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# What problems can be solved with iccMAX?

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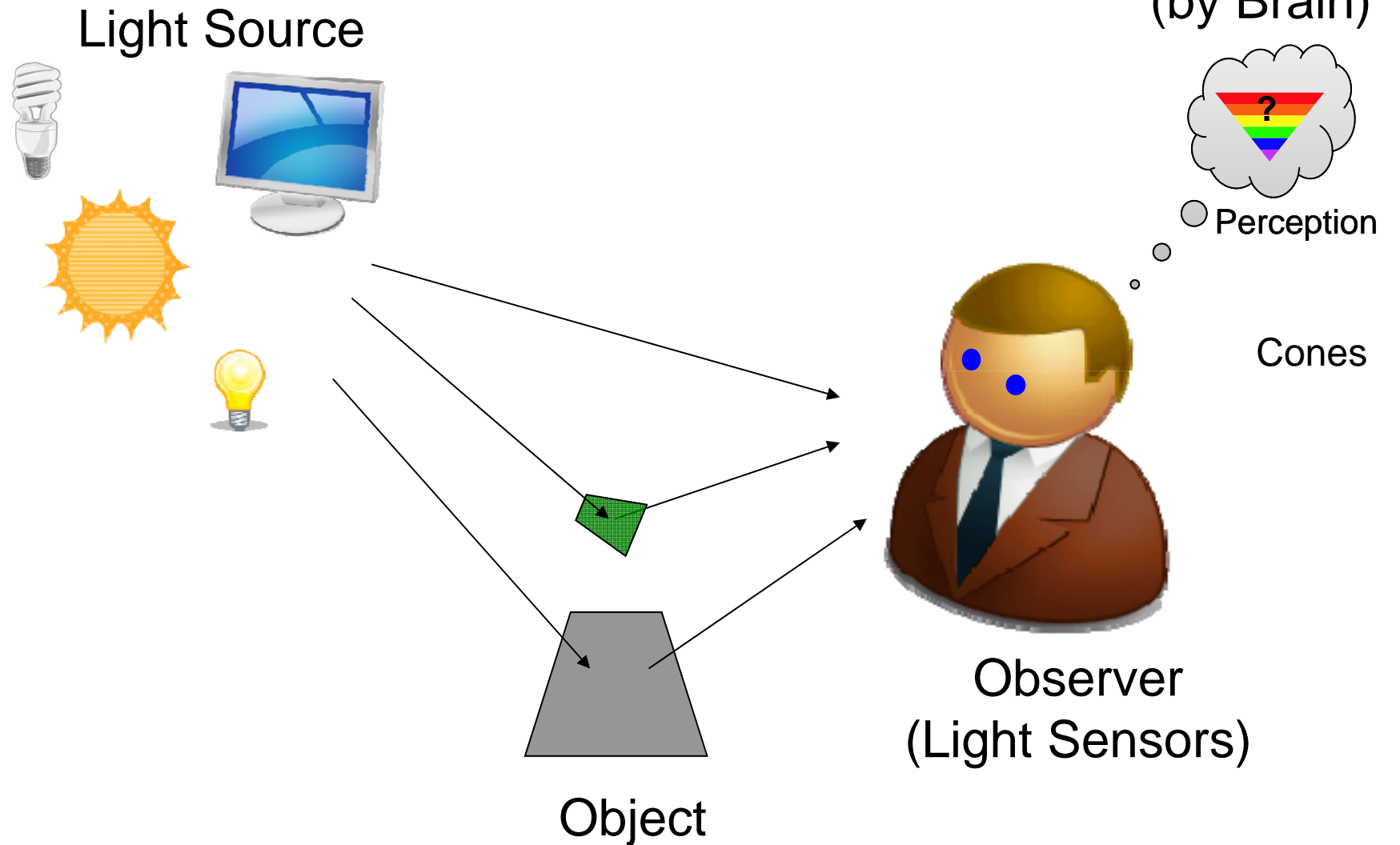


## Overview

- **Color and Color Management**
- **Limitations of ICC.1**
- **Problems addressable using iccMAX**
- **Conclusion**



