MEMORIAV FACHTAGUNG 2022

Handle With Care! Audiovisuelle Träger identifizieren, aufbewahren und handhaben.

Gefährdete Filmträger aus Nitrat, Azetat und anderen Materialien...

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22.06.2022

Ziele

Strategien der Identifikation von Filmträgern durch Kenntnis der Entwicklungsgeschichte

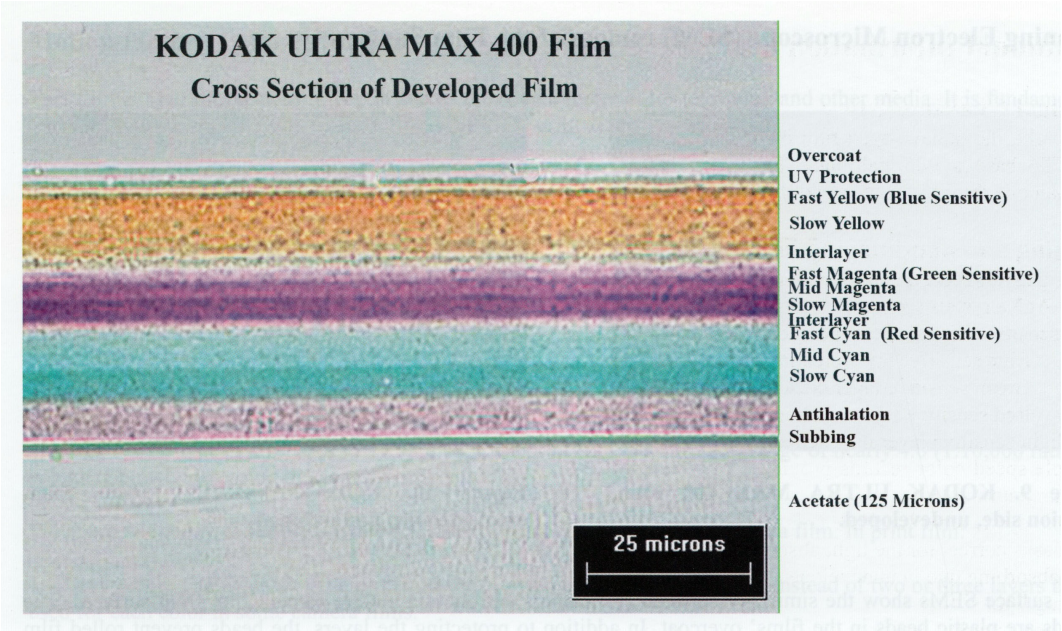
Verbesserung der Konservierung durch Materialkenntnis

Bandbasierte, mehrschichtige Medien (Film, Audio, Video)

Trägerschicht (Stabilität, Handhabung)

Informationsschicht (Daten, Bild, Ton)

Weitere Schichten (Schutz, Haftung, Lichthofschutzschicht etc.)



Schnittbild

Robert L. Shanebrook, Making KODAK Film, 2nd Ed., 2016

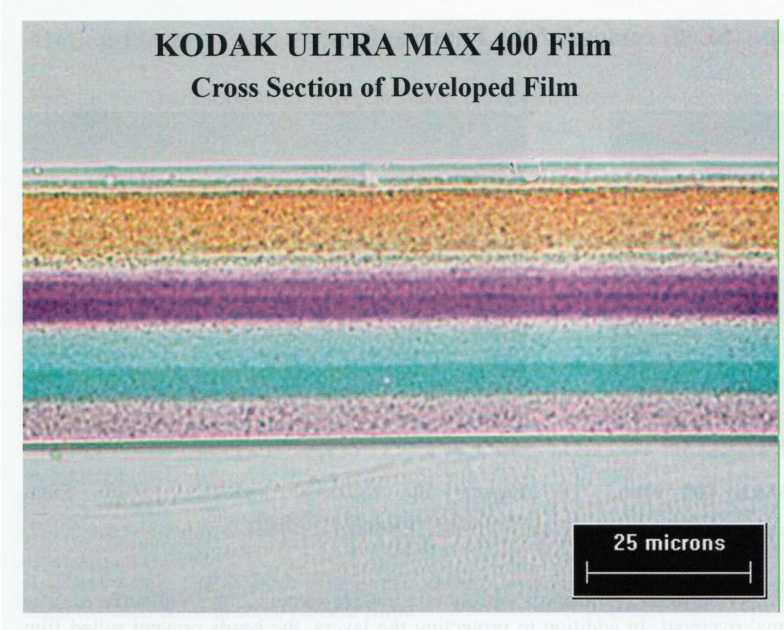
Schematic Cross Section of 400 Speed Color Negative Film

This two-page figure shows a graphical cross section of a typical color negative camera film. A single piece of film is a combination of the seventeen layers

