the messenger of experience

form

and color

2.744 product design
I'll always find you

the messenger of experience
form and color!

I’LL ALWAYS FIND YOU

I’ll always find you
but first…

a mini quiz!

list 4 *steps/levels* in a systematic form-giving process

list 3 types of transition or “corner” types, and what qualities they convey
part 1
form-giving process

structure
what it is
topology
proportions
directionality

surface
feeling
corner treatments types evoke different feelings
consistent use of treatments form a style or brand

details/color
graphics

working in clay gets your hands dirty
surfaces
form-giving process

precise, structured, dangerous
utility, practical, unrefined
sophisticated, fluid, inviting

$C^0$ positional continuity
$C^1$ tangent continuity (first derivative)
$C^2$ curvature continuity (second derivative)
surfaces
form-giving process
dangerous + inviting
hybrid forms
precise + sophisticated
precise + unrefined
surfaces
form-giving process
form/corner treatment vocabulary
form-giving process
surface

rectangle exercise

the feeling
form-giving process
expressive rectangles
form-giving process
expressive rectangles

happy (elizabeth)

happy (micheal)
form-giving process
expressive rectangles

young (ryan)
young (sami)

young
old
sad
happy
calm
angry
form-giving process
expressive rectangles

old (anika)

young
old
sad
happy
calm
angry

sad (ben)
form-giving process
expressive rectangles

angry (stephanie)
calm (cameron)

young
old
sad
happy
calm
angry
form-giving process

expressive rectangles

angry (kevin)

young
old
sad
happy
calm
angry
calm (vrushank)
the messenger of experience

form and color

2.744 product design
part 2
form-giving process

structure  surface  details/color  graphics
form-giving process
details

sympathetic to the overall structure and surface

proportions/grid

flow and direction

surface corner vocabulary
form-giving process

details

organize elements

- grouping
- proximity
- similarity
- continuation
- common region
- connectedness
- closure
form-giving process

details

add predictability and variety

rhythm between or within groups

- number
- arrangement
- dimension
- shape
- color
form-giving process
details/color

visible electromagnetic spectrum

wavelength (nm)
form-giving process
details/color

our sensors

rod vision
cone vision

sensitivity

400  500  600  700
wavelength (nm)
form-giving process
details/color

rodopsin
sensors: dark adaptation
resolution of night vision < 20/200

rod/cone adaptation

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Rods</th>
<th>Cones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

color adaptation

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Red</th>
<th>Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
light sensitivity ranges over 9 orders of magnitude!

white paper can be 1,000,000,000 times brighter in outdoor sunlight than on a moonless night.

but we can only sense across 3 orders at a time

at any time, $10^6$ levels of our range are either black or white
form-giving process

details/color

cone pigments

![Graph showing absorption of wavelength (nm) for short, medium, and long wavelengths.](Image)
form-giving process
details/color

object color/reflectance
fruits and vegetables

reflectance

reflectance

wavelength (nm)

wavelength (nm)
form-giving process
details/color

object color/reflectance

reflectance

white bond

20% gray card

black paper

wavelength (nm)

400  500  600  700
form-giving process
details/color

color and light source

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>Sun</th>
<th>Tungsten</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Color temperature?
form-giving process
details/color

simultaneous contrast  color and context
form-giving process
details/color

simultaneous contrast  color and context
form-giving process
details/color

and so the take-home design message is…?

our perception of color depends on many things
light source, light levels, surrounding context, adaptation

test in use conditions
form-giving process
details/color

color wheel (circa 1700)
your tool for understanding what goes with what
form-giving process
details/color

basic color wheel
warm and cool

warm
cool
cooler
cooler
form-giving process
details/color

all contain red

basic color wheel
colors in common
form-giving process
details/color

basic color wheel
colors in common

all contain blue
form-giving process
details/color

basic color wheel
colors in common

all contain yellow
form-giving process
details/color

basic color wheel
your tool for understanding what goes with what

this is pure hue
form-giving process
details/color

color dimensions

- hue
- lightness/value
- saturation/purity (blend to center)

primary colors:
- red
- yellow
- blue

secondary colors:
- orange
- green
- violet

tertiary colors:
- pink
- brown
- turquoise

color dimensions:
- intensity
- wavelength (nm)

Blend to center for saturation/purity.
form-giving process
details/color
color dimensions
paint speak
tint (add white)
shade (add black)
form-giving process
details/color

color schemes
one point

vivid focus, often used in products
form-giving process
details/color

color schemes
contrasting or harsh

strong patterns, children’s products
form-giving process
details/color

color schemes
similar

quiet, calm, homey
form-giving process
details/color

color schemes
separation

accents differences or tones down
details/
color
form-giving process
color schemes
primary
secondary
primary
contrasting
complementary
analogous
separation
accents differences or tones down
form-giving process
details/color
color and emotions
warm palette
intense, danger, secure
form-giving process
details/color

color and emotions
cool palette
calm, relaxed, unprovocative
form-giving process

details/color

color and emotions
mixed emotions

unsettling (a ralph color scheme)
form-giving process
details/color

color and emotions
value and saturation

tranquil, weak, inexpensive
form-giving process

details/color

color blindness
design considerations

monochromatism: 0.001% of population

protanopia: 1% males, 0.02% females (red/green)

dueteranopia: 1% males, 0.01% females (red/green)

tritanopia: 0.002% males, 0.001% females (blue/yellow)

value (lightness) based schemes
form-giving process
details/color
color setting process

i) product goals, image, function, form
ii) value/lightness, temperature

iii) background color (receding)
iv) accents (color scheme)
v) limit your pallet (typically 3 or fewer)
form-giving process

color challenge

give feeling/emotion through color

<table>
<thead>
<tr>
<th>Feeling</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>angry</td>
<td>1</td>
</tr>
<tr>
<td>young</td>
<td>2</td>
</tr>
<tr>
<td>old</td>
<td>3</td>
</tr>
<tr>
<td>mysterious</td>
<td>4</td>
</tr>
<tr>
<td>happy</td>
<td>5</td>
</tr>
<tr>
<td>sad</td>
<td>6</td>
</tr>
<tr>
<td>calm</td>
<td>7</td>
</tr>
</tbody>
</table>

look inside your name card
download exercise file and references
set color palette
use only colors in palette
only change colors

name feeling_username.png
150 dpi
email 2744ta@mit.edu file
a structured approach
form-giving process

structure  surface  details/color graphics

laptop/software you are comfortable using for graphic/text editing (ppt, keynote, illustrator, photoshop, etc.)
learn how to put text on a baseline before class