# Color: The Perception of an Experience





## Color Management

- **Color Management involves communicating about “Color Experiences”**
  - What is experienced?
    - Color Modeling
  - What the expected experience?
    - Color Reproduction

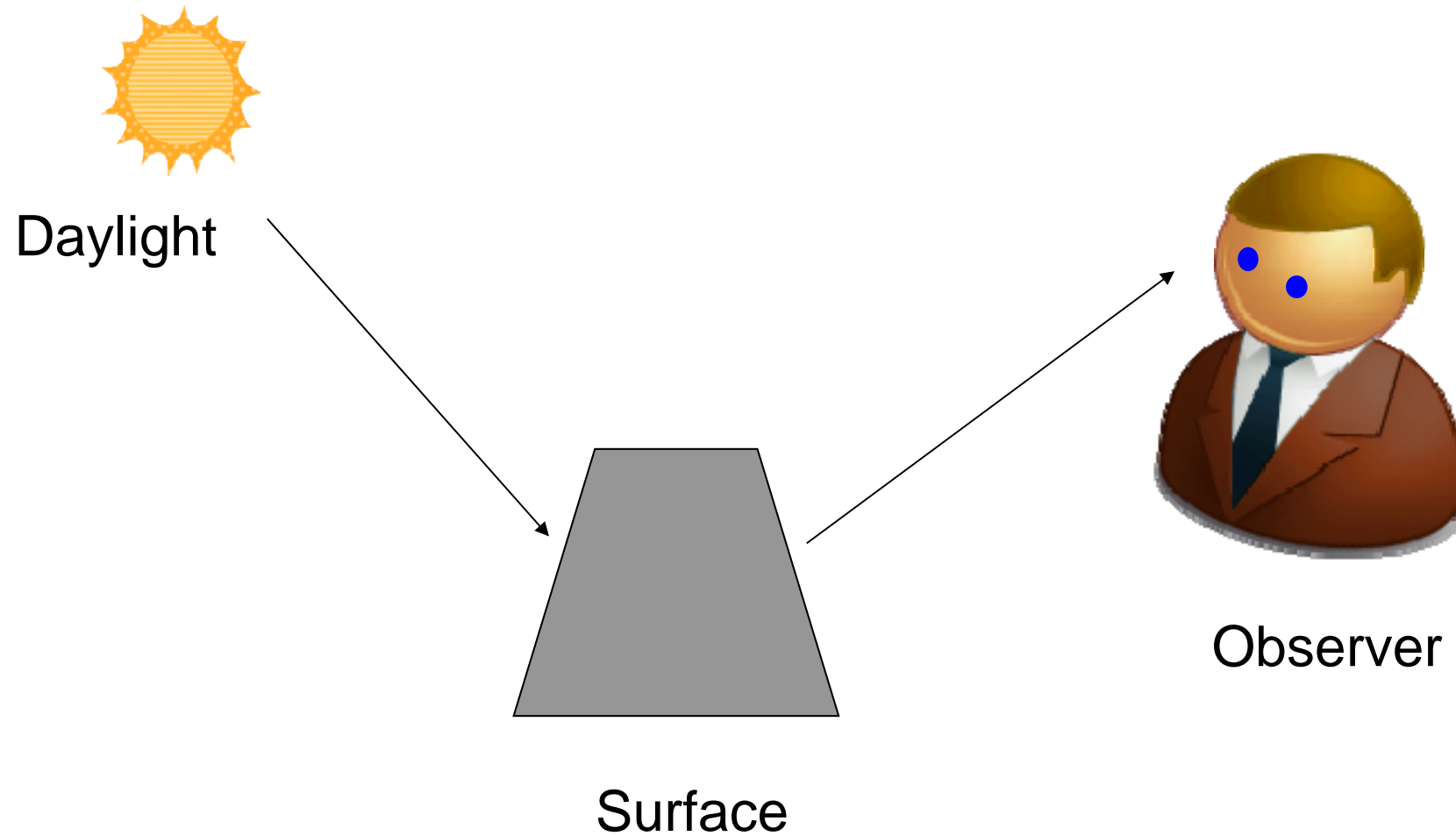


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# Limitations of ICC.1

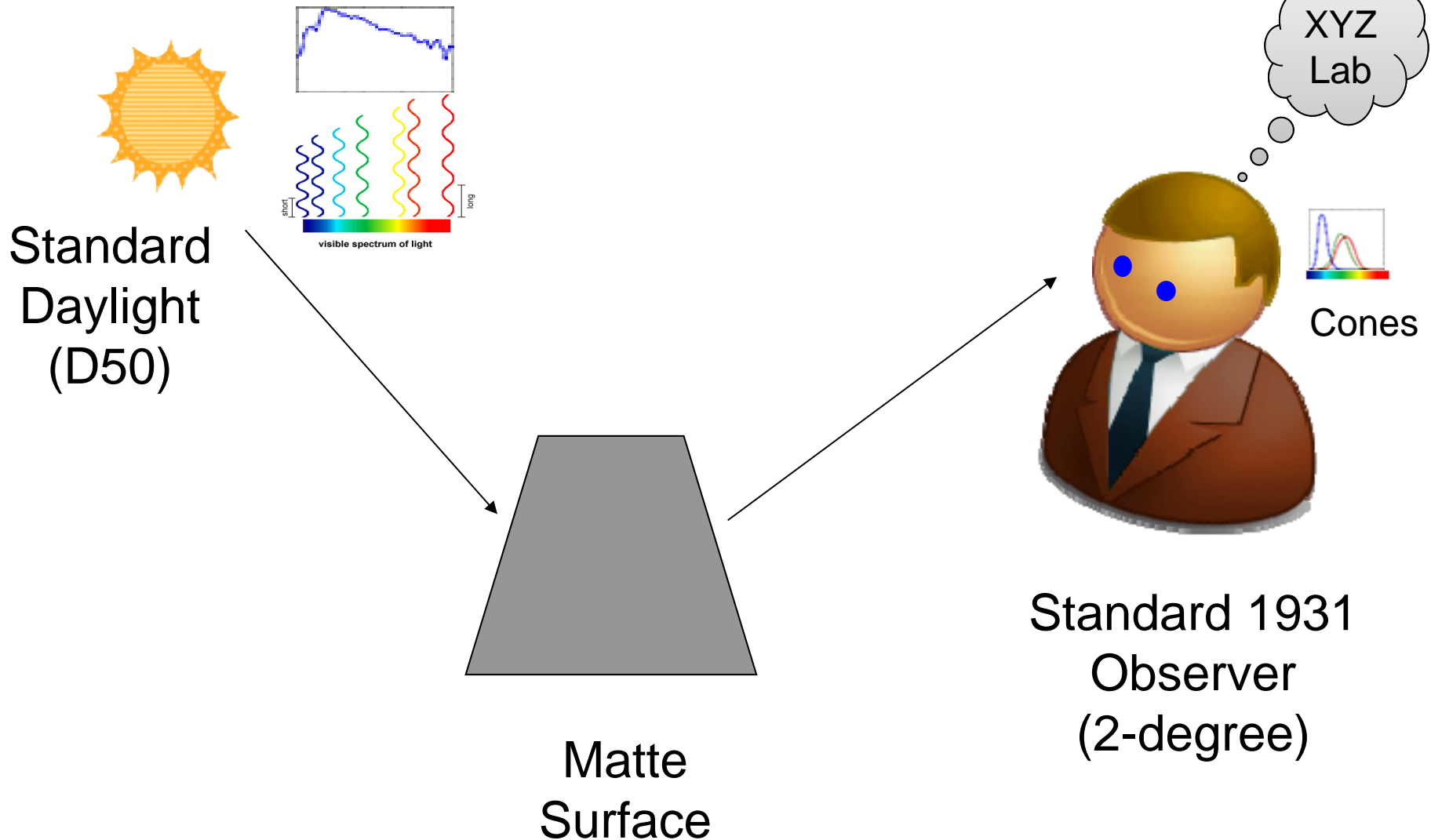


## The ICC v2/v4 Color Experience





# Specifics of the ICC v2/v4 Color Experience

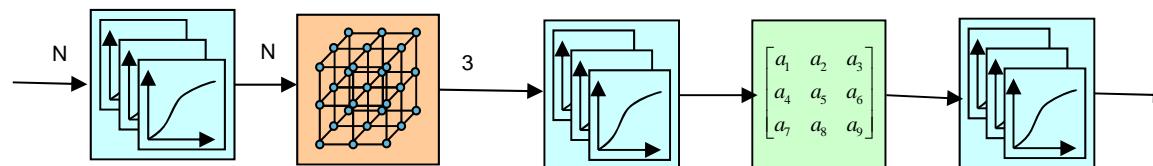




# Fixed Sequences Using Color Lookup Tables

% In	% Out
