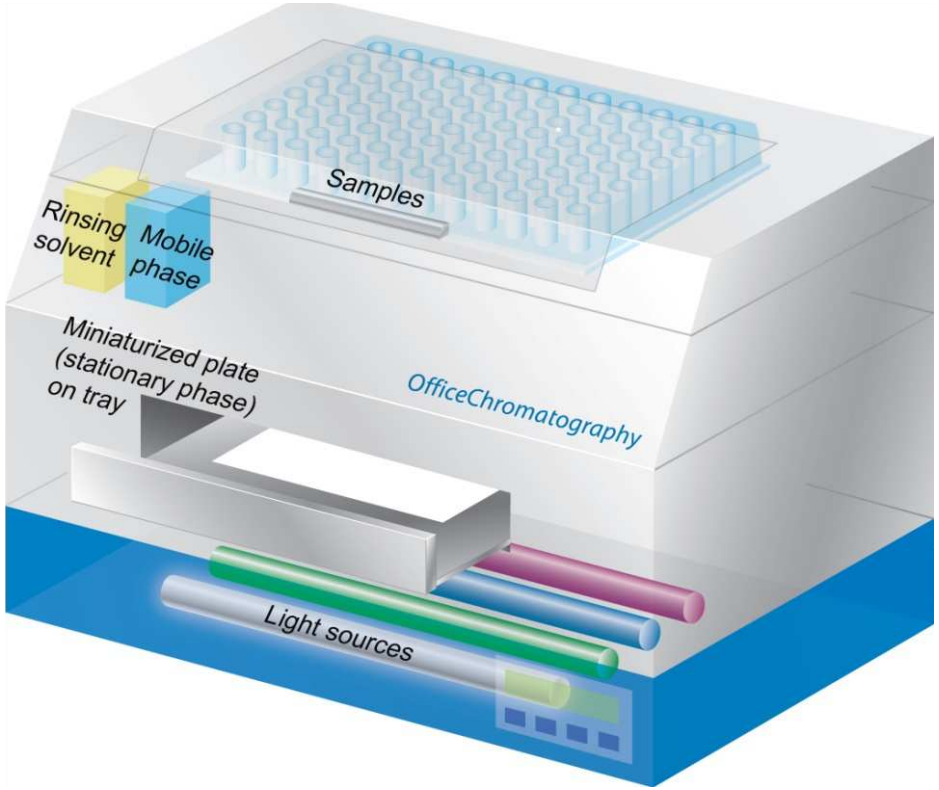
Institute of Food Chemistry
University of Hohenheim, Stuttgart

Office Chromatography



Gertrud Morlock & Wolfgang Schwack
Institute of Food Chemistry
University of Hohenheim, Stuttgart

Institute of Food Chemistry
University of Hohenheim, Stuttgart

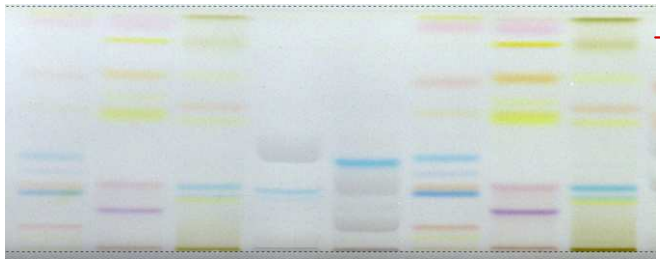
Planar Chromatography

→ 1938 TLC

Thin-layer chromatography

→ 1975 HPTLC

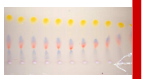
High-performance TLC



→ not known!

→ 2001 UTLC

UltraTLC



J. Sherma, G. Morlock, J. Planar Chromatogr. 21 (2008) 471-477

Institute of Food Chemistry
University of Hohenheim, Stuttgart

The very first start

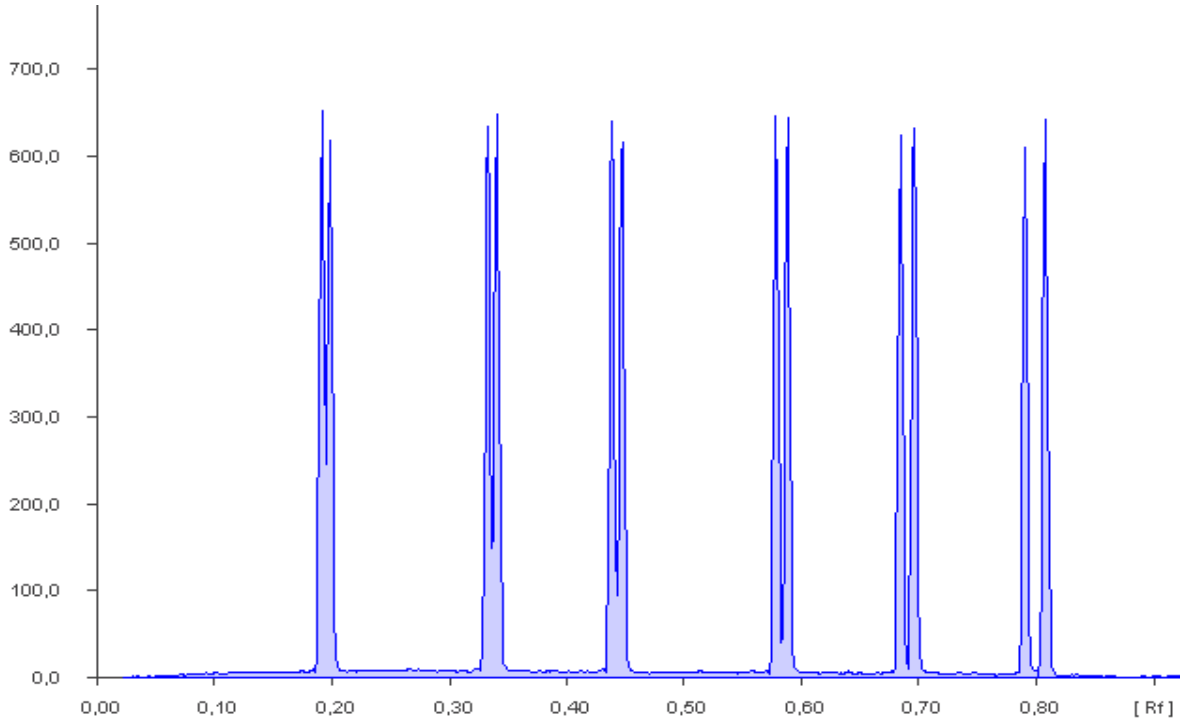
Institute of Food Chemistry
University of Hohenheim, Stuttgart

… printing pictures on TLC foils

Institute of Food Chemistry
University of Hohenheim, Stuttgart

… at a perfect spacial resolution

Scans from 0,6 to 1,5 mm



Institute of Food Chemistry
University of Hohenheim, Stuttgart

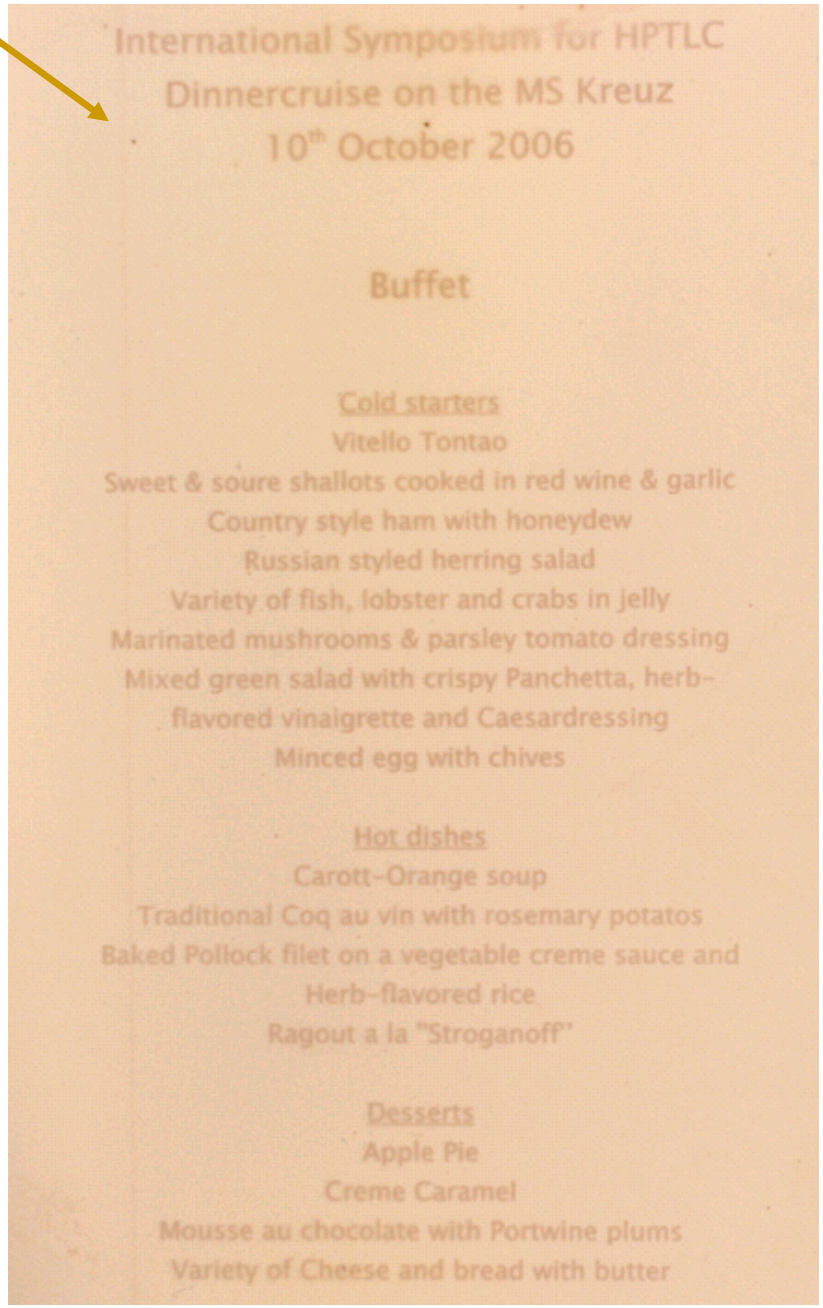
... or the magic dinner card for HPTLC 2006

The most frequently asked question at this evening was: What is the menu?

