

## Chapter 1 : Lithography - Wikipedia

*Our expertly curated collection of beautiful authentic fine art adorns the walls of collectors worldwide for over 20 years. From Rembrandt to Warhol, find your next acquisition.*

As suggested by the name compounded from them, photolithography is a printing method originally based on the use of limestone printing plates in which light plays an essential role. In the 1820s, Nicéphore Niépce invented a photographic process that used Bitumen of Judea, a natural asphalt, as the first photoresist. A thin coating of the bitumen on a sheet of metal, glass or stone became less soluble where it was exposed to light; the unexposed parts could then be rinsed away with a suitable solvent, baring the material beneath, which was then chemically etched in an acid bath to produce a printing plate. The light-sensitivity of bitumen was very poor and very long exposures were required, but despite the later introduction of more sensitive alternatives, its low cost and superb resistance to strong acids prolonged its commercial life into the early 20th century. Lathrop and James R. Nall at the National Bureau of Standards later the U. Army Diamond Ordnance Fuze Laboratory, which eventually merged to form the now-present Army Research Laboratory with the task of finding a way to reduce the size of electronic circuits in order to better fit the necessary circuitry in the limited space available inside a proximity fuze. A single iteration of photolithography combines several steps in sequence. Modern cleanrooms use automated, robotic wafer track systems to coordinate the process. The procedure described here omits some advanced treatments, such as thinning agents or edge-bead removal. Other solutions made with trichloroethylene, acetone or methanol can also be used to clean. Wafers that have been in storage must be chemically cleaned to remove contamination. A liquid or gaseous "adhesion promoter", such as Bis(trimethylsilyl)amine "hexamethyldisilazane", HMDS, is applied to promote adhesion of the photoresist to the wafer. A viscous, liquid solution of photoresist is dispensed onto the wafer, and the wafer is spun rapidly to produce a uniformly thick layer. The spin coating typically runs at 500 to 3000 rpm for 30 to 60 seconds, and produces a layer between 0.1 to 10 micrometres. The spin coating process results in a uniform thin layer, usually with uniformity of within 5 to 10 nanometres. This uniformity can be explained by detailed fluid-mechanical modelling, which shows that the resist moves much faster at the top of the layer than at the bottom, where viscous forces bind the resist to the wafer surface. Final thickness is also determined by the evaporation of liquid solvents from the resist. Exposure and developing[ edit ] After prebaking, the photoresist is exposed to a pattern of intense light. The exposure to light causes a chemical change that allows some of the photoresist to be removed by a special solution, called "developer" by analogy with photographic developer. Positive photoresist, the most common type, becomes soluble in the developer when exposed; with negative photoresist, unexposed regions are soluble in the developer. A post-exposure bake PEB is performed before developing, typically to help reduce standing wave phenomena caused by the destructive and constructive interference patterns of the incident light. In deep ultraviolet lithography, chemically amplified resist CAR chemistry is used. This process is much more sensitive to PEB time, temperature, and delay, as most of the "exposure" reaction creating acid, making the polymer soluble in the basic developer actually occurs in the PEB. Developers originally often contained sodium hydroxide NaOH. However, sodium is considered an extremely undesirable contaminant in MOSFET fabrication because it degrades the insulating properties of gate oxides specifically, sodium ions can migrate in and out of the gate, changing the threshold voltage of the transistor and making it harder or easier to turn the transistor on over time. Metal-ion-free developers such as tetramethylammonium hydroxide TMAH are now used. The hard bake solidifies the remaining photoresist, to make a more durable protecting layer in future ion implantation, wet chemical etching, or plasma etching. Etching microfabrication In etching, a liquid "wet" or plasma "dry" chemical agent removes the uppermost layer of the substrate in the areas that are not protected by photoresist. In semiconductor fabrication, dry etching techniques are generally used, as they can be made anisotropic, in order to avoid significant undercutting of the photoresist pattern. This is essential when the width of the features to be defined is similar to or less than the thickness of the material being etched. Wet etch processes are generally isotropic in nature, which is often indispensable for microelectromechanical systems, where suspended structures must be