0	0
10	5
20	12
30	18
40	28
.	.
.	.
.	.
100	100

C	M	Y	K	L*	a*	b*
0	0	0	0			
33	0	0	0			
66	0	0	0			
100	0	0	0			
0	33	0	0			
33	33	0	0			
.	.	.	.			
.	.	.	.			
100	100	100	100			







## N-Color Lookup Table Challenge

# Channels	# Table Entries (Storage) <i>(for steps of 5%)</i>	# Interpolation Points (Computation)
1	21	2
2	441	4
3	9,261	8
4	194,481	16
5	4,084,101	32
6	85,766,121	64
7	1,801,088,541	128
...	...	...
N	$21^N$	$2^N$



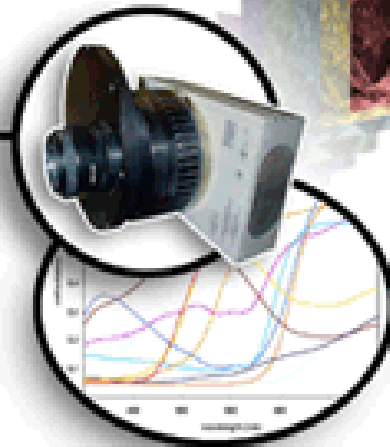
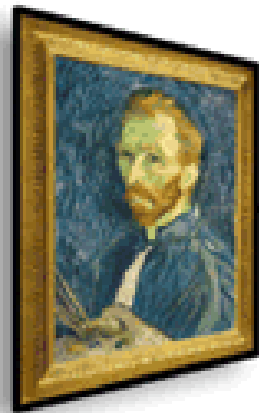
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## Problems addressable with iccMAX



# #1: Light (and observer) independent color capture and reproduction

## Multi-Channel Visible Spectrum Imaging



## Digital Archiving

```
10100101001  
11010101101  
01101010011  
10110010101  
10101100101  
01000101010  
011  
100
```



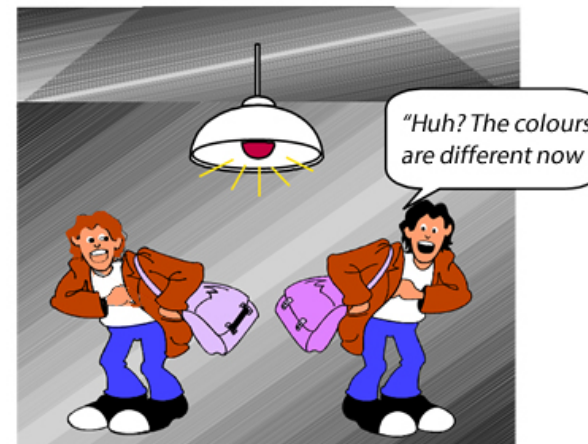
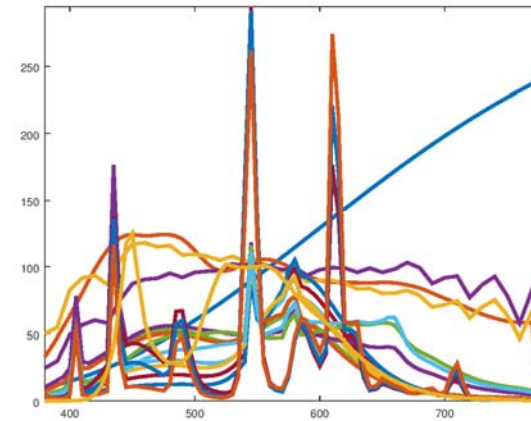
## and Reproduction



(Picture from <http://www.art-si.org/>)



## #2: Handle (predict) changes in lighting





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## #3: Lightweight Profiles for Photography





## #4: Wavelength changes in reflected light (Fluorescence)



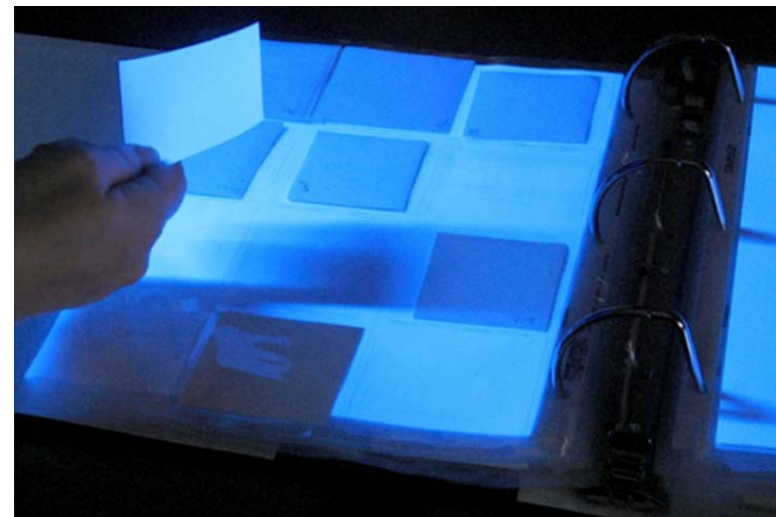
(Picture from <https://www.keech.org.uk/about/news-media/273-fluorescent-fun-for-keech-mum>)



## #4: Wavelength changes in reflected light (Fluorescence)



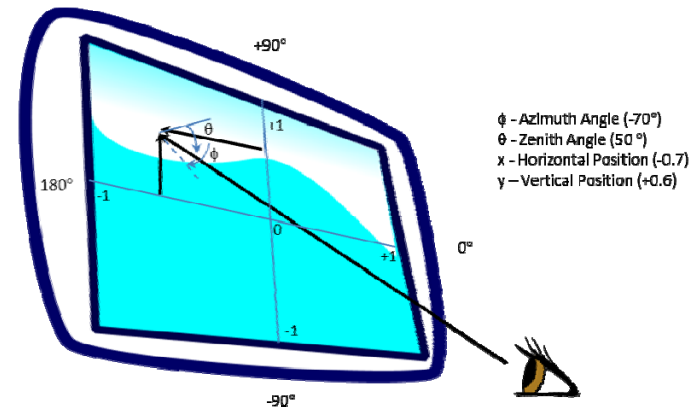
(Picture from <https://www.keech.org.uk/about/news-media/273-fluorescent-fun-for-keech-mum>)



(Picture from <http://news.yale.edu/2015/02/19/yale-launch-lens-media-lab-photograph-research-and-conservation>)



