

Glossary of digital imaging terms

Aliasing

When a non-digital image has to be represented in a digital form, the process splits continuous entities (such as greyscale images, shapes) into discontinuous, 'boxed' or 'pixellated' ones, where the value for each cell is recorded at a definite numerically pegged level. This involves rounding recorded values up or down in the case of any individual image cell.

Where the resolution of this bit-map is poor, the digital image is a degraded over-simplification of the original analogue form of the image.

Alpha channel

In raster graphics (graphic images made up of pixels), an alpha channel is an extra channel of pixels which does not contribute colour data but is used for some editing purpose, e.g. to indicate a degree of transparency for each pixel, or to mediate the degree to which an editing command is applied to each pixel. May also be referred to as a 'mask'.

Anti-aliasing

Any strategy for improving the appearance of the digital display of an analogue form, getting around problems of aliasing. Instead of drastically rounding a marginal pixel in an image to black or white, it can be rendered at an appropriate level of grey.

Anti-aliasing is practical for continuous-tone printing devices such as colour laser printers, film recorders & dye-sublimation printers is used on computer screens. It is also used to improve the appearance of type on low-resolution displays such as computer screens and televisions, and to integrate type into raster images such as scanned photos and video programmes.

Bandwidth

An expression which describes the volume of digital data that can be transferred across a communication channel, and usually expressed in 'bits per second'. The fastest modem connections have a theoretical bandwidth of 56 thousand bits per second (56kbps), though in reality the data transfer rate is often slower.

At the other extreme, Gigabyte Ethernet is a system used in very fast local area networks inside a company or on a university campus, capable of a theoretical rate of transfer of a thousand million bits per second.

Bézier curve

A cubic equation curve, expressed as four points in co-ordinate space – a method for describing cubic curves discovered by Paul Etienne Bézier in the 1960s and used for car-body modelling at Regie Renault Autos where he was employed.

In the 1970s and 1980s, Bézier curves became popular tools for constructing curves in computer graphics systems. John Warnock, one of the founders of Adobe Systems, developed their use for defining the shape of letterforms. A number of illustration programs such as Macromedia Freehand, Adobe Illustrator and Corel DRAW use Bézier curves as one of the fundamental 'graphics primitives', and they are also used to define **clipping paths** for photographs e.g. in Photoshop software.

Bit

Short for '**Binary Digit**'—the fundamental unit of record-keeping in a computer. The binary numbering system uses base-two notation, so only two kinds of digit are needed, **1** and **0**. These can be represented by **on** and **off** states.

Bit-map:

Strictly-speaking, a bit-map is an image that consists of a two-dimensional array of pixels switched to 'on' or 'off' (black/white) and stored in digital form. So called because a single binary digit (bit) is all that is needed to store the state of a pixel than can only be black or white but nothing in between.

BMP

The Windows Bitmap file format, an unsophisticated and badly-named data format from Microsoft for pixel-based images. BMP files may be greyscale or in RGB colour, but not in CMYK colour.

Broadband

A word used to designate data communication channels with high bandwidth. In practice, this usually means the moderately fast connections used by businesses, schools and libraries, or available to home subscribers who want to use the Internet at higher connection speeds than can be achieved with a modem.

Browser

Any software program the function of which is to let a user explore a hyperlinked environment, following the links and reading, watching or listening to the content.

The most common form of browser is a **Web browser** such as Netscape Communicator or Microsoft Internet Explorer, used for looking at Web sites.

Some picture library software is available in cut-down form as a browser which you are allowed to send free to other people, so they can look at image collections you have created.

Byte

A byte is an eight-digit binary number, such as **00010010** or **10100011**. A byte can represent a block of data such as an alphanumeric character, but in digital imaging a byte typically represents the value of a pixel along a range of values from zero to 255. For example, in a greyscale image, zero will represent black, 255 will represent white, and the numbers in between represent various shades of grey.

Computer memory capacity is measured in multiples of bytes e.g. **kilobyte** and **megabyte**. There are 1024 bytes in a kilobyte, 1024 kilobytes in a megabyte. (The next two levels up are **gigabyte** and **terabyte**.)

C47

The most common photographic process for colour negative films, as used by hundreds of thousands of commercial minilabs and laboratories worldwide. There are also some 'chromogenic' monochrome films which use the process, for example Ilford XP2.

