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Information Design 6

Predecessors & Pioneers

Rune Pettersson
Institute for infology

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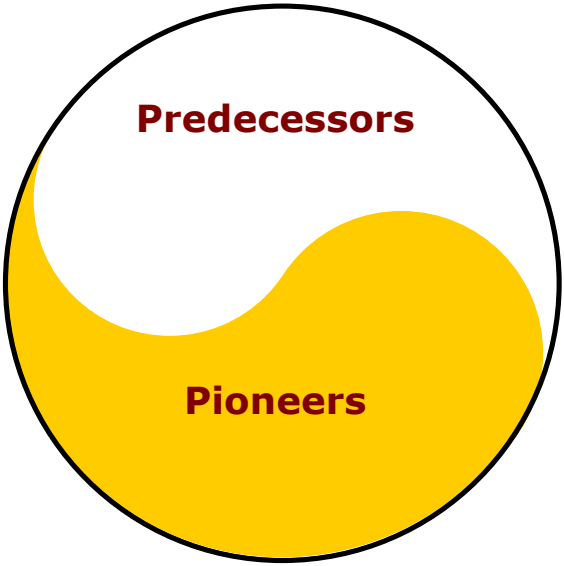
Predecessors & Pioneers



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Preface

Information design is a multi-disciplinary, multi-dimensional, and worldwide consideration with influences from areas such as art and aesthetics, behaviour and cognition, business and law, communication, information, language, as well as media production technologies.

Since my retirement I have revised, edited and expanded sections of my books, conference papers and reports about information design, message design, visual communication and visual literacy. The result of this work is a series of six books about information design.

Information Design 1–Message Design
Information Design 2–Text Design
Information Design 3–Image Design
Information Design 4–Graphic Design
Information Design 5–Cognition
Information Design 6–Predecessors & Pioneers

These books include definitions, selected results from research, and theoretical considerations as well as practical design guidelines. The intended reader is especially interested in research and theory related to message design, and the design of information sets and information materials.

Tullinge, Sweden
Rune Pettersson, Ph.D.
Retired Professor of Information Design

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Introduction

Where are the roots of information design? Where are the early examples of artefacts where the creators have used combined and effective verbal and visual messages? Who are the major predecessors and pioneers in information design? This book includes some examples of people who have served as inspirers and sometimes as guides in the design of messages with words, images and form.

In this book I have used the word *predecessor* for people who are unknown to us today. In these cases we still have access to the results of some of their work. It may be a painting on the ceiling as well as the walls in a church.

In this book I have used the word *pioneer* for people who we know by their names. These individuals were working as architects, artists, engineers, graphic designers, mathematicians, painters, photographers, printers, sculptors, statistics, teachers, type designers, typographers, and writers. Many had several professions or skills.

Obviously there are many people who have worked in these occupations. I have subjectively selected a few individuals whom I find fascinating. They all lived long before *information design* was established as a scientific discipline and as an academic subject matter. All of them were working in other occupations. However, their widespread discoveries and their experiences can help us to convey clear messages today.

Some of these predecessors and pioneers are discussed in the following chapters. There are a number of suggested Internet addresses for pictures and video sequences.

Memories of past experiences have largely been preserved in written records. Historians often focus on events and human developments that occurred in "blocks of time" or "periods" in our history. However, all these systems are more or less arbitrary, and they are often very specific to geographical locations. Also the dates of the start and end of a particular period vary. This means that a specific year may a part of different "historical periods" in different geographical locations. This book is an interpretative history of combined verbal and visual messages. It is *not* a linear sequence. The examples of predecessors and pioneers in information design are not discussed chronologically but rather in a *thematic manner*.

In this book historical periods are mainly related to the development of architecture, painting and sculpture in Europe. There is a European, or even a Scandinavian, focus in this book.

Our oldest pictures

Prehistory is the period before written history. By studying carvings, drawings, paintings, pottery, sculptures, and other artefacts, archaeologists may recover some information even in the absence of written records.

The controlled use of fire occurred about 800 thousand years ago. Modern humans, *Homo sapiens*, emerged in Africa 250 thousand years ago. Around 60–70 thousand years ago modern humans migrated out of Africa and spread in different directions. They reached Europe about 40,000 years ago.

The first lines in the comprehensive book "The history of art, architecture, painting, sculpture" begins with the following paragraph (Myers and Copplestone, 1990, p. 10):

> The earliest art known to us goes back to the very dawn of the history of mankind–indeed, it is fair to say that making art is one of the earliest human activities of which we now have a record. The painting and sculpture of the Old Stone Age provably antedates the majority of the basic crafts, even weaving or making pottery. It is far older than metal working, and belongs to a level of society which we now find almost unimaginably primitive."

Since the Neolithic period (approximately 10,000–2,000 BC) people have communicated not only through gestures and sounds, but also by means of visual language (de Jong, 2010, p. 7). Worldwide, hunters and gatherers and later early farmers made use of information systems to advertise services and products.

Rock art is an archaeological term used to refer to human-made markings placed on natural stone. It is a form of *landscape art*. Prehistoric rock art include images that are carved, engraved, or painted on cave walls and ceilings, and on open-air boulder and cliff faces, rocks or exposed glaciated pavements, and slabs, and engraved into the ground. In some parts of the world images were painted or engraved on bone, eggshell, ivory, leather, portable pieces of rock, and on wood. Human and animal figures were also modelled and sculptured from bone, clay, ivory, and stone. Rock art is found in all parts of the globe except Antarctica.

Many terms are used for discussions about prehistoric rock art in the published literature, such as: petro glyphs, rock carvings, rock drawings, rock engravings, rock images, rock inscriptions, rock paintings, rock pictures, rock records, and rock sculptures. There may even be more terms. It is not always possible to distinguish between some of these terms. Actually some of these terms seem to be synonyms.

Archaeologists studying these artworks often believe that they likely had some kind of magical-religious significance. The available knowledge about rock art is increasing rapidly as this subject becomes a more acceptable and respected field of study within the social sciences. Rock carvings and pictographs are still being found in new areas around the world.

Archaeological artefacts provide the physical evidence on which archaeologists build their interpretations of the past. In a similar manner visual images provide records of cultural change through time. Fee and Fee (2012) argued that “visual archaeology” is a method to understand the past through the analysis and interpretations of visual images. They see visual images as

cultural artefacts (p. 36): “Working with images rather than pottery, skeletal remains, or architectural features requires only a slight expansion on one's understanding of what constitutes an artefact. And, it is the concept of artefact that makes the process archaeological.”

The Blombos Cave

The *Blombos Cave* is located on the Southern Cape coastline in South Africa. The cave is situated in a south-facing cliff face, and it was originally formed by seawater and powerful waves. Today the cave is located 34.5 meter above sea level and about 100 meters from the shoreline. The cave comprises a single main chamber, and it has rich deposits from the Middle Stone Age, 100,000–70,000 years ago (Henshilwood et al. 2009). The interior cave floor is about 39 m² large. Archaeologists have identified seven main phases of occupation in the 2.5–3 meter deep layers in the cave.

Humans have sporadically occupied the Blombos Cave throughout the Middle Stone Age, and even much later. As early as 100,000 years ago humans produced a liquefied ochre-rich mixture, and they stored it in *Haliotis midae* (abalone) shells (Henshilwood et al. 2011). Ochre, bone, charcoal, grindstones, and hammer stones form a composite part of two production toolkits. The authors remark that the application of the mixture is unknown, but possibilities include decoration and also skin protection.

The archaeological materials also include engraved bones and engraved pieces of ochre (Henshilwood et al. 2009). Ochre is an iron-rich mineral. It is often found at Stone Age sites in

Africa as well as Europe. More than 8,000 pieces of ochre-like material has been found in the Blombos Cave. Many of the larger pieces show traces from intentional use and processing. Some ochre pieces have been deliberately engraved or incised with abstract geometric designs. It is argued that they represent a kind of early abstract or symbolic representations (Henshilwood et al. 2002). These designs may be regarded as the oldest known human "artwork."

The engraved ochre pieces with abstract geometric designs were made somewhere between 100,000 and 70,000 years ago. Comparable geometric designs have also been observed on an engraved bone fragment. This is at least 30,000 year earlier than abstract designs in European caves.

There are also marine shell beads (Henshilwood et al. 2004), refined bone tools and stone tools (Henshilwood et al. 2001). The collection of bone tools is remarkable. Bone tools are rarely found in sites older than 25,000 years. There are plenty of remains from terrestrial and marine fauna. Beads made from Nassarius shells were made 75,000 years ago.

Archaeological materials from the Blombos Cave represent adoption of multi-step technology and manufacture of composite tools, stylistic elaboration, increased economic and social organisation and occurrence of symbolically mediated behaviour (Mellars, 2007). We have a new understanding of the development of human behaviour.

See pictures at:
http://en.wikipedia.org/wiki/Blombos_Cave
http://www.wits.ac.za/academic/research/ihe/archaeology/blombos/7106/blomboscave.html

Basic elements in a picture

The simplest components in a picture, i.e., its *basic elements*, are *dots, lines*, and *areas*. Three-dimensional visuals also have *volumes*. The basic elements can be varied and put together in many ways. Changes will result in different images, sometimes of great and sometimes of minor importance. Simple image elements can be rotated, turned upside down, and re-combined to form a series of completely different but still intelligible representations of real concepts.

The basic elements are sometimes meaningful, sometimes not. The number of ways in which the smallest image components can be inter-combined is unlimited, and the importance of certain combinations varies from one picture creator to another.

Dots in visual language

A dot is the smallest graphic element in visual language. The dot is usually a non-significant image element, but it may have a complete meaning. It depends on the situation depicted. Dots can vary in colour, grain, position, shape, size, as well as value. Also the context of dots will vary.

A group of dots may suggest motion and direction in the picture. When the dots are really close to one another, they cannot be individually recognized any more and they form a line.

Lines in visual language

Various lines are often used for decoration to make a more aesthetically pleasing or artistic product. Lines can also be used to aid communication. A line may be varied with respect to its starting point, its brightness, colour, context, curvature, direc-

tion, evenness, grain, length, orientation, and points of change, printing, shape, thickness, value, and terminus. The line is a powerful graphic element. People have a tendency to follow a line along its way. As a result lines can be used to direct attention to specific picture elements.

The line provides the essential elements for perception of motion in a visual. In the western cultures most people will see the upper or left end of a line as its beginning, and the lower or right end as its terminus.

Horizontal lines and vertical lines give the impression of calm and stability. Horizontal lines are restful and relaxing and create a strong sense of equilibrium in any composition. Diagonal lines are unstable and attract the eye. They give the impression of movement, creating visual stress.

Areas in visual language

An area can be varied with respect to brightness, colour, colour combinations, context, "emptiness," grain, grey scale, shaded or non-shaded, shape, size, texture, and value. Roundness is the most common form in nature. When ink, water, or any other liquid material is dropped on a surface, it assumes a rounded form.

The size of an individual area is always relative. It depends on our knowledge of its surroundings. A square is an example of a static area. A rectangle is perceived as more active.

Scribbling

When small children are scribbling they make dots, lines, and endless open circular movements (Kellog, 1955). Already three-year old kids may draw solid circles, triangles and squares (Be-

refelt, 1977). In my view we perceive circles, triangles and squares on a low cognitive level without any special analysis (Pettersson, 1989).

Graphic symbols

The use of graphic symbols has a long tradition. Functional, instructive graphic symbols are actually older than printed words. Symbols are found in every culture however primitive. In specific areas symbols are a supplement to all languages to help create better and faster understanding. Symbols first appeared as paintings or carvings in caves and on stone walls as early as 50,000 years ago, with the first actual depiction of humans dating back about 11,000 years (Dewar, 1999). Dewar pointed out that the specific criteria for individual symbols, or sets of symbols, depend on their applications.

Symbols are often composed of simple graphical elements, such as lines, circles, ovals, squares, rectangles, triangles, or combinations thereof. And maybe the engraved ochre pieces with abstract geometric designs that were made more than 70,000 years ago in the Blombos Cave were symbols with some specific meaning?

Regular, simple, geometrical figures are identified more quickly than complex ones. Symbols must be meaningful, legible, learnable, memorable and used consistently. Distinctively shaped letters are often utilized in modern symbols.

The circle and the triangle, as well as the square, are shapes that have been natural to man for a very long time. There have always been circles and triangles in our natural environment, and they were used as important symbols in pre-historic cultures.

The circle, the equilateral triangle, and the square express visual directions. Circles suggest curved directions, triangles suggest diagonal directions, and squares suggest horizontal and vertical directions.

Body art

Throughout the ages, people have adorned themselves with various decorations. Prehistoric hunters smeared their bodies with clay and earth to better blend into the landscape (Broby-Johansen, 1982, p 75). Body painting, tattoo and scarification occur in all traditional tribal cultures (Burenhult, 1999a, p 136). But body art pictures are obviously normally not preserved.

Body painting

Body paintings are temporary and often worn during ceremonies. These paintings are painted directly onto the human skin. Body paintings may last from a few hours up to a couple of weeks. Some body paintings are limited to the face. Since the 1960s there has been a revival of body painting in Western society and some artists work professionally as body painters.

Tattoo

A tattoo is form of body modification, a drawing on the skin that is formed of carvings or engravings with sharp objects, often inlaid with durable colours that are darker than the skin. Tattooing has been practiced for centuries all parts of the world, especially in Japan, Polynesia and Southeast Asia. Various cultures have had their own tattoo traditions.

The first tattoos could very well been accidental. A sharpened spit used to roast may have left a charcoaled mark on the

skin, a subsequent reminder of a successful kill (Editors at tattoofinder.com, 2008, p. 1). During ancient battles, daggers and spears were purposefully dusted with charcoal or colour, and when they penetrated the flesh, they would have left more than a typical war scar.

Often, these adornments of the body have a deeper meaning than just being decorative. They can, for example, reflect the individual's group affiliation, marital status, or status. In some cultures puberty boys and girls are tattooed and then emerge as marked men and women.

In Denmark, the archaeologists found that needles belonging to toiletries in graves from the Bronze Age have been used for tattooing (Broby-Johansen, 1982, p. 75). Burenhult (1999b, p. 74) argues that continental moss findings have shown that people in Northern Europe have tattooed themselves both during the Stone Age, Bronze Age, and Iron Age.

For a long time it was argued that the oldest tattoos were found on 4,000 year old Egyptian mummies. However, in September 1991 a well-preserved natural mummy was found in the Ötz valley on the border between Austria and Italy in the Alps. Ötzi the Iceman lived about 5,200 years ago and is the oldest natural human mummy in Europe. He has 57 carbon tattoos consisting of parallel and vertical lines on his back, a small cross behind one knee, and dots and lines around both ankles. These signs may have shown his tribal affiliation or his social position (Palmer, Bahn, and Tyldeslv, 2006, pp. 32f). The tattoos may also have been related to pain relief treatments.

Scarification
Scars in the skin form designs and pictures. There are several methods of scarification. Methods include branding, burning, cutting, etching, and scratching into the skin.
Dark-skinned people, mainly in Africa, often have bright scarification. Bright scars are raised from the skin and form decorative, geometric patterns. Here scarification is more visible than tattoos. There may be aesthetic, political, religious, and social reasons for scarification.

The Chauvet Cave

The prehistoric cave paintings illustrated early man's observations of the world around him (Heller and Chwast, 2008, p. 7). The images in the *Chauvet Cave* in southern France belong to the oldest in Europe. They are approximately 32,000 years old. The cave has 200–300 painted or carved animal figures, such as bison, horses, and rhinos.

Archaeologists have not yet found any clear engraved words or texts in a cave. But we can easily imagine that both the actual creation of the rock pictures, as well as the finished pictures in the caves were important parts of various rituals and in contact with ancestors and spirits. If so, also the words were very important together with the pictures.

A child walked around on the muddy floor in the Chauvet Cave and left a few footprints about 26,000 years ago. We can regard preserved footprints as evocative images that can tell us about life in the past. The archaeologist Elisabeth Arwill-Nordbladh (2001, pp. 7–8) argued that footprints "are at once clear and direct imprints of an individual from a special occa-

sion, while being generally human." Oddly enough, many archaeologists have interpreted these conserved footprints *as footprints made by a boy*. But it can of course just as well be foot prints made by a girl. You can't tell the difference between footprints made by boys and girls. Arwill-Nordbladh believes that the archaeological knowledge is "gender-marked." Men and male activities are visible also in archaeology, while prehistory women remain invisible.

In his documentry, *The Cave of Forgotten Dreams*, director Werner Herzog (2010) examined some of these drawings and he pointed out how fires have made the pictures come to life and portray a message of movement. Herzog even remarks how some of the drawings had animals painted with extra legs to suggest movement, creating even an early movie, a "proto-cinema," as Herzog refers to it. (Also see the section *The movie in Chichén Itza*.)

In Europe there are cave paintings in about 120 caves. Some are dated to approximately 30,000–25,000 BC. However, most of these cave paintings were made 18,000–10,000 years before our own time. Common motifs are buffalo, deer, horses, reindeer and other animals. It is conceivable that the people who created the images in the caves believed they could improve their hunting luck and fertility of the animals as well as in their own families. The images have been widely reproduced and are now familiar to the general public.

The images in the caves lack modern codes of perspective and they have no horizon. Sometimes, however, the actual rock walls constitute a type of perspective in cave paintings. Besides paintings on the walls, there are often archaeological finds of smaller objects in the soil layers on the floors of the caves. These

art objects are made of bone, ivory and horn. It is possible that there has also been objects made of clay and wood, but these are now gone. Broby-Johansen (1982, p. 13) argues that people used images of large animals as targets for hunting practice.

This booth at the National Museum of Natural History in Washington shows a cave painter at work.

The cave painters used brown, red, and yellow earth tones. They also used ash, lime and charcoal. Red paint is usually made of ground ochre, while black paint typically is composed of charcoal. White paint may be created from natural chalk or white clay. Grounded pigments were mixed with a liquid. This liquid could be animal fat, blood, egg yolk, urine, and water. In some societies, the paint itself had some symbolic and religious meaning.

The oldest cave paintings have prints and contour lines of hands, directly on the rock walls. There are three kinds of handprints. 1) Hands were covered in wet paint and applied to the rock. 2) Designs were painted on hands and then applied to the rock. 3) A hand was placed against the rock and then "spray-painted" with pigments blown over the hand. The resulting image is a negative print of the hand. We can consider a handprint as one large meaningful basic element, an indented area. (Basic graphic elements are sometimes meaningful, sometimes not meaningful.)

See pictures at:
http://en.wikipedia.org/wiki/Chauvet_Cave
http://www.bradshawfoundation.com/chauvet/
http://www.imdb.com/title/tt1664894/
http://www.ifcfilms.com/films/cave-of-forgotten-dreams

Carved figures

Ever since the Stone Age, artists have used other people as their noblest motives for artistic representations of various kinds. The female images in bone, ivory, stone, and wood show the Palaeolithic hunter's concern with fertility (Fontana, 2010, p. 102). During the 1900s, several archaeologists have found many female statuettes in various parts of Eurasia. These female images are collectively referred to as "Venus figurines."

Other common motifs are small animal figures, which perhaps gave the hunter-gatherer peoples hopeful of good hunting.

In 1908 the archaeologist Joseph Szombathy conducted archaeological excavations at a Palaeolithic site near the village of

Willendorf, in eastern Austria, near the city of Krems. A workman found an 11.1 cm (4.3 in) high statuette of a naked female figure. The statuette is probably 25,000 years old. Szombathy called it *Venus of Willendorf*. In academia the statuette is now also known as the *Woman of Willendorf*.

Archaeologists do not know much about its origin, method of creation, or cultural significance. The artist had probably used simple tools of flint to carve the porous oolitic limestone. The figure is then tinted with red ochre.

This type of limestone is not found in this part of Austria. Humans have certainly brought the figurine to this place. The figure has no visible face. Her head is covered with circular and horizontal bands interpreted as rows of plaited hair. With its sharply marked female forms the statuette may possibly be a symbol of fertility. The little figurine is now available in a booth at the Natural History Museum in Vienna

Another 11.1 cm (4.3 in) high statuette of a naked female figure is the *Venus of Dolní Věstonice*. It was found 1925 in Moravia, now located in the Czech Republic. This statuette follows the general morphology of the other Venus figurines, and was made 31,000–27,000 years ago. It is now in Moravské zemské muzeum, Brno, Czech Republic.

See pictures at:
https://en.wikipedia.org/wiki/Venus_of_Willendorf
https://en.wikipedia.org/wiki/Venus_of_Doln%C3%AD_Věstonice

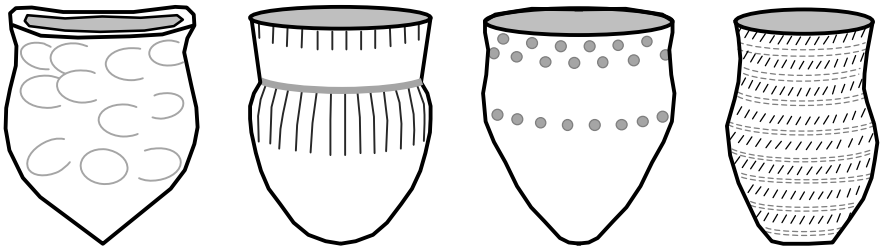
Pottery

About 12,000 years ago the New Stone age, the Neolithic Era, or the Neolithic Period begun in Europe. This period lasted for six to eight thousand years in different geographical regions. It was an important period in the development of human technology that commenced with the beginning of farming and use of metal tools about 2,300 BC.

The gradual use of wild and domestic crops and the use of domesticated animals increased the need for pottery. Emmer wheat was domesticated, and animals were herded and domesticated. People needed pottery for cooking, and for storage of different grains etcetera.

A large number of "archaeological cultures" were developed in different parts of the world. These cultures are often named after the kind of characteristic pottery they produced. Pottery was consumables. Broken jars and vessels were thrown away on refuse dumps and saved for posterity. Regardless of the expected short lifetime potters spent time on decorating their pottery, often with abstract patterns. Today pieces of pottery can often be used for dating of archaeological sites. Pottery analysis may also provide information about past cultural networking and communication patterns.

In these Neolithic communities everyone could see and recognize "their" pottery. People were familiar with the shape and size of the vessels, and they know the specific decorations and patterns. In all the years that have passed, many thousands of people have seen these ceramics with their decorations. How did these decorations affect the people who used the vessels in their daily lives?



This is a schematic illustration of pottery from the Ertebølle culture (left), the Funnelbeaker culture, the Pitted Ware culture, and the Corded Ware culture (right).

Today archaeologists have named "archaeological cultures" based on these characteristic ceramics with their decorations. The following sections present some archaeological cultures in Europe with focus on their pottery.

Ertebølle culture

The *Ertebølle culture* is the name of a late Mesolithic and Early Neolithic fisher-hunter-gatherer culture, about 6,000 BC–3,500 BC. The culture is named after a small village in Danish Jutland (Burenhult, 1999a, p. 221). Here molluscs, mussels, and oysters were important food resources.

The Ertebølle culture was widespread in the northern part of mainland Europe and southern Sweden. It is also called the *Ertebølle-Ellerbeck* culture (Mithen, 1994).

People used arrowheads made of bone and antler; axes of polished stone, chisels, fishhooks, and handles. They hunted a wide range of animals, including birds, marine mammals, and wild boars. There are massive kitchen middens at coastal sites (Rowley-Conwy, 1984). The kitchen midden at Ertebølle is 140 m long, up to 40 m wide, and 1.5 m high. There are cemeteries

with grave goods. Several Ertebølle communities were among the earliest in Europe to have domesticated dogs.

The Ertebølle people adopted pottery but not agriculture from their neighbours. For the production of pottery the potters used local clays that were tempered with crushed stone, organic materials, and sand. The pottery was fired on open beds of hot coals.

There are two main types of Ertebølle pottery. A *beaker* is a bellied and thick-walled bowl that is narrowing at the neck with a flanged, outward turning rim. The acute and pointed bottom supported the vessel when it was placed in clay or in sand. They adapted the size of the vessels to their needs. A small beaker was eight by 20 cm. The largest beakers could be 20 by 50 cm. Some beakers were used for cocking food (Jennbert, 2009).

The potter used fingertips and/or nails to make decorative impressions in horizontal bands on the entire surface of the beaker. Sometimes random grains of barley and wheat have left impressions in the clay during the final decoration phase before the burning. The decorations became more varied late in the Ertebølle culture period. The second type of pottery was a flat blubber lamp, made from single pieces of clay. While burning train oil in the lamps it was possible to perform some activity in the huts after dark.

Funnelbeaker culture

The *Funnelbeaker culture* is the name of an early Neolithic agricultural farming and husbandry culture in Europe, about 4,000 BC–2,800 BC. This culture is also called TRB, which is an abbreviation of its German name *Tricherrandbecher*. The

funnel-beaker culture comprises a number of local communities.

This archaeological culture spread from central to north, east and west parts of Europe. Funnel Beaker sites have been found throughout northern Europe to Austria and the Ukraine. The Funnelbeaker people were the first farmers in large parts of Northern Europe. They cultivated barley, legumes, and wheat, and they herded cattle, goats and sheep. They introduced farming and husbandry to the pottery-making fisher-hunter-gatherers who already lived there.

The Funnelbeaker culture has been named after the characteristic beakers with funnel-shaped necks and no handles. The beakers may have been used as drinking vessels. The potters used local clays that were tempered with crushed flint. They decorated their pottery with lines and various patterns, and used tools for incising, impressing, modelling, and stamping. The principal earthenware shapes are the beaker with the funnel-shaped neck, a beaker with handles on the shoulders, and a collared flask. Also these people adapted the size of the vessels to their needs. A small beaker with thin walls could be used for drinking. Large storage containers held up to 50 litres (Burenhult, 1999a, p 271).

The Funnelbeaker people lived in small and simple houses made of poles. However, from 3,500 BC this culture built collective megalithic passage graves with central chambers. The same chambers were used for several generations. These graves often included grave sacrifices such as daggers and polished stone battle-axes. Early versions of battle-axes were multi-angled. Later versions of axes are called double-edged axes. These axes were stone versions of the copper axes used in Central Europe.

Pitted ware culture

The *Pitted ware culture* is the name of a Middle Neolithic fisher-hunter-gatherer culture along the shorelines in coastal southern Scandinavia, about 3,200 BC–2,300 BC. The name is abbreviated as PWC.

The Pitted ware culture has been named after the typical ornamentation of its pottery. The potter used a small stick and pressed horizontal and decorative rows of pits into the body of the pot before it was fired (Österholm, 1999, p. 108). There may be zones of small indentations on the shoulders of the vessels. Some vessels have flat bottoms; others have rounded or pointed bottoms. North-eastern cultures have influenced the decorations and the shapes of this pottery. People also made small animal figurines of bone and clay. Often archaeological sites have large or even sheer quantities of shards of pottery.

People of the Pitted ware culture rejected agriculture and farming. Instead they favoured the "old style of life" as fisher-hunter-gatherers on the coastlines and islands. Some groups specialized on seal hunting. However, eventually farming re-developed and became the predominant strategy of living.

At first this archaeological culture was contemporary and partly overlapping with the *Funnelbeaker culture*. Later the Pitted ware culture was contemporary and partly overlapping with the *Corded ware culture*. Related cultural communities living across the Baltic Sea, in Estonia and Latvia, are sometimes referred to as *Comb-Ware Culture*. These people decorated their pots by dragging a toothed tool across the surface.

In the Pitted ware culture burials are typically flat, single inhumations. Typical grave goods were animal tooth pendants,

beads of shell and bone, bone spears, fishhooks, harpoons, pottery, and stone axes.

Corded ware culture

The *Corded ware culture* is the name of a Neolithic agricultural culture in Central and Eastern Europe, mainly in Germany and Poland, about 2,900–2,450/2,350 BC. This culture culminates in the early Bronze Age.

The Corded ware culture has been named after its characteristic pottery. The potters pressed twisted cords into the wet clay during manufacturing of pots. In this way they created different decorative patterns and motifs.

In some places there are regional versions of the Corded ware culture called the *Battle axe culture,* and in other places the *Single grave culture*. The Battle Axe culture has individual burials. The graves contain finely crafted beakers and/or battle-axes. The Swedish Battle axe pottery represents a technological break with previous pottery traditions.

The Corded ware culture is related to the *Bell beaker culture*, or the *Beaker culture*, about 2,800–1,800 BC. This was a widely scattered culture in Western Europe with a wide diversity in local burial styles.

Rock carvings

Rock carvings are carved or engraved into the rock surface. Sites in Australia have rock carvings, or *petroglyphs*, that are estimated to be as much as 27 000 years old, and in other places rock carvings could be as old as 40 000 years (Wikipedia, 2012). Rock carvings are found around the world. In Scandinavia rock carvings were made during a period of five thousand years (Nordbladh, 1999, p. 144). There are between 15,000 and 20,000 rock carvings in Sweden (Bengtsson, 2000, p. 66). This means that those who lived here on average produced three to four rock carvings every year.

In Scandinavia archaeologists traditionally distinguish between two rock carving traditions, one northern and one southern. However, there is no distinct, clear and unambiguous border between these two groups. There are several examples of overlap in the middle part of Scandinavia (Burenhult, 1999b, p. 123). And it has been hard to find archaeological finds and evidence supporting the division in the two traditions. According to Goldhahn (2006, p. 128) regional differences are often much larger than the similarities.

Archaeologists have made archaeological excavations at and near several places with rock carvings. There are usually several archaeological finds connected to groups of northern hunters and gatherers from the Neolithic period (Goldhahn, 2006, p. 91f). Archaeological excavations at southern places, with rock carvings from the Bronze Age and from the Iron Age, often have few archaeological finds. However, sometimes there may be many finds also here (Bengtsson, 2011).

For several thousands of years, the weather changing conditions with frost and heat blasting has slowly influenced rock

paintings as well as rock carvings in most parts of the world. However, because of pollutants from vehicle exhausts and the general acidification the weathering is accelerating. Many rock paintings and rock carvings may soon be completely destroyed, perhaps within a few decades (Bengtsson, 1999, p. 33).

To reduce problems with weathering it is important to create as stable conditions as possible (Löfvendahl, 2000, p. 81). Different methods of covering rock carvings, for example with sand, are now tested. The Swedish National Heritage Board has created a digital information system for documentation and restoration inventories of rock carvings and rock paintings (Bertilsson, 2000).

Northern rock carvings

Like many prehistoric rock paintings also rock carvings may be mythical descriptions related to hunting. It is possible that rock art was meant to increase the hunting success and the fertility in the tribe. Northern rock carvings, or *game-carvings*, often depict birds, boats, moose, people, reindeer, seals, and whales. These pictures are often dated from the younger Stone Age up to the middle Bronze Age.

Northern rock carvings exist in Norway and Sweden, but there are similar rock carvings in Northern Russia, Siberia, and North America, and in a chain around the North Pole. According to Hultkrantz (1989, p. 47) northern rock carvings deserve to be named “circumpolar.” Some of these images with hunting motives look like modern “X-rays.” We can see inner parts of the animals, such as hearts and lungs. The circumpolar culture and religion are remains of basic and original religion of man-

kind, which has been abandoned in connection with the transition from life as hunters and gatherers to early farmers.

Alta

The *Rock art of Alta* are located in and around the municipality of Alta in northern Norway. This is the largest collection of rock carvings with hunting motifs in northern Europe. The carvings were made about 6 200–2 500 years ago. The area is divided into four main sites. The approximately three thousand rock carvings have been carved into the rocks of the firm and gray sandstone. Common motifs are brown bear, fish, moose, poultry, and reindeer. The wide variety of imagery shows a culture of hunter-gatherers that was able to control large herds of reindeer that were alternatively nurtured or hunted. People who lived here built boats, went fishing, and practiced shamanistic rituals involving bear worship. Since 1985, this place is a UNESCO World Heritage Site (Altaristningarna, 2011) and an open-air museum.

Nämforsen

One of the largest areas with rock carvings in Northern Europe is *Nämforsen*. Around 2,300 figures and lines were carved or engraved into the rock surface during the period 4,000–2,000 BC, with particular intensity during 2,200–2,000 BC. Here the most common motifs are moose and boats. The boats often have bows designed as heads of moose. Other motifs are bears, feet, fish, people, and weapons. The images are located both on the mainland and on the islands in the murmuring streams.

Nämforsen is located in the province of Ångermanland, in the northern part of Sweden. Nämforsen was located at the

head of a fjord, several miles from the open sea some centuries before 4,000 BC. At that time sandbars and sandbanks attracted a rich wildlife (Welinder, 2009, p. 320). The elevation of the land lifted the rocks and formed the streams of today.

Perhaps this area was a sacred gathering place where hunting groups came during the summer to participate in joint activities. The extensive and rich archaeological finds and the rock carvings show contacts with and influence from cultures in northern Norway, Russia and also southern Scandinavia.

This is a part of a rock carving in the streams at Nämforsen. Some of the moose seems to be cut into pieces.

Previous interpretations have revolved around trade contacts and hunting magic. However, later interpretations consider new views of the world (Carlsson, 1998, p. 46). Bolin (1999, p. 178) argued that the rock carvings had a significant role on a global level. The rock carvings were included in tales of

the creation. The mythological content of the images can be based on a notion of transformation between humans and animals (moose), but also between animals and boats.

At Nämforsen some carved footprints and wheel-crosses are South Scandinavian rock carvings (Lihammar, 2010, p 111). Sometimes areas with rock carvings of both types are called *mixed carvings* (Burenhult, 1999b, p. 123).

See pictures at:
http://www.namforsen.com/default.asp?path=22553&pageid=32598

Southern rock carvings

South Scandinavian rock carvings, also called *agricultural carvings* and *ship carvings,* are found throughout southern Scandinavia. These panels are often dated to 1 500–500 BC. Here the pictures are much younger, more schematic, and usually freer, than the pictures in the northern rock carvings. Rock carvings are particularly common in the provinces of Bohuslän and Uppland in Sweden, and in southern Norway. But there are also many fine carvings in southern Sweden. The northernmost South Scandinavian rock carvings are in Alta, and in the Arctic Ocean (Welinder, 2009, p. 323).

Nordbladh (1999, p 142) suggested that there are more than 5,000 rock art sites along the Swedish west coast. According to Burenhult (1999b, p. 129) the province of Bohuslän is one of the world's premier areas of prehistoric rock art. Lihammar (2010, p. 112) calculated the number of rock art sites in Bohuslän to about 1 500. This is the largest concentration of rock carvings in

the whole of Europe. Because of the huge elevation of the land, many of these areas are today ten kilometres from the coast.

According to Nordbladh (1999, p 140) at least twenty "documentation generations" have been working to locate, describe and map the rock carving sites in Bohuslän. Despite the amount of inventories new panels are still found. At the same time older places with rock carvings disappear, partly because the environmental degradation is hard on the rock and partly because it is hard to find the places again.

Tanum

The rock carvings at Tanum, with 350 panels, have been declared a UNESCO World Heritage Site (Tanum, 2011). The panels often show animals, boats, carved footprints, cup marks, equipments, livestock, palms, people, ships, sun, trees, vehicles, weapons, wheels, and wheel crosses. In total this area is 45 square kilometres. People have lived her for 8,000 years.

