ART 266L / COMM 266L - INTRODUCTION TO NEW MEDIA

COURSE NOTES:

What are the new media ?

Artists and art audiences have long known that media play a powerful role in the creation of any work of art or visual design. Contemporary art and visual communication are sensitive to the enormous influence which the choice of certain media and processes has for the visual image maker. We know for instance of the famous case of Leonardo painting the Last Supper in an encaustic (wax-like) material in his search for a more accommodating medium to portray his vision.

Photography's impact on contemporary culture is impossible to estimate. Holography and other new media extend the impact further yet.

For many millennia the media which artists employed were relatively unchanging in nature. In the two dimensional arts of drawing and painting some form of pigment (colorant) was normally combined with some form of binder to allow marks to be placed on some form of surface (paper, wood, etc.). In the three-dimensional arts some form of solid material was either carved up or some liquid material was cast into a three-dimensional form. Such media as oil paint, watercolors, acrylics, charcoal, pastels, marble, bronze and the like constitute a sort of fundamental pantheon of traditional art media whose history continued more-or-less unchallenged until the early 1800's.

What was it that occurred in the early 1800's which shattered the time-honored approaches of traditional artistic media? The answer to this is the development of photography. Prior to 1800 nearly every image created involved the manipulation of some material/medium by the human hand. In many cultures artists sought with great effort to mimic the world about them. The advent of photography forever altered the direction of art and visual communication and caused image makers to reappraise their individual approaches to their chosen medium. In some instances the reappraisal had very dramatic consequences as in 1839 when the famed artist Paul Del Roche proclaimed "From this day forward painting is dead."

What though was so distinctive about photography as a medium? Photography was one of the first visual media which had a technological/machine base. By this it is meant that the

image which was generated by this process was less the result of labor by the human hand and more the application of scientific principle to the recording of visual information. Some would argue that early printmaking processes such as etching and engraving involved presses and therefore had a machine basis but the images which these presses printed were still largely developed by hand.

What are the NEW MEDIA? For some they only include the latest and most recent technological innovations available to visual communnicators

In our contemporary world, there is no settled term for the rapidly expanding array of media and processes (mostly technological/machine based) with which we are constantly engaged. From xerographic processes and digital imaging to virtual reality and the hologram society continually expands the options of today's visual artists and visual communicators. In many institutions the term **new media** has become common nomenclature for this broad assortment of imaging media. For purposes of brevity, in this course we will define New Media as:

"media which employ some form of mechanical device to record/generate a visual image."

This definition is, by necessity, very generalized in order that it include such media as computer animation (in this case the computer is obviously the mechanical device), photography (here the camera, enlarger, et al are the mechanical intermediaries), Cinema/Film (where cameras record and projectors display the visual form), holography (lasers, lenses and other optical components record the image), Virtual reality (the computer linked to sophisticated viewing devices are critical components in this new medium). Likewise such media as painting, etching, ceramics, fiber weaving and the like would not be associated with this definition since they rely primarily upon the creative energy of the human hand to establish their end product.

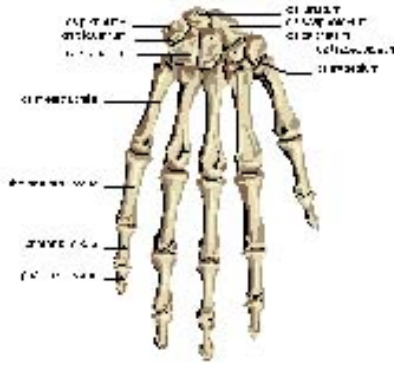
A definition such as this also recognizes a major philosophical issue whose roots trace back to the invention and historical introduction of photography, the original "new medium". This issue is simply whether "art" can be made either "by" or "with" a machine. For many millennia art was synonymous with the crafting of images and objects by hand and many critics still question the validity of personal/human expression which has been mediated by the presence of any machine or mechanical device. The famed film critic and visual psychologist Rudolf Arnheim is succinct when he states:

"Yes. I believe that photography as a medium has a ceiling. By that I mean that it does not seem to go very much beyond what it has been doing as a medium almost from the beginning."

Other critics have assailed the new media in a similar fashion - questioning their intrinsic merit and validity, as in this case by the critic Edward Rothenstein who, in writing for the New York Times, recently commented:

"While there are artists who are trying to use the laborious qualities of the Web to create a form of artistic experience . . . these efforts show lots of sweat and very little light."

While the debate surrounding this issue continues it is important to note that there are now considerably more critics advocating the artistic potential of the many new media now employed by visual artists. This circumstance is in part due to the increased recognition of the medium of photography as a major player on the stage of contemporary art as well as to the enhanced exposure of artists, critics and others to work being created in this realm. Yet another reason for the growing acceptance of various new media is the increased hybrid activity wherein traditional artists are using various new media as substantive components with and within their own artworks.



The NEW NEDIA of this century and centuries to come will be and are extensions of the human organism – they extend and expand our sensory, motor and other physiological systems.

"The illiterate of the future will be ignorant of pen and camera alike."

Lazlo Moholy-Nagy

Glossary

Knowledge of a given discipline or field can often be quickly assessed by determining the extent of one's knowledge of the terminology particular to the discipline or field. This is certainly as true in the new media with their integral connection to technology, as it is in such fields as law, medicine and the like.

The following list of terms and conventional expressions is certainly not exhaustive. It does contain many essential terms and conventional expressions necessary for effective communication with peers in the field. Students in this course are required to be familiar with the entirety of this glossary.

***Bi**nary digi**T** is a bit. A bit is the smallest unit of information which is processed by a computer.*

Bit - contraction from "binary digit". The smallest unit of information handled by the electronic circuits of the computer.

A bit represents the presence or lack of an electrical charge within a computer circuit. When a circuit is charged it is said to be "on"- a condition represented by the number "1". When a circuit is not charged it is said to be "off" - a condition represented by the number "0".

Bit-mapped graphics (see also raster graphics) - a graphic image displayed by the computer as a series of contiguous dots or "pixels" on the video screen. In bit-mapped images each pixel is individually identifiable in the computer's memory.

Byte - a grouping of "bits" of data, usually eight in number. Most information storage is configured in bytes and so a kilobyte = 1,000 bytes and a megabyte = 1,000,000 bytes and a gigabyte = 1,000,000,000 bytes.

Clock - like a metronome the clock emits a regular signal throughout the circuitry of the computer to allow synchronization of its various functions.

CLIP – A short piece of video or audio used in the construction of media files.

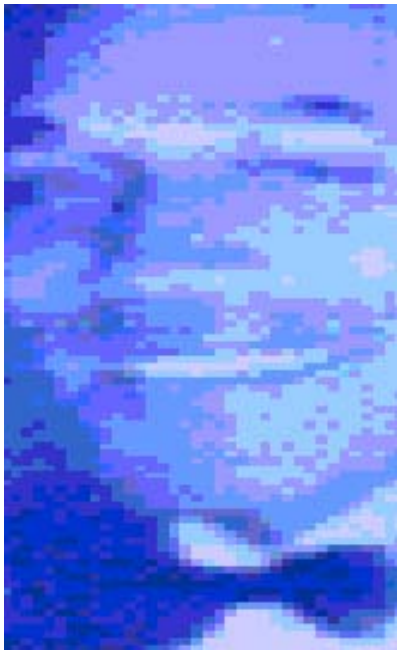
CPU - acronym for *Central Processing Unit, it* is the heart of the computer. Much of the data processing and logic activities of the computer are performed here and thus the CPU sets critical standards for the computer it supports - including its speed.

CRT - acronym for *Cathode Ray Tube*, means the same as monitor. A stream of electrons fired by the electron gun and directed by a large magnet on the tube illuminate the phosphor covered screen, creating the image which we see.

Data bus - quite literally the circuits along which information/data travel within and outside the computer.

Digital image - an image which is recorded, stored and manipulated as a binary series of 0's and 1's within the computer or other digital electronic devices. Often seen as the opposite of the analog image.

Diskette - a static storage device for computer data. Data stored on diskettes is arranged into concentric tracks which are broken down into radial sectors (so an address for data on a diskette might be "track 4 sector 7") and are accessed in a random manner according to address information contained on the directory track. See also hard drive. Although diskettes are no longer in wide use their principle structure is still the basis for many HDD style (traditional) HARD DRIVE mechanisms so knowledge of them is still useful.



Bitmapped graphics are images stored and manipulated as small cells or "pixels."

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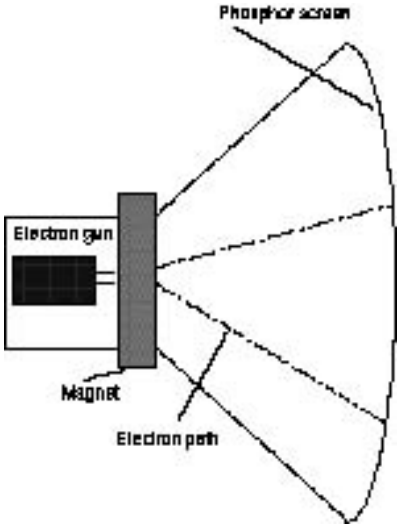
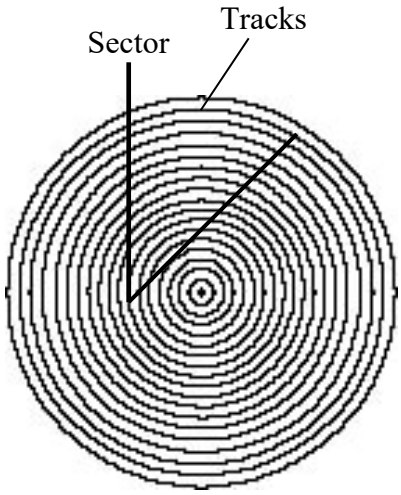
An 8 bit "byte" is a grouping of 8 "bits of information. Bytes contain code relating to certain texts and graphics which appear on the computer's CRT or LCD display.

The inner workings of a CRT





Data stored on diskettes is organized into "tracks" which are then organized into specific sectors

Documentation - a set of verbal instructions either in book, CD ROM or video format that accompanies software and explains their application to primary users. Today most documentation issued for software is in electronic form and sometimes is referred to as Edocs.

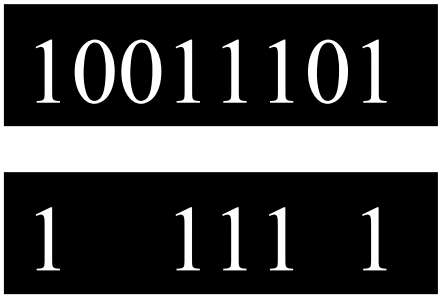
Download - to take data from one computer and transfer it to another. Often this refers to the transfer of information from larger network systems to individual computers.

Dynamic range - The range or number of colors or gray values which may be included in an image. An 8 bit image has the potential for 2^8 or 256 individually identifiable colors (or shades of gray). A 24 bit image may contain as many as 16 million colors or shades of gray.

EPS - acronym for the *Encapsulated Postscript* file format, a popular image file format for vector graphics in particular. If used in conjunction with a raster graphics program, this file format may require translation.

A sample of the icon seen for a file formatted in JPEG.

File compression - A process wherein unneeded data is removed from a file to reduce its overall size and storage requirements (i.e. information on the location of white areas in a recorded text document is not necessary - only the location of dark). Compressed files are decompressed before use in their intended software applications.



A compressed file removes unnecessary information (data) to reduce the required storage space

File format - a designated structure for data which allows more universal access. Many standard file formats exist for storing

graphical images electronically. Among the most recognized today are PICT, EPS, TIFF, GIF, JPEG. The latter two are particularly popular in Internet applications. Specific file formats also exist for sound/music (Enigma Transportable File and MIDI Sequencer File) and text based information. These formats are often tied to the software being employed so that Word, WordPerfect and others are common text file names. See also Text only file.

The various file formats have distinctive icons which allow them to be easily identified. Often the icons extension consaiasts of an acronym for the full name of that format

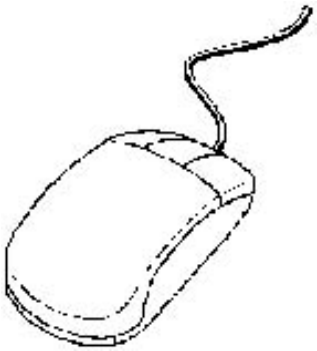
GIF - acronym for *Graphic Image File* format. This format was developed in the early days of the Internet by CompuServe and continues in great popularity today.

Graphics tablet - a small flat drawing surface with a connected pen-like device (stylus). Graphics tablets are used to input design/visual material into the computer by simulating a pen or pencil tool for the user.

Hard Drive - a data storage device built into the computer upon which most applications and data are stored. HD's exist in two versions
1). *HDD* the traditional magnetic storage version.Essentially a storage device constructed of numerous disks stacked vertically like a cake. Unlike traditional floppy disks whose material is pliable, hard disks were of metallic construction and therefore rigid - thus the name Hard Drive. Storage capacities vary and are usually represented in megabytes or, more recently, in gigabytes (10^9 or one billion bytes) and terrabytes (10^{12} or one trillion bytes)
(2). *SDD* (solid state drive) the more recent style of data storage device in which data is stored on interconnected flash-memory chips that retain the data even when there's no power flowing through the device. Most newer computers and external hard drives currently emplo SSD technology

A hard disk often contains several recording disks which are stacked one above the other. A reading arm (like the armature on a record player) slides between these to read data off their surfaces as well as to store it.

HTML - acronym for *Hypertext Markup Language*. A mark-up language for identifying, creating and linking documents which are used on the Internet.



The mouse is so widely used today that it is virtually a symbol for computing.

Input device - any component/peripheral which allows information/data to be imported into the computer. See also Scanner, Graphics tablet, Keyboard, Digitizer, Mouse and Joystick.

JPEG - acronym for *Joint Photographic Experts Group,* a file format recognized by the ISO (International Standards Organization). This file format allows for image compression to reduce the amount of memory required for storage and transfer. It is very popular in Internet applications.

The JPEG file format is widely known and frequently used in internet

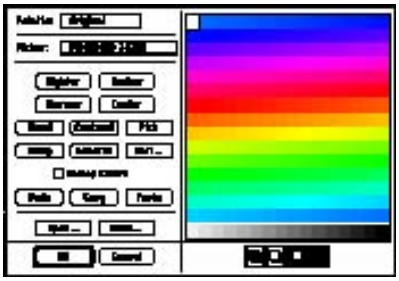
Although primarily associated with game playing – the joystick is a versatile input device now used in medicine and other technological environments.

Joystick - a small input device with a control handle. Much like the mouse in its use of potentiometers or other electronic techniques to permit interaction with a graphical interface and often used in conjunction with a keyboard.

Keyboard - a set of keys, as seen on traditional typewriters, which is used to enter alphanumeric data into the computer and to provide instruction through additional keys.

Mouse - a small input device employing a rolling ball and potentiometers to permit interaction with a graphical interface and often used in conjunction with a keyboard. Track balls and track pads performed similar functions.

Multimedia - a nonspecific term generally referring to a presentation environment in which computers and other modern presentations technologies (CDs, VCRs, laser discs, camcorders, stereo sound amplifiers, et al) are integrally linked for audio-visual presentations.



For color selection and modification image editors offer varying palette designs. This one from Pixel Paint reveals some common components.