"released" from the underlying layer. The development of low-defectivity anisotropic dry-etch process has enabled the ever-smaller features defined photolithographically in the resist to be transferred to the substrate material. Photoresist removal[ edit ] After a photoresist is no longer needed, it must be removed from the substrate. This usually requires a liquid "resist stripper", which chemically alters the resist so that it no longer adheres to the substrate. Alternatively, photoresist may be removed by a plasma containing oxygen , which oxidizes it. This process is called ashing , and resembles dry etching. Use of 1-Methylpyrrolidone NMP solvent for photoresist is another method used to remove an image. The photomask blocks light in some areas and lets it pass in others. Maskless lithography projects a precise beam directly onto the wafer without using a mask, but it is not widely used in commercial processes. Exposure systems may be classified by the optics that transfer the image from the mask to the wafer. Photolithography produces better thin film transistor structures than printed electronics , due to smoother printed layers, less wavy patterns, and more accurate drain-source electrode registration. Contact lithography A contact printer, the simplest exposure system, puts a photomask in direct contact with the wafer and exposes it to a uniform light. A proximity printer puts a small gap between the photomask and wafer. In both cases, the mask covers the entire wafer, and simultaneously patterns every die. Contact printing is liable to damage both the mask and the wafer, and this was the primary reason it was abandoned for high volume production. Both contact and proximity lithography require the light intensity to be uniform across an entire wafer, and the mask to align precisely to features already on the wafer. As modern processes use increasingly large wafers, these conditions become increasingly difficult. Research and prototyping processes often use contact or proximity lithography, because it uses inexpensive hardware and can achieve high optical resolution. The resolution in proximity lithography is approximately the square root of the product of the wavelength and the gap distance. Hence, except for projection lithography see below , contact printing offers the best resolution, because its gap distance is approximately zero neglecting the thickness of the photoresist itself. In addition, nanoimprint lithography may revive interest in this familiar technique, especially since the cost of ownership is expected to be low; however, the shortcomings of contact printing discussed above remain as challenges. Unlike contact or proximity masks, which cover an entire wafer, projection masks known as "reticles" show only one die or an array of dies known as a "field". Projection exposure systems steppers or scanners project the mask onto the wafer many times to create the complete pattern. Photomask The image for the mask originates from a computerized data file. This data file is converted to a series of polygons and written onto a square of fused quartz substrate covered with a layer of chromium using a photolithographic process. A laser beam laser writer or a beam of electrons e-beam writer is used to expose the pattern defined by the data file and travels over the surface of the substrate in either a vector or raster scan manner. Resolution in projection systems[ edit ] Main articles: The spectrum of light emitted by such fixtures gives virtually all such spaces a bright yellow color. The ability to project a clear image of a small feature onto the wafer is limited by the wavelength of the light that is used, and the ability of the reduction lens system to capture enough diffraction orders from the illuminated mask. The minimum feature size that a projection system can print is given approximately by:

## Chapter 2 : THE COLLECTOR'S GUIDE: CONTEMPORARY LITHOGRAPHY

*Lithography is a printmaking process developed in by Alois Senefelder, a German actor and playwright. The printing process originally involved the application of colored inks onto a flat surface via limestone plates coated in wax.*

By Dennis Gaffney Posted: The lithographic process is carried out on a large limestone slab. The artist executes directly onto the stone the drawing he intends to print. He considered self-publishing, but engraving his books was beyond his means. One day, so the story goes, Senefelder picked up a grease pencil and wrote a laundry list on a piece of Bavarian limestone. And that act inspired the discovery of flat-surface printing—or lithography—in , the first major printing innovation since the development of relief printing in the 15th century. Artists usually prefer limestone over metal plates or plastic ones, which are more common in commercial lithography. Another advantage of limestone is that it can be ground down to a clean surface and reused repeatedly. Because new stones are so expensive—a inch by inch stone can cost several thousand dollars to purchase and ship—Bill says printers often buy used stones from each other at a discount. Artists draw their designs on the stone with litho crayons or a greasy black ink called tusche—both familiar cousins to the pencils, chalk and brushes other artists traditionally use, and in lithography the tools mimic the lines of a pencil, pen, crayon, or brush. At the end of the 19th-century, the art form took a big leap forward with the development of color lithography. In color lithography, a different stone is created for each color, so colors can be layered on top of each other. In order to create vibrant yet subtly colored prints, artists would draw on 10 or more stones to create a single work. Then, during the early part of the 20th century, artists largely abandoned lithography, as it became more of a commercial process used to color movie posters, tin toys, and other products. By the s, however, Pop artists such as Jasper Johns and Robert Rauschenberg were resurrecting lithography as a fine-art form once again. Help from Experts An artist who decides she wants to make lithographs, however, will not generally be able to do it alone. Bill is one of the skilled artisan printers who advise artists during the process. After the image is drawn, the technician protects it by rubbing rosin and then talc on the stone. Then the technician brushes on nitric acid diluted in gum arabic. Lithotine, a kind of turpentine, is then applied to the stone to "wash out" the drawing, leaving a ghost of the image in the stone that the ink will adhere to. Finally, the stone is ready to be inked, or "rolled up. A sheet of paper is laid on the stone and then run through the press under considerable pressure. And that means that today, lithographs of varying sorts surround us. Every newspaper that gets read and every art catalogue that gets mailed is done with an offset lithography process.