It was always pointed to the fresh HPTLC plates on each dinner table…

It took a while until a scientist started to heat the HPTLC plate as a plate heater was noticed.

Then, other followed to do the same….



International Symposium for HPTLC
Dinnercruise on the MS Kreuz
10th October 2006

Buffet

Cold starters
Vitello Tontao
Sweet & soure shallots cooked in red wine & garlic
Country style ham with honeydew
Russian styled herring salad
Variety of fish, lobster and crabs in jelly
Marinated mushrooms & parsley tomato dressing
Mixed green salad with crispy Panchetta, herb-flavored vinaigrette and Caesardressing
Minced egg with chives

Hot dishes
Carott-Orange soup
Traditional Coq au vin with rosemary potatos
Baked Pollock filet on a vegetable creme sauce and Herb-flavored rice
Ragout a la "Stroganoff"

Desserts
Apple Pie
Creme Caramel
Mousse au chocolate with Portwine plums
Variety of Cheese and bread with butter

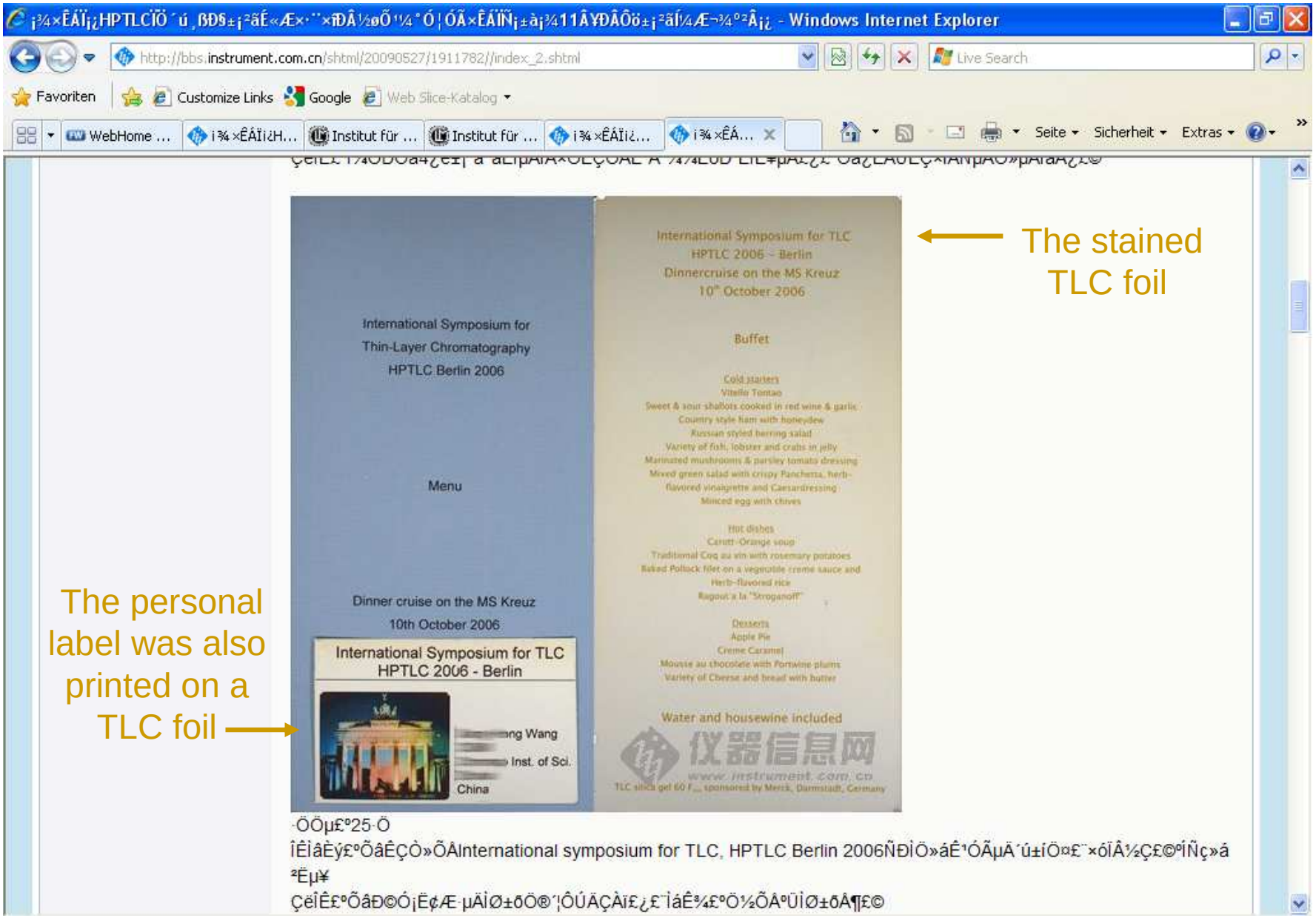
The sweetener sucrose was not in the meal, but on a ß-naphthol-impregnated plate

…the letters were still readable when visualized after 3 days of printing → the diffusion was not caused due to the alcohol consumption of the scientists

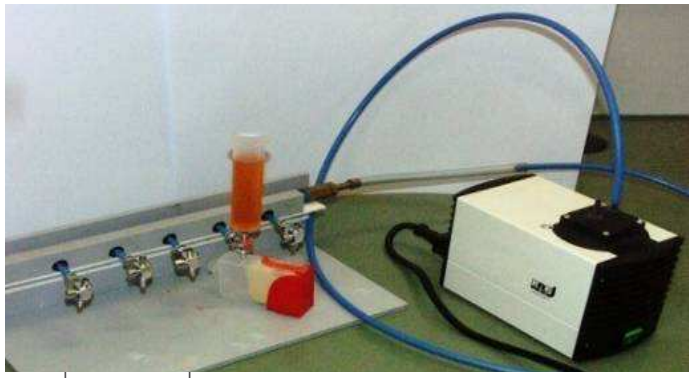
Institute of Food Chemistry
University of Hohenheim, Stuttgart

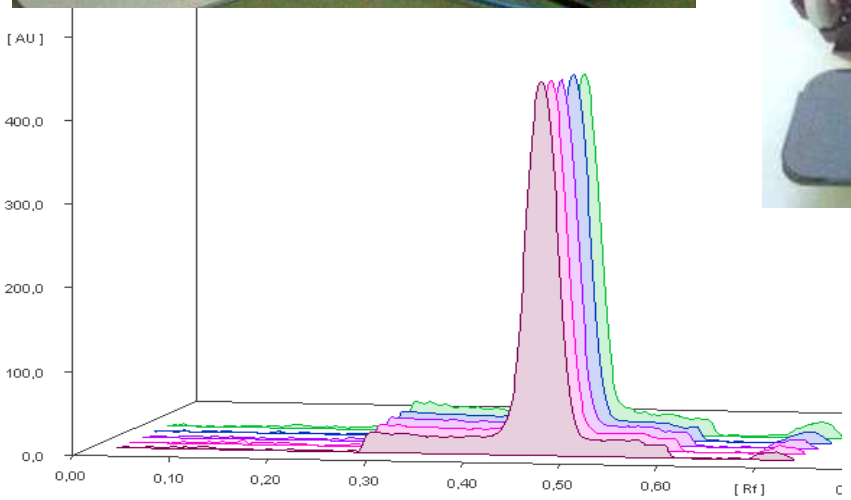
... definitely Chinese scientists managed it!

