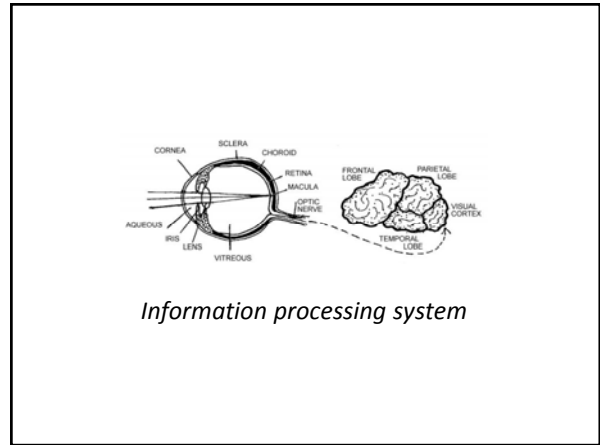
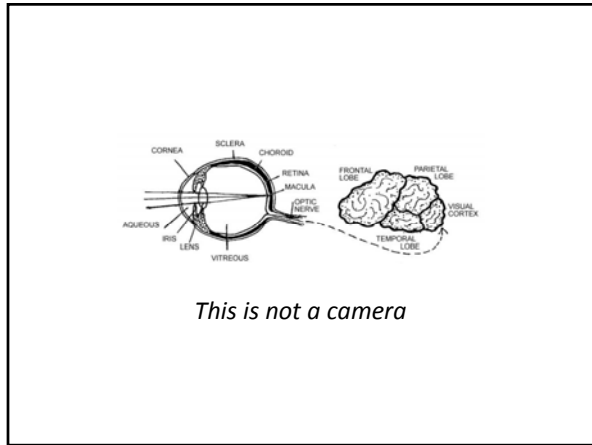
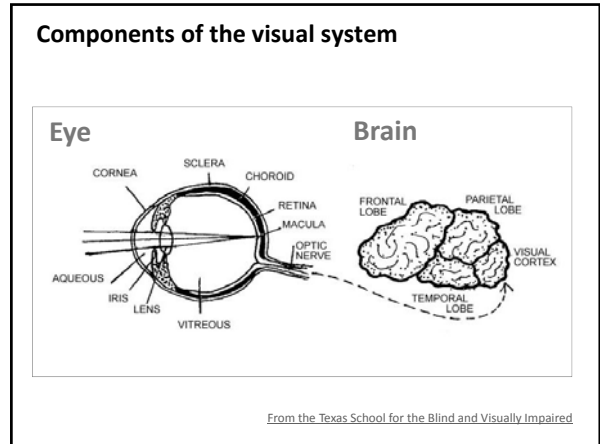



Exploiting the Power of the Human Visual System

Maureen Stone
StoneSoup Consulting

Jock Mackinlay
Tableau Software



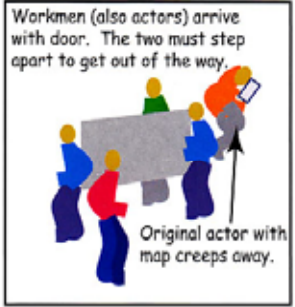
Experiment from Daniel Simons and the Viscog Lab at the University of Illinois



Actor with map asks unsuspecting member of the public for directions.

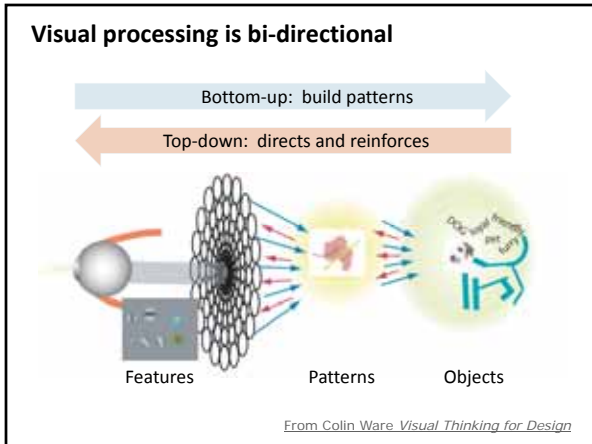
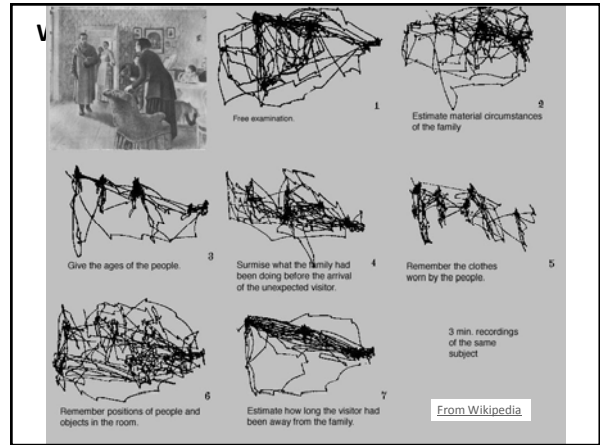
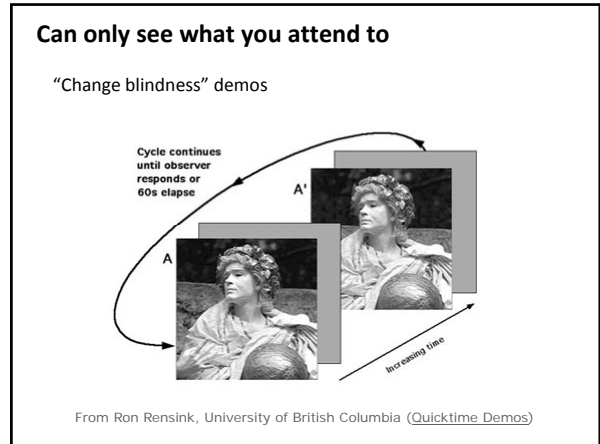
Eager to help.

