Produkt zu welcher Uhrzeit und an welchem Ort erstanden hat. Daraus kann man auch ableiten, welche Produkte zu welcher Tageszeit besonders gefragt sind.
Als „Dynamic-Pricing" wird eine Methode bezeichnet, bei der sich Preise mehrmals täglich ändern können. Die Höhe der Preise wird dabei vom Einkaufsverhalten der KonsumentInnen mitbestimmt. Ist ein Produkt zu einer bestimmten Tageszeit besonders gefragt, werde es teurer. Aufgrund der verfügbaren und präzisen Kundenprofile könnten KonsumentInnen direkt und gegen ihren Willen in die Kalkulation einbezogen werden.