Operating system - a series of software instructions which command the overall operation of the computer and provide compatible operation with various components of the computer and related peripherals.

Palette - a designated set of colors often connected to a particular image or predefined by a software program.

Parallel bus (or cable) - a computer circuit which carries bits of data in simultaneous/parallel fashion along several parallel lines. In other words, eight bits might travel simultaneously along an 8 bit bus or cable. Parallel transfer of data is especially useful within and close to the computer where anomalies and noise are not major concerns.

There are a variety of versions of the icon for the PICT format file. Here are two of the many you may encounter.

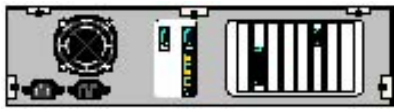
Peripheral Devices - Hardware components which are externally connected to the computer and are not part of the computers intrinsic hardware design. (i.e. scanner, zip drive, printer, etc.)

PICT - a contraction from Picture file. This file format, most popular with mac systems, is widely used a very popular image file format. Because of its popularity it is very useful in transfer situations where files need to be used in various applications or under different operating systems.

Pixel - A Picture Element, the basic unit which makes up the image on a computer monitor/screen. Pixels are similar to the various dot elements which form the basis of picture images in newspapers and magazines.

PIXELs are the small units which combine to create a graphic image on the computer's monitor.

Port - a point for mechanical entry or exit for data coming into or going out of the computer. Ports and cables are necessary to connect the computer to various peripherals and support machinery. Ports often required specialized cables to handle the exporting or importing of data.



Ports allow input and output of data to the computer. Ports generally are connected by cables and traditionally were located on the backs of computers.

Printer - a device for translating electronic data of the computer into graphical output (sometimes known as "hard copy"). There are four primary types of printers common today:

a. Impact printers - strike a ribbon to produce output. Dot-matrix printers exemplify this mode of printing. This was the common design for most early printers.

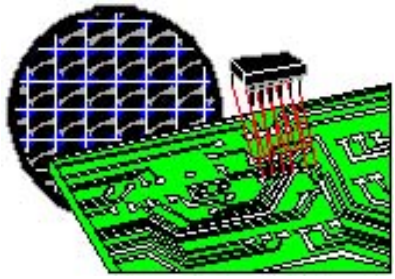
b. Ink jet printers - use very small and fine deposits of ink which have been sprayed onto the printing surface. This mode of printing is both economical and reasonably high in quality.

c. Laser printing - an electrostatic printing process akin to that of copy machines wherein a special statically charged toner is transferred to paper as the result of a charge placed on the paper by the printer. For ordinary output this is high level and now affords very sophisti cated color results as well.

d. Phototypeset - the highest quality output where data is transferred through a photographic process to become a fixed image.

LASER PRINTERS are among the most popular of output devices. They provide excellent resolution at low cost.

RAM - acronym for *Random Access Memory*, a format for temporary data storage within the computer wherein electronic signals (bits/bytes) are stored upon small chips connected to the computers circuitry. This stored data may be modified/added to or deleted by the computer user. Data stored in RAM does not remain after the computer is turned off. (sometimes referred to as "dynamic memory"). The amount of RAM in a computer is usually expressed in megabytes (as in 64megs of RAM).



Ram is stored on special chips in the computer. The amount of data storage capacity on these chips is generally rated in Megabytes or Gigabytes.

A scanner translates 2-D artwork into digital form. This digital artwork may then be stored and manipulated within the computer

A "bus" transfers data within the computer. A cable generally transfers data from or to the computer and its peripherals.

Because software is frequently updated it is often given a "version number". These numbers help to identify your software when upgrading, seeking assistance, etc.

A "vector graphic' is an image stored as a series of lines and curves rather than as graphed points as in a raster graphic.

Raster graphics (see also bit-mapped graphics) - a graphic image displayed by the computer as a series of contiguous dots or "pixels" on the video screen. In bit-mapped images each pixel is individually identifiable in the computer's memory.

ROM - acronym for *Read Only Memory*, a format for permanent data storage within the computer. This information remains in the circuitry of the computer even after the machine is turned off. Sometimes referred to as "static memory".

Scanner - a mechanical device which reads (scans) two-dimensional graphics and translates them into a format recognizable to the computer. Scanners employ three formats drum, wand and flatbed.

Serial bus (or cable) - a computer circuit which carries bits of data in sequential fashion. In other words one bit follows another along the circuit. Serial transfer of data is especially useful for great distances where anomalies and noise might scramble a signal.

Software Version - These are usually designated by a numerical sequence, the larger numbers being more recent. For example Claris Works version 4.0, or Adobe Illustrator Version 6.5, etc.

Text only file format - A standard text file format which is not specific to any particular software application and is therefore useful in transferring between various word-processing applications and page layout programs. Generally these files contain little if any formatting information and thus can be easily imported in various applications.

TIFF - acronym for *Tagged Image/Interchange File Format,* a very popular image file format. This format often provides a more precise record of information but also requires much more storage space than simpler file formats or compressed file formats.

Vector graphics (also called object graphics) - a graphic image displayed by the computer as a series of mathematical points. Information about such a graphic is stored as a formula representing various lines and curves.

GLOSSARY SUPPLEMENT:

CMYK Color (see also COLOR MODE) - A system for generating color used primarily in the print field (magazines, posters, etc.) in which the desired image color are created by combining small dots of four specific colors. The four colors used in this system are **C**yan, **Y**ellow, **M**agenta and **B**lack - thus the acronym.

Compression - a means for reducing the quantity of data required to store an image or any other file type. Generally compression employs some formula for determining what information is essential for recreating the original file. Some compression formulas actually permanently discard original data for an image and are known as "lossy." Other compression formulas maintain the integrity of the original file's data and are referred to as "lossless."

Digital Video - The newer format for video recording and playback in which the video signal is stored and transmitted as a digital signal rather than as an analog signal. The availability of this new format of video has popularized the digital editing of video (sometimes referred to as "non-linear video editing.")

Filter - In graphics and image generation programs filters generally provide some means of manipulating selected areas of a given image. Most filter functions involve applying mathematical translations to the data contained in a specific image.

Noise - Any extraneous data which appears in a digital image as a result of scanning, file transfer or any other computer actions.

RGB Color (see also COLOR MODE) - A system for generating color used primarily in the video/electronic image field (television) in which the desired image color are created by combining small dots of three specific colors. The three colors used in this system are **R**ed, **G**reen and **B**lue.

Resolution - in a digital graphic image resolution is a description of the number of points of information (pixels) used in defining that image. The higher the resolution the more detailed the image and the less the likelihood of seeing aliasing or "jaggies" when the image is enlarged. Higher resolution image files require more storage space. In many graphics programs aliasing is minimized by transitional pixels set along the stairlike lines that create the "jaggies." This process of reducing the "jaggies" is referred to as "anti-aliasing."

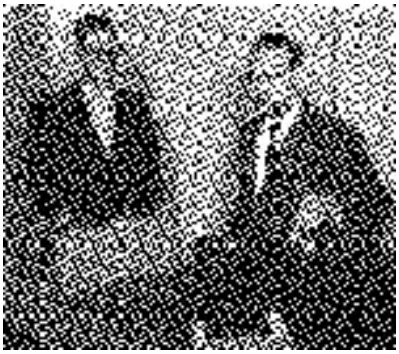
The edges in this image are pixilated, a quality common to low resolution images.

Digital video is stored as a series of 0's and 1's which simulate the electrical impulses encountered in ordinary analog video.

An unfiltered image prior to

Same image translated using th "twirl" filter in Adobe CS3.

Resolution is an expression of the level of detail and clarity in a printed or electronic image. The upper photograph was created at a resolution of 100 pixels per inch. The photo below it was created at 5 pixels per inch.



The upper print image was created at 50 dpi and the lower image at 15 dpi.

d.p.i. (dots per inch) - a popular means for describing printer resolution and the resolution of a digital image which has been printed on a paper surface. Printer resolution is often expressed as a vertical and horizontal resolution level (e.g. 600 X 600 dpi or 1440 X 720 dpi). Higher numbers express a capacity for greater clarity and detail in the resulting image.

Resolution and d.p.i. - These concepts are somewhat synonymous. Resolution is used more commonly when describing the electronic status of an image and is commonly expressed as pixels/inch. Here the resolution greatly affects file size, color clarity, etc. " d.p.i." is more commonly is used to describe the resolution of printed images as described above. Generally speaking it is advisable to have a much higher level of electronic resolution in an image in order for it to be used in a printed image (a factor of 1.5 to 2 is recommended). In other words if you wish to print an image at 50 d.p.i. it would be best if the digital image being employed would be at a resolution between 75 pixels/inch (50 X 1.5) or at most 100 pixels/inch (50 X 2).

USB Memory Stick - A popular form of static memory that is quickly replacing the older "disk" forms of static memory.
These devices have lso been referred to as "USB flash drives" and "USB memory device" to name but a few.

Non-linear editing - the manner in which most digital video editing is currently done. In the early days of video editing content was mostly assembled in sequence. One scene was added on to another. This is linear editing. In digital video an editor may move from section to section of a production inserting new content without on restriction. Because the editing no longer has to follow a linear sequence it is referred to as . . .

DVI - An acronym for "Digital Video Interface". A new standardized connector capable of handling both analog and digital data transmitted from a computer to a computer display. It is likely that this technology will replace the older VGA standard (Video Graphics Array) which was analog and introduced in the late 1980's.

ASCII code (American Standard Code for Information Interchange) - The international standard for defining certain numerical representations of letters and numbers on the computers keyboard.
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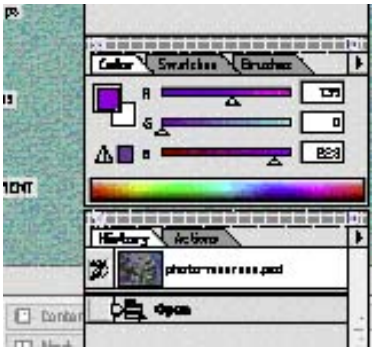
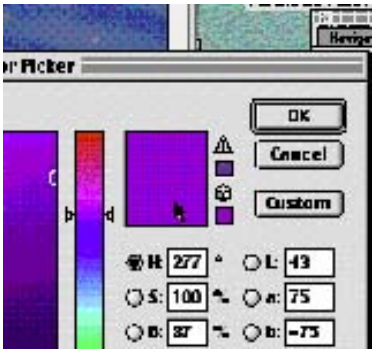
Gamut - Basically the gamut is the range of colors which can be presented by a particular visual imaging system. A computer monitor can present a certain portion of the visible spectrum of colors. Likewise, a color printer may also be capable of printing only a certain portion of the total spectrum of visible colors. The range of colors which is unique to each syetm is refewrred to as its “color gamut.”



Out-of-Gamut - When shifting from one system of color presentation to another it is common to discover that colors which were available in one are not in the other. If for instance you convert an image from the RGB color Gamut to the CYMK color gamut you frequently find that many of the colors available in RGB are not in CYMK. Those RGB colors which cannot be replicated in CYMK are refeerred to as “out-of-gamut.”

bps (bits per second) - a standard for the measurement of the speed with which data travels from one location to another. This may be used to describe the speed of a "modem" or internet transmission among others.

FTP ("file transfer protocol") - a common means for moving data (files) from one location to another over the internet. Thus the term may be used as a verb as well as a noun . . . I'll FTP that file to you tomorrow.



The out-of-gamut warning sign in the color window and the color picker is a small yellow triangle enclosing an exclamation point.

Gigabyte - 1000 Megabytes (1000 Mb).

RAW file - A proprietary file format commonly found in digital photography. A RAW file contains nearly all the data recorded by a camera's sensors. This data has not been compressed orspecially encrypted in any manner - thus the term RAW.

HEX Codes - also referred to as "hexadecimal color code". These codes are s a menas of categorizing colors (especially the standard 216 websafecolors) found on the web using the hexadecimal numbering system (base 16). Color mixers often use this code to describe colors. Hex code for white is: FF FF FF and black is: 00 00 00. A bright red for the web could be:FF 33 00 (although generally no space is placed between the characters in Hex code).

= FF FF FF

= 00 00 00

Render – To produce digital content in its final form, including transitions, lighting, etc. Rendering is often used in software environments where production is complex such as 3-D graphics.

Meta Data – Essential information about the content of a file often including information about the format, date of creation, creator, etc. of a given file.

AI artificial intelligence - the theoretical and mechanical development of computing systems that perform human tasks such as visual perception, speech recognition, decision-making, and translation between languages.
Note that there are varied and distinctive types of AI

Algorithm (a.k.a. formula) - An algorithm is a procedure used for solving a problem or performing a computation. Algorithms act as an exact list of instructions that conduct specified actions step by step in either hardware- or software-based routines. Algorithms are widely used throughout all areas of IT.

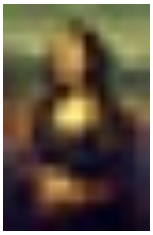
Drone - A remotely controlled aerial device most often associated with "quadcoptors" and widely used for aerial imaging and surveillance.

Filters - though commonly associated with Photoshop as a means of altering photographic images many software programs use filters (Audacity (sound filters), Illustrator (vector filters), etc.). Generally these filters employ some formula (algorithm) to restructure/modify the data in a given file.

Javascript - a programming language that adds interactivity to your website. This happens in games, in the behavior of responses when buttons are pressed or with data entry on forms; with dynamic styling; with animation, etc.

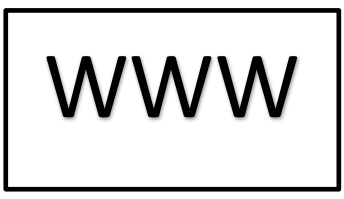
Metaverse - Metaverse is an integrated network of 3D virtual worlds where users have access to digital avatars that let them live in a digital world.

Multiverse - Multiverse is a hypothetical collection of identical or diverse universes with distinct traits and features.



NFT - Non-fungible tokens (NFTs) are assets that have been tokenized via a blockchain. They are assigned unique identification codes and metadata that distinguish them from other tokens.

Popular NFT sites https://opensea.io
https://www.kraken.com/
https://crypto.com



Web 3.0 - Web 1.0 was the first World Wide Web that took off in popularity through web browsers in the 1990s, and that Web 2.0 followed a decade later with the rise of mega platforms like Google and Facebook. Web 3.0 is a vision of the future of the internet where ownership and power are more widely distributed.

Type and Page Design

For the visual artist and communication designer the advent of the computer brings a wealth of new opportunities, chief among these is the level of technical capability which the computer puts into the hands of the user. As little as one decade ago many graphic and visual design functions required very specialized skills and talents. For example, many years ago it was a complex task to alter a photographic image for publication (a client might not like a spot on a model's skin, or the reflection off the surface of a car). To correct this required the specialized talents of a "photo retoucher" who could remove the spot or unwanted reflection by very carefully painting it out - and sometimes painting in new content.

Today, the jobs of the photo retoucher and many other talented graphics personnel such as keyliners, paste-up artists, typesetters, et al have been assumed by the computer. In our example, the computer expands the capabilities for photographic manipulation available to us today and puts those capabilities in the hands of many persons (remember those Bruno Mali shoes on O.J. ? Have any of you ever seen the Sean Connery film entitled Rising Sun where a tangled international incident is based partially upon photographs altered by the computer?). Today, using simple programs which are readily available it is reasonably easy to perform very sophisticated manipulation of electronic images. You will learn some this semester.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

The computer has expanded the range of capabilities for text designers.The two faces seen here, Comic Sans MS (above) and Curlz MT (below) exemplify this new trend.