### Chapter 3 : Lithography: Printmaking Technique

*Lithography For Artists [Anon] on www.nxgvision.com \*FREE\* shipping on qualifying offers. Many of the earliest books, particularly those dating back to the s and before, are now extremely scarce and increasingly expensive.*

At Tamarind, a lithograph is an original image created by an artist who works closely with a master printer. A press is used to transfer drawings from stones or metal plates to paper. Although the term "lithography" may refer to commercially reproduced images, such as those on posters or in magazines, fine art lithography is a hand process used to create original works of art that can be printed multiple times. Lithographs differ from etchings, engravings, serigraphs, and woodcuts in materials and process. For example, etchings and engravings are printed from a metal plate with incised lines, while a lithograph is made from a chemically treated, flat surface. A serigraph is a silkscreen print, and woodcuts are printed from blocks of wood carved in relief. In each case, what distinguishes the print as original is that the artist participated directly in the creation of the image and approves all impressions after they are printed. The Process First an artist draws an image, in reverse, on a fine-grained limestone or an aluminum plate. For a one-color lithograph, this will be the only drawing. Each additional color will generally require a separate drawing on a different stone or plate. Artists use the same kinds of tools they would to make images on paper or canvas. However, since the basic principle of the hand lithographic printing is the natural repulsion of grease and water, the crayons, pencils, and washes used in lithography have a high grease content. The printer first sprinkles rosin on the surface to protect the drawing, then applies talc, which helps the chemical etch lie more closely to the tiny grease dots that compose the drawing. Often a second application of gum arabic is applied before the original drawing materials are removed with a solvent and asphaltum is rubbed in. At the press, the printer sponges the stone or plate with water, uses a roller to apply ink, and prints a series of trial proofs for the artist to consider. The printer continues to make proofs with different color and paper combinations until the artist is completely satisfied with the result. Using this as a standard, the printer prints the edition, comprised of a limited number of individual impressions. Important terms See link on right to Definitions of Terms for a complete description of terminology related to editions made at Tamarind. Edition refers to all impressions of a particular image that are printed after the artist has given an approval to a print. They are important identifying marks, but not all original, limited-edition prints will have them. Artists who print their own work may not use them. Most reputable print shops have a documentation paper for each of their prints that describes all of the details related to the edition and the steps involved in its making. These documentation papers are available to anyone who asks; in fact, some states have laws that require the seller to provide specific information related to the edition. Unfortunately, documentation papers can be misleading. Read the papers carefully and ask questions about anything that is unclear. Originality is difficult to define; it is a complex concept and has become almost meaningless with respect to prints because it has come into such broad and general use. The term is often used in order to imply that the print is more valuable than it may actually be. An important consideration is the degree to which the artist has participated in the concept and execution of the image.

Chapter 4 : Lithography | Tips of the Trade | Antiques Roadshow | PBS

*Lithography (from Ancient Greek λίθος, lithos, meaning 'stone', and γραφειν, graphein, meaning 'to write') is a method of printing originally based on the immiscibility of oil and water.*