CCD (Charge Coupled Device)

An economical form of solid-state light sensor, in which light falling on the sensor generates an electrostatic charge which is then 'read' from the sensor and converted to numerical data that can be passed to a computer. Linear arrays of CCD are used in image scanners, and two-dimensional arrays are used in video cameras and digital still cameras.

Clipping path

In digital photographs, a clipping path is a shape, constructed with **Bézier curves**, which suppresses the display and printing of the parts of the photograph that lie outside of the path. It is used in publishing systems e.g. for newspapers to make it possible to print photos with irregular outlines, such as a cut-out figure against a page background.

In Adobe Photoshop, clipping paths are created with the pen tool.

CMYK

Cyan–Magenta–Yellow–Keyline (black): four pigment colours which are used in the **process-colour** printing technique to simulate or represent a wide palette of different colours.

Colorimeter

A colour measuring device which measures the light coming from a computer monitor through a series of filters, and comes up with a definition of a **colour profile** for that monitor. Used in colour management systems.

ColorSync

System-level software from Apple Computer which provides colour management services to Macintosh workstations.

Colour correction

Alterations to colour values of a photo or illustration, in the course of preparing it for print. Methods used in the past included duplicate photography using filters, adjusting the scanner settings or dry dot etching; these days, the colour values in the image are manipulated electronically in a program such as Photoshop.

Colour management

The process of managing how colour images appear as they move through a publishing production system. The ideal is that e.g. a scanned image should be true to the colours in the original photo; that the representation on screen should look the same; and that the output either to a proofing printer or through the final press should also look the same. Usually this is not possible because the different components have different colour range display possibilities (gamuts), so a Colour Management System will try to give the operator control over how the colours are transformed as they move from one situation to another.

Colour management system

Loosely, all the components (hardware and software) of a system which attempts to provide colour management, including calibration instruments etc. In a more limited sense, a CMS usually means the core software technology which operates at the level of a computer's operating system to provide colour management capabilities to other software running on that system. The best known examples of such a CMS are Apple's ColorSync, and Windows' ICM.

Colour profile

In colour management, a 'colour profile' is a data file which defines how a colour device represents colour: for example a scanner, a computer monitor or a colour printer. Colour profiles may be discovered by using an appropriate measuring instrument (a colorimeter or spectrophotometer), and then can be used within a colour management system to manage how the colour definitions are transformed to achieve constancy of colour display as much as is possible.

Colour separation

The process of converting a full-colour image into four separations for four-colour print, or more separations e.g. in High Fidelity Colour printing.

CompactFlash

One of the standard flash-memory data card types, used to store images inside digital cameras. Other standards include SmartMedia, and Sony's Memory Stick format.

Content management

A somewhat vague term which has come to describe the process of storing and indexing and keeping track of component media files within a publishing project – or files that are being archived in case they may be useful for some future publishing project. A content management system is essentially built around a database which manages the media assets and associated them with various kinds of metadata by means of which they can be searched for, retrieved, checked in and out of workflows, etc.

Picture library software is one example of a content management system.

Continuous tone

Refers to an image with tones that range between white and black (for instance, a photograph or painting as opposed to a line drawing). With the exception of collotype, all printing processes require a continuous tone image to undergo screening before it can be reproduced.

Crop

(v.) To choose and/or indicate the section of a photograph to be reproduced.

Cyan

A light blue colour, one of the four in the four-colour process; usually applied as the first run in the sequence.

Densitometer

A light-sensitive instrument for measuring density. In process photography, a reflection densitometer is used to assess the range of densities in a photograph. A printer may use an integrating densitometer (one that averages the readings from the light and dark parts of a sample area) to check on the ink density being laid down, and the growth through dot gain of the halftone dot structures—important in four-colour printing.

Digital

Any representation of data in the form of numbers; often contrasted with analogue.

Digital camera

A photographic camera in which the role played by film in a traditional camera is replaced by a **CCD** array and some form of computer memory.

Digital camera back

A CCD array which can be fitted to a conventional camera to convert it into a digital camera. Such camera backs are manufactured for use with medium-format cameras such as Mamiya RB and Hasselblad cameras, or with large-format cameras such as the Sinar series. These systems capture considerably more detailed images than standard digital cameras, and are used e.g. in fashion and catalogue and product photography and in museum and library digitization projects.