Fossum

Fossum has a nearly 500-meter long and flat rock with about 20 different panels at the foot of a mountain, facing the sun. The central area of carvings is about 25 square meters. There is a coherent composition with about 130 elegantly rendered figures. These are placed close together. Only a few motifs are covering others. Here are several hunting scenes and beautifully drawn deer. According to Bertilsson (1989b, p. 107), many researchers consider this inscription to be the most complete of all the carvings in the country. It is possible that one single carver alone executed all the figures at the Fossum site, which is dated to the 600s BC (Bengtsson, 1999, p. 47; 2004, p. 85).

This is a part of a rock carving at Fossum. The figure on the left is called "The Dancer." The cup mark between her legs is interpreted as a gender marker. Two phallic men have a "cultic battle."

Vitlycke

Vitlycke has a 22-meter long, sloping flat rock with about 300 carved figures and 170 cup marks (Bengtsson, 1999, p. 39). The images in Vitlycke were probably carved and created over a period of 1,300 years. Several depicted warriors appear to be in conflict with each other (Bertilsson, 1989b, p. 99). The premises comprise approximately 200 square meters.

See pictures at:
http://en.wikipedia.org/wiki/Rock_Carvings_in_Tanum

Newgrange

Over 900 stone circles found throughout Britain and Ireland were positioned with reference to the movements of the sun. Mankind has used circles, triangles and squares as important symbols for thousands of years. On the shortest days of the year, the winter solstice, the first beams of light from the rising sun illuminates an altar-stone inside the *main burial chamber* in *Newgrange*. This special construction shows a deep understanding for the importance of special illumination. Many large kerbstones and stone slabs have carved decorations with ”basic designs.”

A large turf mound

Newgrange is an interesting old prehistoric grave-field in Ireland, in Western Europe (O'Kelly, 1982a). A well-organized farming community constructed Newgrange over 5,000 years ago (about 3,200 BC; Grant et al, 2008).

Now Newgrange is a part of the Brú na Bóinne UNESCO World Heritage Site, with two more principal monuments and 35 smaller mounds. Some of these Neolithic megalithic monuments were used as tombs and maybe also used as places with astrological, ceremonial, religious, and spiritual importance. Today the experts do not agree about what the site was actually used for. According to Burenhult (1999a, p 283) this kind of monuments were central places of worship for a large countryside where village chiefs came with their companions in order to practice their cult and administer their communities under the leadership of a powerful paramount chief.

The most famous passage-tomb, or Ancient Temple, was originally built on top of a hill. The front of the monument was

reconstructed in the 1970s. The monument consists of a large almost circular, or kidney shaped, turf mound. The mound covers an area of over one acre. It is 79–85 meters in diameter and 13.5 m high and it is built of 200,000 tons of stone and alternating layers of earth. All the stones were transported to Newgrange. Grass is growing on the top.

Twelve out of the original estimated 38 large boulders form a ring of about 104 m in diameter outside the base of the large mound. 97 large kerbstones retain the base of the mound.

See pictures at:
http://www.newgrange.com
http://en.wikipedia.org/wiki/Newgrange

The winter solstice

The turf mound has an entrance on its south-eastern side. A 19 m narrow and uphill passage leads into a central chamber and three smaller chambers (O'Kelly, 1982a). The larger chamber (6.5 x 6.2 m) has an altar and a six m high and corbelled vault roof. This may be a burial chamber (Burenhult, 1981; O'Kelly, 1982a, p. 122). Several of the stone slabs in the passage are decorated with carvings. The average height in the passage is about 1.5 metres.

This large Neolithic monument was constructed with great precision. From December 19th to 23rd the first beams of light from the rising midwinter sun passes through a small and rectangular shutter above the entrance and passes through the passage. For this to happen it is necessary first to remove a stone fitting the shutter 25 m from the altar. On December 21st the whole burial chamber becomes dramatically illuminated for

17 minutes and the room gets flooded with sunlight. This illumination marks the end of the longest night of the year and the beginning of the next year. It is speculated that the sun formed an important part of the religious beliefs of the Neolithic people who built it.

Excavations have revealed deposits of human bone in the passage. According to Irish mythology, Newgrange was the alleged burial place of the prehistoric kings of Tara, and also the home of a race of Irish supernatural beings, the people of the goddess Danu.

Newgrange is one of the most important megalithic structures in Europe (Renfrew, 1982, p. 7). It was built 500 years before the Great Pyramid of Giza in Egypt and more than 1,000 years before Stonehenge in England.

Neolithic rock designs

Many of the large kerbstones surrounding the mound, and several of the stone slabs in the passage are decorated with carvings. O'Kelly (1982b, p. 146–147) divides the carved decorations in two main groups: 1) curvilinear carvings, and 2) rectilinear carvings. Both groups include five categories of carvings with basic graphic elements.

In the *curvilinear decorations* the lines are curved in various ways. The five categories are 1) arcs, 2) circles, 3) "dot-in-circles," circles with a dot inside, 4) serpentiforms (lines having the form of serpents), and 5) spirals.

In the *rectilinear decorations* the individual lines are straight. The five rectilinear categories are 1) chevrons (inverted V-shaped patterns) or zigzags, 2) lozenges or diamonds, 3) off-

sets or comb-devices, 4) parallel lines, and 5) radials or star shapes.

However, ÓRíordáin and Daniel (1964, p. 115–117) presented a classification of motifs in the Neolithic art based on earlier work by Professor Piggott (1954). They distinguish between thirteen main categories: face motifs, circles, rayed circles, crosses, spirals, arcs, ovals, scalloped outlines, hurdle patterns, fir tree motifs, zigzag patterns, triangles and lozenges, and cup-marks. There are several versions in each category.

Triskele-like decorations, each with three interlocked spirals, are notable examples of curvilinear designs on the large entrance stone, about 5 tons in weight. ÓRíordáin and Daniel (1964, p. 26) described the entrance stone as: "one of the most famous stones in the entire repertory of megalithic art." According to some archaeologists the purpose of these famous carvings is decorative. However, others believe the purpose is symbolic.

Some of these ten basic graphic elements were used in many rock carvings and on a lot of pottery. Some elements are still used in many designs, illustrations, and ornaments.

The construction of complicated megalithic monuments required an advanced society with specialised groups that were responsible for different aspects of construction. Neolithic people had not yet developed metal. All their tools were made of antler, bone, stone or wood.

It is complicated to find a clear definition of "rock art." From an information design perspective "Neolithic rock design" probably is a better way to term these kinds of carvings than "abstract Neolithic rock art."

Stonehenge

Stonehenge is a huge prehistoric circular monument of large standing stones in Wiltshire, close to Salisbury in the southern part of England (Coe et al., 1986). There are many theories but nobody knows why Stonehenge was built, or how it was continuously used for almost 1,600 years.

As previously noted this kind of large monuments were central places of worship for a large countryside where village chiefs came with their companions in order to practice their cult and administer their communities under the leadership of a powerful paramount chief (Burenhult, 1999a, p 283).

Several archaeologists believe that Stonehenge was constructed in three phases anywhere from 3,100 BC to 2,000 BC. According to Palmer et al. (2006, p. 102) the first monument on this location was built 2,950 BC. It was a large circular earth bank surrounded by a moat. The circular monument had a diameter of about 110 metres. The moat was dug two-meter deep. The excavated soil formed a two-meter high embankment

There was a large entrance to the north-east and a smaller entrance to the south. Inside the earth bank there was a circle with 56 pits. Cremated remains contain human bone from as early as 3,000 BC. Stonehenge could have been a burial ground from its earliest beginnings (Pitts, 2008). Some form of timber structure was built within the enclosure.

In the second phase, around 2,600 BC, the timber was replaced by stone in two concentric arrays of holes in the centre of the site. The holes held up to 80 large standing bluestones. Each weighed about four tons. The north-eastern entrance was deliberately widened so it precisely matched the direction of the midsummer sunrise and midwinter sunset of that period.

During the third phase, around 2,600 BC to 2,400 BC, 30 large blocks of grey sandstone were carefully placed in a circle with a diameter of 33 metres. When viewed from the ground their perspective remains constant. Each block was around four metres high and two metres wide. The blocks weighed around 25 tons each. On top of the standing stones 30 lintel stones were fitted to one another. They formed a continuous circle. Each lintel stone is about 3.2 metres long, one metre wide and 0.8 metres thick. The lintel stones curve slightly to continue the circular appearance of the earlier monument.

60 blue stones were places inside the circle with the blocks of grey sandstone. The 60 blue stones almost form a circle. Inside this area there were two sets of huge stones in an U-shape, with the opening towards the northeast. There are ten upright stones and five lintels. They weigh up to 50 tons each.

Some of the stones were probably transported some 380 kilometres to this site. The total work needed was huge. It has been estimated that the work consisted of over 30 million hours of labour.

At Stonehenge every stone was placed in a carefully calculated position with reference to the movements of the sun, the moon and the seasons. So Stonehenge was designed as a kind of observatory (Burenhult, 1999a, p 315). The openings in the arches were probably used to make astronomical observations. A special stone was set to cast a shadow exactly 25 meters away on a stone altar inside the inner U-shape at dawn of the summer solstice (June 21). On certain days, year after year, Stonehenge acted like a medium conveying probably very important information, maybe from the gods, to all people present at the site.

Some archaeologists believe that Stonehenge is a very advanced *solar calendar* that was used mainly to make advanced and intricate astronomical observations in order to predict eclipse, equinox, solstice, and other celestial events important to a contemporary religion (Hawkins & White, 1970).

Other archaeologists reject this theory and they believe that Stonehenge mainly was a site of *religious significance* and a place for *ancestor worship*. There are also several other theories regarding the actual function of this monument. Maybe Stonehenge was a multifunctional monument?

Stonehenge is one of the most famous archaeological sites in the world. In 1986 the site and its surroundings were added to the UNESCO's list of World Heritage Sites. It is co-listed with the nearby monument Avebury Henge.

Today Stonehenge is a group of huge, rough-cut stones, and the remains of a ring of standing stones set within earthworks. Several hundred burial mounds surround the ring of standing stones. Some graves contain human bones from as early as 3,000 BC. Millions of people come from all over the world to visit Stonehenge.

Also pyramids in Mexico and in Egypt were positioned with reference to the movements of the sun, as well as many other great ancient monuments.

See pictures at:
http://www.stonehenge.org.uk
http://en.wikipedia.org/wiki/Stonehenge

See panoramic view at:
http://www.english-heritage.org.uk/daysout/properties/stonehenge/world-heritage-site/map/panoramic/

See interactive map at:
http://www.english-heritage.org.uk/daysout/properties/stonehenge/world-heritage-site/map/

Sierra de San Francisco

There are *rock paintings*, or *pictographs*, in Africa, Mexico, North America, Siberia and Scandinavia. Rock paintings were made on vertical cliffs. There is often an overhang that has protected the paintings against rain and winds. Some rock paintings are found on major stone blocks. Places with rock paintings may be close to lakes or small and tranquil waterways, and also in places with good views over water. Rock paintings are often dated to the Neolithic period, perhaps to around 4,000 years ago. Rock paintings were often made with red, black and white mineral earths and other natural compounds.

The prehistoric complex and very rich rock paintings of the Sierra de San Francisco region are located in the central region of the Baja California peninsula in Mexico. Since 1993 this is a World Heritage Site. These rock paintings are regarded as some of the world's finest examples of prehistoric art.

The semi-nomadic hunters and gatherers who lived here made seasonal migrations over the peninsula. They moved from coast to coast. They harvested diverse resources on the upland

mesas and mid-peninsula. They took shelter from the summer sun in rock shelters along steep canyons in the mountains. Here they made their first paintings some 3,100 years ago. Over 250 sites with extensive series of elaborate paintings have been found. There are thousands of rock paintings of exceptional quality in very isolated locations in the canyons.

The semi-nomadic hunters and gatherers painted directly on the walls and roofs of the rock shelters. They made their paints from the mineral earths from the region of the volcano of Las Virgenes. They have used a large number of clear colours in their paintings. These shelters are difficult to access and the pictures are very well preserved from air, water and human destruction.

Although crude in technique these paintings show the objects distinctly. The motifs are very varied and tell about the life of the people in the Baja California peninsula. The motifs include men, women and children. Many motifs are far greater than life size animals and humans. Some human figures are more than two metres tall. Images of wildlife are the most common motifs, with mammals such as deer, lynx, mountain lion, mountain sheep, and rabbit (Rose, 1999). Some paintings include marine mammals such as whales. The painters saw the whales during their seasonal migrations. Other motifs include animals like eagle and pelican, turtle, octopus, manta ray, tuna and sardines.

Also today thousands of tourists are coming to Baja for whale watching. From mid-December to mid April, the coastal lagoons of Baja California Sur are calving grounds for the California grey whale (Palmerlee, 2007 p, 35). People gather to observe mothers and their calves cavorting in the shallow waters.

Humans are shown frontally, but often lack facial features. Animals are shown in profile. Horns of mountain sheep, antler of deer, and ears of rabbits are accentuated (Meighan, 1966). Many of the animal figures have an arrow either across them or stuck in them. Also human figures have arrows, some as many as ten arrows. There are also abstract elements in some motifs.

Archaeologists have made detailed analysis of the rock paintings. This gave some insights into the religious and social organization of the prehistoric societies. However, today it is not possible to fully understand the significance of the paintings. Present day California Indians are completely ignorant of the meaning. They only know that their ancestors made the rock paintings (Meighan, 1966). The meaning with the motifs will probably never be fully understood. It is probably associated with their belief system and culture, hunting magic, and renewal of life. Some of the paintings have very dangerous locations. This indicates that the act of painting was more important than the final pictures (Meighan, 1966). None of the investigated rock-shelters had deep deposits. No artefacts indicate how the paintings were made.

The rock-shelters and painting were abandoned 200 years before the arrival of the Spanish. The Spanish Jesuit missionary Francisco Javier Clavijero "discovered" the rock paintings in Sierra de San Francisco in the eighteenth century (Rose, 1999). He reported his findings in a publication in Rome in 1789. The missionary noted pictures of men and women, and different species of animals. At that time the local inhabitants believed that "a nation of giants who came from the north" had made the rock paintings.

The rock paintings were “re-discovered” in the 1960s. Since then several experts have studied and surveyed the sites. Today there are strict regulations for visiting the sites. It is only possible to visit these sites with official guides and the authorization of Mexico's National Institute of Anthropology and History. And it is complicated. According to Palmerlee (2007 p, 138): “Most visitors will find the steep volcanic terrain much easier to manage on mule back, which leaves more time to explore the canyon and enjoy the scenery. The precipitous mule back descent into the canyon takes about five to six hours, the ascent slightly less.”

It can’t be that many people who have seen these remote and often inaccessible images. However, using the Internet, we now have opportunities to study several of these interesting images of animals and humans.

See pictures at:
http://whc.unesco.org/en/list/714
http://en.wikipedia.org/wiki/Rock_paintings#Pictographs

The Bronze Age culture

Most of the Scandinavian rock carvings were made during the Bronze Age (Almgren, 1987). In southern Scandinavia the Bronze Age includes the period 1,700–500 BC (Welinder, 2009, p. 43). Other sources give slightly different information. Bronze was the raw material for tools and weapons, but people continued to use flint and other stone materials for everyday tools. The weapons and ornaments of bronze were luxury goods and social symbols and are common as grave goods, and even sacrifices. Skilled craftsmen gave bronze objects rich ornamental decoration.

The Scandinavian Bronze Age was a dynamic period with many external influences. An entirely new social system was developed, supported by new gods and new religions. Europe got a rapid development. A new elite of skilled and sophisticated craftsmen and specialists developed. Objects and ideas spread quickly through travel and contacts. Metal and salt became important commodities. At the end of the Bronze Age people began importing objects of iron.

Development of crop and livestock began from 3,900 BC in southern Sweden. At the same time the lifestyle of the hunters and gatherers disappeared. According to Welinder (2009, p 169) people's diet changed pervasive in the space of a single generation in the period 3,900–2,000 BC. It went from the marine seals and fish food diet to cheese and steak. From around 1000 BC onwards people have built clearance cairns, field boundaries, and stonewalls. These remains can be joined together to form fossil landscapes (Welinder, 1998, p. 14). Cairns forms the most common remains of ancient agriculture.

A rich visual world

Rock carvings represent only a small portion of all images, ornaments and symbols that people created during the Bronze Age. Malmer (1989, p. 15) argued that Bronze Age people had a treasure of images. People lived in a rich visual world and all knew the forms and meanings. Finds from several archaeological excavations include apparel buckles, funeral urns, jewellery, ornaments, symbols, and weapons. The images were carved, painted or sewn in different materials. The images that were carved into stone, or carved in bronze have survived best. However, materials like bark, ceramics, fabric, leather, and flat pieces of wood are only preserved under very favourable conditions.

Fredell (2003) discussed how to use and read images in societies with oral traditions without written language. In oral-based societies images were not only aesthetic art, and not a writing system (p. 175). The abundance of pictures of objects and carvings, as well as figurines was expressions of conscious communication in symbiosis with speech and people's memories. Images can convey many more messages than a written text. Scripture implies a more fixed, simplified and standardized way of repeating what someone tells us. Many of the variants of the stories that exist in an oral tradition disappear when they are documented with written language.

Purposes and functions of rock art

Rock carvings were created and used for a very long time and under different economic, ideological, political and social conditions. Cutting and carving pictures in a carefully selected, smooth rock requires extensive work. There was a reasonably

clear purpose for each project. It seems that there were three distinct audiences for both rock paintings and rock carvings. The first target was higher, divine powers. The second target group was people within their close circle, as family, tribe or group. The third target was alien and possibly hostile people. Here are some of the purposes and functions suggested by archaeologists.

Aesthetic purpose

Rock paintings and rock carvings had an aesthetic purpose (Malmer, 1989, p. 11). In most cases, they are drawn in a definite artistic style.

Archives of memories

Like many other archaeologists Hagerman (2011, p. 128 f) believes that the purpose of the images on the rock carvings were probably recalling important stories.

The ancient images serve as archives of memories. Oral stories, images and symbols were expressions of ideological communication during the Bronze Age (Fredell, 2003, p. 206). This kept up an ideological system in nearly two thousand years. The stories changed over time and space.

The capacity of images for ambiguity is probably a quality that people used. The same rock could therefore be general memories to tell different stories. Fredell (p. 211) argued that many of the pictures did not necessarily reflect epic/mythical stories, but they may have had other functions. There are similarities between rock carvings and today's cartoons.

Rock carvings are valuable social documents (Carlsson, 1998; Burenhult, 1999b) that show changes in ritual behaviour patterns over long time periods.

Bridges between things and thoughts

Based on image semiotic case studies Fredell (2003) concluded that images on the rock carvings serve as bridges between things and thoughts. The images were also bridges in time and bridges in place. Through oral traditions that were linked to the images were stories, beliefs about gods, ideological messages, cosmological beliefs, myths, rituals, myths, creation stories, thoughts and values conveyed and between generations and also between different communities.

It is conceivable that beliefs and ideas could be communicated in connection with the exchange of goods. Hagerman (2011, p. 100) argues that the elites who had nice ships competed to embark on prestigious trips deep into uncharted waters. Kristiansen and Larsson (2007) compared carvings and bronze figurines in Scandinavia with seal pictures and murals in Mediterranean palaces. They argued that during the time from 1,800–1,500 BC, there were chiefs from Scandinavia who did travel around the whole of Europe (p. 39f).

Ceremonies and rituals

Both rock paintings and rock carvings were used to express worship of the gods, at the same time addressed to the people (Malmer, 1989, p. 11). Performing generally accepted ceremonies and religious rites have always been considered to be honourable. Some images show the gods and goddesses and perhaps ceremonies in which rulers took part.

Kristiansen and Larsson (2007, p. 335) argued that it was possible for thousands of people to simultaneously observe the ceremonies and religious rites that priests and chiefs performed at large and monumental carvings, such as in Vitlycke. It is, however, also possible that fences or palisades separated some rock art sites (p. 337). In this case, the pictures were intended for specially selected members of the elite, and for heaven's deities.

Burenhult (1999b, p. 122) argued that the rock carvings are valuable social documents that show a long section of our prehistoric cultural development, as reflected in changes in ritualistic behaviour patterns among the tens of thousands of characters in the rocks. The significant changes in the Late Bronze Age cult acts reflected in a changed burial and a new composition of findings of sacrifice offerings have their direct counterparts in the world of rock carvings. Findings of the magnificent artefacts that were used in ceremonies, like horned helmets, Bronze Age horns, and ceremonial weapons are brought to life among the rock carvings (Burenhult, 1999b, p. 131).

However, Goldhahn (2006, p. 111) argued that one should question the assumption that all rock images were made in connection with various ceremonies and rituals.

Conceptual content

The essence of both rock paintings and rock carvings are the importance of the images, their conceptual content (Malmer, 1989, p. 12). The aesthetic and artistic value is there, but it is incidental. Rock paintings and rock carvings similar picture writing. Rock art works as modern printed texts and want the reader or viewer to understand (Malmer, 1989, p. 16).

Display of power

Kristiansen (2002, p. 69) argued that a rock with rock carvings was a chieftain "exhibition" where he showed off his accomplishments and long-distance travel, but also the place where they performed rituals to ensure a successful trip.

There are many pictures of ships on the rock carvings in Bohuslän. According to Olsson (1999), several of these ships have "striking similarities" with carved and painted images of ships in the eastern Mediterranean. It is known that there were extensive contacts in Europe. Trade of goods between regions and between people, occurs from about 2,400 BC and forward in time (Welinder, 2009, p. 158). Offer of gifts created trust, influence and affinity with other cultures.

Divine powers

Both rock paintings and rock carvings addressed to the higher, divine powers. Carving or painting a picture is often a magical means to achieve something you desire, such as to get a better hunting or to get a better harvest (Malmer, 1989, p. 11).

Practical purpose

Both rock paintings and rock carvings could have practical functions and show borders and edges of fields (Malmer, 1989, p. 11).

Motifs in rock art

Rock paintings and rock carvings are found in all parts of the world (Malmer, 1989, p. 10). There are many similarities in terms of design and execution. There are quite a few motifs, especially depictions of animals, objects and people. Bengtsson

(2000, p. 71) argued that rock images in the world in general are pretty stereotypical. The representations in Bohuslän are dominated by dozens of subjects that constantly recurs in various designs. These designs include circular shapes of various kinds and especially carved footprints, cup marks, people, and ships. Many types of figures appear only occasionally.

Malmer (1989, p. 17) discussed three main groups of motifs: 1) depictions in real scale, 2) miniature images, and 3) symbols. The first group includes images of weapons, like axe, bow, dagger, spear, and sword. Malmer argued that pictures of weapons depict sacrifices to the gods. The pictures are like the originals. This group also includes images of clothing. The images in this group correspond to concrete nouns, such as "axe."

Malmer's second group includes images of boats or ships, with or without crews. Ship is the most common of all motifs. The "ships" on the rocks have keel and stem. Maybe they were large canoes lined with leather. The small bars can represent crews or perhaps frames. This group also includes images of animals, such as birds, fish, snakes, and images of people. Among the mammals we can recognize bear, cattle, dog, horse, moose, pig, red deer, reindeer, seals, and whales. Some animals are more diffuse in the pictures and they are recognized as "quadrupeds."

The images of people are the most varied. Most pictures show men, rarely women and never children. Some men are standing and others are sitting or riding. Some hold up some gear, shields, or weapons. Pictures showing work are rare. The craftsmen depicted everyday life. In some pictures people use wooden ploughs and wagons pulled by horses or cattle. There may be a connection between fertility, regeneration and death.

Several of the images in this group correspond to concrete nouns, such as "horse." But when a scene is showing how a man is driving a chariot with horses the pictures may correspond to a complete sentence.

Malmer's third group includes circular shapes, carved footprints, cup marks, hands, wheels, and wheel crosses. The images in this group correspond to abstract nouns, which today are difficult to understand. The magical and practical purposes of rock carvings may explain why the same motif is often repeated many times on the same panel. Sometimes a motif fills all available surfaces.

There are a wide variety of gestures in societies with oral traditions. And the human figures on rock carvings show a wide range of gestures. The positioning and design of arms, hands, legs, feet, heads, and bodies show body movements like acrobatics and dance, and emotions and trance (Fredell, 2003, p. 182). The meaning of a specific gesture can vary with the context.

Execution of rock carvings

Rock carvings are found in all sizes, ranging from small single cup marks to large contiguous panels on large rocks with hundreds of individual figures. It was time consuming to make rock carvings. It is possible that people in general could carve out single cup marks near their own pastures. And Malmer (1989, p. 10) argued that it was common for people to make deeper lines in existing images each year as an alternative to make completely new pictures. It was reasonable to wish for abundant harvest and therefore reuse "the right image" every spring. An available rock surface could soon be covered with pictures. In

fact in many places, large rock carvings are very difficult to interpret because multiple images overlap and cover other images.

Bengtsson (2004, pp. 85f) conducted accurate measurements and analyzes of three unique motifs in various sites in Bohuslän. Very large similarities between eight figures of the motif "four-wheeled wagon," from three sites, show that these figures are likely to be executed by one single person. In five sites there are a total of ten representations of the motif "horse footprint." Here the analysis shows that nine of these figures are likely to be executed by one person. Two sites have three unusual "human figures." Again, the analysis shows that one person executed the figures. It was perhaps three different individuals who performed work on these rock carvings. According to Bengtsson (2004, p. 99), these results suggest that the rock carvings were generally made of special people who were specialists in the Bronze Age society. They were people with perhaps the secret knowledge that was required for the ritual execution of pictures.

Thus it is likely that specially selected men or women were trained to execute more advanced designs of rock carvings. In this text these craftsmen are called "carvers." Carvers often used a hard hammer-stone to batter on the stone surface in order to remove parts of it. Carvers used different kinds of hammer-stones to carve lines, and uncover larger areas. In certain societies, the choice of hammer-stone itself had a religious significance. Sometimes the carver used a second stone as a chisel between the hammer-stone and the stone surface. Carvers could also use hard rock chisels to produce fine lines. It seems that this technique continued even after hard metal tools came into

use. The carvers are unknown and we do not know who they were. (During the Viking Age, individuals who made inscriptions on rune stones often signed their work with their own names.)

Bengtsson (2004, p 101) argued that the carver was a kind of druid, or even primarily an individual who possessed special knowledge of genealogical nature. He or she confirmed the heroic tales and myths, and the elite status and power claims. The rock carvings are now speechless characters carved in the rock– when they were in use they were supplemented by the stories, or, as some prefer to describe it–oral narratives. The images were dressed in linguistic form, came to life and design. Each character had their own story, its own justification. The stories may have been just stories but also in the form of songs and poems, which are common during the latter part of the Nordic Iron Age and on the continent.

Kristiansen (2002) believes that a certain type of "alien" ships from the Early Bronze Age, are found on rock carvings in Norway, Sweden and Denmark. These ships differ from the large amount of pictures of the local boats and ships. Maybe one or more chiefs travelled from place to place and made these pictures. In this way they documented their visits and signed their pictures.

It is possible that the lines in some rock carvings were stained from the beginning, for example, with red ochre colours that are clearly visible against dark rock surfaces. Nowadays, the lines in rock carvings are often filled with red paint. However, according to Nordbladh (1999, p. 140) it is doubtful that the rock carvings were stained from the beginning. He says that the colour is meant for the tourists.

Placements of rock art

When the thick land ice melted the whole of Scandinavia started to rise out of the ocean at a considerable rate. Because of the elevation of the land we often find Scandinavian rock carvings far inland today. While rock paintings were created on steep sheltered rock walls and cliffs the rock carvings usually were made on carefully selected flat or gently sloping rocks. Rock carvings were often positioned at the beaches to the sea, lakes, bays and rivers.

Bertilsson (1989a, p. 41) suggested that the prevalence of rock carvings reflect the district's total extent, while the larger rock carvings with other abstract symbols, pictograms and scenes instead showed locations of key importance. Centrally located rock art may have been important places of worship, where the aim was to strengthen social cohesion in the district. Regardless what purpose rock art have had, today they provide signals to areas and places that were important to ancient people. Places where people fished and hunted, where cattle grazed, where people farmed the land, where people worshiped their gods and their ancestors, or where they might have sworn allegiance to a new chief and a new faith, and where strange men who traded with prestigious weapons of bronze arrived. In this way, the rock carvings are not only information about prehistoric ideas and religious practices but also about society and settlement.

Also Bengtsson (2004, pp. 66f) argued that it is possible to interpret the distribution of smaller and larger rock premises in social terms. Larger facilities are recognized as elite places of worship. Here are the figurative images. At smaller premises “ordinary people” lived. Here are most of the carvings. Gold-

hahn (2006, p. 98) argued that this is true for the cup marks, but larger premises with rock carvings have never been found close to contemporary settlements. In some places it may look confusing right now. But it may well be that the images within a local rock may have been there for several hundred years. In many places one can see that the images are placed on flat rocks according to some overarching plan.

Interpretations of rock art

We have only limited knowledge of the people who lived during the Stone Age and during the Bronze Age. We do not know much about either those who ordered the pictures, or those who painted and carved the pictures, or those who looked at the figures and understood (?) the messages. Today we have access to a large number of artefacts, the rock paintings and the rock carvings. There are no words or texts inscribed on the rocks, but there are characters and symbols. Today we do not understand the meanings of any of these signs. And since we can't possibly ask those who created these messages we have to interpret them. Archaeology is an "interpretation science," and Welinder (2009, p. 109) argued that archaeologists do their interpretations in good faith based on their frames of reference and experience.

Hultkrantz (1989, p. 43) noted that the long history of rock research is rich in errors, loose speculations, and re-evaluations. We have to carefully evaluate all the interpretations and perhaps redo some of them. It is impossible for us living today to familiarize us with how the ancient people thought and what cultural conditions applied for thousands of years.

Welinder (2009, p. 342) argued that a contemporary viewer could see rock carvings as a gateway to another world of ideas. It is so intrusive obvious that rock carvings are quiet, but they invite, almost demand, to be understood. We can't leave rock carvings without any thoughts on what they represent, what they mean and what they want to say. Our imaginations get wings, and why would the imagination of one viewer be better than the other's? Who can today know what Bronze Age people thought of when they saw the pictures?

For a modern audience, it is difficult to understand the images in rock carvings and in rock paintings. We do not have access to the correct codes and we do not understand the symbols found in picture stories.

Shamanism is a practice that involves a practitioner reaching altered states of consciousness in order to encounter and interact with the spiritual world. The world is full of invisible spirits, ancestors and forces that can influence and have control over those who are alive. It is not a religion. Shamanism is widespread throughout the world and occurred among hunter-gatherer-tribes 20,000–30,000 years ago.

Bolin interpreted rock paintings (1999, p. 178) and rock carvings (1999, p. 170) as expressions of a long tradition with variations of a shamanic ideology. The execution of the images have been included in formal meetings and in religious rituals in traditional ceremonies intended to communicate with spirits and ancestors to overcome crises and diseases in the local community.

Both the images and the words were probably important elements in spells of various kinds. From the Bronze Age, there are many signs that both the sun and the moon were worshiped

in ancient Norse religions. In several rock carvings there are various circular shapes. Some are single wheel crosses, others consists of more complicated patterns, such as a circle with a number of radial lines, concentric circles, or other patterns. Sometimes these circular shapes are placed on a ship, on a wagon or on some form of status. Some researchers believe that the wheel crosses on the rock carvings symbolizes both the sun and the wheels of the suns own wagon.

In his book about wheels on rocks Nilsson (2005) discusses images of wagons on rock carvings. For a long time he has studied the early history of the wheel. Nilsson has been able to show that some people in the Bronze Age were skilled technicians. Farmers had access to different types of wagons. Some were designed to carry large boulders, others to drive timber.

According to Nilsson (2005, p. 52) it is common practice for primitive people to use several different perspectives in the same image. Geometric requirements are completely set aside. One can, for example, depict a crocodile with body and legs from above, while the head is viewed from the side. In such a picture, you cannot confuse a crocodile with any other animal. It uses multiple perspectives in order to create greater clarity. This is a "clarity perspective."

Sometimes rock carvings show an activity in a simplified way, in an "activity perspective" (p. 53). For example a wheelwright may be standing close to a wheel holding up a tool, but the picture does not show the actual work process. It is similar to the signs once common outside the artisan shops and workshops. In the rock carvings a touch can mean "keep on with" (p. 16).

In some images the size of depicted objects and persons reveal their importance, rank, status or value. Also here geometrical requirements are completely set aside. Significant people who seemingly are far back in the picture are larger than those in the foreground. Such “value perspective” is also found in rock carvings (p. 56).

Nilsson (2005, pp. 137f) suggested that cup marks, which are very common in rock carvings, could have several meanings. Cup marks represent important structural elements in wagons. They often represent heads, and female gender in both humans and animals. But carvings may also be markers of force, direction and movement. A cup mark under a horse can display that the horse moves. A cup mark in a wheel can prove that the wheel is in motion. This provides another dimension to the rock carvings.

In images of wagons on rock carvings the draught-animals can be shown from the side or from above. This also applies to the wheels, pull logs and trailer timber. People can be viewed from the front or from the side. In individual rock images of wagons Nilsson has seen up to five different kinds of perspectives (p. 54).

Within large geographic areas, fire had great ritual significance. But traces of fire can be difficult to interpret. Sometimes there are traces of fire on rock carvings. Along with remains of sacrifices, which have been found in excavations in areas close to rock carvings, traces of fire suggest “purification” and “sacrifice” (Bengtsson, 2004, p 48). Rock carvings premises may have been ritual arenas.

Goldhahn (2006, p. 70) gave examples of a large number of researchers who have discussed the meaning, understanding

and interpretation of rock art. More than 500 articles, reports and other texts on rock art were published during the period 2000–2005.

Design or art?

In various definitions of the word *design* the authors note aesthetic and artistic properties as well as functional properties related to articles for everyday use. The meaning of the word design is very broad. Today design represents the identifying of a problem and the intellectual creative effort of an originator, manifesting itself in drawings or plans that include schemes and specifications to solve the problem. However, the term design also represents the outcomes of each specific design process, such as products, services, processes, and systems (Pettersson, 2012, p. 63). Mullet and Sano (1995, p. 9) noted that whereas *art* strives to express fundamental ideas and perspectives on the human condition, *design* is concerned with finding the representation best suited to the communication of some specific information.

Information design is a science that interprets how people express their messages and how other people perceive these messages. It is also necessary to study the artefacts that convey messages. An information designer is a person who largely works as a project manager. The task is to coordinate production of words, images and graphic design, but also the use of sound, light, space and time, for the presentation of information in different media. Today it can often apply to large and complex information projects.

Good information design makes everyday life easier for the people who need information. By applying the basic principles

of information design the sender make sure that all documentation is accurate, current, relevant and understandable to the intended receivers.