Developments in Lithographic Printing Process Photo-lithography, which is the process of making a lithographic printing plate by photographic means, was the next important progression. It was invented in by the French chemist Alphonse Louis Poitevin. Other inventions included halftone photographic printing and process colour printing. Combined, they were all important steps in the history of lithography, and also book and magazine illustration. However, they were not put to much practical use due to the limitation of the lithographic press itself. That was, until the addition of the offset press, which made the process faster, cheaper and more reliable. Two versions of the offset press were invented: In Robert Barclay, England created a version for printing on tin, and in the American Ira Washington Rubel created a version for printing on paper. In the beginning limestone was used for the plates, but these have since been replaced by metal plates. The stencils or images are designed using photographic plates and the printing is carried out using a 3 roller offset press. Lithographic printing has progressed a long way from its point of origin. For terms relating to engraving, etching, lithography, woodcuts and screenprinting, see: The Basic Lithographic Process In this printmaking process, the artist draws the desired image on a flat stone surface, using a greasy litho crayon or a greasy black ink tusche - note: Limestone is usually the preferred surface for fine art, but zinc and aluminium plates are also used. In addition, the nitric acid opens the pores of the stone, enabling the gum and grease to enter easily. Meanwhile, the gum arabic surrounds the greasy areas, sealing it against the water applied during printing. Because of the mutual repulsion of grease and water, the image attracts the oily ink but repels water. Thus, when the surface is moistened and inked, the ink adheres to the greasy drawing and not the wet stone, and is transferred perfectly to paper. Indeed, lithography is noted for its ability to capture fine detail and subtle differences in shading. Famous Fine Art Lithographers Lithography instantly became a popular form of graphic art with painters during the mids, including the Spaniard Goya , and the French artists Gericault and Delacroix noted for his equestrian lithographs. The draftsman Honore Daumier was more prolific, being one of the first artists to use transfer-lithography, by which the tusche drawing is made on paper instead of on stone. He proved a great influence on subsequent exponents like Whistler Another American exponent of lithographic art was Winslow Homer Later in the 19th century, the Impressionists Edouard Manet , Odilon Redon and Edgar Degas , as well as Henri Fantin-Latour , also adopted this print method. Poster Art Although lithography was invented in , for the first many years it was too expensive a process to be used for poster art. Most posters in the beginning were woodblocks or metal engravings which contained little or no colour or design. This changed when it was discovered that all colours could be produced with as little as four stones, yellow, blue and red, and tones with the addition of black. Although the process was initially difficult, it produced some of the most powerful, luminous images which are still difficult to rival today. The ability to combine colour, image and text on one surface, made the lithographic poster one of the most powerful means of communication in late 19th century, early 20th century Europe and America. However, it only truly became popular as an art form after the French printmaker Jules Cheret invented his "3-stone chromolithography". This invention helped to transform the streets of Paris, New York and London into art galleries. By , during the Belle Epoque in Paris, poster art was in full bloom. In , the Cezech lithographer Alphonse Mucha was creating the first masterpieces of Art Nouveau posters. His fame was secured almost overnight by his lithographic poster of Sarah Bernhardt. Art Nouveau displayed a mix of influences including Pre-Raphaelites and Byzantine art. By the turn of the century, exhibitions of poster art were being held across Europe. At the start of the 20th century, poster art was continued by a new generation of artists including Leonetto Cappiello and A. By the Second World War, posters were more commonly being printed by a mass production technique which involved using photos rather than artistic designs. By the s lithographic posters had virtually died out. Lithography and Fine Art In the 20th century, the Norwegian Edvard Munch , as well as expressionists like Max Beckmann and Ernst Kirchner became avid lithographers, as did the French painters Henri Matisse and

Georges Rouault Escher , Ben Shahn , David Hockney b.

**Chapter 5 : Full text of "Lithography For Artists"**

*Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.*

**Fine-art lithography** The earliest—though no longer the only—method of creating lithographs involved the use of a block of porous limestone. The materials and procedures of the 19th-century lithographer are duplicated in almost every respect by the contemporary hand printer. An image is drawn with tusche a carbon pigment in liquid form and litho crayon before the printing surface is fixed, moistened, and inked in preparation for printing. The printing itself is done on a press that exerts a sliding or scraping pressure. Techniques developed in the 20th century varied the process considerably, though many artists continue to prefer the time-honoured method. Daumier was one of the first lithographers to make use of the process called transfer lithography, by which the tusche drawing is made on paper instead of on the lithographic stone. The drawing is then transferred to the stone and printed in the usual way. Colour lithographs, called chromolithographs or oleographs, were developed in the second half of the 19th century. Although popular, they were of generally poor quality. Commercial lithography After about many firms that utilized the lithographic process were established for producing a variety of commercial work and for distributing popular topical, historical, and religious subjects to a wide audience. Some good early work was done in colour lithography using coloured inks by Godefroy Englemann in and Thomas S. Boys in , but the method did not come into wide commercial use until It then became the most popular method of colour reproduction for the remainder of the 19th century. These commercial prints were made by preparing a separate stone by hand methods for each colour tint to be used and printing one colour in register over another. Sometimes as many as 30 stones were employed for a single subject. It was introduced into the United States in These presses utilized automatic rollers to moisten and ink the stone, while the paper was pressed into contact by a revolving cylinder. In the method known as offset lithography or offset printing was first patented by John Strather of England. The principle was not practically applied until the s, when rubber offset rollers were used on flat-bed presses for printing on metals. In the phototransfer process was patented, enabling a photographic image on sensitized paper to be inked and transferred to the printing surface. Six years later the first lithographic halftone screen was used in England. Offset methods for printing on paper were developed in the United States shortly after In the offset process—by far the most popular method in use—the inked image is first printed on a rubber cylinder, which then offsets, or transfers, the image to paper or other materials. Because of the flexibility of the rubber cylinder, offset lithography can be used to print on tin, wood, cloth, leather, and rough or smooth paper. In the past, offset printing was used mainly to produce printed matter—calendars, greeting cards, booklets, letterheads, books, magazines, newspapers, maps, posters, billboards, stamps, labels on cans, packaging, and other advertising matter—in large quantities. By the turn of the 21st century, however, an increasing number of artists, including Eugene Feldman, Hanne Darboven, Joseph Beuys , Gerhard Richter , Dieter Roth, and Kara Walker , had used the offset process to noncommercial ends. Lithographic printing on a modern rotary offset press can produce high-quality, finely detailed impressions at high speed. It can reproduce any material that can be photographed in the platemaking process. As a result, it accounts for more than 40 percent of all printing, packaging, and publishing carried out; that percentage is more than twice the percentage produced by any other single printing process. Learn More in these related Britannica articles:

**Chapter 6 : Photolithography - Wikipedia**

*Artists) In business with a multilith;: A beginner's manual of offset lithography Tamarind Techniques for Fine Art Lithography Stone Lithography (Printmaking Handbooks) The Tamarind Book of Lithography: Art and Techniques Chemistry of Lithography The Complete Guide to Prints.*

Lithography refers to a lithograph print that is made from an image which has been applied to a flat surface. It is a method of printing based on the principle that oil and water do not mix. Printing is done from a stone lithographic limestone or a metal plate with a grained surface; using oil-based inks. The artist works on a separate stone or plate for each colour. Traditionally this flat surface was a specially prepared limestone, but today grained aluminium printing plates and the original stones are used. An image is drawn, painted or photographically applied to the stone or plate using a greasy medium. The image will repel water and accept ink. The inks are oil based and should be lightfast. The plate is placed on a special press and is then rolled up with either leather or rubber rollers. Paper is then placed on the print and is run through the press by hand. Like many other printing processes, one colour at a time is printed. Usually, one colour is printed per day. So a print that is built up of ten colours would take the master printer ten days to print. Lithography is a very versatile printing technique and artists can get the medium to suit the needs of their particular style. It can be subtle with many layers of washes or it can look like a pencil drawing with strong lines that pick up the texture of the drawing tool and the "tooth" of the plate. It can have large areas of flat colour or else areas can be "scratched" into. With a skilled master printer to guide the artist almost any effect is possible. The chemicals used in processing are relatively harmless and pose no threat to the artist. Offset lithography, although evolving from the same chemical processes as hand done version, is a separate and distinctly different process. Offset printing is the technique used in industry for printing books, magazines etc. It needs complicated machinery and equipment and is only used by artists to do reproductions of their work. When buying prints one should be aware that dealers and artists often refer to prints as original lithographs when they are in fact reproductions of artwork that are printed in the same way that posters and magazines are printed. These prints are not hand printed and they usually involve none or very little collaboration between the printer and the artist. They are often printed with inferior inks on inferior paper and will not have much of an investment value. When buying prints from someone you do not know well, it is always a good idea to ask for a copy of the documentation sheet. The documentation sheet will provide you with all the information that you will need to assure you of the integrity of the print that you are investing in. If the artist or seller is unable to provide a documentation sheet then it is probably not worth buying the print. To see what information should be supplied by documentation sheet please refer to an example of a documentation sheet.

**Chapter 7 : Tamarind Institute of Lithography | About Us: What Is Lithography?**

*Offset lithography, although evolving from the same chemical processes as hand done version, is a separate and distinctly different process. Offset printing is the technique used in industry for printing books, magazines etc.*