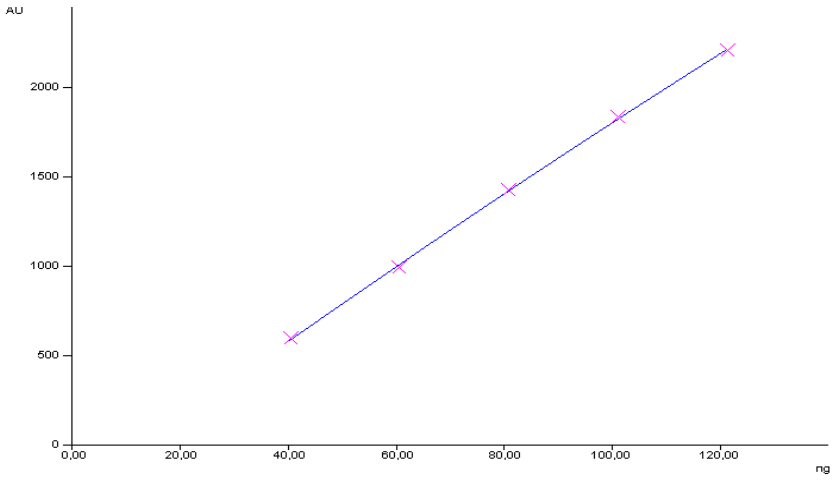
We found the proof later in the Chinese web…

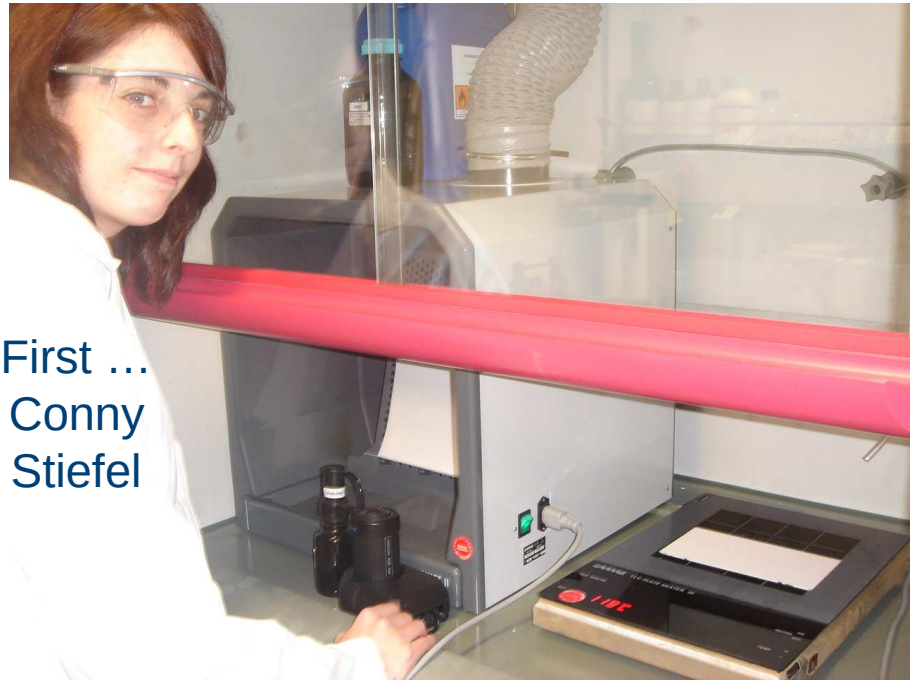


Can one use the printer for printing of reagents?







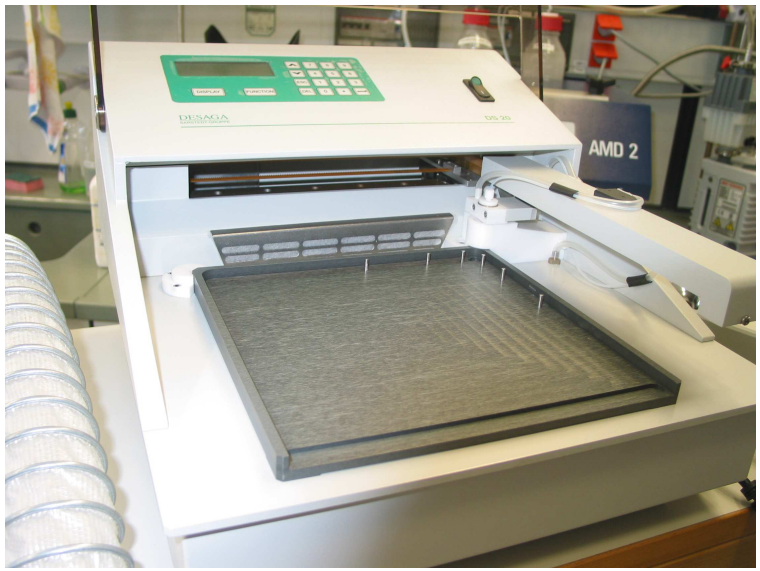


First …
Conny
Stiefel

Institute of Food Chemistry
University of Hohenheim, Stuttgart

Institute of Food Chemistry
University of Hohenheim, Stuttgart

What are the advantageous to given solutions?

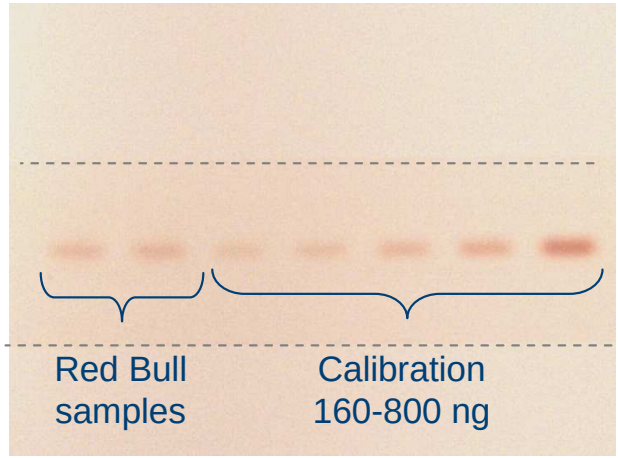


Our students spraying cabinet

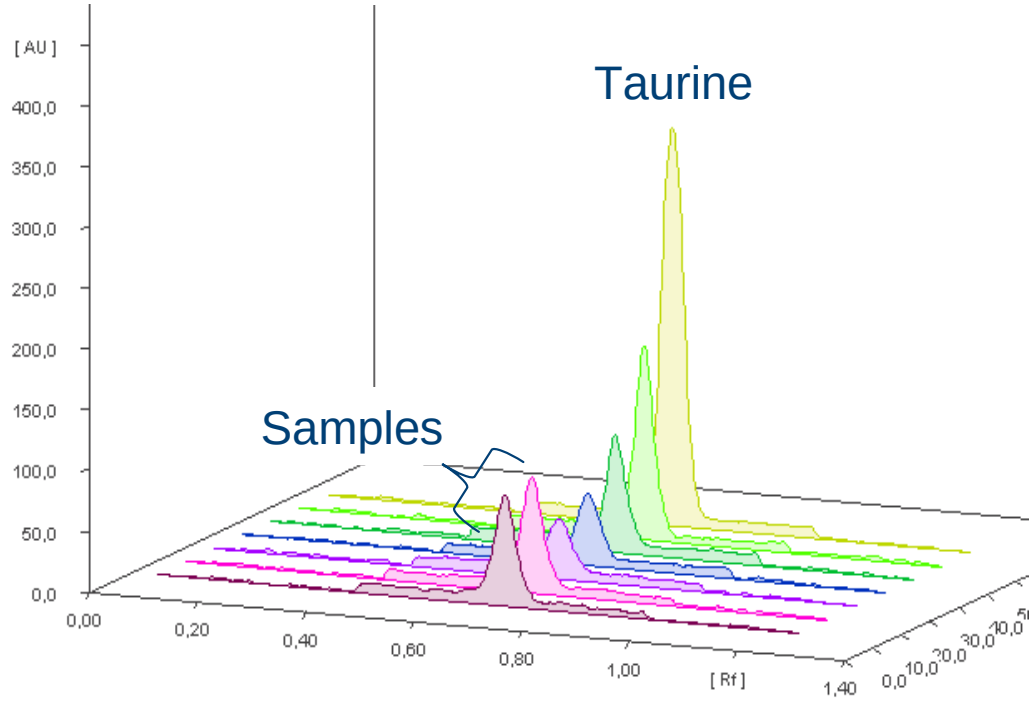
Institute of Food Chemistry
University of Hohenheim, Stuttgart

