the STUFF of history

WEEKLY ASSIGNMENTS DOCUMENT (WAD) 5

Hello again. Welcome again. We know what you're thinking. WAD4 was the one of the best experiences of your life. You've lived the dream. You've reached the pinnacle of learning. Life is good. And with WAD4 holding office in the state legislature, how could things get better than this? Well, let us introduce you to WAD5. We've been saving WAD5 for this occasion, as its mystical powers are not for the inexperienced. WAD5 has a way of inducing a transpersonal state of joy, insight, harmony, creativity, and euphoria. Like solid aluminum, WAD5 is pure, embodied energy.

PROJECT WORK

DUE DATE: Ongoing

This week, you will continue your historical and materials research, and your laboratory experimentation. Your history reading covers three brilliant topics: art, the environment, and everything else. What, that wasn't helpful? OK, I can elaborate. First, you will get a rare opportunity to (briefly) review the artwork produced by your civilization, in advance of your presentation at the MFA. Second, you will be thinking about sustainability all week, and we ask you to consider the environmental aspects of your ancient society, with an eye towards how the environment shaped the development, adoption, use, and modification of your technology. And third, the paper is due a week from Friday, so it is a last chance to finish your research, gather sources, and plan your report.

The materials science readings provide an introduction to the environmental impacts of materials and materials processing. You'll read about resource consumption and the materials life cycle, and you'll crunch a few numbers to get a feel for the environmental impacts the materials you're studying in your project.

At this point, your laboratory experiments should be winding down, and you **should be thinking about your final report in a concrete manner**. Your analyses should start to look coherent and complete, and you should have some high quality figures and graphs that may be directly inserted into your paper. You all have a detailed paper outline, so this week is a great time to start filling in the outline with text… in other words, ***start writing***! As we mentioned last week, bringing it all together isn't always easy, so **ask lots of questions of your instructors**, share your ideas with us, and **request help** if you hit a road block that seems too difficult to pass. We're here to help!

If you're having difficulties with the writing process, this week is a great time to visit the **writing tutors.** For Spring 2011, the writing tutors are Preeta Willemann, Rachita Navara, and Erika Swartz. Preeta took the Stuff course a few semesters ago, so she's been through this very assignment! Writing tutor specifics are available on the ninja page of Mr. Wiki, and all tutors are also available by appointment:

http://mrwiki.olin.edu/mrwiki/AskANinja

MFA TRIP PREPARATION

DUE DATE: Tuesday, February 15, midnight

Hooray! We're going to the MFA! But before you do so, please complete the following tasks as an ancient civilization team.

- Help each other find rides. OK, this need not happen in your ancient civ teams, but all of you have to sign up individually at http://mrwiki.olin.edu/mrwiki/StuffOfHistoryMFARides. Plan to **leave Olin no later than 3:20 PM and do so earlier if at all possible** -- this is a fun day and you can use the additional time to prepare an extra-special talk and explore this amazing museum. For maps and directions you can look at www.mfa.org
- Designate one member of your ancient civilization group to carry their copy of "Handbook to life..." (if it is helpful) to the MFA tomorrow. Or, have one member bring a laptop containing information about your ancient civilization (see next bullet). The goal is to have some historical information with you in the MFA as you prep your gallery talk.[1]
- Meet as a group for about 20-30 minutes on Tuesday to plan your MFA talk. Briefly look over your old presentations, readings, or notes in search for information about *your civilization's overall approach to art and to material culture*. At this time you should also look at the www.mfa.org website, and specifically the "collections" link. What are some candidate items that you can discuss tomorrow? What are some interesting cultural points that you can connect to those items? Write up your findings.
- Get yourselves in the right mood by drinking some vanilla coke and playing a song that reminds you of your civilization. You can select low-hanging fruit of course ("We are the Mesopotamians" "I'm Turning Japanese" "The Theme From Animal House" or anything by Maya) or you can choose a subtler selection. Please share your final theme music choice with Jon and Rob.
- For your reading pleasure, the presentation assignment from the POPO is included right here:

  Feb 16: Ancient Civilization museum talk! We will have a field trip to the Museum of Fine Arts to examine their Mesopotamian, Mayan, Greek, and Japanese artifacts. Visit the web site at www.mfa.org and learn what you can about their collections for your society. Be prepared to guide the class through your section and answer some of the following questions (you choose which ones):

  - Which artistic media (sculpture, painting, etc.) had the most prominence?
  - Describe the artistic styles and criteria in your civilization.
  - Relate the use of art and these specific items to your civilization's societal values, history, cultural paradigms, or economy (i.e., draw connections between MFA items and your readings thus far).
  - Comment on the material and technological aspects of these artistic items.

READINGS

DUE DATE: Wednesday, February 16, midnight

- **Chapters 2 and 3** in Ashby, Michael F., *Materials and the Environment* (New York: Butterworth-Heinemann, 2009). Jon will email a pdf version of this reading to you over the weekend.
- This week, we will be making use of data in the CES EduPack software that describes some environmental impacts of materials and materials processing. We'll also ask you to do some web searching for additional environmental impact information on your materials.