For instance, the positive part of an image is a water-repelling " hydrophobic " substance, while the negative image would be water-retaining " hydrophilic ". Thus, when the plate is introduced to a compatible printing ink and water mixture, the ink will adhere to the positive image and the water will clean the negative image. This allows a flat print plate to be used, enabling much longer and more detailed print runs than the older physical methods of printing e. Lithography was invented by Alois Senefelder [1] in the Kingdom of Bavaria in In the early days of lithography, a smooth piece of limestone was used hence the name "lithography": After the oil-based image was put on the surface, a solution of gum arabic in water was applied, the gum sticking only to the non-oily surface. During printing, water adhered to the gum arabic surfaces and was repelled by the oily parts, while the oily ink used for printing did the opposite. Lithography on limestone[ edit ] Lithography stone and mirror image print of a map of Munich Lithography works because of the mutual repulsion of oil and water. The image is drawn on the surface of the print plate with a fat or oil-based medium hydrophobic such as a wax crayon, which may be pigmented to make the drawing visible. A wide range of oil-based media is available, but the durability of the image on the stone depends on the lipid content of the material being used, and its ability to withstand water and acid. After the drawing of the image, an aqueous solution of gum arabic , weakly acidified with nitric acid  $\text{HNO}_3$  is applied to the stone. The function of this solution is to create a hydrophilic layer of calcium nitrate salt,  $\text{Ca(NO}_3)_2$ , and gum arabic on all non-image surfaces. Using lithographic turpentine , the printer then removes any excess of the greasy drawing material, but a hydrophobic molecular film of it remains tightly bonded to the surface of the stone, rejecting the gum arabic and water, but ready to accept the oily ink. Naturally the water is attracted to the layer of gum and salt created by the acid wash. Printing ink based on drying oils such as linseed oil and varnish loaded with pigment is then rolled over the surface. The water repels the greasy ink but the hydrophobic areas left by the original drawing material accept it. When the hydrophobic image is loaded with ink, the stone and paper are run through a press that applies even pressure over the surface, transferring the ink to the paper and off the stone. Senefelder had experimented during the early 19th century with multicolor lithography; in his book, he predicted that the process would eventually be perfected and used to reproduce paintings. The main challenge was to keep the images aligned in register. This method lent itself to images consisting of large areas of flat color, and resulted in the characteristic poster designs of this period. It was a quick, cheap process and had been used to print British army maps during the Peninsula War. Most of the commercial maps of the second half of the 19th century were lithographed and unattractive, though accurate enough. Most books, indeed all types of high-volume text, are now printed using offset lithography. For offset lithography, which depends on photographic processes, flexible aluminum, polyester, mylar or paper printing plates are used instead of stone tablets. Modern printing plates have a brushed or roughened texture and are covered with a photosensitive emulsion. A photographic negative of the desired image is placed in contact with the emulsion and the plate is exposed to ultraviolet light. After development, the emulsion shows a reverse of the negative image, which is thus a duplicate of the original positive image. The image on the plate emulsion can also be created by direct laser imaging in a CTP Computer-To-Plate device known as a platesetter. The positive image is the emulsion that remains after imaging. Non-image portions of the emulsion have traditionally been removed by a chemical process, though in recent times plates have come available that do not require such processing. Lithography press for printing maps in Munich Lithography machine in Bibliotheca Alexandrina The plate is affixed to a cylinder on a printing press. Dampening rollers apply water, which covers the blank portions of the plate but is repelled by the emulsion of the image area. Hydrophobic ink, which is repelled by the water and only adheres to the emulsion of the image area, is then applied by the inking rollers. If this image were transferred directly to paper, it would create a mirror-type image and the paper would become too wet. Instead, the plate rolls against a cylinder covered with a rubber blanket, which squeezes away the water, picks

up the ink and transfers it to the paper with uniform pressure. The paper passes between the blanket cylinder and a counter-pressure or impression cylinder and the image is transferred to the paper. Because the image is first transferred, or offset to the rubber blanket cylinder, this reproduction method is known as offset lithography or offset printing. Another innovation was the continuous dampening system first introduced by Dahlgren, instead of the old method conventional dampening which is still used on older presses, using rollers covered with molleton cloth that absorbs the water. This increased control of the water flow to the plate and allowed for better ink and water balance. Current dampening systems include a "delta effect or vario," which slows the roller in contact with the plate, thus creating a sweeping movement over the ink image to clean impurities known as "hickies".

Archive of lithographic stones in Munich

The process of lithography printing is illustrated by this simplified diagram. This press is also called an ink pyramid because the ink is transferred through several layers of rollers with different purposes. The advent of desktop publishing made it possible for type and images to be modified easily on personal computers for eventual printing by desktop or commercial presses. The development of digital imagesetters enabled print shops to produce negatives for platemaking directly from digital input, skipping the intermediate step of photographing an actual page layout. The development of the digital platesetter during the late 20th century eliminated film negatives altogether by exposing printing plates directly from digital input, a process known as computer to plate printing.