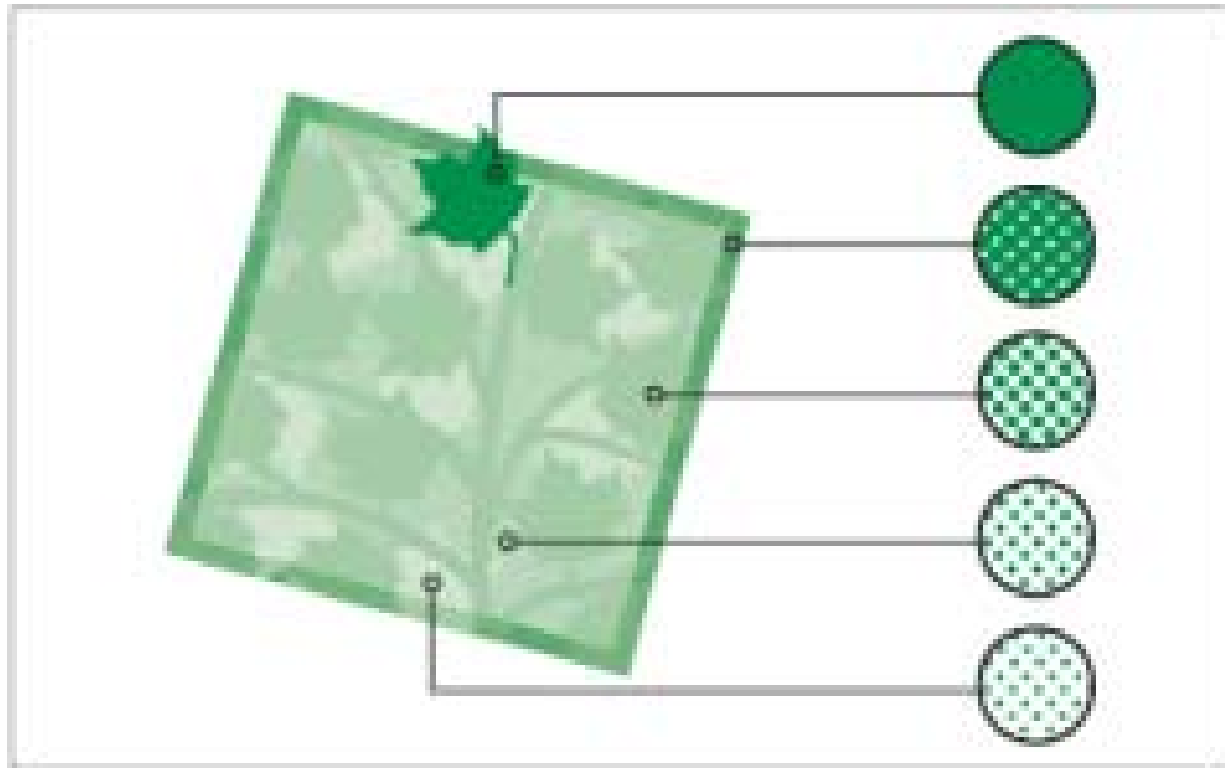
# #5: Dependency of lighting and viewing angles





