IAT 336: Materials in Design
Student Material Sheet
Lab 1- PART A: Exploration of Materials
Fall 2015

In this lab, we will explore the wide spectrum of materials that can be appropriated and manipulated by designers. Many of these materials are not only unique in their visual appeal (e.g. colour, patina, texture) but also in their physical properties (e.g. the shapes and forms that in which they can be formed.)

Objectives of this Lab:

1. By completing this lab, you will:

- Appreciate the aesthetic and utilitarian qualities of various design materials.
- Compare and contrast design materials in different contexts.
- Distinguish properties of materials and their associated functions
- Compare and contrast the effects of using the same material in different contexts
- Demonstrate a visually pleasing annotated mood board.

2. Deliverables: This is a two-week lab. We will complete Part A this week

- **Part A:** 11x17 sheet with images, annotation and or sketches DUE next week
- **Part B:** Digital poster of product dissection (This assignment will be started next week). Due in labs, week four.

3. Steps to Follow:

- **Group numbers:** Please create teams of maximum ***two students***. You will retain this complement for part B (next lab)
- **Complete Part A:** Complete exercise using 11X17 inch sheet of paper.
- **Submit Part A next week. You will then start part B of the lab next week.**

4. Content:

Select a material from the list and identify 1 everyday common use or product e.g. glass for windows, AND one not so ordinary use of the same material e.g. glass eye. Then **compare and contrast** on these aspects:

- **Context of use for both examples** *(e.g. automobiles, architectural, etc.) Specify a specific context where the material is used e.g. window glass.*
- **Aesthetics of material of both examples** includes colour, textures, finish *(e.g. transparent, coarse, tinted glass) What kind of finish/es does the material exhibit in your examples?*
- **Describe the physical forms** that can be made from this material in the products you selected e.g. structural concrete can be formed in many shapes e.g. cylinders, *rectangles, etc..Glass can be rolled in sheets.*
- **Function of materials** *(what function do they perform e.g. glass windshield keeps elements like rain out of car.)*
- **Shortcomings and positive aspects of both examples for same material. Describe functional, aesthetic** *(e.g. glass allows light in, but cannot support a heavy load such as a building structure)*
- **Other:** Are there other reasons that the designer may have chosen this material for both uses? E.g. emotional connotation etc.?

5. List of Materials (Choose one):

1. wood

2. plastics

3. carbon-fibre

4. fabrics *(e.g. organic or synthetic e.g. suede, leather, nylon etc.)*

5. glass

6. concrete

7. metals *(be specific e.g. steel, aluminum)*

8. Anything that doesn't fit this list? E.g. nano-materials? Ask us for approval

6. Specifications for Moodboard:

- 11X17" Landscape format

Output Options

- **Media:** Fineliner pen (for sketches, annotation). Hand-sketch your examples and add handwritten annotation
- **Images:** magazine cut-outs, catalogue images, print-outs from downloaded images and typed annotation.
- **Photoshop/Illustrator collage:** using digital tools to create moodboard
- **Samples:** Some students brought samples of materials in lab to show their peers.

7. Grading:

Part A (this lab is worth 5%) of total grade.
10% of total course grade (Parts A and B) You will be graded on quality and depth of content, layout, design and tidiness.

8. Due: in lab next week.

9. Cool links:

Concrete:
http://www.concretenetwork.com/concrete/concrete-statuary/design-ideas/concrete-coffee-maker.html

Glass snowboard:
http://www.core77.com/blog/materials/cool_materialsproduction_method_video_can_a_glass_snowboard_be_done_24431.asp

IAT 336: Materials in Design
Student Material
Lab 2- PART A: Human Factors and Form
Fall 2015

In this week's lecture we were introduced to the science of human factors. Simply put, human factors involves the study of all aspects of the way humans relate to the world around them, with the aim of improving operational performance, safety, and the improvement in the experience of the end user.

One method for a designer to understand the relationship between human factors and design is to design a physical form (including interface) for a product. Physical forms are the bridges between the functionality of a device and the actions of the users. Some of the important criteria in judging an intuitive design are: **Physical interaction** (human motions [how will it be used?] as well as size and form that rely on human factors tables.