Layer	Materials	Primary Function
17. Overcoat Matte [N]	Plastic beads, about 1 micron in diameter Lubricant Antistat Polymer and gelatin	Provides separation at film's surface Lowers surface coefficient of friction Reduces static electricity Carries the materials
16. UV Filter Dye [N]	Dye [D]	Absorbs ultraviolet radiation
15. Fast Blue Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to blue light
	Yellow Image Dye Coupler [C] Cyan Dye Coupler [D]	Reacts with oxidized developer to form dye image Forms dye image to correct color errors
14. Slow Blue Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to blue light
	Yellow Image Dye Coupler [C] Cyan Dye Coupler [C]	Reacts with oxidized developer to form dye image Forms dye image to correct color errors
13. Yellow filter [N]	Dye [D]	Prevents UV and blue light from exposing green and red layers
12. Interlayer [N]	Gelatin	Chemical barrier with scavengers
11. Fast Green Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to green light
	Magenta Image Dye Coupler [C] Cyan Dye Coupler [C] Yellow Dye Coupler [C]	Reacts with oxidized developer to form magenta dye image Forms dye image to correct color errors Forms dye image to correct color errors
10. Mid Green Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to green light
	Magenta Dye Image Coupler [C] Magenta Masking Coupler [C] Cyan Dye Coupler [C] Yellow Dye Coupler [C]	Reacts with oxidized developer forming magenta dye image Dye image to correct color errors Dye image to correct color errors Dye image to correct color errors
9. Slow Green Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to green light
	Magenta Image Dye Coupler [C] Magenta Masking Coupler [C]	Reacts with oxidized developer to form magenta dye image Dye image to correct color errors
8. Interlayer [N]	Gelatin	Chemical barrier with scavengers
7. Fast Red Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to red light
	Cyan Image Dye Coupler [C]	Reacts with oxidized developer to form cyan dye image
6. Mid Red Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to red light
	Cyan Image Dye Coupler [C] Cyan Masking Coupler [C] Yellow Dye Coupler	Reacts with oxidized developer to form cyan dye image Dye image to correct color errors Dye image to correct color errors
5. Slow Red Sensitive Emulsion [I]	Gelatin, silver halide and dye [D]	Creates latent image when exposed to red light
	Cyan Image Dye Coupler [C] Cyan Masking Coupler [C]	Reacts with oxidized developer to form cyan dye image Dye image to correct color errors
4. Anti-halation [N]	Dye and particles [D] Cyan Dmin Dye [D] Magenta Dmin Dye [D] UV Dye [D] Yellow Dmin Dye [D] Antistatic	Absorbs scattered light Filtration for printing Filtration for printing Filtration for printing Filtration for printing Reduces static electricity
2. Subbing [N]	Polymer	Improves coating adhesion
1. CTA Base [N]	Cellulose Triacetate	Provides physical strength to support the coatings. 3X thicker than all the other coatings combined.
3. Backing [N]	Plastic beads Lubricant Polymer Anti-stat	Provides separation at film's surface Lowers surface coefficient of friction Scratch protection Reduces static electricity

Not to scale ©2016 Robert L. Shanebrook

Figure 21. Two-page cross section diagram of 400 speed color negative film. [21]



Informationsschicht (ca. 35 µm)

Trägerschicht (ca. 125 µm)

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Herausforderungen der Konservierung von Filmmaterialien

Verlust von Information.
Strukturelle Veränderungen.

Herausforderungen der Konservierung von Filmmaterialien

Verlust von Information.
Strukturelle Veränderungen.

Biologischer Zerfall
Obsoleszenz von Abspielgeräten
Obsoleszenz des Signals
Abnützung
Zerstörung
Verlust/Unzugänglichkeit

Herausforderungen der Konservierung von Filmmaterialien

Verlust von Information.
Strukturelle Veränderungen

Biologischer Zerfall
Obsoleszenz von Abspielgeräten
Obsoleszenz des Signals
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Zerstörung
Verlust/Unzugänglichkeit

Chemischer Zerfall
Physikalischer Zerfall
(langsame Prozesse)

