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Chapter 1 : Color and Its Reproduction

This third edition of Color and Its Reproduction: Fundamentals for the Digital Imaging and Printing Industrypresents an updated treatment of the concepts and technologies related to the processes of how we define, produce, and evaluate color reproduction quality.

Angiosperms are types of plants that bear fruits and flowers. Flowers are usually both male and female, and are brightly colored to attract insects to help them carry pollen used for sexual reproduction. Not all flowers are colorful, though. These flowers usually use the wind for pollination. Parts of the Flower The receptacle is the part of the branch on which a flower forms. Color the receptacle B brown. Sepals are leaf like structures that surround and protect the flower before it blooms. Color the sepals C green. Petals are the colorful part of the flower that attracts insects and even other small animals, such as mice, birds, and bats. Color the petals D a bright color of your choice. All flowering plants have flowers, but some are not brightly colored. The petals of these flowers are reduced or absent and the plant relies on the wind or water for pollination. The flower has both male and female reproductive parts. The female reproductive structures are called carpels. In most flowers, the carpels are fused together to form a pistil. Color the pistil P pink. The pistil has three parts, which can be seen, in the box labeled "pistil". The stigma at the top is often sticky and is where the pollen attaches. Color the stigma J purple. The style is the long tube that attaches the stigma to the ovary. Sperm from the pollen will travel down this tube to the ovules. The ovules, or eggs, are stored in the ovary until they are fertilized. Plants can only fertilize eggs of the same species. Special chemicals prevent sperm from fertilizing the eggs of flowers that are not the same kind. Color the style K red, and the ovary L pink. Color the ovules O black. The male reproductive structures are called the stamens. Color the stamens H blue. Each stamen consists of an anther A , which produces pollen, and a filament F , which supports the anther. In the box labeled "stamen" color the anther dark blue, and the filament light blue. Pollen produced by the anther is carried by insects or other animals to the pistil of another flower where it may fertilize the eggs. Plant Reproduction Sexual reproduction in plants occurs when the pollen from an anther is transferred to the stigma. Plants can fertilize themselves: Self-fertilization occurs when the pollen from an anther fertilizes the eggs on the same flower. Cross-fertilization occurs when the pollen is transferred to the stigma of an entirely different plant. When the ovules are fertilized, they will develop into seeds. The petals of the flower fall off leaving only the ovary behind, which will develop into a fruit. There are many different kinds of fruits, including apples and oranges and peaches. A fruit is any structure that encloses and protects a seed, so fruits are also "helicopters" and acorns, and bean pods. When you eat a fruit, you are actually eating the ovary of the flower. What is an angiosperm? The flower attaches to what part of the plant? Why are flowers brightly colored? Name two mammals that might pollinate a plant. If the petals of a flower are reduced or absent, how is the plant pollinated? The female reproductive structures are called the: Name the three parts of the pistil: Where are the ovules stored? Name the two parts of the stamen: Describe sexual reproduction in plants. The ovary develops into what structure? Some flowers are not brightly colored at all, but have a very pungent odor that smells like rotting meat. How do you think these flowers are pollinated? In many flowers, the pistils and stamens reach maturity at different times. Considering what you know about pollination, why would this be an advantage to the plant?

Chapter 2 : Flower Structure and Reproduction

Color and Its Reproduction Gary G. Field. A comprehensive guide to color concepts and practices This third edition of Color and Its Reproduction: Fundamentals for the Digital Imaging and Printing Industry presents an updated treatment of the concepts and technologies related to the processes of how we define, produce, and evaluate color reproduction quality.

Macias Plant reproduction is the process by which plants generate new individuals, or offspring. Reproduction is either sexual or asexual. Sexual reproduction is the formation of offspring by the fusion of gametes. Asexual reproduction is the formation of offspring without the fusion of gametes. Sexual reproduction results in offspring genetically different from the parents. Asexual offspring are genetically identical except for mutation. In higher plants, offspring are packaged in a protective seed, which can be long lived and can disperse the offspring some distance from the parents. In flowering plants angiosperms , the seed itself is contained inside a fruit, which may protect the developing seeds and aid in their dispersal. Sexual Reproduction in Angiosperms: Ovule Formation All plants have a life cycle that consists of two distinct forms that differ in size and the number of chromosomes per cell. In flowering plants, the A hibiscus flower, showing anthers, five stigmas, and pollen. The sporophyte produces haploid microscopic gametophytes that are dependent on tissues produced by the flower. The reproductive cycle of a flowering plant is the regular, usually seasonal, cycling back and forth from sporophyte to gametophyte. The flower produces two kinds of gametophytes, male and female. The female gametophyte arises from a cell within the ovule , a small structure within the ovary of the flower. The ovary is a larger structure within the flower that contains and protects usually many ovules. Flowering plants are unique in that their ovules are entirely enclosed in the ovary. The ovary itself is part of a larger structure called the carpel, which consists of the stigma, style, and ovary. Each ovule is attached to ovary tissue by a stalk called the funicle. The point of attachment of the funicle to the ovary is called the placenta. As the flower develops from a bud, a cell within an ovule called the archespore enlarges to form an embryo-sac mother cell EMC. The EMC divides by meiosis to produce four megaspores. In this process the number of chromosomes is reduced from two sets in the EMC to one set in the megaspores, making the megaspores haploid. Three of the four megaspores degenerate and disappear, while the fourth divides mitotically three times to produce eight haploid cells. These cells together constitute the female gametophyte, called the embryo sac. The eight embryo sac cells differentiate into two synergids, three antipodal cells, two fused endosperm nuclei, and an egg cell. The mature embryo sac is situated at the outer opening micropyle of the ovule, ready to receive the sperm cells delivered by the male gametophyte. Pollen The male gametophyte is the mature pollen grain. Pollen is produced in the anthers, which are attached at the distal end of filaments. The filament and anther together constitute the stamen, the male sex organ. Flowers usually produce many stamens just inside of the petals. As the flower matures, cells in the anther divide mitotically to produce pollen mother cells PMC. The PMCs divide by meiosis to produce haploid microspores in groups of four called tetrads. The microspores are housed within a single layer of cells called the tapetum, which provides nutrition to the developing pollen grains. Each microspore develops a hard, opaque outer layer called the exine, which is constructed from a lipoprotein called sporopollenin. The exine has characteristic pores, ridges, or projections that can often be used to identify a species, even in fossil pollen. The microspore divides mitotically once or twice to produce two or three haploid nuclei inside the mature pollen grain. Two of the nuclei function as sperm nuclei that can eventually fuse with the egg and endosperm nuclei of the embryo sac, producing an embryo and endosperm, respectively. For sexual fusion to take place, however, the pollen grain must be transported to the stigma, which is a receptive platform on the top of the style, an elongated extension on top of the carpel s. Here the moist surface or chemicals cause the pollen grain to germinate. Germination is the growth of a tube from the surface of a pollen grain. The tube is a sheath of pectin , inside of which is a solution of water, solutes , and the two or three nuclei, which lack any cell walls. Proper growth of the pollen tube requires an aqueous solution of appropriate solute concentration, as well as nutrients such as boron, which may aid in its synthesis of pectin. At the apex of the tube are active ribosomes and endoplasmic reticulum types of cell organelles involved in protein synthesis. Pectinase and a glucanase both enzymes that break down carbohydrates probably maintain flexibility of the growing tube and aid in penetration. The pollen tube apex also releases ribonucleic acid RNA and ribosomes into the tissues of the style. The tube grows to eventually reach the ovary, where it may travel along intercellular spaces until it reaches a placenta. Through chemical recognition, the pollen tube changes its direction of growth and penetrates through the placenta to the ovule. Here the tube reaches the embryo sac lying close to the micropyle, and sexual fertilization takes place. Double Fertilization Fertilization in flowering plants is unique among all known organisms, in that not one but two cells are fertilized, in a process called double fertilization. One sperm nucleus in the pollen tube fuses with the egg cell in the embryo sac, and the other sperm nucleus fuses with the diploid endosperm nucleus. The fertilized egg cell is a zygote that develops into the diploid embryo of the sporophyte. The fertilized endosperm nucleus develops into the triploid endosperm, a nutritive tissue that sustains the embryo and seedling. The only other known plant group exhibiting double fertilization is the Gnetales in the genus Ephedra, a nonflowering seed plant. However, in this case the second fertilization product degenerates and does not develop into endosperm. Double fertilization begins when the pollen tube grows into one of the two synergid cells in the embryo sac, possibly as a result of chemical attraction to calcium. After penetrating the synergid, the apex of the pollen tube breaks open, releasing the two sperm nuclei and other contents into the synergid. As the synergid degenerates, it envelops the egg and endosperm cells, holding the two sperm nuclei close and the other expelled contents of the pollen tube. The egg cell then opens and engulfs the sperm cell, whose membrane breaks apart and allows the nucleus to move near the egg nucleus. The nuclear envelopes then disintegrate, and the two nuclei combine to form the single diploid nucleus of the zygote. The other sperm cell fuses with the two endosperm nuclei, forming a single triploid cell, the primary endosperm cell, which divides mitotically into the endosperm tissue. Double fertilization and the production of endosperm may have contributed to the great ecological success of flowering plants by accelerating the growth of seedlings and improving survival at this vulnerable stage. Faster seedling development may have given flowering plants the upper hand in competition with gymnosperm seedlings in some habitats, leading to the abundance of flowering plants in most temperate and tropical regions. Gymnosperms nevertheless are still dominant at higher elevations and latitudes, and at low elevations in the Pacific Northwest coniferous forests, such as the coastal redwoods. The reasons for these patterns are still controversial. The Seed The seed is the mature, fertilized ovule. After fertilization, the haploid cells of the embryo sac disintegrate. The maternally derived diploid cells of the ovule develop into the hard, water-resistant outer covering of the seed, called the testa, or seed coat. The diploid zygote develops into the embryo, and the triploid endosperm cells multiply and provide nutrition. The testa usually shows a scar called the hilum where the ovule was originally attached to the funicle. In some seeds a ridge along the testa called the raphe shows where the funicle originally was pressed against the ovule. The micropyle of the ovule usually survives as a small pore in the seed coat that allows passage of water during germination of the seed. In some species, the funicle develops into a larger structure on the seed called an aril, which is often brightly colored, juicy, and contains sugars that are consumed by animals that may also disperse the seed as in nutmeg, arrowroot, oxalis, and castor bean. This is distinct from the fruit, which forms from the ovary itself. The embryo consists of the cotyledon s , epicotyl, and hypocotyl. The cotyledons resemble small leaves, and are usually the first photosynthetic organs of the plant. The portion of the embryo above the cotyledons is the epicotyl, and the portion below is the hypocotyl. The epicotyl is an apical meristem that produces the shoot of the growing plant and the first true leaves after germination. The hypocotyl develops into the root. Often the tip of the hypocotyl, the radicle, is the first indication of germination as it breaks out of the seed. Flowering plants are classified as monocotyledons or dicotyledons most are now called eudicots based on the number of cotyledons produced in the embryo. Common monocotyledons include grasses, sedges, lilies, irises, and orchids; common dicotyledons include sunflowers, roses, legumes, snapdragons, and all nonconiferous trees. The endosperm may be consumed by the embryo, as in many legumes, which use the cotyledons as a food source during germination. In other species the endosperm persists until germination, when it is used as a food Anatomy of the reproductive organs in angiosperms. In grains such as corn and wheat, the outer layer of the endosperm consists of thick-walled cells called aleurone, which are high in protein. The Fruit The fruit of a flowering plant is the mature ovary. As seeds mature, the surrounding ovary wall forms a protective structure that may aid in dispersal. The surrounding ovary tissue is called the pericarp and consists of three layers. From the outside to inside, these layers are the exocarp, mesocarp, and endocarp. The exocarp is usually tough and skinlike. The mesocarp is often thick, succulent, and sweet. The endocarp, which surrounds the seeds, may be hard and stony, as in most species with fleshy fruit, such as apricots. A fruit is termed simple if it is produced by a single ripened ovary in a single flower apples, oranges, apricots. An aggregated fruit is a cluster of mature ovaries produced by a single flower blackberries, raspberries, strawberries. A multiple fruit is a cluster of many ripened ovaries on separate flowers growing together in the same inflorescence pineapple, mulberry, fig. A simple fruit may be fleshy or dry. A fleshy simple fruit is classified as a berry grape, tomato, papaya , pepo cucumber, watermelon, pumpkin , hesperidium orange , drupe apricot , or pome apple. Dry simple fruits have a dry pericarp at maturity. They may or may not dehisce, or split, along a seam to release the seeds.

Chapter 3 : Color rendering index - Wikipedia

Some of the material is a bit dated, but color science and reproduction really hasn't changed much. Anyone working with digital printing, or any other printing, ought to have a copy of this book or something similar so they can understand the subtle issues that come up in their work.

Gram positive stain of Streptococcus pyogenes, by Dr. The picture above is a wonderful example of the Streptococcus pyogenes being gram-positive. A bacteria is gram-positive when it is a purple color after being stained. As you can see, the Streptococcus pyogenes is a gram-positive bacteria. It can also be seen that the bacteria has a coccoid shape and grows in chains. This picture is a perfect example of what Streptococcus pyogenes looks like when it is properly gram stained. In order to isolate Streptococcus pyogenes, a medium must contain blood but not reducing sugars. In a benzidine reaction, a negative indicates that a gram-positive coccus is a member of the Streptococcaceae. This species is the only member of serological group A. A throat swab that is taken at the doctor is examined only for the presence of a beta-hemolytic streptococci Starr After hours of growth on blood agar the colonies are domed, grayish in color and approximately. The colonies are surrounded by a defined zone of beta hemolysis several times greater than the diameter of the colony. Beta hemolysis is seen as a complete clearing of the blood agar medium around the colonies Joklik and Willett Reproduction Streptococcus pyogenes is a bacteria, so it reproduces by binary fission. Binary fission is a form of asexual reproduction in a single-celled organisms. This process occurs by one cell dividing into two cells of the same size. Binary fission is used by most prokaryotes. Morphology Streptococcus pyogenes species are spherical to ovoid microorganisms from. They have a rigid cell wall, inner plasma membrane with mesosomal vesicles, cytoplasmic ribosomes and a nucleoid Joklik and Willett Physiology Streptococcus pyogenes are facultative anaerobes, which means that it can survive with and without oxygen although most facultative anaerobes would greatly prefer aerobic conditions and requires somewhat complex media for growth. The metabolism is fermentative and the principal product of metabolism is lactic acid. The cell wall is composed of repeating units of N-acetyglucosamine and N-acetylmuramic acid. It is also non-motile and non-spore forming Todar. Under these conditions colony growth will be the greatest. The primary media that is used for isolation contains blood or blood products and the growth may be enhanced by reducing oxygen tension Joklik and Willett Information on this page is from Joklik, Wolfgang K.

Chapter 4 : Reproduction | Definition of Reproduction by Merriam-Webster

Color and its reproduction For this reason, I appreciate the writings of John Gage, who emphasizes that color in its full form can only be examined with a multidisciplinary viewpoint, because there are no exact solutions to color problems.

Print this page using your web browser for a copy of the resource list. Even though at first glance the words reproduction and print may seem to indicate the same product, a reproduction is not the same as a print. The difference is important, not just to wordsmiths but to artists and earnest purchasers. A print is an original work of art including photographs A reproduction is a printed representation, a facsimile, or a copy of an original work of art How very simple this seems. But there is still confusion regarding the authenticity and value of prints and reproductions because of long-standing misuse of the term "print". Albuquerque architect and artist Robert Walters was an internationally recognized abstract expressionist during the s. Abstract expressionism grew out of the surrealist, constructivist and German expressionist movements of the s and s. It filled a need for self expression and spiritual healing following the devastation of World War II. Walters discussed abstraction in his North Valley studio. According to Kathleen Stewart Howe, Curator of Prints and Photographs at the University of New Mexico Art Museum, a print is an original work of art which is "the result of a creative process involving artist and printer. Original fine art prints are multiple impressions of the same image, created in limited editions with the exception of monotypes which are one-of-a-kind , with the direct involvement of the artist. Because of the range of printed images that confront us today, the Print Council of America drew up a list of elements necessary for a print to qualify as a fine art print. A print is made by transferring an image from a printmaking surface, or matrix, onto paper or another support. Prints are classified by the type of matrix from which they were produced. The three main classifications are relief, intaglio, and planographic. The relief process is the simplest method; an image is printed from the raised portion of the printing surface, as with a rubber stamp. Woodcut and linocut are relief processes. Intaglio is a process which prints the ink that has been forced into lines or areas dug into the printing plate. Engraving, drypoint, etching, aquatint, and mezzotint are intaglio processes. A planographic print is made from a flat surface to which the ink adheres because of the drawing material on the surface. Examples of planographic techniques are: After describing a print in terms of the technique used in creating it, one may describe it further in terms of when it was produced in the printing cycle. A proof is an impression printed as part of the process of developing the completed print. Often proofs are unique and very different from the final printed edition. The terms working proof or trial proof describe the impressions pulled in the development of a print. Finally, after all of the adjustments are made, the printer or printshop makes the print. It means that the edition may be printed. As the edition is printed, the prints are numbered. Most workshops destroy the printing surface after the edition is printed. Some printers also have their own stamps, thus some prints will have two chops. Finally, the artist signs the prints in the edition, certifying that they are his or her work. From The Language of Prints, University of New Mexico Art Museums, Albuquerque The quantity of numbered impressions in an edition is usually decided by the artist and the printshop before the edition is printed. At the Tamarind Institute in Albuquerque, a world-renowned center of training, research and publishing of fine art lithography, the number is rarely more than fifty and often considerably smaller. After the artist signs and numbers each impression in the edition at Tamarind, all stones and plates are effaced. Stones are then resurfaced for future use. The important distinction here is between the words produced and reproduced. The printed results are not legitimately signed or numbered as fine art prints. Rose also acknowledges that the availability of inexpensive copies of original art is, however, of merit. It is not a print.

Chapter 5 : How we test: Digital cameras - CNET

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Receives the male spermatazoa during Protects and nourishes the fertilized egg until it is fully developed Delivers fetus through birth canal Provides nourishment to the baby through milk secreted by mammary glands in the breast External Genitals Vulva The external female genitalia is referred to as vulva. It consists of the labia majora and labia minora while these names translate as "large" and "small" lips, often the "minora" can protrude outside the "majora" , mons pubis, clitoris, opening of the urethra meatus , vaginal vestibule, vestibular bulbs, vestibular glands. The term "vagina" is often improperly used as a generic term to refer to the vulva or female genitals, even though - strictly speaking - the vagina is a specific internal structure and the vulva is the exterior genitalia only. Calling the vulva the vagina is akin to calling the mouth the throat. Mons Veneris The mons veneris, Latin for "mound of Venus" Roman Goddess of love is the soft mound at the front of the vulva fatty tissue covering the pubic bone. It is also referred to as the mons pubis. The mons veneris protects the pubic bone and vulva from the impact of sexual intercourse. After puberty, it is covered with pubic hair, usually in a triangular shape. Heredity can play a role in the amount of pubic hair an individual grows. Labia Majora The labia majora are the outer "lips" of the vulva. They are pads of loose connective and adipose tissue, as well as some smooth muscle. The labia majora wrap around the vulva from the mons pubis to the perineum. The labia majora generally hides, partially or entirely, the other parts of the vulva. There is also a longitudinal separation called the pudendal cleft. These labia are usually covered with pubic hair. The color of the outside skin of the labia majora is usually close to the overall color of the individual, although there may be some variation. The inside skin is usually pink to light brown. They contain numerous sweat and oil glands. It has been suggested that the scent from these oils are sexually arousing. Labia Minora Medial to the labia majora are the labia minora. The labia minora are the inner lips of the vulva. They are thin stretches of tissue within the labia majora that fold and protect the vagina, urethra, and clitoris. The appearance of labia minora can vary widely, from tiny lips that hide between the labia majora to large lips that protrude. There is no pubic hair on the labia minora, but there are sebaceous glands. The two smaller lips of the labia minora come together longitudinally to form the prepuce, a fold that covers part of the clitoris. The labia minora protect the vaginal and urethral openings. Both the inner and outer labia are quite sensitive to touch and pressure. Clitoris The clitoris, visible as the small white oval between the top of the labia minora and the clitoral hood, is a small body of spongy tissue that functions solely for sexual pleasure. Only the tip or glans of the clitoris shows externally, but the organ itself is elongated and branched into two forks, the crura, which extend downward along the rim of the vaginal opening toward the perineum. Thus the clitoris is much larger than most people think it is, about 4" long on average. The clitoral glans or external tip of the clitoris is protected by the prepuce, or clitoral hood, a covering of tissue similar to the foreskin of the male penis. However, unlike the penis, the clitoris does not contain any part of the urethra. During sexual excitement, the clitoris erects and extends, the hood retracts, making the clitoral glans more accessible. The size of the clitoris is variable between women. On some, the clitoral glans is very small; on others, it is large and the hood does not completely cover it. Urethra The opening to the urethra is just below the clitoris. Although it is not related to sex or reproduction, it is included in the vulva. The urethra is actually used for the passage of urine. The urethra is connected to the bladder. In females the urethra is 1. Because the urethra is so close to the anus, women should always wipe themselves from front to back to avoid infecting the vagina and urethra with bacteria. This location issue is the reason for bladder infections being more common among females. Hymen The hymen is a thin fold of mucous membrane that separates the lumen of the vagina from the urethral sinus. Sometimes it may partially cover the vaginal orifice. The hymen is usually perforated during later fetal development. Because of the belief that first vaginal penetration would usually tear this membrane and cause bleeding, its "intactness" has been considered a guarantor of virginity. However, the hymen is a poor indicator of whether a woman has actually engaged in sexual intercourse because a normal hymen does not completely block the vaginal opening. The normal hymen is never actually "intact" since there is always an opening in it. Furthermore, there is not always bleeding at first vaginal penetration. The blood that is sometimes, but not always, observed after first penetration can be due to tearing of the hymen, but it can also be from injury to nearby tissues. A tear to the hymen, medically referred to as a "transection," can be seen in a small percentage of women or girls after first penetration. A transection is caused by penetrating trauma. Masturbation and tampon insertion can, but generally are not forceful enough to cause penetrating trauma to the hymen. Therefore, the appearance of the hymen is not a reliable indicator of virginity or chastity. Perineum The perineum is the short stretch of skin starting at the bottom of the vulva and extending to the anus. It is a diamond shaped area between the symphysis pubis and the coccyx. This area forms the floor of the pelvis and contains the external sex organs and the anal opening. It can be further divided into the urogenital triangle in front and the anal triangle in back. The perineum in some women may tear during the birth of an infant and this is apparently natural. Some physicians however, may cut the perineum preemptively on the grounds that the "tearing" may be more harmful than a precise cut by a scalpel. If a physician decides the cut is necessary, they will perform it. The cut is called an episiotomy. Internal Genitals Vagina The vagina is a muscular, hollow tube that extends from the vaginal opening to the cervix of the uterus. It is situated between the urinary bladder and the rectum. It is about three to five inches long in a grown woman. The muscular wall allows the vagina to expand and contract. The muscular walls are lined with mucous membranes, which keep it protected and moist. A thin sheet of tissue with one or more holes in it, called the hymen, partially covers the opening of the vagina. The vagina receives sperm during sexual intercourse from the penis. The sperm that survive the acidic condition of the vagina continue on through to the fallopian tubes where fertilization may occur. The vagina is made up of three layers, an inner mucosal layer, a middle muscularis layer, and an outer fibrous layer. The inner layer is made of vaginal rugae that stretch and allow penetration to occur. These also help with stimulation of the penis. The outer muscular layer is especially important with delivery of a fetus and placenta. Provides the route for the menstrual blood menses from the uterus, to leave the body. May hold forms of birth control, such as a diaphragm, FemCap, Nuva Ring, or female condom. Pelvic inflammatory disease PID is a widespread infection that originates in the vagina and uterus and spreads to the uterine tubes, ovaries, and ultimately the pelvic peritoneum. Signs and symptoms include tenderness of the lower abdomen, fever, and a vaginal discharge. Even a single episode of PID can cause infertility, due to scarring that blocks the uterine tubes. Therefore, patients are immediately given broad-spectrum antibiotics whenever PID is suspected. Cervix The cervix from Latin "neck" is the lower, narrow portion of the uterus where it joins with the top end of the vagina. Where they join together forms an almost 90 degree curve. It is cylindrical or conical in shape and protrudes through the upper anterior vaginal wall. Approximately half its length is visible with appropriate medical equipment; the remainder lies above the vagina beyond view. It is occasionally called "cervix uteri", or "neck of the uterus". During menstruation, the cervix stretches open slightly to allow the endometrium to be shed. This stretching is believed to be part of the cramping pain that many women experience. The portion projecting into the vagina is referred to as the portio vaginalis or ectocervix. On average, the ectocervix is three cm long and two and a half cm wide. It has a convex, elliptical surface and is divided into anterior and posterior lips. The size and shape of the external os and the ectocervix varies widely with age, hormonal state, and whether the woman has had a vaginal birth. In women who have not had a vaginal birth the external os appears as a small, circular opening. In women who have had a vaginal birth, the ectocervix appears bulkier and the external os appears wider, more slit-like and gaping. The passageway between the external os and the uterine cavity is referred to as the endocervical canal. It varies widely in length and width, along with the cervix overall. Flattened anterior to posterior, the endocervical canal measures seven to eight mm at its widest in reproductive-aged women. The endocervical canal terminates at the internal os which is the opening of the cervix inside the uterine cavity. During childbirth, contractions of the uterus will dilate the cervix up to 10 cm in diameter to allow the child to pass through. During orgasm, the cervix convulses and the external os dilates.

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Chapter 6 : THE COLLECTORâ€™S GUIDE: REPRODUCTION OR PRINT?

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Color Our color palette is simple and sophisticated. It relies almost exclusively on a proprietary Northwestern Purple Purple and its tints and shades. By using a range of tones, we add flexibility without sacrificing the recognition and equity of our heritage color. The range of tones runs from Northwestern Purple darkest to Northwestern Purple 10 lightest. Anything darker or lighter loses its connection to Northwestern Purple. The new Northwestern Purple is a custom ink color and can no longer be referenced by a Pantone number. Designers and vendors must refer to approved color swatches coated and uncoated paper, fabric, and plastic chips to ensure color accuracy. To obtain a swatch packet, please contact Erin Phipps. Our Palette The strength of our palette is its consistency. Although our new color palette is based on Northwestern Purple, the predominant color in most layouts should be white. By incorporating plenty of white space, we ensure that our communications feel clean and modern. This guideline also helps us to be mindful of content length. Rather than viewing white space as a blank area, see it as a pause. Rich black and its tints should be used in place of process black in all instances except body text. When setting text at sizes smaller than 12 points, process black and its tints should be used. Color Codes Color code equivalents for Northwestern Purple and related tints are provided below. Color code choice depends on the intended output print or digital. Using correct codes will ensure accurate color reproduction. Print Please note that CMYK tint values are different for coated and uncoated paper stocks; use the appropriate codes for correct reproduction. CMYK on coated paper: Use these color codes when printing on coated paper, which has a smooth, hard surface that minimizes ink absorption. Coated color values will reproduce poorly if printed on uncoated stock. CMYK on uncoated paper: Use these color codes when printing on uncoated paper, which is not as smooth as coated paper and absorbs more ink. RGB color codes should be used when creating digital materials online graphics, social media icons, presentations to be viewed on a monitor, etc. Hex codes should be used when creating websites. Usage Plastic or fabric materials Give your vendor the appropriate color swatch to ensure that the end product will match Northwestern Purple as closely as possible.

Chapter 7 : Color: Brand Tools - Northwestern University

This authoritative guide to color theory and color reproduction in the graphic arts contains comprehensive coverage of all facets of color, from color vision and measurement to the elusive but critical topics of color quality objectives and color communication.

Although the spectrum of light arriving at the eye from a given direction determines the color sensation in that direction, there are many more possible spectral combinations than color sensations. In fact, one may formally define a color as a class of spectra that give rise to the same color sensation, although such classes would vary widely among different species, and to a lesser extent among individuals within the same species. In each such class the members are called metamers of the color in question. Spectral colors The familiar colors of the rainbow in the spectrum â€”named using the Latin word for appearance or apparition by Isaac Newton in â€”include all those colors that can be produced by visible light of a single wavelength only, the pure spectral or monochromatic colors. The table at right shows approximate frequencies in terahertz and wavelengths in nanometers for various pure spectral colors. The wavelengths listed are as measured in air or vacuum see refractive index. The color table should not be interpreted as a definitive listâ€”the pure spectral colors form a continuous spectrum, and how it is divided into distinct colors linguistically is a matter of culture and historical contingency although people everywhere have been shown to perceive colors in the same way [6]. A common list identifies six main bands: It is possible that what Newton referred to as blue is nearer to what today is known as cyan , and that indigo was simply the dark blue of the indigo dye that was being imported at the time. Color of objects The color of an object depends on both the physics of the object in its environment and the characteristics of the perceiving eye and brain. Physically, objects can be said to have the color of the light leaving their surfaces, which normally depends on the spectrum of the incident illumination and the reflectance properties of the surface, as well as potentially on the angles of illumination and viewing. Some objects not only reflect light, but also transmit light or emit light themselves, which also contributes to the color. This effect is known as color constancy. The upper disk and the lower disk have exactly the same objective color, and are in identical gray surroundings; based on context differences, humans perceive the squares as having different reflectances, and may interpret the colors as different color categories; see checker shadow illusion. Some generalizations of the physics can be drawn, neglecting perceptual effects for now: Light arriving at an opaque surface is either reflected " specularly " that is, in the manner of a mirror , scattered that is, reflected with diffuse scattering , or absorbed â€" or some combination of these. Opaque objects that do not reflect specularly which tend to have rough surfaces have their color determined by which wavelengths of light they scatter strongly with the light that is not scattered being absorbed. If objects scatter all wavelengths with roughly equal strength, they appear white. If they absorb all wavelengths, they appear black. An object that reflects some fraction of impinging light and absorbs the rest may look black but also be faintly reflective; examples are black objects coated with layers of enamel or lacquer. Objects that transmit light are either translucent scattering the transmitted light or transparent not scattering the transmitted light. If they also absorb or reflect light of various wavelengths differentially, they appear tinted with a color determined by the nature of that absorption or that reflectance. Objects may emit light that they generate from having excited electrons, rather than merely reflecting or transmitting light. The electrons may be excited due to elevated temperature incandescence , as a result of chemical reactions chemoluminescence , after absorbing light of other frequencies " fluorescence " or " phosphorescence " or from electrical contacts as in light emitting diodes , or other light sources. To summarize, the color of an object is a complex result of its surface properties, its transmission properties, and its emission properties, all of which contribute to the mix of wavelengths in the light leaving the surface of the object. The perceived color is then further conditioned by the nature of the ambient illumination, and by the color properties of other objects nearby, and via other characteristics of the perceiving eye and brain. Perception When viewed in full size, this image contains about 16 million pixels, each corresponding to a different color on the full set of RGB colors. The human eye can distinguish about 10 million different colors. Color theory Although Aristotle and other ancient scientists had already written on the nature of light and color vision , it was not until Newton that light was identified as the source of the color sensation. In , Goethe published his comprehensive Theory of Colors in which he ascribed physiological effects to color that are now understood as psychological. In Thomas Young proposed his trichromatic theory , based on the observation that any color could be matched with a combination of three lights. Ultimately these two theories were synthesized in by Hurvich and Jameson, who showed that retinal processing corresponds to the trichromatic theory, while processing at the level of the lateral geniculate nucleus corresponds to the opponent theory. Color in the eye Main article: Color vision Normalized typical human cone cell responses S, M, and L types to monochromatic spectral stimuli The ability of the human eye to distinguish colors is based upon the varying sensitivity of different cells in the retina to light of different wavelengths. Humans are trichromatic â€”the retina contains three types of color receptor cells, or cones. One type, relatively distinct from the other two, is most responsive to light that is perceived as blue or blue-violet, with wavelengths around nm ; cones of this type are sometimes called short-wavelength cones, S cones, or blue cones. The other two types are closely related genetically and chemically: Light, no matter how complex its composition of wavelengths, is reduced to three color components by the eye. For each location in the visual field, the three types of cones yield three signals based on the extent to which each is stimulated. These amounts of stimulation are sometimes called tristimulus values. The response curve as a function of wavelength varies for each type of cone. Because the curves overlap, some tristimulus values do not occur for any incoming light combination. For example, it is not possible to stimulate only the mid-wavelength so-called "green" cones; the other cones will inevitably be stimulated to some degree at the same time. The set of all possible tristimulus values determines the human color space. It has been estimated that humans can distinguish roughly 10 million different colors. In normal situations, when light is bright enough to strongly stimulate the cones, rods play virtually no role in vision at all. Furthermore, the rods are barely sensitive to light in the "red" range. In certain conditions of intermediate illumination, the rod response and a weak cone response can together result in color discriminations not accounted for by cone responses alone. These effects, combined, are summarized also in the Kruithof curve , that describes the change of color perception and pleasingness of light as function of temperature and intensity. Color in the brain Main article: Color vision The visual dorsal stream green and ventral stream purple are shown. The ventral stream is responsible for color perception. While the mechanisms of color vision at the level of the retina are well-described in terms of tristimulus values, color processing after that point is organized differently. A dominant theory of color vision proposes that color information is transmitted out of the eye by three opponent processes , or opponent channels, each constructed from the raw output of the cones: This theory has been supported by neurobiology, and accounts for the structure of our subjective color experience. Specifically, it explains why humans cannot perceive a "reddish green" or "yellowish blue", and it predicts the color wheel: The exact nature of color perception beyond the processing already described, and indeed the status of color as a feature of the perceived world or rather as a feature of our perception of the world â€" a type of qualia â€" is a matter of complex and continuing philosophical dispute. Nonstandard color perception Main article: Some kinds of color deficiency are caused by anomalies in the number or nature of cones in the retina. Others like central or cortical achromatopsia are caused by neural anomalies in those parts of the brain where visual processing takes place. Tetrachromacy While most humans are trichromatic having three types of color receptors , many animals, known as tetrachromats , have four types. These include some species of spiders , most marsupials , birds , reptiles , and many species of fish. Other species are sensitive to only two axes of color or do not perceive color at all; these are called dichromats and monochromats respectively. A distinction is made between retinal tetrachromacy having four pigments in cone cells in the retina, compared to three in trichromats and functional tetrachromacy having the ability to make enhanced color discriminations based on that retinal difference. As many as half of all women are retinal tetrachromats. Behavioral and functional neuroimaging experiments have demonstrated that these color experiences lead to changes in behavioral tasks and lead to increased activation of brain regions involved in color perception, thus demonstrating their reality, and similarity to real color percepts, albeit evoked through a non-standard route. Afterimages After exposure to strong light in their sensitivity range, photoreceptors of a given type become desensitized. For a few seconds after the light ceases, they will continue to signal less strongly than they otherwise would. Colors observed during that period will appear to lack the color component detected by the desensitized photoreceptors. This effect is responsible for the phenomenon of afterimages , in which the eye may continue to see a bright figure after looking away from it, but in a complementary color. Afterimage effects have also been utilized by artists, including Vincent van Gogh. Color constancy Main article: Color constancy When an artist uses a limited color palette , the eye tends to compensate by seeing any gray or neutral color as the color which is missing from the color wheel. For example, in a limited palette consisting of red, yellow, black, and white, a mixture of yellow and black will appear as a variety of green, a mixture of red and black will appear as a variety of purple, and pure gray will appear bluish. In reality, the visual system is constantly adapting to changes in the environment and compares the various colors in a scene to reduce the effects of the illumination. If a scene is illuminated with one light, and then with another, as long as the difference between the light sources stays within a reasonable range, the colors in the scene appear relatively constant to us. This was studied by Edwin Land in the s and led to his retinex theory of color constancy. Both phenomena are readily explained and mathematically modeled with modern theories of chromatic adaptation and color appearance e. Color naming See also: Lists of colors and Web colors This picture contains one million pixels, each one a different color Colors vary in several different ways, including hue shades of red , orange , yellow , green , blue , and violet , saturation , brightness , and gloss. Some color words are derived from the name of an object of that color, such as " orange " or " salmon ", while others are abstract, like "red". In the study Basic Color Terms: Their Universality and Evolution , Brent Berlin and Paul Kay describe a pattern in naming "basic" colors like "red" but not "red-orange" or "dark red" or "blood red", which are "shades" of red. The next colors to be distinguished are usually red and then yellow or green. All languages with six "basic" colors include black, white, red, green, blue, and yellow. The pattern holds up to a set of twelve: Associations Individual colors have a variety of cultural associations such as national colors in general described in individual color articles and color symbolism. The field of color psychology attempts to identify the effects of color on human emotion and activity. Chromotherapy is a form of alternative medicine attributed to various Eastern traditions. Colors have different associations in different countries and cultures. For example, researchers at the University of Linz in Austria demonstrated that the color red significantly decreases cognitive functioning in men. The outer curved boundary is the spectral or monochromatic locus, with wavelengths shown in nanometers. The colors depicted depend on the color space of the device on which you are viewing the image, and therefore may not be a strictly accurate representation of the color at a particular position, and especially not for monochromatic colors. Most light sources are mixtures of various wavelengths of light. Many such sources can still effectively produce a spectral color, as the eye cannot distinguish them from single-wavelength sources. A useful concept in understanding the perceived color of a non-monochromatic light source is the dominant wavelength , which identifies the single wavelength of light that produces a sensation most similar to the light source. Dominant wavelength is roughly akin to hue. There are many color perceptions that by definition cannot be pure spectral colors due to desaturation or because they are purples mixtures of red and violet light, from opposite ends of the spectrum. Some examples of necessarily non-spectral colors are the achromatic colors black, gray, and white and colors such as pink , tan , and magenta.