**Microolithography and nanolithography**[ edit ] Main article: Photolithography

Microolithography and nanolithography refer specifically to lithographic patterning methods capable of structuring material on a fine scale. Typically, features smaller than 10 micrometers are considered microlithographic, and features smaller than nanometers are considered nanolithographic. Photolithography is one of these methods, often applied to semiconductor manufacturing of microchips. Photolithography is also commonly used for fabricating microelectromechanical systems MEMS devices. Photolithography generally uses a pre-fabricated photomask or reticle as a master from which the final pattern is derived. Although photolithographic technology is the most commercially advanced form of nanolithography, other techniques are also used. Some, for example electron beam lithography , are capable of much greater patterning resolution sometimes as small as a few nanometers. Electron beam lithography is also important commercially, primarily for its use in the manufacture of photomasks. Electron beam lithography as it is usually practiced is a form of maskless lithography , in that a mask is not required to generate the final pattern. Instead, the final pattern is created directly from a digital representation on a computer, by controlling an electron beam as it scans across a resist-coated substrate. Electron beam lithography has the disadvantage of being much slower than photolithography. In addition to these commercially well-established techniques, a large number of promising microlithographic and nanolithographic technologies exist or are being developed, including nanoimprint lithography , interference lithography , X-ray lithography , extreme ultraviolet lithography , magnetolithography and scanning probe lithography. Some of these new techniques have been used successfully for small-scale commercial and important research applications. Surface-charge lithography, in fact Plasma desorption mass spectrometry can be directly patterned on polar dielectric crystals via pyroelectric effect, [13]

Diffraction lithography. Germany was the main center of production in this period. Goya in Bordeaux produced his last series of prints by lithographyâ€™The Bulls of Bordeaux of By the mid-century the initial enthusiasm had somewhat diminished in both countries, although the use of lithography was increasingly favored for commercial applications, which included the prints of Daumier , published in newspapers. In the publisher Cadart tried to initiate a portfolio of lithographs by various artists, which was not successful but included several prints by Manet. The revival began during the s, especially in France with artists such as Odilon Redon , Henri Fantin-Latour and Degas producing much of their work in this manner. The need for strictly limited editions to maintain the price had now been realized, and the medium became more accepted. By the medium in both color and monotone was an accepted part of printmaking. Mourlot encouraged the painters to work directly on lithographic stones in order to create original artworks that could then be executed under the direction of master printers in small editions. Escher is considered a master of lithography, and many of his prints were created using this process. More than other printmaking techniques, printmakers in lithography still largely depend on access to good printers , and the development of the medium

has been greatly influenced by when and where these have been established. List of printmakers As a special form of lithography, the serilith process is sometimes used. Seriliths are mixed media original prints created in a process in which an artist uses the lithograph and serigraph processes. The separations for both processes are hand-drawn by the artist. The serilith technique is used primarily to create fine art limited print editions. An lithograph of Mexican women making tortillas by Carl Nebel. An example of a 19th-century lithograph depicting royal Afghan soldiers of the Durrani Empire in Afghanistan.

## Chapter 8 : Lithography | Definition of Lithography by Merriam-Webster

*fine art lithography is a printing process in which artists use greasy drawing materials to make original images on stones and/or metal plates. At Tamarind, a lithograph is an original image created by an artist who works closely with a master printer.*

Lithography is a beautiful artistic medium in itself, and should not be judged on its ability to imitate. As the technologies of printing become more and more sophisticated, the confusion surrounding "fine art" lithography escalates. The techniques of lithography are numerous and, to the uninitiated, can be complicated. Our intent here is not to teach lithography, but rather to present a guide for the collector of contemporary lithographs. Artist Steve Holzer working on his "Shapes of Love" lithograph with a variety of grease-based drawing tools. Above him is a working proof by which he gauges the changes being made. One of the pitfalls of our exquisite technology is that almost anything can be reproduced, and some reproductions are virtually indistinguishable from the original. In this environment, original hand-pulled lithography tends to be misunderstood and misrepresented. Often, the art buyer judges a lithograph by how much it looks like a painting rather than on its unique lithographic qualities. Reproduction circumvents that aesthetic by removing the artist several steps from the production of the piece. Further, the intention of reproduction often is to make a print look like a painting. The intent of a lithograph is to let the artist speak through the stone. The artist-as-printer has an intimate relationship with the tools of lithography—the inks, the stones or plates, the sticks and brushes. That relationship is no less subjective than that of a painter to his canvas, paints and brushes. Lithography is a beautiful artistic medium in itself, and should not be judged on its ability to imitate another medium.

**Original stone lithographs** Hand drawn by the artist on limestone or marble. Each stone is used to print one color. The best stones, which are Bavarian limestone, are grey in color and have a clear complexion free of fossils and other flaws. These stones are becoming increasingly rare. After the edition the number of impressions made is hand-printed, each impression is signed and numbered by the artist, and the mark, or chop, of the printer is embossed on each print. Imperfect impressions are destroyed, the stones and plates are effaced, and each edition is carefully documented. This is the oldest lithographic technique, and still the best.

**Original plate lithographs** Hand drawn by the artist on aluminum plates. Plates are cheaper than stones, readily available and easier to transport. These factors make plate lithography a popular alternative to stone lithography for the creation of original prints.

**Mylar plate lithographs** The artist draws on a mylar sheet. The information is transferred to a photosensitive lithographic plate. The plate is printed in a manner similar to original plate lithography.