Design processes may include the following activities or phases: 1) define the problem, 2) analyze the needs, 3) define the conditions for the work, 4) create a synthesis, 5) draw a sketch or model, 6) implement a (computer) simulation, 7) conduct an evaluation, 8) implement corrections, 9) make decisions, and 10) create a finished design. This is followed by the technical production and distribution. In information design these activities are guided by design principles and implemented with the help of design tools.

A long period of time

Rock carvings were produced over a very long period of time, perhaps 5,000 years (Nordbladh, 1999). And there are many rock carvings in Sweden, perhaps 15,000–20,000 panels (Bengtsson, 2000). Livestock and crops were developed, while the lifestyle of gatherers and hunters disappeared. Objects and ideas spread quickly through travel and contacts (Welinder, 2009). People's diet changed pervasive within a single generation (Welinder, 2009). Bronze Age people lived in a rich visual world and rock carvings represent only a small portion of all images (Malmer, 1989; Burenhult, 1999a, 1999b; Fredell, 2003).

The interpretations that many archaeologists present in the literature suggest that rock carvings are the result of regulated and structured design processes rather than results of free, artistic processes, as we know them today. If this is true, we can consider the rock carvings as design rather than art, which,

however, does not prevent the rock carvings to also have aesthetic dimensions and purposes.

Several clients

The interpretations that many archaeologists make of social life, primarily during the Bronze Age, suggest that one can consider the chiefs and/or religious leaders, or perhaps the social structure, as the actual customers of figurative carvings.

Intended messages

Previous interpretations of the purposes of the messages of the rock carvings were often related to trade contacts and hunting magic (Carlsson, 1998). Later interpretations may relate to people's view of the world (Carlsson, 1998), and the creation myth (Bolin, 1999). Rock carvings have relatively few motifs. It is above all clear depictions of animals, objects and people (Malmer, 1989; Bengtsson, 2000). Several rock carvings contain intentionally designed message (Hultkrantz, 1989; Malmer, 1989; Fredell, 2003, Nilsson, 2005).

Intended audiences

It is clear that there were different audiences for the messages of the rock carvings (Malmer, 1989). The first target group was the higher, spiritual powers. The second target group was people within their close circle, as the tribe, family, or group (Bolin, 1999). The third target group was strangers. Archaeologists also suggest that at least some contemporary people could understand the messages. However, today we lack the relevant codes. We cannot understand the images, and not understand how ancient people thought (Hultkrantz, 1989; Welinder, 2009).

Skilled craftsmen

An entirely new social system, supported by new gods and new religions developed during the Bronze Age (Burenhult, 1999a, 1999b; Welinder, 2009). A new elite of skilled craftsmen and specialists developed. Many rock carvings are designed in a conscious way. It is obvious that the individual images are thoughtful and the results of very conscious efforts (Bertilsson, 1989b; Hultkrantz, 1989; Jensen, 1989). Some interpretations suggest that there were special people with special skills who carried out the work to make the visual figurative carvings. A few people may have done complete carvings (Bengtsson, 1999; 2004; Kristiansen, 2002).

Oral tradition

Today both rock paintings and rock carvings lack words. However, oral traditions were strong and expressed ideological communication during the Bronze Age (Fredell, 2003). Some ceremonies involved regulated religious rituals (Bolin, 1999). Rock carvings were part of various ceremonies. In addition to words sometimes even fire was used (Bengtsson, 2004), and probably different form of dance, and perhaps music and other sounds (Fredell, 2003).

Graphic design

Many rock carvings are placed in relation to each other in panels on the rocks (Bertilsson, 1989a; Bengtsson, 2004). There is probably often a deliberate graphic design that takes into account the natural conditions. Rock carvings are often placed on the sloping rock outcrops (Bengtsson, 1999). We don't know if

the rock carvings were stained from the beginning (Nordbladh, 1999).

Summary

For me it is clear that rock carvings are results of deliberate work with words, images and graphical form. I consider the several thousand-year-old panels with rock carvings as interesting *predecessors* of the kind of artefacts that are the result of work with information design today. The people who carved pictures in rocks probably worked on behalf of specific clients. They worked in a systematic way to plan and carry out the work with the help of the methods, tools and procedures that were available at the time of each assignment. Thus these individuals were ancient forerunners to those who work with information design today.

Early writing systems

Writing systems were invented at the beginning of the Bronze Age about six thousand years ago. A writing system is an organized and systematic method to use a set of signs or symbols to represent a verbal spoken language. The signs and symbols may be visible or tactile. Writing extends human memory by storage of data and information, and it makes communication of messages possible. There are a large number of writing systems in the world. People need to learn how to encode (write) and decode (read) their writing system. Writing systems are able to express ideas and thoughts.

In many ancient societies people believed that writing was a gift from their gods. Only specially selected people, like religious leaders, could understand the writing system. Writing became a tool for the elite to justify their rule upon the common, illiterate people. In ancient Egypt, for example, the god Thoth was the scribe and historian of the gods. Thoth also invented art and science, and could transform speech into material objects. A person could only achieve immortality if her or his name was spoken or inscribed somewhere forever.

Signs or symbols, generally known as characters, often include letters and numbers. The characters are usually recorded onto a durable medium, such as paper. Writing systems may have alphabets, logographies, or syllabaries. An alphabet has a standard set of letters. Here letters, or groups of letters, represent phonemes of the spoken language. *Alphabets* typically use 20–35 letters. A *logography* has a set of characters that represent words, morphemes or semantic units. Logographies may have several hundreds, and even thousands of characters. A *syl-*

labary correlates a symbol to a syllable. Here groups of phonemes form words. Syllabaries may have 80–100 symbols. There are also other categories of writing systems. Typically writing systems have some kind of grammar and syntax.

Early writing systems were developed in Sumer about 5,200 years ago, in Egypt about 5,200 years ago, in China about 3,200 years ago, and in Mesoamerica about 2,600 years ago.

The cuneiform script is distinguished by "wedge-shaped" marks in vertical columns on clay tablets. Scribes used a pen made from a sharpened reed stylus. The cuneiform script emerged in Sumer, an ancient civilization of southern Mesopotamia. It was used for more than 2,200 years. This writing began as a system of pictographs, and developed through several stages. The sign inventory was reduced from some 1,500 signs to some 600 signs. Writing became increasingly phonological. The cuneiform script was eventually replaced by alphabetic writing. Writing numbers for record keeping began long before the writing of language.

The people of ancient Egypt communicated in a uniquely symbolic manner. The motifs that appeared on buildings, everyday objects, and monuments were not merely decorative but they conveyed the beliefs and ideas that underpinned their society (Fontana, 2010, p. 174).

The early writing systems were based on earlier traditions called proto-writing. These systems used ideograms, pictograms, and other early mnemonic symbols. An ideogram is a graphic symbol that represents an idea or a concept. A pictogram is an ideogram that conveys its meaning through its resemblance to a physical object. Proto-writing systems emerged about nine thousand years ago. It is generally argued that proto-

writing lacked the ability to express ideas and thoughts. However, McKim (1980, p. 142) concluded that although contemporary alphanumeric languages evolved from pictographic languages, we should not infer that words and numbers are necessarily more recent or advanced. McKim further argues that unlike verbal thinkers who usually learn only one language, visual thinkers can very easily acquire a variety of graphic languages. By changing languages, they can largely avoid the "language rut" that holds thinking to a fixed viewpoint and a limited set of mental operations.

Books of the dead

Text and pictures have been produced, distributed, stored, and utilized for thousands of years. Writing systems were created in ancient civilizations. People wrote on everything that could be written upon. Alphabetic writing emerged in Egypt about 5,200 years ago. Ancient Egyptians often used papyrus scrolls for writing. Papyrus is a paper-like material made from a plant.

Early Egyptian hieroglyphics used pictoral elements to convey messages. Simple images could stand for letters or words in a written language. This was one of the earliest examples of being able to "read" and to "compose" (Brill, Kim, & Branch 2007).

The first "travel guides" were produced and sold as early as 4,000 years ago. They were the Egyptian "Books of the Dead" and contained advice and information, in an integrated design with a verbal and visual amalgam of text and pictures on coping with the trip to the Kingdom of Death. *The Books of the Dead*

may be the first examples ever where text, pictures and graphic design really are integrated.

The Books of the Dead were completely hand-made rolls of papyrus and, thanks to their high price, only available to truly wealthy families. The trade in these books is reminiscent of the Medieval Catholic Church's trade in indulgences. Both phenomena are examples of what could be called profitable publishing. "Middlemen", specially trained scribes and copiers who copied text and drawings, often repeatedly, made duplicates in the most literal fashion imaginable.

Even at an early date, libraries of different kinds acquired major importance as "institutional middlemen" in the transmission of information from writers to readers. The first public library, Pisistratus, was founded more than 2,500 years ago (540 BC) in Athens. The first bookstore was opened, also in Athens, 140 years later. Until the middle of the 19th century, bookstores often served as publishers, too, producing as well as selling books and other graphic products.

Pharaoh Amenhotep II and Sennefer

The seventh Pharaoh Amenhotep II of the 18th dynasty of Egypt ruled over a vast kingdom. He was 18 years old when he assumed power, and then he reigned from about 1,427 to circa 1,400 BC. After some victorious military campaigns he erected a number of temples. Like his predecessors he placed statues of himself in some of the temples.

His finest monument is his own impressive mortuary temple in the Valley of the Kings at Thebes (KV35). Here the pillars supporting the ceiling have fully drawn figures of Amenhotep II with funerary deities. According to Pemberton and Fletcher (2011, p. 68) this is the first time fully drawn figures are used in Egypt. In this tomb the hieroglyphic texts are of great importance as they contain a complete version of the *Amduat*. This book of the afterlife tells the story of *Ra*, the Egyptian sun god who travels through the underworld, from the time when the sun sets in the west and rises again in the east. The dead Pharaoh is taking the same journey until he ultimately become one with the god and then will live forever.

During the reign of Amenhotep II the Egyptian noble Sennefer was "Mayor of Thebes." He was also the "Overseer of the Granaries and Fields, Gardens and Cattle of Amun." *Amun* was the "King of the Gods." Being a favourite of the Pharaoh he got very rich. Sennefer placed a double statue of himself and his wife in the temple at Karnak. He was buried in the small tomb TT96 located in the Sheik Abd el-Quurna district of the Theban Necropolis on the west bank of the Nile opposite to Luxor. This richly decorated tomb, known as the "Tomb of the Vineyards," has a small burial chamber painted in splendid colours. The life-size images of Sennefer, of his wife, his family, and the gods

appear all around the tomb (Pemberton and Fletcher, 2011, p. 72). Several lines with pictographic verbal expressions are combined with interesting pictures to tell the stories in scenes on the walls and on the four pillars. Scenes show the funeral procession, the offerings, and the worshipping of the gods. The realistic grapevine design of the entire undulating ceiling has given way to a colourful geometric pattern representing decorative textiles. This is very *early information design*.

See pictures at:
http://www.luxor-on-line.com/tombs-n-sennefer.html

Rune stones

In Scandinavia our earliest known carved characters are called *runes*. The earliest runic inscription in Sweden is dated to around AD 200 (Zachrisson, 1999, p. 338). This inscription is on the tip of a spear, found in the province of Gotland.

Runes and runic inscriptions were used in the Germanic languages before the adoption of the Latin alphabet, with its *letters*. There are many theories regarding runes and rune inscriptions. The rune alphabets were probably based on and inspired by some alphabets that were used in the antique cultures at the Mediterranean Sea where Germanic people often served in the Roman army. In Scandinavia the Latin alphabet was adopted around AD 1000–1200. However, in many places runes were used in rural Sweden until the early 20th century. They are still used for decoration purposes.

People designed runes to be cut out in items made of wood. However, such items are rarely preserved and not present in archaeological finds. Runic inscriptions are preserved on flat, raised stones, but also on boulders, on bedrock, and on items like spears and buckles. These different objects are *the oldest preserved original documents* in Sweden. Many still carry messages from people who lived more than one thousand years ago.

There are several runic alphabets, or *Futharks*. All Germanic people used the *Elder Futhark*. There are a little more than 300 inscriptions from the southern parts of Scandinavia.

During the time period 500–800 the language changed noticeable in Scandinavia. The *Old Norse* became a common northern language with shorter words and changed vowels. The *Younger Futhark* (800–1100) contains 16 runes. Most of the

preserved runic inscriptions belong to this category. Two important variants are called *Danish runes* (long-branch runes), and *Swedish-Norwegian runes* (short-branch runes or Rök runes). The *Danish runes* are well adjusted for rune stones. A third variant is called *Hälsinge runes* (stave less runes).

Most rune stones are located in Scandinavia. Denmark has 250 rune stones; Norway has 50, while there are more than 2,500 in Sweden alone. There are also rune stones in other parts of the world as the tradition of raising rune stones followed the Norsemen wherever they went. Runic inscriptions still convey messages to us from people living during the period 400–1100.

Most of the rune stones were carved and erected during the last century of the Viking Age. Common purposes of rune stones were to mark territory, to explain inheritance, to boast about constructions, to tell of important events. Many of the rune stones were probably erected as memorial stones to bring glory to deceased men. Often the text tells us that the deceased had made extensive travels far away. Balle, Fot and Visäte are examples of signatures made by the rune-masters.

Rune stones were often put close to bridges, on grave fields, at assembly and meeting-places, and alongside roads where people easily could see them. Many rune stones still remain in their original places. Some rune stones have been inserted as construction material and were built into the walls of medieval churches, some were put in cemeteries, and some have been moved to museums. All rune stones have a runic inscription, a short text. However, a few rune stones also have simple images.

This chapter includes the following two sections: *Image stones,* and *Inscribed verbal and visual messages*.

Image stones

An *image stone*, also called *picture stone* or *figure stone* is a raised ornate slab of stone, usually limestone. All image stones have carved and painted visual stories. However, a few image stones also have runic inscriptions.

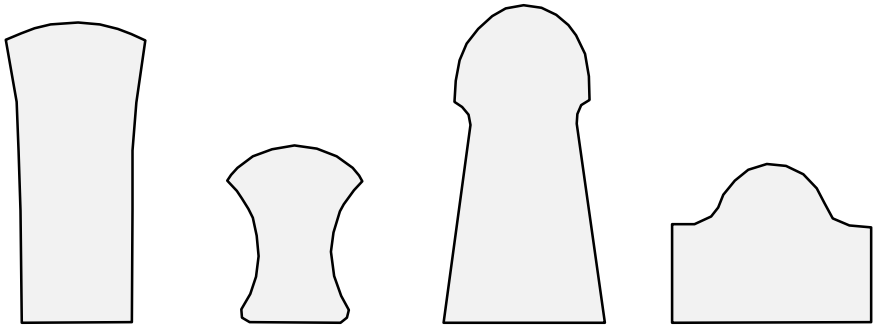
So far more than 400 image stones are known. Motifs often tell stories from the Nordic mythology. Most of these are placed in the province of Gotland. However, some image stones rest in the provinces around Lake Mälaren. The image stones from Gotland belong to the most internationally known archaeological finds from Sweden.

There are image stones from AD 400 until the 12th century. People erected monumental image stones in Gotland during three periods with great prosperity. These periods lasted AD 400–600, 700–800, and 1000–1100 (Burenhult, 1999b, p. 323). People used smaller stones during the intervening periods. During the 11th century the rune stones replaced the image stones. Then the visual stories disappear. In Gotland many of the rune stones have kept the same shape as image stones.

An important function for image stones was to function as noticeable memories in honour of men who had made important contributions to society. Women usually got smaller coffins with decorated flat slabs of stone. Another function for early image stones was probably related to religious ceremonies before Christianity.

The dating of image stones is based on studies of their outer shapes, their ornamentations, patterns and symbols framing the visual stories. It may also be possible to compare with datable finds in graves. Lacking textual explanations, the images are

consequently difficult to interpret. Often iconographic interpretations are based on images that have been "colour corrected" during the 1940s. However, modern studies using 3D scanning demonstrate that several of the "colour corrections" were wrong. Using this method it is possible to study the use of possible templates, handicraft traditions, cutting techniques, and individual cutting tracks.



This illustration shows axe egged image stones (left), dwarf stones, mushroom shaped image stones and decorated flat slabs for coffins (right). (Drawn after Nylén, 1978.)

Axe egged image stones were common 400–600. These stones have a straight form. The upper part is shaped like the edge of an axe. The ornamentations usually include circular forms, often a bow, a spiral or a whirl wheel in an upper, dominating field. A typical ornament is a wheel with many bent spokes. These figures may be symbols for the sun. It is not known how long the sun was an important part of the Old Norse religion. The motifs may also include images of manned ships without sails, as well as sketch-like animals and humans, and

decorations along the borders of the stones. Sometimes there are rune inscriptions. However, these are usually impossible to interpret. The axe egged image stones were often raised as markers close to graves within grave fields.

Mushroom shaped image stones were common 700–1100. These stones are tall with necks and tall bow-shaped profiles. The rich visual stories include several dramatic scenes from the Nordic mythology. A common scene is a man, riding a horse, welcomed by a woman holding a drinking-vessel. It is Odin and his horse Sleipnir entering Valhalla. Traditionally the Icelandic sagas have been the starting point for the interpretation of the motifs. Often the stories behind the scenes have not survived in written form.

Mushroom shaped image stones were often raised and placed in groups as visible monuments close to boundaries, bridges, at meeting-places, religious places, and roads where people easily could see them. These stones marked geographic as well as symbolic boundaries.

Some image stones tell us about everyday life in prehistoric times. These images demonstrate construction of buildings and provide detailed information on arms, carriages, clothes, domestic animals, horses, homes, riders, and ships with sails, sleighs and wagons. Some women have long plaited hair and men have trimmed beards and helmets without any horns. Thus they differ from common opinions about what the Vikings looked like.

Many images show scenes with battles and sacrifices. The images were painted in many and varied colours. At the end of the Germanic Iron Age and at the beginning of the Middle Ages

people used to dye their clothes, various objects and also inscriptions on rune stones Bägerfeldt, 2004, p. 76, 117).

Younger image stones have a stylized Christian cross in an upper, dominating field. Some rune stones from the same period have similar crosses. Furthermore they have dragon-coils in rune stone manner.

Only a few image stones have been found in their original places. Many image stones have been moved to new places and reused during historic time. Some stones were used as building material in bridges, in pre-historic graves, in floors and walls in churches, and even in open fireplaces. Other stones have been used in later graves. Most of the image stones remain in Gotland. However, some have been moved from the island. Today there are some image stones in major museums.

See pictures at:
http://www.guteinfo.com/?id=1275

Inscribed verbal and visual messages

Rune stones frequently have rich ornamentation. A few rune stones also have images, but yet they are mainly verbal documents. Younger rune stones often have a stylized Christian cross together with a short Christian prayer completing the text. Sometimes image stones have rune inscriptions. However, it is often impossible to interpret these characters. Picture stones are mainly visual documents. It may be hard to distinguish between rune stones with rich ornamentation and image stones with runes.

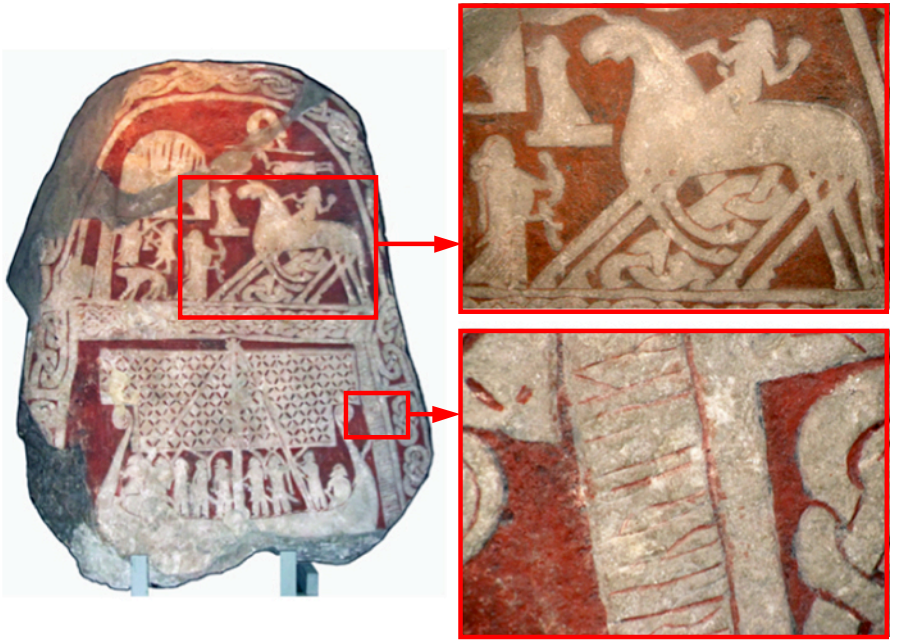
Below are four examples of early verbal and visual messages. In three cases runes and images are engraved and cut in large stones. In one case the medium is a flat rock.

The Tjängvide rune stone

An image stone from Tjängvide, in Alskog parish in Gotland, is dated to 700–800 (Lindqvist, 1941, p. 120f). The 174 cm high slab of limestone was used as building material and built into a cellar. It was discovered in 1844 on the farm of Tjängvide. The front of the stone has Swedish-Norwegian runes and is decorated with a number of figures in low relief, in one upper and in one lower field. The two fields are separated by a braided pattern like wickerwork. The back of the stone has neither figures nor runes.

In the upper field of the stone there is a small man riding a big horse with eight legs. A woman offers the man a drinking-vessel and the keys to the house. Walhalla is seen above the woman. Here blessed warriors enjoy the delights of battle. A spear has hit one man, and another man is lying dead on the ground. But in a moment both men will be able to raise totally

unharmed. The rider is usually interpreted as Odin with his horse Sleipnir. The horse Sleipnir has eight legs to be able to gallop faster than the wind, on the ground, in the air and at sea. The woman in the image is interpreted as a Valkyrie. There are also alternative interpretations of the imagery.



The image stone Alskog Tjängvide I from Gotland is now on display at National Historical Museum in Stockholm. The close-ups show Odin riding his horse Sleipnir, and some runes to the right of the sail.

The lower part of the stone is almost completely filled with the image of a Viking dragon long-ship with high stem and high sternpost. The sail is almost as wide as the ship is long.

The Tjängvide rune stone has two separate runic inscriptions. Eight partly preserved runes are found to the far left in the upper field. They may be there just for decorative purposes (Jansson and Wessén, 1962, p. 195). A 60 cm long band with runes is located to the right of the sail in the lower field. This inscription tells that the stone was erected for the warrior Hjorulf, who died during a Viking raid:

"... raised the stone in memory of Hjorulf, his brother ..."

The name Hjorulf in the text translates as "sword wolf." Today it is not possible to understand if there are any clear connections between the different messages conveyed by words and by images on the Tjängvide rune stone, now on display at National Historical Museum in Stockholm. Anyhow it would be very hard to prove any clear connection since the inscription is very hard to interpret.

The Sparlösa rune stone

We only have defective knowledge about why this 177 cm high stone of gneiss was raised about 800. This rune stone has been badly treated. It was discovered in 1669. At that time it was built into the south presbytery wall of a medieval church in Sparlösa, in the province of Västergötland (Jungner, 1938, p. 194). Some years later, 1684, the church burnt. The rune stone was removed when the church was restored. It was divided in two parts that were built into the wall again. In 1937 these parts were removed from the wall and the rune stone was restored and preserved. Since 1982 the Sparlösa stone is kept in a special building close to the new church.

The Sparlösa rune stone has three sides with inscribed runes as well as images (A, B and C). In addition to the old inscription there is also a younger part from the 11th century. The fourth side (D) has only images.

The rune inscription consists of about 270 runes. After the careless handling it is next to impossible to interpret. However, some have tried. Below is a translation to English based on a translation to modern Swedish (Foteviken, 2010):

> A: "Öjuls, the son of Eric, gave, (as well) gave Alrik".
> B: "... gave ... in return. When (?) was seated in Upsal (?), the father who ... nights and days. Alrik lu(bi)r did not fear (?) Öjuls ..."
> C: "... that Sigmar (Segerfrejdad?) is called (may be called) the son of Erik ... enormous fight (?) For Öjul (the stone is raised?) and interpret the runes there, those derived from the gods, as Alrik inscribed"

The coherence in the text is broken in several places. Furthermore the language itself offers several possibilities for interpretation of the content of the message. Alrik, who inscribed the runes, identifies them as: "those derived from the gods." The word *Upsal* is mentioned in the text. However, it is not known whether this allude to a place (like the town Uppsala) or to something else.

Several researchers have contributed with a number of totally different interpretations of the messages on the Sparlösa rune stone. It may partly be a document about ownership to a large estate and partly a memorial for the donor (Jungner, 1938, p. 71). One researcher saw a "legal document" showing that Öjul, the son of Erik, had transferred the ownership of the

estate where the stone was raised to Alrik (von Friesen, 1940, p. 87).

The inscriptions on the Sparlösa stone has also been interpreted as a memorial for king Erik (Lindquist, 1940, p. 8), as a memorial for the friendship to a killed warrior (Nordén, 1943, p. 190) and as a religious document from heathen times (Marstrander, 1954, p. 532). One researcher (Hyenstrand, 1996, p. 157) saw parallels to the Germanic saga, and another researcher (Norr, 1998, p. 217) interpreted the Sparlösa stone as a royal letter.

Still another researcher argued that there actually are as many interpretations of the rune inscriptions on the Sparlösa rune stone as there are runologists (Andersson, 2001, p. 10). And there is probably still space for additional interpretations.

Three researchers (Almgren, 1940 [in Nordén, 1943]; Isaksson, 1998; and Andersson, 2001) have especially studied the images ornaments on the Sparlösa rune stone. Side A has two images, a man and a cross. Also side B has two images, parts of a face and parts of two spiral ornaments. Side C has four images, two snakes and two birds. Side D has only images. There is an image of a building, a house that may be a temple, at the top of the stone. There is a ship surrounded by two flying birds a bit over the middle of the stone. The ship has a mast with a hoisted sail. There is a small four-footed animal below the ship. The big animal may be a wolf or a lion. There is a horse with a rider, as well as a smaller animal, at the bottom of the stone. Maybe the small animal is a fabulous animal? The rider has pulled out his sword. The 16 images are carved as outlines. Some important motifs have a slight relief (Isakson, 1998, p. 10). The artist has

not tried to give the impression of any depth. The motifs are "hanging free."

According to one interpretation (Andersson, 2001, p. 20) the house on the Sparlösa rune stone represents the house of life and death. The ring in the middle of the gate is the gatekeeper watching the transfer between life and death and these states. The stems on the ship are strongly bent upwards. This corresponds with images of ships on image stones in the province of Gotland. It is also possible to see a connection with the Oseberg find. This is the richest find from the Viking Age in Norway, and it is dated to 834.

As we can see from the examples above it is hard to see any direct link between the messages that are communicated with words and with images. Since the text is so hard to understand and there are many alternative interpretations it is not possible to prove a possible connection. We cannot see this verbal and visual inscription as a result of a conscious work with information design.

Nordgren (2009) argued that the Sparlösa stone is a very early Christian image stone. At the latest the images are from the 7th century. There is no connection between the images and the text, that was added later. According to Nordgren Christianity settled in Scandinavia far earlier than normally presumed.

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See pictures at:
http://www.vastsverige.com/en/Vastgotalandet/products/48909/Sparlosastenen/

The Ramsund inscription

The *Ramsund inscription*, or the *Sigurd inscription*, is situated close to Sundbyholm, which is near Eskilstuna in the province of Södermanland. This is the single largest rune inscription in Sweden. The 4,6 metre wide inscription was carried out on a solid and flat rock during the 11th century at a sound, called Ramsundet.

The text in the Ramsund inscription tells about a long bridge crossing the sound. The inscription reads: “Sigrid, the mother of Alrik, the daughter of Orm, made this bridge for her husband Holmgers, the soul of the father of Sigröd”. Still today there is a fragment of the stone paved abutments of the bridge. Members of this family are known also from other rune stones.

However, the images in the Ramsund inscription describe several episodes in the saga about Sigurd Fafnesbane. The band of runes forms the snake Fafner, that Sigurd pierces with his

sword. Similar visual descriptions of the piercing of the snake/dragon exist on other rune stones in Sweden. The motif is also cut in wood in medieval churches in Norway.

There is no direct agreement between the verbal and visual content in the Ramsund inscription. Maybe the name *Sigröd* was an inspiration for the rune-master to use images from the saga about Sigurd? We cannot see this verbal and visual inscription as a result of a conscious work with information design.

See pictures at:
http://en.wikipedia.org/wiki/Sigurd_stones

The Spånga rune stone

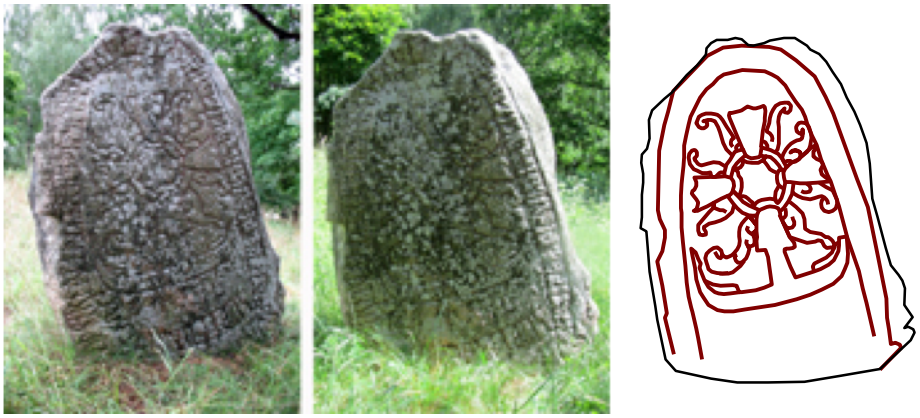
The *Spånga image rune stone* is the only rune stone in Sweden with a clear connection between verbal and visual information (Snaedal Brink & Wachtmeister, 1984, p. 149). This 196 cm high stone is located at Spånga, in Råby-Rönö parish in Nyköping municipality in the province of Södermanland (Brate and Wessén, 1924–1936a, p. 125).

There is a big and artistic image of a ship at the centre of the stone. The mast has a large circular cross. This ship resembles a ship on a rune stone at Lindö. The rune inscription contains short-branch runes as well as stave less runes, with remainders of the original paint (Palm, 2010, p. 109). The text tells about a man who stood “manly in the front part of the ship” (Palm, 2010, p. 131) or “daringly in the front part of the ship.” In a translation from a translation (Brate and Wessén, 1924–1936a, p. 125) the inscription on the stone reads:

”Gudbärn, Odde, they raised this stone for Gudmar, their father.
Stood manly in the front part of the ship, lie buried westwards, he who died (?).”

The deceased is praised because he had been a fighter in the front part of the warship. Only the best and the most courageous of all men were selected for this task.

Based on the shape of the runes and the design of the ornaments this stone has been dated to the middle of the 11th century, maybe 1040 (Blixt, 2010). The Spånga rune stone may be a result of conscious work with information design, and maybe the very first in Sweden.



During the last few years the rune stone Sö 164 has been almost covered by lichen. The picture to the left (Berig, Wikimedia Commons) was taken in August 1980. I took the second photo in June 2011, and made an interpretation of the ship to the right.

The large Jelling stone

During the mid 1000th century King Harold Gormsson concurred the eastern part of Denmark and parts of Norway. He became known as king Harold Bluetooth. Sometime between 960 and 965 he converted to Christianity and was baptized. This marked the arrival of a new order and a new age and contributed to consolidating the royal power and a central authority in Denmark.

King Harold wanted to honour his parents as well as tell his subjects about his own great success. So he ordered a memorial to be erected. The memorial consists of a large rune stone. It is not known exactly when or how this happened. The dating is uncertain. Different sources propose different years, from about 965 to 986. (For examples of different dating see Harrison 2009, p. 126, Hedeager & Tvarmo 2001, p. 275, Honour & Fleming 1991, p. 320, Nationalmuseet 2010, Nielsen 1991, p. 248–249, Palm 2010, p. 460, Wikipedia 2010 Jellingestenarna, Zachrisson 1999, p. 343–344.)

The National Museum in Copenhagen is responsible for the "Jelling world inheritance" and dates the *large Jelling stone* to "about 965." The world inheritance also includes a church, a burial mound, and an older and smaller rune stone erected about 955 by King Gorm in honour of his wife Thyra.

The large Jelling stone is a three-sided pyramid, and 243 cm high boulder of granite. The weight is ten tons. This rune stone is often called "The certificate of baptism for Denmark." This is partly due to the fact that the name Denmark is mentioned in the text and partly due to the fact that this grand rune stone is a very concrete and noticeable "official document." It is

an artefact showing the transition from Old Norse religion to Christianity.

The work with this rune stone lasted more than one year for one or more artists and rune masters. It is quite possible that there were a group of artists at the royal court. Some sources state that the text was inscribed at two stages, or possible even at three stages, possibly several years apart. It is possible that the work started already 965 and was fully completed by 986.
In contrast to many other rune stones this text is placed in organized in horizontal lines, framed and kept together by double bands on side A. The first three lines were inscribed during the first phase of the work. These lines hold one complete sentence. Furthermore the two other sides (B and C) with images were inscribed during this phase.

Side A has this text: “King Harold bade these memorials to be made after Gorm, his father, and Thyra, his mother. The Harold who won the whole of Denmark.” The meaning of the expression “the whole of Denmark” is actually vague. But it has certainly comprised the main part of present Denmark and also the provinces Halland and Skåne in Sweden.

Side A got a fourth line with the beginning of a new sentence during the second phase. This second sentence continues below the images on the two other sides. Different sources provide partly different interpretations and translations of these texts. However, the messages are basically the same. (For examples of different interpretations see Harrison 2009, p. 126, Hedeager & Tvarmo 2001, p. 275, Honour & Fleming 1991, p. 320, Nationalmuseet: 2010, Nielsen 1991, p. 248–249, Nordisk Forskningsinstitut, 2010, Wikipedia 2010, Jellingestenarna, Zachrisson 1999, p. 343–344).

On one side (B) a large four-footed animal, probably a lion is fighting with a long heathen snake. This motif is a symbol for the battle between the good and the evil. The second sentence from the text-side continues below the image with the words "and Norway." The whole sentence (A+B) reads: "The Harold who won the whole of Denmark and Norway." The image tells that the whole of Denmark as well as Norway has been conquered and are now ruled by King Harold who represents "the good."

Technically the inscription on the large Jelling stone differs from inscriptions on other rune stones in Denmark. The figures are cut in a low profile. This indicates that the artist or artists were used to work with more soft stones that granite, like limestone or sandstone. This may indicate that the artist or artists had been working abroad or else were not from Denmark.

Animal ornamentation had been around in many cultures since the Palaeolithic Age. The animal ornamentation had gone through a gradual development, away from biological reality in a direction to a more anatomical dissolution of the forms. Motifs with extreme abstraction reached their highest point around 800. However, the big four-footed animal on the large Jelling stone fighting with the snake has a comparatively true to life anatomy.