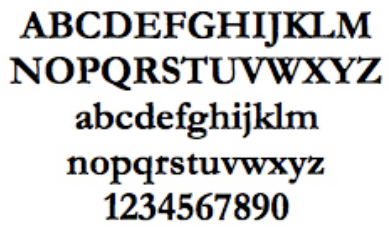
ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

Another primary gain to visual artists and communication designers which arises out of the computer's presence are the expanded capabilities it provides in conjunction with the design, use and presentation of text based material - or "type". In past years type was visual material which had to be set by hand from clumsy individual letters. Manipulating type, either by its size or its style, was a cumbersome process and very expensive. In our contemporary world the computer affords tremendous flexibility in the selection, placement, manipulation and nearly every other dimension of type usage. In order to enhance both your appreciation of the complexities of type design and usage it would be helpful to discuss some of the major issues surrounding type as it relates to the computer and visual design in general.

Typefaces, type families and typeraces

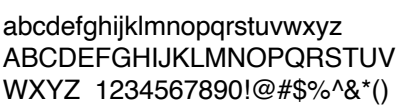
TYPEFACES

A **typeface** refers to a set of the alphabet's letters designed with a single stylistic intent. A particular typeface is generally identified by a name which designates either the location of the development or origin of the face - the Helvetica face is named for its origins in Switzerland (Helvetia), the name of the original designer - the Garamond face is named after Claude Garamond, the mood or intended effect - the Cosmic Normal typeface tries to give an outer space effect; and, lastly, after some publication - Times New Roman was designed especially for the Times (London) by designer Stanley Morison.



A specific typeface has a unique character throughout the design of each of its elements. Garramond, shown above is named after Claude Garramond

Within the application of letterforms for publication there are generally two categories. The first of these is **TEXT**, that is, letterforms up to 14 points in size (most text is between 8 and 12 points in size). The term "text" here means precisely that - letters that form the body copy of the printed, or published material. Type which is 14 points or larger in size is referred to as **DISPLAY**. This size type is generally reserved for headlines, titles, etc. In any situation in which emphasis is required, a display text may be required. Prior to the advent of the computer, text was created either by engraving or typesetting (assembling individual type elements) of the required text. These smaller letters were often cast in lead. The larger letters required for display type were more often carved from wood since individual metal stamps (letters) would have been enormously heavy and difficult to handle.

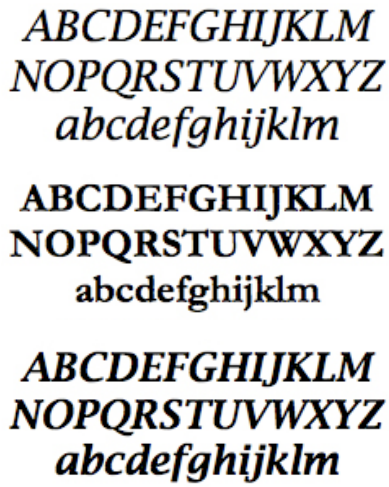


A sampling of 10 point Helvetica

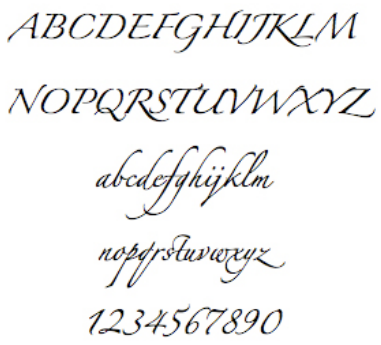
A sampling of 24 point Helvetica. Type faces at display size traditionally did not employ the broader range of style options – italics, bold, special characters and the like

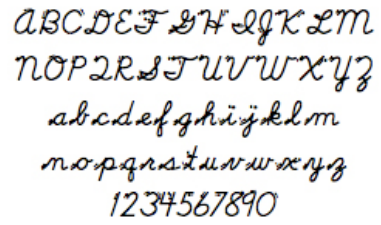
TYPE FAMILIES

Most display texts may be identified on the computer because of their singular state. In other words, they exist simply as a single face without any variation. Text faces, however, usually occur in groups to provide the variety needed to create clear and readable body copy. The italic form of each letter in a typeface is exemplary of this. Italic forms are not generally employed in display copy. Likewise, bold, demi-bold, expanded, condensed light and other versions of text faces exist largely to provide distinction between text elements. The grouping of variants which accompanies a typeface is known as a type family.

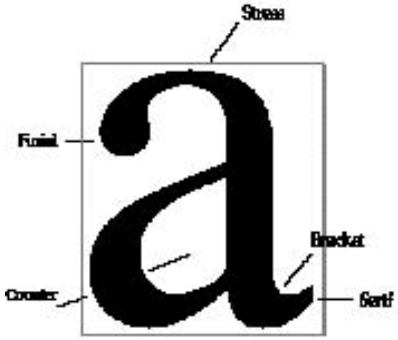


A type family affords a range of design variations within the same type family. Lucida Bright Italic, Lucida Bright DemiBold and Lucida Bright DemiBold Italic seen above are all in the Lucida Bright family.





Script faces often emulate cursive writing and have a characteristic elegance. The upper face illustrated here is Zapfino and the lower is Schoolhouse Cursive.



The Roman type race brought with it a significant number of innovations. This included the serif, bracket, stresses, etc.

The concept of typeraces bears some resemblance to that of the various human races, in that certain typefaces share a common ancestral history and are therefore viewed as related to each other. Like the various human races, typeraces reveal specific unifying characteristics. For instance, all Roman letters employ serifs of one form or another. The evolution of the various typefaces is historically significant but too long a topic to cover here. For the purposes of this guide we will discuss seven specific typeraces.

THE STORY OF TYPERACES:

Long before words were mechanically printed, all text had to be originally written or transcribed by hand. In most cultures certain conventions to the formation of letters were developed and creating documents was done by highly skilled individuals called scribes. Many of the texts which these individuals wrote or copied were quite elaborate and ornate in character. Perhaps some of the best known are those housed in the Library at Trinity University in Dublin. The 9th Century Book of Kells, Book of Durrow and others attest to the extraordinary cursive skills of their creators. The typefaces which eventually emerged from this tradition are known as **SCRIPT.**

Script faces naturally try to mimic the effect of handwritten letters and are very popular for their ability to convey a personal touch as well as, in many instances of their application, a sense of elegance and flare. With moveable type a true script effect was not always easy to accomplish because in cursive writing the letters do not connect at the same points in all situations. With the advent of the computer, however, the cursive effect is more manageable and script faces continue to be popular options in text design today. There are very many individual typefaces of the script character. Among these are Zapf Chancery, Piranesi, Park Avenue, et al.

The universal alphabet consisting of the Roman letters A, B, C . . . was developed largely by the Romans several centuries before the birth of Christ. The original letter forms (typefaces) from which they derived were all upper case (their lower case complements appear to have been added in the early middle ages) and appeared most notably on monuments throughout the Roman Empire. Some of the notable features of these typefaces are the strong linear elements which vary in thickness (these variations are known

as stress). More notably, the Romans introduced the "serif", a cross stroke that appeared on the end of certain elements in a given letter. They also contributed the "bracket", a transitional element between the serif and the main strokes of a letter. Finally, the Romans introduced the concept of the rectilinear basis for the letterform. This is the idea that each letter is bounded by an imaginary rectangle/square, which produced an effect of great regularity and order. The many typefaces containing these essential attributes are therefore referred to as **ROMAN**.

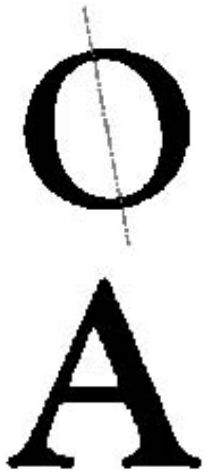
Roman typefaces are said to be austere and authoritative while also being dignified and harmonious. In this way they cover a great deal of territory and are remarkably flexible. Within the Roman typefaces, there are actually subcategories of typefaces. Among these are the two primary faces known as “old style” and “new style”. The old style fonts in roman face were identified by their oblique stresses, the presence of brackets between their serifs and strokes and lastly a limited level of contrast between the strokes of the letters overall. Some examples of these characteristics are seen in the typefaces known as Garamond, Caslon and Goudy.

Later, under the influence of other designers, especially the French, the new style Roman faces acquired sharper bracketing of serifs and more contrast between the lines/strokes overall. This new style was felt to be more elegant and formal relative to its earlier predecessor. Some examples of these characteristics are seen in the typefaces known as Bodoni and others. In more recent times, the Roman letter has become somewhat transitional - absorbing components from both of the preceding traditions - and has eventually evolved into a third style which is referred to as a “transitional style." In these transitional style faces, aspects of both preceding traditions are mixed to the taste of the designer. Thus a letter may have vertical stresses but very pronounced bracketing and very little contrast.

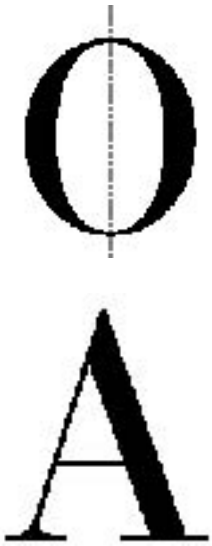
The tradition of the scribe, which was being discussed earlier, continued all the way into the late middle ages, where it is best symbolized by the monastic scribe working tirelessly in a small cubicle of space. These scribes continued to refine the traditions begun with Roman typefaces. This construct for the production of text was radically redefined by the invention of movable type and the introduction of the printing press. Suddenly, text documents were no longer

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm

Palatino is a Roman style face which exhibits many of the traditional attributes of this typerace.



In Goudy Old Style brackets are distinctive as are the oblique stresses. These letters have less stress contrast as is common in “Old Style” roman type design.



In Bauer Bodoni bracketing has nearly disappeared as have oblique stresses – but contrast is greater in the “New Style” Roman.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

Blackmoor LET and (below it) Lucida Blackletter are both exemplary of the blackletter typerace. Blackletter faces have a romantic and traditional character.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

The square serif is amongst the most predictable characteristics of those typefaces included in the Egyptian typerace. The typeface Playbill (above) and Rockwell Extra Bold (below it) exemplify these traits.

individual creative endeavors. They were now mechanically replicated copies. The concept of the "original" was a thing of the past. Nevertheless, the invention of movable type, like the invention of the computer, saw the creation of whole new skills and occupations. Chief among these was the type designer. Initially using wood and later lead, these designers chiseled out their letters by hand and later cast them in molds. Whichever process they chose, it was costly and laborious. In the early days of moveable type those typefaces most in favor were derived from various forms of script or calligraphy variously known as Gothic, **BLACKLETTER** and Old English.

The blackletter style of typeface is perhaps best known for its compactness. The strokes of the letters themselves are very tightly compacted giving the letters a very dense and dark tone overall when they appear in combination with one another. The blackletter faces put greater emphasis on their vertical than on their horizontal strokes. The letterforms characterizing these faces are often associated with a medieval setting, and although still in use, are relatively limited in number. Among some current day examples of these faces are Cloister Black, Engraver's Old English, Fette Fraktur and others.

Roman and blackletter typefaces were very prevalent from the time of the invention of moveable type until the early 19th Century. In the 18th Century, the work of various archeologists and historians had generated considerable interest in both foreign and ancient cultures throughout the world. Chief among these at the time was the ancient culture of Egypt. The interest in things Egyptian included various forms of hieroglyphics, the discovery of the Rosetta stone, and other forms of written communication. In mimicking some of the stylistic features found in the writing of this early culture, typeface designers created a new form of letter, traditionally identified by its radical square serifs. These typefaces were collectively known as **EGYPTIAN.**

The Egyptian typeface is best known for its prevalent use in display signs, posters and the like. When we first encounter this type of face it is associated with circus and wanted posters. Some designers today connect it to the southwestern portions of the United States because of its strong association with the wanted poster. The square serifs themselves generally include no bracketing and depending on the typeface under discussion may have very

strongly accented serifs. Some examples of these faces include Egyptian, Gold Rush, Lubalin Graph, Playbill, Posse, and Princetown, among others.

Interestingly, some writers associate the development of Egyptians typefaces with the eventual development of the very modern style typefaces known as **SANS SERIF.** Letters without serifs were also popular in ancient cultures and had periodically been explored as alternatives to the blackletter and Roman typefaces. It was not until the twentieth century, however, that these faces' popularity truly came into its own. Some of this popularity is certainly due to the modernist movement in contemporary culture. To younger designers and artists the Sans Serif letter form seemed a distinct break with the past.

Sans Serif faces have a very clean and unencumbered appearance. Without the serif they can at times be less legible and this has led to some differences over theory on their application in text and display applications. The Sans Serif faces were extremely popular at the Bauhaus - a very influential design and art center in Germany in the early years of the Twentieth Century . Their repeated use by teachers and later by their students also accounts, in part, for the rapid rise in popularity of the Sans Serif typefaces. Because Sans Serif typefaces continue to be extremely popular today there are numerous examples around us. Helvetica, Geneva, Univers, Futura and many other faces populate the san-serif universe.

A far less structured set of faces are those created for special applications or to communicate a very specific mood or association on the part of the reader. With the advent of computer type design more faces of this order appear every year. There are typefaces which convey the horror of Halloween, typefaces which proclaim their origins in the design of electronic circuitry and still others which mimic the special symbolic coding used in modern day banking. These faces generally share very little in common and are collectively referred to as **SPECIALTY FACES**. Eklektik, Kids and Orbit Normal are but a few examples of the many faces evolving in this arena.

PI FACES are not comprised of traditional alphabet letters as are most other type faces. Instead, they are constituted of commonly used symbols and markings which are frequently used in printed text.

ABCDEFGHI
JKLMNopqrst
uvwxyz

Sans serif faces are extremely popular in contemporary page design. The typeface seen here is known as "Helvetica" and it exemplifies many of the qualities commonly associated with this typerace.

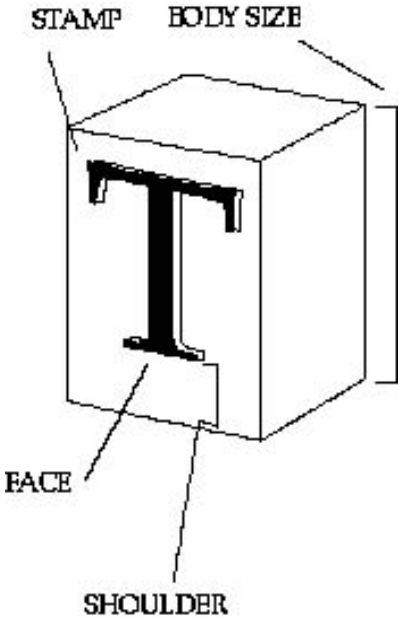
ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

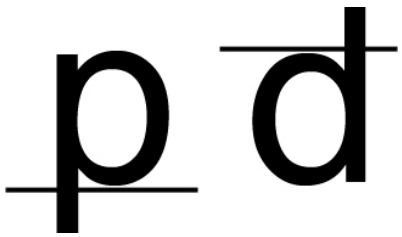
Specialty faces like "Cracked" (above) and "Curlz" (below) are often designed to convey a specific mood or association to the reader.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
1234567890

Pi faces are comprised of symbols rather than letters as seen in this example of Zapf Dingbats.