Digital press

A printing device which does not have the master image for reproduction in physical form e.g. as a plate or stencil or cylinder, but rather as a digitally-stored representation which is imaged onto the pages fresh each time, generally using laser printing, ink-jet or ion-deposition printing technologies.

Digitization

Any progress or programme of activity that is aimed at converting an analogue resource into a digital one. For example, a photograph or negative may be scanned to digitize it; a museum artefact may be digitized with a digital camera.

The term can also be applied to other media. Videos and films may be digitized to make them editable on computer equipment; sound recordings are digitized for editing or for distribution on CDs or via Internet.

Dot gain

As the halftone image is passed through successive stages in the printing process, it tends to grow—partly due to compression of the blanket, or absorption into paper; even more due to internal reflection of light within the very top layers of the paper, increasing the *apparent* size of printed dots. This leads to darker images, especially in midtone areas, but can and should be compensated for when the photo is being screened or scanned.

dpi

Dots per inch, a measurement of the resolution of a digital printing device such as a laser printer or ink-jet printer. See **resolution** for a fuller explanation.

Dublin Core

A standard set of metadata fields commonly used in librarianship and content management systems, to record essential data about publications e.g. author, date of publication. So called because the initial definitions were established at a conference held in Dublin, Ohio (USA).

Duotone

A halftone image printed from two plates, usually black plus a second colour but sometimes two black plates or two colour plates. The original is screened differently for each of the plates; the superimposed images give a better separation of tonal values than is generally possible in halftone screening, and the 'tinted' effect of any second colour used adds atmosphere.

Dye sublimation

A printing method in which colour dyes held in a roll of donor material are heated, and turn directly from a solid to a gas (sublimation). The gas diffuses into the surface of a receptor material, paper or transparency, and solidifies there. This printing technique is one of very few in which graduated amounts of colour can be transferred without using a halftoning technique. Sometimes used as a digital proof in the printing world.

E6

A colour photographic process used in the development of many brands of colour reversal (transparency) film. E6 is the standard for commercial photography. The films can be processed in as little as one hour.

Emulsion

The light-sensitive layer coated onto one side of a photographic film. In making litho plates, the emulsion side must be in contact with the plate to ensure a sharp image.

EPS (Encapsulated PostScript)

A versatile graphic file format based on the same imaging model as Adobe's PostScript language. EPS files may include both raster and vector elements and can have font data embedded in them as well. However, because most computer operating systems cannot render PostScript data to the screen, EPS files usually contain a preview image so that DTP operators can judge how to place, crop and scale them.

EXIF

Exchangeable Image File Format is in fact not a file format but a standardised method of embedding digital camera data into a graphics file, usually a JPEG file. The EXIF data records information from the camera such as the shutter speed, aperture, flash mode used and so on. Image library applications can retrieve this data from the file so that it can become part of the database record about that image.

File format

The way in which information is arranged in a computer file containing digital media. There are hundred of different file formats e.g. for encoding images, audio, video, publications etc. File formats may be designed by a software company, or developed by a vendor-neutral committee. Example: the Tag Image File Format, or TIFF, was developed to encode various kinds of pixel-based images.

Film recorder

An output device for a computer that uses a flying beam of light to record onto photographic film. Often used to describe desktop devices which incorporate a set of filters and create an image on colour transparency film; used to generate high-quality 35mm slides for presentations. Term occasional used also to refer to the part of a phototypesetting system which exposes the film or paper.

FireWire

Apple Computer's popular name for the high-speed serial data link standard, IEEE-1394. Increasingly used as a way of connecting scanners, digital cameras, camcorders and hard disks to computers.

Flash

A program from Macromedia which is very popular with Website developers for adding animated or interactive features to Web sites. Flash movies can contain still and animated images and sound. The data is converted to the company's **Shockwave** format for Web distribution.

FM Screening

Frequency Modulated screening, also known as stochastic screening or diffusion dithering, is a method of **halftoning** that does not use a regulary-spaced pattern of halftone dots of variable size, but instead uses dots of the same size that are scattered irregularly in a pseudo-random fashion. Dots are closer together in shadow zones, further apart in the highlights. Used in many ink-jet and colour laser printers, and as a specialist technique by some offset litho printers. Claimed benefits include avoiding subject moiré in pictures of textiles, and enhanced edge detail.