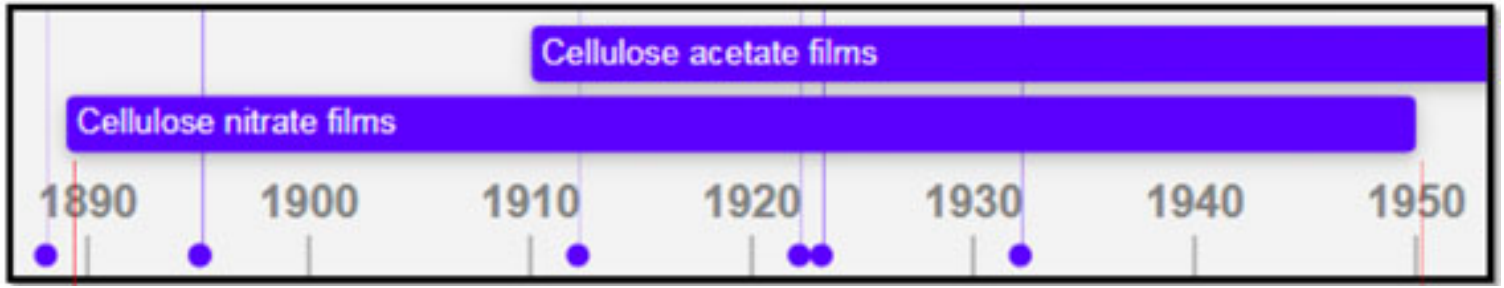
Zerfall der Informationsschicht

Robert L. Shanebrook, Making KODAK Film, 2nd Ed., 2016

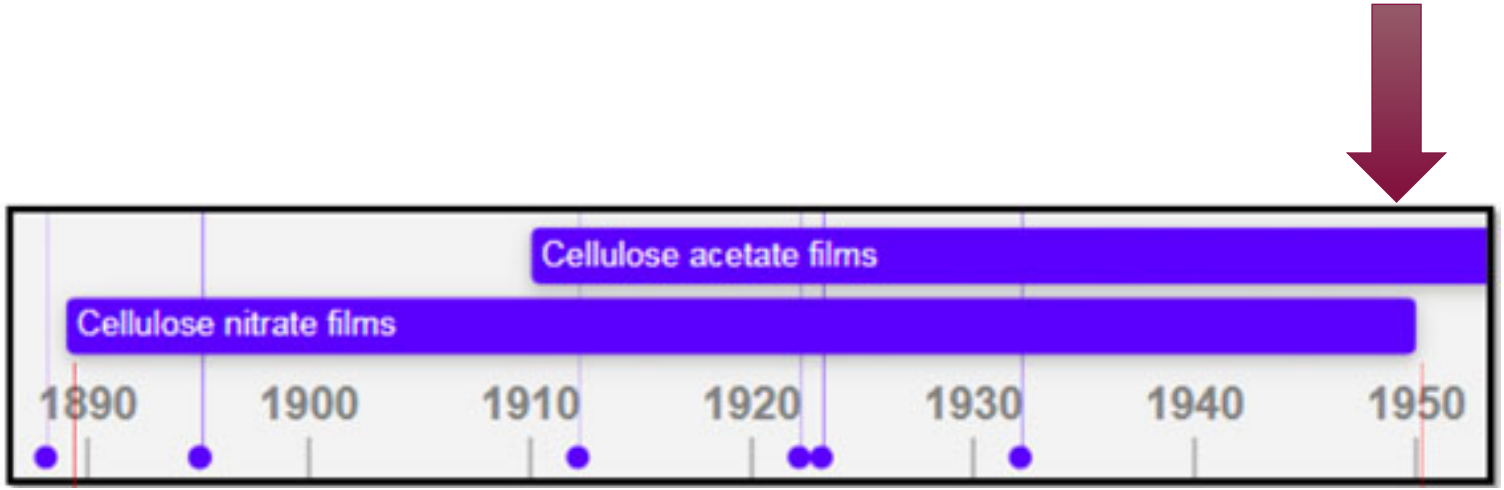
Zerfall der Informationsschicht

Biologischer Zerfall: Schimmel/Bakterien

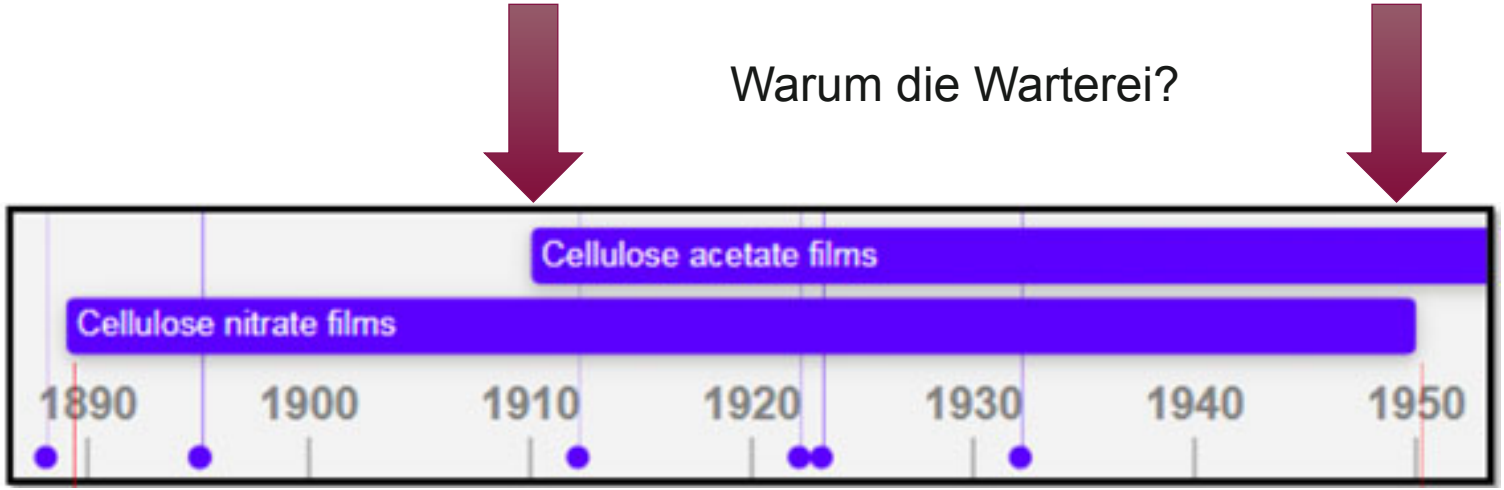
Zerfall und Verformung das Trägermaterials