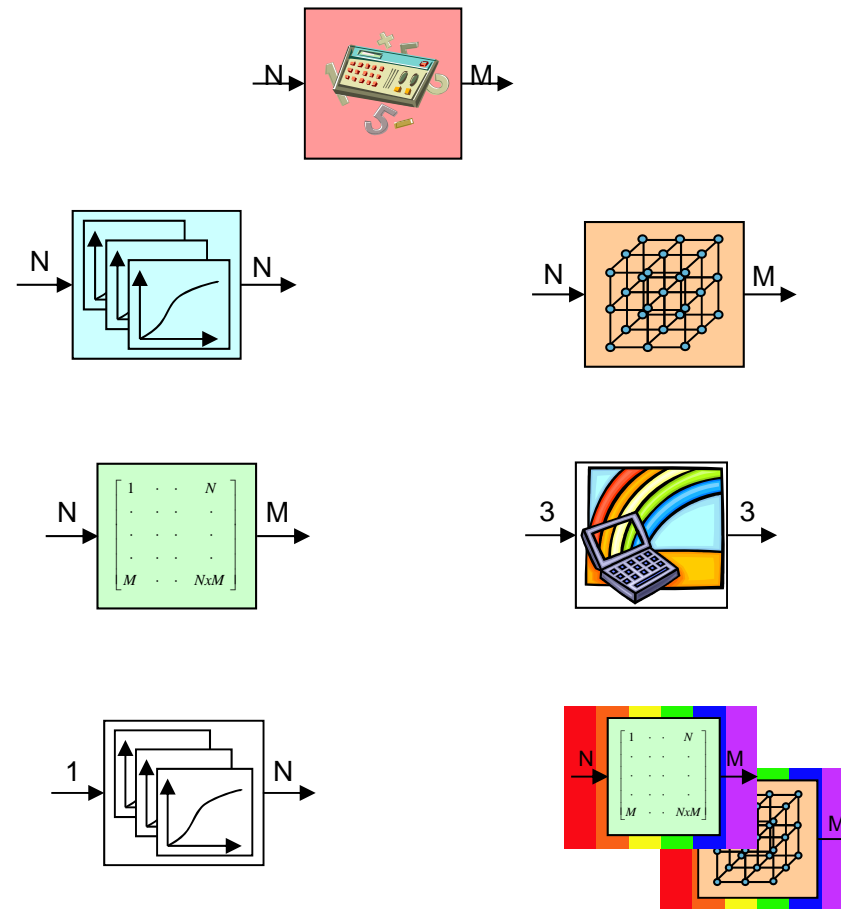
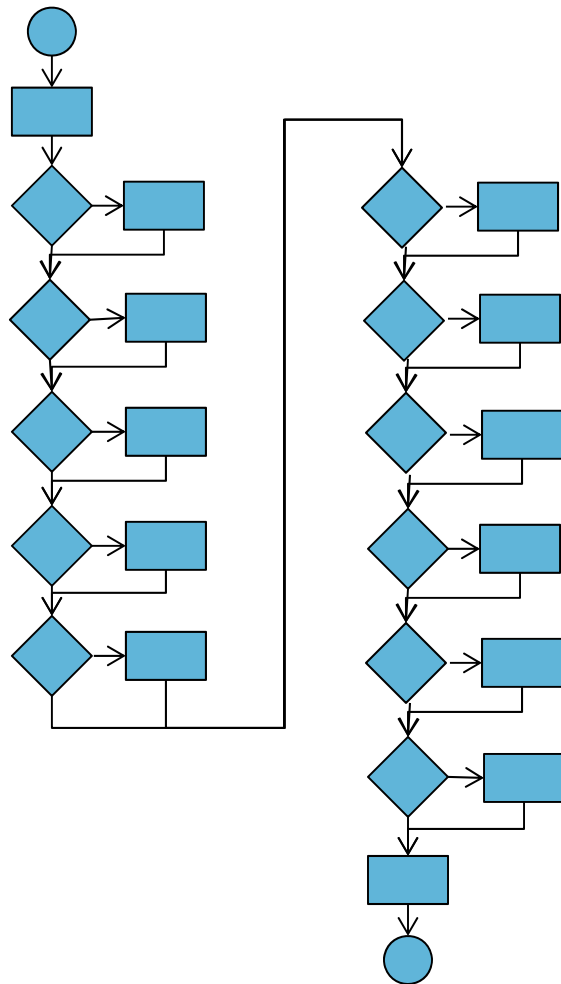