Team Formation: 3 students (you will retain this complement for the second part of the lab next week)

1. Objectives of this Lab

This lab will prepare you to:

1. Design and build three form factors (flashlight form and functional button) for three unique user contexts.
2. Explain the relationship between the ergonomic requirements of three distinct users
3. Create simple ergonomic blue foam models conforming to chosen user requirement
4. To explore and justify various form factors for different contexts of use.

2. Deliverables:

1. Three blue foam models of flashlights (one per team member) focusing on one of the three end-users.
2. The flashlight does not have to illuminate, but functionality must be clearly indicated/simulated on the model e.g. lens, activator/button
3. Written answers (1 page) on grid sheet provided (Part 2A).
4. Other observations or sketches to show initial ideas and findings can be added.
5. You must include ergonomic measurements on the grid sheet related to hand sizes and or grasping sizes for your intended end user. They can be sketched or drawn by computer.

3. Steps to Follow:

A. **Group numbers:** Please form a three-person team. You will retain these for part II next week.

B. **Pick one user group (one for each team member) from the following list:**

I. **Construction Worker** (think of a specific context e.g. working in confined space with gloves on)

II. **Elderly person** living at home with arthritis in their hands and wrists. The arthritis is affecting their ability to use their hands normally (e.g. grasping or clenching fists is nearly impossible).

III. **3 Year-old Child:** a child this age does not have fine motor skills but can easily grasp, push, kick objects. Consider that their hands and fingers are not fully developed size-wise compared to adults.

C. **Complete Part 1:** (grid sheet) - use the table template to help design your flashlight form, particularly motions (you can act these out), posture (uses whole hand, fingers?), position (it is held, worn as an appendage?), function (how does the light turn on and off), Shape considerations. You can annotate and draw sketches to support your ideas.

D. Research ergonomic tables for hand sizes and suitable shapes for form factor. Consider also buttons/switches if applicable. You can use these online resources:

   I. Children's hand measurements
   http://ovrt.nist.gov/projects/anthrokids/child.html

   II. Hands sizes /Gloves (for construction workers)
   http://www.glove.org/Modern/glovemeasure.php

   III. Table provided (see next page)

E. Build your physical model using blue foam

F. Submit physical model/s and answers from table for final grading next week. (no poster required)

G. Prepare to give a two-minute presentation of your findings next week.

4. Other Considerations:

- This is not a styling exercise. You will be graded on the thoughtfulness of your design and research. You have to justify your design choices and form selection choices.
- Consider the functionality (button/switch) and form of the flashlight.
- **THINK OUT OF THE BOX:** Can you come up with a novel solution for the form? e.g. how Dyson came out of the roller ball idea for their vacuum machine. Same analogy applies.
  - Make use of the operation of the hand, must be hand/finger operation. You can also interact with another appendage e.g. tap flashlight on thigh.
  - Please put emphasis on the interaction between user the on/off activation button.
  - Research how other flashlight manufacturer or designers designed flashlight
  - Ergonomics/measurements of the flashlight, that ties to form.
- **Prohibited:** Headband flashlights, mouth-operated flashlights
- Your flashlight interface **can-not** be solely gestural based…e.g. waving your hand. There has to be physical, tangible interaction with the device one or both hands.
- **The flashlight does not have to illuminate, but functionality must be clearly considered as part of the model e.g. an activator/button that moves.**
- **Buttons, activators that are drawn on model are not allowed**