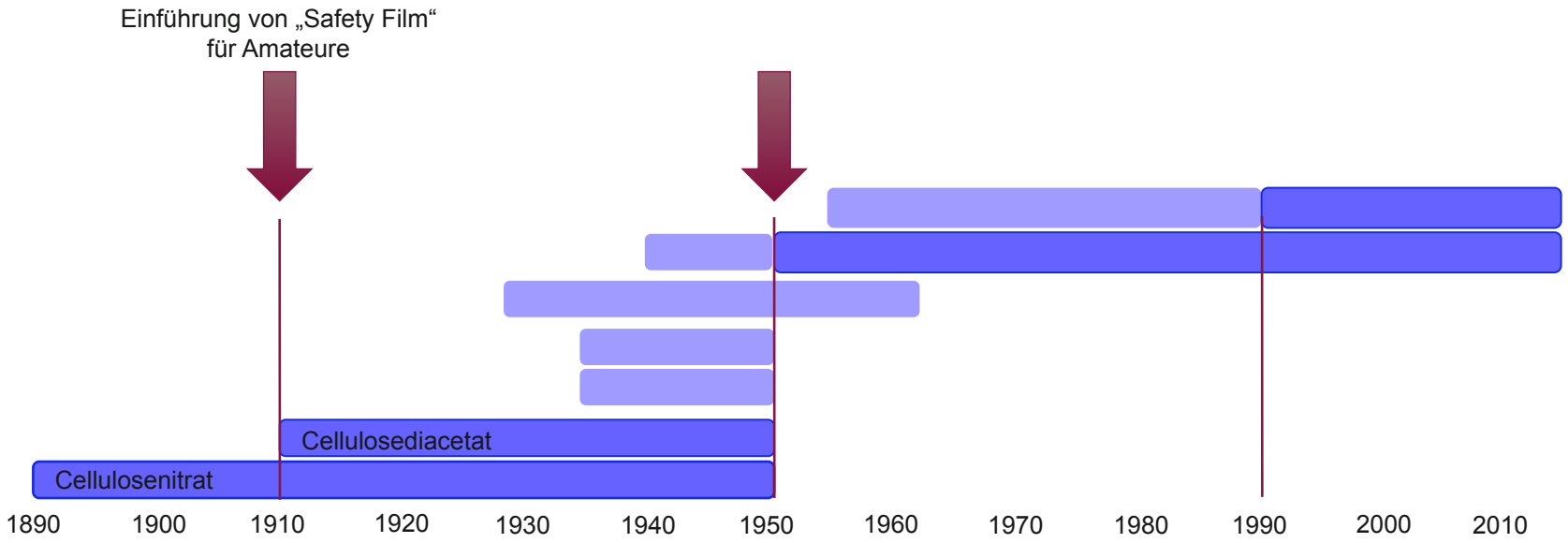


INA-Workshop “Audiovisual Materials Preservation and management”, Etienne Marchand


Cellulose acetate films
Cellulose nitrate films
1890
1900
1910
1920
1930
1940
1950

Warum die Warterei?




Einführung von „Safety Film“
für Amateure
Cellulosediacetat
Cellulosenitrat
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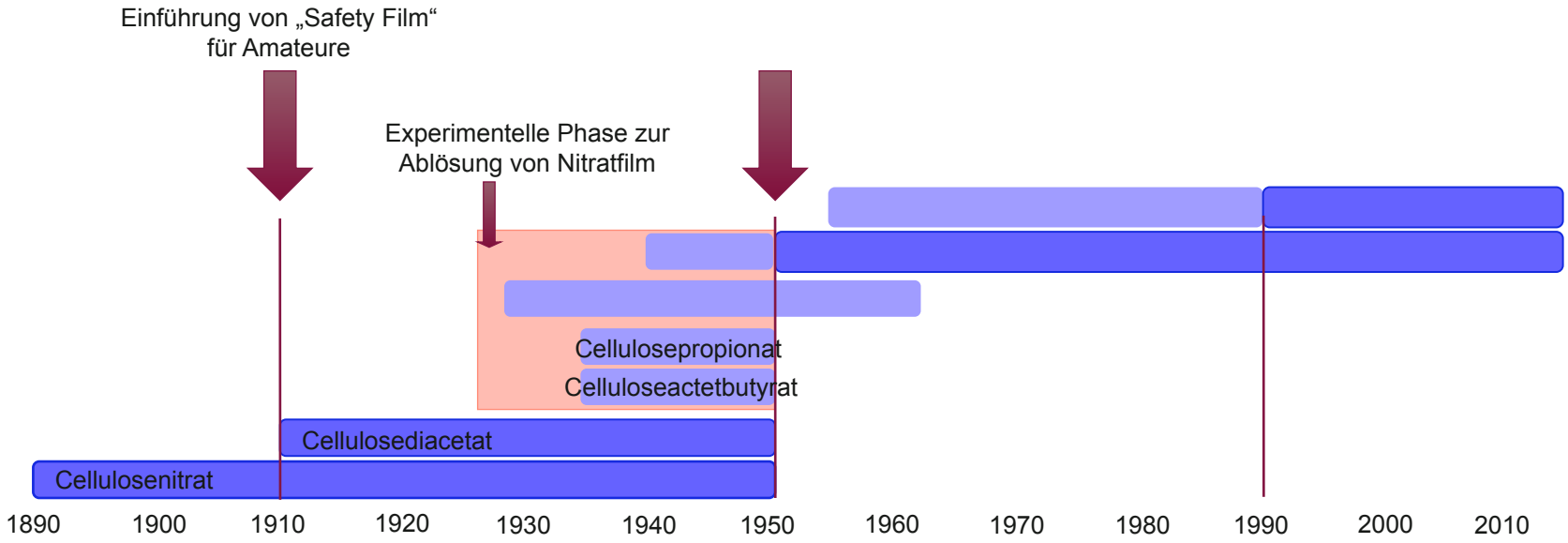
2010