Performance of the reagent printer

Analysis of taurine in energy drinks

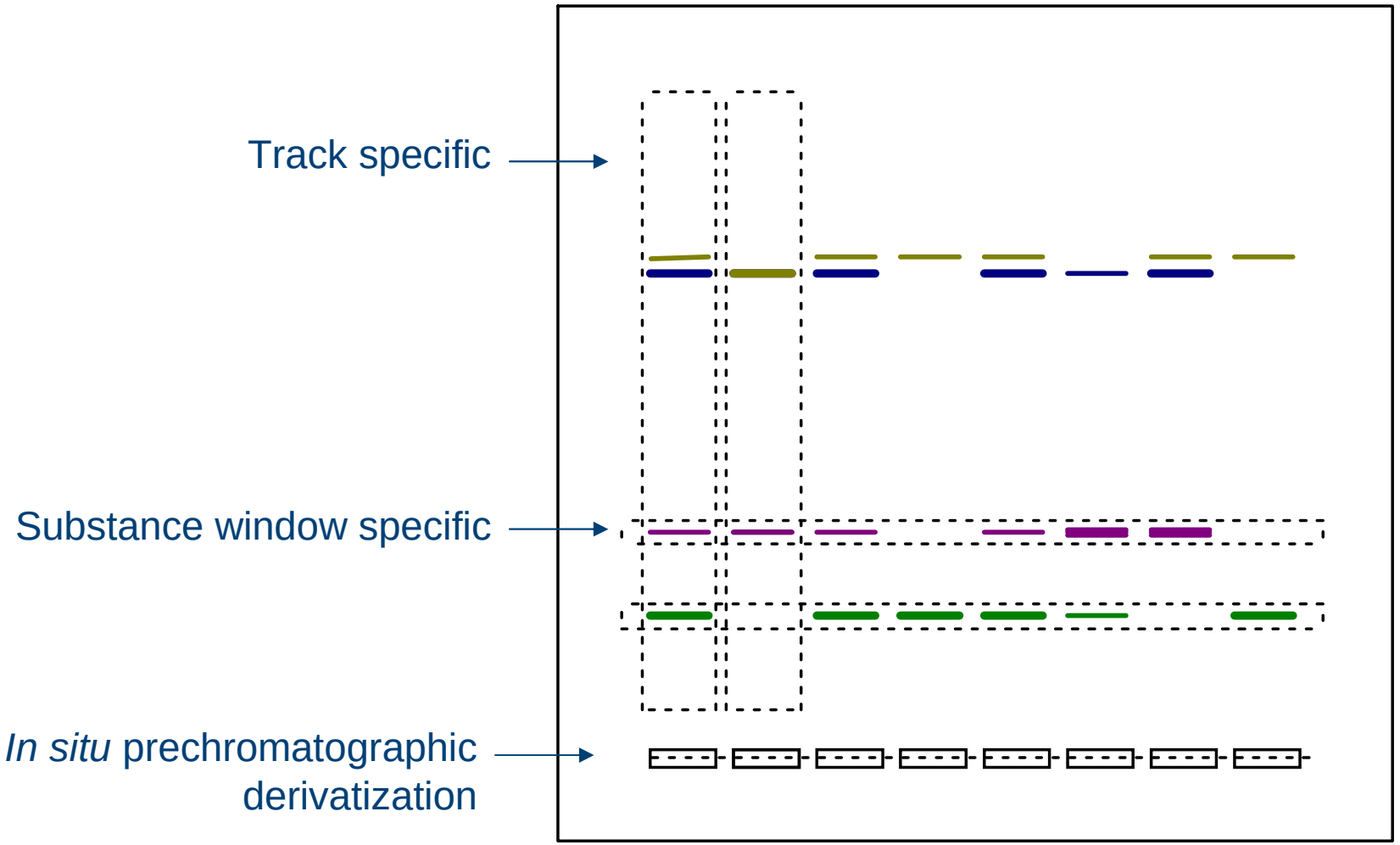


	Dipping[9]	Printing
Functional correlation		
RSD	±0.9%	±1.0%
Correlation coefficient r	0.9998	0.9996
LOD	41 ng	30 ng
LOQ	82 ng	75 ng
Repeatability (RSD, $n = 5$)	±0.9%	±1.0%
Taurine found	0.37% ($n = 4$)	0.35% ($n = 2$)
Recovery rate ($n = 3$)	103% ± 3.0%	98% ± 2.8%



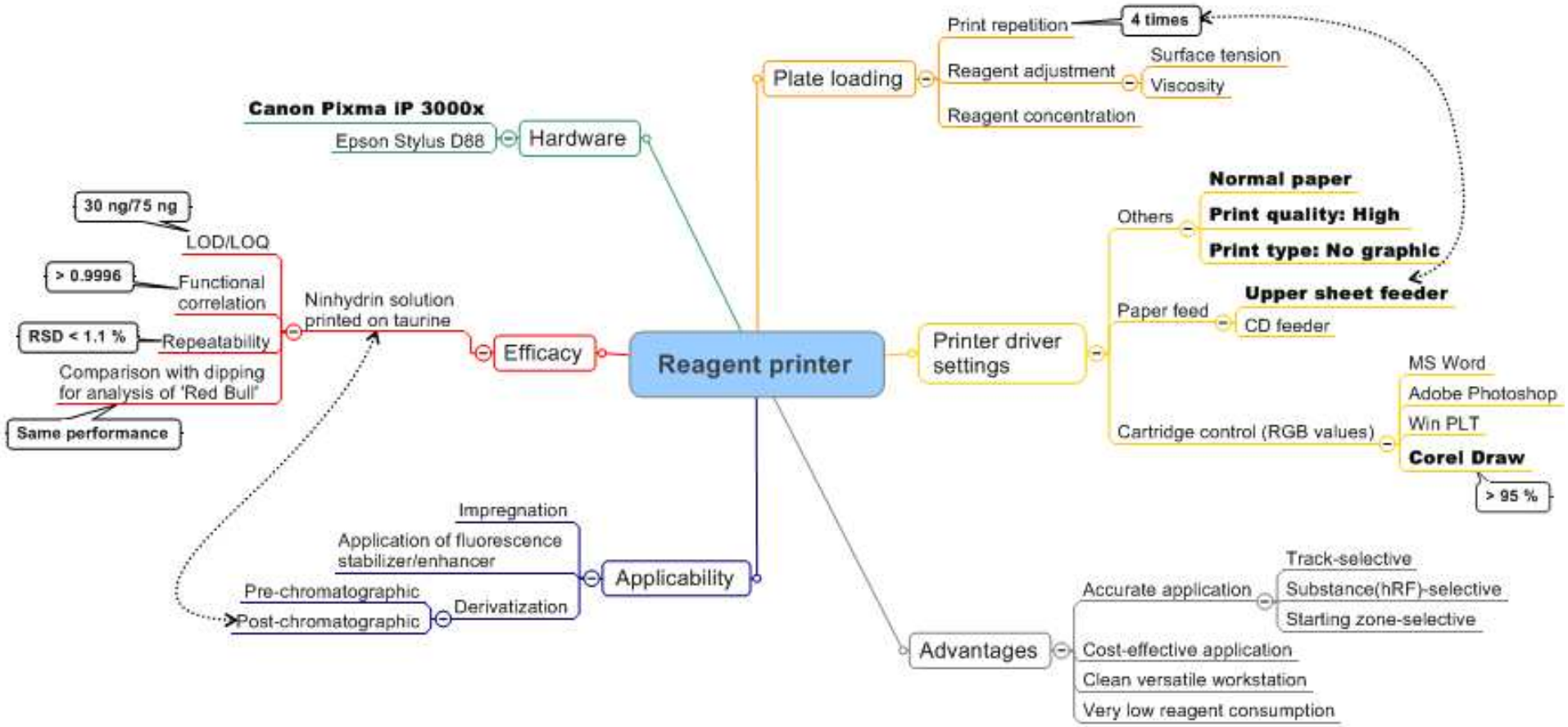
Institute of Food Chemistry
University of Hohenheim, Stuttgart

Flexibility of the reagent printer



Institute of Food Chemistry
University of Hohenheim, Stuttgart

Get married with a reagent printer



G. Morlock, C. Stiefel, W. Schwack J. Liq. Chromatogr. Relat. Technol. 30 (2007) 2171-2184

Activities for HPTLC worldwide

10th jubilee of the French TLC Club

19

10th jubilee celebrated at Sanofi-Aventis in Neuville-sur-Saône in October 2008

20

Louise Vicard got a unique HPTLC plate written by luminescent Vibrio Fischeri bacteria

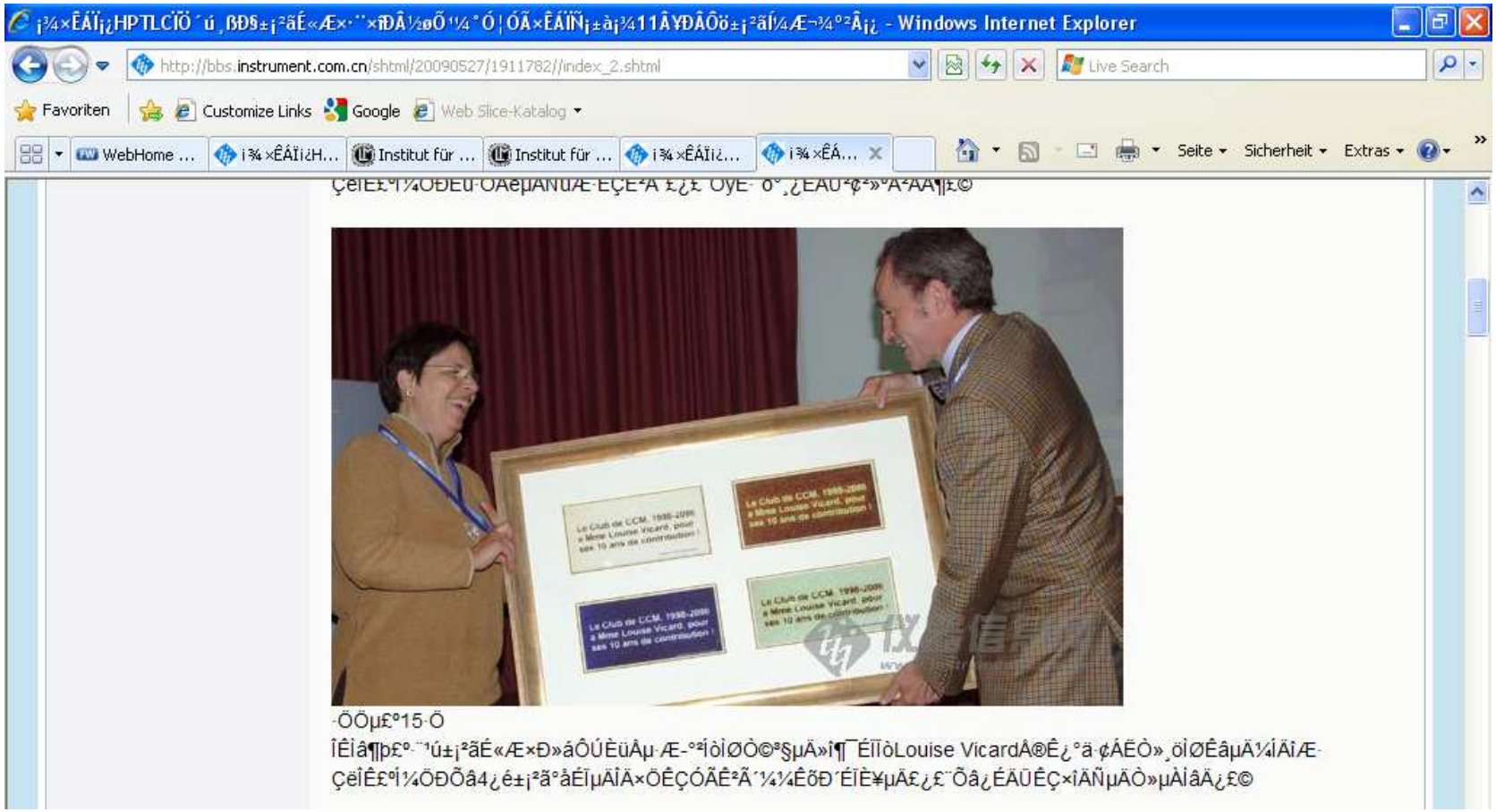
It has already been ten years since the French Club de CCM (CCCM) was founded in 1998 by a group of HPTLC fans. This association has organized twenty days of conference, two each year, and three international symposia: Lyon in 2003, Berlin in 2006, and Helsinki in 2008 (www.hptlc.com). The next International Symposium for HPTLC will take place in Basel, Switzerland, on 6–8th July 2011.