1”= 72 points





Ascenders and descenders characterize lower case letters and enhance readability.

ADDITIONAL TERMINOLOGY

The use of type and typefaces involves a very specific jargon with a lengthy list of terms. In order to comprehend the literature on these topics and to apply them in conjunction with computers, page design, etc. it is necessary to be familiar with a core segment of this terminology. It is important to note that many of the terms used in modern day type talk relate to the physical properties of moveable type. For this reason, the terms may require explanation based upon this. The following terms are basic and are essential to discourse on type.

POINTS/PICAS - a traditional means of measurement employed in typesetting and page design. There are 72 points in an inch and 6 picas to an inch (or 12 points in each pica). This terminology is used almost universally in computers to define type size, scaling and all other measurement of type.

Point size (body size) - the actual height of the metal form on which the typeface rests. Just because a typeface is listed as 72 points does not mean that its capital “T” will be one inch high. It does mean that the body of the actual type element will be 1 inch in height.

Face - in older lead type the face was the actual surface on which the ink was rolled before being printed to paper. Today face (or typeface) most often refers to a particular alphabet design.

Stamp - in older, moveable style type this was the portion of the type block or body which was below the inking surface but still on the top side of the type block.

Shoulder - a concept relevant to older moveable wooden and lead type. This was the distance from the bottom of the face to the bottom of the stamp and has considerable impact on leading.

Upper case/Lower case - referring to capital and non-capital letters from the alphabet.

Descender - the portion of a lower case letter which extends below the base line (or x-height) of a typeface.

Ascender - the portion of a lower case letter which extends above the x-height of a given typeface.

Serif - a crosstroke on a letter form

Bracket - a small transitional area between the stroke and crosstroke of a letter which generally serves to ease and soften the meeting of the two strokes.

Finial - a small circular ending to a letter stroke. Most often found on the various ascender and descender portions of a letter.

Baseline - An imaginary line which denotes the base of all letters in the typeface.

Counter - the opening inside a letter form (i.e. the circular opening in the letter “o”).

X-height - the height of the letter x and many portions of the lower case letters in a particular typeface.

Cap-height - the height of capital letters. This is also referred to as the key size.

Leading - originally thin bars of lead were placed between lines of type to separate them. Today the space between lines of type is referred to as leading in recognition of this. Typefaces with larger x-heights normally need more leading. There are three common means for measuring the distance between lines of type:

1. Top of stamp leading - measures it from the top of the stamp to the bottom of the leading beneath the stamp.

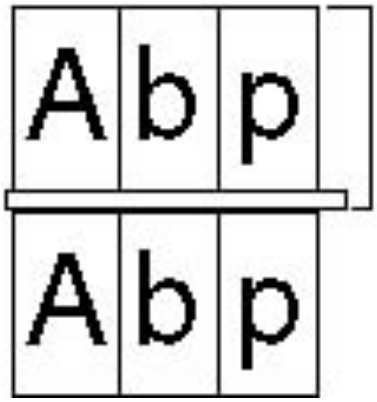
2. Baseline leading - measures the distance between the baselines of two lines of type.

3. Proportional leading - relies on a formula to determine the proportion of distance from the top of the stamp to the baseline. Whatever this proportion is, the remaining portion is from the baseline to the bottom of the leading for that line. This type of leading is commonly used in page layout software such as Quark.

Alignment - in text this refers to the positioning of lines relative to one another. There are generally three means of alignment offered by computer programs.

The baseline determines the theoretical bottom of the typeface.

The x-height determines the size of the central portions of the lower case letters. In some typefaces it is much larger than in others.



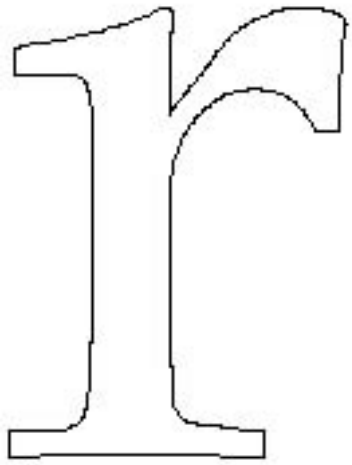
Top of stamp leading measures the leading as the distance from the top of the stamp to the top of the stamp below it. If the stamp is 10 points and the lead shim between the stamps is 2 points then the total leading is said to be 12 points using this method of calculation.

APPLY

APPLY

The text in the uppermost row above reveals large spaces between letters. This spacing is exaggerated by the shape of the letters "A" and "Y". To correct for this text is KERNED. When the text is kerned this problem is alleviated as seen above.

Bitmapped font



Outlined font

1. left alignment - the left end of all sentences fall into alignment.

2. right alignment - the right end of all sentences fall into alignment.

3. justified - text is set so that both ends of all sentences are aligned with all others.

Kerning - the process of spacing letters so as to take account of their unique shape and optimize their legibility.

FONT FORMATS

Type composition has changed dramatically in the last twenty years. Although the old moveable lead type still exists and is actually used for various applications it has now been supplanted by electronic typesetting. In electronic typesetting the form of the font being used is very important for determining various aspects of application. For computer usage fonts generally come in one of two forms.

Bitmapped Font - these fonts are defined by the location of points on the display screen as in a raster graphics image. Bitmapped fonts are distinctive in that there is a descriptive code for each face at a given size. In other words the computer has a record for the proportional relationship of pixels for each distinct size of a given typeface - for instance 10 pt, 12 pt. and 18 pt. Bitmapped fonts are generally identifiable by the icon for the file in which they are stored. A bitmapped font file icon displays a single capital letter "A". Below the icon, the name of the font and its size appear.

Bitmapped fonts are important since they are the primary screen display typefaces for your computer. Because they are configured at a particular size bitmapped fonts can be displayed very quickly. For printing however bitmapped fonts are slow and cumbersome. They can be scaled to accommodate changes in size but this is a very time consuming process.

Outlined Font (also called True Type and Scalable) - fonts in this form exist in memory as a mathematical model of the outline of the letter. Larger or smaller versions of the typeface are simply created by having the computer mathematically scale-up or size down the original font formula.

This is very important because it provides maximum flexibility.

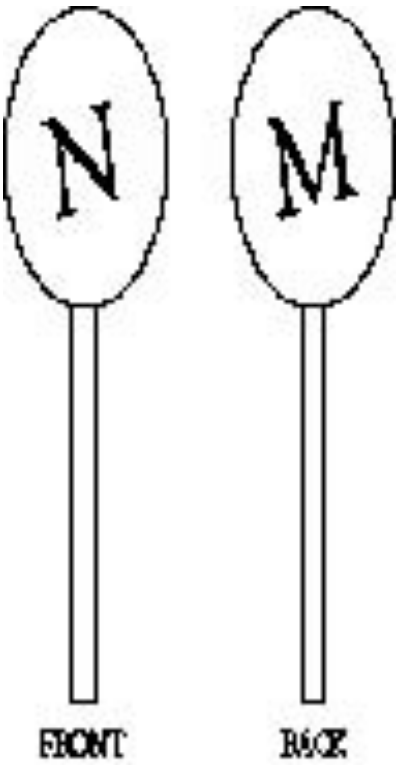
Postscript Fonts - Postscript is an industry-wide page description language, used for creating high quality print output. Postscript fonts actually consist of two fonts, the actual postscript font and an accompanying bitmapped font, when they are installed in the computer. The bitmapped font is used normally and is particularly important for screen display. The mathematical descriptions in the accompanying postscript font come into play when the font is used in printing applications.

Some notes on film and animation

Film and video are two powerful "New Media". Both film and video manipulate time and space in a manner unlike any other traditional art medium.

If photography is the fundamental new medium from which all other new media succeeded, then the cinema or film is certainly a close second. The idea of presenting moving images is as old as the art of the theater - yet the concept of a mechanically recorded image in motion was wholly novel when it was introduced in the late 19th century. The thought of projecting these images to large audiences (something which had been done in some Southeast Asian forms of puppet theater) was another step beyond any known tradition in the art world.

Just as important to the developing art of cinema as the mechanical principles for the creation of the motion picture was the growing knowledge of human perception and its role in permitting static images to move. Here the primary principle is known as "persistence of Vision," a principle of human perception widely known in the 19th Century and eventually written about in a learned manner by Peter Roget (the author of the Thesaurus).



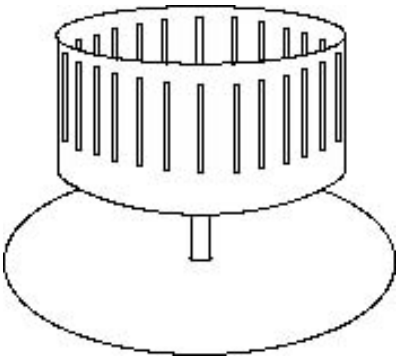
The thaumotrope shown above was rotated to alternate images before the eye. If the device was rotated quickly enough the two images appeared to fuse - or become one

Roget, like many of his contemporaries, experimented and played with a number of novelties and toys which demonstrated the principle of persistence of vision. The earliest of these toys was the Thaumotrope (c. 1826) - a circular card mounted on a string or stick with pictures on either side of the card. If the stick was rotated quickly the eye was presented with alternating images which appeared to fuse. Shortly after this, in the early 1830's, came the Phenakistoscope - another circular disk spun in front of a mirror. You

looked through slots in the spinning card to see images in the mirror. In the 1860's came the Zoetrope - a circular bowl-like device into which a strip of drawings was placed. The sides of this bowl had slits and it was spun rapidly so that when viewing through the slits, separate frames of the drawing were viewed in succession. A mirror-like version of this, known as a praxinoscope, was produced by the Frenchman Emile Reynaud - one of the earliest animators.

It is interesting to note historically that before humankind made the photograph move (and created the art of cinema), they were able to make the drawn image move. The drawn image(as well as the photographic) in motion is the basis for the art of **animation**. Since it's inception, and throughout most of the contemporary history of cinema, animation was thought to be solely a form of entertainment and was often affiliated with the cartoon. Yet today, animation is gaining new adherents and much greater respect both in the fine and commercial arts. With the

advent of animation on the computer the medium has truly come of age. Recent popular films such as Jurrasic Park, Dante's Peak, Terminator and a host of others have demonstrated the incredible expressive range that computer animation brings to the new medium of animation.



The Zoetrope employed a strip of paper on which sequenced drawings appeared. This strip, when placed inside the drum and rotated, created a very life-like animated experience. The image was viewed through the slits in the drum.

Animation has undergone a revival in the advertising arena of late. Much of this is due to its great measures of economy when compared to traditional film production as well as some issues surrounding artistic rights. Of particular importance in this regard is the primary role which animation plays in multimedia production. The principles of animation are the foundation of much of the work designed for multi-media presentation. Increasingly, artists and marketers are turning to interactive, multi-media CD-ROMs to express ideas and to promote products. Through new, sophisticated software and hardware, these CD-ROM programs offer a range of dynamic and interactive effects. In one case, the publisher of Communication Arts, a well respected design publication, has begun publishing an Annual of Interactive Design on CD-ROM, featuring the best work being done with interactive CD-ROM materials and other forms of interactive computer design. Much of this design work centers on animated effects brought top life on the computer screen.

In order to better understand what issues are currently being explored in the broader realms of animation it will be necessary to acquire some command of the concepts and terminology commonly used in this new medium.

Glossary of Animation and related terms

Animation - the act of giving life to otherwise static objects or images. Animation relies on the principle of persistence of vision, that the eye may only perceive a fixed number of individual images (generally no more than 12-15) over the duration of one second. More images than this begin to "fuse" or blend together and the result is a perceptual sense of continuity between the images (this effect is also known as CFF - critical flicker fusion).

Virtual reality and other interactive video technologies continue to expand the potential market for electronic imagery.

There are a great variety of forms of animation generally classified by the primary tools or materials employed in creating the various elements that make up the animated image. Included among these are computer animation, cell animation, claymation, rotoscoping, direct draw, collage, and others.

Cut - a point in an animation or a film when the entire scene or frame's content changes. For instance, a cut might involve changing the shot from an image of a robber to a close-up of the gun he/she is holding

In a "Fade-out" shot the frames of the film are progressively darkened as seen above. The reverse effect is known as a "Fade-in".

Aspect Ratio – The shape of a film or video image expressed as width to height. A 4:3 is considered "standard aspect ratio" and a 16:9 is considered "widescreen aspect ratio"

Dissolve - A transitional shot in which one frame literally dissolves into another. Very popular in computer animated imagery because of the unique capabilities which the computer brings to this type of shot.

Fade - in an animated or photographic filmwork a fade is a series of frames in which the image gets progressively darker and eventually turns black. This may be used to end a film or simply a single scene.

Freeze Frame – When a particular frame of video is held on the screen to stop motion in the film or video production.

F.P.S. (frames per second) - refers to the rate at which camera films are recorded or animated and camera films are played back. Sound films and animations were traditionally projected at 24 F.P.S. and silent animations and films at 18 F.P.S.

Key frame – A critical frame in the continuum of an animation sequence. Very often major changes in the nature of screen content occur at the key frames and tweening often occurs between them.

Limited animation - in this concept the quantity of motion in an animated image is limited to a very few elements of the image. By limiting the number of moving elements it is possible to reduce production time and costs.

Mapping - in computer animation this is a form of programmed image manipulation wherein two dimensional texture patterns or photographic images may be connected to a three-dimensional form generated by the computer.

Morphing - the transformation of of visual forms (shapes or objects) in an animation from one distinct form to another distinct form.

Motion graphics - The use of time and movement in visual content that would otherwise be static (i.e. animated graphic design)

MPEG – Video file format (codec) developed by the "Moving Pictures Expert Group."

MOV - A proprietary video file format (codec) developed by Apple and commonly used in the MAC OS environmnet.

Pop-ons - animated objects which appear quickly and seemingly from nowhere, often denoting certain mental processes or thoughts. A standard example of this is the ubiquitous light bulb which may pop-on over someone's head to denote that they have an important thought.

Scrub – To run the playback head over the timeline to check the results of an edit.

Tweening - in computer animation, this is a form of programmed image manipulation in which the computer calculates the varying positions or "frames" between two static states of an image. By calculating and drawing these frames, a great deal of hand work is eliminated from the animation process.

Ray tracing - in computer animation this is a form of programmed image manipulation in which reflected surfaces are given lifelike, and varying reflections, by mathematically simulating the changing reflections brought about by changing environments. It is termed ray tracing after the optical terminology which led to its development.

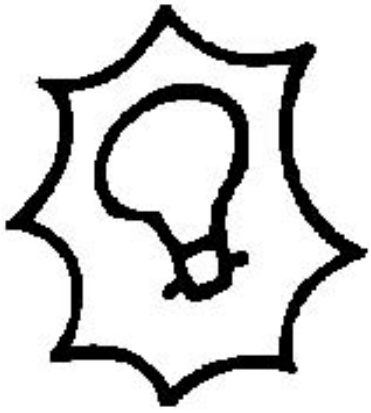
Shot angle (framing) - there are many terms for this. In respect to distance is the frame revealing a 1). close-up 2). mid-shot 3). long shot. In respect to angle of view is the frame revealing 1). a view from above 2). a straight-on view 3). a view from below.

Slow motion effect - this effect is achieved by increasing the number of frames recorded of a certain event than would be normally required. When projected at a normal speed the extra number of frames takes longer to project giving the sense of a slowed event.