**Lithographic reproductions** The artist produces an original artwork in any medium. The original artwork is photographed. A color separation is produced from the photograph. The information from the color separation is transferred to photosensitive lithographic plates. Each plate is printed individually. Reproduction prints are usually called posters.

**Offset print** Any lithograph mechanically printed using an offset press. With an offset press, the ink from the plate is transferred to a rubber blanket, and from that blanket onto paper. However, with a direct or hand press, the ink is transferred directly from the plate or stone onto the paper.

**Limited edition** There will never be more prints produced than is signified on the documentation.

**Unlimited edition** Prints will be produced as long as there are people to buy them.

**Documentation** A document which describes how a print was created, which lithographic processes were used, who drew the plates, where and when the print was made, and how many prints are in the edition. Was the intent to use lithography to create an original work of art, or was the intent to reproduce an existing image? An original print may be created in this manner, but whose signature belongs on it? How large is the edition and is it thoroughly documented? Beautiful reproductions are available. It should be remembered however, that the more directly involved the artist is, the more valuable the piece.

Art and Techniques, Garo Z. Antreasian and Clinton Adams. Both books are published by Harry N. Abrams, Inc, New York.

### Chapter 9 : Art Prints | Artwork | Shutterfly

*Limited by Saatchi Art is a new way to buy curated, ready-to-hang limited edition prints that allow you to tell a story that is uniquely yours. Discover art prints by some of the world's most exciting emerging artists, featuring a variety of subjects and styles including abstract, street art, landscape, beaches, portraits, and more.*

The plate is then soaked in acid which eats into the areas exposed by the drawing to produce an image. Intaglio uses the opposite process to woodcuts, in that the raised portions remain blank while the grooves or crevices are inked. In this process, the entire matrix surface is involved, but some areas are treated to retain the ink. The best known example is lithography, during which the design is drawn onto the matrix stone with a greasy crayon. Ink is then applied to the whole surface, but adheres only to the grease marks of the drawing. Other surface printing methods include stencil printmaking - where the image or design is cut out and then printed by spraying ink or paint through the stencil. The planographic technique is also used for monotyping, digital prints, screen-printing and pochoir. The most famous exponent of this form of printmaking - in his case, screenprints - was Andy Warhol. Stencils Another print method is stencil-printing, from which silkscreen printing serigraphy is derived. In this process, a design is drawn directly onto the screen, and undrawn areas sealed with glue or varnish. Oil-based ink is then squeezed through the mesh of the silk screen onto paper. Alternative methods of transferring an image to silkscreen are the use of photo stencils. Andy Warhol popularized these techniques in his multiple portraits of celebrities. Contemporary printmakers often use a combination of conventional and digital techniques as well as the use of digital printers and photographic equipment. The latest type of digital fine art printmaking is Giclee Prints. For details of other graphic arts, such as fine art photography, read about the Greatest Photographers c. History Following its invention by Chinese art many centuries previously, fine art printmaking became established during the German Renaissance, during the early period of the Northern Renaissance. Technical and artistic developments which paved the way for new types of fine print, included the following. The invention of the screw printing press in 1467, by the German Johann Gutenberg, along with an oil-based ink, metal prism matrices, punch-stamped typeface molds and a functional metal alloy to mold the type. Then, after Jules Cheret invented his "three stone chromolithographic process", poster art suddenly became high fashion, especially in France, making low-cost colour posters a reality. Japonism and the arrival of colourful Japanese Ukiyo-e woodblock prints, plus the emergence of the Czech lithographer Alphonse Mucha gave a huge boost to Belle Epoque Art Nouveau chromolithography, as the functionalist designer Leonetto Cappiello did for poster art in the years 1900-1910. History of Poster Art. Twentieth Century Printmakers Pablo Picasso was the supreme exponent of contemporary graphic art. He produced over 1,000 prints, including etchings, engravings, drypoints, woodcuts, lithographs and linoleum cuts. Georges Braque produced numerous Cubist etchings, while Henri Matisse created a large number of lithographs as well as several outstanding line etchings and cutout prints. Marc Chagall produced a significant body of graphic art including illustrations of the Bible. The witty colour etchings of Joan Miro, as well as the collage prints of Max Ernst were also highly influential. In Britain, Henry Moore, and Graham Sutherland, as well as David Hockney, produced a wide range of printworks, while in the United States many members of the Pop-Art movement became active in printmaking. Examples of the latter, together with their specialities, are: Irish Printmakers The 18th century artist James Malton c. Other exponents of printmaking and graphic art in Ireland include: