Acronyms and terms in cell research and microscopy

Acronyms, terms	Abbreviations meanings, explanations
ABC	avidin-biotin-peroxidase-complex
absorbance	quantity of light absorbed by a chemical or biological substance as measured in a spectrophotometer or similar device; in practice, absorbance is the logarithm to the base 10 of the ratio of the spectral radiant power of light transmitted through the reference sample to that of the light transmitted through the solution. The terms extinction and optical density should no longer be used
achromatic optical system	standard optical system for microscopes; chromatic aberrations corrected in two colors, and sperical aberrations corrected in one color
acridine orange	heterocyclic chromophore containing the acridine nucleus which binds to DNA and RNA by intercalation between successive base pairs to produce a broad emission band in the green to red wavelength region
A. dest.	Aqua destillata, distilled water
additive color mixture	color mixture achieved by adding one ligth to another
additive primaries	red, blue and green are the additive primaries, all other colors of light in the visible spectrum are obtained by combining lights which are the colors of these primaries (see also *subtractive primaries*)
adjuvant	any substance that enhances the immunogenicity of an antigen in the course of immunization
AEC	3-amino-9-ethylcarbazole
AFM	Atomic Force Microscope
Alexa fluor dyes	synthetic fluorescent dyes trademarked by Molecular Probes
AMCA	aminomethylcoumarin
AOTF	Acousto Optic Tunable Filter (AOTF): a device that uses sound waves to modulate the wavelength/intensity of light emitted by a laser source. It consists of a specialized crystal (e.g. tellurium) sandwiched between an acoustic transducer and absorber to induce standing sound waves with alternating domains of high and low refractive index; the crystal acts as a diffraction grating to deflect the incident beam. Specific wavelengths are selected by altering the frequency of sound waves (changing the period of the diffraction grating)
AP	alkaline phosphatase, e.g. from calf intestine or from *E. coli*
APAAP	soluble alkaline phosphatase anti-alkaline phosphatase complex
aperture diaphragm	aperture below the microscope condensor
apochromatic optical system	best corrected optical system in microscopes throughout the used light spectrum
autofluorescence	generation of background fluorescence due to endogenous metabolites and organic or inorganic compounds in biological specimens such as FAD, FMN, NADH and NADPH
background	detectable light (noise) that is not part of the emissison signal from a fluorescent probe
bandpass filter	filter transmitting a defined region (band) of wavelengths; wavelengths shorter or longer than that of the passband are attenuated
barrier filter	filter designed as a longpass or with a defined bandpass region which transmits emission wavelengths collected from the specimen while blocking residual excitation light

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BCIG	5-bromo-4-chloro-3-indolyl-ß-D-galactoside
BCIP	5-bromo-4-chloro-3-indolyl-phosphate
beamsplitter	optical device used for separating an incident beam of ligth into two or more components that are subequently projected in different directions
bFGF	basic fibroblast growth factor
birefringent	kind of molecule with the ability to alter polarized light by causing double refraction
bleed-through	occurs when unwanted wavelengths are transmitted through an optical filter designed to block them
BMP	bone morphogenetic protein
BNHS	biotin-N-hydroxy-succinimide ester
Bp	base pairs (DNA)
BP	bandpass (filter)
B-PE	phycoerythrine
BSA	bovine serum albumin
cancer stem cell	self-renewing cell responsible for sustaining a cancer and for producing differentiated progeny that form the bulk of cancer
CD	cluster designation; cluster of differentiation, cell surface markers to differentiate cell populations
cDNA	complementary DNA
chromatic aberration	an aberration in which light of different colors will not focus at the same point
chromogen	visible reaction product at the site of antibody binding, f.e. DAB (diaminobenzidine) chromogen
chromophore	natural or synthetic pigment with characteristic optical absorption
CIC	circulating immune complexes
CIE	counterimmunoelectrophoresis
CLSM	Confocal Laser Scanning Microscopy, a mode of optical microscopy in which a focused laser beam is scanned laterally along the x and y axes of a specimen in a raster pattern
cm	centimeter
CN	4-chloro-1-naphthol
coherent light	light beam that is defined by the individual waves vibrating in the same phase but not necessarily in the same plane
commitment	exit from self-renewal (stem cells) and engagement in a programme leading to differentiation
complementary colors	colors that lie opposite each other on the color wheel; complements may be either additive or subtractive
compound lens	two or more lenses mounted in close proximity to one another
compound microscope	microscope with an objective lens near the specimen and an eye lens (in an eyepiece) near the eye
Con A	Concanavalin A, lectin of *Canavalia ensiformis*
condensor	lens system (one or more lenses) that condenses light; f.e. when collimated light passes a positive lens, the light will focus on the other side of the lens. In the microscope, condensers are used to get concentrated light to the specimen
CPE	cytopathic effect
crossover	crossover (bleed-through) occurs when unwanted wavelenghts are transmitted through an optical filter designed to block them
crosstalk	term used in filter nomenclature that describes the minimum blocking level over a specified range of two filters placed together in series
Cy2	carbocyanin

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Cy3	indocarbocyanin
Cy5	indodicarbocyanin
cyanine dyes	fluorochromes containing a centralized heterocyclic benzoxazole moiety first marketed by Amersham Inc.
^{o}C	degree Celsius
DAB	diaminobenzidine (3,3'-diaminobenzidine tetrahydrochloride)
DAPI	4',6-diamidino-2-phenylindole
dark field illumination	an optical contrasting method to give a bright specimen on a dark background
DC	dichroic beamsplitter
DEAE	diethylaminoethyl
deconvolution microscopy	deconvolution analysis is a technique that applies algorithms to a through-focus stack of images acquired along the optical (z) axis to enhance photon signals specific for a given image plane (or multiple focal planes in a stack of images). The analysis is used to deblur and remove out-of-focus light from a particular focal plane f.e. using fluorescence excitation and emission
dichroic mirror	interference filter or mirror combination used in fluorescence microscopy filter sets to produce a sharply defined transition between transmitted and reflected wavelengths
dichromatic beamsplitter	see dichroic mirror
DID	double immunodiffusion
DIF	direct immunofluorescence
diffraction	phenomenon caused by light waves bending very slightly when passing the edge of an obstruction
direct technique	in immunohistology, label directly conjugated to the primary antibody
DMF	dimethylformamide
DMSO	dimethyl sulfoxide, used in freeze protection and cryopreservation of cells
DNA	deoxyribonucleic acid
dNTP	desoxynucleotide
dsDNA	double-stranded DNA
DTAF	dichlorotriazinylamino fluorescein
DTT	dithiothreitol
dwell time	term in confocal microscopy that refers to the length of time that the scanned laser beam is allowed to remain in a unit of space corresponding to a single pixel in the image
EDTA	ethylenediamine N,N,N',N'-tetraacetic acid
EGF	epidermal growth factor
EIA	enzyme immunoassay
electronic state	overall configuration of electrons in an atom or molecule which determine the distribution of negative charge in the molecule and the molecular geometry
ELISA	enzyme-linked immunosorbent assay
EM	electron microscopy
embryonic stem cell	pluripotent stem cell-lines derived from early embryos
emission spectrum	spectrum of wavelengths emitted by an atom or molecule after its excitation by a photon; after emitting a photon, the fluorochrome returns to the ground-level energy state and is ready for another cycle of excitation and emission

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epi-illumination	mode of illumination for fluorescence and reflected light microscopy; the illumination source is placed on the same side of the specimen as the objective which serves the dual role of both condensor and imaging lens system
excitation filter	matched filter system in a fluorescence microscope and filters selected regions from a broadband light source to produce the exciting band of wavelengths for fluorescence microscopy
excitation spectrum	spectrum of wavelengths which are capable of exciting a fluorochrome to exhibit fluorescence
Fab	Fab fragment, a product of papain digestion of an IgG molecule; Fab has a single antigen-binding site
Fab'_2, $F(ab')_2$	95 kDa immunoglobulin fragment, a product of pepsin digestion of an IgG molecule; $F(ab')_2$ has two antigen-binding sites
FACS	fluorescence activated cell sorting
FAD	flavin adenine dinucleotide, a coenzyme composed of riboflavin 5'-phosphate (FMN) and adenosine 5'-phosphate linked by a pyrophosphate bond; serving as an electron carrier by being alternately oxidized (FAD) and reduced ($FADH_2$)
fading	permanent loss of fluorescence due to photon-induced chemical damage or modification (photobleaching), see photostability
Fc	Fc fragment, a product of papain digestion of an IgG molecules (fragment crystallizable); it is comprised of two C-terminal heavy chain segments
FCS	fetal calf serum
FGF	fibroblast growth factor
field diaphragm	a diaphragm located above the light source (microscopic lamp); the light passes through the diaphragm before reaching the aperture diaphragm (located near the condenser/specimen stage)
field lens	the eyepiece lens closest to the objective
filter slope	indicates the filter profile in the transition region between blocking and transmission
FISH	fluorescence *in situ* hybridization; technique is based on the hybridization between target sequences of chromosomal DNA with fluorescently labeled single-stranded complementary sequences (cDNA)
FITC	fluorescein isothiocyanate
FLIM	Fluorescence Lifetime Imaging Microscopy: technique that enables simultaneous recording of fluorescence lifetime and the spatial location of fluorophores throughout every location in the image
FLIP	Fluorescence Loss in Photobleaching: technique which is related to FRAP; a techniques used to determine the diffusional mobility of target fluorophores in a cell. To this end, a defined region of fluorescence within a living cell is submitted to repeated photobleaching by illumination with intense irradiation. Over a measured period, this action will result in complete loss of fluorescence signal throughout the cell if all of the fluorophores are able to diffuse into the region that is being photobleached
fluorescence	spontaneous emission of radiation (luminescence) from an excited molecular entity; process by which a molecule (which is transiently excited by absorption of external radiation, e.g. ultraviolet light) releases the absorbed energy as a photon having a wavelength longer than the absorbed energy

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fluorescence lifetime	characteristic time of a molecule to remain in an excited state prior to return to the ground state
fluorochrome	natural or synthetic molecule (dye) that is capable of exhibiting fluorescence
fluorophore	structural domain/specific region of a molecule that is capable of exhibiting fluorescence
FPLC	fast protein (fast performance) liquid chromatography
FRAP	Fluorescence Recovery After Photobleaching: f.e. used in experiments of translational mobility of fluorescently labeled macromolecules; a small selected region of the cell is subjected to intense illumination (e.g. with a laser) to produce complete photobleaching of fluorophores within the area. After the photobleaching pulse, the rate and extent of fluorescence recovery is monitored as a function of time to obtain information about repopulation by fluorophores and the kinetics of recovery
FRET	Fluorescence Resonance Energy Transfer: f.e. used in fluorescence microscopy to obtain temporal and spatial information about the binding and interaction of molecules in living cells in the nanometer range. FRET (also called Förster Resonance Energy Transfer) is a non-radiative transfer of energy from an excited donor molecule to a suitable acceptor molecule in close proximity. Excitation of the donor fluorophore results not only in donor emission but partially also in emission characteristic for the acceptor fluorophore. FRET efficiency depends largely on the distance between the two interacting molecules
g	gram (metric unit of mass)
g	earth's gravity, gravity constant
GFP	green fluorescent protein, a naturally occurring fluorecent probe derived from Aequorea victoria, which is used to determine the location and dynamics of a target protein in living cells
GOD	glucose oxidase from *Aspergillus niger*
h	hour
HABA	4'-hydroxyazobenzene-2-carboxylic acid
HEPES	N-(2-hydroxyethyl)piperazine-N'-(2-ethanesulfonic acid), free acid or sodium salt
HEPES buffer	HEPES buffer; HEPES cell culture media, f.e. to be used in serum-free cell culture media and for cell culture where sodium bicarbonate has a toxic effect
HIER	Heat Induced Epitope Retrieval (prior to immunostaining)
hot mirror	dichromatic interference filter employed to protect optical systems by reflecting heat back into the light source
HPLC	high pressure (high performance) liquid chromatography
HRP	horseradish peroxidase
IC	immune complex
ID	immunodiffusion
IEF	isoelectric focusing
IF	immunofluorescence
IIF	indirect immunofluorescence
immunocytochemistry	immunological methods applied in histology for the study of cells and tissue
immunogen	any substance which can generate an immune reaction
immunohistochemistry	frequently used instead of immunocytochemistry

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indirect technique	in immunohistology, unlabelled primary antibody (e.g. mouse antibody) is detected by labelled secondary antibody (e.g. rabbit anti-mouse IgG), i.e. the secondary antibody raised against the species providing the primary antibody is labelled by the marker molecule
in situ hybridization	an assay for the detection of nucleic acids in cells and tissue sections by the use of specific nucleic acid probes
INT	iodophenyl-nitrophenyl tetrazolium
interference color	colors created by the interaction of polarized light with birefringent molecules and and analyzer (see polarized illumination)
interference contrast	optical contrasting technique; structures in a specimen can cause shift phase of light when the light is passing through the specimen
interference filter	filter to transmit or reflect a specific region/band of wavelenghts, e.g. used in microscopy to isolate excitation illumination from fluorescene emission
ISH	in situ hybridization
IU	international unit
Jablonski diagram	graphical depiction of enery levels occupied by ground state and excited electrons in a fluorescent molecule
K4M	K4M resin, Lowycryl
kb	kilobase
kD (kDa)	kiloDalton refers to molecular mass being expressed in Daltons (D or Da); one Dalton is equal to one-twelfth of the mass of carbon-12 atom
kg	kilogram
Köhler illumination	brightfield illumination setup of the microscope giving the most possible contrast and resolution
kU	kilo (1000) units
L (mL)	liter (milliliter)
laser	a source of ultraviolet, visible or infrared radiation which produces **l**ight **a**mplification by **s**timulated **e**mission of **r**adiation (origin of the acronym)
Lf U	lime flocculation unit, e.g. vaccines contain Lf units such as diphtheria toxoid or tetanus toxoid
light, particle theory	theory that interprets light as being made of particles; light is a form of electromagnetic energy, light can exhibit both wavelike and particle-like behaviour
light, wave theory	theory that interprets light as a wave traveling away from the light source; light can exhibit both wavelike and particle-like behaviour
LM	light microscopy
longpass filter (LP)	interference or colored glass filter that attenuates shorter wavelenghts and passes longer wavelengths over the active range of the target spectrum; in microscopy, longpass filters are frequently used in dichromatic mirrors and barrier (emission) filters
M (mol/L)	molar (mol per liter)
mAb	monoclonal antibody
mechanical tube length	length of the microscope tube into which the objective and eyepiece inserts; see also *optical tube length*
metachromasia	color change of a dye that occurs when the dye chemically reacts with the specimen
mg	milligram
microtome	device for cutting sections from specimens (embedded or not) for histological studies
min	minute

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mL	milliliter
mM	millimolar
monochromatic	light beam composed of a single wavelength
monoclonal antibodies	immunochemically identical antibodies produced by one clone of plasma cells which react with a specific epitope on an antigen
mordant	intermediary substance between a mordant dye and the specimen
mordant dye	a dye requiring a mordant substance to attach dye molecules to the specimen
mRNA	messenger RNA
µ (µg; µL)	micro (microgram; microliter)
MTT	thiazolyl blue
multipotent	ability to form multiple lineages that constitute an entire tissue, f.e. hematopoietic stem cells
MW	molecular weight
NA	numerical aperture
NBT	nitro blue tetrazolium
nDNA	native DNA
neutral density dilter	filter used to control light intensity without changing its color; f.e. used in photomicrography when dimming the lamp might change the illumination color
NHS	normal human serum
NHS ester	N-hydroxysuccinimide ester
Niche	cellular microenvironment providing support and stimuli necessary to sustain self-renewal
nm	nanometer
NSOM, *see SNOM*	-
numerical aperture	light gathering capability of a lens; the numerical aperture of the objective determines its resolution
OD	optical density, see absorbance
objective	in microscopy: the lens closest to the specimen, the set of lenses closest to the specimen which are housed in a removable tube
optical tube length	distance between two adjacent focal planes: one of the planes is of the objective in the direction of the eyepiece, the other plane is of the eyepiece in the direction of the objective (not identical with *mechanical tube length*)
PAGE	polyacrylamide gel electrophoresis
PAP	soluble peroxidase-antiperoxidase complexes
PBS	phosphate buffered saline
PCR	polymerase chain reaction
phase contrast	optical contrasting technique; structures in a specimen cause some of the light passing through them to shift phase which is made visible
photobleaching	see fading
photostability	fluorescence is a cyclical process where molecules are repeatedly raised to an excited state and subsequently relaxe back to the ground state with emission of fluorescent photons. One of the consequences of repeated excitation and emission is the loss of fluorescence from the molecules; this process is referred to as photobleaching, photofading or photodestruction
pluripotent	ability of cells to form all the body's cell lineages, f.e. embryonic stem cells
PMS	phenazine methosulfate (synonym: N-methylphenazonium methosulfate)
PNP	p-nitrophenylphosphate

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pNPP	p-nitrophenylphosphate
polarized illumination	an optical contrasting method which uses polarizing layers of material to create interference colors
polychroic beamsplitter	specialized mirror or beamsplitter that is designed to transmit multiple bandpass regions of fluorescence emission from the specimen and to reflect other defined wavelength regions that correspond to the excitation bands
polychromatic mirror	see polychroic beamsplitter
polyclonal antibodies	immunochemically dissimilar antibodies produced by different clones of plasma cells which react with various epitopes on a given antigen
precursor cell	general term for a cell without self-renewal ability that contributes to tissue formation (can generate tissue stem cells)
primary antibody	the first used antibody in an immunological assay
primary fluorescence	see autofluorescence
progenitor cell	generic term for any dividing cell with the capacity to differentiate (including putative stem cells in which self-renewal has not yet been demonstrated)
prozone phenomenon	observed with some immune sera which give agglutination, precipitation or other immunologic reactions only when diluted several hundred- or thousand-fold
quantum yield	quantitative measure of fluorescence emission efficiency (expressed as the ratio of the number of photons emitted to the number of photons absorbed)
quencher	a molecular entity that deactivates an excited state of another entity by energy transfer, electron transfer or by a chemical mechanism
quenching	reduction in fluorescence emission of a fluorochrome due to environmental conditions such as pH, ionic strength, solvent effects or a locally high concentration of fluorochromes that reduces the efficiency of emission
rcf, RCF	relative centrifugal force
r-DNA	recombinant DNA
refraction	direction change of light rays passing from one transparent medium to another medium with different optical density
refractive index	degree to which a medium bends light; velocity of light through a vacuum divided by the velocity of light through the medium
resonance energy transfer	Förster energy transfer (see FRET); radiationless transfer of excitation energy from a donor to an acceptor, there is no emission of light by the donor
RIA	radioimmunoassay
RID	radial immunodiffusion
R-PE	phycoerythrine
RNA	ribonucleic acid
rpm, RPM	revolutions per minute (rounds per minute)
RRX	rhodamine RedX, lissamin rhodamine dervative
RT	room temperature
RT-PCR	reverse transcriptase-polymerase chain reaction
RZ	Reinheitszahl, purity of enzymes
s (msec)	second (millisecond)
SAv	streptavidin
SDS	sodium dodecyl sulfate
sec	second