Gamut

In any system which can represent colour, the gamut describes the range of colours that can be represented by that system. For example, a computer monitor has a wider gamut of possible colours than the printed page, and a system printing onto coated paper offers a wider gamut than one which prints onto newsprint.

Graphics tablet

A device for drawing with a computer. As the pen or 'puck' is moved over the surface of the tablet, its position on the tablet is recorded and the cursor on screen is moved accordingly. A tablet can be used for accurate tracings from drawings.

Grey component replacement

In colour separation, GCR is an algorithm that reduces the need to use the proportion of cyan, magenta and yellow ink in a printed image which would in any case result in a neutral grey, replacing it with an increased printing weight of black ink instead. This saves costs and makes the print job easier to dry. If applied to an extreme degree, GCR is also known as achromatic separation.

Grey-scale image

In electronic publishing, a scanned image from a continuous-tone original in which grey levels have been recorded and stored as a numeric value for each point (pixel) in the picture.

Halftone

A screened line image derived from a continuous tone original, so that levels of grey are represented by areas filled with dots of differing size; the halftone may be either positive or negative, on film, paper or other substrate. See also screening.

Hexachrome

A method for **High-fidelity colour** printing patented by Pantone, Inc. Hexachrome adds a green and an orange plate to the cyan, magenta, yellow and black plates, in order to reproduce a wider range of colours in print.

High-fidelity ('HiFi') colour

A recent term for methods of producing full colour images in print that give a more extended gamut (range) of colours than can be achieved with only cyan, magenta, yellow and black. For example, Hexachrome add a green and an orange plate.

Image database

A kind of database program which has been created to serve the needs of people with a large collection of images – some examples are iView MediaPro, Extensis Portfolio, Apple iPhoto, Thumbs Plus, Canto Cumulus.

An image database will allow the storage of thumbnail images and the addition of indexing fields, sometimes called 'metadata'. You can then search the collection using combinations of keywords and other fields.

Most low-cost image database software only works with digital image resources, but some (e.g. Portfolio) allow records to be created for physical, non-digital resources as well. Some of these database programs also support the management of other media types in the collection, for example audio and video files, and fonts.

Ink-jet printing

A non-impact printing method used for printing on soft, uneven, curved or non-absorbent surfaces, or where details require to be changed from item to item under computer control. A stream of fine electrically-charged droplets of ink are squirted from a nozzle and steered electrostatically to land as patterns of dots making readable characters or graphic symbols.

"Sell-by" dates on cans or cartons and some "personalized" insertions in sales letters are generated by ink-jet.

Desktop inkjet printers are also used as high-quality computer printers, with a resolution of up to 2000 dots per inch. The inkjet printer is the only computer printer capable of imaging several colours in a single pass.

JPEG

Joint Photographic Experts Group – the name of a committee jointly composed of CCITT and ISO technical experts who were given the task of finding a practical way of compressing digital photography for transfer over phone lines and the Internet. The system they devised works by dividing an image into blocks of 8×8 pixels, and the deviation of each pixel from the average for the block is stored as a rounded number. Because of the rounding, JPEG compression is 'lossy' – the image is degraded in the process, but the operator can determine by what degree.

JPEG-compressed files are widely used in publishing and the Internet, and JPEG compression is one way in which PDF files containing photographs are made so compact.

JPEG file

Strictly speaking, JPEG is not a file format but a compression technique, but representatives on the JPEG forum from C-Cube Systems devised a file format based on the technique, and this is what's commonly meant by 'a JPEG file'. Properly, they are JFIF files – JPEG File Image Format.

JPEG 2000

A development of the JPEG standard, using a different form of compression (wavelets).

L*a*b colour

A method of encoding the colour inside digital images, in which each pixel is defined as having a Lightness level (the 'L') part, plus a location within a two-dimensional colorant space with an a-axis (green-to-magenta) and a b-axis (blue-to-yellow). Favoured as a colour encoding model by the International Lighting Commission or CIE, it describes the widest range of possible colours, and other colour definition schemes such as RGB or CMYK can fit within the range described by L*a*b (often written simply as Lab).

Landscape format

The word refers to the rectangular shape of a photograph, sheet or book where the width is greater than the depth (see **portrait**).