Storyboard – A series of sketches used to provide a preliminary description of a time-based work.

Wipe - when a new scene appearing in the image covers (or wipes) over the existing image.

Zoom (in or out) - a series of frames in an animated image which bring the viewer closer to the subject (Zoom in) or



Pop-ons, such as the light bulb shown above, often denote certain mental processes or mental states. The balloon is often employed to frame the "pop-on" and this balloon may also incorporate expressive content.

A sample storyboard with prototypical cells.

Animation types - There are several very distinctive types of animated imagery available to the animation artist, among these are the following:

Rotoscoping – An approach to animation in which images from photographs or existing drawings are traced into individual frames for the animation. This technique is widely used in advertising and other animation production.

Stop-Motion (or stop-frame) – An animation technique in which actual objects are moved slow amounts for each recorded frame. This may employ live subjects or inanimate subjects. This technique has been employed in feature-length animated films such as Tim Burton's 1993 film The Nightmare Before Christmas,

Claymation - A popular subset of stop motion animation in which the objects which are modified for recording are all made of clay materials. Claymation dates back to the earliest animation works of the Edison film studios and was popularized culturally in the United States during the 1950's with the Art Clokey series Gumby.

Cel Animation - The traditional method of animation often associated with early cartoons and Disney feature length films such as Snow White, et al. In this approach to animation wherein each element is drawn as a single cell. The animated image is then produced by the combination of these images presented together. Some forms of cel animation employ elaborate painted backgrounds with foreground content being created on transparent film frames which are laid over the background to record the individual animated frames.

Computer animation – An extension of cel animation technique in which the imagery is generated and processed digitaly.

2D Animation – A broad category of varied animation techniques that generate animation content in two dimensions.

3D Animation – A sophisticated methodology for digitally animating content with apparent dimensionality.

Collage animation – Another subset of stop motion animation in which cut out photographs, drawings, etc. are recorded to create an animated sequence events.

Holography

Holography is perhaps the least understood of all the new media. Because the conditions required for its viewing are relatively stringent it is less accessible to some audiences. Nevertheless, it is a powerful medium which prefigures many concepts and issues facing contemporary art and artists. The unique capabilities of this medium give a singularly symbolic essence. For many it represents aspirtations for the future and is synonymous with the future.

Despite its predictive nature, the medium of holography is very much grounded in the here and now. In order to understand more about it, we should learn a bit about the early history of the medium and something of its technical parameters. Understanding this will improve competence in both understanding this medium as well as working with it.

HOLOGRAPHY - A BRIEF HISTORY

The primary theoretical foundations of holography were first developed and proposed in 1947 by a Hungarian physicist, then working in England, Dr. Dennis Gabor. His discovery was an outgrowth of his research into means of improving the resolving power of electron microscopes. Although Gabor was able to create holograms by applying his theory, and eventually received a Nobel Prize in physics for his research in 1971, the early images which he constructed were crude and difficult to view because he lacked an appropriate coherent light source for creating them.

Dr. Dennis Gabor discussing his discovery. Note that the diagram shown reflects Gabor's initial interest in the subject of electron microscopy.

In the early 1960's, Emmett Leith and Juris Upatnieks, two researchers at the University of Michigan in Ann Arbor, combined Gabor's theory of holography with the coherent light produced by the recently developed LASER. By means

of a special recording technique known as off-axis holography, which they devised, Leith and Upatnieks were able to create images of great clarity with an amazing degree of visual depth. From their initial research, the various applications of holography, including its use by artists, engineers, advertisers, the military, medical community, etc. have spread to many sectors of our society.

Emmett Leith (right) and Juris Upatnieks (left) in the early 1960's displaying some of the key components of their off-axis arrangement for holographic recording.

Most holographic images, although exciting to see, were very costly to create and to view because they required expensive lasers for both these tasks. In the later 1960's several advances changed this situation markedly. In 1968 Dr. Stephen Benton of the Polaroid Corporation created the technique of white-light transmission holography. At approximately the same time, Lloyd Cross and others working at the University of Michigan developed a hybrid form of hologram made from motion pictures and known as the integral or multiplex hologram. In the Soviet Union, Y.N. Denysiuk had developed the reflection mode of holography in 1962 and research continued into its application.

The advantage common to each of the advances described above was that the holograms created by them did not require a costly LASER for viewing. Rather, these new types of holograms could be viewed (reconstructed) with white-light. The availability of holograms viewable in white-light led, in turn, to an increased interest in and broader range of uses for holography. From the 1970's until the 1980's holography was increasingly popular with public audiences.

"Transponder" , a permanent holographic art installation by the author created for the Durham Science Center at the University of Nebraska, Omaha. This artwork employs daylight (through the atrium skylight) and artificial sources at night. Holography is a very adaptive medium and offers visual artists an entirely new vocabulary for expression.

The next major development was the advent of the embossed hologram. In the early 1980's several researchers discoverd that the image (fringe) pattern of a hologram could be created on the surface of certain recording materials, then transferred into the form of a stamping mold and finally stamped out in very large quantities. The holograms seen on Bank Cards and in various commercial applications today are of this variety. The ubiquitous character of the embossed hologram helped further popularize the medium by bringing it to a larger audience.

In the new millennium holography, perhaps more than any other visual medium or technology, symbolizes the promise of the future. Scientists continue to search for means of applying the underlying principles of the technology.

HOLO / GRAPHY
WHOLE MESSAGE

The essential theoretical principles of holography were proposed by Dr. Dennis Gabor in the late 1940's. Gabor did not originate the term holography immediately, however, instead, in his early papers, he referred to it by the rather complex, descriptive name "wave-front reconstruction." Although there has been disagreement over who first introduced the term holography to refer to Gabor's discovery, there is reason to believe that Gordon Rogers, an early pioneer in the field, deserves this credit.. However, Rogers himself, of Dundee, Scotland, gives the credit to Dennis Gabor, stating that Gabor apparently used this term because the theory of "wave-front reconstruction" provided a technique for a more complete (whole) form of image recording. Over time, a simple vocabulary has developed within the medium wherein the general process of wavefront reconstruction is referred to as holography.

HOLOS

The roots of this word come from the ancient Greco-Roman and essentially imply "whole" or "complete" states of existence

GRAPH-ICS

This suffix is used widely today. Its meaning includes such concepts as image-making and visual representation.

HOLOGRAMS (not holographs)

In contrast to the process of holography, a single image created through holographic means is referred to as a hologram ! This is obviously simple terminology, but its proper use helps to clarify meaning while discussing the medium. The term "holograph" has been used to describe a singular image as well and, in fact, is considered proper usage according to the Oxford English Dictionary. However, a "holograph" is also defined as a written document such as a will, contract, etc. and, because this presents some confusion, it seems more practical to refer the singular image as a hologram.

A DEFINITION OF HOLOGRAPHY

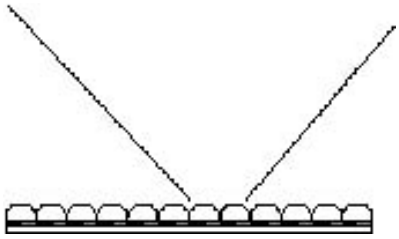
Although it is difficult, if not presumptuous, to try to define the sophisticated scientific principles and natural phenomena of the holographic process in a few short sentences, the following gives an adequate overview of the primary components in this technology.

"Holography is the recording (construction) of wavefront interference patterns created by coherent (laser) light sources and the replay (reconstruction) of these patterns as visual images or other forms of wave media."

In some instances of definition, it is as important to clarify what you are not describing as what you are. This is certainly the case in holography. The popular awareness of three-dimensionality in the holographic image has led to many confusing associations of the medium with other, less sophisticated, technologies.

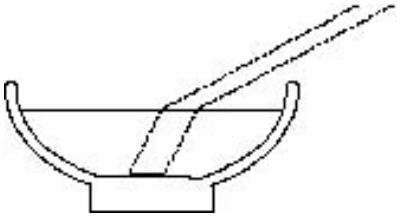
Among these are the following:

A. Lenticular Devices - There are a great variety of these and most of us have encountered them in post card form at some time. These are the popular cards which either have a three-dimensional appearance or that jump rapidly from one flat image to another as the card is moved in the hand. Often, "lenticulars" can by distinquished by their highly textured surface (these are the lenses which form the image you see). In recent times the "NIMSLO" camera has offered a related process which allows you to create these sorts of images by using their special camera and processing procedures.



A "Lenticular Device", as diagrammed above, presents different images to the viewer depending upon the angle from which they study it.

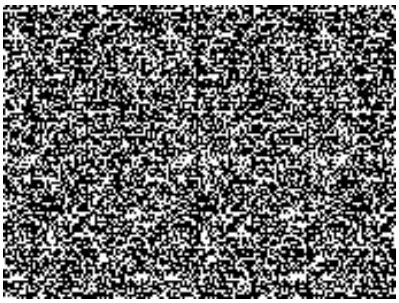
B. Film Animation - Fictional, future-oriented projections of holography have often gone far beyond the real capablilites of the medium. Wanting to satisfy the dreams of movie audiences, however, filmakers have resorted to special animation techniques and trick photography to simulate holgraphy as it might be at some point in the future. The most popular examples of this are the scenes from the film "Star Wars." Many of us wish that holography was at such an advanced stage in its development but, sadly, it isn't. Real holograms have been used in films such as "Logan's Run" and "The Man Who Fell From Earth," but, because film is a two-dimensional medium, it is incapable of carrying the same level of information as a hologram (i.e. a 2-D image for a 3-D image is still 2-D).



A penny placed in a bowl full of water will appear to float on the surface of the water. This illusion is the result of refraction which causes rays of light to bend in such a manner as to make the penny appear displaced.

C. The Floating Penny and Other Optical Illusions - Long before the development of holography, physicists and artists used special mirror and optical configurations to project images into and through space. Various novelties sold today still rely upon this, as do some of the popular diversions in the haunted house at Disneyworld and other theme parks. These are not holograms, simply sophisticated visual tricks for your viewing pleasure !

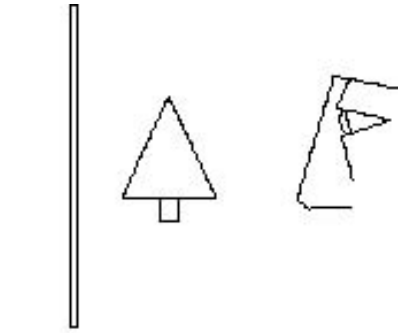
D. Random Dot Stereograms - these are the ubiquit-ous speckled images which populated the malls of America for many years. These were often labeled erroneously as holograms
Instead, they are very clever adaptations of theories involving both stereo vision and computer technology. By a very clever and precise arrangement of the dots, the eye sees nothing until it is focused in the correct manner, at which point, a set of stereo images are presented to the eye and the image seen appears to be three-dimensional.



The tiny dotted images seen throughout U.S. malls in the past are known as Random Dot Stereograms.

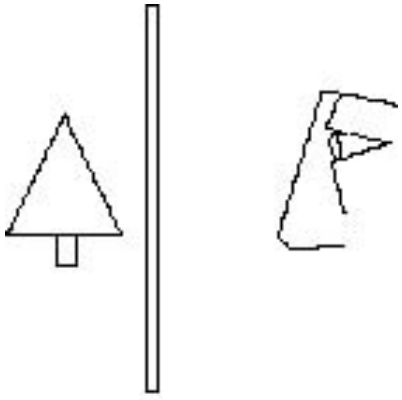
FEATURES OF A HOLOGRAM

Because of the many varieties of holograms which are possible with present day technology, it is difficult to describe what a hologram is. If the following characteristics are present in an image then you may be looking at a hologram.



A. "REAL" IMAGE

A real image projects into your personal space as diagrammed above. A virtual image appears to be behind the surface of a hologram as diagrammed below.



A. "VIRTUAL" IMAGE

A. There is some surface into which you are looking. The physical portion of a hologram is a photographic emulsion and it requires some support surface. Generally, when looking at holograms, the image you see is related to a tangible material (glass plate or piece of film).

B. The image is "vaporous" and does not appear to have a physical presence. You may be able to touch the image itself, but you feel nothing when you do.

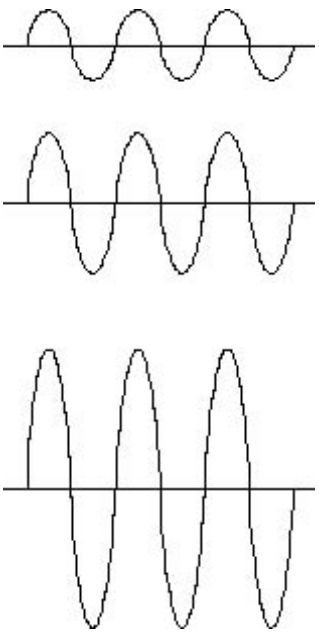
C. Some special lighting is involved. A hologram is an image constituted of light, created by the holograms ability to modulate (bend, that is) light in a highly sophisticated and controlled manner. In order for the proper replay of a holographic image, a special form and arrangement of illumination may be required. In certain instances, this may involve cumbersome and noticeable lighting paraphernalia.

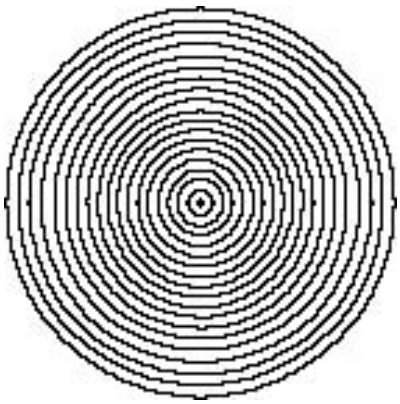
D. The image which you see appears to be projecting toward you. There are several optical means for projecting images (the Ghost in the Haunted House at Disneyworld is a good example but this is NOT a hologram). An image which is projected into space is referred to as a "real" image (as opposed to an image that appears behind a surface – this is referred to as a virtual image). A projected image in a hologram may appear vaporous as mentioned above and may lack precise definition. Nevertheless, the illusion of the projecting image may be extremely convincing.

LIGHT AND INTERFERENCE

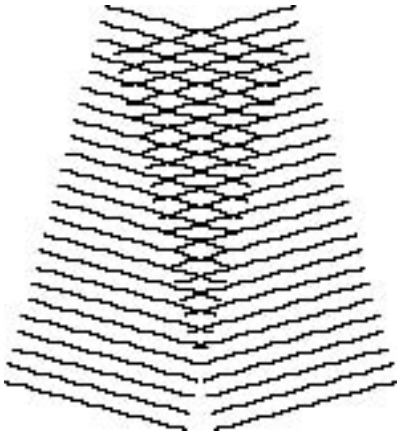
The coherent light of lasers is quite useful in itself for industrial research, communications and various other applications. For holography, however, the coherent character of a light source is essential. This is so because the technology of holography is made possible by the nature of light waves and the manner in which they interact with one another. The effect of light waves upon one another is generally described in a relationship known as interference.