Einführung von „Safety Film“
für Amateure
Experimentelle Phase zur
Ablösung von Nitratfilm
Celluloseproprionat
Celluloseactetbutyrat
Cellulosediacetat
Cellulosenitrat
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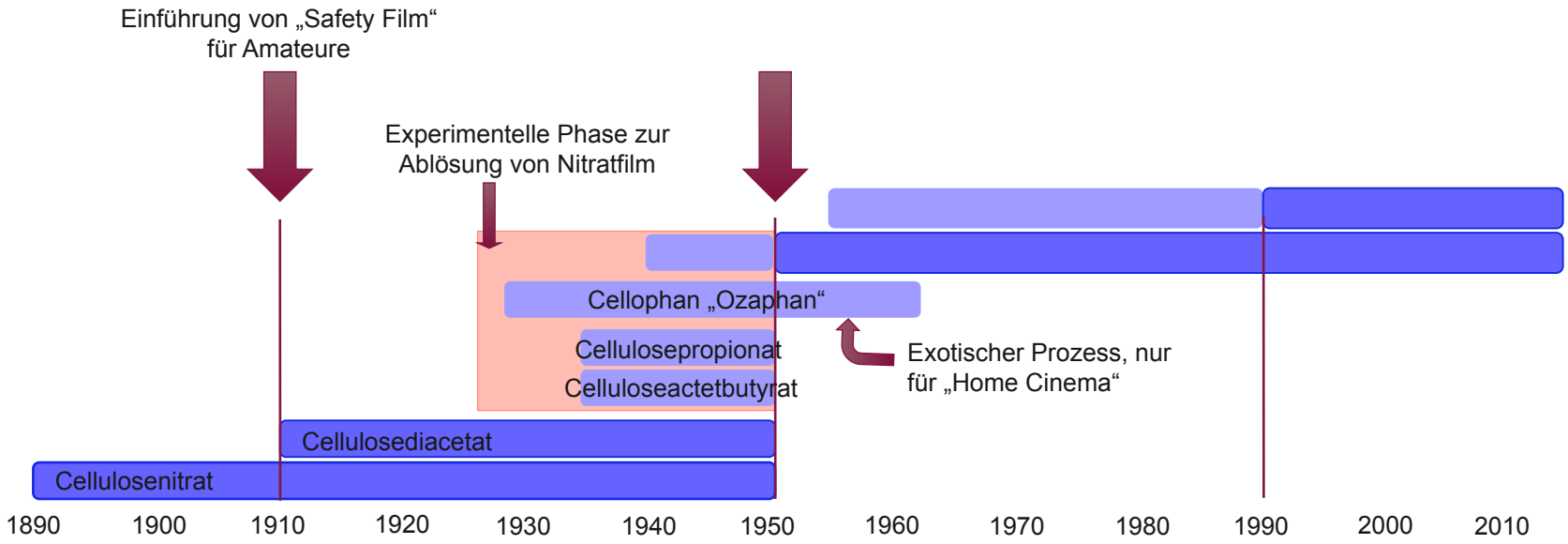
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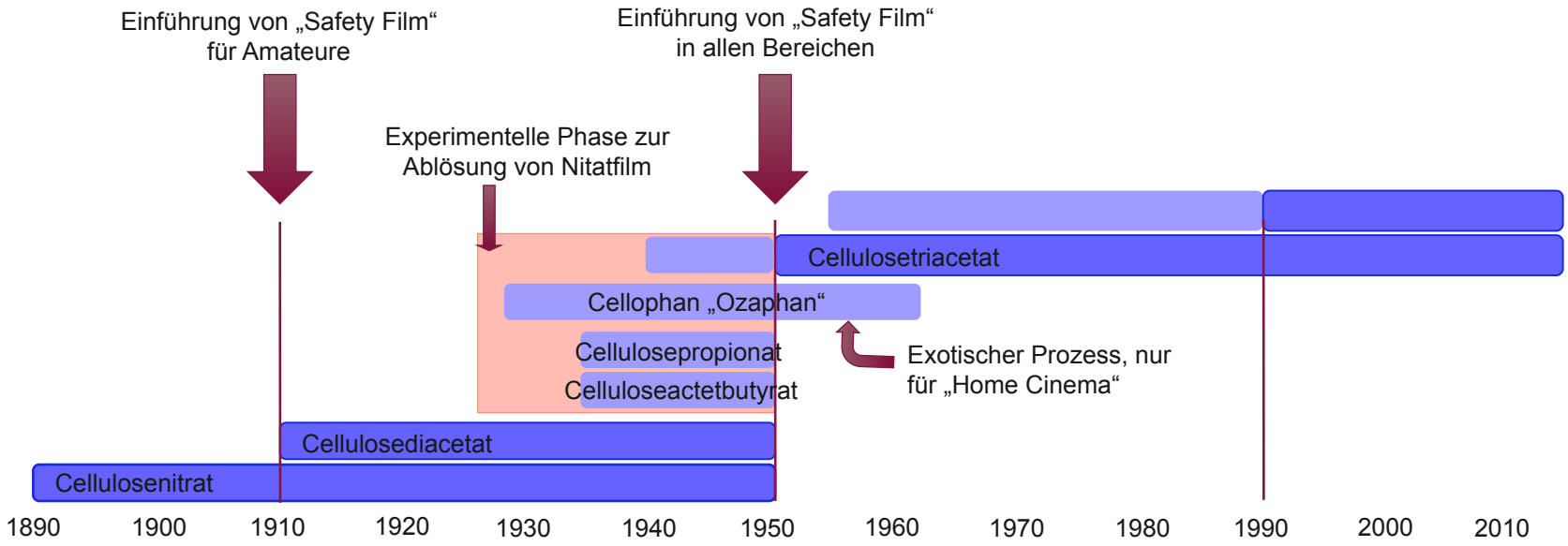
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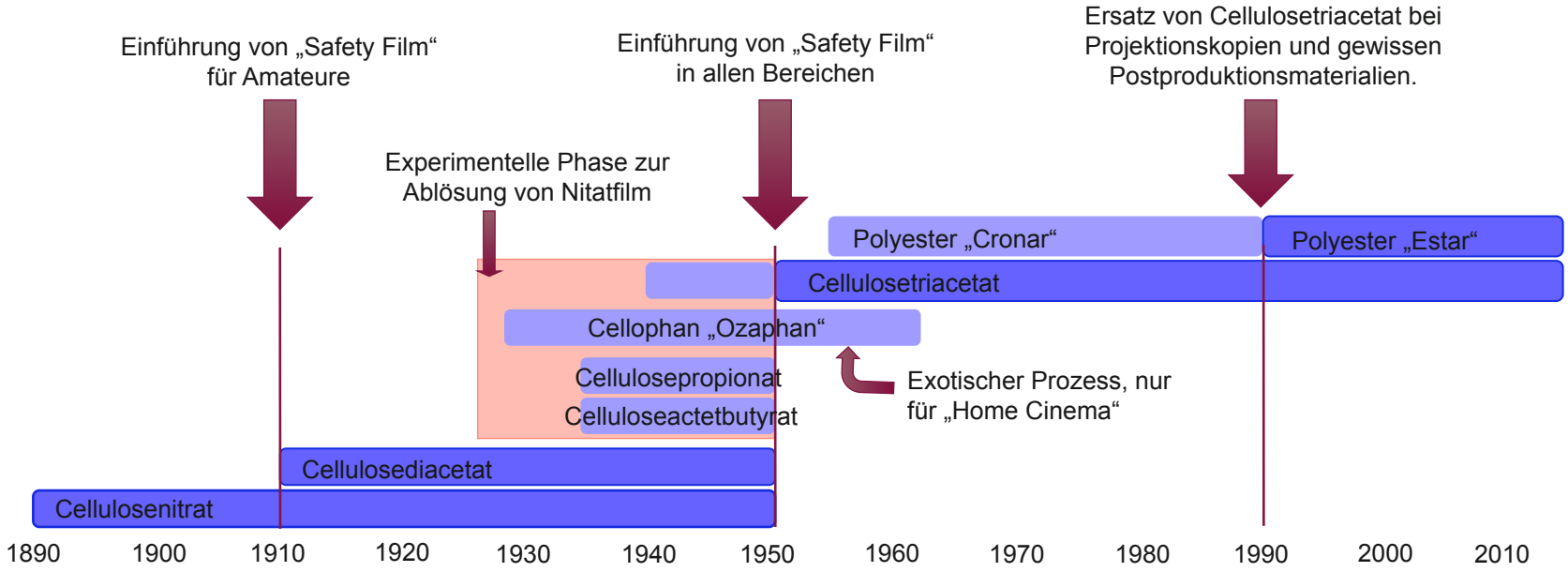
Einführung von „Safety Film“ für Amateure
Experimentelle Phase zur Ablösung von Nitatfilm
Einführung von „Safety Film“ in allen Bereichen