The last meeting, pictured above, was the occasion to celebrate not only the Club's birthday, but also the retirement of Louise Vicard, who has been a regular contributor to CBS over the years, and now serves as treasurer on the board of the club.

The next meeting on the 11th of June will focus on hyphenation with preparative HPLC and on fundamental topics on plates. Please contact Pierre Bernard-Savary, president of CCCM (info@hptlc.com) for further information.

→ CBS 100 (2008) 9

Again found in the Chinese web…



Institute of Food Chemistry
University of Hohenheim, Stuttgart

Printing bacteria on the plate

Vibrio Fischeri still alive congratulate:

Institute of Food Chemistry
University of Hohenheim, Stuttgart

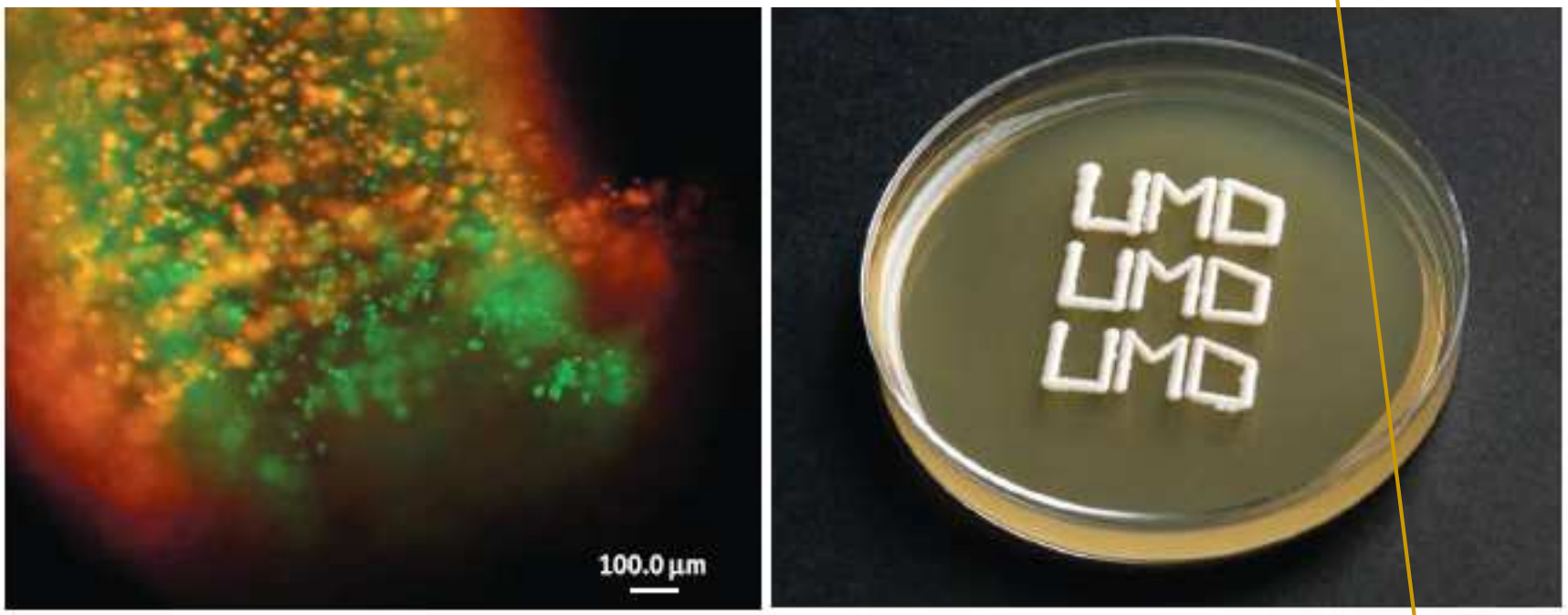
MATERIALS SCIENCE

Printing Cells

Paul Calvert

Sometimes one should be few months earlier!

Inkjet printing technology offers a way to create three-dimensional biological structures for studying cell interactions and artificial organs.

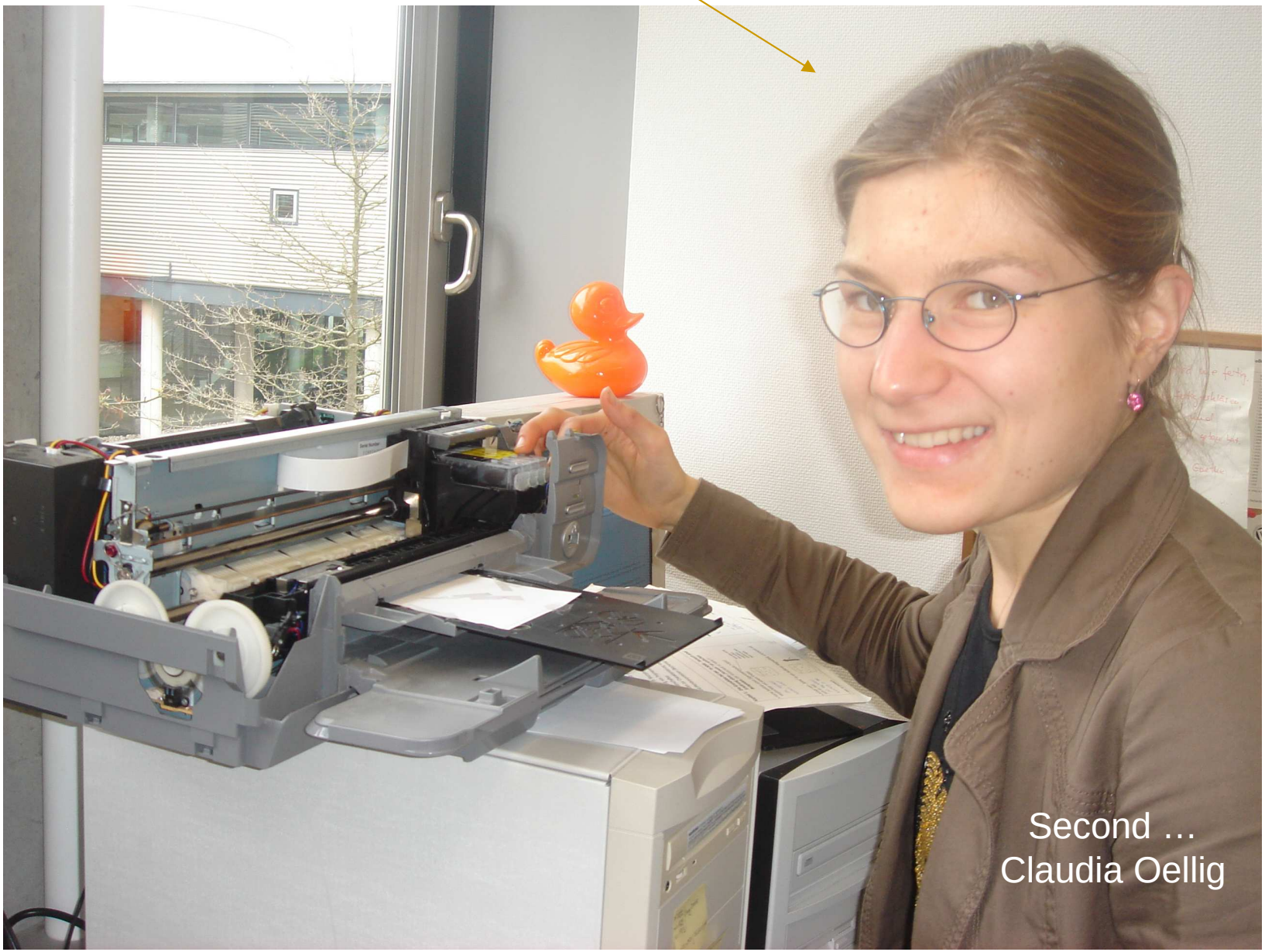


Cells on demand. (Left) Three-dimensional tube structure made from bioprinted cells. This composite image shows an inner layer of human umbilical endotheial cells (green) and an outer layer of human aortic smooth muscle cells (red). **(Right)** Printed and cultured yeast patterns after 3 days of culture. The patterns were printed at 75, 150, and 300 drops per second, from top to bottom.