If we think of light waves as water waves (there are some great similarities between them) we can demonstrate some of their interactive effects. If two wave sources collide with one another (Fig.1) the phase conditions of these waves (the relation of their crests and the phase troughs) mutually interact with one another. The rising action of the crests may be reduced if they coincide with the trough segment of another wave and vice versa, or two crests coinciding may create an amplified crest and trough in the wave. The results constitute a combined effect. In the illustration, waves A and B combine in such a manner that both waves reach a cresting stage at the same time. The result of this is that the two waves magnify each others intensity (amplitude) as a result of their additive relationship. The wave which results from this combination is represented in C. Although the wavelength of the original waves has not changed, the height of its crest and depth of its trough has chnaged, as if the energy in the seperate waves had been combined. This additive effect is referred to as **CONSTRUCTIVE INTERFERENCE.**



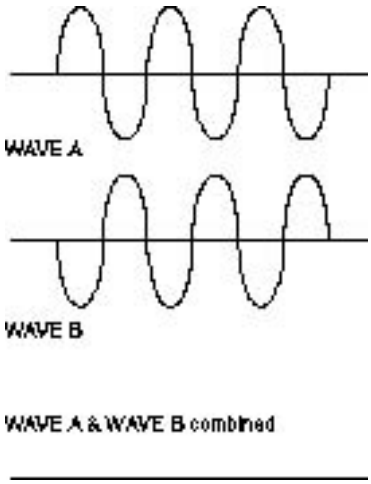


Interference patterns are visible in this set of overlapping concentric circles. This effect is much the same as that observed in water waves.



Interference patterns are also visible in this set of overlapping straight lines. This effect simulates interference from sources with flat wave structures.

In contrast to this situation, it is possible for another event to occur in which two waves of opposite phase collide with one another. In this case, something very curious occurs. Because the energy states of the two waves oppose each other (one is cresting while the other is troughing) the two waves process to cancel each other out. Because of destruction or nullification of the wave's energy at this point, this phenomena is referred to as DESTRUCTIVE INTERFERENCE.

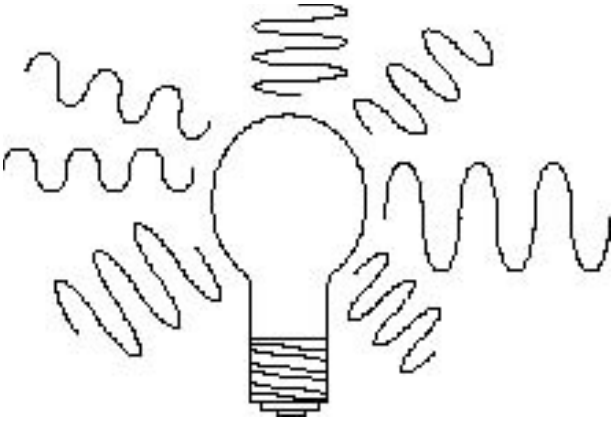


In reality, it is somewhat unlikely that two waves would meet so neatly to form a new wave of such a consistent configuration. Instead, it is more likely for them to be slightly out of phase with one another and therefore forming somewhat irregular patterns of constructive and destructive interference.

In describing the interference mechanism of light, it is important for us to realize that this effect is essentially characteristic of light, whether the source is coherent or incoherent. Thus, interference effects can be demonstrated using ordinary incandescent sources of light (this is what Thomas Young did in his famous double slit experiment). However, as we now know, incoherent light is not as clearly organized and structured as coherent light and this makes it difficult to create highly ordered patterns of interference from incoherent light. Since the mechanism of holography relies upon the creation and recording of the interference relationships a coherent light source provides a more orderly pattern and thus a more highly resolved image.

COHERENT AND INCOHERENT LIGHT:

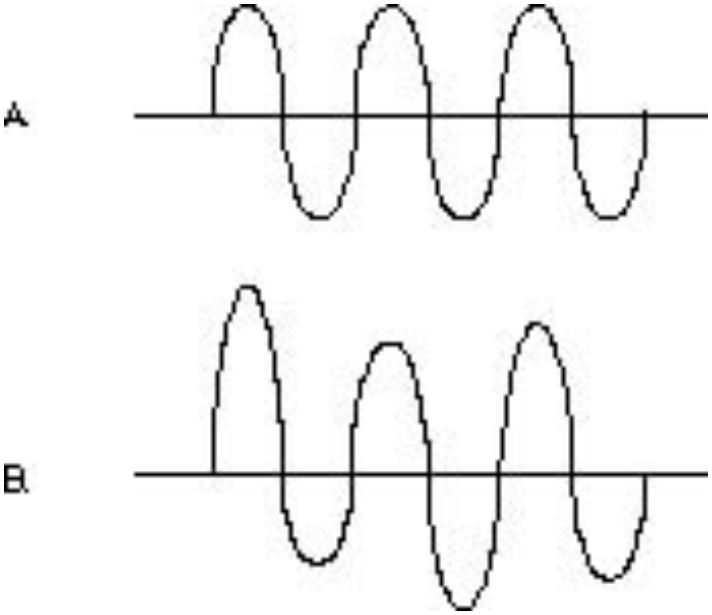
As stated in the discussion of light, because photons are emitted spontaneously from sources such as light bulbs, burning candles and distant stars they are not emmitted in an orderly or structured fashion. Firstly, the waves which are emmitted consist of a myriad of differing wavelengths. If we compared them in a diagram:



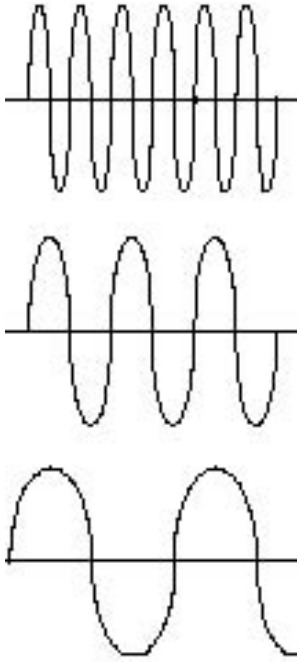
Traditional light sources emit a variety of wavelengths of light

we would say that such waves are not **TEMPORALLY COHERENT** with one another. Essentially, we would perceive their wavelength variations as differing color sensations. White light is temporally incoherent since it lacks a singular, specified wavelength.

It is the quality of coherent/incoherent light which helps to distinguish the LASER from common light sources such

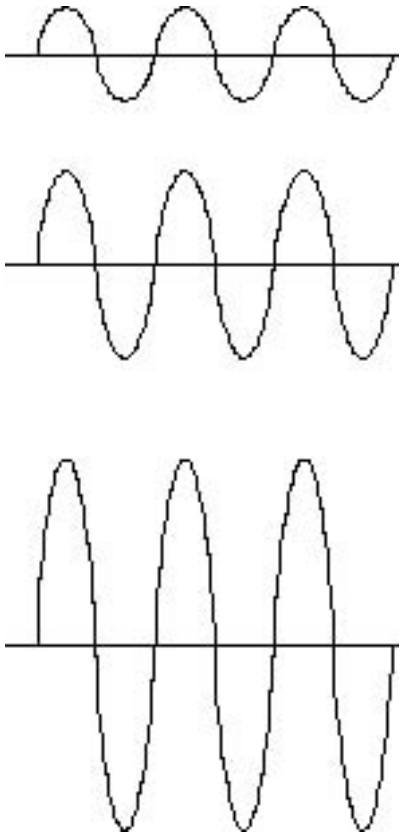


Temporal coherence is maintained in (A) above, but is lacking in wave (B) below

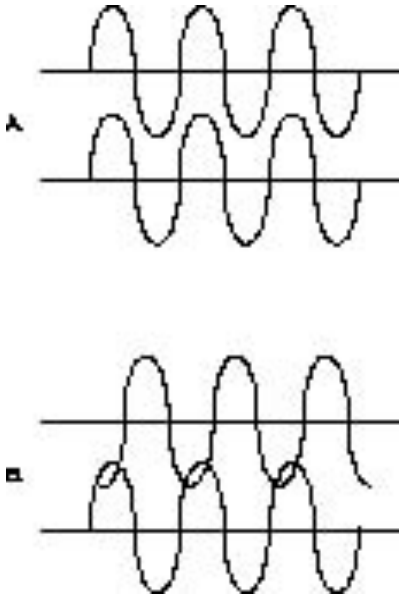


The varying length of electromagnetic waves account for many phenomena we experience . Very long waves are used to transmit TV and radio signals. Shorter waves are used for X-ray imaging and the like. Wavelength also accounts for the colors we see. In the visible spectrum (that portion of the electromagnetic spectrum which stimulates nerves in the eye) shoter waves are perceived as greens , blues and violets while longer waves constitute the reds, oranges and yellows.

as neon tubes, flourescent tubes, and the like. Unlike these incoherent light sources, the laser generates (in theory at least) one very specific wavelength of light. In the case of the helium-Neon lasers commonly used in holography, the specified wavelength is 632.8 nanometers or .0000006328 meters. Because the wavelength is so specific, the light generated by a laser appears very pure and intense. In the case of the helium-neon laser the wavelength for lasing creates a brilliant red. Finally, because all the wavelengths emmitted are the same, we say that laser light is temporally coherent.



Variations in the height of a wave indicate a difference in intensity. With sound waves this is experienced as amplitude (volume or loudness). In terms of light this amplitude is relected in brightness. The waves above have identical wavelengths and thus the same color their brightness levels however are noticeably different.



The wave sets in (A) above are in sync (or "in phase") with one another. These waves are spatially coherent. The wave sets in (B) below are out of sync with one another (or "out of phase"). These waves are spatially incoherent.

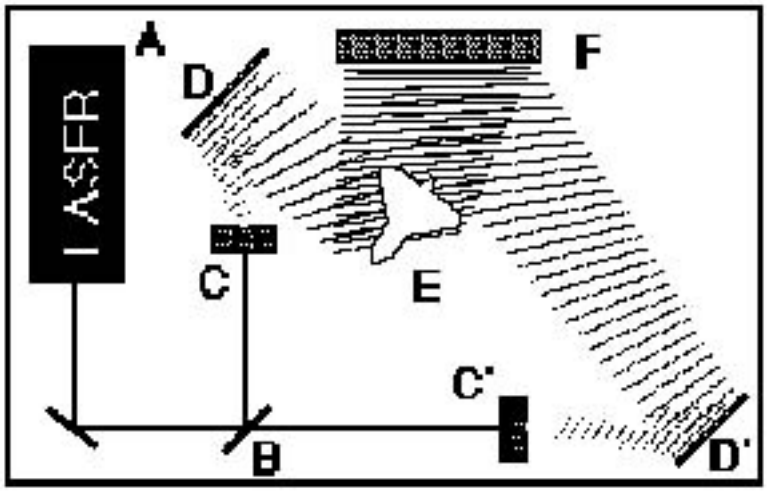
If we continue to examine the character of light generated by the laser, we find that there is yet another pattern to it. Not only are the waves of energy emitted all of the same length, but they are also perfectly in step with one another. Thus, all the waves of light which the laser creates are in perfect synchronization with each other. As one of the waves rises, they all rise and so forth. This second, highly ordered characteristic of laser light, is known as **SPATIAL COHERENCE**, and when waves of light are synchronized in such a manner, we say that they are **IN PHASE** (conversely, if these wave movements are not synchronized they are said to be “out of phase.”)

The special coherent properites of laser light (both temporal and spatial) are very important because these properties of laser light make it ideal for creating the interference effects which are the essence of the holographic recording process.

Holography and the Interference Mechanism:

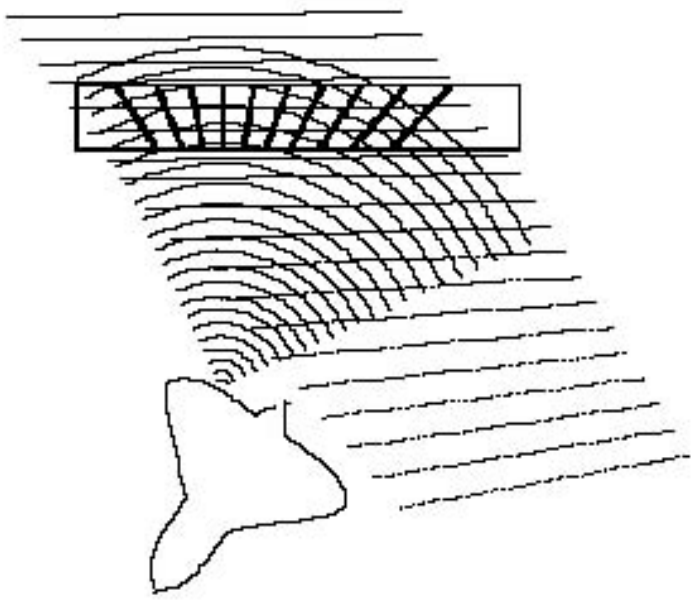
Constructive and destructive interference are essential to holography because this interference can carry information about the visual properties of objects in our environment. Because these interference patterns are constituted of light, we are able to record them on light-sensitive films, thus storing them for future use. The actual technique used for creating and storing the information in a hologram is most easily represented through the process of transmission holography. Other types of holograms, such as reflection and embossed, are created using specific variations of this arrangement.

In a transmission hologram, as diagrammed here, the beam of light generated by a laser (A) is split into two beams by an optical element (B). Each of these two beams is then diffused by a lens (C,C') and one of these beams is reflected off a mirror (D) onto an object (E). This light is then reflected off the object onto a nearby film plate (F). The coherent laser light is modified by the object and carries information about it (the same information which our eyes see when light is reflected off objects to them). The second beam is reflected directly off another mirror (D') onto the film plate. Since this beam does not strike the object it retains its original coherent properties and is referred to as the reference beam. The beam illuminating the object is referred to as the object beam.



An overhead view of the arrangement of components for a laser transmission hologram

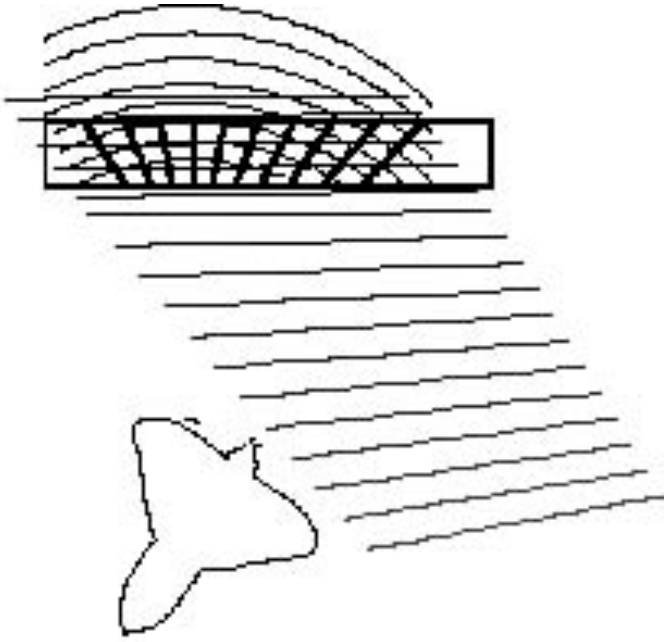
When the beams of light from the object and the reference source collide, they create varying patterns of constructive and destructive interference. The areas of constructive interference, with their higher energy levels, are recorded on the light-sensitive holographic emulsion. After the exposed hologram is processed, these areas of the holographic emulsion have a greater density than other areas of the emulsion. Traditionally, these thicker elements in the holographic emulsion are referred to as fringes.



An enlargement of the film zone reveals the formation of the fringes in the holographic recording material.