This specific type of animal ornamentation is usually called "Jelling-style." Similar types of large four-footed animals return on Swedish rune stones and also on the porch of the stave church in Urnes in Norwey during the 11th century. In Sweden most of the rune stones from the 11th century are monuments from the early phase of Christian mission. The Church took a clear distance from the former heathen animal ornamentation

as soon as it had been well established in Scandinavia. As a consequence Scandinavian visual art lost its individual character. Since then Scandinavian visual art has been subordinate to and dependent of the aesthetic developments in Europe.

The second image side (C) shows the tied up, but winning Christ. The second sentence on the text side (A) continues also here, with the words: “and turned the Danes to Christianity” This inscription may represent a third phase of the work on the rune stone. The whole sentence (A+C) reads: “The Harold who won the whole of Denmark and Norway and turned the Danes to Christianity” together with the image (C) tells us that the subjects in Denmark (but not in Norway) had turned to Christianity.

The large Jelling stone has got the oldest preserved image of Christ in Scandinavia. Here Christ has no cross. Christ is tied to the background by a ring around his belly and snares of band ornaments in interlacing patters. This kind of patterns with twisted and tied ropes and straps had been painted in European manuscripts already 200 years earlier.

However, the attempts made by King Harold Bluetooth to force a new religion on his subjects failed. As a result he was driven away and was overthrown about 986 or 987. His own son Sweyn Forkbeard was the leader of a rebellion. Harold Bluetooth was wounded and escaped to his ring fort Jomsborg, where he died after a short period of time.

In reality the process of Christening of Denmark and Norway took another century. Sweyn Forkbeard did not honour his parents with erection of a rune stone. However, this became a tradition among nobility. A rune stone fashion spread to one province after another northwards through Sweden. In most

districts, this custom disappeared after a generation. However, in the l provinces of Södermanland and Uppland the rune stone fashion lasted into the 12th century.

All in all King Harold used text, images and graphic form to mediate approximately the following three short and vigorous messages about power and religion to the subjects in Denmark:

> I, King Harold, honour my father Gorm and my mother Thyra.
> I, King Harold, won and now govern the whole of Denmark and Norway.
> I, King Harold, turned the Danes to Christianity. I am the friend of God. The Danes are now loyal subjects to me and to God.

The whole form of the rune stone is used in an optimal way. It is artistically decorated with runes, graphic ornaments and images. The two visual stories are closely connected with two of the three verbal messages.

From the beginning the verbal as well as the visual inscriptions were painted in strong and clear colours. However, these colours have disappeared due to influence of various weather conditions and air pollutions during more than one thousand years. In the museum *Royal Jelling* there are copies of the three sides of the large Jelling stone. These copies are painted in the hues that probably were used from the beginning.

The painting was important. Good contrast between the hues makes it easy to distinguish runes and image elements. Furthermore the painted background contributes to “holding together” the story on each side. At the same time the ornaments help “binding together” the different sides to a whole. We

can actually see how the ornaments form distinct knots in each corner.

As an *originator* King Harold Bluetooth had three *intended messages*. He wanted to tell his subjects about his parents, about his power, and about his religion. Most likely King Harold Bluetooth needed help to design and plan the messages and create a sketch with *preliminary messages*. In the next step the king certainly needed help by professional artists and rune masters to actually execute the *designed messages*.

By inscribing and painting the words, images and ornaments on the large boulder these people created an *original document*, the finished rune stone. The large Jelling stone contains messages that are *mediated* and distributed to the subjects when they look at it, and secondly when they are told about it. Each individual receiver will interpret the messages and create *interpreted messages*, maybe assisted by literate people who could read.

The graphic form on the Jelling stone indicates that King Harold Bluetooth from the beginning only had in mind one side with text honouring his parents, and the two sides with the visual stories. The very limited space for the other texts strongly suggests that King Harold Bluetooth wanted to add them afterwards, thus clarifying and emphasizing his own importance. A combination of images and text work better than text alone. Nowadays it is not at all uncommon that people change their minds during the progress of the work.

It is easy to imagine that the oldest example in Scandinavia of a document with a combination of images and text would be an artefact where the text is written in Latin on parchment (sheepskin). But the words on the large Jelling stone show the

common Scandinavian language that ordinary people used during the Viking Age. The messages are mediated using runes that had been manually and laboriously inscribed in a huge boulder.

We can imagine that King Harold, as the originator and buyer fully decided about the content of the message, but that the unknown artists and rune-masters had some artistic freedom. Nowadays it is still common that designers are totally unknown to the intended receivers.

All three messages are clearly mediated to a large audience. How many people have been able to take part of these messages during more than one thousand years? How many people have seen images of the large Jelling stone in books, journals, magazines, television, Internet and other media? Certainly many thousands of individuals have seen the messages that were created more than a thousand years ago. This is really unique.

See pictures at:
http://www.emu.dk/gsk/fag/his/logo.html
http://en.wikipedia.org/wiki/Jelling_stones

See video at:
http://whc.unesco.org/en/list/697/video

Pictures in churches

Medieval cathedrals had great splendor. They have been called "theological encyclopedias," because they presented church teachings in pictorial form for the many people who could not read. At the beginning of the 7th century pope Gregorius the Great (about 540–604) had said that pictures are used in churches so that those who cannot read at least can look at the walls and understand what they cannot read in books (Piltz, 2007, p. 128; Sandquist Öberg, 2007, p.171). Gregorius the Great presented his insights and views in a new and simple manner (Hill, 2008, p. 169).

In many medieval churches pictures cover the interior walls, partitions, and ceilings. They may be large and magnificent paintings in *al fresco* as in the Basilica of San Francesco d'Assisi, and the Scrovegni Chapel in Padua, both in Italy. Here the frescoes were made by some of the greatest painters of the 13th and 14th centuries. The pictures can also be overwhelming and expensive *golden mosaics* with millions of pieces of glass in beautiful colours, as those seen in the Basilica of San Marco in Venice in Italy. Here, many unknown fine artists worked for some hundred years to complete all the decorations. In Sweden church painters have used the *fresco secco* method when they painted numerous parish churches.

The first section in this chapter concerns an ancient Maya Temple and *The movie in Chichén Itza,* in the Yucatán peninsula, Mexico. The second section *An early "strip"* concerns the Bayeux Tapestry in the Bayeux Cathedral, France. The third section is *Basilica of San Francesco d'Assisi*, Italy. The fourth section is about small *Parish churches* in Sweden.

The movie in Chichén Itza

The Maya lived in isolated and independent city-states in dense forests in present-day Guatemala, El Salvador and Honduras, as well as in present-day Belize (Coe et al., 1986). For some unknown reason, the Maya civilization declined within these areas. The Mayas moved north to low lands in south-eastern Mexico, especially to the Yucatán peninsula. Here the Maya civilization had a second height for a period of 300 years, from the 600's to the 900's, before it started to degenerate (Harrell, 1994). Never-ceasing fights and civil wars among the city-states in the Yucatán peninsula weakened the strength of the Mayas and destroyed the highly cultivated society and the conditions for prosperity. According to Vidal-Naquet (1987) the society collapsed from within.

Temple cities

Ancient Maya achievements include superb art and architecture, a highly developed style of hieroglyphic writing and of mathematics, and a precision in tracking time day by day over centuries. Hundreds of Maya cities were centres for religious festivals, markets, and courts of justice. These temple cities are believed to have served a function similar to universities of today. Each major Maya city was carefully planned with monumental and remarkable buildings of stone, such as temple-topped pyramids and palaces in the centre, astronomical observatories, dwells, aqueducts, and decorated stone pillars, a nearby ball court for the famous pre-Hispanic team sport (Ventura and Ceserini, 1982).

During the religious ceremonies the priests lived in the ceremonial centre of the town. The priests and the nobility had

embroidered or painted cloths made of cotton and decorated with feathers. Common people had clothes of pounded tree bark or sisal hemp. Many had necklaces of seeds or beetle wings. The common people lived throughout the countryside in simple huts made of poles, mud, grass and palm leaves. They grew maize, beans, squash, chilli peppers, avocado, sweet potatoes, papaya and some other crops. Stone-surfaced roads connected cities and parts of cities. This was at a time when their European counterparts were largely dependent on dirt tracks. Some of the most important Mayan cities are Bonampák, Chichén Itzá, Copán, Labná, Palenque, Piedras Negras, Tikal and Uxmal (Coe et al., 1986).

The Mayan architects built their pyramids, temples, and observatories with cores of dirt, which they covered, with facings of limestone. One of the Maya's unique contributions to architecture is the Korbal Arch, also called the Maya Arch. Projecting stone blocks out from each side of a wall until they met forming a peak formed this. This technique was a good substitute for a true arch (Coe et al., 1986). Some of these almost "solid" buildings have lasted for hundreds of years. Since they had no wheeled vehicles, people had to carry all the building materials.

Decorated stone pillars, reliefs and mural paintings tell us about the daily life of the Mayas. Extraordinary mural paintings were discovered in a small temple in Bonampák in Mexico in connection with a movie production in the 1940s. The pictures show musicians playing drums, trumpets and maracas (Salmoral, 1990). Unfortunately the colours started to fade in contact with the air outside the temple.

Maya traders came to the markets in the cities. They had developed complicated networks in the southern parts of Mexico and in the northern parts of Central America (Dineen, 1992). Local farmers brought maize, beans, squash, chilli peppers, avocado, sweet potatoes, papaya and honey. People of the lowlands traded jaguar pelts, feathers, copal incense, lime, flint knives, and edible hearts of palm trees. In return, they received the highly prized quetzal feathers and jade of the highlands, and sharp obsidian, or volcanic glass, which was used for knives.

In contrast to other high civilizations the Mayas created a system of numbering which included a symbol roughly equivalent to our zero, although it really stood for completion. Therefore it was possible for astronomers and mathematicians to make calculations with large numbers. The Mayan system of numbering was based on the number 20 (the number of fingers and toes) instead of ten, as in our numbering system.

A "four-storied" temple-topped pyramid in Tula, called Pyramid B, was an inspiration for the architecture of the Pyramid of the Warriors at Chichén Itza. According to maps in Coe et al. (1986) pyramid B has approximately the same geographic orientation (150 NE) as El Castillo (17.50 NE) and the Pyramid of the Warriors. Tula is 1,000 kilometres west of Chichén Itza. Pyramid B has only got one staircase, mainly facing south. Thus there are no serpent-like shadows at sunset. The staircase to the large "Sun-pyramid" in Teotihuacan mainly faces east and is illuminated at sunrise. Also this pyramid has approximately the same geographic orientation (150 NE). At Dzibilchaltun, also on the Yucatán peninsula, long streams of sunbeams hit the exact centre of two windows opposite each other while at Edzna,

Campeche, the mask of the sun god is beautifully illuminated during the Equinox.

Chichén Itza

Since 1988 Chichén Itza is an UNESCO World Heritage Site. It is located 120 km east of Mérida. Chichén Itza is one of the most visited archaeological sites in Mexico with an estimated 1.2 million tourists every year. This large site is the best excavated and restored of all the ruins in Mexico. The Maya name "Chichen Itza" means “At the mouth of the well of the Itza” (Boot 2005, p. 37). Itzá is the name of a group of Maya from Guatemala.

War and power

Chichen Itza was one of the largest Maya cities, covering an area of at least five square kilometres. The city may have had the most diverse population in the Maya world, a factor that could have contributed to the variety of architectural styles at the site (Miller 1999, p. 26).

This ancient city was already founded in 445. The city covers an area of approximately six square kilometres. It was the religious and political centre for the whole Mayan culture during the second height, from the 600s to the 900s, (Harrell, 1994). In 918 the Itzá entered the Yucatán peninsula and conquered Chichén Itza. In about 975 the inhabitants had to surrender to the Toltecs. They forced the Mayas to worship their god Quetzalcoatl with the new name Kukulcan. Toltecs and Mayas built several new buildings in order to develop Chichén Itza into a better version of Tula.

The northern Yucatán Peninsula is arid, and the rivers in the interior all run underground. In Chichén Itza there are two

natural and large sinkholes. These “cenotes” provided plentiful water for the people year round. People sacrificed objects and also human beings into the cenotes as a form of worship to the Maya rain god Chaac. Archaeologists have found gold, jade, pottery, and human remains with wounds consistent with human sacrifice (de Anda Alanís, 2007).

Chichén Itza became a strong central machinery of power on the Yucatán peninsula. The cities could no longer survive just by crops from the poor soil in the jungle. People in the ruling cities got their food by trade and they required taxes from people whom they had conquered in war. During the 12th century, the cities Izamal and Mayapán joined forces, and together they defeated Chichén Itza. Mayapán became the new capital and Chichén Itza was abandoned around 1200 or 1250. However, Chichén Itza remained a sacred place to which the Maya made pilgrimages as late as the 16th century (Culbert, 1993, p. 142).

The Spaniards came to Chichén Itza in 1541. The remains of the abandoned Chichén Itza were re-discovered at the end of the 19th century. The ruined city was cleared from trees and other plants and partly reconstructed in the 1920s and 1930s.

El Castillo and Kukulcan

On top of the big pyramid in Chichén Itza is a six metre high temple built on a square platform. (The heaven was a square.) The temple, El Castillo, (the castle) was completed about 830 AD for the god Kukulcan. Actually the pyramid is a huge calendar, rising 21 meters above the jungle floor. The view from the sacred square platform is magnificent. We can see that the original city stretched for miles in all directions out to the jungle.

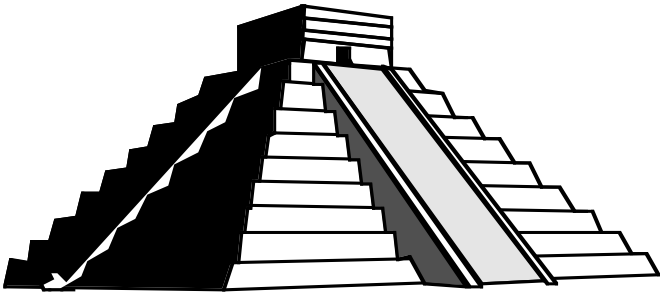
From this main temple you have a view of several other buildings like the “Pyramid of the Warriors” where a stiffly posed figure called “chaac mool” holds a receptacle for offerings, the “Pyramid of the Jaguar”, and the “Ball Court”, all more spectacular than the buildings at Tula (Coe et al., 1986). Chaac mool was the Mayan divine messenger. Twenty or so structures of the several hundred at the site have been fully explored.

This step pyramid stands about 30 metres high and consists of nine square terraces or levels, one for each month in the Mayan calendar, also indicating the nine heavens; 54 indented squares, one for each week; and 365 steps, one for each day of the year. Each side of the pyramid is approximately 55.3 metres and has a steep staircase with 91 steps. All the steps and the square platform make 365. At the bottom of the staircase at the northern side of the pyramid, there are two snakeheads in stone, which represent Kukulcan (García-Salgado, 2010, pp.119, 122).

The sun travels 182 days to the north and returns 182 days to the south again every Mayan Earth year. This is the season or cycle of the solstices. At the midpoint of this season/cycle is another cycle of the east and the west called the Equinoxes. On the Equinox, the sun crosses at a centre point of all four seasons making exact 90 degrees angles directly on top of the pyramid of Kukulcan.

At the vernal Equinox (March 21) and at the autumnal Equinox (September 21) up to 40,000 people gather on the ground in front of the pyramid. They want to experience a remarkable phenomenon, a “story” produced by light and shadow on the pyramid. These days the light from the dying sun casts shadows from the terraces in such a way that an illuminated

image of a snake appears on the northern staircase. During the hours before sunset "the feathered serpent" appears to move, slither and wriggle from his temple at the top of the pyramid and down to the ground. To the Mayans, this represented their god coming down to reward his loyal followers and to ensure a good harvest. (Also see the section *The Chauvet Cave*.)



At El Castillo "the feathered serpent", Kukulcan, appears to move from his temple at the top of the pyramid and down to the ground.

It is the mathematical exact precision with attention to solar astronomy and geometry in the construction of the huge calendar pyramid, and the play of light and shadow that produces a "movie" twice a year. The continuous images are formed by seven illuminated triangles on the dark stones of the staircase. To the Mayans these seven triangles represent the awakening of seven centres of the physical human body and this illustrates their connection with the group of stars called the Pleiades (Yaxk'in, 1995). This may, in fact, be the oldest "movie" in the world, seen by many thousands of people throughout the centuries. In my view these images of the feathered serpent can be called the sacred triangles of the Mayas. No doubt the Mayan

culture was far ahead of its time with respect to advanced skills in visual literacy.

Excavations in the mid-1930s found another temple buried inside of El Castillo. Inside the temple chamber was a Chaac Mool statue and a throne in the shape of Jaguar (Sharer and Traxler 2006, p. 565).

A sacred prophesy

In a sacred prophesy in the year 1475, before the arrival of the Spanish invaders, "The Supreme Maya Council" revealed that the following two cycles of 260 years should be a decline of the culture and for the worship of the sun god (Yaxk'in, 1994, 1995). There should be a "dark period" for humanity. 520 years later humanity should leave a "time of belief" and look forward to the beginning of prosperous times for the next 260 years, with a new interest in worship of the sun.

In the spring of 1995, humanity was reawakened into the "Age of Knowledge". Many researchers have written that we now have left the "Industrial Age" and entered the "Age of Information" or the "Age of Knowledge". Yaxk'in (1995) explains how to perform a simple solar ceremony for the modern sun-worshipper. Facing the rising sun the sun-worshipper begins to mediate and says the name of the sun K'IN (K'ieeeeeennn) seven times for the body, seven times for the spirit, and seven times for the awakening of the cosmic human.

See pictures at:
http://whc.unesco.org/en/list/483
http://en.wikipedia.org/wiki/Chichen_Itza

An early "strip"

One of the most impressive visual stories was made as a remarkable textile, *The Bayeux Tapestry*. It may actually be called a "strip." This is parallel with modern cartoon strips. The Bayeux Tapestry may be one of the best-known examples of early historical graphical reporting. It depicts the events leading up to the Norman conquest of England in 1066. UNESCO has listed The Bayeux Tapestry as a "Memory of the World."

This important cultural and historical document is not a true tapestry in which the design is woven into the cloth. It is actually an embroidered cloth, which is 68.38 metres in length by 51 centimetres in height (224.3 ft × 1.6 ft). It was made in nine embroidered parts that were sewn together. The joins were then carefully disguised with subsequent embroidery.

A tabby-woven linen ground is embroidered with coloured wool yarns. The main original colours are blue, blue-green, gold, olive green, and terracotta. In later repairs include light green, light yellow, and orange. The workmanship is exquisite, and one of the supreme achievements of the Norman Romanesque.

The Bayeux Tapestry was probably commissioned by Bishop Odo of Bayeux, and made in a monastery in the south of England for the Bayeux Cathedral that was built in the 1070s. Other embroideries originate from England at this time. However, the origins of the Bayeux Tapestry have been the subject of much speculation.

The Bayeux Tapestry is a visual narrative with 79 consecutive scenes. The central part of the embroidery contains scenes beginning with the English King Harold II's visit to Bosham and

ending with the English fleeing in the Battle of Hastings on October 14th, 1066.

More than fifty scenes have Latin tituli, a form of captions, often embroidered with dark blue yarn. These texts give names of people and places and explain briefly the depicted events. Most of these short texts are placed within the image area of each scene, but some are placed in the top border.

The decorative borders above and below the main narrative story show associated events, animals, beasts, and scenes from agriculture, fables, and hunting. The embroidery has been partially restored and it may now contain portions that are not entirely faithful to the original material.

The Bayeux Tapestry is now exhibited at the Musée de la Tapisserie de Bayeux in Bayeux, Normandy, France.

See pictures at:
http://www.tapestry-bayeux.com
https://en.wikipedia.org/wiki/Bayeux_Tapestry_tituli

Basilica of San Francesco d'Assisi

Since 2000 the Papal Basilica of St. Francis of Assisi, in Italy, is a UNESCO World Heritage Site. It is the mother church of the Franciscan Order. Building begun in 1228. The basilica is built into the side of a hill and comprises two churches and a crypt. In 1253 Pope Innocent IV consecrated both churches. The buildings have later been extended.

St. Francis appears 92 times in the art works of the Basilica: 65 times in fresco, 16 on glass, six in wood, two in stone and terracotta, once in mosaic and twice in bronze (Giandomenico, 1995, p. 16).

The stained glass windows in the Basilica are among the best examples of 13th-century Italian glasswork. However, the main medium used for conveying the Church's message is fresco. The work with the fresco involved numerous artists. Most of them are no longer known by name. Some paintings and several large frescoes in the Basilica are attributed to the Florentine master Cimabue (or Bencivieni di Pepo, c 1240–1302), and some frescos are attributed to his pupil and disciple Giotto di Bondone.

Round-headed arches divide the single nave of the Lower Church into four bays with cross vaulting. The nave is bright and spacious with patterns of crosses and leaves. The four ribbed vaults are alternately decorated with golden stars and paintings. Cimabue and members of his workshop have decorated the west end of the transept and the apse with many frescoes. From 1306 to 1311 Giotto painted frescoes in the transept area of the Lower Church, including *The Life of Christ*.

The Upper Church

From the very beginning the architects had planned for large frescos in the Upper Church. Here the frescos are an integral part of the architecture in a spatial, luminous, almost aerial dimension (Giandomenico, 1995, p. 48). No less than 28 scenes show the events in the text *Life of St. Francis*. These 230 x 270 cm large frescos are placed on the lower part of the nave and on the inner facade on either side of the entrance wall (Bellosi, 1995, p. 31). These frescoes were made from 1297 to 1300. Many art historians have disputed the authorship for the frescos. It seems that Cimabue made some of them, but several painters may have contributed. Giotto is the best-known naturalistic painter of his period and he was probably involved in the design of the 28 scenes and maybe he painted some of them.

The finished frescoes in San Francesco provided the educated viewers with intellectual stimulation to in-depth interpretations of the Bible. For ordinary people the frescoes showed what previously had seemed incomprehensible and unreal in a new and understandable manner (Perrig, 1995, p. 58). Roger Bacon's “natural style” was widely used by many young apprentices, and artists who had participated in the extensive work in Assisi. For the first time since antiquity people were depicted in expressive and realistic environments filled with faithfully reproduced details.

All 28 scenes have an accompanying explanatory inscription in Latin (Bellosi, 1995, p. 14). These inscriptions are quotations from the official biography of the saint, St. Bonaventures *Legend Maior*. These inscriptions were written below each painting, but they have aged and are pale and “practically illegible” (Giandomenico, 1995, p. 48). Regardless of the aging pro-

cess this shows that it was considered important to use combined verbal and visual messages.

Giotto di Bondone

Giotto di Bondone (c 1266–1337) is better known just as Giotto. He was an Italian architect and painter from Florence.

Giotto had a crucial role in the development of painting in the early Renaissance in Italy by combining the static, rigid and stylized Byzantine art with the Gothic sculpture's vivid rendition of the human body. He "translated" the sculpture to painting and he gave his characters plastic form and perspective. A thorough use of colour accentuated the perception of a spatial dimension. All works by Giotto has a religious content.

His series of murals in the Scrovegni Chapel in Padua, also called the Arena Chapel, is often regarded as a turning point in Western art history. Giotto worked here from 1304 to 1306. The paintings inside the Arena Chapel can be divided into three sections: ceiling, top portion of the sidewalls and the front and back walls, and the bottom portion of the sidewalls.

The fresco cycle is divided into 37 scenes or “stories.” Here most of the frescos measure 185 x 200 cm (Bellosi, 1995, p. 31). The fresco cycle depicts the life of the Virgin and the life of Christ. Giotto went so far as possible when it came to eliminating non-essentials (Honour and Fleming, 1992, p. 360). Each scene has a compelling simplicity. Giotto's success as a storyteller is manifest in his ability to transform the formulas of conventional religious images and make them appear physically and emotionally present to the viewer. The images of depth and composition, as well as the characters' gestures and clear ex-

pressions of emotion was a completely revolutionary and bold innovation.

The inclusion of the *Seven Virtues* and *Seven Vices* in the chapel decoration was in accordance with the didactic programme of many thirteenth and fourteenth-century schemes (Bellosi, 1995, p. 52). These 14 paintings look like sculptural reliefs, and they all have an explanatory label, like “Prudence.”

Parish churches

In the 15th century Sweden was a rural country with something like half a million inhabitants. There are no reliable records. Most people lived in the countryside where they worked with primitive methods for farming, cattle-breeding, hunting and fishing. The church was the natural centre in the parish (Harrysson, 2009, p. 168). The towns were small during the Middle Ages.

Stockholm was founded about 1250. By the year 1500 Stockholm had some 6 000–7 000 inhabitants (Dahlbäck, 1988, p. 50) and it was the centre for finance, politics and trade. People depended to a large extent on boats and ships for transportation. Rudimentary roads made it very complicated and difficult to travel on land. During winters people made use of sleigh rides. Generally speaking it was probably a hard life for most people.

The religious centre was in Uppsala, with a few thousand inhabitants, where Jakob Ulfsson (about 1435–1521) was archbishop (1469–1515) of the Roman Catholic Church. During this period a large number of parish churches were re-built. Porches were added and brick vaults resting on pilasters erected at the

same time replacing old wooden vaults. The vaults have varied systems of ribs. These churches were re-decorated with murals. In the summer of 1473, a major fire damaged the city of Uppsala. As a consequence also a number of city churches had to be re-decorated.

There was a demand for people who could do murals. The first university in Sweden was Uppsala University. It was founded after having received papal approval in the form of a bull of Sixtus IV, 1477. The archbishop was the first chancellor of the university. There was a catholic tradition in Sweden until King Gustav Vasa in effect broke with it, making Sweden a Lutheran nation starting 1531.

Why were churches decorated?

In the rural churches narrative murals include colourful and expressive representations of decisive moments in the Old and in the New Testament, of prophets, and of saints. In some cases the motifs are profane. However, the deeper function of the paintings is always religious. The narrative murals in medieval churches tell us stories, amuses us, scares us and inspire us (Harlin and Lönnebo, 2009, p. 13). These pictures cover the interior walls, partitions, and ceilings. Medieval culture was an image culture with fixed symbols all learned to recognize (Wessnert, 2010, p. 54).

There may be different reasons for investment in church decorations. Some rich people left land and money to the Church in order to secure a place in heaven after death. Another possibility is a wish from the religious leadership to educate the people.

It has also been suggested that major representatives of the catholic tradition wanted to increase the competence of the priests and increase the power of the Church (Sandquist Öberg, 2007, p. 182). In their view the local parish preachers needed to play a more active role and develop their sermons. Extraordinary church decorations could provide the inspiration that was needed to explain the biblical messages in plain words for not very sophisticated audiences.

In fact there were clear rules for preaching in the Catholic Church during the late Middle Ages. Every parish priest had to explain the content of the Christian faith to the parishioners. Then the priest could have good help using the church paintings (Piltz, 2007, p. 126–127). Usually the painters have remained unknown.

Albertus Pictor

Albertus Pictor (about 1440–1509) is the most famous and prominent of all late medieval church decorators and painters in Sweden. He was born in Immenhausen, a small town in central Germany. No paintings or documents connected with him, however, are known from Germany (Svanberg, 2007, p. 156).

Albertus Pictor moved to Arboga, a small town in central Sweden. He was admitted a burgher there in 1465 (Cornell and Wallin, 1972, p. 31). During the 15th century Arboga was one of the most important towns in Sweden for handicraft and trade. On a regular basis large amounts of iron was loaded on boats and transported to Stockholm, 150 km east. Arboga was the Nordic centre for the Franciscan order of the Roman Catholic Church. Their monastery was started already in 1285. More than 70 monasteries were founded on 60 locations in present

day Sweden during the Middle Ages and 22 belonged to the Franciscan order.

After eight years in Arboga, Albertus Pictor moved to Stockholm in 1473, where he married Anna, a widow of the deceased painter Johan (Cornell and Wallin, 1972, p. 31). Albertus took over his workshop and a house built in stone. He became a successful church painter and embroiderer. In the last year of his life he performed as an organ player during a mass for the dead in the Church of St. Nicolas in Stockholm (today named Storkyrkan). Albertus Pictor was also known as Albrecht Ymmenhusen, Albert Painter and Albert Embroiderer.

In the latter part of the 15th century Albertus Pictor and members of his workshop decorated the walls and vaults of over thirty small gothic style countryside churches around Lake Mälaren in central Sweden with fresco secco murals. Some 6 000 paintings and accompanying text scrolls have recently been documented and examined by a group of scholars (Hall, 2007, p. 8). This is a unique treasure of medieval art in northern Europe. No other medieval painter comes close to his achievement.

Although Albertus Pictor (about 1440–1509) is the most well documented artist from medieval Sweden there are still many questions related to him and to his work. His fame rests mainly upon the expressive mural paintings in parish churches. Why were churches decorated? Who were the customers? Who paid for these mural paintings rich in colour? Who decided the content of the messages? Which people belonged to the "audience"? Who was Albertus Pictor himself? Where did he find facts and inspiration for the paintings? Why were mural paint-

ings selected? Albertus Pictor was a skilled predecessor in information design – more than 500 years ago.

The church decorations

The murals with pictures and scrolls of late medieval churches can be considered part of the sacred rhetoric of the Church (Piltz, 2007, p. 126). We can see churches with their walls and vaults and sermons as a medium to convey biblical messages from a sender to a number of receivers.

Medium

The walls and vaults in churches provided spaces for texts and pictures to communicate biblical messages. What the preacher in a parish church was supposed to convey in plain words, the painter was supposed to do in clear lines and bright colours. The murals may be seen as a series of clear short stories with didactic religious instructions. They may in fact be compared with modern newspaper cartoons.

During the 1480s (about 1485) Albertus Pictor and members of his workshop made 146 paintings in Härkeberga church, 75 kilometres NV of Stockholm. The painted area is about 600 square meters. This church is representative of the rectangular rural churches built of random rubble and split granite boulders. This church can be dated to the years 1280–1310, the early phases of the Gothic period in Sweden. After the middle of the 15th century brick vaulting resting on pilasters, erected at the same time, replaced the wooden vaulting.

This is Härkeberga church.

The architectural structures with stone framework of ribbed vaulting provide natural frames for the different biblical scenes and messages. There are several well-known motifs in the porches, where everyone easily can see them. The ”Wheel of life,” is found in 33 medieval churches in Sweden. Albertus Pictor and his workshop made eleven of these.

In comparison with mosaic and stained glass, murals are cheap to make. They are durable under good conditions, but liable to be damaged by damp and stained by candle smoke. The painters used bright, clear and distinct blue, green, red and yellow hues on the white plaster. These murals became important parts of the interior design of the churches. Today most of the colours in the pictures have changed due to oxidation. Some blue and yellow parts have faded. Some yellow parts are darker. Green parts have lost their previous energy and vigour. Red parts have become brown or almost black. We can only imagine the original splendour with much more contrast and light. Unfortunately pictures on the walls have been covered by white paint in several churches.

Messages

The life, passion, death, and resurrection of Jesus were portrayed in the murals as the supreme model of life (Piltz, 2007, p. 130). The key concept in Christian preaching was that of following Christ. The listener/ viewer was invited to enter into the story by a personal commitment. In the medieval Christian perspective, man was in constant need of any help he could get.

The texts in *scrolls* accompanying many paintings are important keys to the understanding of the function of the paintings and their messages. Already the Bishop Paulinus of Nola (354–431), and the Abbot Suger of Nola (1081–1151) argued that the texts in scrolls served as clarification of the messages in the pictures in the churches (Sandquist Öberg, 2009, p. 26).

Most of the texts are written in Latin. Only a few scrolls have text in Swedish. The scrolls in Swedish and their corresponding paintings were intended for literate parishioners as a complement to the religious instructions transmitted to them by the parish priests in the form of catechism and preaching (Andersson, 2007, p. 24).

The Latin scrolls were intended for the local parish priests and visiting clergy. Latin texts seem to have one of three main functions (Sandquist Öberg, 2007). One large group of scrolls includes single names. The second group includes hymns, sequences of liturgical texts held by angels. A large group of scrolls are inspired by the texts in Biblia Pauperum. These texts are prophecies, verses, and summaries of biblical texts. The paleography of the text scrolls demonstrates that they appear like fairly good quality book scripts. Characters are not uniform, especially not in the early churches. Here some script is rather irregular. Sometimes texts are rather carelessly arranged. These

texts are not copied word for word, but skillfully edited, shortened and abbreviated according to the Latin system of abbreviations (Hedlund, 2007).

This picture from Härkeberga church shows the "Wheel of life." Each phase has a figure and a Latin text. (I will have power. I have power. I had power. I have no power.)

The architectural structures with pointed arches with stone *framework* of ribbed vaulting provide natural frames for different scenes. These building structures are used as elements of graphic design. Ribs are decorated and emphasized with colourful, imaginative and luxurious ornamentations of leaves, loops and systematically produced patterns and various shapes. Here templates have been used for smooth and cost effective production. However, the decorations constituting the frames around the different scenes do not interfere with the actual information content, the messages, conveyed by the pictures and their ex-

planatory texts. On the contrary they hold stories together in many pictures.

Albertus Pictor managed to visualize the biblical messages in a popular way. The imaginative, narrative murals had bright and distinct colours and clear lines. They include colourful and expressive representations of decisive moments in the Old Testament and in the New Testament, of prophets, and of saints. In some cases the motifs are profane and secular. Many animal symbols, dancing women and musicians have symbolical implications, which must be interpreted in relation to the surrounding motifs. They may tell the parishioners about virtues and deadly sins. These pictures would certainly attract a lot of attention in a world where pictures were rare.

The deeper function of the realistic paintings is always religious, aimed at strengthening not only the knowledge of the Christian fate, but also the faith itself (Andersson, 2007, p. 19). Messages can be described in terms of the traditional categories of Christian teaching: the commandments, the deadly sins, relations with one's neighbor, temptations of the devil, compassion with Christ and the inevitability of death.

Albertus Pictor found his models from the immediate surroundings. The pictures give a good indication of how people dressed at that time. Clothing is used to emphasise age, gender, profession and wealth. In the execution of the pictures dress codes, colours, facial expressions and gestures function as a rhetorical device. Clear and easily recognisable markers help the viewer to grasp the messages of the pictures (Melin, 2006, p. 218–220). The use of contemporary clothing and humour in many practical situations probably provided a sense of familiarity for the local people.

Many motifs appear in several churches with the same messages. However the pictures are not exactly alike (Svanberg, 2007; Åkestam, 2007). Pictures differ with respect to attributes, composition, sizes of the figures, their directions, clothing and facial expressions, and the use of colour. This is an indication that full size templates were not used for people.

Who paid?

Rebuilding and decorating churches required substantial resources on the part of those who ordered the work. Some scholars have suggested that the farmers in the parish paid for it. Others have argued that members of the local nobility were responsible for financing. Many coats of arms are painted in the choir of the vaults in several churches. Also the Church paid for this work. The Church had large assets and may have paid for some of the decorations. Albertus Pictor was "any man's painter–as long as he was paid for his work" (Dahlbäck, 2007, p. 41). It would be interesting to know how much sponsors had to pay for a decorating a church. However, this has not been possible to find out.