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Color and Its Reproduction. analyses of the dataset presented in the article "A preliminary comparison of CIE color differences to textile color acceptability using average observers" by.

Under daylight-balanced HMI lighting, we shoot a series of test targets to determine how well a camera deals with important image-quality challenges such as noise, accurate color reproduction, and sharpness. Image-quality tests Noise test The laws of physics dictate that it is impossible to digitally capture an image that is completely free of noise. Also, the larger the physical size of a sensor not the number of pixels , the less susceptible a sensor usually is to noise. We then analyze the images using Imatest image-analysis software to measurably evaluate the generated quantity of color and luminance noise. Sharpness test The potential sharpness of an image is directly impacted by the resolution of the camera that captured the image. All test images are captured using the native resolution of a camera and its automatic exposure mode using program mode, automatic, or aperture priority, depending on the unit. Digital zoom is turned off for all test shots. If a camera includes special features, such as an extreme wide-angle lens or very high ISO settings, we perform additional tests of those features as needed. If a camera saves uncompressed files, we capture uncompressed test images using three different white-balance settings: Other than the built-in flash, the only additional light source for this test is a shaded lamp with a watt incandescent bulb. We evaluate the quality of the test images for dynamic range , tonal range, proper exposure , accurate color reproduction and saturation , highlight and shadow detail , white-balance accuracy , proper flash illumination , image sharpness , and lens distortion. We also look for typical problems that arise in digital cameras images, including noise , chromatic aberration fringing , blooming , and aliasing , as well as artifacts caused by compression , or demosaicking. In addition to the test images captured in our camera lab, we shoot additional photos in both indoor and outdoor settings. Scenes are photographed in a variety of lighting situations, capturing images that contain a diversity of colors, contrast, patterns, and light levels. We also capture images of people with a variety of skin tones, both with and without the flash. Performance testing For all digital-camera performance testing, we run each set of tests a minimum of four times, discarding any anomalous results. We report the average of the remaining times, using a minimum of three iterations to calculate the average. Time-to-first-shot test This test measures how soon a camera can capture its first picture after being powered up. Shot-to-shot time test This set of tests measures how fast a camera captures a second photo immediately after capturing the first. We perform four different versions of this test: A typical scenario using the highest-quality compressed-image setting The slowest possible scenario using the highest-quality, compressed-image setting and the flash Using TIF file settings, if available Using RAW file settings, if available For each scenario, we press the shutter, then press it again rapidly and repeatedly, until a second shot is captured. With the camera set to continuous-shooting mode, we capture as many frames as possible with a camera focused on a digital timer. We count how many frames a camera captures at a consistent rate until the rate starts to slow. To obtain the frame rate, we divide the number of frames captured by the total time from the first frame to the last frame shot. We choose the low-speed option, if available. The optical lens is zoomed in as tight as it can go. The flash is turned off. We use the highest-available resolution. We use the lowest-available compression setting. We choose the high-speed option, if available. The optical lens is zoomed out to its widest angle. We use the lowest-available resolution. We use the highest-available compression setting. Shutter-lag tests This set of tests measures how quickly a camera captures an image after the shutter-release button is pressed. Anyone who has ever tried to take a picture of an active child, pet, or similar subject in motion knows the importance of this information. To run these tests, we use the shutter-lag test created by Ed Schwartz at Shooting Digital. We follow the procedure for the Without pre-focus test, but instead of focusing the camera on the rotating image on the CRT display, we first focus the camera away from the image, on an object off in the distance to set the focus to infinity so that the AF system is starting from its furthest focus point. We use the following settings for both versions of the test: We enable the autofocus illuminator option, if available. We choose the lowest-available resolution. The bulbs are rated at watts and are daylight balanced. Our Labs-based, simulated, real-world scene is photographed using two Mole-Richardson Tweenie II Solarspot lights with watt tungsten bulbs, and a Lowel Omni-light with a watt tungsten bulb. Depending on the camera, we use one of the following storage media during testing:

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