Ersatz von Cellulosetriacetat bei Projektionskopien und gewissen Postproduktionsmaterialien.
Polyester „Cronar“
Polyester „Estar“
Cellulosetriacetat
Cellophan „Ozaphan“
Celluloseproprionat
Celluloseactetbutyrat
Exotischer Prozess, nur für „Home Cinema“
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Cellulosenitrat
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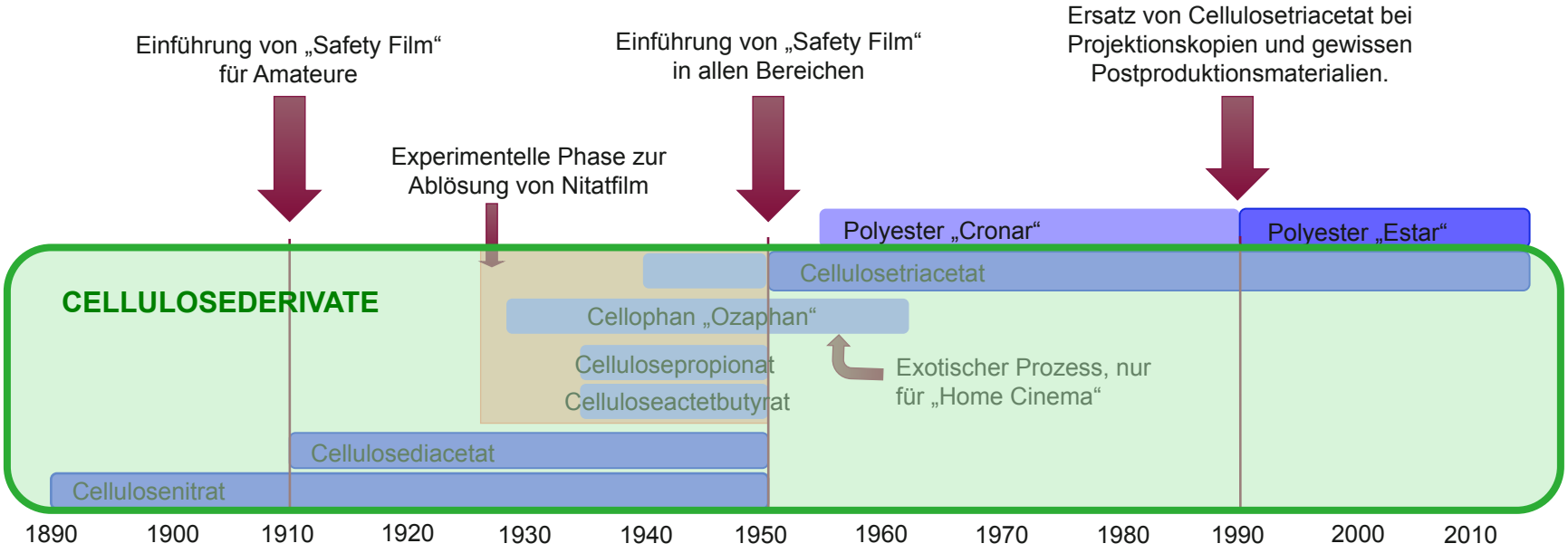
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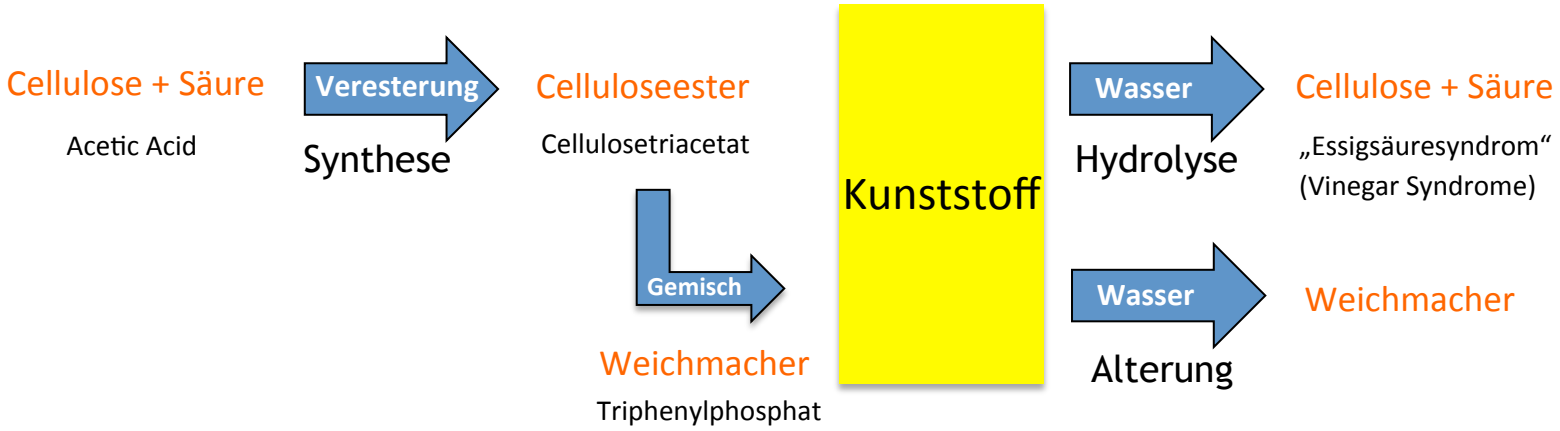
Acetatfilm / Diactetat, Triacetat = Cellulosediacetat, Cellulosetriacetat + Weichmacher