Illustration from Colin Ware *Visual Thinking for Design*

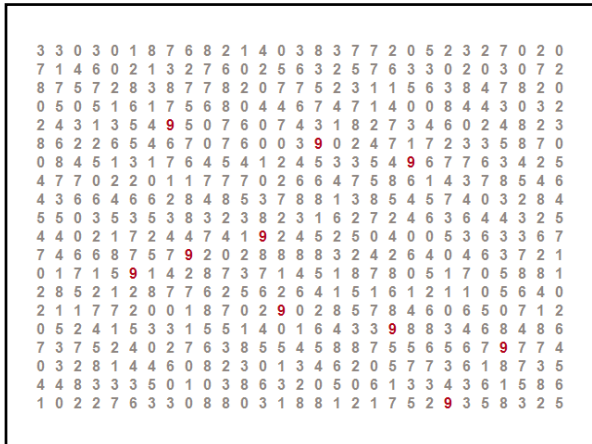


Workmen (also actors) arrive with door. The two must step apart to get out of the way.

Original actor with map creeps away.

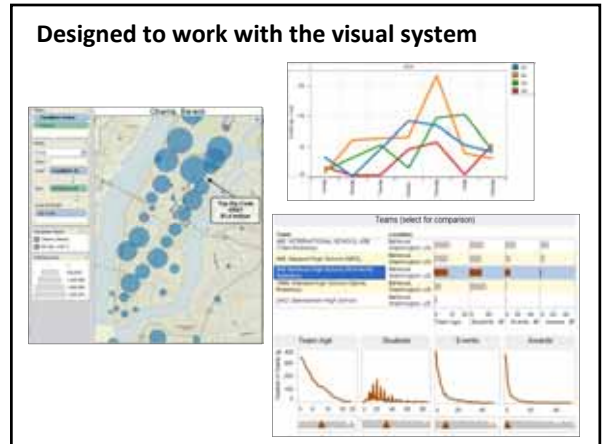
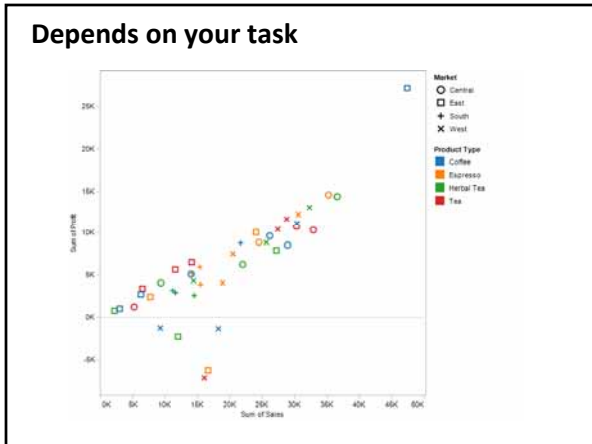
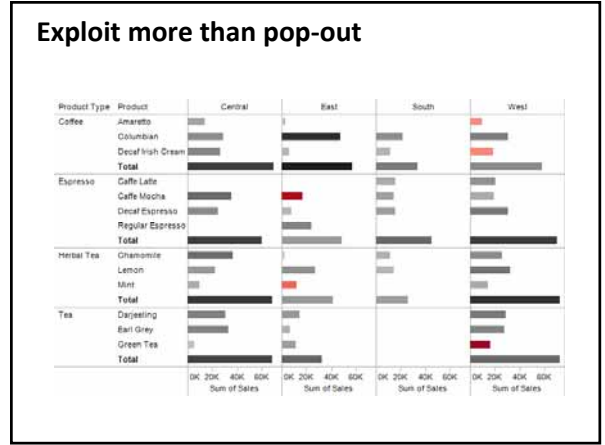