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[1] Note that the MFA has a "no handbag" policy -- you check coats and bags (for free) when you enter. They won't mind if you bring in a book, and I assume a laptop is allowed too. Please reward the teammate who carries their book/laptop into the MFA by designating them a "Peer of the Realm." Or you can give them a poptart.

PRESENTATION FOUR

DUE DATE: Wednesday, February 16, at the MFA!

On Wednesday, your great adventure is about to begin. Please follow this plan:

1. Eat a good breakfast. How's the french toast looking today? Sausages anyone? Maybe some eggs?
2. Go to your morning class or do whatever you normally do in the morning. But smile as smugly as possible whenever anyone sees you. If they ask why, hum a few bars from your theme song and walk away in a pompous manner. Strut.
3. Eat lunch... unless you want to eat lunch at the MFA!!!!!!!! Probably not. OK, just eat lunch. Toast your cookies with pride.[2]
4. Head to the MFA no later than 3:20 PM by following the designated transportation plan -- and **BRING YOUR OLIN ID**.
5. When you arrive (hopefully no later than 3:50ish), show your ID at the entrance desk and explain that you are here for a class activity through Olin College. They will give you a special ticket. Cherish it.
6. Check your coat/bag if you want, grab a map, head to your ancient civilization's room, and look around. When other members of your group arrive, finish planning your gallery talk.
    - every member of your team needs to participate at least a little
    - you have up to 15 minutes for this talk, no more!
    - brief q/a after the talk
    - you need to focus -- there's way too much to cover so be selective

7. At **4:35 PM**, stop your preparations and walk to the **Japan** room (probably on floor one). Use your map (step 6) to get there promptly.

    7a. **Japan group**: as hosts, you should help to direct us all to the starting point of your talk. We won't know which part of the Japan exhibit matters most to you, so joyously greet and herd us.

8. Schedule:
    - **Japan** = 4:45-5:05 PM (mostly on floor one I believe, but the map lists floor two as well)
    - **Greece** = 5:05-5:25 PM (early stuff on floor one, awesome classical stuff on floor two)
    - **Mesopotamia** = 5:25-5:45 PM (you guys have one amazing room on floor one, but check the hallway too)
    - **Maya** = 5:45-6:05 PM (I have no idea, this section was recently redone!)

REMINDER: we represent Olin, so we need to behave. The main issue in the past has been crowding, so try to let other visitors and heavily armed guards pass by without jostling. Presenters can talk loudly but everyone else needs to keep their voices down. Refrain from climbing or sitting on 4,000 year old statues, and if anyone asks you about the etching "Chris Marra Was Here" on a priceless katana dating to the Muromachi period, do your best to feign ignorance. We're still hoping that will blow over soon.

9. When all talks finish we will head to the American wing for Rob's brief Revere talk. And then you are free to enjoy the museum, dine, explore Boston… or head back to Olin for a long night of thankless toil.

[2] Do not allow your cookie to slide into the innards of the toasting mechanism. It will burn.

EXAM 5
DUE DATE: Friday, February 18, class time

Instructions: Examination questions are graded and count towards your course grade as shown in the "Grade Breakdown" table in your syllabus.

This is a **team exam**. Please work on this collaboratively with your project team, and submit one deliverable for the entire team. You may work on this as much as you like, but we'll plan to devote some class time on Tuesday to working on this exercise, and some class time on Friday to discussion. Please submit an electronic copy of your work via **email to both instructors** no later than **class time on Friday, February 18**. A portion of your submission comes in the form of filling out a spreadsheet template, which we'll send to you. For the other parts of this assignment, please use **Word format**.

Estimated time for this entire exam: 3-4 hours, divided across the team

RESOURCES

For this exam, you will need to access the CES Edupack software, which is available on several computers on campus. Locations are as follows:

- Library. The CES software is on a lower level computer located next to the class assignments boxes. There is a small CES sticker on the machine.
- Computer Lab, lower level of Milas Hall. You'll find the CES software on a couple computers in the lab. Look for the CES sticker on the monitor.
- Materials Lab. The CES software is on several machines in the mat sci lab:
    - Microscopy lab, AC429. CES is on the optical microscope computer that is closest to the SEM.
    - Chemistry lab, AC409. CES is on the FTIR computer.

If you're looking for an alternative to the CES software, you can use the Material Profiles in Ashby's *Materials and the Environment* book. Ashby did a nice job of including detailed material data for the most commonly used materials in this section of the book, so you can do some analysis without buying the expensive CES software. There's a hard copy of the Material Profiles on top of the bookshelf at the front of the room in AC413.