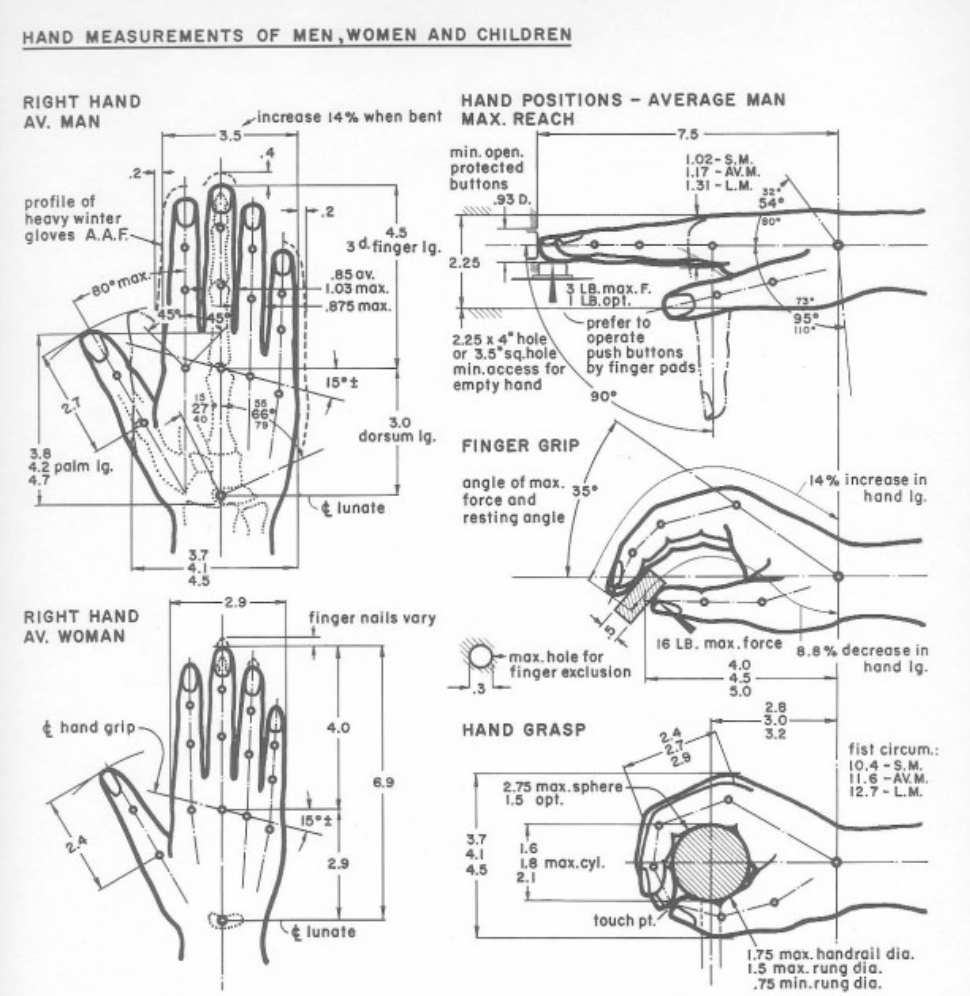
5. Next Steps:

In part B of our lab (next week), we will consider the aesthetics of the flashlight and their connotations.

6. Grading: <u>DUE NEXT WEEK (week 4) in labs</u>

Worth 7.5% of course grade

- You will be grade heavily on the thoughtfulness of your interaction/functionality of the button, ergonomic considerations
- Other areas we look for will be the fit and finish of the models, creativity, form, thoughtfulness, aesthetics etc..