www.sciencemag.org SCIENCE VOL 318 12 OCTOBER 2007

Institute of Food Chemistry
University of Hohenheim, Stuttgart

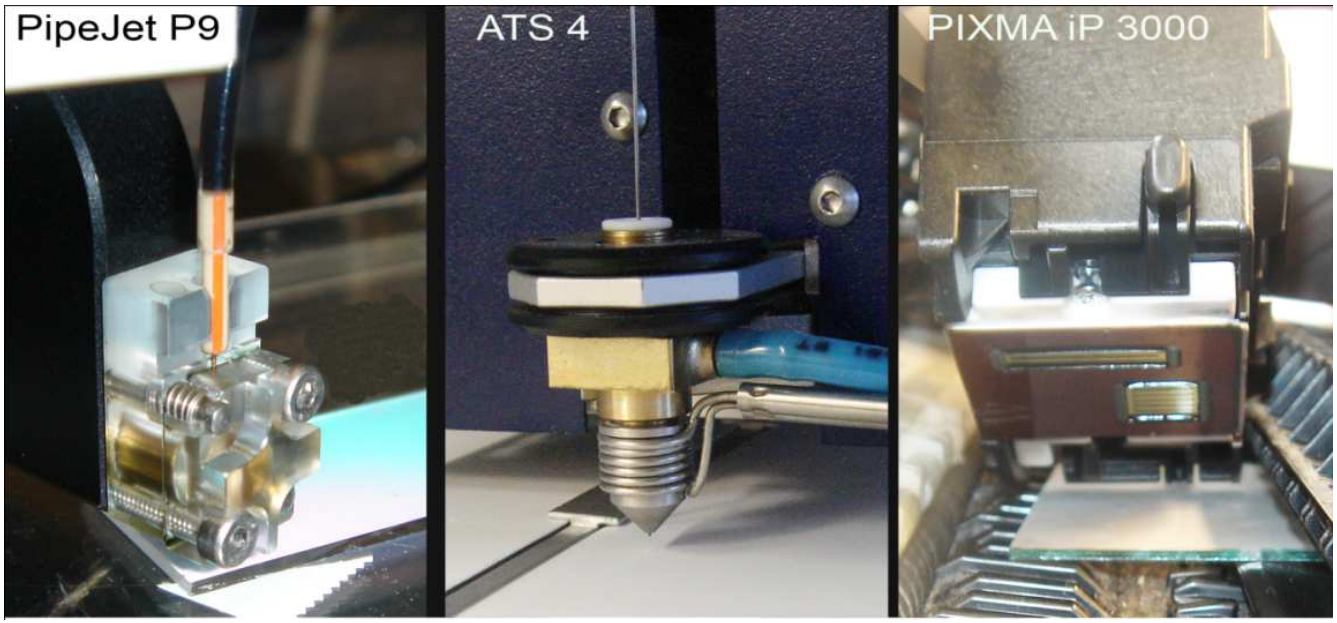
Our next working station



Institute of Food Chemistry
University of Hohenheim, Stuttgart

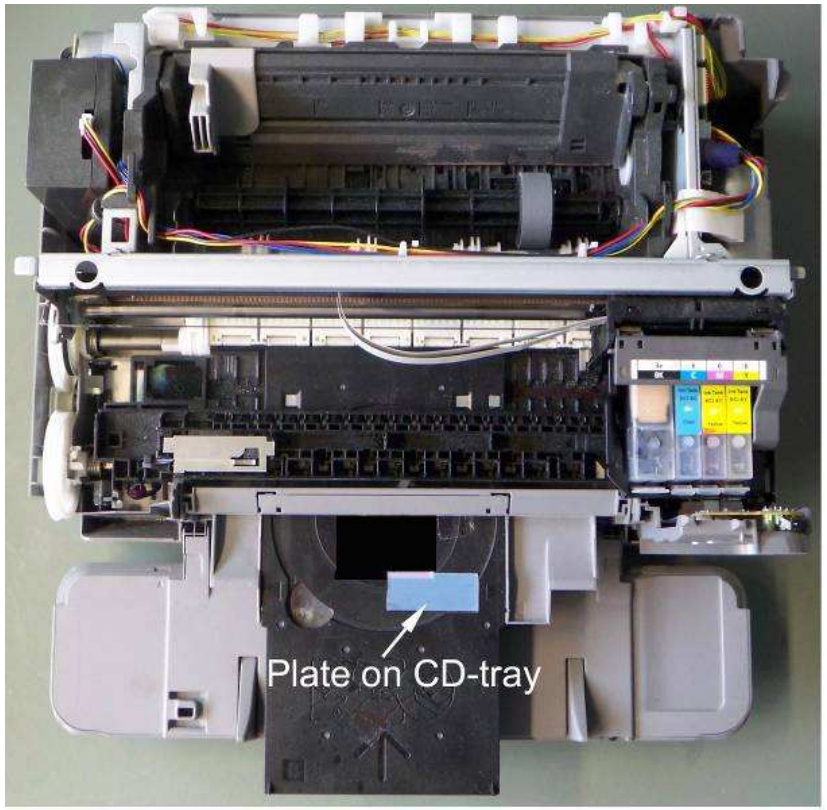
Printing samples quantitatively?

Applicator	**Deposition volume**	**Application linearity** R^2 (max. *%RSD*)		**Precision** *%RSD* (≥*S/N*)	
		Spots	Bands	Spots	Bands
Inkjet printer	0.8 – 9.6 nL	≥0.9913 (*3.2%*)	≥0.9988 (*1.3%*)	3.1 – 6.0% (*6*)	2.9 – 3.8% (*10*)
Piezoelectric dispenser	6.8 – 10.6 nL	≥0.9940 (*2.3%*)	n/a	1.3 – 3.4% (*9*)	n/a
Pneumatic spray	0.1 – 1.6 µL	≥0.9917 (*6.4%*)	≥0.9804 (*5.1%*)	2.7 – 7.3% (*9*)	4.5 – 8.7% (*21*)

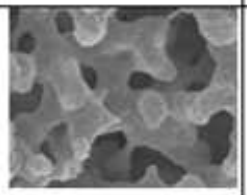
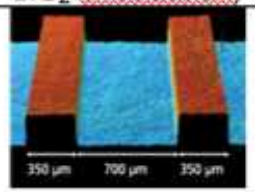
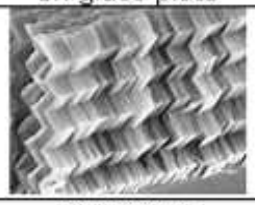
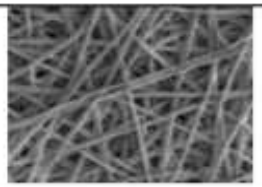
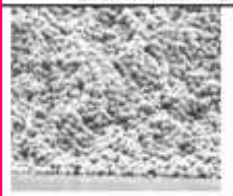
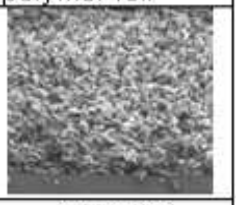


Institute of Food Chemistry
University of Hohenheim, Stuttgart

Office Chromatography = printer & scanner



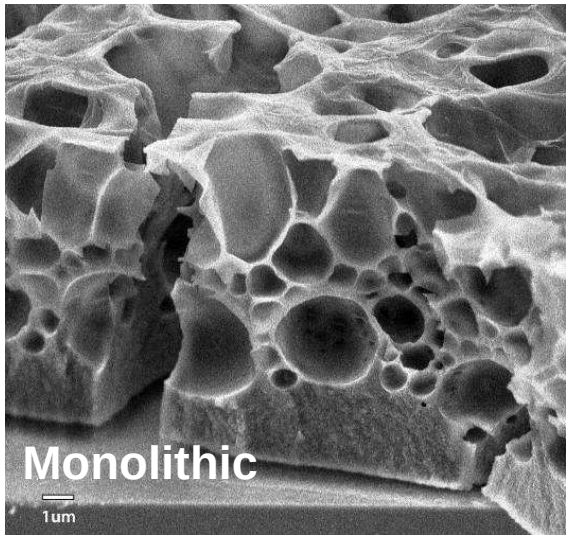
UTLC plates

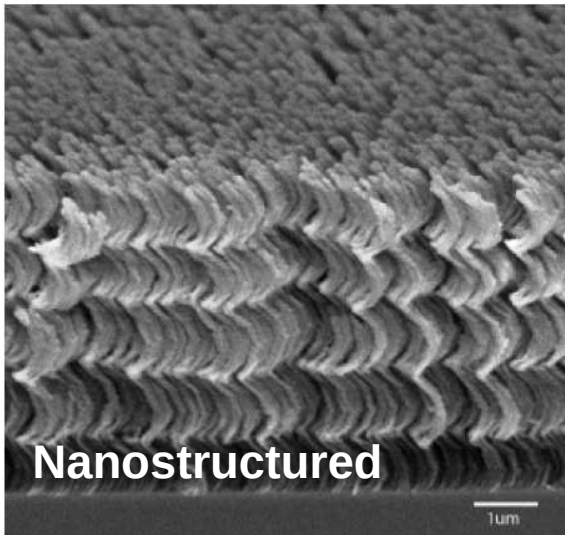
	UTLC				HPTLC	
Birthday	2001 [188]	2001 [190]	2008 [191]	2009 [192]	1975 [189]	
Plate type	Monolithic plate	Plate for shear-driven flow	Nanostructured plate	Electrospun plate	HPTLC plate	
Technique of fabrication	Polymerization on glass plate	Etching of Si-wafer surface (also after SiO_2 anodization)	Glancing angle deposition (GLAD) on glass plate	Electrospinning on aluminium foil	Slurry overlay on various carriers, e.g. glass plate, aluminium or polymer foil	
Layer image						
Layer structure and geometry (if not otherwise, length x height)	Monolithic texture, 60 x 36 mm	Nanochannel, e.g. 0.7 x 20 mm (width x length), spacers 0.1 µm deep	Columnar nanostructure, e.g. 25 x 25 mm or 100 x 20 mm	Nanofiber mat, e.g. 30 x 60 mm	Spherical	Irregular
					particles, maximal 20 x 10 cm, individually sliceable	
Layer thickness	10 µm	= Channel bottom, e.g. 0.05 – 0.3 µm (silicon-C8)	5 or 7 µm	25 µm	50 - 200 µm	