Laser

The original and largely forgotten acronym stands for **Light Amplification by Stimulated Emission of Radiation**. Laser light is highly coherent, capable of being focused precisely and switched rapidly on and off under computer control. This is why laser light is so important in the graphic arts today, e.g. colour and monochrome scanning, phototypesetting, laser printing, plate making and engraving.

Laser printing

A form of electrostatic (or xerographic) printing essentially identical to plain paper photocopying, except that in lieu of an actual original, a laser beam 'writes' a pattern of text and graphics onto the electrostatically charged selenium drum under computer control. Some large laser printers can turn out over hundreds of different originals every minute; smaller ones are used as output devices for Desktop Publishing systems.

Line art

Artwork purely in black and white with no mid tones.

Line conversion

A special-effects treatment of a halftone image which converts it to a high-contrast picture with no mid-tones.

Lithography

Planographic process of printing from a flat surface based on the principle that grease and water will not mix. The image area of the plate is made to repel water and attract the greasy ink; while the non-printing areas are treated to attract water but reject ink. The plate is supplied with both ink and water. Easily the most popular process in use today. See also **offset litho**.

Lossless compression

Any technique of computer data-file compression which does not result in any loss of data or quality: the file when decompressed is identical to the file before it was compressed. Lossless compression techniques like LZW often rely on finding regular repeated patterns in the data: the pattern can be stored just once, and represented elsewhere with a short token code.

Lossy compression

In contrast to lossless compression, any technique of computer data-file compression which cannot be fully reversed – when the file is decompressed, some fidelity to the original has been lost a quality degraded. The JPEG compression method for images is lossy; in the world of digital audio, MP3 is also lossy.

LZW compression

A general-purpose method for compressing the data in a digital file, developed at Sperry Corporation by the researchers Lempl, Ziv and Welch from whose names the initials come. LZW compression is lossless; that is, when the reverse translation is performed from the compressed version, the original data is completely restored without loss.

Magenta

The pinkish-red which is one of the four used in the four-colour process; usually but not necessarily second in the sequence (yellow, magenta, cyan, black).

Mask

Any device that protects part of an image area so that a process being applied to that area is prevented from taking effect in those parts. For example, in traditional litho platemaking, masking film and tape would be applied to the film to stop the exposure lights from affecting the masked areas of the film. In digital editing systems, masking may be achieved by a path in a vector graphics system, or by an **alpha channel** in a raster graphics system.

Medium format

A term used in photography to denote the use of '120 rollfilm' photographic materials. It's called medium format because this produces slides and negatives which are larger than 35 mm film but smaller than the $4" \times 5"$ plates used in large-format photography. The 120 film is slightly larger than 6 cm across: various kinds of camera use the film to generate images 4.5×6 cm, 6×6 cm, 6×7 cm or 6×9 cm in size.

Megabyte

1,048,576 bytes—a 'binary million'.

Metadata

'Data about Data' – metadata is the data that is added to media (particularly digital media) to make it easier to catalogue and index and search for in collections. This could include date of creation, author, keywords, version... whatever is relevant in the context in which the media is being stored.

Metadata is an essential component of any content management system.

Moiré

An interference effect between dot patterns, caused by (a) using a wrong screen angle in four-colour printing or (b) making a halftone from an already screened image.

Offset litho

The full name for the printing process most commonly used today is 'offset lithography'; 'lithography' because the plates were originally of stone ('lithos' is Greek for stone) and 'offset' because the image is not printed direct from the plate, but is first offset onto a rubber-covered blanket cylinder, then offset again onto the paper.

The interposition of the blanket cylinder brought two benefits to lithography: the image on the plate could be right-reading, and the compressibility of the rubber blanket allowed a wider range of paper surfaces to be printed without resorting to either tremendous pressures or to damping the paper.]

Another rarely-used offset process is **letterset**, or offset letterpress, in which a plastic relief printing plate transfers its image to a blanket cylinder for transfer to paper. Some offset litho presses are convertible to letterset printing, the main advantage of which is that no fountain solution is required.

Optical Character Recognition

Use of a scanner to read typescripts into a computer or typesetting system, to avoid having to re-keyboard the text.

Orthochromatic

Refers to photographic materials insensitive to red light, though with good sensitivity to green and blue light.

Panchromatic

Refers to photographic films and papers which are sensitive to the complete spectrum of visible light. Usual opposite term is **orthochromatic**.