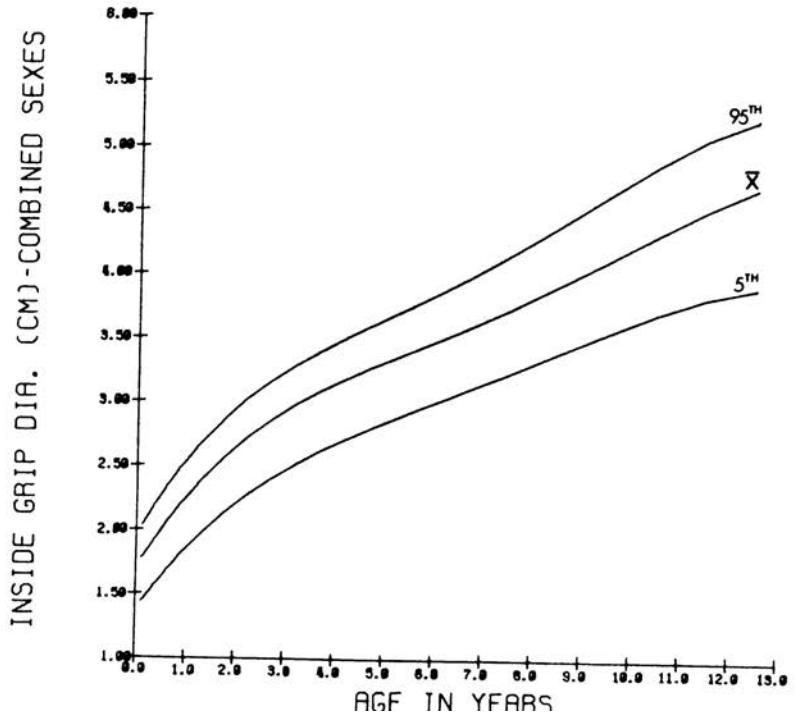


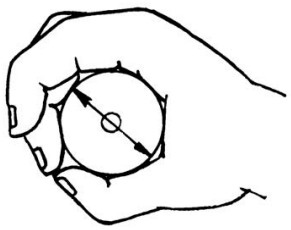
HAND DATA	MEN			WOMEN			CHILDREN			
	2.5% tile	50.% tile	97.5% tile	2.5% tile	50.% tile	97.5% tile	6 yr.	8 yr.	11 yr.	14 yr.
hand length	6.8	7.5	8.2	6.2	6.9	7.5	5.1	5.6	6.3	7.0
hand breadth	3.2	3.5	3.8	2.6	2.9	3.1	2.3	2.5	2.8	—
3d. finger lg.	4.0	4.5	5.0	3.6	4.0	4.4	2.9	3.2	3.5	4.0
dorsum lg.	2.8	3.0	3.2	2.6	2.9	3.1	2.2	2.4	2.8	3.0
thumb length	2.4	2.7	3.0	2.2	2.4	2.6	1.8	2.0	2.2	2.4

Note: Table in inches. 50% tile is the average size.

INSIDE GRIP DIAMETER, IN CMS. - COMBINED SEXES

AGE(MO/YRS)		N	MEAN	S.D.	5%	50%	95%
0- 3		134	1.71	0.19	1.43	1.61	1.99
4- 6		102	1.94	0.19	1.59	1.85	2.20
7- 9		52	2.09	0.20	1.64	2.02	2.34
10- 12	1	42	2.18	0.20	1.75	2.10	2.47
13- 18		57	2.38	0.23	1.93	2.31	2.68
19- 24	2	68	2.58	0.18	2.23	2.51	2.81
25- 30		65	2.74	0.25	2.26	2.64	3.13
31- 36	3	103	2.89	0.24	2.41	2.81	3.21
37- 42		272	2.98	0.21	2.57	2.89	3.25
43- 48	4	293	3.03	0.23	2.60	2.93	3.33
49- 54		361	3.16	0.23	2.72	3.07	3.49
55- 60	5	329	3.25	0.24	2.78	3.15	3.61
61- 66		245	3.32	0.26	2.81	3.24	3.68
67- 72	6	175	3.43	0.26	2.85	3.33	3.80
73- 78		176	3.54	0.25	3.08	3.44	3.86
79- 84	7	171	3.61	0.26	3.18	3.51	3.96
85- 96	8	279	3.79	0.28	3.27	3.67	4.23
97-108	9	271	3.96	0.30	3.44	3.83	4.45
109-120	10	258	4.09	0.35	3.54	3.99	4.64
121-132	11	203	4.33	0.35	3.70	4.24	4.87
133-144	12	117	4.47	0.37	3.78	4.38	5.00
145-156	13	53	4.74	0.39	3.95	4.61	5.30





IAT 336: Materials in Design
Student Materials
Lab 2- PART B: Human Factors, Form and Aesthetic Connotations
Fall 2015

In our previous lab, we learned about the relation between materials, human factors, and product design. In this week's lecture, we learned that products and materials display diverse emotional attributes and associations in relation to contexts, the users and design intent.