The audiences

Different biblical messages were well adapted for two quite different groups of intended receivers, 1) *the local parishioners*, and 2) *the local parish priests*.

The parishioners

The pictures woven into ornamentations were important for the members of the congregations, especially since parts of the services were in Latin. The illiterate parishioners were farmers,

farm hands, servant girls and other people living in the rural congregations. The main aim of the pictures is to warn, invite reflection and influence the parishioners. The pictures tell us about messages and stories in the Bible and they help people never to despair (Sandquist Öberg, 2007).

The parish priests

The messages were also well adapted to the parish priests. Most of the clergy could read and speak Latin, at least to some extent. The paintings and their accompanying short texts, most of them in Latin, may mainly have served as huge and important verbal and visual instructions, a kind of "speaker notes" for the parish priests and their sermons. Many of the Latin texts are short introductions to text passages in the Bible.

Lighting conditions

Today's plentiful access to light and heat mislead contemporary visitors in medieval churches. Medieval churches lacked both lighting, seating and heating. It was often very cold and very dark inside small country churches. It is also likely that no windows had glass.

The wall to the north often lacked windows, the south side had a few narrow openings and the sanctuary usually had a window in the direction of the rising sun (Nilsén, 1986:244).

Jonsson has simulated the actual lighting conditions that existed inside a small medieval church when the spectacular paintings were executed (2003, p. 9; 2010, p. 60 f). The light from tallow candles and wax candles is not at all enough to increase the general lighting in the room and illuminate the paintings. But at different moments during the year the light from

the sun illuminates specific paintings. Here, the propagation of light is crucial. During the winter the sun is low and provides an almost horizontal flow of light through the small and narrow windows in the south wall.

Jonsson's observations suggest a deliberate exploitation of the natural light to highlight certain images at specific moments during the year. This was possible on the north wall of the nave and in the lower part of the northern arches. The images in the west side of the vaults and on the west wall may also have had this function before the narrow window in the sanctuary was closed. The rest of the images remained in semi-darkness and they were not clearly visible, either in daylight or candlelight.

Thus, it is likely that it was possible to clearly see some images in a church on at least one occasion during the year when the natural lighting conditions were good. Furthermore at that time the pictures were brand new with bright colours. Today all pictures are faded and dirty.

Jonsson (2010, p 66) suggested that an important function of the paintings was to place the visitor in a connection with the characters depicted in the pictures in the ceiling and on the walls. Through the play of light and shadow the participants were in a kind of microcosm. The entire church building probably served as a sundial that placed the participants in time and in the world. The paintings were far more than just educational illustrations.

Sources of inspiration

Medieval painters had access to a number of different sources for inspiration and for facts. They usually had access to pattern-

books and sketchbooks. These aids were wide spread and of great importance in the diffusion of stylistic ideas.

Other sources of inspiration were murals and paintings in churches, woodcuts, copperplate engravings, and illustrated Bibles. It has been estimated that Albertus Pictor found inspiration in *Biblia Pauperum* for the composition of more than a third of his motifs (Svanberg, 2007). However, he did not favour the crude and rough pictorial style of the small woodcuts. Pictures in the murals are very much enlarged and filled with expression and life.

Albertus Pictor found inspiration in copperplate engravings of high quality. The most important copperplate engravers were Meister E. S. and Meister des Hausbuchs from the southern part of Germany (Cornell and Wallin, 1972, p. 13–18). Albertus Pictor developed his own distinct, fresh and sturdy style with bright and clear colours and distinct lines. His style and iconography is applicable to the visual culture of northern Europe in late Middle Ages in general (Åkestam, 2007).

In the late 15th century Sweden was in conflict with Denmark. After the Swedish victory in the Battle at Brunkeberg in 1471, the situation stabilized for some years. The Viceroy Sten Sture the Elder (about 1440–1503) wanted to celebrate the victory with a sculpture, to be erected in the Church of St. Nicolas in Stockholm. At that time Lübeck, a town with 25.000 inhabitants, in northern Germany, was the center for the design and production of art and handicraft products in northern Europe (Dahlbäk, 1988, p. 50). The prominent German painter and sculptor Bernt Notke (about 1440–1509) was commissioned to do the work. He went back and forth to Stockholm, where one third of the population was German businessmen and mer-

chants. Bernt Notke and his team finished the work with "St. George and the Dragon." The sculpure was consecrated on New Year's Eve 1489 by a papal envoy. He enclosed relics and a consecration document in a pendant on the breast of the knight (Svanberg and Qwarnström, 1998, p. 45).

In the sculpture group Sten Sture (the martyr) saved Sweden (the princess) from the dragon (Denmark). The sculptures and reliefs of the group are carved out of oak, painted and gilded. Various other materials have been used for details. The height of horse and rider is 360 cm and the length of the base is 283 cm.

Albertus Pictor lived very close to this church. As previously noted, Stockholm was a small town. Thus it is likely that Albertus Pictor had followed the work on the sculpture closely and that he met with Bernt Notke and his assistants several times during the work on the sculpture (Eimer, 1985, p. 122). Acording to Svanberg and Qwarnström (1998, p. 135) one scholar have argued that Albertus Pictor actually painted some parts of the relief on the base for the sculpture. Albertus Pictor has painted the motif "St George and the Dragon" in several churches.

After Johannes Gutenberg died in 1468 the craft of printing spread quickly. By the year 1500 there were more than one thousand printing offices in Europe (Järv, 1992). Many books were printed in Latin, for scholars in all countries to read. In Sweden the archbishop Jakob Ulfsson invited the German printer Johan Snell to print a large religious book, *Missale Upsalense vetus*. And in 1483 Johan Snell set up his printing office at the Franciscan monastery in Stockholm, which was close to the house owned by Albertus Pictor.

While Johan Snell was working on the religious book he also spent some time printing a much smaller book with 122 educating stories (in Latin) on morals. Each story was illustrated with a woodcut, copied from earlier editions of the book, printed in Holland (Munkhammar, 2008). This book, *Dyalogus creaturarum moralizatus*, is the first book that was printed in Sweden. The work finished on December 20, 1483 (Collijn, 1917). The religious book was printed in 1484, and Johan Snell left for Lübeck. At that time printing offices were known to be important meeting places. Thus it is very likely that Albertus Pictor met with Johan Snell and saw his book.

In the late 15th century a large number of churches in Sweden acquired objects of art from Lübeck (Lundberg, 1961, p. 108). Stockholm was the centre for an extensive import of embroideries, furniture, paintings and sculptures. Albertus Pictor and other artists would have seen these objects and they could follow the trends in modern art at that time.

Although Albertus Pictor was a prominent painter and embroiderer, he shared the conditions of commoners (Jansson, 2007). Necessary information, religious and moral instructions, and even diversions reached him not only through the eyes but also very much through his ears. Thus it is very likely that some of his motifs were based on what he heard. A series of motifs in his paintings seems to be derived from folklore or from literature.

Albertus Pictor was also interested in and inspired by music. He depicted music in a number of paintings, mainly ones from the New Testament along with some motifs warning against sin (Helenius, 2007). Realistic depiction of music is found in scenes with musicians on earth or in hell, such as

herdsmen, dancing people or demons, etc. Music-making angels using symbolic instruments represent the function of praise in the music of the heavenly spheres and in connection with holy persons.

An early information designer

In conclusion it is possible to say that Albertus Pictor was indeed a skilled predecessor in information design – more than 500 years ago.

1. In competition with others Albertus Pictor managed to get commissions from different patrons/customers.
2. The customers asked him and his team to design and execute messages aimed at different audiences.
3. Albertus Pictor obviously had access to experts and facts on the subject matter.
4. The walls and vaults in churches provided spaces for texts and pictures to communicate selected biblical messages.
5. Albertus Pictor managed to visualize the biblical messages in a popular way. These messages get attention. Even today it is hard not to notice them.
6. The scrolls in Swedish were intended for the literate parishioners.
7. The scrolls in Latin were intended for the local parish priests and for visiting clergy.
8. The architectural structures with pointed arches with stone framework of ribbed vaulting provide natural frames for different scenes.
9. The colourful pictures woven into luxurious ornamentations were important for the illiterate parishioners.

10. People in the pictures wear their contemporary clothing. The pictures had bright and distinct colours and clear lines. Clothing is used to emphasise age, gender, profession and wealth. Dress codes, colours, facial expressions and gestures function as rhetorical devices.
11. The paintings and their accompanying short texts in Latin may have served as huge and important verbal and visual instructions, a kind of "speaker notes" for the parish priests and their sermons.
12. Albertus Pictor and members of his workshop made some 6,000 paintings and accompanying text scrolls. Albertus Pictor was obviously a skilled project manager.

Architecture and sculpture

In European history the Renaissance represents a cultural rebirth from the 14th through the middle of the 17th centuries. It was a cultural movement beginning in Italy and slowly spreading to the rest of Europe. The main theme of the Renaissance was the renewal of antiquity. Several pioneers made remarkable achievements related to verbal and visual information.

Renaissance sculptors applied characteristics of classical sculptures in their work. Since most surviving pieces from ancient times had lost their paint Renaissance sculptures were left unpainted. Renaissance sculptors portrayed an idealized, beautiful human form rather than a convincing likeness.

The Italian architect and engineer *Filippo Brunelleschi* (1377–1446) designed several important buildings in Florence. Filippo Brunelleschi figured out a practical method that made it possible to produce accurate representations of a scene from a precise location and a definite point of view. Around 1420 Brunelleschi made public demonstrations of optical linear perspective. Linear perspective spread throughout Western Europe. It became standard studio practice and opened up for illustrative drawings. His most spectacular mission was to design and build the great dome of the cathedral *Santa Maria del Fiore* (1417–1434). The dome became an architectural masterpiece that came to stand as a symbol for both Florence and the Renaissance period in general.

The Italian goldsmith and sculptor *Lorenzo Ghiberti* (c 1378–1455) is best known as the creator of the bronze doors of the Baptistry of the Cathedral in Florence. These doors are recognized as a major masterpiece of the Early Renaissance, and

Michelangelo called them “Gates of Paradise.” Ghiberti had a large workshop for sculpture in metal. One of his assistants was Donatello.

Donatello (c 1386–1466) was the most significant sculptor in the Italian Renaissance. He applied the principles of central perspective in his shallow relief sculptures. Donatello worked in bronze, clay, marble, and wood. His most famous work is the bronze *David*, about 1440s. This sculpture is independent of any architectural surroundings, and the first known freestanding nude statue since ancient times. Donatello had many followers within the European art.

Together with the architect *Filippo Brunelleschi* and the painter *Masaccio* (1401–1428) Donatello is considered to be one of the founders of Renaissance art.

The Italian architect, engineer, painter, poet, and sculptor *Michelangelo* (1475–1564) was considered the greatest living artist in his own lifetime. Michelangelo had a major influence on Western art. The *Pietà* (1498–1499) in St. Peter's Basilica in Vatican City is a masterpiece of Renaissance sculpture, but his most famous sculpture is *David* (1501–1504) in Florence. Michelangelo painted the ceiling in The Sistine Chapel (1508–1512).

Sculptures from the Baroque period focused on energy and passion. The main sculptor was the Italian architect and sculptor *Gianlorenzo Bernini* (1598–1680). He was a pioneer in the design of light, movement, volume, and even sound. He made his personal mark on an entire epoch. Baroque architects often used a sense of central projection, and strong colours on the interior of their buildings.

The French sculptor *Auguste Rodin* (1840–1917) was a pioneer in modern sculpture. He worked in clay in an object-oriented manner and used the same form elements in several sculptures. He modelled the human body with realism and departed from traditional decorative tradition. The original sculpture *The Thinker* is 71.5 cm high (1888). Later a large number of bronze versions were made in various sizes. During the peak of his career Rodin had up to 50 assistants.

This chapter includes the following two sections: *Bernt Notke,* and *Gianlorenzo Bernini.*

Bernt Notke

The German painter and sculptor Bernt Notke (1450–1509) was one of the most important late medieval northern European artists. He was active as a painter and sculptor, but also as a graphic designer and successful businessman. With today's terminology, we can actually say that he also was an information designer. In competition with other artists he got assignments from various clients.

Bernt Notke was a good project leader and organised large and complex artistic and informative projects. The messages were visualized in both paintings and sculptures. Text and images are integrated in his great wallpapers. Bernt Notke worked with many innovative and creative solutions in the choice of materials and technology in his sculpture groups.

He and his team made the sculpture *St. George and the Dragon* in Stockholm. This large sculpture was consecrated in the Church of St. Nicolas on New Year's Eve 1489 by a papal envoy.

In the late 15th century Sweden was in a grave conflict with Denmark. After the Swedish victory in the Battle at Brunkeberg in 1471, the situation stabilized for some years. The Viceroy Sten Sture the Elder (about 1440–1503) wanted to celebrate the victory with a sculpture, to be erected in the Church of St. Nicolas in Stockholm. At that time Lübeck, a town with 25,000 inhabitants, in northern Germany, was the center for the design and production of art and handicraft products in northern Europe (Dahlbäck, 1988, p. 50). The prominent German painter and sculptor Bernt Notke* (about 1440–1509) was commissioned to do the work. He went back and forth to Stockholm, where one third of the population was German businessmen and merchants. Bernt Notke and his team finished the work with "St. George and the Dragon." The sculpture was consecrated on New Year's Eve 1489 by a papal envoy. He enclosed relics and a consecration document in a pendant on the breast of the knight (Svanberg and Qwarnström, 1998, p. 45).

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the relief on the base for the sculpture. Albertus Pictor has painted the motif “St George and the Dragon” in several churches.

Gianlorenzo Bernini

The Italian architect and sculptor Giovanni Lorenzo (Gianlorenzo) Bernini (1598–1680) made his personal mark on an entire epoch (Geese, 1997). He was a pioneer in the design of light, movement, volume, and even sound.

Gianlorenzo Bernini was born in Naples. He was early apprenticed to his own father, the skilled painter and sculptor Pietro Bernini (1562–1629), originally from Florence. The family moved to Rome in 1605. Bernini began sculpting already at the age of eight and he took his own commissions when he was 16 years old (Geese, 1997). Gianlorenzo Bernini quickly gained an accomplished technical mastery. Bernini was able to carve a tear or a virtually transparent leaf in a marble sculpture and achieve in sculpture almost the same effect as in painting (Fagiolo, 2004, p. 62).

The father of the Baroque style

The “Age of Baroque” comprises broadly the 17th and 18th centuries in European art (Myers and Copplestone, 1990, p. 600). This block of time includes five artistic movements and styles: Baroque, Seventeenth-century classicism, Realism, Rococo, and Neoclassicism.

The Baroque style began in Rome, Italy, and spread to most of Europe. This style produced drama, exuberance, and gran-

deur in architecture, painting, and sculpture. This is the intermediate phase between the Renaissance and the Modern age.

As Michelangelo Bernini was very versatile. As well as a sculptor, he was also active as an actor, architect, city planners, painter, set designer, and writer. Michelangelo had begun the transition from the classical regular and stable and static form of a sculpture to new, more free forms. The Baroque period was the great century for sculpture.

Bernini developed sculpture to a level that no one had seen before or since. The sculpture was often an integral part of the surrounding space. Bernini's work in sculpture corresponds to what Pietro da Cortona (1596–1669), Rembrandt and Peter Paul Rubens did in painting during the Baroque period. Bernini was "the father of the Roman Baroque style." Bernini has inspired a large number of followers in both architecture and sculpture, but none of these reached at all up to his level.

Bernini was a leading person in the emergence of Baroque architecture in the entire city of Rome. The city was more or less one big construction site during the mid-1600s (Fagiolo, 2004, p. 48). The permanent population was about 100,000 people, but up to 700,000 pilgrims visited the various festivals.

Bernini was more than the sum of his works. He had enormous influence over the architecture and he changed the city's entire image. He made adjustments to existing buildings and designed new constructions. His main task as an architect was to design the *Piazza San Pietro* in front of St. Peter's Basilica (1656–1667). St. Peter's Basilica is a Late Renaissance church located within Vatican City. The elliptical Piazza San Pietro, with its quadruple colonnades, is one of his most innovative and

successful architectural designs. Bernini had up to 200 employees who carried out many of his projects (Fagiolo, 2004).

Motion designer

Bernini solved complicated spatial relationships and various motion problems with great imagination and great skill. He transformed immobility and certainty into movement and ambiguity (Fagiolo, 2004, p. 7). Already at a young age he demonstrated this with some stunning works.

Villa Borghese

The Cardinal Borghese commissioned Bernini to make pieces for the garden of the Villa Borghese in Rome. These sculptures focus on specific points of narrative tension in the stories they are trying to tell. The sculptures represent transitory moments in each story (Hibbard, 1965, p. 53–54).

The marble sculpture *Aeneas, Anchises, and Ascanius* (1619) depicts the exact moment when Aeneas carries his father Anchises and his son Ascancius away from the burning Troy.

The *Rape of Proserpina* is a large marble sculptural group (1621–1622). It depicts the exact moment when the god Pluto grasps Persephone for abduction to the underworld. Prosperina tries in vain to escape from Pluto's steady grip. She is desperately struggling to free herself. We can even see two clear tears on Persephone's cheek.

In the marble relief-like sculpture *Apollo and Daphne* (1622–1625) Bernini depicts the exact moment when the sun god Apollo sees his beloved nymph Daphne begin her transformation into a laurel tree for protection. Daphne's mouth is wide

open in fear. Some of the leaves are only one or two millimetres thick.

Like Donatello and Michelangelo also Bernini portrayed David's battle against Goliath in his early marble sculpture *David* (1623–1624). However unlike earlier versions that show David in his triumph after the battle with Goliath, Bernini has captured David just seconds before he knocks down Goliath. David is biting his lip in determined concentration.

One almost gets the impression that these characters are alive.

See video at:
http://smarthistory.khanacademy.org/berninis-apollo-and-daphne.html

St. Peter's baldachin

Bernini was the court painter of Pope Urban VIII. He was appointed chief architect for the basilica of St Peter's. With assistance from the architect Francesco Borromini (1599–1667) Bernini created the bronze columned canopy over the high altar of St. Peter's Basilica (1624–1633). The baldachin is 28,5 metres high. It is made of wood and bronze and it is located below the centre cross of St. Peter's Basilica.

The baldachin has spiral columns decorated with floral ornaments and the heraldic bees of the Barberini family coat of arms. These heraldic bees can bee seen throughout St. Peter's Basilica, and in a series of fountains and sculptures.

After working with the baldachin Bernini and Borromini became bitter rivals. They competed for the title of the leading Baroque architect. Francesco Borromini was primarily an inno-

vative architect. In his churches Borromini worked with geometric shapes and new perspectives. Bernini portrayed snapshots of movements. You could say that he was a very deliberate "motion designer." In his altar groups and funerary monuments, he gave the marble seemingly their own "life." This is particularly evident for snapshots of solidified movements of the characters' cloths. As in the early works the characters also have clear emotional expressions.

Justice and Charity

The funeral monument for Pope Urban VIII in St Peter's Basilica is called *Justice and Charity* (1639–1646). Here Bernini combined architecture and sculpture into a harmonious and functional whole. The monument has a pyramidal layout. A tall and white marble pedestal supports the bronze figure of the Pope. The Pope is portrayed talking, giving a blessing.

This monument has an intense vitality. Two female figures are symbolizing Justice and Charity. On the left side is Charity with small children. On the right side is Justice with the sword and scale. In this monument Bernini used a skeleton to represent death. The figure is placed on the urn. Heraldic bees of the Barberini family are placed on the monument.

Using light and shadows, Bernini eliminated the boundaries between the arts. By combining bronze and marble in the composition the funeral monument has got a strong colouristic diversity and power. Bernini had the ability to synthesise architecture, painting, and sculpture into a coherent conceptual and visual whole.

Light designer

Bernini used light as an important metaphorical device in his religious settings. He unified sculpture and richly polychrome architecture and the carefully effects of designed light.

The Ecstasy of St Teresa

One of the most important of all Bernini's works is the sculptural group *L'Estasi di Santa Teresa* (Ecstasy of St. Theresa, 1644–1652) in the Cornaro Chapel in Santa Maria della Vittoria in Rome. Bernini designed the sculptural group and the setting of the burial chapel in marble, stucco and paint. This masterpiece of the Roman Baroque shows the saint Teresa of Ávila and her moment of religious ecstasy.

Bernini shows the saint just in the highest moment of her religious ecstasy (Honour and Fleming, 1991). Teresa is laid-back and her mouth is half-open. She seems floating on a bed of clouds, indicating that this is intended to be a divine apparition. Her clothes have undulating and dissolved forms and distinct movements. The viewer can actually perceive all the sculpted persons as “alive” and really moving.

At the same time an angel is getting ready to pierce her heart with the long golden dart of divine love. The light of golden rays in bronze falls into the sculpture group through a special, hidden aperture high up in the vault. This light will clearly emphasize the otherworldly character of the group. You could say that Bernini was a very conscious light designer.

Bernini designed this burial chapel for the Venetian Cardinal Federico Cornaro (1579–1673) and his family (Hammacher, 1988, p. 32). The financier himself and seven other male members of his family are forever sculpted in life-size high-relief

portraits. They are spectators seated in two “boxes at a theatre” at the sides of the chapel. The whole scene gives a clear hint of a play when the family members are witnessing and discussing the holy Teresa's rapture. One group is illuminated by natural light from a hidden window. Bernini's most talented students sculpted the two groups of four spectators (ATS, 1999).

See video at:
http://smarthistory.khanacademy.org/bernini-ecstasy-of-st.-theresa.html

The Chair of Saint Peter

A *cathedra* or bishop's throne is the chair or seat of a bishop. In the Catholic Church it is a symbol of the bishop's teaching authority. Bernini used the theatre idea on a monumental scale in *Cathedra Petri* (The Chair of Saint Peter, 1657–1666) in St. Peter's Basilica.

The sky opens up over the sculpted realistic and gilded bronze throne that appears to hover over the altar. A relic is enclosed in a bronze seat cushion. There are large angelic figures. Light streams down from a central tinted window, illuminating the gilded glory of sunrays and sculpted clouds that surrounds the window. It repeals the light border between the outer and the inner room. Everything flows together into a cohesive experience. The light blurs the boundaries between the outer and the inner space, everything flows together into a cohesive experience. Like the *Ecstasy of St Theresa* the *Chair of Saint Peter* is a fusion of the Baroque arts.

Sound designer

With his fountains, Bernini created a naturalistic type of fountains. One of the most beautiful fountains is *Fontana del Tritone* (Fountain of the Triton) in Piazza Barberini (1642–1643). From his shell the sea god Triton has sprayed water through a conch for more than 350 years. The fountain was created at the request of Pope Urban VIII Barberini.

Fontana dei Quattro Fiumi (The Fountain of the Four Rivers) in the baroque Piazza Navona is a masterpiece of spectacle and political allegory. Bernini created this fountain for Pope Innocent X Pamphili, whose family palace is faced onto the piazza (1648–1651). The clip-shaped fountain carries a Roman obelisk that had previously been on the Via Appia. Bernini was concerned with the problem of discharging the water in the basin of the fountain. He solved the problem with a big sea serpent that swallows the water (Fagiolo, 2004, p. 70).

The Flood Fountain is a compilation of allegorical figures and raw natural stone, combined with cascading water and a crowning obelisk. The rivers are the Nile representing Africa, the Danube representing Europe, the Ganges representing Asia, and the Río de la Plata representing the Americas. The dynamic fusion of architecture and sculpture made this fountain revolutionary.

There are also two other fountains on the Piazza Navona. Here the sea god is struggling against a big fish (1653). You could say that Bernini was a very conscious sound designer.

Paintings and drawings

The Italian architect and painter *Giotto di Bondone* (1266–1337) was a pioneer in painting. He painted the fresco in the *Arena Chapel* in Padua (1304–1306). The Italian multi-talented classical scholar *Leon Battista Alberti* (1404–1472) published his pioneering treatise *Della Pittura* (De Pictura, On Painting) in 1435.

Albrecht Dürer (1471–1528) was a pioneer in illustrative drawings. He made altarpieces and religious works, a large number of drawings, copper engravings and woodcuts, portraits and self-portraits. His watercolours made him one of the first European landscape artists. He revolutionized printmaking, and made it an independent art form. One example is the engraving *Adam and Eve* (1504). Dürer is regarded as the greatest artist of the Northern Renaissance. His theoretical work involves principles of ideal proportions, mathematics, and perspective. He worked on his *Four Books on Human Proportion* between 1512 and 1528.

Leonardo da Vinci (1452–1519) was an Italian Renaissance genius. He was active in several fields, and he conceptualised a number of inventions such as the helicopter. But he never published his findings. He recorded his ideas, observations and studies in 13,000 loose pages with a large number of verbal notes and drawings. Leonardo is considered one of the greatest painters of all time. He painted *Mona Lisa*, or *La Gioconda*, in Florence (1503–1507). The special shadow in the portrait is called “sfumato.”

The Italian architect, engineer, painter, poet, and sculptor *Michelangelo* (1475–1564) was considered the greatest living

artist in his own lifetime. Michelangelo had a major influence on Western art. The *Pietà* (1498–1499) in St. Peter's Basilica in Vatican City is a masterpiece of Renaissance sculpture, but his most famous sculpture is *David* (1501–1504) in Florence. Michelangelo painted the ceiling in *The Sistine Chapel* (1508–1512).

Raphael (1483–1520) was an architect and painter from Rome. His work is characterized by balance, clarity of form, and ease of composition, harmony, human grandeur, and symmetry. He had a large workshop and was very productive. His best-known work is the fresco *The School of Athens* in the Vatican Stanza della Segnatura (1509–1511). Together with Leonardo da Vinci and Michelangelo Raphael forms the traditional trinity of great masters of the Italian High Renaissance.

Baroque paintings featured a realistic approach to the human form. The Flemish/Dutch painter *Peter Paul Rubens* (1577–1640) is regarded as the most significant Baroque painter north of the Alps. Many regard him as one of the greatest and most influential artists who ever lived. The Dutch painter *Rembrandt* (1606–1669) is one of the greatest in the history of art. He produced approximately 600 paintings, 1,400 drawings, and 300 etchings.

The Swedish director-general of fortifications *Erik Dahlbergh* (1625–1703) produced an impressive collection of topographical posters depicting castles, fortifications, manors, and settlements in Sweden.

The English engraver *Thomas Bewick* (1753–1828) was a pioneer in illustrative drawings. He used metal-engraving tools to engrave pictures across the grain in woodblocks of hard boxwood. In this way he was able to print good quality pictures. His

book *A History of British Birds,* in two volumes (1797 and 1804) was greatly appreciated. This was the first "field-guide" for non-specialists.

The American painter and illustrator *Norman Rockwell* (1894–1978) was a pioneer in illustrative drawings. He made cover illustrations for *The Saturday Evening Post* magazine for more than four decades during the 20th-century.

This chapter includes the following three sections: *Leon Battista Alberti,* and *Peter Paul Rubens.*

Leon Battista Alberti

The Italian multi-talented classical scholar, explorer of the fine arts, and humanist Leon Battista Alberti (1404–1472) was versatile and active in many occupations such as architect, art theorist, artist, author, bureaucrat, cryptographer, jeweller, linguist, mathematician, musician, painter, philosopher, poet, priest, and sculptor (Borsi, 1977). He is seen as a model of the Renaissance "universal man" (Kelly-Gadol, 1969). Alberti had a major influence on the Italian Renaissance and he was a predecessor to Leonardo da Vinci (1452–1519). Leon Battista Alberti was a Renaissance scholar with crucial importance for the development of combined verbal and visual messages.

After two years in Florence Leon Battista Alberti published his pioneering treatise *Della Pittura* (On Painting), 1435. His own translation from Latin into Italian was published in 1436. At this time the old and the new order in art existed side by side. Della Pittura is the first modern treatise on the theory of painting, and it broke with the Middle Ages and pointed to the mod-

ern era. The Italian translation became an "inspirational handbook" with detailed practical instructions for active artists.

He described Filippo Brunelleschi's (1377–1446) mathematical construct of the central perspective (Toman, 1999b, p. 448). Alberti finished his large treatise on architecture *De Re Aedificatoria* (Ten Books on Architecture) in 1452, but not finally printed until 1485. The first translation from Latin into Italian was published in 1546. By the 16th century De Re Aedificatoria had been translated into Italian, French, Spanish and English. The 256 page English version is available online (Alberti, 1965).

De Re Aedificatoria was the first architectural treatise of the Renaissance. Here Alberti covered a wide range of subjects, from ancient history and classical ruins in Rome to planning of the ideal town. He also discussed engineering and the philosophy of beauty. Alberti was the first really important architect of the Renaissance (Grafton, 2001). He provided the designs and the ideas, and he leaved the execution and practical work to building contractors and craftsmen.

After his theoretical studies of architecture, central perspective, and sculpture Alberti concluded that *beauty and harmony* of a building is more important than the actual purpose with the building and the resulting demands of suitable materials for the building. Alberti was very influential and his line of thought that "function follows form" became a leading doctrine in architecture and aesthetics for several hundreds of years. Today's design motto is very much: "function can take any form."

For hundreds of years the culture of Western Europe was dominated by an ob-session with allegory and symbol. Since Alberti wrote his books on architecture emblems are related to

Egyptian hieroglyphics. At that time emblems were considered a lost universal language (Raybould, 2005, p. 170). The word *emblem* was used in architecture for an inscription and a drawn, painted, or sculptural representation of a concept that was attached to a building. The Renaissance knowledge of antiquity also comprised Greek and Roman antiquity.

Peter Paul Rubens

The Flemish/Dutch prolific painter Peter Paul Rubens (1577–1640) is regarded as the most significant Baroque painter north of the Alps. Many regard him as one of the greatest and most influential artists who ever lived. Rubens is one of few artists who gained fame and a substantial fortune during his own lifetime.

Rubens studied Latin and classical literature in Antwerp. At the age of fourteen he began his artistic apprenticeship under leading painters in Antwerp. In 1598 he entered the Guild of St. Luke as an independent master. In 1600, Rubens travelled to Italy, and studied art in Venice, Florence, and Rome. He stayed for several years, and was specially inspired by Titian, Tintoretto, Michelangelo, Raphael, Leonardo da Vinci, and Caravaggio. During this time he painted numerous portraits, and he travelled to Spain on a diplomatic mission. Rubens was a classically educated humanist and a scholar in the Catholic tradition.

In 1609 Albert and Isabella, the governors of the Low Countries, appointed Rubens as their court painter. He got permission to have his studio in Antwerp, and he was also allowed to work for other clients. He married Isabella Brant. In 1610, they moved into a new house, now the Rubenshuis museum.

Rubens was important in the Catholic Counter-Reformation. His Baroque style of painting emphasized colour, drama, movement, and sensuality. He worked with colourful compositions with great sense of colour and light. His commissioned works were mostly religious subjects. In many altarpieces, and many large religious paintings Rubens combined people and allegorical and mythological subjects into a common composition of a complex whole. The painting Last Judgement (1617) is among his most important works. The Last Judgement has a special mix of Italian magnificence and Flemish luminosity.

Rubens also painted history motifs, landscapes, and portraits. He designed tapestries and prints. His drawings are mostly forceful but not detailed. Rubens supplied a number of skilled engravers with drawings, and a huge production of prints extended his fame throughout Europe. In some countries he managed to established copyright for his prints.

In his Italian-influenced villa, in the centre of Antwerp, Rubens had a large workshop and numerous assistants and students. His most famous pupil was the young *Anthony van Dyck* (1599–1641). Strict studio routines created the conditions for mass production of paintings that were popular with the nobility and art collectors throughout Europe. In several cases Rubens mainly created colour sketches in small formats. Then his assistants magnified the sketches on large canvases and painted the motifs. Finally Rubens made some additions and corrections and finished the paintings.

Rubens was also active as a diplomat. He was knighted by Philip IV, King of Spain, and also by Charles I, King of England.

See pictures at:
http://www.peterpaulrubens.org
http://en.wikipedia.org/wiki/Peter_Paul_Rubens

Early books

Before the invention of the printing press, almost all books were copied by hand. The bookmaking process was long and laborious. The first books used parchment (sheepskin) or vellum (calfskin) rather than paper. The book covers were made of wood and covered with leather. This made books expensive and rare. During the later Middle Ages books were often chained to a bookshelf or a desk to prevent theft from the libraries. Often one of these valuable manuscripts was *Biblia Pauperum*, called the "Poor Man's Bible." From about 1250 *Biblia Pauperum* consisted of a collection of about 50 colourful hand-painted loose pages.

In Germany *Johann Gutenberg* (1399–1468) developed a revolutionary technology for printing books with movable type, and he published the *Gutenberg Bible* (1452–1454) with illuminated decorations.

Andrea Alciato (1492–1550) and *Cesare Ripa* (c. 1560–c. 1645) wrote emblem books with symbolically conceived personified abstractions using combinations of words, images and form.

Many books were published in the fields of anatomy, archaeology, architecture, botany, engineering, mechanics, technology, and zoology during the first half of the 16th century. Here illustrations were important as valuable complements to the text. *Andreas Vesalius* (1514–1564) and *Johannes Oporinus* (1507–1568) worked together with layout, typography, and quality control of the first book to contain accurate depictions of the human anatomy.

Iohannes Amos Comenius (1592–1670) was the first person to really show to a broader audience how visuals and words could interplay in an active way. He was a pioneer in information design.

The French philosopher and writer *Dénis Diderot* (1713–1784) was the editor for the general, great, innovative and epoch-making French encyclopaedia *Encyclopédie*.

This chapter includes the following seven sections: *Manuscripts, Johann Gutenberg, Andrea Alciato, Andreas Vesalius, Cesare Ripa, Iohannes Amos Comenius,* and *Dénis Diderot*.

Manuscripts

Already in the fifth century, the Greeks introduced the concept of symmetry. This was based on their observations about the natural world. Later, Roman artists developed symmetric arrangements of letters and graphic elements in design. For centuries monks produced hand-drawn manuscripts in their monasteries. They paid careful attention to the selection and placement of each graphic element, and they tried to maintain a consistent style throughout every single piece of work.

Aesthetic decorations

Manuscripts often have aesthetic decorations in the form of drop caps, illustrations and ornamentations. Drop caps, or initial letters, are decorative initials that are larger in size than the text in the paragraph. A drop cap is usually at least three rows high and aligned with the top of the first row and the bottom of the lowest row. In the Middle Ages ornamented drop caps could cover an entire book page. Illustrations refer to any type of im-

ages that are related to a text. Ornaments include stylized patterns utilizing the basic shape of an object. Typography has been used as decoration ornaments since 1478. During the Renaissance, stylized vine leaves were popular as ornaments.

Some manuscripts were primarily intended as *works of art* to admire and look at, rather than reading. Some splendid manuscripts were written with gold or silver on purple parchment. In such products the printer aim to produce an aesthetically perfect ornamentation rather than a clear text. Originally, monks in monasteries and convent schools created the decorated manuscripts. To write and illustrate books became bourgeois professions from the mid 1200s. This was an extensive operation throughout the Middle Ages. It was primarily Bible manuscripts and liturgical books. When a printer copied a book he left the precise areas for all illuminations to be added later.

The illuminator started his work by putting gold leafs in the right places. Then he painted pictures and ornaments. The purpose illuminations were to "lighten up" book pages, divide the text into paragraphs and give structure to the page so that it is easier to read and understand the contents (Bettley, 2001, p.14). Miniature paintings in manuscripts often reached high artistic quality with richly detailed landscapes behind the figures in the foreground.

Visual instructions

Pope Gregory the Great (540–604) stated: "What writing is to the reader, pictures are to those who cannot read." Already by the Middle Ages, a wide spectrum of image types was already used for teaching and training. The pictures ranged from realistic drawings to abstract diagrams. Pictures were used for

the identification of important medical herbs, for instruction on how to load and use a cannon, how to swim, how to fight with a sword, how to construct a building, and for training the art of angling. Manuals and instructions have been preserved since the 15th century. Mijksenaar and Westendorp (1999, p. 21) mentioned a fencing manual by Hans Thalhoffer (1443) that includes visual instructions in wrestling and unarmed combat.

Woodcuts

The woodcut can be traced back to ancient Egypt, Babylonia, and China, where wooden stamps were used to make decorative patterns or symbols in wax or clay. Blocks may have been used to print textiles in India as early as 400 BC. The oldest book, *The Diamond Sutra,* was block printed in 868 in China. In Europe the oldest coloured woodcut is from 1423. It was hand painted in a few colours (Janzin and Günter, 1997, p. 104).

The ability to print images on paper was achieved in Europe in the 14th century. It is a relief printing technique. The block book contained text that was written by hand but had printed images, coloured by hand. Traditionally artists designed the images for the woodcuts. Then specialist craftsmen, block-cutters, carved the images into the surface off blocks of wood. Usually lines were crude. All areas to show white are cut away. All parts to show black are left. In the printing process these parts are covered with ink that is transferred to parchment, vellum or paper.

Movable type and woodcuts can easily be printed together. This was the main technique used for printing illustrated books until the late sixteenth century. Usually illuminators painted illustrations by hand with a few colours. Stencils and templates

were often used for this work (Dal, 2001, p. 81). In practice this meant that all the books were different in a number of details.

Woodcuts became very important when the art of printing expanded. At the end of the 15th century Albrecht Dürer brought the Western woodcut to a high level. He increased the status of the separately sold single-leaf woodcut prints. Printing with coloured blocks were invented in Germany in 1508. However, colour woodcuts were normally only used for single-leaf prints and not for illustrations in books.

Biblia pauperum

From about 1250 *Biblia Pauperum* consisted of a collection of about 50 colourful hand-painted loose pages (Cornell, 1925). These sheets were copied in many varieties. *Biblia pauperum* was often called the "bible of the poor." However, these manuscripts were very expensive, and not intended to be bought by "economically poor" people, but maybe by people that were "poor in spirit" (Cornell & Wallin, 1972 p. 23).

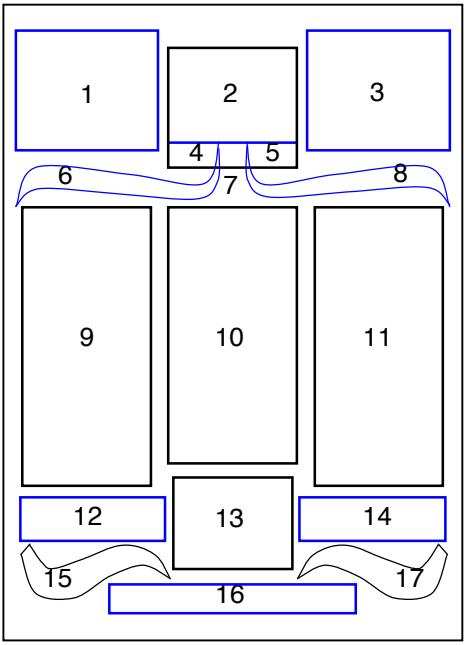
The purpose of *Biblia Pauperum* was to recount the teachings of the Bible to the illiterate, who were at that time in the majority among the inhabitants in most countries. Words spoken by the figures in the pictures could be written on scrolls coming out of their mouths. This is parallel with modern cartoon strips.

Printed images invariably included some form of captions or texts. When the moveable type was introduced during the 15th century, it became possible to produce books in larger quantities. This was the beginning of a cultural revolution. A dramatic growth in the quantity and quality of books and other

printed learning materials like maps followed. Informative drawings developed.

In the 1460s printed copies of *Biblia Pauperum,* from Germany, were produced (Banning, 1984, 1991; Henry, 1987). Here both images and texts were cut entirely in one single wood block for each page. The text-face was about 25 x 18 cm. The wood block transfers the printing ink to the paper. It is difficult to produce text in small fonts on a plate of wood and it is not possible to use thin lines in pictures. Thus all lines are usually quite rough. However, woodcuts became very important when the art of printing expanded. Such 40 page block-book versions of *Biblia Pauperum* were far cheaper than the previous illuminated manuscripts.

In an "illustrated Bible" the pictures are subordinated to the text. However, the *Biblia pauperum* placed the illustrations in the centre, usually with brief and explanatory texts. According to medieval belief in typology each page had a central picture of an event from the Gospels accompanied by two pictures of events from the Old Testament.



Each page in a printed version of Biblia Pauperum carries 17 elements: five pictures, eleven texts and a page number. The central picture (10) shows a scene from the New Testament. On each side is a prediction from the Old Testament (9 and 11). The text in the upper left corner (1) explains the link between 10 and 9, and the text in the upper right corner (3) explains the link between 10 and 11. In the upper part of the page is a picture with two Old Testament authors (2) giving their Prophecies (6 and 8). Their names are noted under the picture (4 and 5). Each of the three scenes (9, 10 and 11) has a caption (12, 14 and 16). There are two Old Testament authors (13) in the lower part of the page with their Prophecies (15 and 17). The remaining element is the page number (7). The pictures form a cross.

Page •g• in a printed version of Biblia Pauperum from the 1460s here reduced in size. The text-face in the facsimile is about 25x18 cm. In the picture to the left Josephs brothers throw him into a well. In the picture to the right Jonas is thrown in the see to the great fish. The caption below this picture reads: "Jonas is swallowed yet is unhurt." The text block above the picture tells the reader that Jonas signifies Christ, who was three days and three nights in the belly of the earth. The picture on the middle shows how Christ is buried.

According to medieval belief in typology each page had a central picture of an event from the Gospels accompanied by two slightly smaller pictures of events from the Old Testament. Above these two pictures there are descriptive summaries of the

events, often with a reference to the Bible. Just below each picture there is a short caption. Words spoken by the figures in the pictures could be written on scrolls coming out of their mouths. This is parallel with modern cartoon strips. Texts were usually in the local vernacular language, rather than in Latin.

Today the term “Poor Man's Bible” describes works of art within churches and cathedrals that either individually or collectively have been created to illustrate the teachings of the Bible for a largely illiterate population. These artworks may take the form of carvings, paintings, mosaics or stained glass windows. Like these artworks the murals made by Albertus Pictor and the members of his workshop provide free entertainment and instruction to all who enter the doors of the churches. We can only speculate, but during 500 years there must be many thousand visitors to churches with narrative murals. There are certainly many visitors today.

Johann Gutenberg

Johann Gutenberg, or Johannes Gensfleisch zur Laden zum Gutenberg (c 1395–1468) grew up in the German city of Mainz. He had probably received a good education and he had a good knowledge of Latin. The goldsmith Johann Gutenberg developed a revolutionary technology of printing books with movable type. The new technology came to dominate Western production of books until the 1800s.

The *Gutenberg Bible* is incunabula. An incurable is a book, a pamphlet, or a broadside that was printed before the year 1501 in Europe. The term includes 1) block books printed from single carved wooden blocks for each page, and 2) typographic books printed with movable metal types.

Movable type

The world's first known movable type printing press technology using ceramic materials was invented in China around 1040. The first movable-type printing press technology using metal was developed in Korea in 1234. Both systems required enormous amounts of labour in the production of large numbers of individual characters, and then production of complete solid ceramic tablets and metal tablets respectively for each individual page.

In the middle of the 15th century Johannes Gutenberg invented the first European printing press, and he independently developed a movable type system.

As a goldsmith Gutenberg was familiar with techniques of cutting punches for making coins from moulds. To produce large numbers of durable movable metal type pieces the printer needs 1) hard metal punches, 2) matrixes/moulds and 3) mol-

ten type metal. Every *hard metal punch* has a hand-carved character carved back to front. Cutting a single letter or ligature could take a craftsman a day of work. Hyphens and punctuation marks were easier. These punches are hammered into softer metal bars of copper or iron, thus creating *matrixes*. Each matrix is placed into a *hand-held rectangular mould*. Then a piece of type is cast by filling the mould with *molten type metal*, a mixture of lead, tin, and antimony. After a while the now cold and hard rectangular block of metal, with the character at the end, can be removed from the mould. Each matrix can be reused to cast a large number of identical metal pieces of type. The hand-held mould was the first practical means of making cheap pieces of type in vast quantities.

Gutenberg also developed a hand-held instrument in which the compositors put the metal printing types they needed for each line of a text. The lines with types were then put in an iron frame on an iron plate. These lines formed blocks of text, finally forming all the text of a page ready to be printed.

Inspired by contemporary screw presses for the production of cheese and wine Gutenberg manufactured a hand press of wood for printing. In the printing process all letters and other characters on each page were inked and then pressed against paper, transferring the text to the paper.

Gutenberg produced a new type of oil-based ink that could adhere to his metal types. The ink was of primarily carbon with and a mixture copper, lead, and titanium. At the same time, they switched from enjoying the precious parchment and vellum to print on much cheaper paper (Hassner, 1977; Ridderstad, 1986; Törnklev, 1987).

The 42 line page

Medieval manuscript Bibles had beautifully handwritten pages with ornamented drop caps, floral ornaments, and hand-painted illustrations in gold and brilliant colours. In order to get acceptance from the Church Gutenberg wanted his printed Bible to look like medieval handwritten books, and the *Gutenberg Bible* has been widely praised for its high aesthetic and artistic qualities as well as technical quality.

After many initial experiments with different kinds of page layout Gutenberg decided on a large folio format (445 x 307 mm). The printed area had the same ratio, 1.45:1 that is close to the *golden ratio* 1.61:1. The pages are set in two columns with 42 lines.

During 1452–1454 Gutenberg and his staff printed the *Gutenberg Bible*, or the *Mazarin Bible,* in Mainz. The text is the first translation of the Bible into Latin.

Gutenberg used 290 metal types of varying widths to create beautiful lines with letters and other characters. Later, it became normal with about 120 characters in each line. The Gutenberg Bible is printed in the black-letter type styles that become known as *Textualis* and *Schwabacher*. Here straight vertical strokes are combined with horizontal lines.

Gutenberg and his staff probably produced about 180 copies of the Bible. 30 books were printed on parchment and vellum. For these 30 books they needed some five to six thousand sheepskins and calfskins. Some 150 books were printed on paper, imported from Italy. They printed two sheets of paper at a time. Each sheet gave four pages in the book. Then they needed one goatskin for the cover of each book.

The Bible lacks modern features such as title pages, pagination, indentations, and paragraph breaks. Although the printed texts look alike each book is unique. Some copies of the Bible were never decorated, but some actually were highly decorated. Spacious margins allowed illuminated decorations to be added later by hand. Some illustrations have motifs with dragons, falcons and peacocks.

The complete Gutenberg Bible has a total of 1,272 pages. Most copies were divided and bound in two volumes. Heavier copies on vellum were sometimes bound in three or four volumes.

Today some 48 substantially complete copies of the Gutenberg Bible remain in various libraries. Many scholars consider these copies to be the most valuable books in the world.

In parallel with the time-consuming work of the Bible Gutenberg printed some profitable indulgences, a calendar and a small Latin grammar. For this work Gutenberg used other metal types and another printing press.

In 1450 Gutenberg was back in Mainz, where he borrowed money from the goldsmith Johann Fust. In 1455 Fust demanded his money back and sued Gutenberg. The court decided in favour of Fust, giving him control over the Bible printing workshop and half of all printed Bibles. By 1457 Johann Fust and the engraver Peter Schöffer, a former associate of Gutenberg, operated the printing house in Mainz. An undated 36-line edition of the Bible was printed, probably in 1458–1460. This may be the work of another printer.

Gutenberg was effectively bankrupt and publically disgraced. In 1459 Gutenberg moved to Haarlem where he founded

a new printing office. From 1465 Gutenberg received an annual pension from the Archbishop of Mainz.

Rapid dissemination

It took Gutenberg and his staff three years to produce some 180 complete Bibles. However, at that time it could take three years for monks to write and manufacture one single copy of a book of a similar size. Therefore books were very expensive. Some copies of the printed Bible were probably sold for 30 florins each. This was roughly the same as three years' wages for an average clerk. A Bible printed on parchment and vellum cost as much as a house.

The new printing technology offered opportunities to a very large increase in the production of graphical products–and that was exactly what happened. When Gutenberg died in 1468 ten printers where active in Europe. Then the new printing technology spread rapidly across Europe. Punches and copper matrices became standardized. At the turn of 1500, there were more than one thousand printers in Europe. It became easy to produce texts at relatively low costs and therefore more books were sold than ever before.

In fact, business was “too good.” This rapid disseminating of printing presses across Europe soon led to an international “book crisis.” Between 1460 and 1470 the cost of a book decreased by about 80 percent. The availability of books quickly became larger than the demand for books. As a consequence numerous book printers and publisher were bankrupt and ruined (Hassner, 1977, p. 25).

The printing technologies fed the growing Renaissance. Venice became the capital of printing. Visionary printers like

Aldus Manutius ensured widespread availability of the major Greek and Latin texts.

Technology for words

Before Gutenberg's time, it was a “natural relationship” between words, images and graphical form. All expressions were gathered in the same hand-written page, or printed from the same block of wood. The Gutenberg Bible had a huge effect on the history of the printed book. The development of the new printing technology resulted in a dynamic and easier dissemination of the printed word.

However, the production of images was equally demanding and time-consuming as before with complicated handwork. In the earliest printed books images where printed from woodcuts. During the 1600s and 1700s copperplates dominated. This meant that the technical quality of printed images increased significantly, but there was a great distance to the text. In the 1800s, lithography dominated. It became possible to print pictures in colour, but the technology meant that it was no longer possible to print continuous texts and images in the same printing presses. Thus words and pictures were irretrievably separated from each other for a long time. Development of the offset and other printing methods during the 1900s laid the foundation for a real change. The previous technical barriers are now eliminated with the help of computer-aided production of graphical products.

Transmitting a message from an author to the readers requires people such as text and picture editors, graphic designers, typesetters, repro technicians, printers, bookbinders, stock-

room staff, salespersons, order takers, bookstore employees, librarians, buyers, and administrators.

The different steps involved in publishing are still time-consuming and jointly represent a major expense. About ten percent of the price of a book, not including tax, usually goes to the author. Electronic publishing may change this situation to some extent. That would reduce the distance between authors and readers. New opportunities for a dialogue might then develop in some instances.

Andrea Alciati

The Italian lawyer Andrea Alciato (1492–1550) is regarded as the founder of the French school of legal humanists. He was born in Alzate Brianza, near Milan, and settled in France in the early 16th century. Alciato studied law, and the classical languages at the Universities of Milan, Pavia and Bologna. On 18 March 1516, he became a doctor of law in Ferrara, although he had not studied there. He worked as a lawyer in Milan and later as a professor at several universities in France and in Italy (Wikipedia, 2013).

Renaissance emblem books

According to *Oxford English Dictionary* (Simpson & Weiner, 1989) the noun *emblem* is defined as "a pictorial image, abstract or representational, that epitomizes a concept — e.g., a moral truth, or an allegory — or that represents a person, such as a king or saint." In *The New Websters Dictionary and Thesaurus* (Ottenheimer, 1991) the noun emblem is defined as "an object, or a representation of an object, symbolizing and suggesting to

the mind something different from itself; sign; badge; symbol; device. In the *Oxford Dictionaries* (2013) the noun emblem is defined as "a heraldic device or symbolic object as a distinctive badge of a nation, organization, or family: America's national emblem, the bald eagle."

However, in Renaissance and Baroque Europe the noun *emblem* was used for pictures containing allusions, allegories, and symbols (Kluckert, 1999, p. 428). Emblems influenced celebrations and festivals, painting, poetry, rhetoric, and writing. According to Toman (1999a, p. 483) an emblem consists of three elements: 1) pictura, 2) inscriptio, and 3) subscriptio. Here *pictura* refers to an allegorical image, *inscriptio* the heading explaining the motto, and *subscriptio* the text written below the heading and the picture. Usually an emblem has one main message, related to moral, nature, politics, religion, or virtues conveyed by the combination of a header, a picture and an explanatory text. According to Glasgow University Emblem Website (2013) an emblem is a symbolic picture with an accompanying text. Emblems developed in the sixteenth century and enjoyed an enormous popularity for the next 200 years or more.

In the *Oxford Dictionaries (*2013) the noun *emblem book* is defined as "a book of a kind popular in medieval and Renaissance Europe, containing drawings accompanied by allegorical interpretations." According to Wikipedia (2013) "Emblem books are a category of mainly didactic illustrated books printed in Europe during the 16th and 17th centuries, typically containing a number of emblematic images with explanatory texts." Many thousands of emblem books were printed throughout Europe. Emblem books exercised an enormous influence on literature and the visual arts, and therefore they have long attracted

the attention of scholars interested in cultural history, decorative arts, iconography, illustrated books, literature, painting, social history, symbolism, and theories of representation.

Emblematum liber

Andrea Alciato wrote a collection of short moralizing Latin epigrams in the emblem book *Emblematum liber* or *Book of Emblems*. It is a collection of 212 Latin emblem poems, each consisting of a motto (a proverb or other short enigmatic expression), a picture, and an epigrammatic text (Barker et al., 2005). The *Book of Emblems* includes topics like God and religion, astrology, awareness, beauty, friendship, life and death, love, nature, politics, and virtues related to disloyalty, faith, pride, stupidity and more. According to Manning (2002, p. 38) Andrea Alciato is called "the father of the emblem." Before the actual publication of the book Andrea Alciato had circulated his texts in un-illustrated manuscript form. The emblems were intended to draw the reader into a reflective examination of his or her own life and moral.

Illustrated epigrams

According to Bath (1994, p. 1) the genre "emblem books" was invented by accident. In the first edition of *Emblematum liber* the printer/publisher Heinrich Steyner (?) published the manuscript with selected woodcuts in 1531, in Augsburg. Heinrich Steyner selected the woodcuts himself without any input from the author. Usually emblems have a header, a picture and an explanatory text. The addition of illustrations, and the apparently adventitious use of the phrase *Emblematum liber* on Steyner's title page began a process that resulted in the recogni-

tion that such a combination of text end pictures was a genre in its own right, and that the proper name for this new genre of illustrated epigrams was “emblems” (Bath, 1994, p. 30).

Picture-text combinations

Scholars have discussed whether the actual emblems are 1) the pictures, 2) the texts, or 3) the combined verbal and visual messages. However, the public soon expected emblem books to contain combined verbal and visual messages. Since pictures always are subject to numerous interpretations readers needed to have the complete picture-text combinations in order to be able to understand the intended meaning in each emblem.

Glasgow University has a special website for the project *Alciato at Glasgow* as a part of Glasgow University Emblem Website. This website gives access to 22 editions of the emblems of Andrea Alciato. These editions date from 1531 to 1621, in the original Latin, and in French, German, Italian, and Spanish versions. The website provides keywords that are related to the each image as well as to each text in Iconclass, a subject-specific classification system designed for art and iconography. Today numerous institutions across the world use this hierarchically ordered collection of definitions of objects, people, events and abstract ideas to describe and classify their collections of drawings, paintings, and photographs in a standardized manner.

The widely disseminated emblem books launched a fascination with emblems that lasted for two centuries in many continental European countries. Emblem books were especially numerous in Belgium, France, Germany and the Netherlands.

A *Memorial Web Edition* in Latin and English is available online as *Alciato's Book of Emblems* (Barker et al., 2005). Ac-

cording to this group of scholars the edition 1621 was the 152nd edition from the start. There were in all 171 editions from 1531 to the end of the 17th century. Later production fell off dramatically, with only five later printings in the 18th century. 1621 is the principal source of the images in this Memorial Web Edition. In addition to the above 22 editions CAMENA has published a 23rd edition, from 1577 on-line. According to CAMENA (2013) the type area was 8,7 x 13,8 cm in this edition. Classical page formats were based on the proportions of the golden section, with the proportions 1:1.618. Measurements and calculations of the on-line page indicate that the printed page was about 11,6 cm wide and 18,8 cm high.

Power of Love

I made a random selection of one emblem in the *Book of Emblems,* and we will have a closer look at emblem number 107, *Potentia amoris* (Power of Love). This emblem tells us about Amor/Cupid and his rule over land and sea (Manning, 2002, p. 168; Gillgren, 2011, p. 64). The picture shows Amor with flowers in one hand and a fish in the other. Eros was the Greek god of love. His Roman counterpart was Cupid, also known in Latin as Amor (Love). In painting and sculpture, Cupid is often portrayed as a nude winged boy or baby armed with a bow and a quiver with arrows. This emblem is based on an epigram in a Greek Anthology. The illustration on the next page was used in the editions 1534, 1536, 1539, 1532, and 1546.

Potentia Amoris

Nudus Amor viden' ut ridet, placidumque tuetur.
Nec faculas, nec quae cornua flectat, habet
Altera sed manuum flores gerit, altera piscem,
Scilicet ut terrae iura det atque mari.

The verse below the illustration was early translated in this way (Barker et al., 2005):

> Do you see how unclothed Love smiles and looks so gentle?
> He has no torches, nor bows which he could bend.
> But in one of his hands he bears flowers, in the other a fish.
> That's to say he sets the law on land and sea.

On the next page is a later translation of the same verse (Gillgren, 2011, p. 64)

Do you see how naked Eros smiles, how gentle he looks?
He has neither torches, nor bows that he could bend.
But one hand holds flowers, the other a fish
That is to say that he lays down the law on land and see.

There are 22 editions of Alciato's book in the project *Alciato at Glasgow*. The emblem "Potentia Amoris" is included in 21 books with ten different illustrations. Cupid has wings in all ten pictures. He is depicted as a child in six pictures and as an adolescent or young man in the remaining four. Cupid is standing up in three pictures, walking slowly in one, and sitting down in the other six pictures.

In four pictures Cupid holds a fish in his right hand and in four pictures it is in the left hand. In five pictures he holds the flowers in his left hand, and in four pictures in the right hand. There is no clear fish in two pictures, and no flowers in one. Cupid has a bow and a quiver with arrows in two pictures.

In one picture Cupid is blindfolded. It is a limited background with a flame. Another picture has a limited background with a few trees and clouds. Two pictures have a moderate background. The remaining six pictures have rich backgrounds. There are groups of birds and groups of plants in five pictures. There are low hill country landscape in three pictures and mountains in two.

Four pictures have a detailed landscape with a city or town in the background and one has a tower or castle in background. Six pictures have water and there are boats or sailing ships in four. In these pictures the detailed backgrounds may cause a competition with the main content.

The book facsimiles do not tell us the real sizes of the books and not the real sizes of the pictures. However, it is possible to calculate a "format index" for the height-width relationships of the pictures (the height/width x 100). This is regardless of how large the individual pictures are. With this index rectangular horizontal formats have index values below 100, which is common for pictures of landscapes. Very wide formats get low index numbers. All square formats get an index of 100. All vertical formats get index values more than 100, and are common for portraits. Very high formats get high index numbers.

For the "Potentia Amoris-images" in Andrea Alciato's emblem books these index values range from 71 to 163 when close surrounding ornaments are excluded from the pictures. Five pictures are close to squares, three are horizontal rectangles and two are vertically oriented. The mean value is 99,9. As a comparison the height-width relationships for a vertical US-letter page is 129 and for a vertical A4-paper it is 141. Based on the information of the type area it is possible to calculate that one picture is 6,8 cm high and 6,6 cm wide.

All pictures have distinct frames. The pictures are carefully positioned on the book pages, like paintings on a wall. Rich decorative and detailed ornaments surround a picture that was used in five books. These books were published between 1449 and 1551. (Andrea Alciato died on 12 January 1550.) Rather than a pleasant addition to the page, as in the first picture, this kind of detailed ornamentation with complicated patterns become overwhelming and may actually effectively distort or even more or less hinder the perception of the actual message in the image and the text. See the illustration below. Two pictures are supplemented with rather small ornaments. It is interesting

that the remaining seven pictures have no ornaments at all, with the exception for small ornaments around one picture.

Many emblem versions have variations in written commentaries and they certainly have great variations in the pictures. However, all these versions include the same message. It seems that it was possible to use a range of versions to convey the messages in the emblem books.

In this book another 14 emblems tell us about forces related to love. *Potentissimus affectus amor* (Love, the all-powerful emotion) features Cupid's abilities as a lion-tamer. Here the most savage of beasts willingly draw his chariot. *Vis amoris* (The Strength of love) shows that "Cupid's fire is more powerful even than lighting: love yields to none." *In studiosum captum Amore* (On the scholar who has fallen in love) is a satire on the "wise" scholar who becomes a fool when he is caught by love. *In statuam Amoris* (A statue of love) tells us that many poets in the past have told us who Love is, and recorded his deeds under many names. They agree that he has no clothes and is small in stature, carries arrows, wears wings, but has no eyes. This is the appearance, the bearing of the god.

Other emblems in *Alciato's Book of Emblems* have similar variations in their executions. We would probably find the same kind of differences and similarities in details and in design.

See pictures at:
http://www.emblems.arts.gla.ac.uk/alciato/books.php?id=A31a&o=

Cesare Ripa

In the European medieval simultaneous perspective, time is a spatial dimension in paintings. Several manifestations of the same character or person may be seen in one picture. The allegories, icons, and symbols that are used determine to a large degree the interpretation of medieval images. Several manuals with directions for understanding visual arts have been published. One very important example is the book Iconologia, written by the Italian art historian and scholar Cesare Ripa (c. 1560–c. 1645).

Cesare Ripa was the pseudonym of Giovanni Campani (Bath, 1994, p. 95). He worked as a cook and butler for the Cardinal Anton Maria Salviati. Cesare Ripa was born in Perugia and he died in Rome. After the death of the cardinal, Ripa worked for relatives of the cardinal.

Iconologia

In his free time Cesare Ripa studied the symbolism in Egyptian, Greek and Roman emblem books (Wikipedia, 2013). The *Iconologia* is a didactic encyclopaedia with a collection of alphabetically arranged symbolically conceived personified abstractions with verbal descriptions of the allegorical figures. This science of "iconology" could be defined through its Greek derivation as "speaking pictures," or a "discourse in images" (Manning, 2002, p. 97).

Emblems in this book usually have a header, the name of the author, a picture, a caption, and a reference to the engraver, an explanatory text, and a section with references to sources.

The Iconologia was first published in Rome 1593 and dedicated to Anton Maria Salviati. The first edition had no illustra-

tions. A second edition was published in Rome in 1603, this time with 684 concepts and 151 woodcuts, dedicated to Lorenzo Salviati. The book was extremely influential in the 17th and 18th centuries and published in another eight Italian editions, and eight editions in other languages. An English translation appeared in 1709. The 1709 title has no hesitation in identifying Ripa's icons as "Moral Emblems" (Bath, 1994, p. 259).

According to Manning (2002, p. 97): "The suites of woodcuts or engravings in later publications do not illustrate all the images, nor do they present any consistent iconographic translations of the text. These were commissioned, of course, not by the author but by various publishers." This is still common practise.

Ripa was knighted for the success of the book. For more than three hundred years experts in art history all over Europe used Iconologia as their prime source of knowledge when they discussed description, identification, interpretation of the content of classical art. Art historians had learned, and knew the language of art. However this was, and still is, not true for people in general. The general public lack these necessary frames of references.

Artists, orators and poets used the Iconologia to give substance to qualities such as arts, passions, sciences, vices, and virtues. Ripa influenced and inspired several architects, artists and painters.

The illustration below is the complete page 118 in the edition of Iconologia, published in Perugia 1765 (Ripa et al.). This edition has 495 pages, 27 x 17,8 cm, and includes contributions from several people. In this book copperplate engravings have replaced woodcuts. This emblem contains the same message,

"Power of love," as the previous example from Emblematum liber. As previously mentioned this emblem tell us about Amor/Cupid and his rule over land and sea (Manning, 2002, p. 168; Gillgren, 2011, p. 64). The picture shows Amor with flowers in one hand and a fish in the other.

Both headings, *Potentia amoris* and *Forza di Amore*, translate into *Power of love*. In Iconologia the motto is further specified with "Si nell' Acqua, come in Terra" ("yes in the water, like on earth," or maybe "at sea and on land") below the heading and as a caption below the picture. There is also a reference to Carlo Grandi who made the engraving.

The verse below the illustration is exactly the same in the two emblem books. However, in Iconologia there is a short introduction with references to Alciati and again to the translation from Greek.

Eros/ Cupid/Amor is friendly in the text: "He has neither torches, nor bows that he could bend."

But he has power: "That is to say that he lays down the law on land and see."

Some images are printed from crude woodcut plates and some are printed from detailed copperplates. But basically images to the same emblem tell the same story. As previously noted Cupid may hold the fish and the flowers in different hands. However, both illustrations are true to two lines in the verse:

"Do you see how naked Eros smiles, how gentle he looks?"
"But one hand holds flowers, the other a fish."

At the bottom of the page Ripa provides references to Alciati and the translation from Greek. The next page includes more references to sources.

118 *ICONOLOGIA*

FORZA DI AMORE,

Sì nell' Acqua, come in Terra.

Di Cesare Ripa.

Forza d'Amore, sì nell' acqua, che in Terra Grandi inc.

FAnciullo ignudo, colle ali agli omeri. Colla destra mano tiene un Pesce, e colla sinistra un mazzo di fiori. Così l' Alciato dal Greco lo tradusse:

Nudus Amor viden, ut videt, placidumque tuetur,
Nec faculas, nec quæ cornua flectat habet.

Altera, sed manuum flores gerit, altera piscem,
Scilicet ut terræ jura, det atque mari. (*a*)

Nudus

(*a*) L' emblema dell' Alciato non è compreso che in questi due primi distici; i due seguenti sono nel quarto libro degli Epigrammi Greci, e sono il fonte, donde l' Alciato ha tratto il suo Emblema: *Potentia Amoris*. Così il Greco:

Γυμνὸς

This is page 118 from Iconologia, published in Perugia 1764–1767. The original size is 27 x 17,8 cm, a bit lower than the golden section. The topic is Forza di amore (Power of love). The original size of the picture is approximately 9 x 12,5 cm. Some emblems in Iconologia cover one page, but many have more space.

For some years the project *Emblematica Online* is digitizing two of the world's most important Renaissance emblem book collections online. This is a co-operation between the Library at the University of Illinois, USA, and the Herzog August Bibliothek at Wolfenbüttel in Germany. Several editions of Iconologia, as well as many other emblem books, are available online (Emblematica Online, 2010).

Conscious work

Emblem books are the result of conscious work to mediate messages with symbolically conceived personified abstractions using combinations of words, images and form. Some of this early work during the Renaissance seems to be in good concert with aesthetic and functional principles of contemporary information design. Together with publishers, printers, engravers and woodcarvers Andrea Alciato and Cesare Ripa managed to visualize and communicate selected allegorical interpretations and moral values in a popular way to reach their audiences. The *Book of Emblems* includes topics like God and religion, astrology, awareness, beauty, friendship, life and death, love, nature, politics, and virtues related to disloyalty, faith, pride, stupidity and more. Different images are used to supplement the text in telling specific messages. These messages got people's attention.

See pictures at:
http://archive.org/details/iconologiaormora00ripa

Andreas Vesalius

Andries van Wezel, or in the Latinized form *Andreas Vesalius* (1514–1564) is an early example of a person engaged in advanced and skilled graphic presentation. He revolutionized the study of biology and the practice of medicine by his careful verbal and visual descriptions of the anatomy of the human body. Andreas Vesalius is therefore often called the ”founder of modern human anatomy.”

Andreas Vesalius was born into a wealthy family in Leuven near Brussels, Belgium. Most members of his family were physicians. Andreas Vesalius began his education by studying Latin, Classical Greek and Hebrew 1530–1533 at the university in his hometown. Vesalius' Latin is a tribute to his teachers (Nutter, 2013). He then moved to Paris and the leading medical school north of the Alps. Here anatomy was primarily learned from books and lectures.

In order to get the opportunity to study the human body, Andreas Vesalius began working as a surgeon in the French army. Vesalius returned to Leuven in 1536. He graduated in medicine in 1537 at the Universitas aristarum in Padua, close to Venice in Italy. Andreas Vesalius was only 22 years old. The day after his graduation he was appointed to a lectureship in Surgery and Anatomy (Nutter, 2013). He began teaching straight away. The following year he became a professor of Surgery and Anatomy (Lindberg 1997, p. 109).

Vesalius also lectured at Bologna and Pisa. Rather than accepting many of the previous observations of anatomy, Vesalius took a straightforward experimental and scientific approach. He created a new scientific method when he throw away the ancient traditions and totally relied on his own observations. In

the university's anatomical theatre he initiated the use of rigorous, systematic and very startling dissections of human corpses as an active teaching aid. He compared the anatomy of various animals with the anatomy of humans and he noted the fallacy of extrapolating from one individual to the other.

In this way Vesalius systematically built up a considerable knowledge of the anatomy of the human male body. At this time nobody thought much about women's bodies. Vesalius discovered that the contemporary perception of the (male) body was very wrong.

In Venice Vesalius asked Tizian (1477–1576), who was one of the most talented artists of this time, for help to find an artist that could draw some accurate and clear images that could show the results of his dissections (Lindberg 1997, p. 113). On the basis of Vesalius' own drawings Johann Stephan van Calcar (1499–1546 or 1550), a student in Titian's Venetian workshop, drew these illustrations. In 1538 Vesalius published *Tabulae anatomicae sex* (Six anatomical plates) six anatomical tables in large format with detailed lists of anatomical terms in Greek, Latin, and occasionally Arabic and Hebrew. Vesalius actively used these printed sheets as visual aids in his own teaching, in connection with his dissections (Lindberg 1997, p. 111). These six plates mark a major quality change in anatomical illustration. Earlier anatomical illustrations were often crudely drawn, and their anatomy largely fanciful (Nutter, 2013).

Several printers throughout Europe plagiarised and published the *Tabulae anatomicae sex*.

The Fabrica and the Epitome

Based on the observations of the pioneering dissections of human cadavers he did in Padua and later in Bologna, he wrote the first comprehensive textbook of human anatomy, *De humani corporis fabrica libri septem* (On the Fabric of the Human Body in Seven Volumes). It presents a careful examination of the organs and the complete structure of the human body. This book is now known as the *Fabrica*. Andreas Vesalius dedicated his book to the Holy Roman Emperor Charles V (1500–1558). He ruled over extensive domains in Central, Western, and Southern Europe. (The Holy Roman Empire existed in Central Europe from 962 to 1806.) Vesalius presented Charles V with a hand-coloured copy of the *Fabrica*.