G. Morlock, W. Schwack, TrAC, in preparation

Institute of Food Chemistry
University of Hohenheim, Stuttgart

UTLC plates





UTLC Plate	**Stationary phase**	**"Linearity"** R^2 (max. *%RSD*)	**Precision** *%RSD* (≥*S/N*)	**LOQ range** (amount/band)
M-UTLC	Monolithic silica gel, 10 µm thick	≥0.9988 (*1.3%*)	2.9 – 3.8% (*10*)	26 – 69 ng
NS-UTLC	Nanostructured silica, 5 µm thick	≥0.9997 (*1.3%*)	2.7 – 3.3% (*16*)	21 – 84 ng

Institute of Food Chemistry
University of Hohenheim, Stuttgart

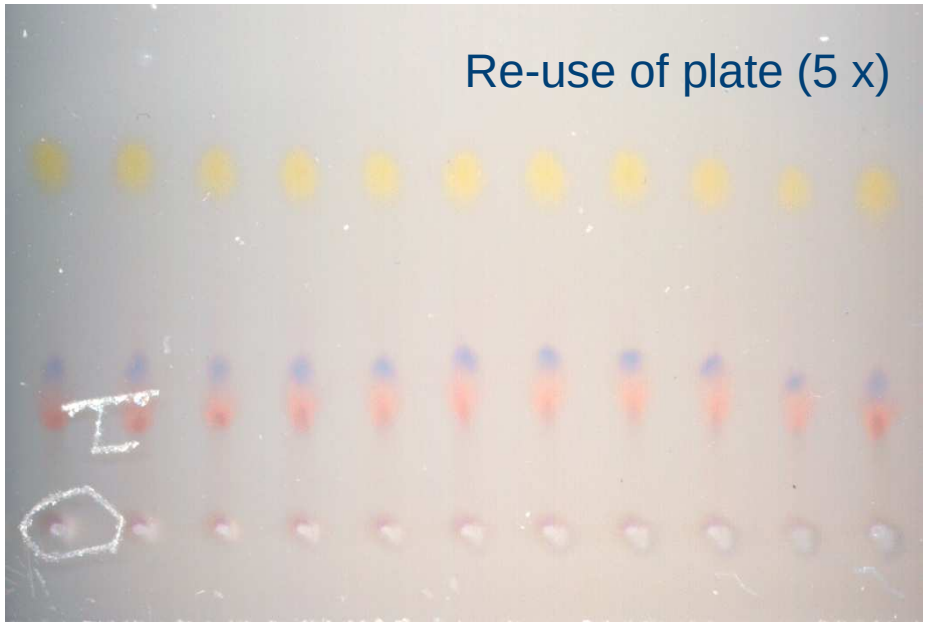
Development within a minute

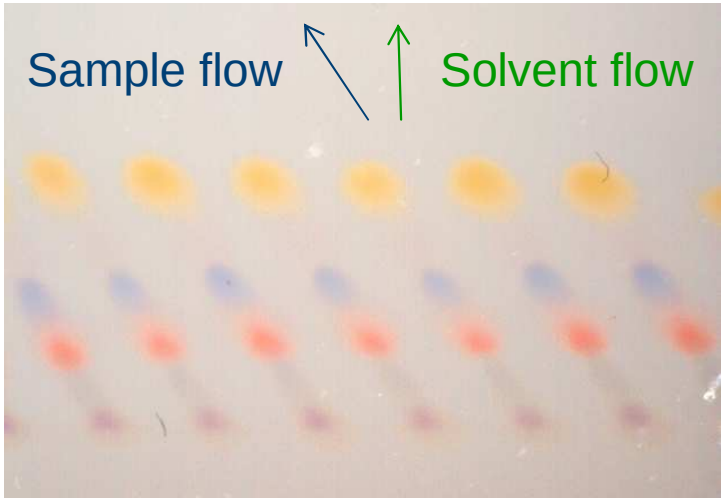
Institute of Food Chemistry
University of Hohenheim, Stuttgart

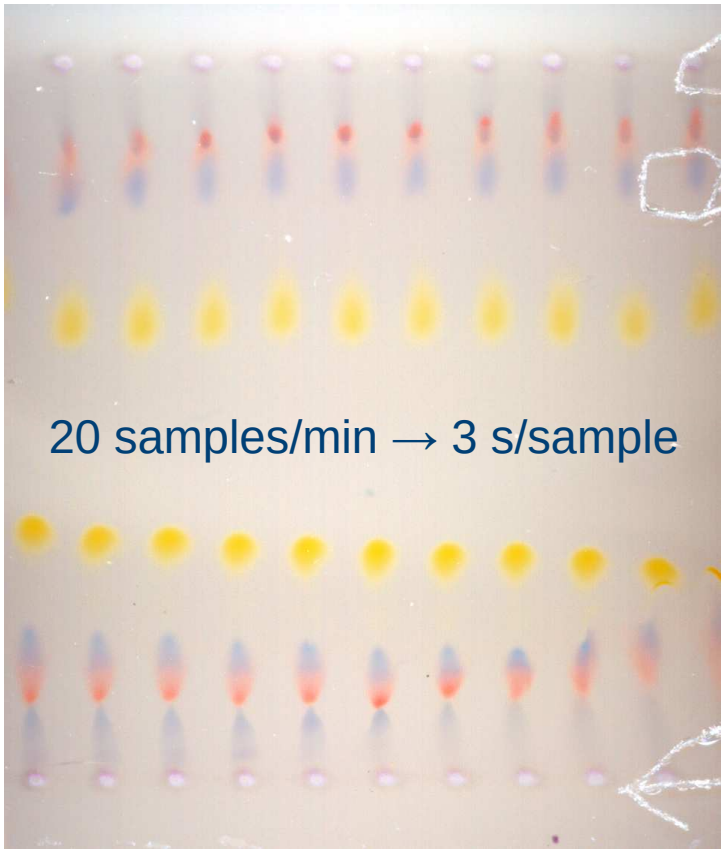
Ultrathin plate (UTLC)

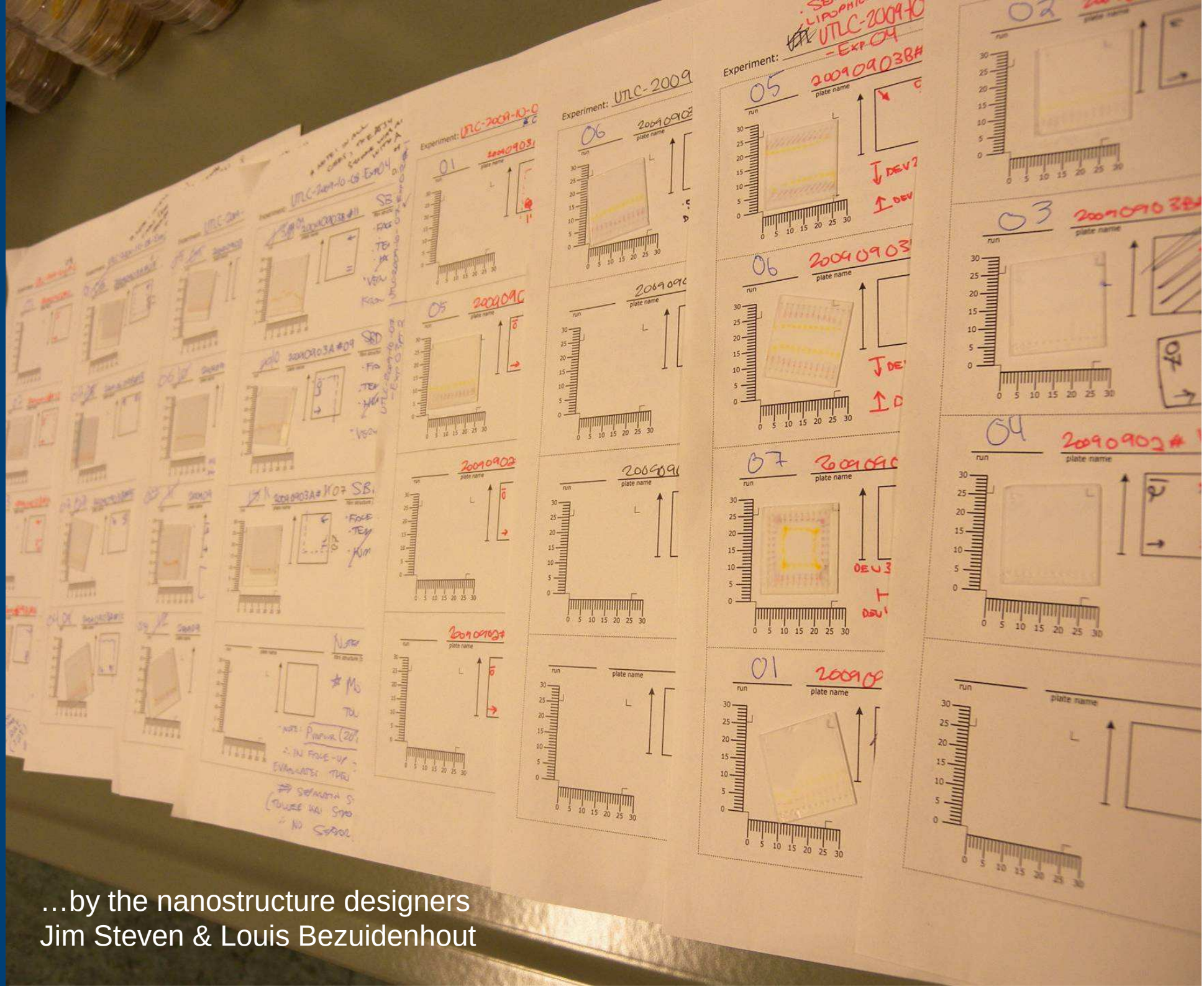
Institute of Food Chemistry
University of Hohenheim, Stuttgart