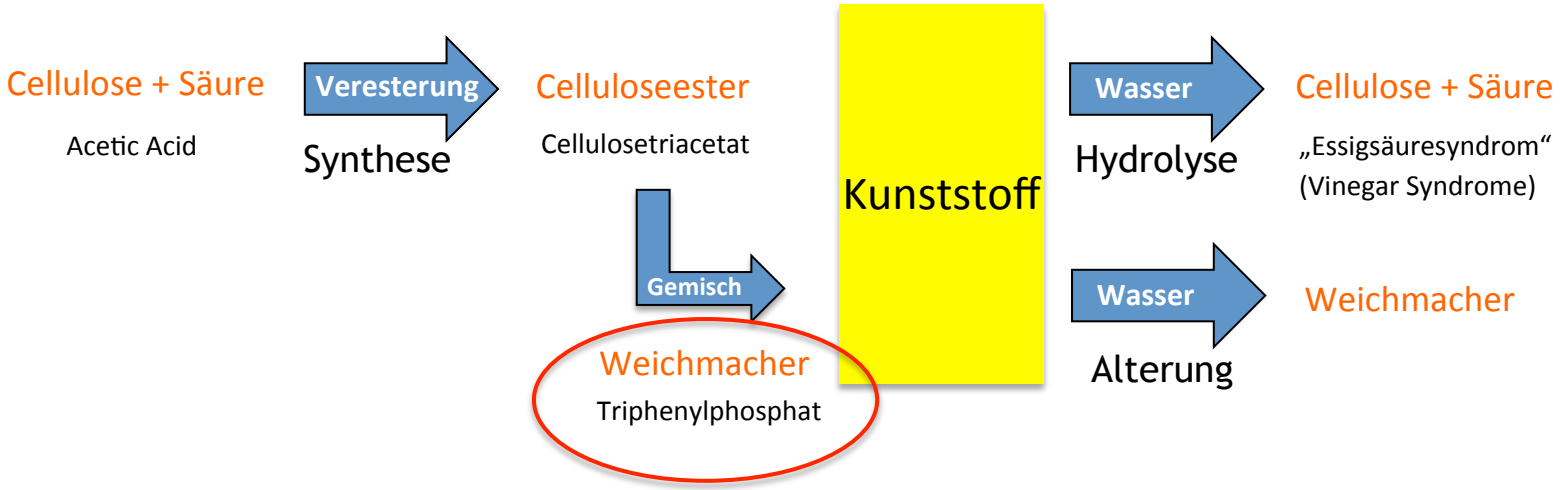
Nitratfilm, Nitrofilm = Zelluloid = Cellulosenitrat + Weichmacher