Pantone®

Trademark for a widely-used system of colour reference for the graphic arts. Each colour in the system has a reference number and describes how it can be mixed from a small stock of basic ink colours. Reference books are produced and sold by Pantone Inc., giving samples of the colours in the system printed both on coated and uncoated stock. Pantone has also licensed its system to software companies and colour-printer vendors.

PDF, Portable Document Format

A file format developed by Adobe Systems. Inc., and based on the same imaging model as their **PostScript** page description language (q.v.). Compared to PostScript, PDF files have a hierarchical structure with a well-defined index, which makes it easier to manipulate them, and there are a variety of methods for compressing the data within PDF files and ensuring that font data is embedded inside the file.

To support the creation, editing and viewing of PDF files, Adobe have introduced the Acrobat family of software products. Other companies also have tools that work with PDF files, for example to convert the colours within them or impose them for printing to litho plates.

PDF has many uses in publishing and the graphic arts: to make documents available on the web, to send adverts in to publications, to take jobs to final print.

Photoshop

The industry-standard software for working with digital images, to adjust them, convert them from one format to another, and make them into montages. Photoshop was developed in the early 1990s by Adobe Systems and remains the pre-eminent digital photo retouching and image manipulation tool.

Pixel

An individual 'picture cell' which is the smallest unit of a raster-based digital image.

PMT

PMT (photo-mechanical transfer) is a Kodak trade name for their system of diffusion-transfer graphic arts photography. A popular method in the printing industry of making very detailed copy prints of line drawings and artwork.

Portrait format

The shape of a photograph or publication where the depth is greater than the width. See also **Landscape**.

Posterization

The conversion of an image such as a photograph which originally contained a wide range of tones into one that contains a limited set of tones so that there are 'steps' between the shades in the picture. So called because photographs used to be converted thus to make posters using the screen printing process. The style was popular in the 1960s and 1970s and was associated with rock music and the hippy movement.

PostScript

The proprietary name for a Page Description Language created for the graphic arts in the early 1980s by John Warnock and Charles Geschke, and marketed by their company Adobe Systems. It is now the predominant language for interfacing desktop publishing systems to high-performance laser printers and photosetting machines.

ppi

Pixels per inch, a measurement of the resolution of a digital image. See **resolution** for a fuller explanation.

PNG

Public Network Graphics. A file format for raster images developed by Thomas Boutell and collaborators. PNG was initially intended as a replacement for GIF when it seemed that legal action by Unisys would make GIF illegal. With their advanced method for making parts of the image varying degrees of transparent, PNG is widely used in the multimedia industry for image components of screen displays.

Process camera

A large camera used in graphic arts to make large-scale photographic copies of artwork or to screen halftones, or to make the films from which printing plates will be prepared. Also known as a '**repro camera**' or '**graphic arts camera**'. Now increasingly rare, as images are handled digitally using scanners, and computers print straight out to film or plate.

Process colours

The colours used in a multi-colour printing process, printed from separate plates and superimposed to reproduce a continuous-tone, full-colour original. Normally there are four process colours: yellow, magenta, cyan (a light blue) and black. (In a printing context, black is a colour.)

Progressives

A set of proofs taken from the plates in four colour printing, showing each colour separately as well as registered in the correct sequence, i.e. yellow-magenta, then yellow-magenta-cyan, then yellow-magenta-cyan-black.

Proof

Any representation (on paper, film or screen) which simulates the printed product, allowing the customer to check for accuracy and quality.

QuickTime

QuickTime is a comprehensive system developed by Apple Computer for dealing with a wide range of digital media formats, including still images, video and music files, 360° interactive panoramas etc. The QuickTime Player for Macintosh and Windows computers can play back a wide range of media types.

RAM

Random Access Memory—the volatile memory of the computer which is used for temporary working storage of programmes and data. Contents of RAM are erased when the computer is switched off (unlike contents of ROM, q.v.).

Raster, raster image

A representation of an image as a matrix of pixels. Most digital typesetting systems produce type by running a light source such as a laser beam across the photographic paper in fine parallel lines, switching it on and off rapidly to build up a raster image. Scanned images are also rasters.

Raster Image Processor

Equipment which converts the information in a Page Description Language or typesetter driver programme into machine-specific instructions necessary to create the raster image (see above).