Team Formation: 3 students (you will retain the same complement from last week)

1. Objectives of this Lab

This lab will prepare you to:

a. Compare and contrast affordances and constraints of materials in a specific context paying attention to the requirements of the end user (table)
b. Explain the relationship between the materials and the style of interaction in contexts (rendering)

2. Deliverables: 15% in total (part A and B)

a. Table poster (part 1) and foam model
b. Rendering Poster, Short summary and presentation (part 2)

3. Steps to Follow:

a. **Group numbers:** Please retain the existing three-person teams from the previous week.
b. **Complete Part I: (table poster) - use the template to create a table that will help you to delineate the relationship of materials to user and context. Submit for feedback and signoff.**
c. **Proceed to Part II and as a team, complete the requirements for producing your mood board, final summary and team presentation.**
d. **Submit Part 2 for final grading next lab.**

4. Specifications

Part I: Table Component – comparing of materials in contexts.

In the critique, we isolated one foam flashlight model to proceed to the second part of the lab. With your chosen foam flashlight, pick **one constraint** from the list below (also on Part 2B on handout) e.g. hygienic and expand on this. Use the template of your mood board to illustrate the results of your table, the details of materials in relation to one persona (e.g. construction worker). Next, select another material that you think could be used to produce this model- that is not so common or is innovative.

Pick (one) of the below categories of <u>constraints</u> when you are identifying your materials:

- Rugged, durable
- State of the art/high tech
- Environmentally friendly/ecological
- Desirable for children
- Hygienic and easy to clean
- Can you think of another category? Run it by us.

****Do not** combine categories**

Part II: Moodboard for Chosen Constraint

To ensure that you have selected the most appropriate materials for your designs, you are encouraged to research magazines, catalogues etc. for the kinds of aesthetic choices that you assume or imagine your target group/context would require for the flashlight. Make sure to draw labels and annotate your choices and the rationale behind them.

What needs to be on the Moodboard:

- Photo of your physical foam prototype from last week.
- Persona of user (e.g. construction worker)
- Your chosen constraint in a heading (e.g. hygienic)
- Brief description of interaction/style for chosen flashlight (use images/sketches and text to describe)
- Sketches/ideation if applicable (from Part 2A)
- Information from the written table (Part 2B). You can use a different table format if you choose.
- Illustration / Rendering of material association applied to flashlight e.g. SolidWorks, Photoshop (make sure to depict material, colour choices faithfully) For the novel material, you may show swatches of materials or photos. It need not be applied twice.
- For the material chosen, explain why it is representative of your chosen constraint e.g. hygienic. You may show additional photos to support your choice.
- For the alternative material, you can show a swatch of the material or render the model in this material. Explain your choice.
- With the chosen physical model from the critique, make updates, revisions (ergonomic, functional). These should be shown graphically using rendering or illustration software- don't update your physical model.
- Prominent title, sub-heads and text explaining choices where needed. Give your product a name e.g. 'Tough Flashlight'
- **Write a paragraph summary: [Can be in point form]**
    a. Comparison of the differences in the 3 contexts including the forms
    b. Explain the role of the constraint that you selected on your choice of materials (consider the everyday materials and the innovation materials)
    c. Note the most interesting thing you have learned about materials in this lab.

5. Deliverables:

Specifications for each printed moodboard [poster]:

- Min. 17x22 inches or (2) 11x17 colour prints taped or mounted on foamcore
- A title for your group project and a list of each member in the group
- Please upload a digital PDF copy to Canvas.

6. Due Date/Submission:

- **At beginning of lab next week (week 5). Late submissions will be penalized as per syllabus.**

Worth: This lab is worth 7.5%**.** The two labs (2A and 2B) are worth 15% together.