After processing, the hologram may be placed before a diffused beam of laser light (often it is returned to its original recording position). Now, if the laser light is passed through the hologram from the same orientation as the reference beam used to record it, the object, although no longer present, may be seen. The fringes recorded in the hologram during the construction stage act like tiny microscopic prisms, or lenses, bending the light of the laser as it passes through the hologram. The manner in which the light is bent is dependent upon the size, shape and orientation of the fringes, which was, in turn, determined by the modulated waves coming from the object during the recording of the hologram. Now the hologram simply reconstructs those object waves, making it appear as though the object

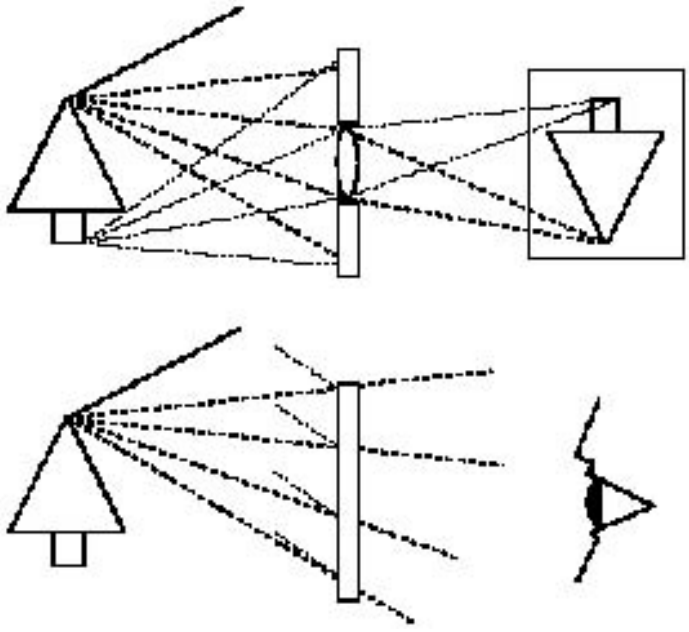
is still there. This stage of viewing a hologram is known as reconstruction.



In reconstruction the processed fringes of the hologram diffract the light of the reference beam, creating an optically faithful copy of the original object beam.

Holography: How does it differ from Photography ?

Although both photography and holography record their information on light sensitive emulsions, the kinship of the processes is limited. In photography, we record the amplitude variations of the light reflecting off of an object. In holography, we record the phase variations of the light reflecting off of an object. This means that in a hologram, each ray of light coming from an object is individually recorded in the holographic emulsion, so that it may be recreated later. This is one of the features of holography that permits us to view images which appear three-dimensional in character. This also accounts for the ability of every part of a hologram to record information about every part of an object (although it is important to realize that the information about individual points on the object will not be the same at each point in the hologram).



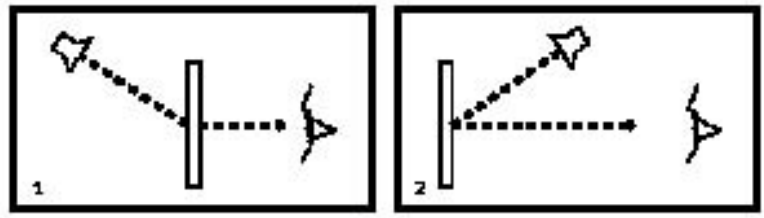
A photograph records amplitude variations in light waves and a hologram records variations in their phases.

Because the hologram records the phase relationships of light coming from an object, the image is invisible until it is properly illuminated . When light is brought to the hologram from the proper orientation, it is played back to the viewer as if it were coming from the object. The image we see is constituted only of light - no physical substance. Obviously, for this reason it is important to know how to reconstruct holographic images.

Reconstruction: Viewing a Hologram

Knowing the steps involved in constructing a hologram is very helpful when one needs to reconstruct or playback an image. There are four major types of holograms which are distinguished by the manner in which they are constructed. Each of these will be listed separately, along with a brief discussion of their important characteristics.

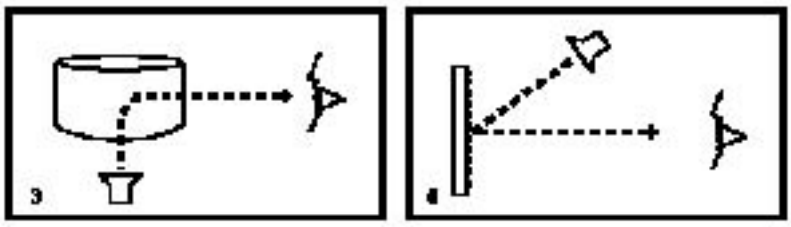
1. Transmission hologram: Transmission holograms of the off-axis variety were the first type created by Leith and Upatnieks at the University of Michigan. This is the type diagrammed in the earlier construction discussion. Transmission holograms are easily distinguished by their need to be illuminated from the side opposite the viewer (see Fig. 1). Early transmission holograms required lasers for viewing as well as recording the image. Today, through a special technique developed by Dr. Stephen Benton, these holograms can be viewed with white light. When the light passes through these holograms, it is broken up into its spectral (rainbow) constituents. For this reason, these holograms are often referred to as "rainbow" transmission holograms.



A transmission hologram (as diagrammed in figure 1 above) is viewed by passing a light source through the hologram from behind the hologram proper. The light source for a transmission hologram will always be on the side opposite that of the viewer. A reflection hologram (as diagrammed in figure 2 above) is illuminated from the same side as the viewer - with light reflecting back to the viewer's eyes.

from the same side as the viewer. The light frequently comes from overhead. As is shown in the diagram, that light which enters the hologram is reflected out by the fringes recorded in it. Because this type of hologram is illuminated from its front side, it may be hung on a wall as is common with more traditional visual media. Early reflection holograms were largely monochromatic but the development of new techniques over the past several years has seen the introduction of multi-color effects.

3. Integral Hologram: This type of hologram is known by many names - integral, multiplex, stereogram, etc. Most of these names imply that this type of hologram is made through a hybrid process. In the integral hologram, cinema footage is made of a subject, and after the film is processed, the individual frames of the movie are exposed holographically onto a light sensitive film. Each frame is exposed as a condensed vertical line. These multiple cinema frames are exposed sequentially side-by-side so that when viewing the image each of our eyes sees separate frames but fuses them stereoscopically. As a result of this fusion of frames, the mind perceives space. Integral holograms are often presented in plexiglas cylinders (see Fig. 3) and frequently exhibit the rainbow effect described earlier for transmission holograms.



An integral hologram (as diagrammed in figure 3 above) combines time-based visual technologies. Because it synthesizes images using multiple technologies it is one of the more efficient means for holographically recording humans and other subjects too unstable for traditional continuous wave imaging. An embossed hologram (as diagrammed in figure 4 above) uses the surface fringe properties of certain holograms to permit the production of large numbers of holographic images.

4. Embossed Hologram: This is the type of hologram used on popular credit cards to inhibit fraud, and the type which appeared on two recent covers of The National Geographic. Embossed holograms are produced by transferring a surface diffraction grating from a master hologram into a copy material (various plastic materials). The images in this type of hologram are often multi-colored as in the rainbow holograms described above. The presentation of embossed holograms however is similar to that of a reflection hologram, with the reconstructing source of illumination coming to the hologram from the same side as the viewer. One of the most distinctive features of this type of hologram is its shiny metallic backing.

TEN COMMON QUESTIONS ABOUT HOLOGRAPHY

1. What does the word holography mean?

The word comes from the ancient terms HOLOS and GRAPHICS. Holos means simply "whole or complete" and graphics refers to writing or message making. Together the terms combine to mean *"whole or complete message"*.

2. What is holography?

An advanced visual technology in which three-dimensional images are recorded on light sensitive film with the aid of lasers. Holography is not simply 3 - D photography the way some imagine. Holograms can store enormous amounts of information and are used in an extremely wide range of applications - from security to stress testing, in architectural lighting and in guidance.

3. What is the best way to look at a hologram?

Because the hologram image is three-dimensional you must examine it thoroughly. Begin by looking into the center of the image - if possible, look for your own reflection. After studying the hologram's image from this position begin to slowly move about, going up and down, side to side and back. While doing this, notice what new information is revealed to you. Remember that a holographic image may extend toward you, so be careful to move back far enough to make sure you don't miss any parts of the image (Caution: when moving backwards check behind you first so that you don't accidentally bump into something or someone). If it appears to be extending out toward you, try locating the image in space with your finger tip - but be careful not to touch the hologram itself. The oil from your skin can cause damage to the holograms.

4. Can the LASERs in holography exhibitions hurt my eyes?

Surprise. There are no lasers illuminating holograms in most exhibitions. The holograms in most exhibitions are illuminated with white-light sources. These lights are not terribly different from the lights used in your own home, except that most of these are clear bulbs without the frosted coating common in lamp bulbs or flourescent lights. If a frosted or diffuse source were used, the image recreated in

the hologram would likewise be very diffuse or unclear.

Sometimes our eyes feel a bit of strain after looking at holograms, but this is not because of LASERS or any harmful light source. Rather, it is because we must constantly focus and refocus on objects at various points in space.

5. Are there any practical uses for holography?

Most certainly. Holography is used in many applications today, often without most persons knowledge of this usage. Some supermarket scanners employ a specially constructed holographic scanning disk to improve the speed and accuracy of their bar code scanning. Holograms are used to test the effects of vibrations on speakers and microphones, turbine blades and so forth. The range of applications is amazingly broad.

6. How do they make holograms of people?

Most holograms require that their subjects remain motionless during the recording process - even the slightest movement will destroy the image. Since it is not possible to keep a human subject or some animals, plants and so forth motionless, holographers use a special laser referred to as a PULSE laser. This laser acts somewhat like the flash on a camera. It emits its recording light for a very brief period of time (as briefly as 1 billionth of a second in some cases) and freezes the subject for the image.

7. Why aren't the colors more natural in holograms?

Natural, or true-color, holography is possible today but it is very expensive and difficult to control. To date the involvement with true-color holography has largely been restricted to scientific laboratories.

8. When will we have holographic television?

It is safe to assume that holographic TV may still be at least a decade or more away. Holograms contain enormous quantities of information and current electro-optic technology is not capable of transmitting or translating these quantites of information at this time. Various researchers continue to search for means to achieve a form of holographic television however.

9. Is there only one type of hologram?

Definitely not! There are four major types of holograms employed today and each has many subtypes. Transmission, Reflection, Embossed and Integral holograms are the four major categories of holograms currently in wide use.

10. How do they put holograms into movies like "Star Wars"?

It is possible to make a motion picture of a hologram. Sadly, this does not capture the three-dimensional properties of the hologram. Unfortunately, it is easier to invent futuristic movie fantasies of holography than it is to work with the medium. When holograms are thought to appear in motion pictures they are usually in the form of animated special effects. This is certainly the case in such films as "Star Wars" and also in the more recent film "Total Recall" with Arnold Schwarzeneger. A few decades ago, Soviet scientists experimented with a purely holographic cinema. The special screen required to project their movie onto only permitted four persons to view their motion picture simultaneously. Since these early efforts, little has been done to develop holographic cinema.

ART/COMM 266. INTRO TO NEW MEDIA: *DIGITAL SECURITY*

NOTES FOR PROTECTING YOUR IDENTITY AND PRIVACY (a few definitions)

MALWARE - Short for "malicious software," malware refers to software programs designed to damage or do other unwanted actions on a computer system. The Latin root "mal" is a prefix that means "bad," making the term "badware," which is a good way to remember it.

Common examples of malware include viruses, worms, trojan horses, and spyware. Viruses, for example, can cause havoc on a computer's hard drive by deleting files or directory information. Spyware can gather data from a user's system without the user knowing it. This can include anything from the Web pages a user visits to personal information, such as credit card numbers.

Types of MALWARE

VIRUS - is a specific type of malware that self-replicates by inserting its code into other programs.

WORM - A computer worm is a type of malware/virus that spreads copies of itself from computer to computer. A worm can replicate itself without any human interaction, and it does not need to attach itself to a software program in order to cause damage.

TROJAN HORSE - A Trojan horse, or Trojan, is a type of malicious code or software that looks legitimate but can take control of your computer. ... A Trojan is sometimes called a Trojan virus or a Trojan horse virus, but that's a misnomer. Viruses can execute and replicate themselves. A Trojan cannot. A user has to execute Trojans.

RANSOMWARE - Ransomware is a form of malware in which rogue software code effectively holds a user's computer hostage until a "ransom" fee is paid. Ransomware often infiltrates a PC as a computer worm or Trojan horse that takes advantage of open security vulnerabilities. It is particularly commonplace in the corporate world.

SPYWARE - Spyware is the term given to a category of malware designed to access personal or organizational information. Some spyware is benign and used to give popup advertisements based on user habits and search history (adware).

Spyware can also be used maliciously. One of the simplest, yet dangerous forms of spyware are Keyloggers. They are used to record computer user's keystrokes to gain access to passwords, banking information, et al.

Spyware is mostly classified into four types: adware, system monitors, tracking including web tracking, and trojans; examples of other notorious types include digital rights management capabilities that "phone home", keyloggers, rootkits, and web beacons.

It is unfortunate that there are software programmers out there with malicious intent, but it is good to be aware of the fact. You can install anti-virus and anti-spyware utilities on your computer that will seek and destroy the malicious programs they find on your computer. So join the fight against badware and install some protective utilities on your hard drive!

FIREWALL - is a network security system that monitors and controls the incoming and outgoing network traffic-based on predetermined security rules.[1] A firewall typically establishes a barrier between a trusted, secure internal network and another outside network, such as the Internet, that is assumed not to be secure or trusted.

Firewalls are often categorized as either network firewalls or host-based firewalls. Network firewalls filter traffic between two or more networks; they are either software appliances running on general purpose hardware, or hardware-based firewall computer appliances. Host-based firewalls provide a layer of software on one host that controls network traffic in and out of that single machine.

VIRUS - is a type of malicious software program ("malware") that, when executed, replicates itself by modifying other computer programs and inserting its own code.[1] Infected computer programs can include, as well, data files, or the "boot" sector of the hard drive. When this replication succeeds, the affected areas are then said to be "infected" with a computer virus.[

https:// - HTTPS (also called HTTP over Transport Layer Security (TLS), HTTP over SSL, and HTTP Secure) is a communications protocol for secure communication over a computer network which is widely used on the Internet. HTTPS consists of communication over Hypertext Transfer Protocol (HTTP) within a connection encrypted by Transport Layer Security, or its predecessor, Secure Sockets Layer. The main motivation for HTTPS is authentication of the visited website and protection of the privacy and integrity of the exchanged data.

In its popular deployment on the internet, HTTPS provides authentication of the website and associated web server with which one is communicating, which protects against *man-in-the-middle attacks*. Additionally, it provides bidirectional encryption of communications between a client and server, which protects against eavesdropping and tampering with or forging the contents of the communication.[5] In practice, this provides a reasonable guarantee that one is communicating with precisely the website that one intended to communicate with (as opposed to an impostor), as well as ensuring that the contents of communications between the user and site cannot be read or forged by any third party.

Historically, HTTPS connections were primarily used for payment transactions on the World Wide Web, e-mail and for sensitive transactions in corporate information systems. In the late 2000s and early 2010s, HTTPS began to see widespread use for protecting page authenticity on all types of websites, securing accounts and keeping user communications, identity and web browsing private.