In 1542 Vesalius obtained the university's permission to go on leave. He arrived in Basel in January 1543 to supervise the printing of the *Fabrica*. Vesalius had already sent his manuscript and all the woodblock plates to the humanist printer Johannes Oporinus (1507–1568). He was one of the foremost printers of the time. Vesalius and Oporinus worked together with layout, typography, and quality control. Vesalius corrected the proofs and probably made some minor changes. Johannes Oporinus printed the *Fabrica* in 1543 in a deluxe folio format (17 5/8" × 11 3/8"; approximately 43 x 28 cm).

The *Fabrica* consisted of 663 pages and 83 plates containing 430 illustrations. The large images are approximately 32–34 cm tall and 17–20 cm wide. The text includes more than 80,000 words. It is written in a complex and literary humanist Latin. The seven books have the following contents:

1. The things that sustain and support the entire body, and what braces and attaches them all.
1. All the ligaments and muscles, instruments of voluntary and deliberate motion.
2. The series of veins and arteries throughout the body.
3. The nerves.
4. The organs of nutrition and generation.
5. The heart and organs serving the heart.
6. The brain and organs of sense.

The many careful descriptions of human anatomy helped establish modern observational science. The *Fabrica* was the first book to contain accurate depictions of the human anatomy. Many pictures show blood vessels, muscles, and the skeleton of a standing man, seen both from the front and from the side. The 300 woodcuts in the book were probably based on illustrations made by Johann Stephan van Calcar and other artists in the studio of Titian. These artistically masterful illustrations are essentially correct, even with today's high demands on detail, accuracy and precision. It is clear that the artists were present during the dissections. An unknown artist prepared the woodblock plates at Vesalius' own expense. Some illustrations were printed with engraved copper plates, called intaglio (Hassner, 1977 p. 32). This allowed for very fine details in the pictures.

In 1543 Andreas Vesalius and Johannes Oporinus also published an excerpt of his book aimed for students, *De humani corporis fabrica librorum epitome*. This excerpt is called *Epitome*. It has a strong focus on the illustrations and only short and concentrated texts in Latin. Vesalius also published a German translation of Epitome, *Von des menschen Cörpers Ana-*

tomey. This version is called *Auszug*. Vesalius dedicated the *Epitome* to King Philip II of Spain (1527–1598).

Two leaves in the excerpts contained small pictures of organs. The reader cut these pictures out and fixed them to marked locations on a template of the human body. Then the reader could fold away the organs and see what's underneath. In a sense the book became "three dimensional" (Lindberg 1997, p. 117).

The book *De humani corporis fabrica* fulfilled an important role as a reference tool in medical science for two centuries. The first edition was illustrated with woodcuts. A second, revised edition of the *Fabrica* was published in 1555. Its typography is even more elegant, and the illustrations are better spaced and made more legible. The *Fabrica* was very popular and several pirate editions were published.

Controversial knowledge

This epoch-making book was acclaimed and highly controversial. Because Vesalius dared to criticize the prevailing view of human anatomy, he got a lot of enemies. He came into conflict with other professors in Padua and was condemned by his teacher in Paris, Jacques Dubois (1478–1555). Previously all physicians based their perceptions of human anatomy on theories that the Greek physician Claudius Galenos (129–199) had formulated far more than a thousand years earlier. Claudius Galenos was educated in Alexandria. He was a successful gladiator physician and later personal physician to two emperors of Rome. Galenos used apes and pigs for the dissections and various physiological experiments. Claudius Galenos wrote no less than about four hundred books. Although much of what he

wrote was completely wrong his influence in Western medicine was large right into the 1800s.

Andreas Vesalius accepted an invitation as the Imperial and personal physician to the Holy Roman Emperor Charles V, and he turned down an invitation to move to the expanding university in Pisa. Later he became the personal physician to King Philip II of Spain. The king rewarded Andreas Vesalius with a pension for life and by being made a count palatine.

The medical historian Vivian Nutter provides a comprehensive online biography *Andreas Vesalius De Humani Corporis Fabrica* at Northwestern University's Vesalius Project.
http://vesalius.northwestern.edu

A complete copy of the Fabrica, including images in high resolution, is available online from the History of Science Collections, University of Oklahoma Libraries.

See pictures at:
http://hos.ou.edu/galleries/16thCentury/Vesalius/1543/

Iohannes Amos Comenius

Jan Amos Komenský, or Latinized Iohannes Amos Comenius, (1592–1670) was the first person to really show to a broader audience how visuals and words could interplay in an active way. Comenius was born in Moravia (later a part of Czechoslovakia). His parents Martin and Anna Komenský belonged to the Moravian Brethren, a pre-Reformation Protestant denomination. He later served as the last bishop of Unity of the Brethren. He was also an educator, teacher, and writer. Comenius is often considered to be the father of modern education.

His wanderings brought him into contact with some of the intellectual leaders in England, Germany, the Holy Roman Empire, the Royal Hungary, the Netherlands, Poland, Sweden, and Transylvania.

Comenius forged a philosophy that emphasized educational cooperation, political unity, and religious reconciliation. He published more than forty titles related to education, including textbooks of an entirely new nature.

Philosophy of education

Comenius formulated a general theory of education. He was the first to introduce pictorial textbooks in education. *Didactica Magna* (Great Didactic) is a large treatise on education. It was first published 1627 in Czech. It was later extended and translated in Latin. This version was published in 1657 with the title *Opera Didactica Omnia*.

The book contained his educational goals, philosophy and principles. This philosophy presented the goal of education as the development of universal knowledge among all people of all social classes in all nations, including women and children.

Teaching should be adapted to the children's stages of development. His teaching was based on a gradual growth from simple to comprehensive concepts. Children should not be in school to learn to recite tables and to practice spelling in a mechanical way. Instead, children should learn to actively observe their environment and learn to use as many of their senses as possible. In school, children should learn to ask questions about reality and learn to describe what they see.

According to Comenius, the teacher shall show everything to everyone, as far as possible, that is, things that are visible to sight, those that are audible to the hearing. When something can be perceived by several senses, one should show this to several senses. To facilitate learning, teachers should use pictures showing other events than those children have in their immediate vicinity, and therefore can easily observe themselves.

Comenius supported lifelong learning, and the idea of equal opportunity for all. He believed in the basic goodness of each child and hoped to improve educational opportunities for impoverished children.

Comenius' conclusion, that nonverbal communication between parent and child both precedes and forms the basis of later language acquisition and development, is still considered a sound tenet of the theory of visual language (Reynolds-Myers, 1985; Sinatra, 1986; Moriarty, 1994). Moriarty noted that (p. 15): “Child development scholars would agree that visual communication skills are not secondary, derivative, impure or peripheral and, in fact, develop earlier than verbal skills in children.”

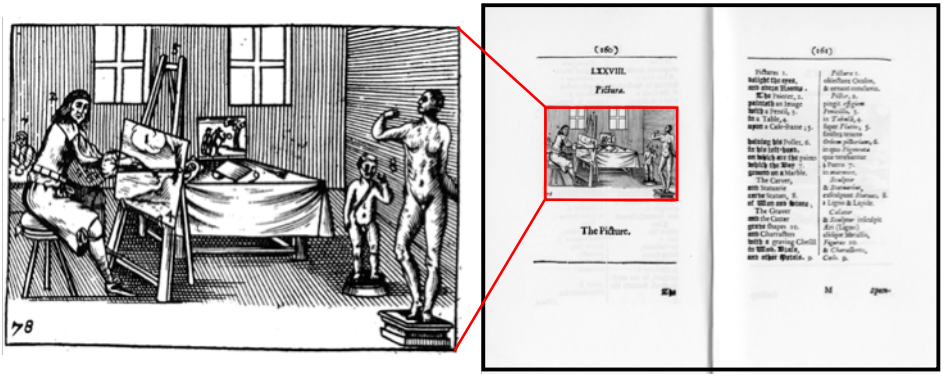
In *Didactica Magna* Comenius outlined a system of schools that is a counterpart of the existing American system of kinder-

garten, elementary school, secondary school, college, and university.

Orbis Sensualium Pictus

Comenius' illustrated textbook, *Orbis Sensualium Pictus* (The Visible World in Pictures), was first published in 1657. This book may be the most renowned and most widely circulated of school textbooks. Here Comenius presented information on the world and on mankind in closely related pictures and words. Through 150 illustrated chapters the book was designed to teach the pupil Latin with the help of short, but memorable sentences. Considered by some scholars to be the first schoolbook designed specifically for children, the *Orbis* brought into the home a complete world, combining subjects and modes of life from near and far. Comenius sought to strengthen the learning of linguistic symbols by visual means. Sensible things are suggested by representative images, non-representative visual devices (i.e., pictorial signs), and by words (i.e., verbal symbols). Creatures and artefacts are shown and named. Pictorial signs and verbal symbols indicate ideas.

The illustrations had numbers referred to in the text. In some later editions, the text was printed in four different languages. This book was widely used in both Europe and the USA for some 200 years. The first American edition was published in 1810, with texts in Latin and in English.



Here are pages 160–161 from Orbis Sensualium Pictus by Johannes Amos Comenius. The topic is "The Picture." These photos are from a 1970 facsimile edition of the 1659 edition in Latin and English. The picture is 5 x 7 cm.

Many authors of ABC-books have later adopted Comenius' famous illustrated alphabet, combining letters, pictures, and "sounds" found in the opening pages. In *Orbis Sensualium Pictus* the illustrations are actual teaching devices and not merely decorations and ornaments on the pages. Thus Comenius preceded Diderot's encyclopaedic picture-volumes and the visualized fact books of today.

See pictures at:
http://books.google.se/books?id=pxkaVdo-bpgC&printsec=frontcover&hl=sv&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Dénis Diderot

Dénis Diderot (1713–1784) was a French art critic, philosopher, writer, and a prominent person during the Enlightenment. Diderot is best known for his work with the *Encyclopédie*. It was a huge undertaking that occupied Diderot for a quarter of a century.

Diderot grew up in Paris. His parents thought he should study to judge or priest. He was an atheist and materialist and went his own way with diverse interests. Diderot moved quickly from one area to another with ease and empathy. He got many friends, who later became prominent in their respective fields.

In 1728 Ephraim Chambers commissioned Dénis Diderot to do a French translation and adaptation of the English encyclopaedia *Cyclopedia* or *Universal Dictionary of Arts and Sciences*, or just *Cyclopedia,* by (1728). During this work, Diderot got the idea to create a separate, large and illuminated French encyclopaedia.

La Grande Encyclopédie

The French encyclopaedia *Encyclopédie Dictionnaire Raisonné des Sciences, des Artes et des Métiers,* or *La Grande Encyclopédie* (Encyclopaedia or a Systematic Dictionary of the Sciences, Arts and Crafts) became the greatest early enterprise in message design and visual information. This general, great, innovative and epoch-making French encyclopaedia is often simply called simply *La Encyclopédie* (The Encyclopaedia).

The *Encyclopédie* included 17 volumes of text, supplemented by eleven volumes of illustrations. There were 71,818 with a total of 20 million words printed on 18,000 pages of text. Il-

lustrations were designed and printed from 2,885 copper engravings.

Editorial work

A group of publishers in France collaborated to go through with the great encyclopaedia project. In 1748 Dénis Diderot (1713–1784) and the mathematician Jean Le Rond d'Alambert (1717–1783) was employed as co-editors. Work on the huge encyclopaedia project quickly grew in size with several contributors and employees.

Many of the most noted figures of the French Enlightenment contributed. Leading persons such as Montesquieu, Rousseau, Turgot, and Voltaire wrote articles for the encyclopaedia. This was the first encyclopaedia to publish the names of the contributors. The Encyclopedie was a collaborative effort involving numerous writers and technicians.

Diderot and Jean d'Alambert themselves wrote a large number of key articles. There would be an inner connection between the articles. An understanding of a sensible world would emerge from the whole. The implicit goal of the entire work was to create a better society. In the article “Encyclopédie,” Diderot stated that the aim of the Encyclopédie was “to change the way people think” (Hunt, 2007, p. 611).

Diderot and Jean d'Alambert worked together for ten years. Then Diderot assumed the editorial responsibility. The work continued until 1780.

The general attitude was tolerant, liberal, and above all, rational. Because of the censorship the editors included criticism of the church and criticism of the State power in various articles in the huge encyclopaedia. In this way, it became very difficult

to find the criticism. It was possible to complete the project despite heavy opposition from the authorities.

Content and structure

The structure of this new encyclopaedia was based on Francis Bacon's classification of universal knowledge, the most complete and systematic inventory of areas of knowledge and human achievement at that time. This assured representation of topics across the entire spectrum of knowledge.

The three main branches of knowledge are: Memory/History, Reason/Philosophy, and Imagination/Poetry. Unlike prior encyclopaedias, the contributors and the editors addressed knowledge as a product of human reason rather than divine intervention or nature (Darnton, 1979, p. 7). Knowledge and intellect branched from the three categories of human thought. All other perceived aspects of knowledge, including theology, were components of these man made categories (Brewer 1993, p. 18–23).

Diderot wanted to incorporate all of the world's knowledge. He hoped that the text could disseminate all this information to the public and future generations.

As the Encyclopaedia was primarily intended for the bourgeoisie the editors felt that it was necessary to have a comprehensive illustration of high class. In the first volume the editorial staff states that the illustrations are there to overcome the verbal language's inability to describe complex technical conditions and partly to arouse the reader's curiosity in order to then proceed to the text for further details. The plates are not just a supplement to the text. They can also be a starting point for further studies in the text (Wlodarcyk, 1997, p. 151).

The accessible printing technology made it practically impossible for the editors to combine text and images on the same book pages. They had to print the running text with relief printing technology. There were seventeen volumes with text, and two index volumes.

All illustrations are organized in 2,885 plates. These plates are distributed in eleven "image volumes." All illustrations are engraved in copperplates and printed by gravure technique. The illustrations are aesthetic, detailed, and unique visual reportages.

One group of plates have large "overviews" describing areas like human anatomy, how peasants work the fields and meadows, and work elsewhere in contemporary society. A large number of "crafts images" show activities at construction sites and work in various handicraft workshops. A third category includes analytical "catalogue images" for example showing collections of machines and tools.

The encyclopaedia, not to mention the collection of plates, became a model for how to organize and present knowledge to a broad audience (Wlodarcyk, 1997, p. 150). The 71,818 text articles provide facts in an easily understandable form.

The images show in detail how the different objects are and how different processes are done. Diderot didn't have access to three tools that we have access to today. Due to limitations in the printing technique, he could not combine text and image. In practice, he could not make use of colour in the image volumes. Finally, the photograph was not yet invented. Engraved letters and numbers provide the reader with references to the relevant entries in the text volumes.

Also today, combined verbal and visual information is very important in the natural sciences. In engineering, science, and business, clear thinking is often synonymous with visual thinking. Horton (1991) noted that Albert Einstein and several other highly valued thinkers relied on visual images. Moore and Dwyer (1994) stated that visuals might be the main source for information and communicate.

Publication

The encyclopaedia was published in Paris with seventeen volumes of text issued from 1751 to 1765. The eleven volumes of illustrations were issued from 1762 to 1772. The first edition of 10,500 copies was sold across Europe. Later there were revised editions, and five supplementary volumes. In total six editions were published and 25,000 copies sold.

The Age of Enlightenment

Diderot was a monarchist. He believed that a king who took into account what was best for the common people was an ideal ruler. At the same time, he spoke warmly of people's resistance against all forms of abuse of power.

The Age of Enlightenment of the eighteenth century was an exultant intellectual movement that shook the foundations of Western civilization. Enlightenment philosophers planted the seeds for modern liberalism, cultural humanism, science and technology, and laissez-faire capitalism.

After the second volume was published in 1752 the authorities banned further publication because of the criticism of religion. However, since many customers already had paid for the encyclopaedia the editors were allowed to continue work on the

image volumes. But they also worked with and published text volumes. There were constant attacks and abuse of the editors. When the seventh volume was published in 1759 the authorities prohibited all further work on the project. However, the work still continued in secret until 1766, when the remaining ten volumes were published.

The *Encyclopédie* exerted great influence throughout the world. It played an important role in the intellectual ferment leading to the French Revolution. Paris was the intellectual capital of Europe at the time.

About the same time, work started on the second major classic among reference books. *Encyclopaedia Britannica* was published in three volumes from 1768 to 1771.

In addition to writing articles for the *Encyclopédie* Diderot also wrote dialogues, novels, philosophical treatises, and plays. Diderot emphasized the hands-on, practical, tangible and sensual. He is usually regarded as the first modern writer. Dénis Diderot was a scholar with crucial importance for the development of combined verbal and visual messages.

See pictures at:
https://commons.wikimedia.org/wiki/Encyclopédie,_ou_Dictionnaire_raisonné_des_sciences,_des_arts_et_des_métiers

Graphic design

The term typeface refers to the general outline, the face, personality, and shape of the individual characters. During the little more than 500 years of western printing history, probably more than 60,000 typefaces have been designed (Mijksenaar, 1997). It is easy to combine them in many ways. Most of these typefaces are, however, limited in their usefulness. Differences are often subtle. It is not always possible to see the differences without special training. The distinctive details and the explicit forms of words may facilitate word recognition.

The Roman type style includes most of the typefaces used in modern printing. These typefaces have serifs, finishing strokes normally at the top and at the bottom of the main strokes of letters. Common examples of serif typefaces are Baskerville, Berling, Bodoni, Bookman, Caslon, Century Old Style, Garamond, New Century Schoolbook, Palatino, and Times New Roman.

The Sans serif type style has no serifs on the characters. These typefaces provide uniform weight when there are less-than-optimal reading conditions. Common examples of sans serif type are Avant Garde, Futura, Geneva, Gill, Helvetica, Optima, Univers, and Verdana.

To a large extent the history of graphic design is parallel to the history of art and the history of illustration. The French printer *Nicolas Jenson* (1420–1480) studied the art of metal movable type under Johannes Gutenberg in Mainz. Later he carried out most of his work in Venice, Italy. Nicolas Jenson perfected the first Roman lowercase letter type already in 1471.

He transferred Gutenberg's imitation of handwriting to a printing style that is still used.

The Italian humanist *Aldus Pius Manutius* (1449–1515) founded the Aldine Press in Venice and became the most famous printer and publisher of his own time. He commissioned the punch cutter *Francesco Griffo* (1450–1518) to cut a compact, narrow and slanted typeface. This "Italic typeface style" allowed for more economical use of space, and became known as Aldus Roman type. They designed a scheme of book design for inexpensive small size books, in octavo book format. Manutius published the beautifully illustrated book *Hypnerotomachia Poliphili* (1499) with 170 refined woodcut illustrations nicely matched to the font and in an elegant page layout.

The French humanist Geoffroy Tory (c 1480–1533) may be seen as one of the first graphic designers. In 1531 *Heinrich Steyner* (?–?) added woodcuts to book *Emblematum liber*. (See the section *Andrea Alciati* in the chapter *Early books*.)

Andreas Vesalius (1514–1564) and *Johannes Oporinus* (1507–1568) worked together with layout, typography, and quality control of the first book to contain accurate depictions of the human anatomy. (See the section *Andreas Vesalius* in the chapter *Early books*.)

The French printer *Claude Garamond* (c. 1490–1561) was an assistant to *Geoffroy Tory* in Paris. At that time many of the printers had to master all of the artistic and technical skills of book production. Garamond, however, focused on punch cutting, type design, and type founding. He provided a successful service to many famous publishers. His typefaces spread all over Europe, and they were often copied.

Garamond was interested in the ancient Greek capital letterforms. In 1540 King Francois I demanded Garamond to produce a Greek typeface. This later became known as "Grecs du Roi." *Robert Estienne* (1503–1559) used this typeface in three sizes exclusively for the printing of Greek books. In 1539 Robert Estienne had received the distinguishing title of "Printer in Greek to the king." The Greek editions were famous for their typographical elegance.

Garamond designed his *Garamond typeface* in 1540. He worked as his own publisher from 1545, and used his own typefaces. He admired the works of Aldus Manutius. Garamond insisted on clarity in design. He used generous page margins. He demanded quality of paper and printing, as well as superb binding. Claude Garamond's typefaces are considered the typographical highlight of the 16th century.

In England *William Caslon* designed the Caslon-style in 1734; and *John Baskerville* created the Baskerville-style about 1757.

The Italian printer, publisher, type-designer, and typographer *Giambattista Bodoni* (1740–1813) designed the *Bodoni typeface* (1788) and no less than 297 other typefaces. In page layout he used several type sizes, wide margins, and few selected illustrations. Bodoni was called "The Kings book printer, and the book printers king." For more than 200 hundred years the Bodoni-style has been called "modern" or "modern type."

The French engraver, printer, and type founder *Firmin Didot* (c 1764–1836) designed the *Didot typeface* about 1800 and revolutionized the book trade by cheap editions.

The English artist, furniture designer, illustrator, philosopher, poet, textile designer, and writer *William Morris* (1834–

1896) was a pioneer in graphic design, and type design. He realized the importance of a well-functioning graphical form that can clarify, emphasize, and explain what is important in a graphical message. In 1891 he started The Kelmscott Press, and printed limited editions of illuminated high quality books. The 1896 Kelmscott edition of the *Works of Geoffrey Chaucer* is considered a masterpiece of book design. Morris was also a libertarian socialist associated with the Pre-Raphaelite Brotherhood and English Arts and Crafts Movement.

Around 1850 the American sculptor *Horatio Greenough* (1805–1852) wrote, "form follows function." The American architect *Louis Sullivan* (1856–1924) made this phrase famous in 1896. The German architect *Walter Gropius* (1883–1969) was a pioneer in design. He was the founder and leader of the *Bauhaus School*, 1919–1933. At Bauhaus the function of an object was crucial to its appearance. Bauhaus combined crafts and the fine arts. Eventually all arts would be brought together. The name Bauhaus refers to the medieval building hut. It was a meeting place for architects, builders, craftsmen and artists at major church buildings. The goal for all design was clarity, effectiveness, and objectivity (Tambini, 1998, p. 90). These objectives are now also important in information design. The Bauhaus School had a huge influence upon typography and graphic design.

The British typographer *Stanley Morison* (1889–1967) was one of the most influential type-designers of the 20th century. Commissioned by the British newspaper The Times he designed the serif typeface *Times New Roman* (1932).

The Swiss typeface designer *Max Miedinger* (1910–1980) designed the sans-serif typeface *Neue Haas Grotesk* (1957) in

Zürich. In 1960 it was renamed *Helvetica*. Times New Roman and Helvetica are widely used typefaces.

Sir *Harold Matthew Evans* (1928–) is a British-born journalist and writer. As editor of The Sunday Times (1967–1981) he was a pioneer in newspaper design. *He wrote Pictures on a page* (1978). In 1984 he moved to the United States, where he had leading positions in journalism with US News and World Report, The Atlantic Monthly, and the New York Daily News. In 1986 he founded *Conde Nast Traveler*. He has written various books on history and journalism, with his *The American Century* (1998) receiving particular acclaim. In 2000, he retired from leadership positions in journalism to spend more time on his own writing. Since 2001, Evans has served as editor-at-large of *The Week Magazine* and since 2005, he has been a contributor to *The Guardian* and BBC Radio 4.

The British graphic designer *Peter Sullivan* (1932–1996) was a pioneer in the design and use of information graphics in The Sunday Times. He wrote *Newspaper Graphics* (1987) and *Information Graphics in Colour* (1993). He worked for the paper 15 years, starting from the beginning of the 1970s, until his death at the age of 64. His colleagues included Nigel Holmes, Edwin Taylor, Robert Harding and John Grimwade. Sullivan was also Head of Graphic Design at Canterbury College of Art.

This chapter includes the following three sections: *Geoffroy Tory, Stanley Morison,* and *Max Miedinger*.

Geoffroy Tory

The French humanist Geoffroy Tory (c 1480 – 1533) may be seen as one of the first graphic designers. Geoffroy Tory was born in Bourges, where he studied Latin literature. He continued his studies at universities in Rome and Bologna. He was one of the youngest professors to teach at the College du Plessis. Around 1511, Tory became a professor at Coqueret, and soon after that at the college de Bourgogne, a unit in the university of Paris. During his life he was also active as an artist, author, a bookbinder, bookseller, calligrapher, an editor, engraver, a poet, professor, printer, publisher, translator, and a typographer, mainly working in Paris.

In 1524 Geoffroy Tory discovered *The Book of Hours*. These books were prayer books carefully adopted for individual use with selected and appropriate prayers for specific hours of the day, days of the week, months and seasons of the year. Usually these manuscripts had beautiful illustrations. The illustrations should help the reader to meditate on the subject of the prayers. Monks in monasteries had produced these books from the 13th century. In 1525 Geoffroy Tory designed and published his own first version of a *Book of Hours*, and he broke with all the traditions. His book contained sixteen full page borders, and thirteen large woodcuts with a completely new kind of design. He draw, engraved and illuminated all the woodcuts himself. Geoffroy Tory used a new roman letter that was free from the earlier dependence on handwriting. Later he published new versions of his Book of Hours.

In 1529 Geoffroy Tory published his own book *Champ Fleury*. At a time when most books were in Latin his book was partly about the proper use of the French language. Like Dürer

he shows how to draw roman capital letters with geometrical aids. He also shows how the proportions of the roman capital letters relate to the human body. Although the book was not aimed at the printing trade it became one of the most influential works in France. Geoffroy Tory became a key figure in printing and publishing during the Renaissance. As a result King Francis I appointed Geoffroy Tory the position of "Imprimeur du Roi" in 1530. He was the first official "printer to the King." One of his apprentices was Claude Garamond. In 1532 Geoffroy Tory became a librarian at the University of Paris.

Geoffroy Tory was among the first persons in the world to design books and book pages by editing text and illustrations based on their visual expressions (Dalley, 1983, p 104). He is best known for adding written letters in French. In his publications he introduced the accent, the apostrophe, the cedilla, and other punctuation marks. Geoffroy Tory was careful with correct grammar and correct spelling, and he explored the importance of illustration, typography, and book binding. He was interested in all aspects of book publishing and provided the model for book decoration and styles in the French Renaissance. Geoffroy Tory had a great influence on publishing in France.

See pictures at:

http://expositions.bnf.fr/tory/livres/champ_fleury/index.htm

http://en.wikipedia.org/wiki/Geoffroy_Tory

Stanley Morison

The British type designer Stanley Morison (1889–1967) openly criticised *The Times* newspaper in London for the poor quality of its typographically antiquated printing. Then he was commissioned to produce a new, first-class and easy-to-read typeface with very good legibility even in small sizes for the newspaper. The production methods for The Times newspaper were far above the world standard at that time.

Together with *Victor Lardent* (1905–1968), an advertising designer and draftsman at The Times, he created a new typeface in 1931. It was first used in the newspaper on the 3rd October 1932. Times New Roman was designed for hot-metal print and the rotary letterpress printing. Times New Roman combines the classic elegance of typefaces for books with modern demands for economy of space. This compressed Roman serif type has high x-height and thus good legibility even in small font sizes. It became possible to have a lot of text on each page, thus saving paper.

Stanley Morison had a very strong influence on the typographic development during the 20th century. Times New Roman was issued commercially by the Monotype Corporation in 1933. His book *First Principles of Typography* (1929) got many readers, and he was a typographical consultant to several large corporations. Stanley Morison worked with The Times newspaper for a long time. He edited the History of the Times 1935–1952, and he was editor of The Times Literary Supplement 1945–1948. Stanley Morison was also en expert on the history of printing.

Nowadays there are several variants of the Times New Roman. Several versions of Times New Roman have been devel-

oped. Typefaces and fonts belonging to “the Times family” are all easy to read. They are probably the most widely used serif typefaces in the world. Times typefaces are used in newspapers and magazines as well as in books. Times New Roman is often included in word processors from the beginning. However, Times New Roman cannot be successfully used on computer screens, and laser printers cannot print the fine lines in small letter sizes.

Max Miedinger

The Swiss typeface designer Max Miedinger (1910–1980) created Helvetica in Zurich in 1957. The working name for the new font was *Neue Haas Grotesk*, but this name was never used in marketing. It was renamed *Helvetica* in 1960, and it was immideatly a success. Max Miedinger was trained as a typesetter in Zürich 1926–1930, and he he attended evening classes at the Kunstgewerbeschule.

Helvetica was developed from the Bauhaus tradition, inspired by the font Futura. Helvetica is a sans-serif typeface and designed with simple, striking lines in a compact way. It is the ultimate design of the Bauhaus–Swiss–International schools.

Nowadays we see texts in Helvetica everywhere around the world, on billboards and posters, in books, magazines and newspapers, as well as in numerous publications of various kinds. Helvetica typefaces are very useful for captions, headings, single words in pictures, tables, and for titles of various kinds. Helvetica is often used in business graphics, for overhead transparencies, and reader slides.

Helvetica has endured over time as an example of clean, durable, malleable, rational, and universal design. This all-purpose font is everywhere, particularly in commercial use representing all kinds of brands. But Helvetica may be hard to read in running text. In running text, it is difficult to tell the difference between uppercase I and lowercase l (and also the number 1). This becomes particularly troublesome in words such as "Illustration." Thus Helvetica is an inappropriate font in a language like French where this combination of letters is common. Running text in Helvetica will need extra space between the lines.

Like Times, Helvetica has been developed in many typefaces and font versions. According to Collier and Cotton (1989) Helvetica typefaces may be the most widely used sans serif typefaces in the world today. Despite the fact that Helvetica is difficult to read in small sizes it is included in many word processors.

Early posters

The term *poster* was originally used (about 1838) in England to refer to a printed sheet of paper that combined text and illustration. Posters were displayed in public places as announcements, advertisements, or propaganda. The design of these early utilitarian posters gradually became more ambitious as they began to compete against each other to catch the public's eye for commercial, promotional, or political reasons.

The breakthrough of posters was in the 1830s, as a consequence of the development of the lithographic printing technique. Well-known artists created the black-and-white pictorial posters of the Romantics. At the same time, purely typographical posters were developed, where the design of letters, words, and texts became very important. The development of chromolithography established the poster as an advertisement medium in the 1840s.

The main objective of a poster is to deliver e message or endorse a product, cause or event. A successful poster should instantly grasp the attention of the audience and maintain it until the message has been conveyed (Purvis, 2010, p. 11).

In a book with a collection of one thousand posters Cees de Jong (2010, p. 7) concluded that “Looking back on the last hundred and thirty years of poster design, the initial development of the poster usually included typography and the use of some type of illustration, and the purpose of the poster has always been to deliver a message. A simple, practical medium requiring paper, ink and an idea the poster has remained essentially unchanged from the industrial revolution until today.”

Since the beginning the poster proved to be useful also in other contexts than advertising and propaganda. The line between advertising and propaganda can be diffuse and difficult to determine. Examples of other uses are classroom posters, educational posters, and research posters.

New printing techniques developed during the 20th century. The poster of today is printed with silk-screen-printing, or with offset techniques, which makes it possible to also use photographs. The constant influence by different mass media today heightens the demands on us to perceive the messages in posters as quickly as possible. Therefore, today's posters have to be even clearer, simpler, more distinct, and more effective than the earlier posters.

Repetition is a common way to solve the problem. Advertisers simply set up a number of similar posters next to each other. Another way is to make posters in giant format on a whole gable.

This chapter includes the following five sections: *Propaganda, Advertising, Jules Chéret, Henri de Toulouse-Lautrec, Alphonse Mucha,* and *Educational posters.*

Jules Chéret

The multi-talented Jules Chéret (1836–1932) was a French artist, decorator, lithographer and painter. He was born in Paris in a poor and creative family of artisans. At the age of thirteen he began as an apprentice to a lithographer. Due to his interest in drawing and painting he took a course at the *École Nationale de Dessin*. He also studied the works of different artists who were represented in art museums in Paris.

Modern technology

In 1858, at age twenty-two, Jules Chéret created his first lithographic coloured poster in a characteristic sweeping style. The following year he travelled to London to practice and study lithography. He was impressed and influenced by the new design possibilities offered by the new printing technology.

After a seven-year-long stay in London he returned to France bringing modern English printing equipments with him. In 1866 he founded a lithographic printing business in Paris and started production of posters on a large scale. It was now possible to print up to ten thousand posters in one hour at low cost. Chéret drew his posters directly on the lithographic stones, and he successfully developed the lithographic multi-colour technology. His posters were ultra modern.

The father of the poster

Chéret created artistic posters advertising a wide range of products such as art exhibitions, cabarets, music halls, opera, plays of touring troupes, municipal festivals, theatre performances, variety shows, and several consumer goods like beverages, cos-

metics, kerosene, liquors, perfumes, pharmaceutical products, soaps, and many more. He became a major advertising force.

• *Jules Chéret made many posters advertising consumer goods like kerosene. This poster was published in 1891. The size is 120 x 82 cm.*

We read a poster at a long distance when we pass it. Since so much information compete for our attention, it must not take too much time to understand a message. Therefore, posters contain short and focused messages that are presented in a clear and distinct way. Typography and layout must provide good legibility in both texts and pictures. The most important elements must be large enough to draw the viewer in close to a point where the specifics can be presented. Texts and pictures must have good readability. In addition, the message must be interesting and attract attention, in order to make people willing to consider the message. These factors applied towards the end of the 19th century, and they still do. Due to communication and psychological reasons and a trademark legislation (in

1884), the shape and colour of posters were simplified in a well-balanced aesthetic cooperation between picture and text.

At the beginning Chéret probably found inspiration from circus posters and their tradition. However, in Chéret's posters texts and illustrations have equal roles, complementing each other in a completely new way. Here the words announce the contents, and the picture–often dominating the poster–describes the contents in the least little detail. Chéret developed a unique, playful and pleasurable style. He concentrated the message in a big, central comprehensive picture, in order to accomplish maximal effect and visual impact (Hardy, 1986).

Chéret's posters are characterized by a colourful and light-hearted design with inspiration by the Rococo style (Hedström, 2008, p. 18). As time went on, Chéret formed the actual words as illustrations. He is often called both "the father of modern advertising" and "the father of the poster."

Huge production

The industrial revolution had created a consumption society with an increasing demand for and offering of both products and services. The producers needed to advertise in order to persuade the customers to by their products. The simultaneous developments of more efficient printing methods made it possible to start a cheap mass production of posters on a large scale.

All in all, Jules Chéret produced about 1,200 posters. Broido (1992) has listed 1,089 of these posters in an illustrated catalogue. People in Paris, and in other large cities, encountered a great variety of brightly coloured posters, glued on walls, poles, and fences. The lithographic poster was the information graphics of that time. Along with contemporary works by Tou-

louse-Lautrec posters by Chéret represent the introduction of the modern poster art. The posters were printed in large numbers and the message reached out to many people. The contact cost was only a few hundredths of a penny per person. No item or product was so simple and so cheap that it could not be advertised on a poster.

Above all, Chéret depicted elegant and lively women in many of his posters. He created and conveyed the picture of the charm, elegance, and vanity of Paris–a myth that several imitators have further developed and that still prevails today.

This completely new image of women in the arts had great importance in the struggle for gender equality. Women in Paris were able to engage in formerly taboo activities. Chéret was called the "father of the women's liberation."

Chéret also conducted room decorations and paintings in watercolour and in pastel. In his old age Chéret moved to Nice, where he died in 1932 at the age of ninety-six. In Nice the "Musée des Beaux-Arts Jules Chéret" is named after Chéret.

See pictures at:
http://www.google.se/search?q=jules+ch%C3%A9ret+posters&tbm=isch&tbo=u&source=univ&sa=X&ei=JD8GUou5J6754QSupYHYDg&ved=0CDsQsAQ&biw=1327&bih=900

Henri de Toulouse-Lautrec

Henri-Marie Raymond de Toulouse-Lautrec-Monfa (1864–1901) is one of the most well known painters of the Post-Impressionist period. He revolutionized the art of posters and gave the commercial poster status as an independent art form. He became “the king of posters.”

Count Henri-Marie Raymond de Toulouse-Lautrec-Monfa (1864–1901) belonged to one of France's most distinguished noble families. The family lived in a chateau near Albi in the south of France. Henri's parents were first cousins and he suffered from a hereditary disease of the bones. In 1878 he fell and broke his left femur. A year later he fractured the other leg. He was immobilised for months and filled his days with drawing and painting.

The disease made him severely disabled. He got stunted legs. This stalled a traditional career in the administration or in the military. He was physically unable to participate in many activities and he immersed himself in art. From 1882, Toulouse-Lautrec completed his training first at Leon Bonnat’s academic workshops, then with Fernand Cormon, in Montmartre.

Bohemian lifestyle

In his works Toulouse-Lautrec recorded the late-19th-century bohemian lifestyle in Montmartre in Paris. During the late 1800s, Paris was a city where social life was centred on consumption and enjoyment (Lennartsson, 2008, p. 88). “Bohemians” were associated with artists who endeavoured with their life styles to develop alternative forms of creativity resulting in better work (Stoern, 2008).

Toulouse-Lautrec became the foremost portrayer of the special entertainment world in bars, brothels, dance lounges and cabarets. There he found his models and inspired among brothel moms, prostitutes, variety artists, alcohol and other drugs. For a time he lived in a brothel and he was a major consumer of alcohol (LaMure, 1952).

His painting *La Danse au Moulin Rouge* (Dance at the Moulin Rouge) was exhibited in 1890. Charles Zidler, the director of the Moulin Rouge, purchased the painting. He placed the painting in the bar, and he commissioned Toulouse-Lautrec to make a new poster for the Moulin Rouge. Jules Chéret had made an earlier poster advertising the Moulin Rouge.

According to Hedström (2008) Toulouse-Lautrec took a position at the borderline between popular culture and traditional elitist culture.

Moulin Rouge

The 27-year-old Toulouse-Lautrec became famous over a night, when his poster *Moulin Rouge: La Goulue* was put on walls and advertising pillars all over Paris in October, 1891.

Moulin Rouge was opened as a vaudeville and dance saloon in 1889, the same year as the inauguration of the Eiffel Tower. The Moulin Rouge poster shows the immediate and intense dance performance by the two cabaret performers and audience attractions Louise Weber and Etienne Jacques Renaudin (Gelfer-Jørgensen, 1995).

The Moulin Rouge poster is one of the most well known posters in the history of art. Here, Toulouse-Lautrec works with a great simplification; a very unusual composition at that time with figures partly within and partly outside the picture, figures

as silhouettes towards a lighter background, and a linear contouring of different surfaces. It is possible to recognize some of these people. On the far left is Tapié de Céleyran, a cousin of Toulouse-Lautrec.

• *The large poster "Moulin Rouge: La Goulue", 191 x 115 cm, were glued on billboards, fences and walls all over Paris in October 1891. Later the printing company has printed an additional text on the bottom half of the image, and thereby destroying the original design.*

The upper part of the poster, has the text MOULIN ROUGE CONCERT/ MOULIN ROUGE BAL/ MOULIN ROUGE TOUS Les SOIRS/ LA GOULUE in large red and black, hand-written

letters. Valentin-le-Désossé is dancing in the foreground. He is depicted as a pale, greenish gray and shadowy silhouette that we see in profile. He partially obscures La Goulue dancing in the centre of the image with white fluttering petticoats and red socks. She is partially obscured by large yellow lights in the left part of the image. The relative sizes of the characters, and the clear central perspective of the boards in the floor emphasize the depth of the room.

This poster is the result of a high degree of abstraction and simplifications in several steps. This process resulted in an extreme reduction and stylization with "a limited interplay of lines, surfaces, colour, and text" (Arnold, 1990, p. 34). Toulouse-Lautrec began his work by making several preliminary sketches, charcoal drawings with parts in watercolour and pastels. The finished charcoal drawing on rough paper is enhanced with white and coloured parts in tempera.

The sketch was drawn in the same format as the printed poster. The final sketch was drawn on rough paper. The charcoal drawing is enhanced with white and coloured highlights in tempera. The charcoal drawing was used to transfer the image to the lithographic stones. The poster was printed on three separate papers with four colours: yellow, red, blue and black.

The image was printed on two 84 x 122 cm sheets of paper. And a 27 cm high paper was added at the top to make room for the text. Since it is not possible to paste or glue these pieces in exactly the same way through the entire edition the finished posters have slightly different sizes. The poster image is approximately 191 x 115 cm. However, different experts specify a variety of dimensions, up to 195,5 x 124 cm fort the entire poster (see Mourlot, 1967; Adriani, 1986; Arnold, 1990; Biblio-

thèque Nationale, 1991; Gelfer-Jørgensen, 1995; Hedström, 2008).

Billboards, fences and walls offered various conditions for a successful display of the poster. Some of the posters were pulled through the streets mounted on special carriages (Hedström, 2008, p. 18). Between one thousand and three thousand copies were printed.

For a part of the edition the printing company has printed an additional text at the bottom half of the image: “TOUS LES SOIRS/ MOULIN ROUGE/ les Mercredis et Samedis/ BAL MASQUÈ” (All evenings / Moulin Rouge / Wednesdays and Saturdays / masquerade). This was likely on behalf of the client. The new text clearly has another design, and someone else designed it (Adriani, 1986). It destroyed the original design.

The poster “Moulin Rouge: La Goulue” exists in three different versions. In the third version there are only two “MOULIN ROUGE” in the large red and black, hand-written letters.

The following year, 1892, Toulouse-Lautrec exhibited the Moulin Rouge poster at the *Salon des Indépendants* along with seven paintings. A few years later, in 1896, the Moulin Rouge poster was exhibited at *L'Exposition International d'Affiches Artistique de Reims*.

Japanese woodcuts

In Japanese woodcuts Toulouse-Lautrec found a starting point for his compositional approach and perspective effects (Gelfer-Jørgensen, 2008). The use of decorative contours and the use of silhouettes also seem to have interested him. He was inspired

by the use of effective colours, and he worked with an expressive line and with strong colour centres in his own posters.

The pictures on the posters are metaphors, composed of hints and symbolic details. The words that fill the space between the different parts of the picture are there only to explain the picture. The function of the pictures is to tell something, without dominating the text. We may see Toulouse-Lautrec's posters of actors, singers, and cabaret artists as a European correspondence to the popular Japanese woodcuts of actors, flirts, geishas, and wrestlers.

More posters

Toulouse-Lautrec made thirty more posters. He was ahead of his time when it comes to posters for advertising, and he immortalized several artists from the nightlife in Paris. His technical championship made it possible for him to express his full creativity (Devynck, 2008, p. 129).

Often Toulouse-Lautrec made his posters as a “service to his friends” (Hedström, 2008, p. 22). He made four posters advertising Aristide Bruant and his cabaret. The entertainer, with the red scarf, was famous for being rude to the cabaret guests. One of these posters is the first poster where Toulouse-Lautrec signed with his initials interwoven into a monogram after the Japanese model. Toulouse-Lautrec also made a number of drawings that were printed in a magazine published by Bruant.

The technique of working with simplified areas for the dancer in the poster “Jardin de Paris: Jane Avril” is in great contrast to the contrabass from the orchestra pit, in the foreground. Here, an asymmetrical framing of the picture is being formed. This is a first taste of art nouveau.

Sometimes Toulouse-Lautrec used photographs as a way to avoid sittings (Devynck, 2008, p 130). He generally made numerous studies before he could print a lithographic work (Arnold, 1990, p 43). This was a long process with simplification of the image, usually starting with a spontaneous sketch, then detailed drawings on paper, one or more studies in watercolour, tempera or oil mostly on paper, and finally a full image, sometimes painted on canvas. After all this he could transfer the motif to the lithographic stones. However, like Chéret also Toulouse-Lautrec sometimes drew his poster images directly on lithographic stones without any sketches.

A short life

For most of his adult life Toulouse-Lautrec was an alcoholic. At the age of 36 he died from complications due to alcoholism and syphilis. Given his short life, his production is almost unimaginable large: 737 oil paintings, 360 lithographs including the posters, 275 watercolours, and more than five thousand drawings, some ceramics and stained glass works. Furthermore, his production is also very varied. The Toulouse-Lautrec Museum in Albi possesses over 1,000 of his works, including the 31 posters. This is the world's largest collection of works by Toulouse-Lautrec.

See pictures at:
http://www.google.se/search?q=toulouse-lautrec+posters&tbm=isch&tbo=u&source=univ&sa=X&ei=tD8GUtKcF4qu4ATn1IGQAw&sqi=2&ved=0CDsQsAQ&biw=1327&bih=900

Alfons Maria Mucha

In the 1890s, “the new art” interrupted the historical cavalcade of style that had been dominating architecture, art, and art handicrafts for a long time. This new style has its origin in England, where it was called *Liberty*. It got different names in various countries, such as *La Libre Esthetique* in Belgium, *L’ Art Nouveau* in France, *Style Liberty* in Italy, and *Jugend* in Germany. The generally accepted international term is *Art Nouveau*. This new art dominated the European culture for 15 years, at the turn of the 2000 century.

Art Nouveau had an influence on posters, and radically changed the relationship between pictures and texts. The posters had texts in clear typography, abstract pictures, and illustrations in the margins in the shape of decorative patterns and flourishing ornaments. The ornamentation serves the demands of the modern times on effective pictures with strong visual effects. Like Henri Toulouse-Lautrec, many artists were inspired by Japanese woodcuts. In art nouveau, however, aesthetic considerations are predominant. The message is no longer as sharp and clear; the message is no longer information graphics.

During the heyday of the style, architects, artists, graphic designers, and typographers developed a surfeit of stylishly distinctive wood and metal typefaces that complemented architectural and interior motifs, and so defined the style and movement (Heller and Chwast, 2008, p. 34). These were delightfully eccentric typefaces that tested the tenets of legibility but were nonetheless rooted in the fundamentals of type design–balance, colour, and harmony. Art Nouveau gave a signal of a cultural and social realignment.

The Art Nouveau decorative artist and painter Alfons Maria Mucha (1860-1939) was born in Ivančice in Moravia in the east of the present Czech Republic. He studied in Munich, worked and studied in Vienna and Paris. Alfons Maria Mucha became one of the most successful advertising poster artists. In 1910 he moved to Prague (Mucha, 2006).

During Christmas of 1894 Mucha created a lithographed advertising poster for a play featuring Sarah Bernhardt. The poster *Gismonda*, 216 x 74,2 cm, was posted in the city on 1 January 1895. Sarah Bernhardt, who was the most famous actress in Paris, was very satisfied and gave Mucha a contract for five years (Arwas, 2006).

Alfons Maria Mucha produced many advertising illustrations, book illustrations, murals, paintings, portraits, postcards, and posters (Lipp, 2006). He produced the first tourist posters with advertising for travelling by train to the popular seaside resorts.

Alfons Maria Mucha is best known for his very distinct style, and motifs with beautiful young women often seen in floral arrangements. He also made decorative designs, and designs for carpets, jewellery, wallpaper, and theatre sets. The main and radical idea was that art was imbued in everything functional, and it was applied in everything from advertising to architecture. Alfons Maria Mucha often worked with pale pastel colours.

See pictures at:
http://www.google.se/search?q=alphonse+maria+mucha+posters&tbm=isch&tbo=u&source=univ&sa=X&ei=GEgGUuqRA4Ll4gSkloCQAw&ved=0CDAQsAQ&biw=1327&bih=900

Educational posters

Educational posters, or school posters, have been a standard feature of classrooms worldwide. Millions of people have seen school posters in school. Many skilled artists were involved in the production.

In Sweden the Golden Age for educational posters lasted from 1920 to 1950 (Ekegren, 1988, p. 118). An individual school could have a collection of several hundred posters.

The German natural history illustrator and painter *Friedrich Specht* (1839–1909) made illustrations of animals and landscapes for a large number of science publications, such as the first edition of *Brehms Tierleben* (1864–1869). Specht was also a pioneer in design of educational school posters.

The Swedish painter *Nils Tirén* (1885–1935) made it his life's work to document the Swedish wildlife (Wahlstedt, 2005, p. 143). He contributed with 80 large format watercolours in the series *Swedish Animals*, published in the period 1917–1935. Nils Tirén was inspired partly by his own father, the renowned landscape painter *Johan Tirén* (1853–1911), and partly by the Swedish artist *Bruno Liljefors* (1860–1939). Tiran's animal motifs are characterized by artistic sense and in-depth knowledge about the animals and their habitats. These wall charts were also widely distributed in the neighbouring Nordic countries.

Another Swedish pioneer was *Henrietta Sjöberg* (1842–1915). She was a botanical illustrator, painter, and printmaker, and she made botanical posters. Also *Wilhelm Balslev* (1860–1935) and *Johannes Eugenius Bülow Warming* (1841–1924) made botanical posters at the beginning of the 1900s. They were both from Denmark. William Balslev was a teacher in Copenhagen, and he published a number of textbooks in botany and

zoology. Eugen Warming was a botanist, and he wrote the first textbook (1895) on plant ecology. He also wrote a number of textbooks on botany

Even if the teacher told the pupils about the intended pedagogical content of every school poster there was always a lot left for the pupils to experience for themselves on an emotional level (Ekegren, 1988, p 40). There can be no doubt that the educational posters had great significance for both teachers and students. In its day, school posters were a very nice complement to the textbooks. In Sweden slides, filmstrips and overhead transparencies replaced educational posters. Now these media have been replaced by image databases on CD-ROMs, and the Internet.

Early diagram design

The British scientist *Joseph Priestley* (1733–1804) was a pioneer in diagram design. He designed his diagram *A Chart of Biography* with timelines for important individuals. This chart was published in 1765. Inspired by Joseph Priestley's work with timelines the Scottish engineer and political economist *William Playfair* (1759–1823) developed the line graph (1786), the bar chart (1786), the pie chart (1801) and the circle graph (1801) to represent economic data. He made the first modern charts in his book *The Commercial and Political Atlas* (1786).

The English physician *John Snow* (1813–1858) illustrated the clusters of cholera cases in the London epidemic of 1854 with a *dot map*. With his statistics Snow could demonstrate the connection between the bad quality of polluted water from the Thames and the high number of cholera cases. Snow's study is regarded as the founding event of the science of epidemiology.

The French engineer *Charles-Joseph Minard* (1781–1870) was a pioneer in diagram design. He designed a map using pie charts to represent the cattle sent from all around France for consumption in Paris (1858), and a unique *flow map* of Napoleon's disastrous Russian campaign 1812–1813 (1861).

The Irish journalist *Michael George Mulhall* (1836–1900) was a pioneer in statistical diagram design.

The British nurse and statistician *Florence Nightingale* (1820–1910) was the founder of modern nursing. She tended to wounded soldiers during the Crimean War. Florence Nightingale was a pioneer in the visual presentation of information and statistical graphics. She developed and made extensive use of polar area diagrams, a special form of pie chart, in her reports

on medical care in the Crimean War. This type of diagram is also known as the *Nightingale Rose Graph*. Florence Nightingale is famous for her *Diagram of the causes of mortality in the army in the East,* 1858. Civil servants and Members of Parliament were unlikely to understand traditional statistical reports

The US engineer *Willard Cope Brinton* (1882–1945) was a pioneer in visualizing numeric data. He designed and wrote the book *Graphic methods for presenting facts* (1914). This was the first book about graphic design aimed for business and a general audience.

The English engineering draughtsman *Harry Beck* (1902–1974) designed the radically simplified topological map of the Underground tube system in London (1931). The map was immediately popular.

This chapter includes the following five sections: *Joseph Priestley, Charles Joseph Minard, Michael George Mulhall, Willard Cope Brinton,* and *Harry Beck*.

Joseph Priestley

The versatile British scientist and clergyman Joseph Priestley (1733–1804) is perhaps best known for his discovery of oxygen in 1774, which he published in 1775. (A year earlier, the Swedish chemist Carl Wilhelm Scheele discovered oxygen, but he did not publish his results until 1777.) Priestley's scientific reputation rested on his invention of soda water, his writings on electricity, and his discovery of several gases. He was also an educator, and political theorist.

Priestley believed in the free and open exchange of ideas. His support of the French Revolution aroused suspicion, and he had to flee. In 1794 Priestley immigrated to the United States, and settled in Pennsylvania. He wrote articles, books and pamphlets in a variety of topics. He published over 150 works. Among other things, he argued that the education of the young should anticipate their future practical needs.

In 1765, Priestley published *A Chart of Biography*, a large sheet (about 60x90 cm) with a chart showing the "timelines" for individuals who were important during the interval 1200 BC to 1800 AD. The diagram with an accompanying booklet supplemented his oral lectures in history and general policy. The material consisted of two thousand names.

A new version, *A New Chart of History*, was published in 1769. For each person there is a timeline. Solid lines represent confident intervals. Unreliable data are marked with dots.

Priestley argued that the diagrams would help students to see connections between different people and different historical events. The material was organized into six categories according to how famous the persons were: antiquarians, lawyers curators and historians; artists and poets; critics, orators, and

writers; divines and metaphysicians; mathematicians, natural philosophers and physicians; and statesmen and warriors. Obviously Priestley had difficulty assigning all the people to individual categories

Both of these charts were popular for decades. Until 1816 *A New Chart of History* was printed in fifteen editions. In 1764, Priestley received a doctorate in law from the University of Edinburgh.

See picture at:
http://en.wikipedia.org/wiki/A_Chart_of_Biography

Charles Joseph Minard

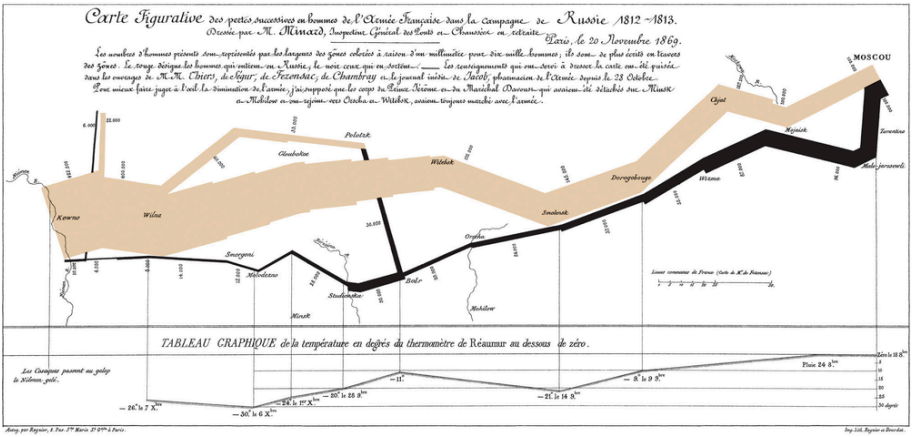
The French civil engineer Charles Joseph Minard (1781–1870) born in Dijon. He studied science and mathematics at the École Polytechnique. For many years he worked as a civil engineer on bridge, canal, and dam projects throughout Europe. In 1830 Minard was appointed superintendent of the École nationale des ponts et chaussées (School of Bridges and Roads). He became an inspector in the Corps des Ponts (Corps of Bridges) and retired in 1851.

After his retirement Minard designed more than fifty graphic tables and thematic maps with statistical information showing changes and movements of various kinds, in space, time and volume. He is known for his inventions in the field of information graphics.

In 1861 Minard created a flow map showing six different types of facts about Napoleon's disastrous Russian campaign 1812–1813, the problematic march to Moscow and back. The map was published in 1869. Here Minard combined statistical data with a time-line treatment in a single two-dimensional image.

Geography. Cities and major battles are highlighted in the simplified map. The geographical co-ordinates are noted for the army as it moved.

Routing. In June 1812 the Army moves from the Polish-Russian border, near the Niemen River, into Russia. The Russians retreated until they reached Borodino. In a battle on September 7 both sides suffered heavy losses. The Russians withdrew. On September 14 Napoleon occupied Moscow, but Russians burned the main part of the city. On October 19 the French left the city and started their retreat to Poland.



This is a very small version of Minard's flow map showing Napoleon's Russian campaign (1812–1813). The size of the army is proportional to the line width. The original graphic is 24 x 51.8 cm.

Direction. The army's way towards Moscow is marked with a thick line in a golden yellow colour. The retreat out of Russia is marked with a declining black line.

The size of the army. In the 24 x 51.8 cm large graphic the size of the army is proportional to the line width of the two lines showing the directions to and from Moscow. Every inch represents 10,000 men. The decreasing width of the line in the graphic indicates the gradually declining size of the French army at each place on the map.

Napoleon entered Russia with 422,000 men in June 1812, and he returned back into Poland in December 1813 with only 10,000 men. 6,000 of these men had not participated in the march at all. Less than 2.5 percent of the men in the original force returned back home. This was due to a combination of re-

sistance from the Russian army, the cold Russian winter and the scorched-earth tactics.

Temperature. The lower graph shows the temperature during the retreat, measured in Celsius degrees. It was extremely cold during the retreat, down to minus 40 degrees Celsius. The low temperatures caused great sacrifices from the retreating army. Only about 40,000 starving soldiers survived their time in Russia.

Time. The lower graph shows the time during the retreat. The scale starts October 24 1812 and continues to the left until December 7 1813.

Tufte noted (1983, p. 40): "Minard's graphic tells a rich, coherent story with its multivariate data, far more enlightening than just a single number bouncing along over time. ... It may well be the best statistical graphic ever drawn."

See pictures at:
http://www.datavis.ca/gallery/minbib.php

Michael George Mulhall

It is difficult to visualize numeric data in an understandable and clear manner. The Irish editor, geographer, journalist, statistician, and writer Michael George Mulhall (1836–1900) introduced simplified images, called *pictograms*. In a chart or a map the varying sizes of the pictograms represent data. Different sized silhouette images of a cow, for example, can represent meat production in different countries. Silhouette images of ships can illustrate volumes of transported goods. The reader should compare the size of these diverse areas.

Mulhall was born in Dublin. After his education at the Irish College in Rome he moved to Buenos Aires in Argentina (Meehan, 1911). In 1861 he started *The Standard* together with his brother, Edward Thomas Mulhall. This was the first English language newspaper in South America. The Mulhall brothers also published several books about South America.

Michael George Mulhall wrote, illustrated and published books with statistical information: *Progress of the World* (1880), *Balance-sheet of the World, 1870–1880* (1881), *Dictionary of Statistics* (1884), and *The History of Prices since 1850* (1885). *Dictionary of Statistics* is a standard work of reference. He presented numerical values in creative and innovative ways (Horn, 1998, p. 39). Mulhall used the symbols of different commodities and goods in representative colours. It turned out, however, that this type of chart can be very difficult to read and understand. Therefore silhouette images often supplemented with numbers and text.

In response to a proposal to establish an Agricultural Board for Ireland Mulhall and his wife Marion McMurrough Mulhall conducted extensive travels in Europe during 1896. His task

was to collect statistical data on agriculture for the Committee of the English Parliament.

The pope decorated Michael George Mulhall in recognition of his literary work.

See books at:
Balance-sheet of the World for Ten Years, 1870-1880 (1881)
http://openlibrary.org/books/OL23544943M/Balance-sheet_of_the_World_for_Ten_Years_1870-1880

Dictionary of Statistics (1884)
http://www.archive.org/stream/mulhallsdiction00unkngoog#page/n7/mode/2up

Willard Cope Brinton

The US engineer *Willard Cope Brinton* (1882–1945) was a pioneer in visualizing numeric data. He designed and wrote the book *Graphic methods for presenting facts* (1914). This was the first book about graphic design aimed for business and a general audience.

The need for knowledge of how to visualize numeric data increased during the First World War. There was a great need for standardization in the field. Different reporting formats easily led to misunderstandings. From 1914 Brinton was president of the multidisciplinary group *Joint Committee on Standards for Graphic Presentation*. This group discussed how to present data and information. The group had representatives from 15 professional organizations whose members used graphical presentations in their daily work. The group worked with the standardization of symbols and visual presentation of numerical data. The goal was that the group would produce a small number of simple and concise rules that could serve as a grammar for those who would present facts and information for different groups using graphical presentations.

Brinton lectured on how to visualize numeric data already several years before the war. He was a guest speaker at the higher education of economy at Harvard and Chicago (Stiff, 2005, p. 217). He was also a guest lecturer at other courses, as well as in business and government in the United States. Brinton said that the collection of data was only half of the job. The other half was to present the data in an appropriate manner. For many years Brinton collected a large number of good and bad examples of visualization of numerical information that he found in books, magazines and more. Many of the readers of his

book *Graphic methods for presenting facts* sent him letters with clippings from magazines. All of this laid the basis for another book.

Brinton published the book *Graphic Presentation* himself (1939). This book is a detailed guide for everyone who wants to visualize numeric data. The voluminous book (524 pages) contains a large number of concrete design proposals. Brinton discusses the types of visualizations that work well and which are not appropriate in different situations. The book also includes practical tips for how to make charts, graphs and maps. Although there were no computers in 1939, the images are remarkably similar to images made today. Since the pictures are handmade, they have a chunkier style.

See books at:
Graphic methods for presenting facts (1914/1919)
http://archive.org/details/graphicmethodsfo00brinrich

Graphic Presentation (1939)
http://archive.org/details/graphicpresentat00brinrich

Harry Beck

During the 1930s the English engineering draughtsman Harry Beck (1902–1974) designed a radically simplified topological map of the Underground tube system in London (1931).

The first subway line in London opened already in 1863. A few years later another line opened, soon to be followed by others. At the beginning it was easy to make a traditional, geographically accurate map that showed exactly how subway lines go between different places. Initially subway lines were often superimposed over roads on existing city maps.

But the maps became more complex when the system grew rapidly. It became a major problem to make room for all the necessary information for all the lines, and for all the centrally located stations. Meanwhile, the large distances between the stations in the suburbs meant that maps had to be very large. The network had become too big to be represented in a geographically correct way.

Harry Beck, whose real name was Henry Charles Beck, solved the seemingly incompatible design problems. He had earlier worked on drawings for electrical switching systems and signalling systems at the London Underground Signals Office. He was therefore familiar with the subway system's extent and geography. In his spare time he sketched on a new type of map that would work better than the ones used. Since 1908 the drivers of many subway trains had a simple non-geographic linear diagram with the stations evenly distributed along a horizontal line in the driver's compartment. It is possible that this system with simple line charts inspired Beck.

During the 1930s unemployment rates rose in Britain, and Harry Beck was dismissed from his job. When unemployed, in

1931, Harry Beck presented his concept of a very simplified and not to scale topological map of the metro system. The new map was based on a map of the River Thames. All subway lines were represented in different colours with horizontal, vertical, or diagonal lines. The stations were evenly distributed. Diamonds indicated interchange stations. At first the management of London Underground was sceptical and rejected Beck's proposal that broke all the traditions of what a map should look like, and it did not at all give correct information about the distances.

After a successful trial with 500 copies of the new map in 1932 a large-scale trial was carried out in January 1933. 750,000 copies of a small brochure, with the new map in miniature, were placed at various metro stations. The new map was an instant success among travellers and they soon had to print another 100,000 copies. Beck was paid the equivalent of £5.25 (about £500 pounds today). For almost thirty years Beck continued working with new versions of the subway map on a freelance basis. He also designed a series of publicity posters. In 1947 Harry Beck started teaching typography and colour design at the London School of Printing and Kindred Trades. Beck's importance was posthumously recognised in 1997.

Harry Beck considered the needs of the individual passengers to be able to easily plan their journeys, how to get from one station to another and where to change trains. He therefore prioritized function, simplicity, and usability over geographical accuracy. He placed the stations in the system of underground lines on top of a schematic map of the River Thames. This was really a new type of diagram that shows *context* rather than correct geographic locations.

The London Underground Tube map is a great example of good information design. It takes just a quick glance at the map to quickly understand the system. The different subway lines are colour coded. General stations are marked with short strokes, while nodes are marked with circles. All termini are shown with long dashes. Different symbols show where there are connections to the air, rail, and sea. Colour codes and symbols are used in a consistent way in carriages, maps, prints, signs, and stations.

Nowadays, the London Underground system has a dozen subway lines with a total of over 400 kilometres of tracks and nearly 300 stations. It is a very complex system that is difficult to grasp. A map of the subway system must simultaneously be both detailed and easy to grasp. The map needs to be simple and it must show the entirety in a clear way. The map must also contain other information, such as where it is possible to switch to other means of transport.

Ever since the 1930s, the London Underground Tube map has been an important source of inspiration throughout the world for others who have had the need to develop information about the transportation system. Many rail and subway companies around the world use Beck's principles, and there are now similar maps in many cities. The system must be flexible. It must be possible to change this type of map as lines and stations are added or shut down.

See maps at:
The Story of Beck's London Underground Map
http://britton.disted.camosun.bc.ca/beckmap.htm

Early photography

The French inventor *Nicéphore Niépce* (1765–1833) made the worlds first photograph in 1825. His technique was called heliography.

The British inventor *William Henry Fox Talbot* (1800–1877) made a photomechanical reproduction in the 1840s. His new technique led to the photo glyphic engraving process, which in turn led to photogravure. As a photographer Talbot contributed to the development of photography as an artistic medium. Also *Louis-Désiré Blanquart-Evrard* (1802–1872) was a pioneer in photography in France. He published the Calotype process (1847) and developed the albumen silver paper print technique (1850).

Roger Fenton (1819–1869) was a British photographer and one of the first war photographers. He documented the Crimean war in 1855.

The French photographer, physiologist, and scientist *Étienne-Jules Marey* (1830–1904) was a pioneer in photography and the history of cinema. He developed animated photography and he was able to catch several phases of a movement in one photo. In 1890 he published the richly illustrated book *Le Vol des Oiseaux* (The Flight of Birds). In the book he used diagrams, drawings, and photographs.

The Danish American journalist and photographer *Jacob August Riis* (1849–1914) used his talents to help the impoverished in New York City. In his book *How the Other Half Lives: Studies among the Tenements of New York* (1890) he documented the lives of poor people in New York.

The Swedish photographer *Lennart Nilsson* (1922–) gave people all around the world new insights of the human body with pictures published in *Life*, and in his two books *A Child is Born* (1965) and *Behold Man* (1973).

This chapter includes the following two sections: *Early film* and *Early television*.

Early film

As noted earlier director Werner Herzog (2010) remarked that some of the drawings in the *Chauvet Cave* had animals painted with extra legs to suggest movement, creating even an early movie, a "proto-cinema." These painted or carved animal figures are approximately 32,000 years old.

Some old civilizations and cultures relied on advanced pictorial messages related to the movements of the sun. The exact lighting from the sun was very important at *Newgrange* and at *Stonehenge*. Another example is the "The movie in Chichén Itza. "

By showing a sequence of pictures describing a course of events so quickly that the eye cannot discern the individual pictures, the brain experiences movement. At the beginning of the 20th century, different toys with animated cartoons were experienced as "live" by the amazed audience.

The English photographer Eadweard Muybridge (1830 – 1904) made the first projected film, after 1877 and before 1880. In the 1880s Muybridge produced over 100,000 images of animals and humans in motion at the University of Pennsylvania in Philadelphia.

The French inventor *Louis Le Prince* (1841 – 1890?) created the oldest surviving film in England in 1888. His film lasted two seconds and showed walking people.

The two French brothers Auguste Marie Louis Nicolas Lumière (1862–1954), and *Louis Jean Lumière* (1864–1948), were the earliest actual *filmmakers* in history. The brothers worked in their fathers photographic firm. When their father retired in 1892 they began to create moving pictures. They showed their first ten motion pictures in Paris in 1895. Each film was 17 meters long and lasted for approximately 50 seconds.

Motion pictures developed rapidly in the "silent era." Silent films had no spoken dialogue and no recorded music. Title cards were often used for the dialogue. The visual quality of silent movies was often high.

"Talking pictures" replaced the silent films in the late 1920s. The *Jazz Singer* (1927) was the first feature-length motion picture with synchronized dialogue sequences. Here the movie star Al Jolson performs six songs.

Often film is re-corded and shown with 24 frames per second. Faster recording and projection gives a more stable picture. Film can also be projected with a different image frequency than that with which it was recorded. Recording with high frequency and projection with normal frequency results in slow motion. This is used for studies of fast or very fast and complicated courses of events, for example, a bullet leaving a rifle. Recording with low frequency and projection with normal frequency results in the opposite; fast motion. This is used for studies of slow or very slow courses of events, for example, a bud developing into a flower. There have been many different

kinds of film formats. Examples are standard 8mm film, S-8mm film, 16mm film, 35mm film, and 70mm film. Usually “standard film” refers to 35-mm film for movie production. The height-width relationship of this 35-mm film is 1:1.33. At the middle of the screen the resolution is some 450 dots per square inch. There are several types of wide-film-formats.

Early television

The word “television” comes from the Greek word *téle*, distant, and from the Latin word *vidére*, to see. Television, or TV, is a tele technical system for transmission of sound and images, stills, as well as motion pictures in both black and white and colour.

The history of television comprises the work of a large number of people. The German student *Paul Gottlieb Nipkow* (1860–1940) developed the first electromechanical television in 1884. He used a spiral-perforated disk to divide a picture into a mosaic of points and lines. Entirely new designs followed.

About 1925 the Scottish engineer and inventor *John Logie Baird* (1888–1946) produced some of the first successful television images. He was the first inventor to use Nipkow's disc successfully. On 26 January 1926, Baird made a demonstration for members of the Royal Institution and a reporter from The Times. It was the world's first publicly demonstrated television system, and the world's first fully electronic colour television tube. On 3 July 1928, Baird made a demonstration of the world's first colour transmission. John Logie Baird is known as “the father of television.”

Early television sets where placed in huge cabinets. The tiny screens used 30 lines, and showed black and white flickering images. The BBC started their first experimental broadcast of mechanical television in 1929. In the US, broadcast television began in the 1930's. BBC abandoned Baird's mechanical system, and used an electronic picture scanning system from 1937. This system was based on the work of the German inventor *Manfred von Ardenne* (1907–1997), and the Russian-American inventor *Vladimir Zworykin* (1888–1982). From the early thirties Zworykin played a role in the practical development of television.

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