IAT 336: Materials in Design
Student Material- Week 5
Lab 3- Manipulation of Sheet Materials (Styrene Model Making)
Fall 2015

Background

Prior to the advent of the Industrial Revolution, and mass production, model making was limited to carving wood, bone, paper and simple metal cast from molds. With the invention of the Injection Molding Machine (invented in 1872 by the Smith & Lock Company) and cellulose acetate plastic (produced in 1919 in Germany), a whole new era of model making capabilities arose. Polystyrene (styrene) plastic (perfected by BASF in the 1930s) became the dominant form in which model kits were made. This bendable and glue-friendly material can be created in sheet form, much like paper, in various thicknesses. Additionally, styrene can be manipulated in many ways. It can be cut, sanded, glued and painted. Styrene can also be formed into various shapes using heat and vacuum.

Team Formation: 2 students [Please form new pairs]

Objectives of this Lab

This lab will prepare you to:

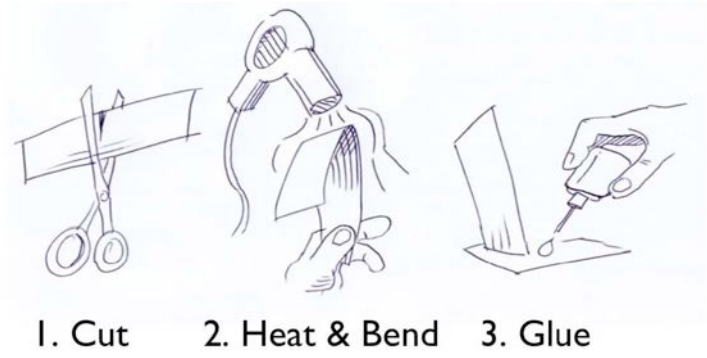
1. Create and cut stencils using styrene
2. Assemble styrene parts using solvent glue
3. Create complex shapes using heat gun and hand-bending
4. Optionally utilize pre-formed styrene shapes (e.g. coffee lids) in a different means than originally intended.
5. Use ideation/sketching for design development process

Steps to Follow:

1. **As a team, you will create at least (two) of the four following models using styrene sheet and tube. You may also use a found styrene object e.g. coffee lid as one minor component (optional)**
2. **Each team member must sketch out the product ideas on minimum legal-sized paper before building the model.**

3. **Model Types:**
    a. **Pen/Pencil Holder** (rests on desk and holds at least five writing utensils)
    b. **Business card holder:** Sits on desk and holds at least 10 business cards
    c. **iPhone/Cell phone stand** Sits on desk and must hold iPhone in vertical or horizontal format. You must also consider hold for USB/charger cord.
    d. **Thumbtack, paper clip & post-it note holder**.
4. **Requirements:**
    - Use knife to cut and shape desire components
    - At least one surface must utilize heat bending
    - Composed of at least two physical parts joined by adhesive.

- **Techniques:**
    - Painting or marking (e.g. felts) of surface is NOT allowed.
    - Sandpaper block: Use this to create clean and smooth edges.
    - No other added materials e.g. string, foam, rocks, decals allowed
    - Do not substitute other plastics- please use white styrene



5. **Other Considerations:** Size of model should not be bigger than 5 inches (wide) by 5 inches (long) by 5 inches high. Not smaller than 1.5 x 1.5 x 3 inches high.

Deliverables: 5% of total course mark. [DUE in lab week 6 at beginning]

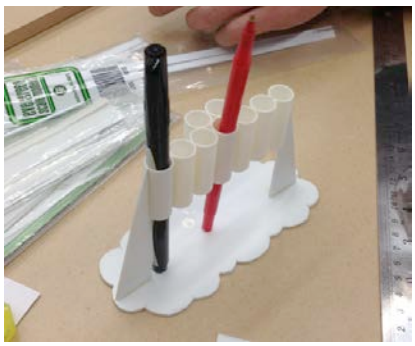
1. Completion of two models in styrene per team.
2. Two 11 x 17 sheet or similar with hand-sketches for designs (one per team member)
3. Models will be graded on creativity, practicality (functionality) and modelmaking (quality, workmanship, accuracy, tidiness)

Cool Resources:

http://ultrawerke.blogspot.ca/2007/03/scratchbuilding-tutorial-part-i.html

Next Steps:

- In our lab next week, we will be looking at resin casting.
- Please bring a small toy to mold with minimum of undercuts.



Images: Snaphow.com