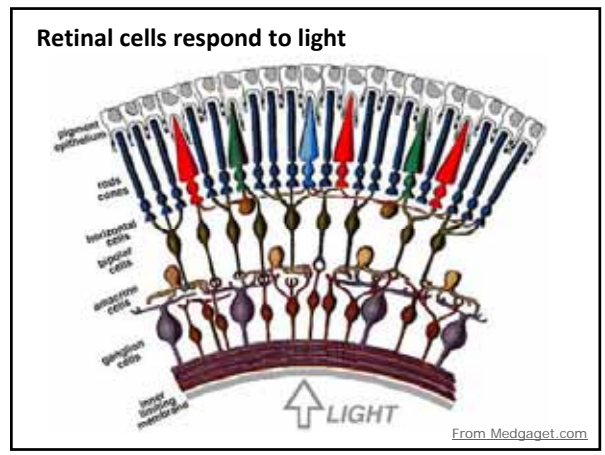
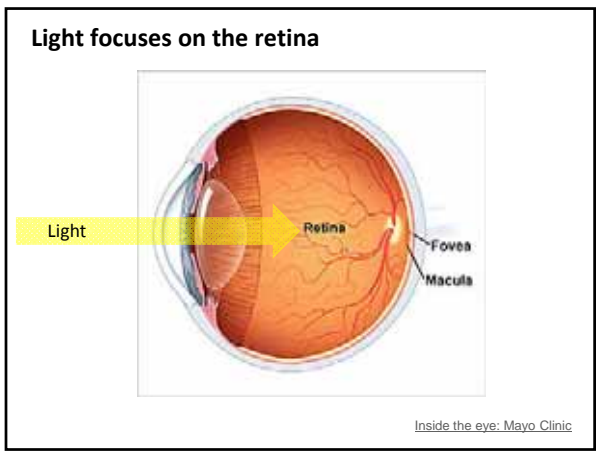
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8	7	5	7	2	8	3	8	7	7	8	2	0	7	7	5	2	3	1	1	5	6	3	8	4	7	8	2	0	
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1	0	2	2	7	6	3	3	0	8	8	0	3	1	8	8	1	2	1	7	5	2	9	3	5	8	3	2	5	



Accountants use pop-out

Product Type	Product	Central		East		South		West	
		Sum of Sales	Sum of Profit	Sum of Sales	Sum of Profit	Sum of Sales	Sum of Profit	Sum of Sales	Sum of Profit
Coffee	Amaretto	\$5,155	\$18,011	\$1,009	\$2,893				
	Columbian	\$9,538	\$38,913	\$27,253	\$47,388	\$8,767	\$21,064	\$11,253	\$38,357
	Decaf Irish Cream	\$9,632	\$26,156	\$2,727	\$6,261	\$2,833	\$11,592	(\$1,305)	\$18,235
	Total	\$21,285	\$69,080	\$30,889	\$58,640	\$11,700	\$33,258	\$8,724	\$57,898
Espresso	Caffe Latta			\$3,872	\$15,442				
	Caffe Mocha	\$14,640	\$35,218	(\$6,230)	\$16,646	\$5,201	\$14,163	\$4,064	\$18,876
	Decaf Espresso	\$8,880	\$24,485	\$2,410	\$7,722	\$5,930	\$18,384	\$12,302	\$30,578
	Regular Espresso			\$10,062	\$24,036				
Total	\$23,500	\$59,703	\$6,242	\$48,405	\$15,003	\$44,989	\$23,868	\$69,911	
Herbal Tea	Chamomile	\$14,434	\$36,570	\$785	\$2,194	\$3,180	\$11,106	\$8,852	\$25,832
	Lemon	\$6,251	\$21,978	\$7,901	\$27,176	\$2,593	\$14,497	\$13,120	\$32,274
	Mint	\$4,069	\$9,337	(\$2,242)	\$11,992			\$4,330	\$14,380
	Total	\$24,754	\$67,885	\$6,424	\$41,362	\$5,774	\$25,603	\$4,330	\$52,285
Tea	Earl Grey	\$10,331	\$32,881	\$3,405	\$6,505			\$19,425	\$27,287
	Green Tea	\$1,227	\$5,211	\$5,654	\$11,571			(\$7,109)	\$16,063
	Total	\$22,330	\$68,300	\$15,557	\$32,172			\$12,316	\$43,350

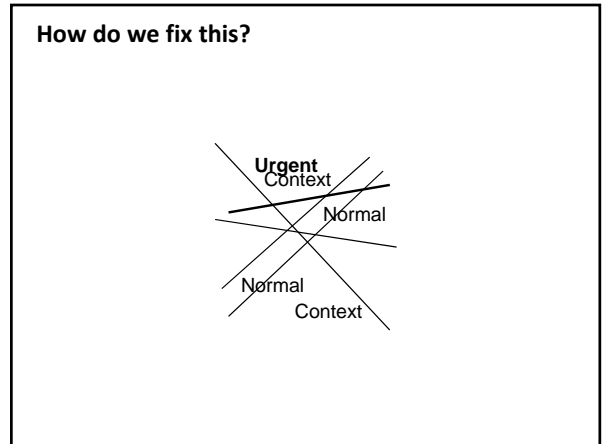
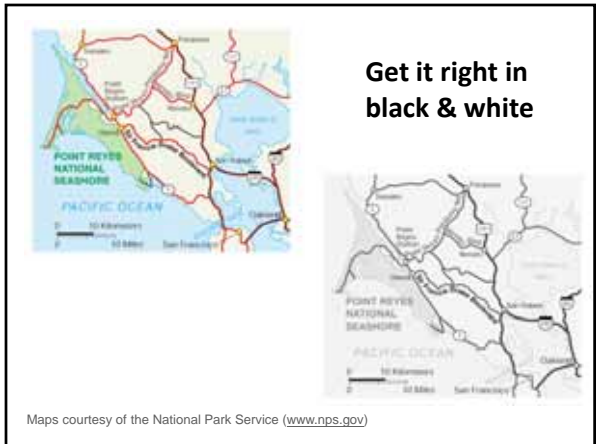
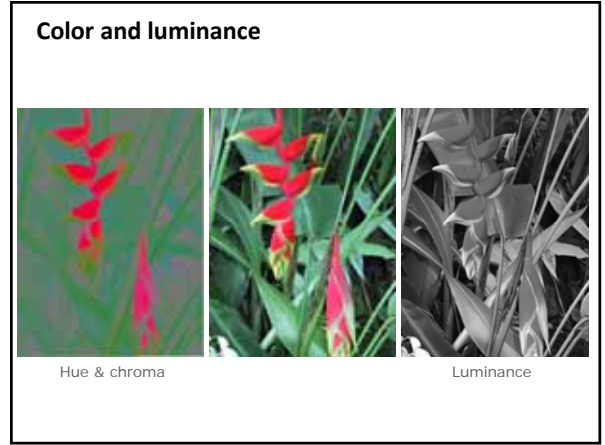