Reflection copy

Any original art or photography which is opaque, and should therefore be illuminated from above for photographic reproduction; as opposed to transmission copy, which is transparent or translucent and should be illuminated from below.

Register

Correct positioning of two or more colours/images relative to each other when printed on the same side of a sheet so that they fit together as intended.

Repro camera

See **process camera**.

Resolution

A term which defines the fineness or granularity of a digital image – the factor which affects how much detail the digital image can express.

When used to describe a computer screen, resolution is expressed in terms of the width and height of the display in pixels. For example, the XGA standard for computer displays is 1024 × 768 pixels.

When used to describe a digital camera, the same approach is taken. For example, the Nikon Coolpix 5700 camera has 2560 × 1920 pixels. Sometimes resolution for cameras is described by reporting the appropriate total number of pixels (for the Coolpix 5700, 5 million pixels or '**5 megapixels**').

However, for scanned images, the resolution is not defined as the total number of pixels, but how many of those pixels lie within a linear measurement such as an inch or centimetre. For example, scanned photos are often used in publishing at a resolution of 300 pixels per inch, or 300 **ppi**.

Resolution may also be used as a term to express the sharpness of a printing device. For example, an ink-jet printer might have a resolution of 1200 dots per inch, or 1200 **dpi**.

Reverse

Inverting the black/white image relationship without affecting the direction it faces, to produce a negative version of the image. For example, a boxed heading which otherwise would be reproduced as black or coloured type in a ruled box can be reversed out, so that white or coloured type shows from a solid black surround. The effect can be done by the printer at the negative stage, or a reversal diffusion transfer print can be mounted on the artwork.

RGB

Red–Green–Blue: the three additive primary colours which are used to generate the illusion of a full range of colours on a computer or TV screen. Also, digital cameras and scanners typically analyse original images and views through red, green and blue filters, and RGB encoding is the commonest way to store the data about the colour of pixels within a scanned image or digital photograph.

RIP

short for **Raster Image Processor**.

ROM

Read Only Memory, a permanent and unalterable area of memory resident on ROM chips. This must include certain basic elements of the operating system, enough so that the machine can 'boot' from a system disk. ROM could also contain programmes and resources—thus the LaserWriter ROM chips include the PostScript interpreter programme and all the fonts required.

Scanner

Any device in the graphic arts which 'reads' the surface of an original image one section at a time and converts it either into a second, derivative image or (more usually these days) a stored electronic record of the image. Modern scanners are digital, converting measurements of the original to a signal of coded numbers which can be manipulated by computers.

Flatbed scanners are the most common type, used for scanning prints and pictures. There are also specialist **transparency scanners** which have higher resolution and lighting systems to scan from photographic slides or negatives. **Drum scanners** are the most expensive type, used by printing companies to scan either flat prints or transparencies with a highly sensitive and accurate photo-multiplier tube sensor.

Screen

(v.) To convert a continuous tone original, such as a black-and-white photograph, into a high-contrast bitmapped image which simulates the range of tones in the original by means of regularly-spaced dots of varying size. This conversion is essential if a photograph is to be reproduced in print.

Screen printing

A printing process, also known as serigraphy, based on the stencil principle. Stencils, prepared by hand or photographically, are attached to screens (originally of silk, now more commonly polyester); ink is forced by a manually or mechanically operated squeegee through the gaps in the stencil down to the substrate below. Fine quality printing is possible using this process, onto almost any surface: metal, glass, wood, textiles, ceramics, plastic, leather as well as paper and board.

Another benefit of screen printing is the cheapness of printing short runs of large areas (e.g. billboard posters); the main disadvantage is that it is slow and labour-intensive.

Screened print

A photographic paper print which has been made by screening a continuous-tone image; a halftone print.

Screen ruling

An expression which defines the fineness of the dot pattern used to represent a continuous-tone image in print as a halftone. For reasons to do with a now extinct method of making halftones, this is measured in 'lines per inch'. Newspapers use a coarser screen ruling of about 100 lpi, and glossy publications use about 180 lpi.

Separations

Artwork or films which correspond to different coloured images which will be combined together at the printing stage in the form of multi-coloured printing. For example, publications containing colour photographs are separated into cyan, magenta, yellow and black component originals for full colour printing.

Server

A server is a computer on a network, endowed with generous storage capacity, the job of which is to service the requirements of other computers on the network.