1. **ECO IMPACT ANALYSIS.** For this question, your team will use analyze the environmental impacts of a component of your modern product. You'll also use your knowledge of your modern artifact's property and performance requirements to select and analyze alternative materials choices for the component.

    a. Component selection. Choose one component of your object for analysis. You may choose to study whatever component you like (e.g., the plastic handle or the ceramic blade of a knife, a metal fishing hook or composite fishing rod, etc.). Try to pick a component that is relevant for the modern section of your upcoming project report.

    b. Materials selection. Time to do some design work. Think about the property requirements that are necessary for manufacturing, function, and performance of your component. Identify the **three most important properties** for your component, and specify **acceptable property ranges** for each of these properties. For example, if you decide that melting temperature is important for low cost manufacturing of your product, and the material used in your component melts at 150 °C, you may specify an acceptable property range of 115 to 155 °C. If, however, the melting temperature is important for high temperature service of your product, you may specify an acceptable melting temperature range of 145 to 180 °C.

c. Based on the property ranges you specified in part (b), identify **two alternative materials** that could be used in your component. Note that the alternatives do not need to be from the same material classification, e.g., your metal may be replaced by ceramic or polymer or composite.

   - The CES Edupack software provides an excellent way to identify alternatives based on property screening. To do this, click on the **Select** icon at the top of the screen. Under (1) **Selection Data**, select the database you'd like to use (typically "MaterialUniverse: All Bulk Materials". Under (2) **Selection Stages**, click the Limit button. To the right you'll see lots of properties you can use to limit your search. Enter some values for your screening properties, and click the Apply button. You'll see a list of materials that fit your criteria on the lower left. If you'd like to graph the materials, click the **Graph** button under (2) Selection Stages. This opens a New Graph Stage Wizard window, in which you can choose what you want as your x-axis and y-axis. For example, you could choose to plot the list of materials on graph of Embodied energy (J/kg) versus Melting Temperature (degrees C). To get a graph of just the materials that passed your property screening, simply click the "Result Intersection" and "Hide Failed Records" icons at the top of the graph. At this point, you can click on the different material bubbles to find out what each one represents, and double click the bubbles to open the detailed property data sheets. Fun!

d. Identify how the materials are processed, e.g., injection molding, rolling, drawing, powder sintering, etc. The CES software suggests a couple of common processing methods near the bottom of each material data sheet, and these are generally good places to start. You can also browse different processing methods in CES if you go to the ProcessUniverse part of the software.

e. **Environmental Impact.** Let's do some analysis. For your actual material and your two alternative materials, look up the following values:

   - Embodied energy (report in MJ/kg)
   - CO_2 footprint (kg/kg)
   - Recycle fraction.
   - Energy required for processing (report in MJ/kg)

f. Enter the values for you actual component material in a master spreadsheet, and compare your material to those of other teams.

   - We'll send out a link to a master spreadsheet, or perhaps a spreadsheet template, which will be set up to graph your values for easy comparison to other teams' materials.

2. **BEYOND THE NUMBERS.** For this question, let's consider the embodied energy values for your material, as well as the processing energies, a bit more closely.

a. **Embodied energy**. The embodied energy, H_e, is the energy that is committed in making a unit weight of material from its ores or feedstock:

$$H_e = \frac{\sum \textit{Energy entering plant per year}}{\textit{Mass of material shipped per year}}$$

The form of the "unit weight of material" in polymers may be, for example, pellets for injection molding or extrusion, resin for reaction with a hardener, etc. For ceramics, the "unit weight" may be in the form of powder for sintering. For metals, the "unit weight" may be ingots for casting, rod for drawing, plate for rolling, etc.

For your material,

- Describe the steps required to turn ore or feedstock into the raw material used in processing, e.g., how do polymers go from oil or coal to pellets for injection molding.
- Describe the energy inputs throughout this process. Which steps of the process do you think require the most energy?

b. **Processing Energy**. Briefly describe the process used to form your particular product component. Where are the energy inputs for this process, i.e., what are the sources of the "Energy required for processing" value? Compared to other methods of processing, would you describe this as energy intensive or energy efficient?

c. **Recycling**. Discuss the **Recycle fraction** value for your material. What fraction of products made from your material are recycled? For what applications is recycling practical? What are the costs (e.g., energy, waste streams) of recycling? If your material is not recycled, how is it permanently disposed?

d. **Waste streams, ecosystems, and future outlook**. What waste streams are produced during the initial and final processing stages of your material? Where does the waste go? What are the toxicity levels of the chemicals and impurities used during extraction, purification? Where is the processing happening? How do these substances impact the local ecosystem? What advances in sustainable production or reuse/recycling are being explored or implemented? How does the extraction, production, or recycling of your material impact people or communities (consider both positive and negative impacts)? Are we generally moving in the right direction, or are there major problems still to solve? How's the long-term outlook for your material – will we still be using this material in 10 years, 50 years, 100 years?

Note that your answers to question 2d are directly relevant to your part one final report. You might want to answer some of these questions for your ancient counterpart in order to form a parallel argument for your paper, but do not do so as a group, and you do not need to submit that as a part of this WAD.