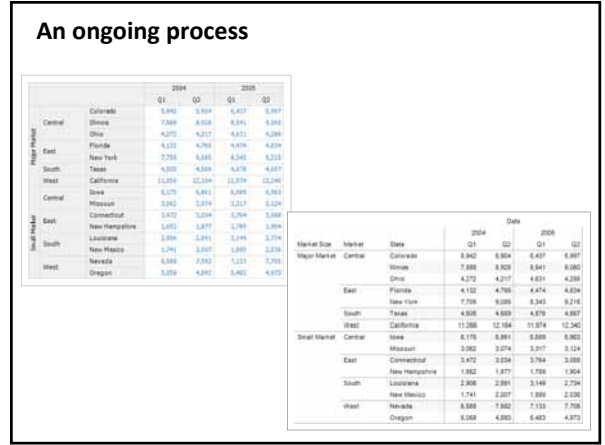
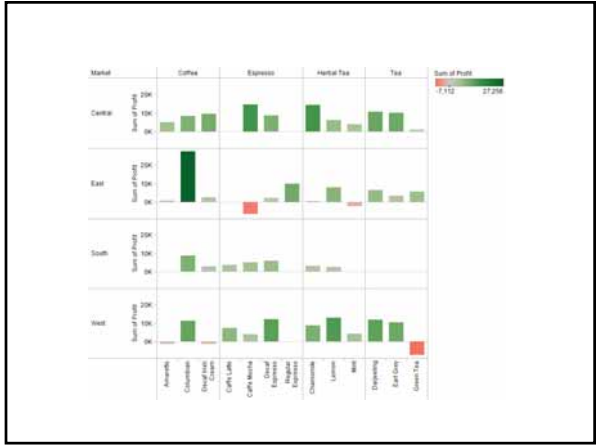
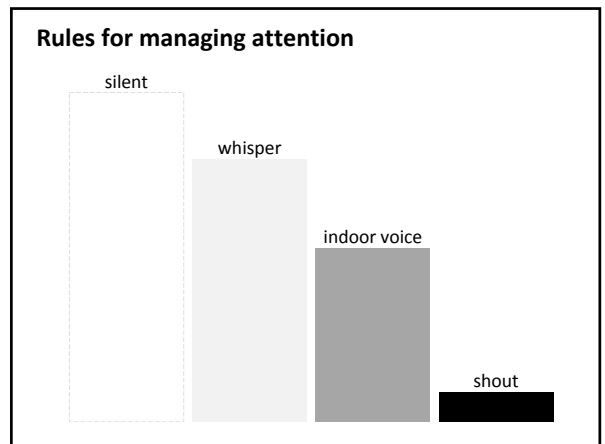
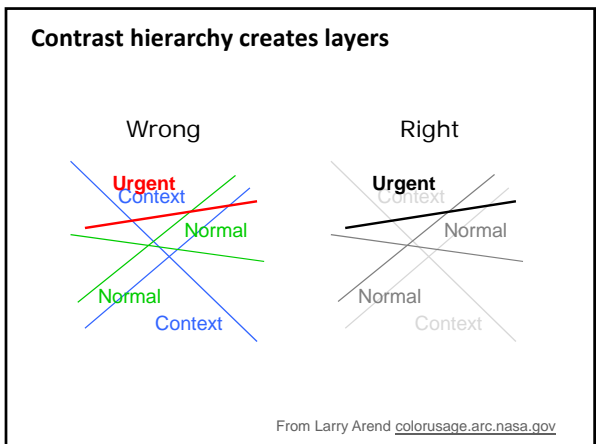