Ozaphan = Cellophan = Cellulosehydrat

Cronar, Estar = PET = Polyethylenterephtalat

Trivialname/Markenname Filmtechnik
Trivialname/Markenname Kunststoff
Chemische Bezeichnung


Cellulose + Säure
Acetic Acid
Veresterung
Synthese
Celluloseester
Cellulosetriacetat
Gemisch
Weichmacher
Triphenylphosphat
Kunststoff
Wasser
Hydrolyse
Cellulose + Säure
„Essigsäuresyndrom“
(Vinegar Syndrome)
Wasser
Alterung
Weichmacher



In Nitrofilm bis zu 30% Kampfer
In Triacetat bis zu 15% Triphenylphosphat

Acetatfilm

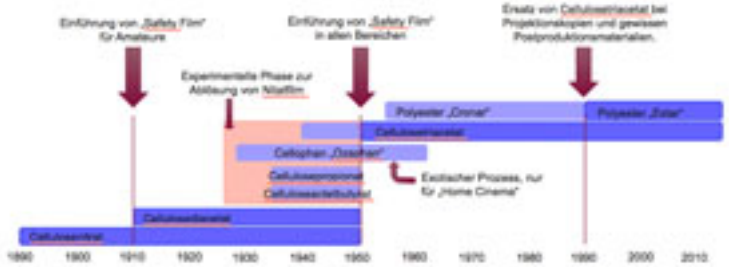
Nitratfilm

	Bennbar?	Reissbar	Gelatine	Dicke	Zeitraum	Filmbreiten
Nitrofilm	Gut	Ja	Ja	ca. 150 µm	1890er bis 1950er	35mm, Exotische
Acetatfilm	Schlecht	Ja	Ja	ca. 150 µm	1910er bis 2020er	Alle
Acetatbutyratfilm	Schlecht	Ja	Ja	ca. 150 µm	1930er und 1940er	16mm, (35mm?)
Propionatfilm	Schlecht	Ja	Ja	ca. 150 µm	1930er und 1940er	(16mm?), (35mm?)
Ozaphan	Schlecht	Sehr	Nein	ca. 60 µm	1930er bis 1960er	16mm, Exotische
Polyesterfilm	Schlecht	Nein	Ja	ca. 130 µm	1990er bis 2020er	(8mm), 16mm, 35mm, 70mm

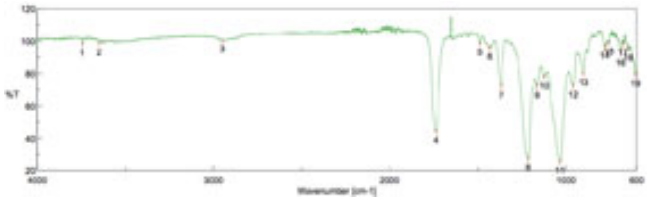
Ausnahmen bestätigen die Regel!

Identifikation von Materialien

Kenntnis der Geschichte



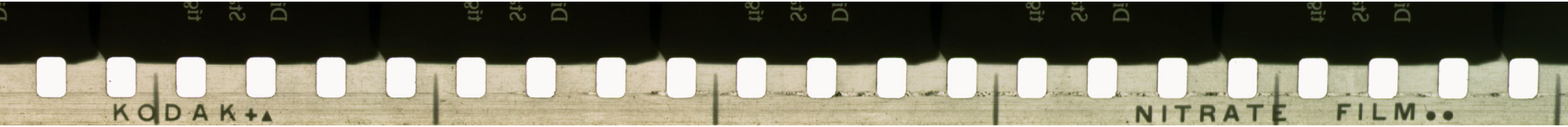
Messungen/Tests



Fourier-Transform-Infrarotspektroskopie (FTIR)

Burn test

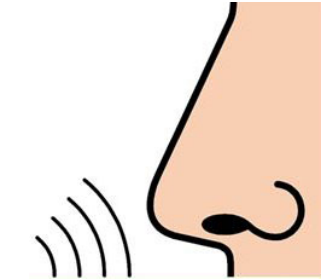
Randinformationen



Identifikation von Zerfallsphänomenen

Visuelle Inspektion

Geruch



www.film-e2e.com

Messungen

A-D-Strips
Image Permanence Institute
www.imagepermanenceinstitute.org

Identifikation von Zerfallsphänomenen

Klimakontrolle

Trennen von Materialien

Kopierung oder Digitalisierung zu Archivzwecken

Arriscan