## #6: Describe tints of named colors



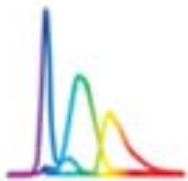


# #7: Compact (more accurate) profiles using algorithms

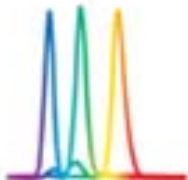




# #8: Account for differences between observers

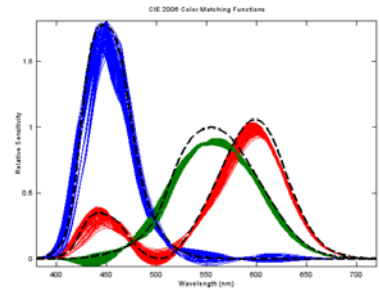


LCD Display



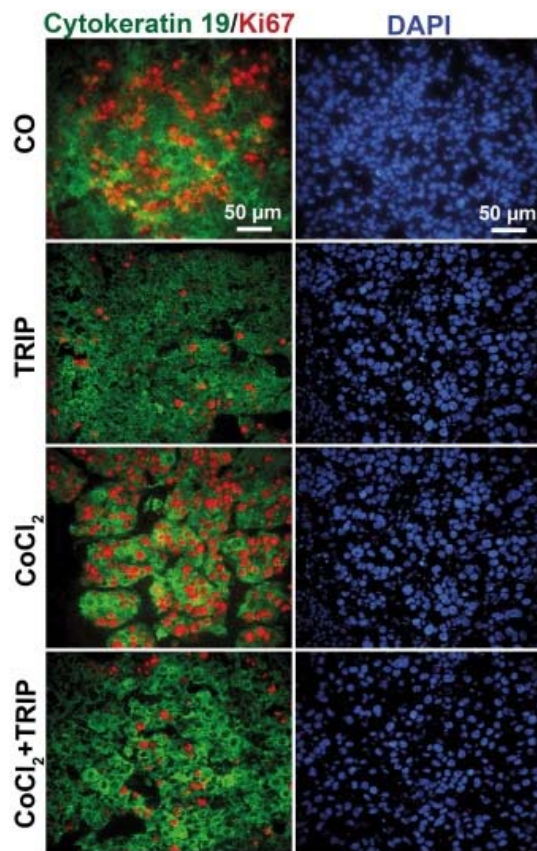
Quantum Dot Display

The central illustration features a variety of human figures, including a man in a white shirt, a woman in a pink top, a man in a brown shirt with a camera, a man in a blue uniform with a yellow hard hat, a man in a green uniform with a green cap and a wrench, a man in a white uniform with a white cap, a man in an orange uniform with a pizza, a woman in a white headscarf, a man in a red sombrero with a rainbow shirt, a man in a white uniform with a white cap, a man in an orange uniform with a red cap and a camera, and a man in a brown suit. Three thought bubbles are connected to these figures: one above the man in the white shirt says "I see grey", one above the man in the blue uniform says "I see blue", and one above the man in the brown suit says "I see green".

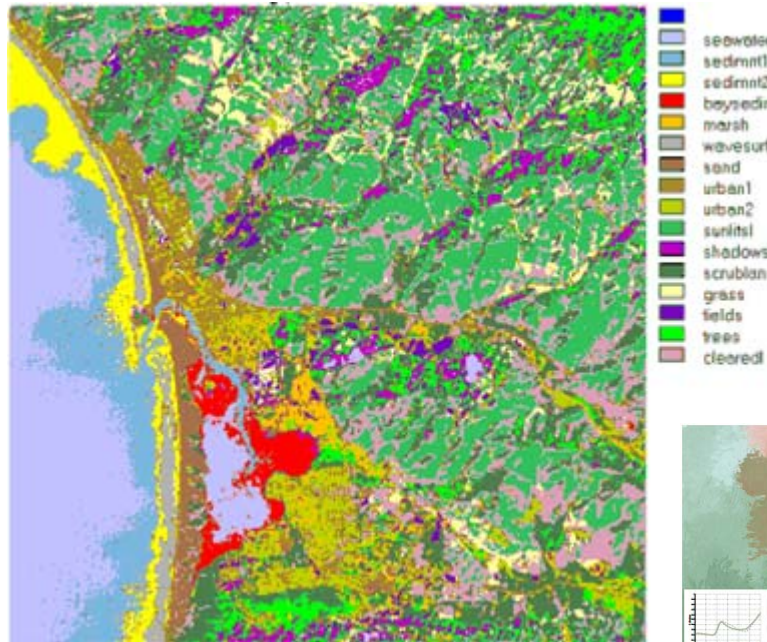




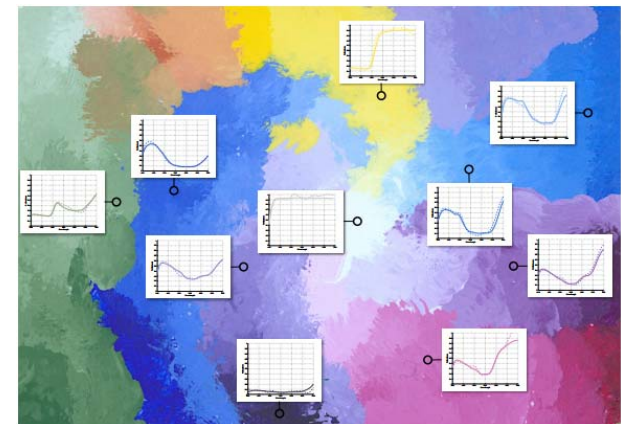
# #9: Describe and visualize “color” in terms of “What is it?”



(Picture from <https://www.spandidos-publications.com/10.3892/or.2014.3196>)



(Picture from <http://wgbis.ces.iisc.ernet.in/envisirs/?q=node/26/>)



(Picture from <http://scholarworks.rit.edu/cgi/viewcontent.cgi?article=9306&context=theses>)



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**In Conclusion...**



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## iccMAX is for the Real World



- **The complexities of color in the Real World are encompassed by iccMAX**
- **iccMAX provides a flexible and extensible platform for modeling and defining color workflows**



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**Thank You**  
**Questions?**