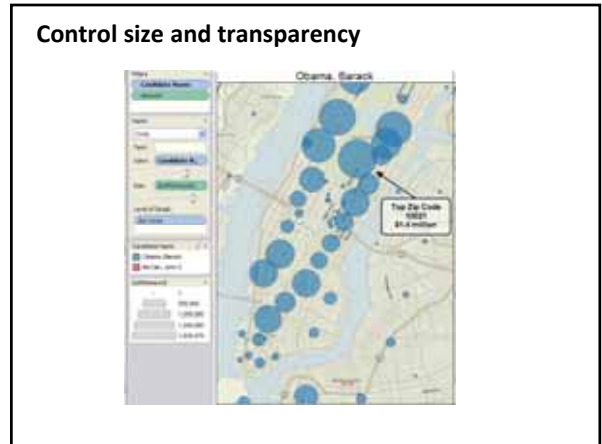
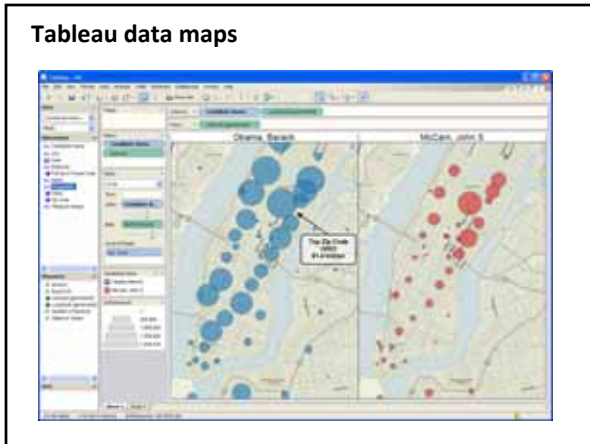
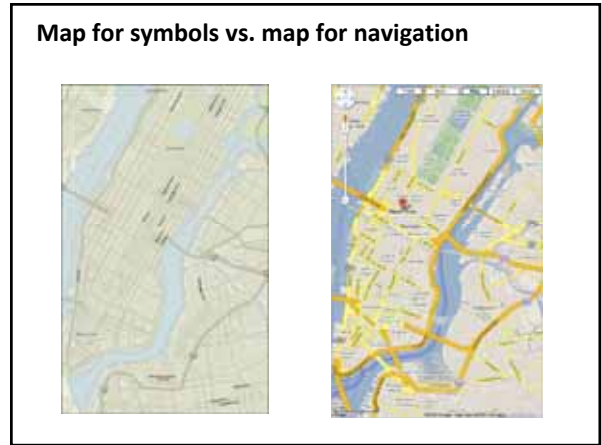
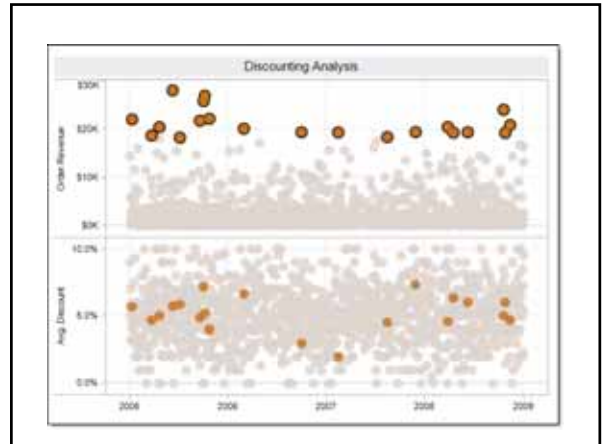
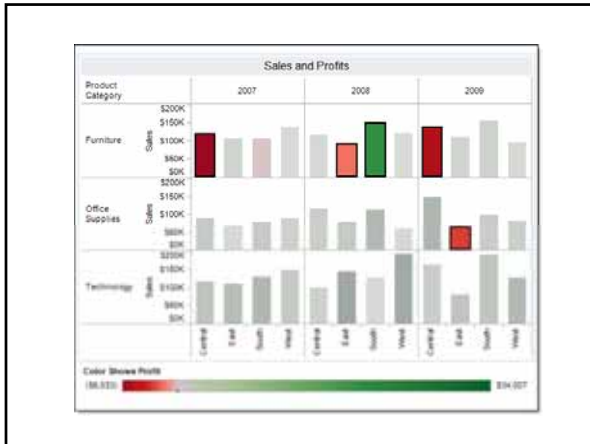
Two visual systems: Where and What

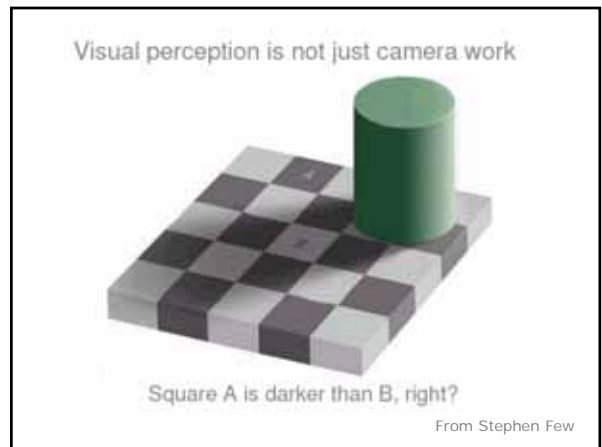
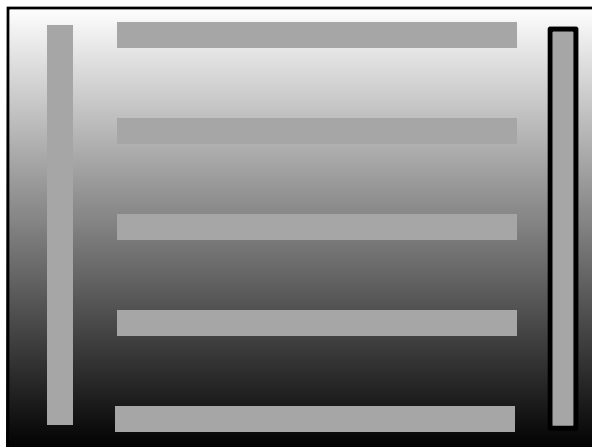
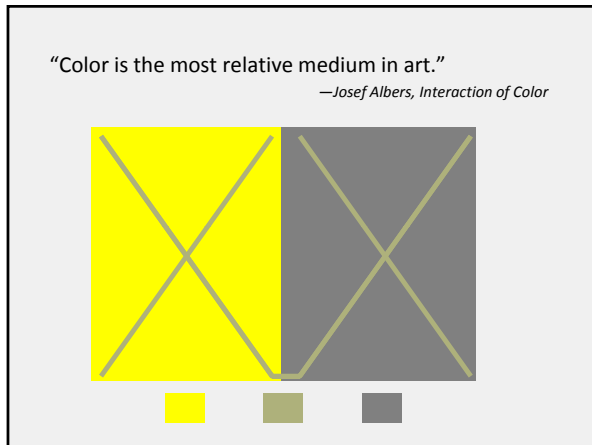
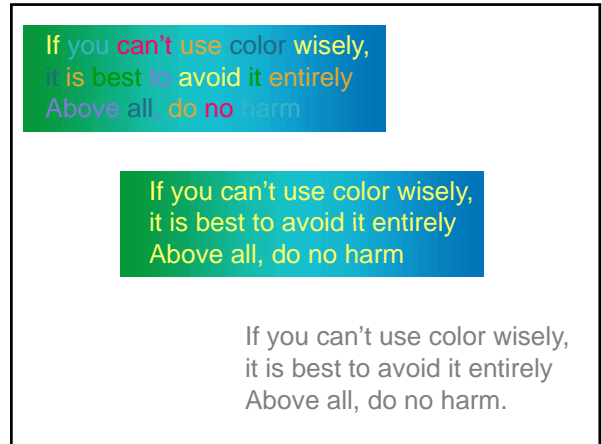
<p>Where System motion perception depth perception spatial organization figure/ground segregation</p> <p>colorblind fast low acuity high contrast sensitivity</p>	<p>What System object recognition face recognition color perception</p> <p>color selective slow high acuity low contrast sensitivity</p>
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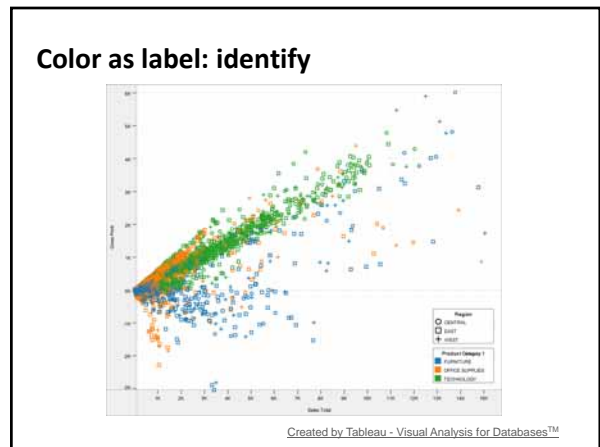
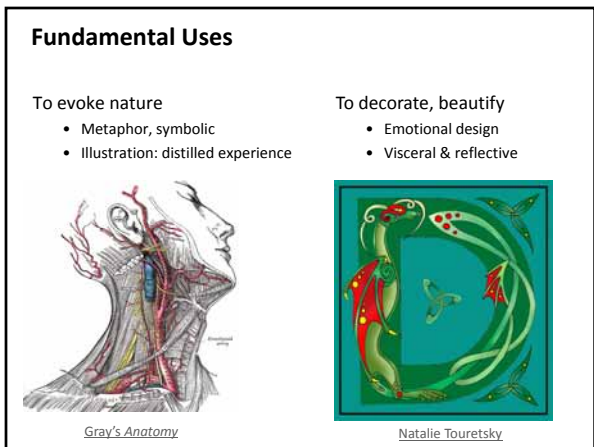
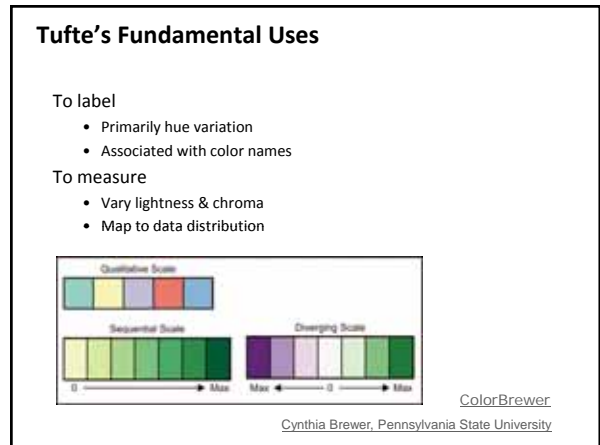
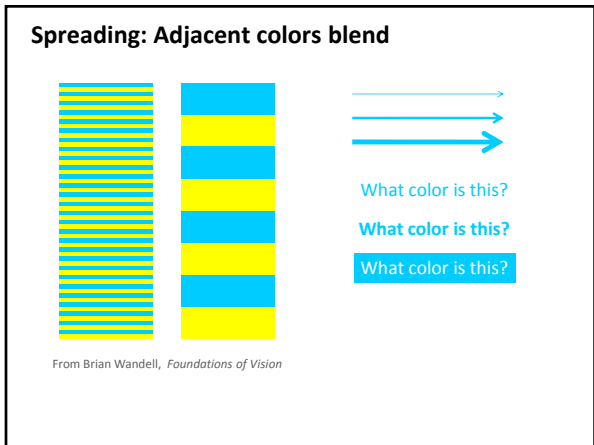
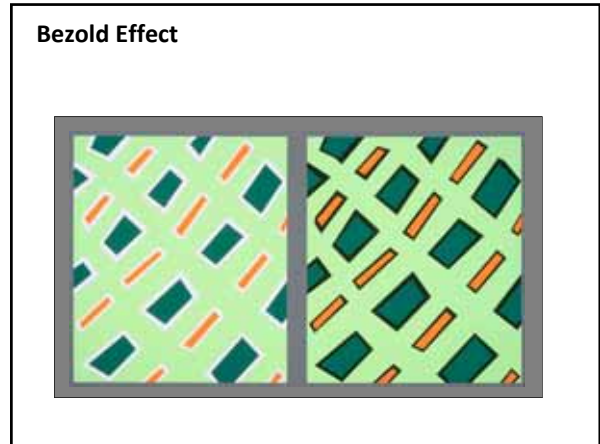
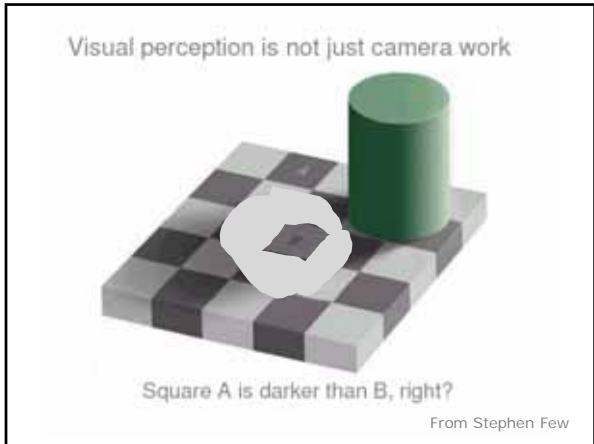
From *Vision and the Art of Seeing* by Margaret Livingstone