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secondary antibody	the second antibody used in an immunological assay by reaction with the primary antibody (now the antigen); also named "link" antibody
self-renewal	property of stem cells with cycles of division that repeatedly generate daughter equivalent to the mother cell
SEM	Scanning Electron Microscope
shortpass filter (SP)	interference or colored glass filter that attenuates longer wavelengths and passes shorter wavelengths over the active range of the target spectrum. In microscopy, shortpass filters are frequently employed in dichromatic mirrors and excitation filters
signal-to-noise ratio (S/N)	standard ratio of the optical signal from a specimen to the noise (optical) of the surrounding background
singlet state	the electronic configuration is referred to as a singlet state, when for any *many-electron system* the electronic spins are paired. The spin quantum number (S) of an atom/molecule is the absolute value of the sum of electronic spins within the system. In the singlet state (with antiparallel/paired spins), the spin quantum number is zero
singlet-triplet energy transfer	transfer of excitation from an electronically excited donor to a singlet state to produce an electronically excited acceptor in a triplet state
SNOM	Scanning Near-field Optical Microscope, alternatively NSOM (Near-field Scanning Optical Microscope)
spherical aberration	rays of light passing through the center of a lens focus on a different plane than those passing through the lens periphery
ssDNA	single stranded DNA
STAT	signal transducer and activator of transcription
STED	Stimulated Emission Depletion, f.e. STED method in fluorescence microscopy, 4Pi-confocal fluorescence microscopy
STEM	Scanning Transmission Electron Microscope
stem cell	a cell that can continuously produce unaltered daughter cells and also has the ability to produce daughters that have restricted properties
Stokes shift	difference in enery or wavelength between photons involved in fluorescence excitation and emission, e.g. Stokes shift for fluorescein is aprrox. 20 nanometers; the Stokes shift enables the isolation of excitation and emission wavelengths using interference filters
subtractive color mixture	color mixture occurring when particular colors are removed/absorbed from light
subtractive primaries	red, yellow and blue; all other colors can be obtained by subtracting these primaries from white color
TBS	Tris buffered saline
TEM	Transmission Electron Microscope
time-resolved fluorescence (TRF)	TRF is employed for measuring intensity or anisotropic decays; the measurements rely on exposing the specimen to a short pulse of light where the pulse width is typically shorter than the decay time of the fluorophore
tissue stem cell	cell derived from (or resident in) a fetal or adult tissue with potency limited to cells of that tissue; those cells sustain turnover and repair throughout life in some tissues
titer (antibody)	in immunohistology, the highest dilution of an immune serum which gives a specific reaction and the least amount of background staining

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TLC	thin-layer chromatography
TMB	3, 3', 5, 5'-tetramethylbenzidine, peroxidase enzyme substrate
TNBT	tetra nitro blue tetrazolium
totipotent	totipotency is seen in zygote; sufficient to form entire organism
TR	Texas Red
Tris	Tris(hydroxymethyl)aminomethane (synonym: 2-amino-2-(hydroxymethyl)propane-1,3-diol; Tris buffer, e.g. Tris-HCl or Tris-saline buffer to be used in enzyme studies
triplet state	the electronic configuration is referred to as a triplet state, when for any *many-electron system* (atoms, molecules) the electron spins are unpaired. The spin quantum number (S) is the absolute value of the sum of electronic spins within the system. In the triplet state with parallel (unpaired) spins, the spin quantum number is 1 for a two-electron system (and the multiplicity is 3)
TRITC	tetramethylrhodamine isothiocyanate
TRSC	Texas Red sulfonylchloride
TUNEL	terminal deoxynucleotidyl transferase-mediated dUTP nick end labelling
U (U/L)	unit (unit per liter)
UV	ultraviolet
µg	microgram
µl	microliter
µm	micrometer
VEGF	vascular endothelial growth factor
WB	Western blot
w/v	weight per volume (e.g. g/L)

For glossary of terms see also http://www.unibas.ch/epa/glossary/glossary.htm