VIDEO (CAMERA) SECURITY

Camera hacking is a fairly prevalent practice that affects even sophisticated tech users (it is reported that the head of FACEBOOK, Mark Zuckerberg even practices camera hygiene to protect his privacy). Here are some simple precautions you may want to take:

Check the camera indicator light. Usually a small LED light source located near the cameras lens on your laptop, computer or device. If this light is on your camera is live and producing a signal. In some situations this simply is the result of an APP or browser extension that automatically starts your camera. To see if this is the case you need to check your browser extensions and Apps. Try rebooting your computer and see if the camera light comes on when you start your browser – if so this may explain why your camera is on.

In addition to this you may want to determine if there are webcam processes operating on your computer or laptop that could be activating your camera. If none of these circumstances is occurring there is a possibility that your computer's camera system has been compromised. If that is the case you may want to do a virus scan looking for malware that is a responsible for your circumstances and follow instructions for disabling or removing that malware.

THE CAMERA SOLUTION – the best news about your camera being hijacked is that to fix it, you may only need to put a small piece of tape across the camera lens on your device.

TELECONFERENCING SECURITY

*portions of an article from: COMPUTER WORLD , Do's and Don'ts of Videoconferencing Security by Keith Shaw (April 2020).

(https://www.computerworld.com/article/3535924/do-s-and-don-ts-of-videoconferencing-security.html)

When any technology sees its popularity increase quickly, the number of bad actors taking advantage of new and untrained users also grows. The world is seeing this now with videoconferencing services and applications, as reports about the popular Zoom app being hijacked — known as "Zoom-bombing" — have surfaced.

While hijacked meetings are disruptive and disturbing for participants, a more insidious threat is intruders who lurk in meetings without revealing their presence — a nightmare for corporate security and individual privacy alike.Volume 0%

Locking down meetings

The good news is that many videoconferencing products include security settings that can prevent such incidents. The bad news is that it's often left to users with no security training to configure these settings.
We're here to help. As part of its advisory, the FBI offered safety tips for companies, schools and individuals using videoconferencing services. After speaking with other security experts, we've expanded on those ideas to create this list of web meeting security do's and don'ts.

Don't use consumer-grade software or plans for business meetings. Consumer tools most likely don't have all the administrative tools you need to lock things down. While no videoconferencing service can guarantee 100% protection from threats, you'll get a more complete set of security tools with products geared for enterprise use, many of which are being offered for free for the next several months.

Do use waiting room features in conferencing software. Such features put participants in a separate virtual room before the meeting and allow the host to admit only people who are supposed to be in the room.

Do make sure password protection is enabled. Zoom now auto-generates a password in addition to a meeting room ID. Make sure that your service uses both a meeting ID number and a string, but in addition, that it also has a separate password or PIN. If the service lets you create a password for the meeting, use password creation best practices — use a random string of numbers, letters, and symbols; don't create an easily guessable password like "123456."

Don't share links to teleconferences or classrooms via social media posts. Invite attendees from within the conferencing software — and tell them to not share the links.

Don't allow participants to screen share by default. Your software should offer settings that allow hosts to manage the screen sharing. Once a meeting has begun, the host can allow specific participants to share when appropriate.

Don't use video on a call if you don't need to. Turning off your webcam and listening in via audio prevents possible social engineering efforts to learn more about you through background objects. Audio-only also saves network bandwidth on an internet connection, improving the overall audio and visual quality of the meeting.

Do use the latest version of the software. Security vulnerabilities are likely to be exploited more often on older software versions. For instance, Zoom recently updated its software to require password-protected meetings, and it has paused work on new features to focus its developers on stamping out privacy and security vulnerabilities, indicating that more updates are to come. Double-check that participants are using the most up-to-date version available.

Do eject participants from meetings if an intruder is able to get in or becomes unruly. This prevents them from rejoining.

Do lock a meeting once all the participants have joined the call. However, if a valid participant drops out, be sure to unlock the meeting to let them back in and then re-lock it after they return.

Don't record meetings unless you need to. If you do record a meeting, make sure all participants know they are being recorded (the software should indicate this, but it's good practice to tell them too) and give the recording a unique name when you save it.

Do educate all employees who host meetings on the specific steps they should take in the software your company uses to ensure their conferences are secure.

For instance, Gabriel Friedlander, the CEO of security awareness training firm Wizer, posted a list on LinkedIn of recommended security settings for people who use Zoom, whether through their companies or for personal meetings. Here's a summary of his recommendations:

- Turn off [Participants Video]. They can turn it back on once you allow them to join.
- Turn off [Join before host]
- Turn off [Use Personal Meeting ID (PMI) when scheduling a meeting]
- Turn off [Use Personal Meeting ID (PMI) when starting an instant meeting]
- Turn on [Require a password when scheduling new meetings]
- Turn on [Mute participants upon entry]
- Turn on [Play sound when participants join or leave] (this is heard by host only).
- Turn on [Screen Sharing] - host only
- Turn off [Annotation]
- Turn on [Breakout room] - allows host to assign participants to breakout room scheduling.
- In the advanced settings, hosts should Turn on [Waiting Room] feature.

While these settings are specific to Zoom, any videoconferencing software you use should offer similar settings. If yours doesn't, it's time to change to a more secure product.

ANNOTATED LIST OF FILE FORMATS:
ART/COMM 266 INTRO TO NEW MEDIA

HEIF

The HEIF file type/format is amongst the newest digital file formats in use today and is often associated with images taken on Apple devices. The HEIF acronym stands for High Efficiency Image Format
This file format was developed by the Moving Pictures Experts Group (MPEG) during the early 2000's and was first deployed around 2013-2015. HEIF is often referred to as a container format since it can store still images, burst images and brief video content (live shots).HEIF is a lossy compressed format similar to JPEG files but with the ability to compress with greater efficiency and to retain greater quality than its predecessor. HEIF is becoming more widely accepted. It is often compared to the JPEG and boast some of the following advantages (as well as disadvantages):
It is said that HEIF files are approximately one half of the size of JPEG files. HEIF files are capable of recording 16-bit color depth despite their smaller size (a distinct advantage over the JPEG which is constrained to 8-bit color depth. This allows for better color rendering and the elimination of banding associated with 8-bit photos. HEIF files can store depth data; i.e., camera to subject distance and camera to background distance. HEIF files support transparency. HEIF can replace animated GIFs. HEIF can also provide for greater speed in image processing.

JPEG/JFIF

JPEG (Joint Photographic Experts Group) is a compression method; JPEG·compressed images are usually stored in the JFIF (JPEG File Interchange Format) file lormat. JPEG compression is (In most cases) lossy compression. The JPEG/JFIF filename extension is JPG or JPEG. Nearly every digital camera can save images in the JPEG/JFIF format, which supports 8·bit grayscale Images and 24·bit color images (8 bits each for red, green, and blue). JPEG applies lossy compression to images, which can result In a significant reduction of the file size. The amount of compression can be specified, and the amount of compression affects the visual quality of the resulting image. When not too great, the compression does not noticeably detract from the image's quality, but JPEG files suffer generational degradation when repeatedly edited and saved. (JPEG also provides lossless image storage, but the lossless version is not widely supported.)

JPEG 2000

JPEG 2000 is a compression standard enabling both lossless and lossy storage. The compression methods used are different from the ones in standard JFIF/JPEG; they improve quality and compression ratios, but also require more computational power to process. JPEG 2000 also adds features that are missing in the standard JPEG format. It is not nearly as common as JPEG, but it is used currently in professional movie editing and distribution (some digital cinemas, for example, use JPEG 2000 for Individual movie frames).

EXIF

The Exif (Exchangeable 1mage file format) format is a file standard similar to the JFIF format with TIFF extensions; it is incorporated in the JPEG-wnting software used in most cameras. Its purpose is to record and to standardize the exchange of images with image metadata between digital cameras and editing and viewing software. The metadata are recorded for individual

images and include such things as camera settings, time and date, shutter speed, exposure, image size, compression, name of camera, color information. When images are viewed or edited by image editing software, all of this image information can be displayed. The actual Exif metadata as such may be carried within different host formats, e.g. TIFF, JFIF (JPEG) or PNG. IFF·META is another example.

TIFF

The TIFF (Tagged Image File Format) format is a flexible format that normally saves 8 bits or 16 bits per color (red, green, blue) for 24·bit and 48·bittotals, respectively, usually using either the TIFF or TIF filename extension. TIFPs flexibility can be both an advantage and disadvantage, since a reader that reads every type of TIFF file does not exist. TIFFs can be lossy and lossless; some offer relatively good lossless compression for bi·level (black&wh1te) images. Some digital cameras can save in TIFF format, using the LZW compression algorithm for lossless storage. TIFF image format is not widely supported by web browsers. TIFF remains widely accepted as a photographic file standard in the printing business. TIFF can handle device-specific color spaces, such as the CMYK defined by a particular set of printing press inks. OCR (Optical Character Recognition) software packages commonly generate some (often monochromatic) form of TIFF image for scanned text pages.

RAW

RAW refers to raw image formats that are available on some digital cameras, rather than to a specific format. These formats usually use a lossless or nearly lossless compression, and produce file sizes smaller than the TIFF formats. Although there is a standard raw image format, (ISO 12234-2, TIFF/EP), the raw formats used by most cameras are not standardized or documented, and differ among camera manufacturers.

Most camera manufacturers have their own software for decoding or developing their raw file formats, but there are also many third party raw file converter applications available that accept raw files from most digital cameras. Some graphic programs and Image editors may not accept some or all raw file formats, and some older ones have been effectively orphaned already. Adobe's Digital Negative (DNG) specification is an attempt at standardizing a raw image format to be used by cameras, or for archival storage of image data converted from undocumented raw image formats, and is used by several niche and minority camera manufacturers including Pentax, Leica, and Samsung. The raw image formats of more than 230 camera models, including those from manufacturers with the largest market shares such as Canon, N1kon, Phase One, Sony, and Olympus, can be converted to DNG.(1). DNG was based on ISO 12234·2, TIFFIEP, and ISO's rev1s1on of TIFFIEP is reported to be adding Adobe's modifications and developments made for DNG into profile 2 of the new version of the standard.

GIF

GIF (Graphics Interchange Format) is limited to an 8-bit palette, or 256 colors. This makes the GIF format suitable for storing graphics with relatively few colors such as simple diagrams, shapes, logos and cartoon style images. The GIF format supports animation and is still widely used to provide image animation effects. It also uses a lossless compression that Is more effective when large areas have a single color, and ineffective for detailed images or dithered images.

BMP

The BMP file format (Windows bitmap) handles graphics flies within the Microsoft Windows OS. Typically, BMP files are uncompressed, hence they are large; the advantage is their simplicity and wide acceptance in Windows programs.

PNG

The PNG (Portable Network Graphics) file format was created as the free, open-source successor to GIF. The PNG file format supports 8 bit paletted Images (with optional transparency for all palette colors) and 24 bit truecolor (16 million colors) or 48 bit truecolor with and without alpha channel - while GIF supports only 256 colors and a single transparent color. Compared to JPEG, PNG excels when the image has large, uniformly colored areas. Thus lossless PNG format is best suited for pictures still under edition - and the lossy formats, like JPEG, are best for the final distribution of photographic Images, because in this case JPG files are usually smaller than PNG files. The Adam7-lnterlacing allows an early prev1ew, even when only a small percentage of the image data has been transmitted.

PNG provides a patent-free replacement for GIF and can also replace many common uses of TIFF. Indexed-color, grayscale, and truecolor images are supported, plus an optional alpha channel.

PNG is designed to work well in online viewing applications like web browsers so it is fully streamable with a progressive display option. PNG is robust, providing both full file integnty checking and simple detection of common transmission errors. Also, PNG can store gamma and chromaticity data for improved color matching on heterogeneous platforms. Some programs do not handle PNG gamma correctly, which can cause the Images to be saved or displayed darker than they should be.[21

PSD

Photoshop files have default file extension as .PSD, which stands for "Photoshop Document. A PSD file stores an image with support for most imaging options available In Photoshop. These include layers with masks, color spaces, ICC profiles, CMYK Mode (used for commercial pnnting), transparency, text, alpha channels and spot colors, clipplng paths, and duotone settings. This is in contrast to many other file formats (e.g. .JPG or .GIF) that restrict content to provide streamlined, predictable functionality. A PSD file has a maximum height and width of 30,000 pixels, and a length limit of 3 Gigabytes.

Photoshop files sometimes have the file extension .PSB, which stands for "Photoshop Big" (also known as "large document format"). A PSB file extends the PSD file format, Increasing the maximum height and width to 300,000 pixels and the length limit to around 4 Exabytes. The dimension limit was apparently chosen arbitrarily by Adobe, not based on computer arithmetic constraints (it is not close to a power of two, as Is 30,000) but for ease of software testing PSD and PSB formats are documented.

Because of Photoshop's popularity (and due to Its quality programming), PSD files are widely used and supported to some extent by most competing software. The .PSD file format can be exported to and from Adobe's other apps like Adobe Illustrator, Adobe Premiere Pro, and After Effects, to make professional standard DVDs and provide non-linear editing and special effects services, such as backgrounds, textures, and so on, for television, film, and the web. Photoshop's

primary strength is as a pixel·based Image editor, unlike vector-based image editors. Photoshop also enables vector graphics editing through Its Paths, Pen tools, Shape tools, Shape Layers, Type tools, Import command, and Smart Object functions. These tools and commands are convenient to combine pixel-based and vector-based Images In one Photoshop document, because it may not be necessary to use more than one program.

WEBP

WebP is a new Image format that uses lossy compression. It was designed by Google to reduce image file s1ze to speed up web page loading: its principal purpose Is to supersede JPEG as the primary format for photographs on the web.
WebP Is based on VPS's intra-frame coding and uses a container based on RIFF.

PICT

PICT is a graphical file format that appeared with the Apple's original Macintosh computer after its introduction in 1984. It is designed to permit the exchange of both bitmapped and vector graphics for a variety of Macintosh applications. The file format is still used although dated in its functionality.

TARGA

TARGA (**Truevision, a.k.a. TGA or .tga)**, often referred to as **TARGA**, is a raster graphics file format created by Truevision Inc. (now part of Avid Technology). It was the native format of TARGA and VISTA boards, which were the first graphic cards for IBM-compatible PCs to support Highcolor/truecolor display. This family of graphic cards was intended for professional computer image synthesis and video editing with PCs; for this reason, usual resolutions of TGA image files match those of the NTSC and PAL video formats.[2]

TARGA is an acronym for ***T**ruevision **A**dvanced **R**aster **G**raphics **A**dapter*; **TGA** is an initialism for ***T**ruevision **G**raphics **A**dapter*.

TGA files commonly have the extension ".tga" on PC DOS/Windows systems and Mac OS X (older Macintosh systems use the "TPIC" type code). The format can store image data with 8, 15, 16, 24, or 32 bits of precision per pixel[3] – the maximum 24 bits of RGB and an extra 8-bit alpha channel.

EPS

EPS is a graphics file format saved in the Encapsulated PostScript (EPS) file format. It may contain 2D vector graphics, bitmap images, and text. EPS files also include an embedded preview image in bitmap format. EPS files are typically used to save artwork, such as logos and drawings, and as a standard means for transferring image data between different operating systems. The files are supported by several different drawing programs and vector graphic editing applications. You can convert EPS files to .PDF, .JPG, .PNG, and .TIFF files in programs such as Illustrator, Photoshop, and CorelDRAW.