Define groups

	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
red	25.37	13.70	0.05	26.27	14.13	0.04	18.41	10.16	0.05	17.43	9.30	0.00
green	22.14	51.24	0.35	20.68	49.17	0.44	21.11	46.00	0.20	16.36	37.95	0.12
blue	13.17	3.71	74.89	15.38	5.20	86.83	11.55	3.37	65.53	9.96	3.44	56.14
gray	63.46	73.30	78.05	64.66	71.99	90.08	52.96	62.49	67.99	45.54	53.65	58.14
black	0.66	0.70	0.77	0.63	0.66	1.09	0.47	0.58	0.70	0.44	0.54	0.71

	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
red	25.37	13.70	0.05	26.27	14.13	0.04	18.41	10.16	0.05	17.43	9.30	0.00
green	22.14	51.24	0.35	20.68	49.17	0.44	21.11	46.00	0.20	16.36	37.95	0.12
blue	13.17	3.71	74.89	15.38	5.20	86.83	11.55	3.37	65.53	9.96	3.44	56.14
gray	63.46	73.30	78.05	64.66	71.99	90.08	52.96	62.49	67.99	45.54	53.65	58.14
black	0.66	0.70	0.77	0.63	0.66	1.09	0.47	0.58	0.70	0.44	0.54	0.71

Contrast creates emphasis

Colors are named

Eleven basic names in English
 Red, green, blue, yellow, black, white, gray, orange, purple, brown, pink