A **file server** is simply a shared file repository, rather like a shared hard disk. However, a server may have a more active role as the result of software installed on it – for example a **Web server** makes Web pages accessible to computers connected to it, and a **database server** lets a whole number of simultaneous users update, search for and access information in a database.

Shockwave

Shockwave is a family of data formats developed by Macromedia so that interactive and animated programs developed with the company's Flash and Director software can be viewed and listened to on the Web. Shockwave movies are efficiently compressed and can often start to play before all of the file has been transferred.

Show through

Impression on one side of a printed sheet that is visible on the other, due to poor opacity of the paper stock. Similar in appearance but different in cause is strike-through, the result of paper absorbing ink and conducting it through the fibres to the other side; this may also be caused by poor choice of paper, but may also be a problem with the ink.

SmartMedia

One type of flash memory data storage card, used to store images inside digital cameras. Other types include CompactFlash and Sony's Memory Stick formats.

Spectrophotometer

A measuring instrument for determining the colour of an object or sample which uses a prism or diffraction grating to split the incoming coloured light into a range of samples spread across the entire visible spectrum at regular intervals (e.g. ten nanometres of wavelength).

Spectrophotometers are used in publishing to get the most accurate possible measurement of printed samples of output. In colour management, this is often done to establish the colour profile of an output device – data which can be used to predict how colour will change as an image moves from one environment to another.

Spot colour

A single colour used on its own in areas where register is not critical, e.g. as a background solid or for a headline or title to liven up an all-black page.

Stochastic screening

See **Frequency-modulated screening**.

Strikethrough

If an ink is formulated with too thin a medium for the paper it is being printed on, it may migrate through the fibres and discolour the further side—this is strikethrough.

TIFF (Tag Image File Format)

A graphic file format, or family of related formats, used in the graphic arts to encode and store digital raster images. There are varieties of TIFF file for bit-maps, greyscale raster images, and colour images encoded in **RGB**, **L*a*b** or **CMYK** colour modes, as well as in special custom limited palettes of colours ('indexed colour'). A standards committee chaired currently by Adobe Systems develops and defines TIFF formats.

Tint

Shading in the form of an even pattern of small dots or thin lines too fine to be readily identified as such. Coarse tints may be produced on artwork by the application of adhesive-backed shading films: Letratone, Normatone, Zipatone. Today, tints are routinely generated by computer-based page make-up and illustration systems.

Unsharp masking

A confusing term for a computer algorithm which actually makes a scanned image appear a little sharper by modifying the brightness and contrast values of the pixels that lie along the edges of objects in the image.

USB

Universal Serial Bus, a popular standard for plugs and sockets for connecting peripherals to a computer, such as keyboards and mice, digital cameras, scanners and ink-jet printers.

Vignette

A fading away of tone at the edges of a photograph.

Vector graphics

Strategy for describing a shape in computer terms as an outline of straight lines between points in co-ordinate space. Vector-described type and images can be re-sized freely without degrading in image quality, unlike raster images which give a rougher, 'pixellated' appearance if they are enlarged too much.

Wavelets

A compression technique for photographs and other scanned images in which the data that describes the image is arranged so that the earlier parts of the data describe the image at low fidelity, while later 'waves' of data refine the quality of the image description.

The advantage of wavelet technology is that the system that is used to view the image needs only import as much data as is appropriate to the level to which the image is zoomed on screen. For example, a map of an entire county will display quickly at low resolution, and when the viewer zooms in on that part of a map which displays a single village, only that section of the map data will be retrieved, but at a higher level of detail.

XML

The eXtensible Markup Language, a modernised variant of the Standard Generalised Markup Language, SGML. Like SGML, XML lets you define your own elements out of which a document will be built up, but the syntax rules are much stricter so that it is easier to write programs that will reliably manipulate it. XML is often used as a way of storing data in content management systems e.g. as used in catalogue publishing or to drive dynamic web sites.

XMP

The Extensible Metadata Protocol, a method proposed by Adobe Systems for embedding metadata in a file so that the information can be retrieved and used by workflow and content management systems. Latest versions of Adobe's own programs such as Photoshop and FrameMaker support XMP in their file structures. The scheme is 'extensible' because an organization would be able to customise the fields to suit its own business model and requirements.

ZIP

A method of compressing files, especially on Windows computers, so that they can be sent more quickly over data lines or take up less space in an archive.