Nanostructured UTLC plates









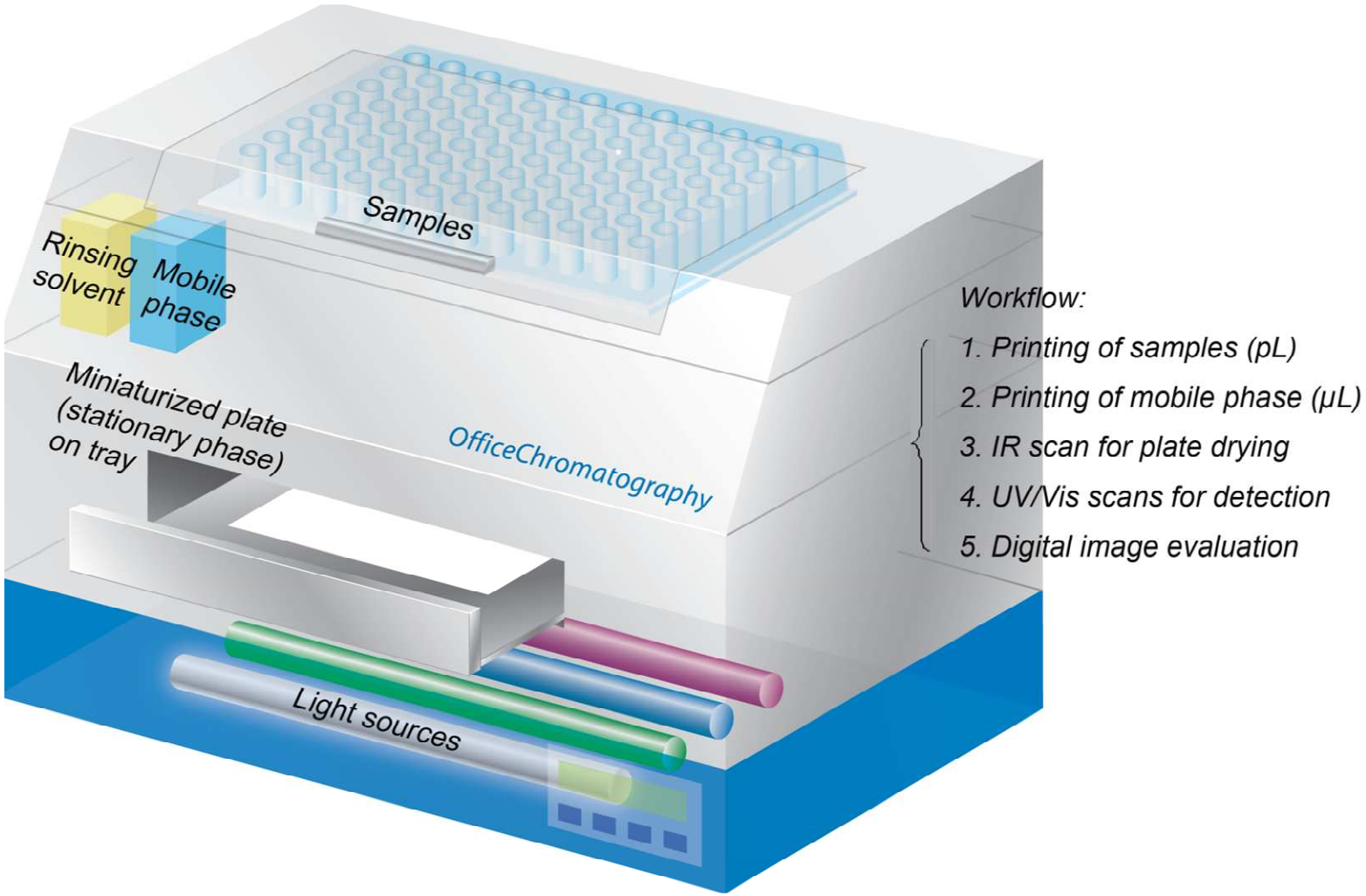
Institute of Food Chemistry
University of Hohenheim, Stuttgart

…by the nanostructure designers
Jim Steven & Louis Bezuidenhout

Institute of Food Chemistry
University of Hohenheim, Stuttgart

Office Chromatography

The whole concept is even more…



Miniaturized planar chromatography using office peripherals,
G. Morlock, C. Oellig, L. Bezuidenhout, M. Brett & W. Schwack, Anal. Chem. 2010 in print

Institute of Food Chemistry
University of Hohenheim, Stuttgart

Office Chromatography - next steps

- At its infancy…we appreciate funding!
- Plate design…in co-operation with the group of Prof. Dr. Brett
- Apparatus…we appreciate co-operations!
- Hyphenations

Reaching the water source you have to swim against mainstream.

Konfuzius

Institute of Food Chemistry
University of Hohenheim, Stuttgart

Thanks to …


Prof. Dr. M. Brett


Steven Jim


Prof. Dr. W. Schwack


Louis Bezuidenhout

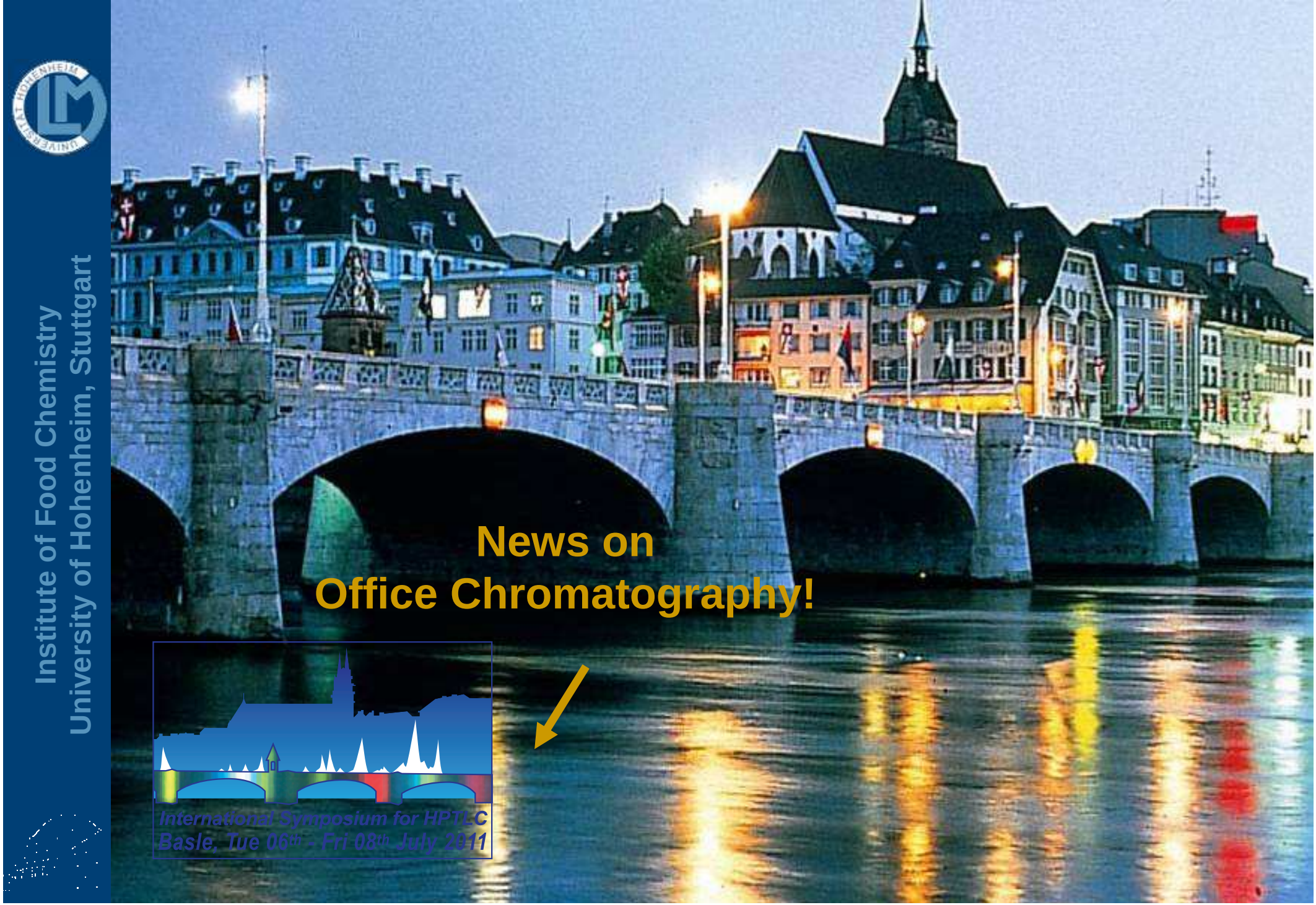
CAMAG, CH

Merck, D

Jeol, F

Bruker Daltonics, D


Claudia Oellig



HPTLC 2011, Basel : 6th-8th July 2011 → www.hptlc.com