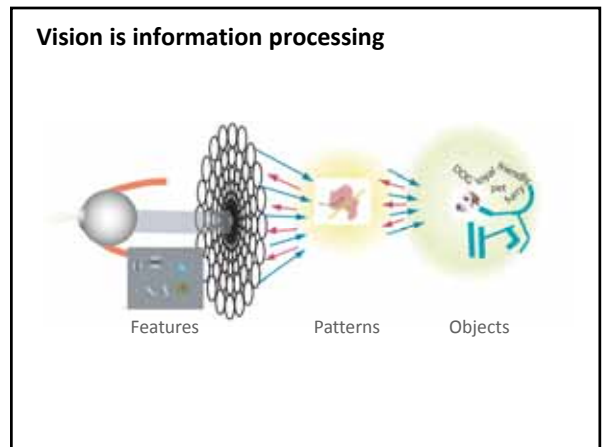
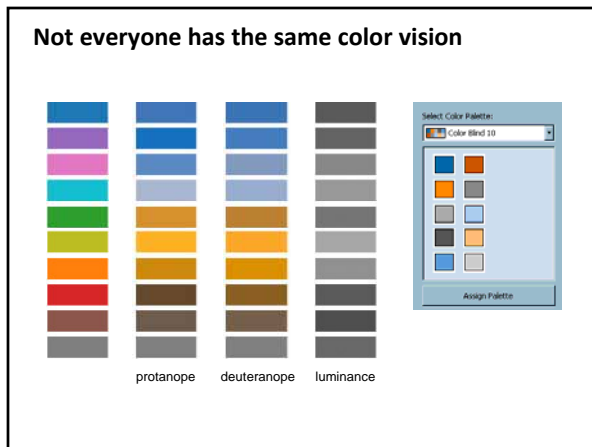
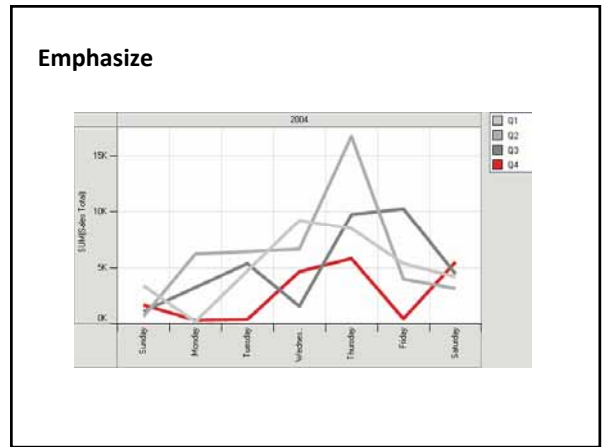
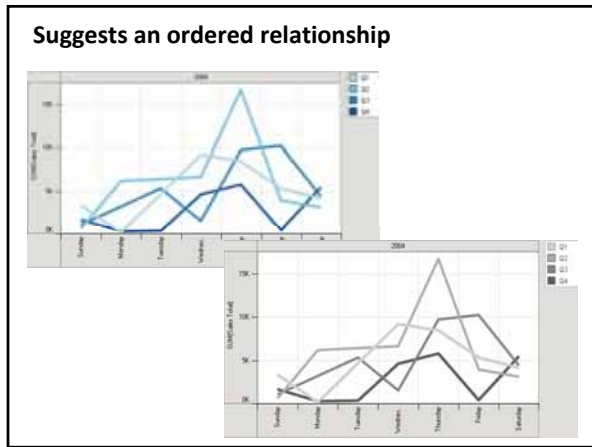
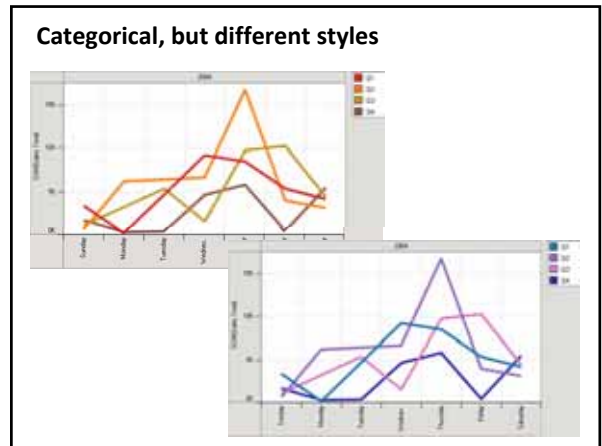
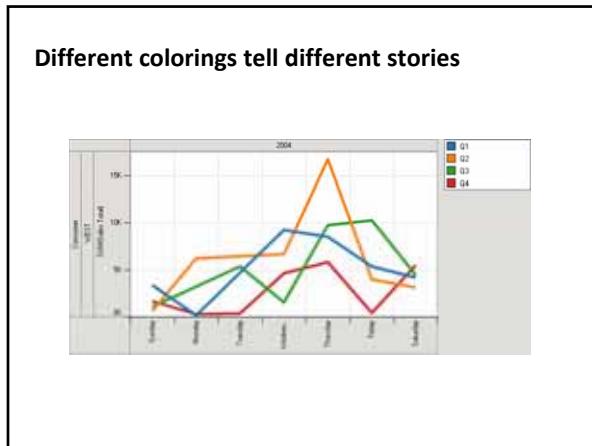
Language, thought and color: recent developments, Paul Kay and Terry Regier.

Categorical colors

Spreading

Bezold Effect

Tell your story



Designed to work with the visual system

The collage contains four distinct visualizations:

- Top Left:** A bubble chart overlaid on a map, where bubbles of varying sizes and colors represent data points in a geographic space.
- Top Right:** A line graph with multiple colored lines (red, green, blue, orange) plotted against a grid, showing trends over time or categories.
- Middle:** A table titled "Teams (select for comparison)" with columns for "Team", "Year", "Score", and "Rank". The table uses a color-coded heatmap to represent the data values.
- Bottom:** A histogram showing a distribution of data, with a red curve overlaid on the bars.

Resources

Colin Ware

- *Visual Thinking for Design*. Morgan Kaufmann

Margaret Livingstone

- *Vision and Art, the Biology of Seeing*. HNA Press

Edward Tufte

- *Envisioning Information*. Graphics Press

Stephen Few

- *Now you see it*. Analytics Press

Maureen Stone

- *A Field Guide to Digital Color*. AK Peters

Jock Mackinlay

- *Information Visualization: Using Vision to Think*. Morgan Kaufman
co-authors: Stuart Card, Ben Shneiderman